C200H-CP114
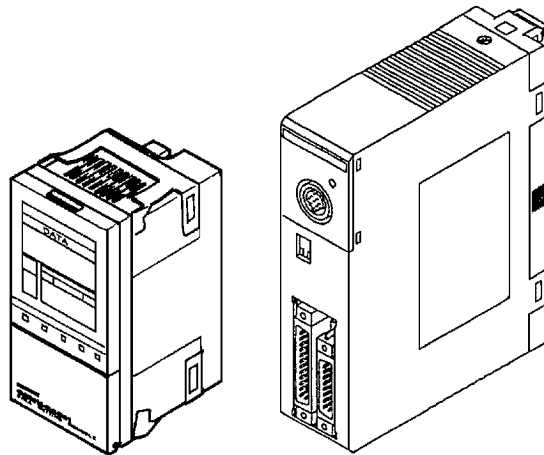# Cam Positioner Unit

Operation Manual

Revised January 2001

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ **DANGER**   Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **WARNING**   Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **Caution**   Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense.

The abbreviation "PC" means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note   Indicates information of particular interest for efficient and convenient operation of the product.

Reference   Indicates supplementary information on related topics that may be of interest to the user.

1,2,3...   1.   Indicates lists of one sort or another, such as procedures, checklists, etc.

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the C200H-CP114 Cam Positioner Unit and includes the sections described below. Also briefly described is the basic operation and installation of the C200H–DSC01 Data Setting Console.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the Temperature Control Unit and Data Setting Console.

Section 1 provides Cam Positioner Unit features and describes its basic system configuration.

Section 2 provides information on the connections and settings of the Cam Positioner Unit.

Section 3 provides the basic operating procedures of the Data Setting Console including data settings and monitoring.

Section 4 provides the C200H□ PC's memory allocation for the Cam Positioner Unit. Basic programming procedures and examples are also provided.

Section 5 provides possible errors and corrections.

The **Appendices** provide information on specifications, resolvers, and dimensions.

⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

PRECAUTIONS

This section provides general precautions for using the Programmable Controller (PC) and Cam Positioner Unit.

The information contained in this section is important for the safe and reliable application of the Cam Positioner Unit. You must read this section and understand the information contained before attempting to set up or operate a PC system and Cam Positioner Unit.

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems
- Personnel in charge of designing FA systems
- Personnel in charge of managing FA systems and facilities

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the OMRON Cam Positioner Unit. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

⚠ WARNING It is extremely important that a PC and all PC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PC System to the above-mentioned applications.

3 Safety Precautions

⚠ WARNING Do not attempt to take any Unit apart while power is being supplied. Doing so may result in electric shock.

⚠ WARNING Do not touch any of the terminals or terminal blocks while power is being supplied. Doing so may result in electric shock.

4 Operating Environment Precautions

⚠ Caution Do not operate the control system in the following places:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.

• Locations subject to shock or vibration.

⚠ Caution Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

⚠ Caution The operating environment of the PC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5   Application Precautions

Observe the following precautions when using the PC.

⚠ WARNING Always heed these precautions. Failure to abide by the following precautions could lead to serious or possibly fatal injury.

- Always connect to a ground of 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- Always turn off the power supply to the PC before attempting any of the following. Not turning off the power supply may result in malfunction or electric shock.
  - Mounting or dismounting I/O Units, Power Supply Units, CPU Units, Memory Cassettes, or any other Units.
  - Assembling the Units.
  - Setting DIP switch or rotary switches.
  - Connecting or wiring the cables.
  - Connecting or disconnecting the connectors.

⚠ Caution Failure to abide by the following precautions could lead to faulty operation of the PC or the system, or could damage the PC or PC Units. Always heed these precautions.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.
- Always use the power supply voltage specified in this manual. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.

- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.

- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.

- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

- Disconnect the functional ground terminal when performing withstand voltage tests. Not disconnecting the functional ground terminal may result in burning.

- Do not attempt to disassemble, repair, or modify any Units.

- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.

- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter such as wire cuttings enter the Unit.

- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.

- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

- Double-check all the wiring before turning on the power supply. Incorrect wiring may result in burning.

- Wire all connections correctly.

- Mount the Unit only after checking the terminal block completely.

- Be sure that the terminal blocks, Memory Units, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.

- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.

- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
    - Changing the operating mode of the PC.
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.

- Resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.

- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.

- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.

- Before touching the Unit, be sure to first touch a grounded metallic object in order to discharge any static built-up. Not doing so may result in malfunction or damage.

- Install the Units properly as specified in the operation manuals. Improper installation of the Units may result in malfunction.

SECTION 1
Features and System Configuration

This section provides Cam Positioner Unit features and describes its basic system configuration.

1-1 Features

The Cam Positioner Unit detects angles of rotation by means of a connected resolver and provides cam outputs with preset ON/OFF angle data.

Numerous Cam Outputs and Set Data Items

A maximum of 48 cam outputs (16 internal/external and 32 internal) are available.

A maximum of seven ON/OFF data items can be set for a single cam output.

A maximum of eight banks of cam data can be present, with each bank consisting of 48 cam outputs.

A bank can be selected from the C200H□ by means of either a peripheral tool such as the Programming Console or the C200H□ user's program.

Applicable Resolvers

Any OMRON-made resolver can be used.

To connect a resolver to the Cam Positioner Unit, use the 20-cm-long auxiliary connection cable that is provided. When using a resolver with no cable attached, prepare a cable for the resolver.

Response Accuracy

Responds at a maximum angle-detecting cycle of 200 µs (with a sampling frequency of 5 kHz) and at a maximum resolver speed of 800 revolutions per minute.

An angle unit of 1° is used for cam output control (resolver resolution).

Data Input and Display

For inputting data, displaying present values, and so on, use the C200H-DSC01 Data Setting Console (sold separately).

The display is easy to read and can be panel-mounted.

Data can also be set by means of the C200H□ user's program.

Easy Adjustment

ON/OFF data can be set or altered by actually moving the machine.

Origin adjustment is possible with either the origin adjustment switch on the front panel of the Cam Positioner Unit or an Origin Adjustment Flag. (Origin adjustment matches the resolver origin with the mechanical origin.)

Cam Data Can be Protected

After debugging and trial operation, the final ON/OFF cam output data can be protected.

To protect the data, set the protect setting pin to "permitted" and make the setting with the Data Setting Console.

Independent protection is possible for each bank and cam output.

Cam Data Can be Set from the C200H□

It is possible to set cam ON/OFF data and required revolution data for a single process via the C200H□ (using a peripheral tool such as the Programming Console, or the user's program).

1-2 Basic System Configuration

C200H PC

C200H-CP114
Cam Positioner Unit

3F88L-CR0R2A Auxiliary Connection Cable
(20 cm provided with Cam Positioner Unit)

3R88L-RS□□□ Resolver

Prepare a resolver cable for
3F88L-RS15 or 3F88L-RS15W
Resolver connection.

C200H-CN225 (2 m) or
C200H-CN425 (4 m)
Connection Cable

External cam output

C200H-DSC01
Data Setting Console

G79-□□□C
Connection Cable (1 to 5 m)

G7TC-OC16 Output Block

Output Devices

Lamp   Fastener   Relay   Solenoid   DC Input Unit

3

Number of Units The Cam Positioner Unit belongs to the C200H Special I/O Unit group. A maximum of ten Special I/O Units (including PC Link Units) can be mounted on the CPU Rack, Expansion I/O Rack, and Slave Rack.

Note 1. Refer to the *C200H□ PC Operation Manuals* or the table below for information on which units belong to the Special I/O Unit group.

2. The Units used are limited by the maximum supply current and current consumption. Refer to the *C200H□ PC Operation Manuals.*

3. The number of Units used with a Slave Rack is limited by data transmission considerations, as described below.

Number of Units Mountable on Slave Rack The number of Special I/O Units used with a Slave Rack is limited by data transmission considerations, as shown in the table below. The numbers in the table indicate the maximum number of Units of groups A, B, C, or D which can be used with a single Slave Rack.

A	B	C	D
High-speed Counter Units Position Control Units (NC111/112) ASCII Unit Analog I/O Units ID Sensor Units Fuzzy Logic Unit Cam Positioner Unit	High-density and Mixed I/O Units Temperature Control Units	Temperature Sensor Input Units Voice Unit	Position Control Unit (NC211)
4 units	---	---	---
---	8 units	---	---
---	---	6 units	---
---	---	---	2 units

Note 1. When a combination of Units from groups A, B, C, and D is used, the number from each group must satisfy both the following equations:

$$3A + B + 2C + 6D \leq 12$$
$$A + B + C + D \leq 8$$

2. Other Units can be added until the total number of units reaches ten. If PC Link Units are used, the number of Units including the PC Link Units must not exceed ten.

Precautions The IR area of the C200H Special I/O Unit is allocated according to the setting of the unit number switch on the front panel, *not* the address of the slot where the unit is mounted. Refer to *4-1 Memory Allocation* for the allocation of the memory area.

Leave the 2 slots next to the CPU free. It is not possible to use devices connected to the CPU (such as the Programming Console) if these slots are occupied.

If the C200H Slave Rack is connected to another SYSMAC model Remote I/O Master Unit, such as the C120, C500, C1000H, or C2000H, it is not possible to use a Special I/O Unit with the C200H Slave Rack.

⚠ WARNING Always turn the C200H□ power OFF before connecting or disconnecting a Unit, terminal block, or output connector.

⚠ Caution Connect thermocouples with the appropriate compensating conductor.
Wire I/O leads in separate ducts from power leads to prevent noise problems.

SECTION 2
Connection and Settings

This section provides information on the connections and settings of the Cam Positioner Unit.

2-1   Nomenclature and Functions

Nomenclature

Front Panel   **Rear Panel**

Model label

Indicators

Origin adjustment
switch

Resolver
connector

Unit number
selector

Operation mode
selector

Data Setting
Console connector

External cam
output connector

DIP switch (for selection of
CW or CWW rotation, protect
setting, and adjustment op-
eration setting)

Rack connector
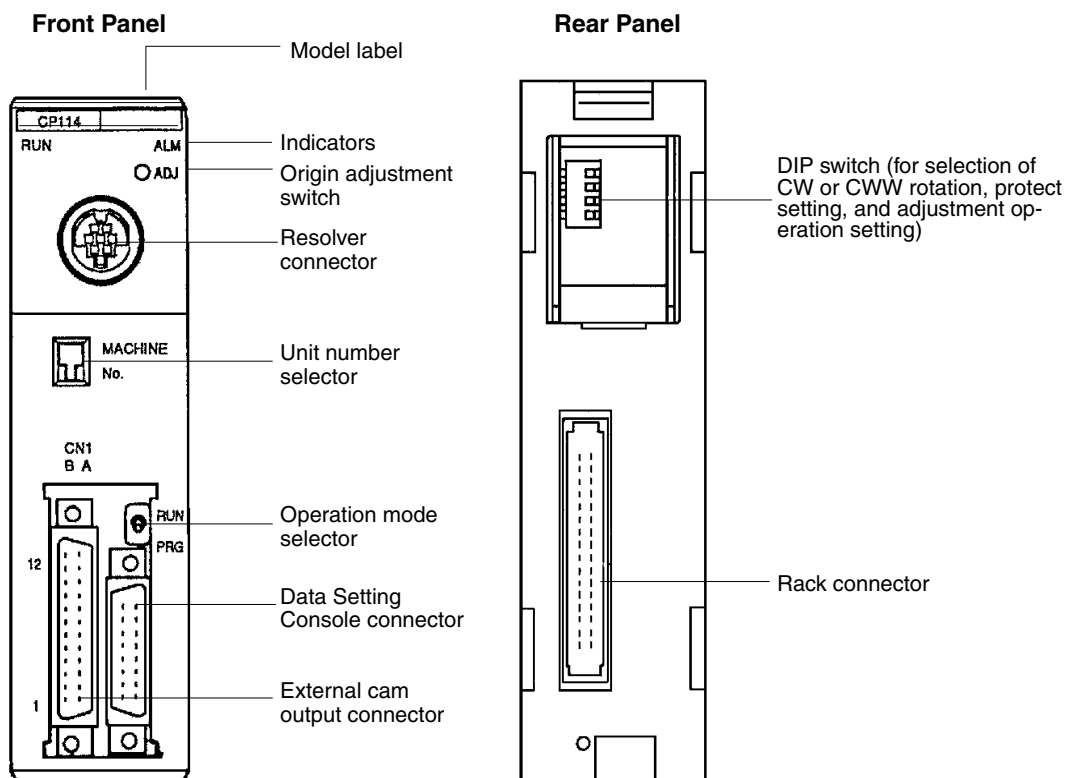
Indicator Functions

RUN	Lit when the Cam Positioner Unit is in normal operation. Unlit when an I/O Unit over error or Special I/O Unit error occurs, and Unit operation stops.
ALM (Alarm)	Lit when the Cam Positioner Unit malfunctions.

2-2   Switch Settings

Unit Number
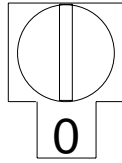
Use a small flat-blade screwdriver to select the unit number, while being careful not to set the selector between two adjacent unit numbers.

Unit no. setting	Allocated words	Allocated DM
0	100 to 109	DM1000 to DM1010
1	110 to 119	DM1100 to DM1110
2	120 to 129	DM1200 to DM1210
3	130 to 139	DM1300 to DM1310
4	140 to 149	DM1400 to DM1410
5	150 to 159	DM1500 to DM1510
6	160 to 169	DM1600 to DM1610
7	170 to 179	DM1700 to DM1710
8	180 to 189	DM1800 to DM1810
9	190 to 199	DM1900 to DM1910

The Unit is factory-set to 0.

Note If the Unit number is set to an existing Unit number, an alarm occurs and the C200H□ does not operate. Turn the C200H□ power OFF before setting the Unit number. If the setting is changed with the power ON, the new setting is not valid until the power is turned OFF and back ON again.

Operation Mode Selector

RUN

PRG
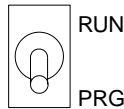
Setting	Operation mode	Function	Function item
RUN	RUN mode	Select RUN to place the Cam Positioner Unit in RUN mode. The following settings are necessary to operate the Cam Positioner Unit (i.e., to turn cam outputs ON and OFF). (1) Set banks 1 to 8 at word n + 1. (2) Turn ON bit 00 of word n (operation flag). (n = 100 + 10 x Unit no.)	Cam output Monitoring of the number of process execution cycles Monitoring of the present cam angle Adjustment operation Bank selection Origin adjustment
PRG	Program-ming mode	Select PRG for setting values with the Data Setting Console.	Cam data setting Cam data protect setting Setting the number of revolutions required for a single process Origin adjustment

Note The mode cannot be switched if the Unit has an error.

Origin Adjustment Switch

◯ ADJ

ADJ	Press this button switch to execute origin adjustment. The set value will be written to the EEPROM.

DIP Switch
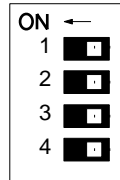
Pin no.	Function item	ON	OFF
1	Direction of rotation	CCW	CW
2	Protect setting	Not permitted	Permitted
3	Adjustment operation setting	Not permitted	Permitted
4	Not used.	---	---

All the pins are factory-set to OFF.

CW direction   CWW direction
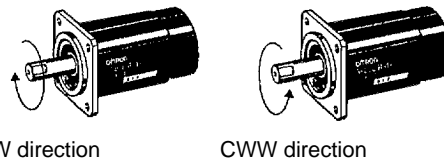
If protect setting and adjustment operation setting are permitted (i.e., if pins 2 and 3 are set to OFF), the settings can be made with the Data Setting Console.

2-3 Wiring

2-3-1 External Cam Output

Connector Wiring Diagram

Cam output number
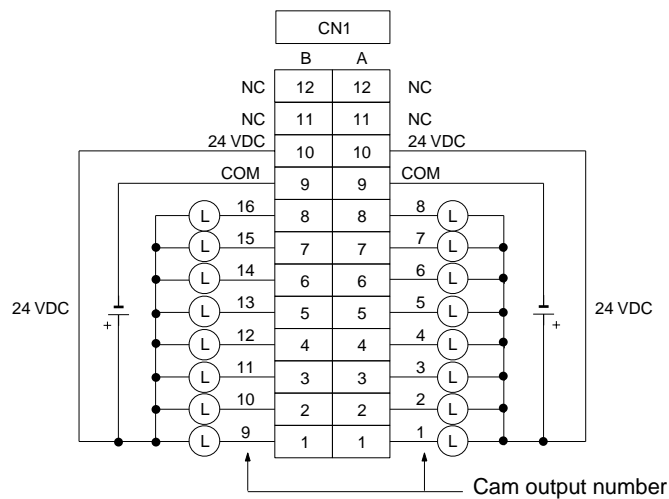
Note 1. Do not connect the load directly until trial operation has been completed. Instead, connect to a device that will enable monitoring the external cam output status, such as a G7TC-OC16 I/O Relay Terminal.

2. Be sure to supply power to terminals A10 and B10, or the Data Setting Console will not operate. Power is supplied to the internal circuit and the Data Setting Console via these terminals.

3. Although there are internal connections between terminals A9 and B9, and between A10 and B10, a wire must still be connected to each of these terminals.

The following connector set manufactured by Fujitsu is included with the Unit:
FCN-361J024-AU (soldered connector)
FCN-360C024-J2 (cover)

Circuit Diagram
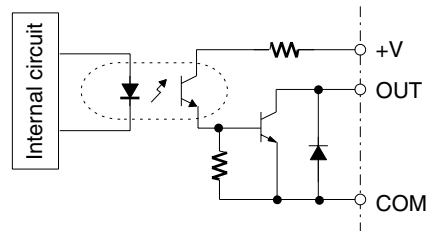
Recommended Cables and Output Blocks

The following external cam output cables are recommended.

Model	Cable length
G79-100C	1 m
G79-150C	1.5 m
G79-200C	2 m
G79-300C	3 m
G79-500C	5 m

The following Output Blocks are recommended.

Model	Rated load		Relays used
	Resistance load	**Inductive load**	
G7TC-OC16	24 VDC 5 A, 220 VAC 2 A	24 VDC 2 A, 220 VAC 1 A	G7T-1112S 24 VDC
G7VC-OC16	24 VDC 2 A, 220 VAC 2 A	24 VDC 0.8 A, 220 VAC 0.8 A	G6B-1174P-FD-US 24 VDC
G7VC-OA16	75 to 264 VAC, 0.1 to 0.5 A		G3S-201PL-PD 24 VDC
G7VC-OD16	3 to 26 VDC, 0.01 to 0.5 A		G3SD-Z01P-PD 24 VDC

Connection Method Example using G7TC-OC16.
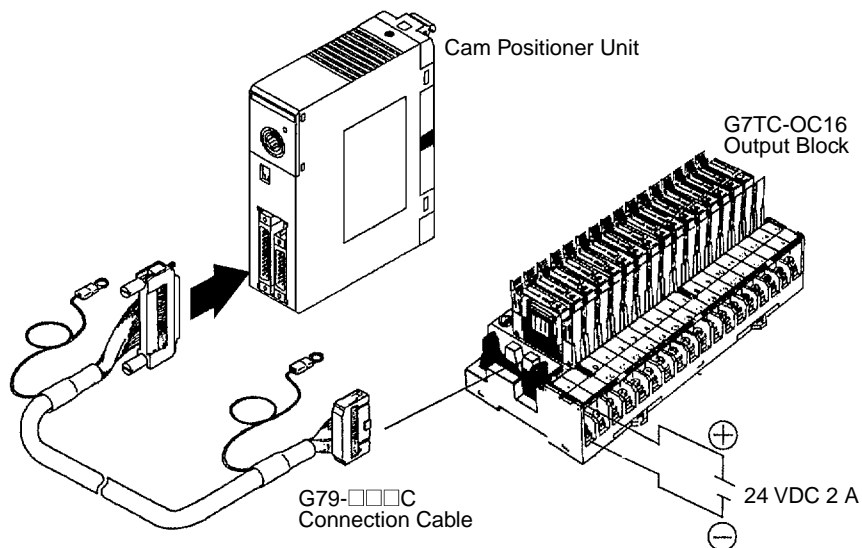
Be sure to lock the connectors securely.

Note If a 24-VDC power supply is not provided, the Data Setting Console and external cam output will not function.

Countermeasures to Noise

In order to prevent malfunctions due to noise, conduct the following countermeasures.

Use shielded wire for external cam output lines and resolver cable.

Be sure to wire power lines (e.g., AC power supply, electrical power lines) and control lines (e.g., external cam output lines, resolver cables) in separate ducts.

Be sure to mount a surge-absorbing diode or surge absorber to an inductive load (such as a relay, solenoid, or electromagnetic valve). Use a surge-absorbing diode with a voltage resistance of at least five times the circuit voltage.

10
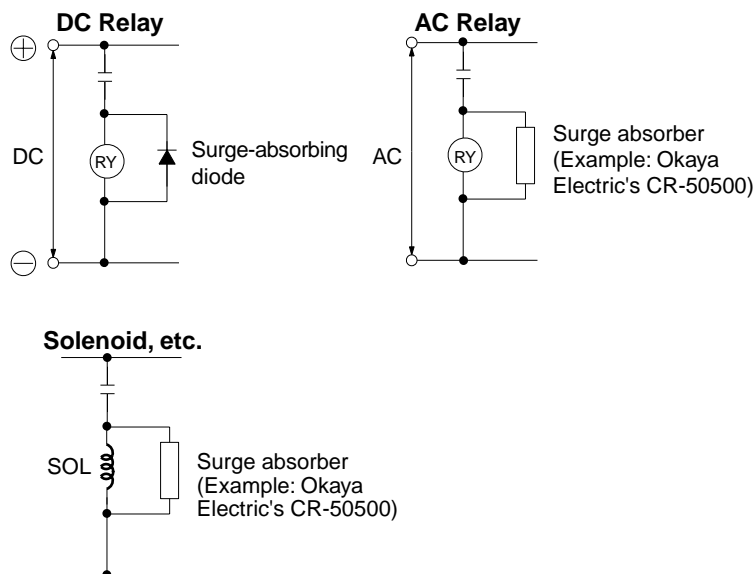
2-3-2   Resolver Connection Cable

To connect a resolver to the C200H-CP114 Cam Positioner Unit, use the 3F88L-CR0R2A Auxiliary Connection Cable which is provided with the Unit.

20 cm
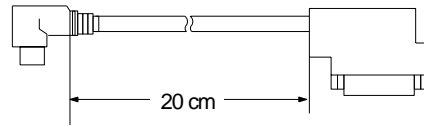
To extend the cable for a 3F88L-RS17 or 3F88L-RS17T Resolver, use 3F88L-CR□□□C Extension Cable. The total length of the connection cables must not exceed 100 meters, or an operation error may result.

Note Secure the resolver cable so that no external force will be imposed on the auxiliary connection cables.

Inserting Connectors into the Unit

Connector for resolver

Insert the connector so that the cable will be pointing downward.

Connector Pin Wiring

Cam Positioner Unit			Resolver	
1	Sin(+)		1	Sin(+)
2	Sin(−)		2	Sin(−)
3	Cos(+)		3	FG
4	Cos(−)		4	Cos(+)
5	OUT(+)		5	Cos(−)
6	OUT(−)		6	FG
7	---		7	---
8	---		8	---
	Connector case		9	FG
			10	OUT(+)
			11	OUT(−)
			⋮	---
			15	---

Connector case

11
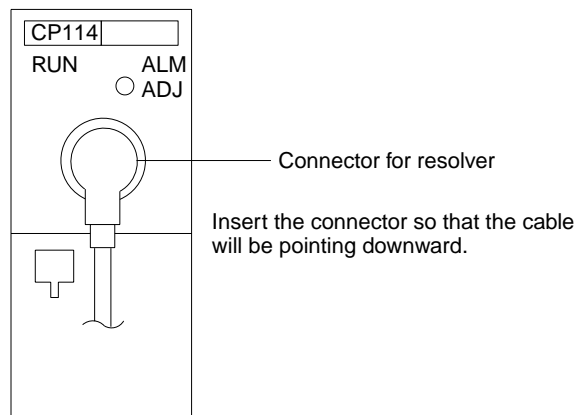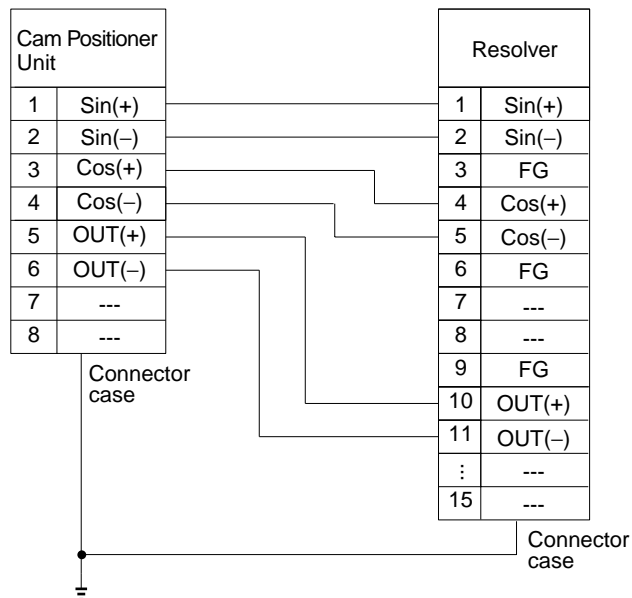
2-3-3 Data Setting Console Cables

Connecting Cable

Use the connecting cables in the table below (sold separately) to connect the unit to the Data Setting Console.

Model	Cable length (L)
C200H-CN225	2 m
C200H-CN425	4 m
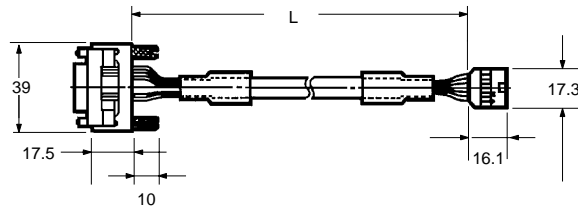
Connection Precautions

Tighten the lock screws after inserting the connector into the unit.

Push the connector firmly into the Data Setting Console until the clips fully lock.

Power is supplied from the Cam Positioner Unit via connection cable. If power is not supplied between external cam output terminals (A10, B10) and (A9, B9), the Data Setting Console cannot be operated.

Install the supplied connector cover when the cable is not connected.

SECTION 3
Data Setting Console Operation

This section provides the basic operating procedures of the Data Setting Console including data settings and monitoring.

3-1 Operating Procedure

Follow the procedure outlined below for preparing the C200H☐ prior to operating the Cam Positioner Unit.

1,2,3...
1. Set the switches (Refer to *2-2 Switch Settings*). Set the front and rear panel switches according to the operating conditions.

2. Mount the Unit to the Rack. Be careful to turn off the power supply to the C200H☐ before mounting the Cam Positioner Unit to the Rack or removing it from the Rack.

3. Wire the external cam outputs (Refer to *2-3 Wiring*). Until the trial operation has been completed, do not directly connect a load. Instead, connect to an object (such as the G7TC-OC16) for which the external cam output status is known.

4. Connect the resolver and the Data Setting Console (Refer to *2-3-2 Resolver Connection Cable* and *2-3-3 Data Setting Console Cables*). Use the specified connection cable for connecting the resolver and the Data Setting Console.

5. Turn ON the C200H☐ and external cam output power supply. Place the C200H☐ in program mode.

6. Set the data with the Data Setting Console. Set the RUN/PRG selector switch to PRG before setting the data.

7. Set the bank that is to be executed. Set the RUN/PRG selector switch to RUN. Set the number of the bank to be executed in word n + 1.
(n = 100 + 10 x Unit no.)

8. Turn ON the Operation Flag. Turn ON bit 00 of word n (the Operation Flag).

3-2   Nomenclature and Functions

3-2-1   Nomenclature

Front View

Side View

PV
DATA

Data display

Operation indicators

Cover

omron
C200H-DSC01
DATA SETTING CONSOLE

Panel mounting bracket
(Refer to *Appendix D Dimensions* for details about panel mounting.)

Rear View

Down Key

Up Key

(With cover open)

Return Key

Operation Keys

Mode selection
Item selection
Data setting

Reverse Key   Clear Key

Cam Positioner Unit connector
Connecting cable (purchase separately)
C200H-CN225 (2 m)
C200H-CN425 (4 m)

The bottom row of the operation Keys have upper and lower labels. The upper labels apply to Temperature Control Unit operation. The lower labels are for the Cam Positioner Unit.

Two display sheets are supplied: one for the Temperature Control Unit and one for the Cam Positioner Unit. If the Data Setting Console is to be used with the Cam Positioner Unit only, stick the display sheet with the lettering corresponding to the lower labels over the original lettering.

Note   1.   If 24-VDC power is not supplied between external cam output connector terminals (A10, B10) and (A9, B9), the Data Setting Console cannot be operated.

2. If a resolver is not connected, "$E10$" will blink. Should this occur, follow the procedure outlined below to turn it off. In any case, data can still be set even if no resolver is connected. To do that, carry out only d) and e) below.

   a) Turn OFF the power supply to the C200H□.

   b) Connect a resolver.

   c) Turn ON the power supply to the C200H□.

   d) Set the operation mode selector to PRG.

   e) Press the CLR Key.

3-2-2 Functions

Display Functions

Data Display

Name	Function
DATA	Depending on the "MODE" setting number, the following data will be displayed. Data concerning cam output ON/OFF settings, protect settings, and settings for the number of revolutions required for a single process. The process execution conditions and present cam angle will be displayed.
MODE	Modes 1 to 6 will be displayed. The mode that can be selected will vary according to the setting of the RUN/PRG switch. When PRG is set: Mode 3: Cam data setting mode Mode 4: Protect setting mode (*) Mode 5: Mode for setting the number of revolutions required for a single process (*) Cannot be selected when pin 2 of the rear panel DIP switch is ON (i.e., when protection is not permitted). When RUN is set: Mode 1: Mode for setting the number of cycles for the processes to be executed Mode 2: Present cam angle monitor mode Mode 6: Adjustment operation mode (*) (*) Cannot be selected when pin 3 of the rear panel DIP switch is ON (i.e., when adjustment operation is not permitted).
BK	Banks 1 to 8 will be displayed. In Modes 1, 2, and 6, the number of the bank to be executed will be displayed. In Mode 5, nothing will be displayed.
CAM	Cam output numbers from 1 to 48 will be displayed. These will only be displayed in Modes 3, 4, and 6, however, and not in Modes 1, 2, and 5. Numbers 1 to 16 are for internal/external cam outputs, and numbers 17 to 48 are for internal cam outputs.
STEP	Step numbers 1 to 7 will be displayed. These will only be displayed in Modes 3 and 6, however, and not in Modes 1, 2, 4, and 5. Seven ON/OFF settings can be made for each cam output.

Operation Displays

Name	Function
ON	When this indicator is blinking, the cam angle can be set for when cam output is ON.
OFF	When this indicator is blinking, the cam angle can be set for when cam output is OFF.
RUN	Lit while the Cam Positioner Unit is in operation. While this indicator is lit, cam outputs will turn ON and OFF. The procedure for operating the Cam Positioner Unit is as outlined below. (1) Set the Cam Positioner Unit's RUN/PRG selector to RUN. (2) Set banks 1 to 8 at word n + 1. (3) Turn ON bit 00 of word n (Operation Flag). (n = 100 + 10 x Unit no.)
ALM1	Lit if the resolver is accidentally disconnected.
ALM2	Lit if any of the following errors occur. Memory error Bank selection error Power failure error Communications error Memory load error Parameter error

Operation Key Functions

Name	Function
Return Key	When beginning a setting change, press the Return Key, the Up Key, or the Down Key. The MODE number will then blink. Each time the Return Key is pressed, the set value that is blinking will be entered and the next item to be set will start blinking.
Up Key	When beginning a setting change, press the Return Key, the Up Key, or the Down Key. The MODE number will then blink. Press the Up Key to increment the number that is blinking. When making a DATA setting, press the Up Key continually to successively increment the number.
Down Key	When beginning a setting change, press the Return Key, the Up Key, or the Down Key. The MODE number will then blink. Press the Up Key to decrement the number that is blinking. When making a DATA setting, press the Up Key continually to successively decrement the number.
Reverse Key	When the Reverse Key is pressed, the setting item that is currently blinking will stop and the previous item will start blinking. To finish making settings in a given mode, use the Reverse Key to return to the blinking MODE display and then press the Reverse Key again. The blinking display will then stay lit and the settings will be complete.
Clear Key	When the Clear Key is pressed, all data below the blinking item will be cleared. For example, if "1" is blinking for BK, all of the data for bank no. 1 will be cleared. When the Clear Key is pressed once, the item that is to be cleared will start blinking. If the Clear Key is then pressed a second time, the data will be cleared. To cancel the clear, press any Key other the Clear Key before pressing the Clear Key the second time. This function does not exist in the adjustment operation mode (mode 6). Press the Clear Key to clear an error display.

3-3 Data Setting and Monitoring

Setting Items

MODE	Setting item	Name	Setting range	
3 (Cam data setting) 6 (Adjustment operation)	BK	Bank no.	1 to 8 In Mode 6, the setting (i.e., the number of the bank to be executed) is made from the C200H□ user's program or a peripheral device.	
	CAM	Cam output no.	1 to 48 1 to 16: internal/external cam output 17 to 48: Internal cam output	
	STEP	Step no.	1 to 7	
	ON	ON angle	0 to 359	
	OFF	OFF angle		
4 (Protect setting)	BK	Bank no.	1 to 8	
	CAM	Cam output no.	1 to 48 1 to 16: internal/external cam output 17 to 48: Internal cam output	
	DATA	Not protected	"- - -"	
		Protected	"Pro"	
5 (Number of revolutions required for a single process)	DATA	Decimal point position	2 digits to right of decimal 1 digit to right of decimal 0 digits to right of decimal	Set the number of resolver revolutions required for a single process cycle.
		Data	0.01 to 9.99 0.1 to 99.9 1 to 999	

For Modes 3, 4, and 5, set the RUN/PRG selector to PRG.

Mode 4 is valid only when pin 2 of the rear panel DIP switch is OFF (i.e., when protection is permitted).

Mode 6 is available only when pin 3 of the rear panel DIP switch is OFF (i.e., when adjustment operation is permitted). For Mode 6, set the RUN/PRG selector to RUN.

Monitor Items

MODE	Name	Function
1	Monitoring of the number of process execution cycles	Displays the number of process execution cycles per unit time.
2	Monitoring of the present cam angle	Monitors the present cam angle of the resolver.

Set the RUN/PRG selector to RUN.

Cam Setting Data and Cam Outputs

The following table shows the relation between the cam data that has been set and the cam outputs.

Cam output no.	Step no.	ON angle	OFF angle
1	1	90	180
2	1	0	45
	2	90	135
	3	180	270
3	1	180	90
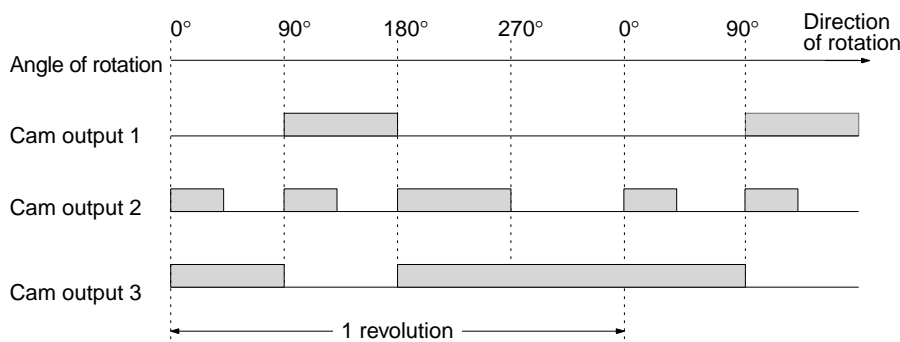
The cam output turns ON at the ON angle and turns OFF at the OFF angle minus 1°.

Cam outputs turn ON and OFF only when the Cam Positioner Unit is in operation.

The procedure for operating the Cam Positioner Unit is outlined below.

1,2,3...
1. Set the Cam Positioner Unit's RUN/PRG selector to RUN.
2. Set banks 1 to 8 at word (n + 1).
3. Turn ON bit 00 of word n (Operation Flag).
   (n = 100 + 10 x Unit no.)

During operation, the RUN indicator on the Data Setting Console will remain lit.

Number of Revolutions Required for a Single Process and Monitoring of the Number of Process Execution Cycles

The relation between the Mode 5 (number of revolutions required for a single process) set value and the Mode 1 (monitoring of the number of process execution cycles) monitor value is as shown below.

$$\text{Mode 1 monitor value} = \frac{\text{Number of resolver revolutions}}{\text{Mode 5 set value}}$$

If the number of revolutions required for a single process (i.e., the Mode 5 set value) is "1," then the monitoring of the number of process execution cycles (i.e., the Mode 1 monitor value) will indicate the number of resolver revolutions.

The Mode 1 monitor value will also indicate the number produced per unit time.

Mode Selection and Data Setting Procedure

Cam Data Setting (Mode 3)

ON/OFF angle
Mode no.
ON angle
OFF angle
Bank no.
Cam output no.
Step no.
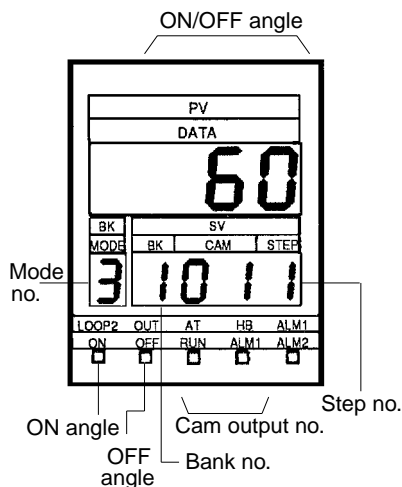
1,2,3... 1. Set the RUN/PRG selector to PRG.

If PRG is already selected, then proceed directly to (2).

2. By means of the Return Key, the Up Key, or the Down Key, select the Mode 3 indicator so that it starts to blink.

Press the Return Key, the Up Key, or the Down Key. The MODE indicator "3" will blink. If "3" is not indicated, then use the Up Key or the Down Key to increment or decrement the number until "3" is indicated.

3. Press the Return Key to enter the set value and select the next item.

Each time the Return Key is pressed, the set value that is blinking will be entered and the next item to be set will start blinking.

MODE → BK → CAM → STEP → ON DATA → OFF DATA
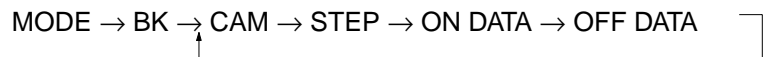
When ON DATA or OFF DATA is selected, the respective ON or OFF indicator will blink.

Each time the Reverse Key is pressed, the next item to be set will start blinking, but in the reverse order from that shown above. If a newly set value has not already been entered with the Return Key, then pressing the reverse can will clear the changed data and restore the original data.

4. Use the Up Key or the Down Key to increment or decrement the set value.

Increment or decrement the set value for the item that is blinking. For data other than BK, it is possible to change the values rapidly by holding down the Key.

5. Press the Return Key to enter the data that has been set.

After data has been changed, the Return Key must be pressed in order for the data to be entered. In order to clear the newly set data and return to the original value, simply press the Reverse Key instead of the Return Key. Then follow (3) through (5) of this procedure to set the data.

6. Press the Reverse Key to restore a blinking item to its previous lit condition.

As the Reverse Key is pressed, the items will blink in the order shown in (3). When the mode number is blinking, pressing the Reverse Key again will restore it to its previous lit condition and the setting operation will be finished.

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How to Clear Data

1,2,3...   1. Follow (1) to (3) of the above procedure to cause the items that are to be cleared to start blinking.

2. Press the Clear Key twice. When it is pressed the first time, all of the items to be cleared will start blinking.

When it is pressed the second time, all of the ON/OFF angle data will be cleared for the items that are blinking. If CAM no. "1" is blinking, for example, then the ON/OFF angle data for steps 1 to 7 for cam output no. 1 will be cleared.

To cancel a clearing operation, press any other key instead of pressing the Clear Key the second time.

Protect Setting (Mode 4)
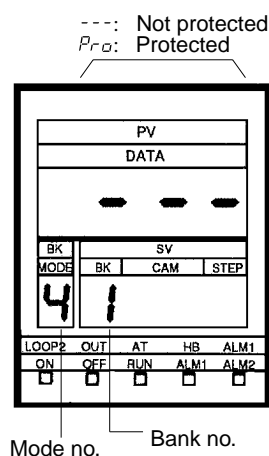
```
- - -:  Not protected
Pro:  Protected
```


Mode no.   Bank no.

1,2,3...   1. Set the RUN/PRG selector switch to PRG.

If PRG is already selected, then proceed directly to (2).

2. Press the Return Key, the Up Key, or the Down Key to cause the Mode 4 indicator to blink.

Press the Return Key, the Up Key, or the Down Key.

The MODE indicator will blink.

Press either the Up Key or the Down Key until "4" is displayed.

Mode 4 cannot be selected if pin 2 of the rear panel DIP switch is ON (i.e., if protection is not permitted).

3. Press the Return Key to cause the bank number to blink.

4. Use the Up Key or the Down Key to display the bank number for which protection is to be set or cleared.

5. Press the Return Key to cause the data display to blink.

For each bank number, use the Up and Down Keys to select either "*Pro*" (protection set) or "*- - -*" (protection not set). Then press the Return Key to enter the selection.

When changing bank numbers, press the Reverse Key to return to the blinking bank number display.

To set or clear protection for cam numbers, proceed to (6).

6. Press the Return Key to cause the cam number to blink.

7. Use the Up Key or the Down Key to display the cam number for which protection is to be set or cleared.

8. Press the Return Key to cause the data display to blink.

9. With the Up and Down Keys, select either "Pro" or "$- - -$".

10. Press the Return Key to enter the selection.

    Repeat (6) through (10) for each cam number.

11. Press the Reverse Key to restore the blinking display to its previous lit condition.

    When the mode number is blinking, press the Reverse Key a second time to restore the blinking display to its previous lit condition and complete the setting operation.

Setting the Number of Revolutions Required for a Single Process (Mode 5)

Number of revolutions required
for a single process

Mode no.

1,2,3... 1. Set the RUN/PRG selector switch to PRG.

   If PRG is already selected, then proceed directly to (2).

2. Press the Return Key, the Up Key, or the Down Key to cause the Mode 5 indicator to blink.

   Press the Return Key, the Up Key, or the Down Key.

   The MODE indicator will blink.

   Press either the Up Key or the Down Key until "5" is displayed.

3. Press the Return Key to cause the decimal point to blink.

4. Use the Up Key or the Down Key to set the position of the decimal point.

   This setting also sets the decimal point position for the monitoring of the number of process execution cycles (see next page). When making this setting, take into account the maximum number of digits to be displayed to the left of the decimal point.

   Example: If the set value for the monitoring of the number of process execution cycles is 52.0, and if the decimal point position is set at 0.00, then 2.00 will be displayed. Therefore, in this case, the decimal point position should be set at 00.0.

5. Press the Return Key to cause the numerals to blink.

6. Use the Up Key or the Down Key to increment or decrement the set value.

   It is possible to change the values rapidly by holding down the Key.

   If either the decimal point or the set value is blinking, then press the Clear Key twice. " $l.$ " will then be displayed.

7. Press the Return Key to enter the set value.

8. Press the Reverse Key to restore blinking items to their previous lit condition.

If the mode number is blinking, press the Reverse Key again. The blinking display will then stay lit and the settings will be complete.

Monitoring of the Number of Process Execution Cycles (Mode 1)
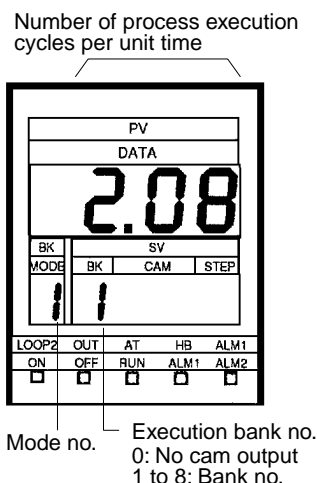
Number of process execution cycles per unit time

Mode no.

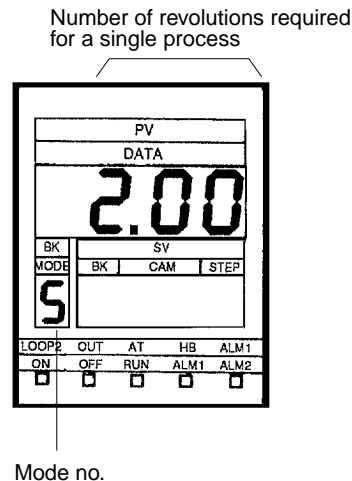Execution bank no.
0: No cam output
1 to 8: Bank no.

1,2,3...   1. Set the RUN/PRG selector switch to RUN.

If RUN is already selected, then proceed directly to (2).

2. Press the Return Key, the Up Key, or the Down Key to cause the Mode 1 indicator to blink.

Press the Return Key, the Up Key, or the Down Key.

The MODE indicator will blink.

Press either the Up Key or the Down Key until "1" is displayed.

3. Press the Return Key to enter mode "1."

Based on the number process execution cycles set in Mode 5, the number of process execution cycles per minute will be displayed as follows:

$$\text{Number of process execution cycles per minute} = \frac{\text{Number of resolver revolutions}}{\text{Number of revolutions required for a single process}}$$

4. Set the bank that is to be executed.

In word n + 1 (n = 100 + 10 x Unit no.), set the number of the bank (0000 to 0008) that is to be executed.

If the bank number is 0000, only the number of process execution cycles (and not the cam output) will be displayed.

When setting the number of the bank to be executed, make the setting with bit 00 of word n OFF (i.e., with the Operation Flag OFF), or turn the Operation Flag OFF and then ON again after the setting has been made in word n + 1. The setting cannot be made when the Operation Flag is ON.

Set the bank number with either the user's program or with a peripheral device such as the Programming Console.

5. Turn ON the Operation Flag.

Turn ON bit 00 of word n (the Operation Flag).

Make the setting with either the user's program or with a peripheral device such as the Programming Console.

From this point on, operations will be carried out according to the cam data of the bank that has been set.

When changing the number of the bank to be executed, first make the change in word n + 1, and then turn the Operation Flag from ON to OFF, and then ON again.

Monitoring of the Present Cam Angle (Mode 2)
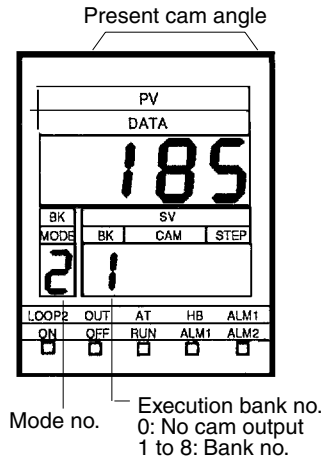
Present cam angle

Mode no.

Execution bank no.
0: No cam output
1 to 8: Bank no.

1,2,3...   1.   Set the RUN/PRG selector switch to RUN.

If RUN is already selected, then proceed directly to (2).

2.   Press the Return Key, the Up Key, or the Down Key to cause the Mode 2 indicator to blink.

Press the Return Key, the Up Key, or the Down Key.

The MODE indicator will blink.

Press either the Up Key or the Down Key until "2" is displayed.

3.   Press the Return Key to enter mode "2."

During operation, cam outputs will turn ON and OFF in response to the present cam angle, according to the ON and OFF angle setting data of the bank that is executed.

If the bank number is set to "0," then there will be no cam output.

Adjustment Operation (Mode 6)
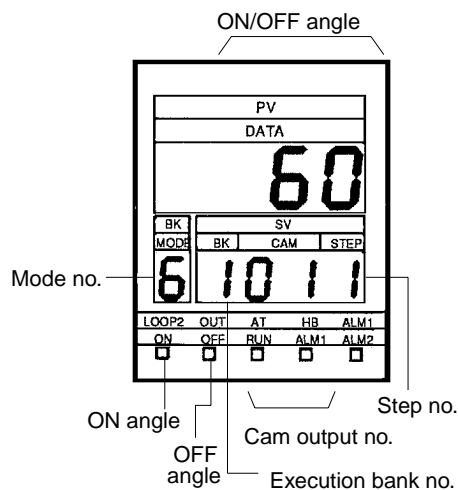
ON/OFF angle

Mode no.

ON angle

OFF angle

Cam output no.

Execution bank no.

Step no.

1,2,3...   1.   Set the RUN/PRG selector switch to RUN.

If RUN is already selected, then proceed directly to (2).

2. Press the Return Key, the Up Key, or the Down Key to cause the Mode 6 indicator to blink.

    Mode 6 cannot be selected when pin 3 of the Cam Positioner Unit's rear panel DIP switch is ON (i.e., when adjustment operation is not permitted).

3. From this point on, follow (3) through (6) of the setting procedure for Mode 3.

    The number of the bank to be executed will be displayed in BK, so "BK" cannot be selected.

    When changing the number of the bank to be executed, make the setting in word n + 1 by means of the user's program or a peripheral device such as the Programming Console, and then turn bit 00 of word n (the Operation Flag) from ON to OFF, and then ON again.

Origin Adjustment   The term "origin adjustment" refers to the matching of the resolver origin to the mechanical origin. For example, if the present cam angle is 130° and if you want this angle position to match the mechanical origin of 0°, then origin adjustment can be used.

Origin Adjustment Methods

Either of the methods described below can be used for origin adjustment. When origin adjustment is executed, "7" will blink three times in "MODE," and the resolver absolute angle will blink three times in "DATA." When origin adjustment is finished, the previous display will be restored.

Press the button on the front panel of the Cam Positioner Unit. The origin adjustment value will then be written to the EEPROM in the Unit.

or Turn the Origin Adjustment Flag (bit 01 of word n) from OFF to ON.

When the origin adjustment has been completed, turn ON the Origin Adjustment Completion Flag (bit 05 of word n + 8). This flag will automatically turn OFF when the Origin Adjustment Flag turns OFF.

Origin adjustment will be written to the RAM in the Unit according to the Origin Adjustment Flag.

When entering the origin adjustment, turn the EEPROM Write Flag (bit 02 of word n) from OFF to ON. The origin adjustment value will then be written to EEPROM.

Note Because there is a limit to the number of times that data can be written to EEPROM (approx. 10,000 times), the second of the two methods described above is recommended for origin adjustment.

During resolver rotation, origin adjustment will not be effective even if it is executed.

If origin adjustment is attempted while the Unit has an error, the origin adjustment will be executed after the error is cleared.

SECTION 4
PC Memory Allocation and Programming

This section provides the C200H☐ PC's memory allocation for the Cam Positioner Unit. Basic programming procedures and examples are also provided.

4-1 Memory Allocation

Memory Allocation
According to the setting of the Unit number switch on the front of the C200H-CP114 Cam Positioner Unit, 10 words are allocated for each Unit number in the Special I/O Unit area between IR 100 to IR 199, which is used as the I/O refresh data area. The IR area used by the C200H-CP114 Cam Positioner Unit is refreshed on each C200H☐ PC I/O refresh cycle.

C200H☐ PC

IR area	
Unit#0	IR 100 to IR 109
Unit#1	IR 110 to IR 119
Unit#2	IR 120 to IR 129
Unit#3	IR 130 to IR 139
Unit#4	IR 140 to IR 149
Unit#5	IR 150 to IR 159
Unit#6	IR 160 to IR 169
Unit#7	IR 170 to IR 179
Unit#8	IR 180 to IR 189
Unit#9	IR 190 to IR 199

During PC I/O refresh, each cycle is executed for the outputs (PC to Cam Positioner Unit) followed by the inputs (Cam Positioner Unit or PC).

Cam Positioner Unit

I/O refresh data area	
Word (n) to word (n+2)	Output refresh
Word (n+3) to word (n+9)	Input refresh

(n=100 + 10 x Unit number)

The terms "output" and "input" are defined with reference to the C200H☐.

Note A Duplicate I/O Unit error occurs if the set Unit number corresponds to the number of an existing Special I/O Unit.

DM Number Allocation

C200H☐ PC

Data Memory (DM)
Dedicated DM (Read Only)

Unit #0	DM1000 to 1010
Unit #1	DM1100 to 1110
Unit #2	DM1200 to 1210
Unit #3	DM1300 to 1310
Unit #4	DM1400 to 1410
Unit #5	DM1500 to 1510
Unit #6	DM1600 to 1610
Unit #7	DM1700 to 1710
Unit #8	DM1800 to 1810
Unit #9	DM1900 to 1910

Including dedicated DM and general DM, one word at a time will be transmitted during the PC's I/O refresh.

General DM (Read and Write)

1 data block (15 words)

DMx
DM(x+1)
to
DM(x+14)

15 words max. x 8 = 120 words

Cam Positioner Unit

Fixed Data Area

DMm
DM(m+1)
DM(m+2)

For cam data setting

For setting the number of revolutions required for a single process.

DM(m+10)

(m = 1000 + 100 x Unit no.)

DMx
DM(x+14)

For cam data setting

15 words max. x 8 = 120 words

(x=0000 to 0985)

For details on DM number allocation, refer to page 31.

4-1-1   Bit Allocation Chart

(n = 100 + 10 x Unit no.)

I/O classi-fica-tion	Word no.	Bit															
		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Out	n	0				0				0	0	Memory down-load	Memory upload	Error reset	EE-PROM write	Origin adjust-ment	Opera-tion instruc-tion
	n+1	0				0				Bank number 00 to 08: 2-digit BCD 00: No cam output							
In	n+2	Internal/external cam output status															
		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	n+3	Internal cam output status															
		32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
	n+4	Internal cam output status															
		48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
	n+5	0				Present cam angle (000° to 359°: 3 digits BCD)											
						$\times 10^2$				$\times 10^1$				$\times 10^0$			
	n+6	Number of process execution cycles															
		Decimal point position data				Numeral data (000 to 999: 3 digits BCD)											
	n+7	0				0				Executed bank number (00 to 08: 2-digit BCD)							
	n+8	Status data															
		ALM2	ALM1	0	0	0				0	Memory load enabled	Origin adjust-ment com-pleted	Memory load com-pleted	Resolver stopped	Error	RUN mode	In opera-tion
	n+9	0				0				Error code							

Note For the number of process execution cycles, the same value will be read as for the Data Setting Console display value in Mode 1.
Decimal Point Position Data
1: No digits to right of decimal point
2: 1 digit to right of decimal point
4: 2 digits to right of decimal point

4-1-2   Bit Allocation Data Contents

(n = 100 + 10 x Unit no.)

I/O clas-sifica-tion	Bit number		Data item	Data contents
	Word	Bit		
Out	n	15 to 06	---	Not used. Set to "0."
		05	Memory download	Turns ON when cam ON/OFF data is transferred from the C200H☐ to the Cam Positioner Unit. When the data transfer is complete, bit 04 of word n + 8 turns ON.
		04	Memory upload	Turns ON when cam ON/OFF data is read from the Cam Positioner Unit to the C200H☐. When the data transfer is complete, bit 04 of word n + 8 turns ON.
		03	Error reset	When an error occurs, it can be cleared by turning this flag from OFF to ON. The same result can be obtained by pressing the Clear Key on the Data Setting Console.

| I/O clas-sifica-tion | Bit number | | Data item | Data contents |
	Word	Bit		
Out	n	02	EEPROM write	Turn this bit from OFF to ON to write the origin adjustment value to the EEPROM in the Cam Positioner Unit after the origin adjustment has been determined. Because there is a limit to the number of times that data can be written to EEPROM (approx. 10,000 times), it is recommended that this bit be turned ON only once, after the final determination has been made. Bit 05 of word n + 8 will be ON when data is written to the EEPROM.
		01	Origin adjustment	To execute the origin adjustment, turn this flag from OFF to ON. When the origin adjustment has been completed, bit 05 of word n + 8 will turn ON. When this flag (bit 01 of word n) is turned from OFF to ON, the origin adjustment value is written to the RAM in the Cam Positioner Unit. After the final origin adjustment determination, turn bit 02 of word n from OFF to ON to write the value to EEPROM.
		00	Operation	When this flag turns ON, the bank in word n + 1 begins operation. During operation, the RUN indicator on the Data Setting Console will light and cam outputs will turn ON and OFF according to the data that is set. When this flag turns OFF, operation will stop.
	n+1	15 to 08	---	Not used. Set to "0."
		07 00	Bank number	The number of the bank to be executed (00 to 08) is set in two digits BCD. If "00" is set, there are no cam outputs. Make the bank number setting while the Operation Flag (bit 00 of word n) is turned OFF. If the Operation Flag is ON, then turn it OFF and back ON when changing the bank number setting. Without doing this, the bank number cannot be changed.

I/O classifi-cation	Bit number		Data item	Data contents	
	Word	**Bit**			
In	n+2	15 to 00	Internal/external cam output status	When an internal/external cam output turns ON, the appropriate bit turns ON. Bits 00 to 15 correspond to internal/external cam output numbers 01 to 16.	
	n+3	15 to 00	Internal cam output status	When an internal cam output turns ON, the appropriate bit turns ON.	Bits 00 to 15 correspond to exter-nal cam output numbers 17 to 32.
	n+4	15 to 00			Bits 00 to 15 correspond to exter-nal cam output numbers 33 to 48.
	n+5	15 to 12	---	Not used. Set to "0."	
		11 to 00	Present cam angle	Monitors the present resolver cam angle. 000° to 359° (3 digits BCD) The value will be indefinite if the Resolver has been disconnected.	
	n+6	15 to 00	Number of process execution cycles (see note 1)	Monitors the number of process execution cycles (the number pro-duced) per minute, in 4 digits BCD. Number of process execution cycles = Number of resolver rotations/ number of rotations required for a single process (unit: shots/min) 15 ◄──────► 00 Numeric Data (000 to 999: 3 digits BCD) Decimal Point Position Data 1: No digits to right of decimal point 2: 1 digit to right of decimal point 4: 2 digits to right of decimal point This value is the same as the value displayed at the Data Setting Console in Mode 1.	
	n+7	15 to 08	---	Not used. Set to "0."	
		07 to 00	Bank being exe-cuted	Monitors the bank that is presently being executed. 00 to 08 (2-digit BCD)	

I/O classifi-cation	Bit number		Data item	Data contents	
	Word	**Bit**			
In	n+8	15	ALM2	The ALM 2 bit turns ON and the ALM 2 indicator on the Data Setting Console lights when any of the following errors occur. Memory error Bank change error Communications error Data transfer error Power failure error Parameter error	When the errors on the left occur, the following conditions occur simultaneously. The ALM indicator lights on the front panel of the Cam Positioner Unit. Bit 02 of word n + 8 turns ON. The error code is output to word n + 9.
		14	ALM1	The ALM 1 bit turns ON if an error occurs due to the resolver being disconnected. At that time, the ALM 1 indicator on the Data Setting Console lights.	
		13 to 07	---	Not used. Set to "0."	
		06	Memory load enabled	When this flag is ON, memory downloading and uploading is possible. This flag is ON when the Data Setting Console display is lit, and OFF when the display is blinking. (The display blinks while data is being set.)	
		05	Origin adjustment completed	Turns ON when origin adjustment is completed, based on the Origin Adjustment Flag (bit 01 of word n) or the EEPROM Write Flag (bit 02 of word n) turning ON, and turns OFF based on these bits turning OFF.	
		04	Memory load completed	Turns ON when memory downloading (bit 05 of word n) or memory uploading (bit 04 of word n) is completed, and OFF based on either of these bits turning OFF.	
		03	Resolver stopped (see note 2)	ON while resolver rotation is stopped (4 r/min or less), and OFF during rotation.	
		02	Error	Normally OFF. Turns ON when a Cam Positioner Unit error occurs. At that time, the ALM indicator on the front panel of the Cam Positioner Unit lights.	
		01	RUN mode	ON when the operation mode selector on the front panel of the Cam Positioner Unit is set to RUN, and OFF when the selector is set to PRG.	
		00	In operation	ON during operation (i.e., when the Operation Flag, bit 00 of word n, is ON).	
	n+9	15 to 12	---	Not used. Set to "0."	
		11 to 00	Error code	When errors occur, the following codes are output. (2-digit BCD) 01: Memory error ALM2 02: Communications error ALM2 03: Power failure error ALM2 20: Bank change error ALM2 21: Data transfer error ALM2 22: Parameter error ALM2 10: Resolver disconnection error ALM1 For details, refer to the *SECTION 5 Troubleshooting*.	

Note 1. Data other than 0 may be output even if the Resolver is not operating when the power is turned ON, the Special I/O Unit has been reset, or origin adjustment has been executed.

2. May turn OFF even if the Resolver is not operating when the power is turned ON, the Special I/O Unit has been reset, origin adjustment has been executed, or the Resolver has been disconnected.

4-1-3   DM Allocation Chart

Dedicated DM (Read Only)

(m = 1000 + 100 x Unit no.)

DM number	Data item	
DM m	Leading DM number for cam data storage	
DM (m+1)	Number of cam data storage combinations (1 to 8)	
DM (m+2)	Transfer of data permitted/not permitted for number of revolutions required for a single process	
DM (m+3)	Bank 1	
DM (m+4)	Bank 2	
DM (m+5)	Bank 3	
DM (m+6)	Bank 4	Setting data for number of revolutions required for a single process
DM (m+7)	Bank 5	
DM (m+8)	Bank 6	
DM (m+9)	Bank 7	
DM (m+10)	Bank 8	

The DM 1000 data block is for reading only. Therefore data cannot be written by means of the program. Set the data with a peripheral device such as the the Programming Console.

General DM (Read and Write)

(x=0000 to 0999 – 15 x number of cam data storage combinations)

DM number	Data item	
DM x	Bank no.	Cam no.
DM (x+1)	Step no. 1	ON data
DM (x+2)	Step no. 1	OFF data
DM (x+3)	Step no. 2	ON data
DM (x+4)	Step no. 2	OFF data
DM (x+5)	Step no. 3	ON data
DM (x+6)	Step no. 3	OFF data
DM (x+7)	Step no. 4	ON data
DM (x+8)	Step no. 4	OFF data
DM (x+9)	Step no. 5	ON data
DM (x+10)	Step no. 5	OFF data
DM (x+11)	Step no. 6	ON data
DM (x+12)	Step no. 6	OFF data
DM (x+13)	Step no. 7	ON data
DM (x+14)	Step no. 7	OFF data

The 15 words shown on the left constitute a single block. Bank numbers and cam numbers can be changed, and data can be set or retrieved for a total of eight blocks from DM (x + 15) onwards.
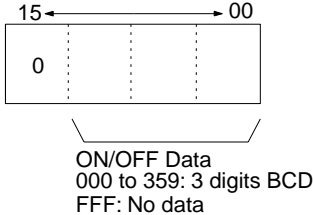
4-1-4   DM Allocation/Data Contents

Dedicated DM   (m = 1000 + 100 x Unit no.)

DM number	Data item	Data contents
DM m	Cam data storage, leading DM number	The leading general DM number for storing cam data is set in 4 digits BCD (0000 to 0985).
DM (m+1)	Cam data storage, number of combinations	The number of combinations (i.e., the number of combinations of DM x bank numbers and cam numbers) for stored cam data is set in 4 digits BCD (0001 to 0008).

DM (m+2)	Transfer of data permitted/ not permitted for number of revolutions required for a single process	This is used when transferring from the C200H□ to the Cam Positioner Unit the data stored in DM m + 3 to DM m + 10 (i.e., the number of revolutions required for a single process).
		
		  Odd: Transfer permitted
		  Even: Transfer not permitted

DM (m+3) to DM (m+10)	Setting data for number of revolutions required for a single process	DM m + 3 to DM m + 10 correspond to Banks 1 to 8. The data for the applicable bank is set according to the bank number set in word n + 1. 15 ← → 00 Numeric Data (001 to 999: 3 digits BCD) Decimal Point Position Data 1: No digits to right of decimal point 2: 1 digit to right of decimal point 4: 2 digits to right of decimal point

General DM   (x=0000 to 0985)

DM number	Data item	Data contents
DM x	Bank no.	Bank numbers for the cam data in DM x + 1 to DM x + 14 is set in bits 15 to 08, in 2-digit BCD.
	Cam no.	Cam numbers for the cam data in DM x + 1 to DM x + 14 is set in bits 07 to 00, in 2-digit BCD.
DM (x+1) to DM (x+14)	Cam ON/OFF data	This is the cam ON/OFF data for steps 1 to 7. When down-loading memory, set the data in this area. When uploading memory, retrieve the data in this area. 15 ← → 00 0 ON/OFF Data 000 to 359: 3 digits BCD FFF: No data

4-2   Peripheral Device Operations and Data Setting

This section explains how to use a peripheral device such as the Programming Console to turn I/O bits ON and OFF, to change present values, and how to start up Cam Positioner Unit operations and set data.

For these operations, preset the operation mode selector to RUN.

In the examples, the Unit number is set to "0," and the procedure for the Programming Console is shown.

Setting the Bank Number

1,2,3...   1. Monitor word n + 1 (the bank number).

Example: Shift→Word/Indirect→1→0→1→Monitor (When Unit no. is "0")

2. Write the present value to the bank that is to be executed.

Example: Change→1→Write (Bank no. = 1)

By means of either the Data Setting Console or the setting method using a peripheral device which is described on the next page, set the data in advance in the bank that is to be executed.

When setting the number of the bank to be executed, make the setting with bit 00 of word n OFF (i.e., with the Operation Flag OFF), or turn the Operation Flag OFF and then ON again after the setting has been made in word n + 1.

Note   The number of the bank to be executed can be set only in the operation mode.

Operation Startup

1,2,3...   1. Monitor bit 00 of word n (the Operation Flag).

Example: Shift→Contact/Constant→1→0→0→0→0→Monitor (When Unit no. is "0")

2. Press the Set/Reset Key to turn ON bit 00 of word n.

The following conditions will occur with operation startup:

The RUN indicator will light on the Data Setting Console.

Cam outputs will turn ON and OFF according to the cam ON/OFF data that is set.

Bit 00 of word n + 8 (the in-Operation Flag) will turn ON.

Origin Adjustment

1,2,3...   1. Turn ON bit 01 of word n (the Origin Adjustment Flag).

Example: Shift→Contact/Constant→1→0→0→0→1→Monitor→Set/Reset

2. After the origin adjustment has been determined, write the value to EE-PROM.

Turn ON bit 02 of word n (EEPROM write).

Example: Shift→Contact/Constant→1→0→0→0→2→Monitor→Set/Reset

Setting Cam ON/OFF Data

1,2,3...   1. Write the DM usage conditions,described in (2) below, to DM m and DM m + 1.

2. Write the bank number, cam number, and cam ON/OFF data to DM x onwards.

With the Programming Console, monitor each DM number and then write the data by changing the present value.

For convenience, the Ladder Support Software (LSS) can be used.

The above settings can be be made after the operations described in (3), but they must accord with the contents of (1).

3. Either turn the Special I/O Restart Flag (AR 0100 to AR 0109) from OFF to ON, or turn the C200H□ power supply from ON to OFF and then ON again.

These operations will cause the contents of (1) to be read.

4. Turn the Memory Download Flag (bit 05 of word n) from OFF to ON.

    This operation will begin the transfer to the Cam Positioner Unit of the data from DM x onward.

    Data will be transferred one DM word at a time.

    Verify the end of the transfer with the Memory Load Completed Flag (bit 04 of word n + 8).

    After bit 04 of word n + 8 has been turned ON, it will automatically turn OFF when bit 05 of word n turns OFF.
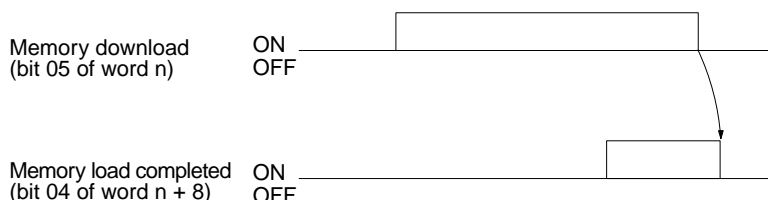
Note Memory downloading can only be executed when the memory load enabled flag (bit 06 of word n + 8) is ON. (When this bit is ON, the Data Setting Console display will be lit.) This is independent of the operation mode selector setting and the operating/stopped setting.

Example of Setting Cam ON/OFF Data

Set the following cam ON/OFF data so that the bank number = 1 and the cam number = 1.
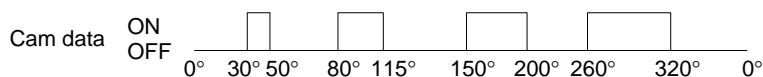
Assume that the Unit number is 0 and that the general DM words to be used begin at DM 0100.

Dedicated DM

DM1000	0100	Leading DM number for cam data storage
DM1001	0001	Number of cam data storage combinations

General DM

DM0100	0101		01 01
DM0101	0030	Step 1	Cam no.
DM0102	0050		Bank no.
DM0103	0080	Step 2	
DM0104	0115		For each step, set the ON data first and then the OFF data.
DM0105	0150	Step 3	
DM0106	0200		
DM0107	0260	Step 4	
DM0108	0320		
DM0109	0000		If the steps are not to be used, set either "0000" or "0FFF."
⋮	⋮		
DM0114	0000		

1,2,3...
1. Set the data shown above.
2. Turn the Special I/O Restart Flag (AR 0100) from OFF to ON. (Or else turn the C200H□ power supply from ON to OFF and then back ON.)

3. Turn the Memory Download Flag (10005) from OFF to ON.

4. Monitor the memory load completed flag (10804), and wait until it turns ON. When it turns ON, the transfer will have been completed.

5. Turn OFF bit 10005. When this bit is turned OFF, bit 10804 will turn OFF automatically.

Retrieving Cam ON/OFF Data

1,2,3... 1. Write into DM m and DM m + 1 the DM usage conditions described in (2) below.

2. Write the bank number and cam number for the data to be retrieved in DM x.
   Data from a maximum of eight blocks (combinations of bank numbers and cam numbers) can be retrieved, so the combinations that are to be retrieved should be set for each block in 15 words from DM x.
   The above settings can be be made after the operations described in (3), but they must accord with the contents of (1).

3. Either turn the Special I/O Restart Flag (AR 0100 to AR 0109) from OFF to ON, or turn the C200H□ power supply from ON to OFF and then ON again.
   These operations will cause the contents of (1) to be read.

4. Turn the memory upload flag (bit 04 of word n) from OFF to ON.
   This operation will retrieve the cam ON/OFF data in DM x + 1 to DM x + 14. (If multiple blocks are set in (2) above, it will be retrieved in those areas).
   Data will be transferred one DM word at a time.
   Verify the end of the transfer with the Memory Load Completed Flag (bit 04 of word n + 8).
   After bit 04 of word n + 8 has been turned ON, it will automatically turn OFF when bit 04 of word n turns OFF.
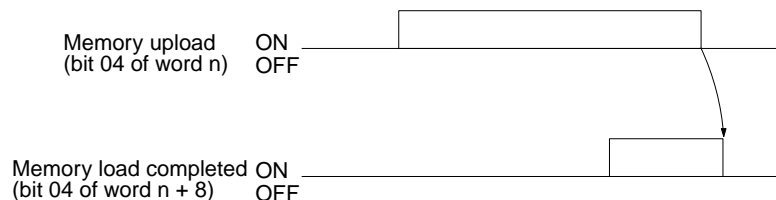
Note Memory downloading can only be executed when the Memory Load Enabled Flag (bit 06 of word n + 8) is ON. (When this bit is ON, the Data Setting Console display will be lit.) This is independent of the operation mode selector setting and the operating/stopped setting.

Retrieving Example

Retrieve the "bank number = 1" and the "cam number = 1" cam ON/OFF data. The Unit number is 0.

Dedicated DM

DM1000	0200	.... Leading DM number for cam data storage
DM1001	0001	.... Number of cam data storage combinations

General DM

DM0200	0101	.... 01 01

Cam no.

Bank no.

1,2,3...   1. Set the data shown above.

2. Turn the Special I/O Restart Flag (AR 0100) from OFF to ON. (Or else turn the C200H☐ power supply from ON to OFF and then back ON.)

3. Turn the memory upload flag (10004) from OFF to ON.

4. Monitor the Memory Load Completed Flag (10804), and wait until it turns ON. When it turns ON, the transfer will have been completed.

5. Turn OFF bit 10004. When this bit is turned OFF, bit 10804 will turn OFF automatically.

6. Monitor DM 0201 onwards.

DM0201	0030	Step 1
DM0202	0050	
DM0203	0080	Step 2
DM0204	0115	
DM0205	0150	Step 3
DM0206	0200	
DM0207	0260	Step 4
DM0208	0320	
DM0209	0FFF	
⋮	⋮	
DM0214	0FFF	

For each step, set the ON data first and then the OFF data.

For words with no cam data, "0FFF" is stored.

Setting the Number of Revolutions Required for a Single Process

1,2,3...   1. Write 0001 (transfer permitted) to DM m + 2.

With the Programming Console, make the settings by changing the present values.

2. Write the number of revolutions required for a single process into the word (from DM m + 3 to DM m + 10) that is appropriate for the bank set in (3) below. (The number of revolutions required for a single process is the number of resolver revolutions required for one process, e.g., the number required to complete one product. The value stored in DM m + 6 is the number of resolver revolutions divided by the number of revolutions for one process in shots per minute.)

3. Write into word n + 1 the number of the bank that is to be executed.

    4. Either turn the Special I/O Restart Flag (AR 0100 to AR 0109) from OFF to ON, or turn the C200H☐ power supply from ON to OFF and then ON again.

       These operations will cause the contents of DM m + 2 to be read. If DM m + 2 is "0001," then the data from (2) above will be transferred from the C200H☐ to the Cam Positioner Unit.

       From this point on, each time the bank no. data in word n + 1 is changed, the data from (2) above will be transferred.

Note The transfer of the required number of revolutions for a single process can be only executed when the Memory Load Enabled Flag is ON (i.e., the display on the Data Setting Console is lit).

Setting Example

Set the following data:

Number of revolutions required for a single process for Bank 1 = 1.00

Number of revolutions required for a single process for Bank 2 = 002

Assume that the Unit number is 0.

1,2,3...   1. Set "0001" (transfer permitted) to DM 1002.
    2. Set "<u>4</u>100" to DM 1003.
      ↑ Two digits to right of decimal point.
    3. Set "0001" (bank number = 1) to word 101.
    4. Turn the Special I/O Restart Flag (AR 0100) from OFF to ON. (Or else turn the C200H☐ power supply from ON to OFF and then back ON.)

      This will cause the number of revolutions required for a single process for Bank 1 to be set to "1.00."
    5. Set "<u>1</u>002" to DM 1004.
      ↑ No digits to right of decimal point.
    6. Set "0002" (bank number = 2) to word 101. This will cause the number of revolutions required for a single process for Bank 2 to be set to "2."

4-3   Program Examples

4-3-1   Setting the Bank Number and Starting Operation

Example   Set the bank number as "2" and start operation. Stop operation with input A.

Conditions   Unit number = 0 (Allocated word numbers: 100 to 109)

                               Operation mode selector is set to RUN. (C200H☐)

Program Example
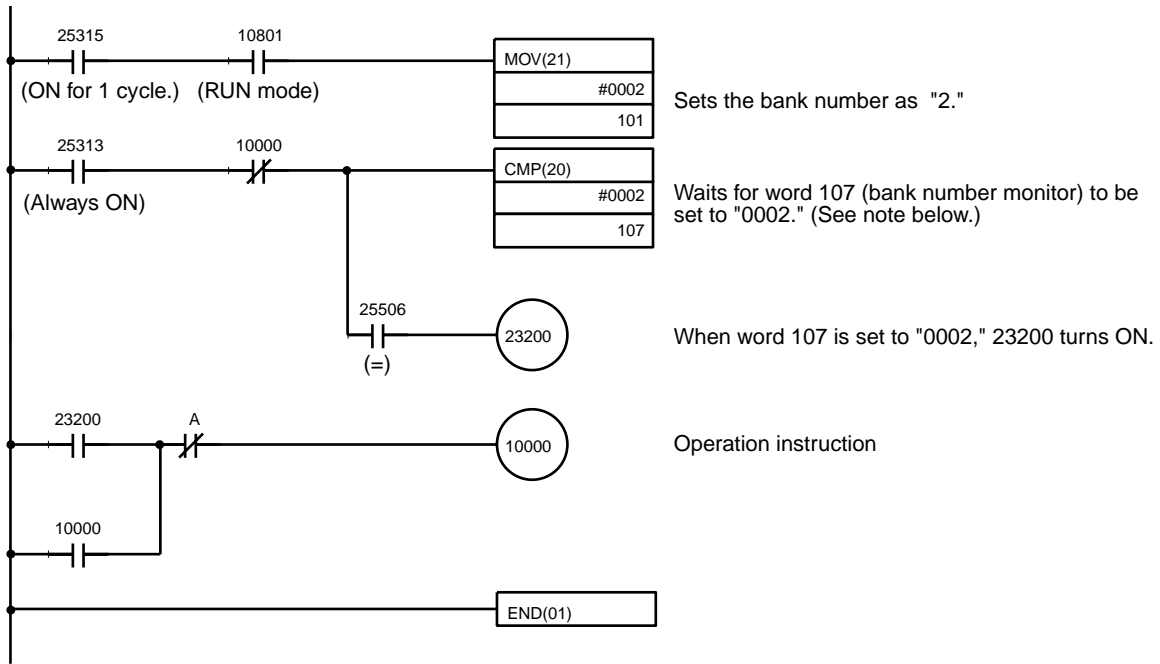
Note It takes approximately 900 ms for the bank number data to be transferred. The transfer time required varies with the PC's cycle time. Therefore, as shown in the example, verify that the transfer has been completed before turning ON the Operation Flag.

4-3-2 Setting Cam ON/OFF Data

Example

Set the following cam ON/OFF data so that the bank number = 1 and the cam number = 1.
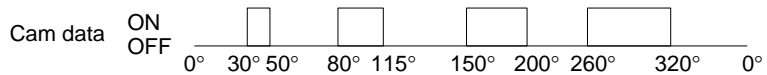
General DM words used: DM 0100 to DM 0114

Conditions

Unit number = 0 (Allocated word numbers: 100 to 109)

Operation mode selector is set to RUN. (C200H□)

Program Example

Preset the following data in the dedicated DM Area words using a peripheral device such as the Programming Console.

(Turn AR 0100 OFF and ON or turn the C200H☐ ON, OFF, and ON after setting.)

Dedicated DM

DM1000	0100
DM1001	0001

··········· Leading DM number for cam data storage

··········· Number of cam data storage combinations

General DM

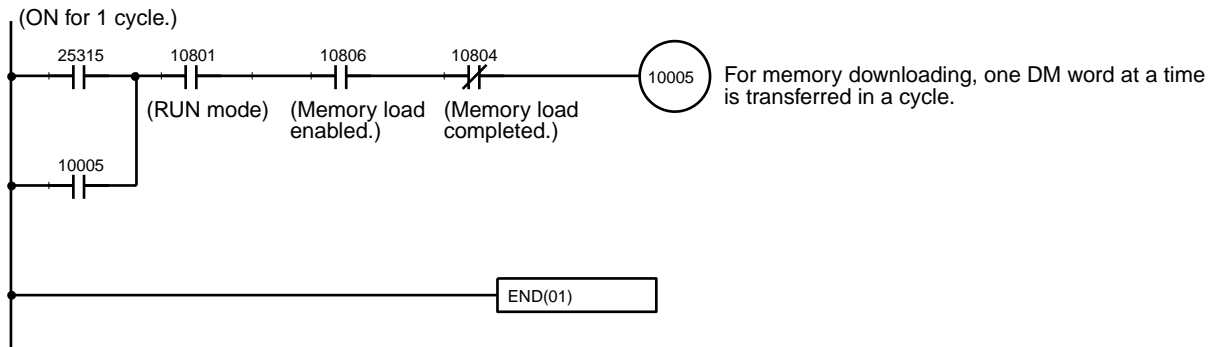|	
DM0100	0101
DM0101	0030
DM0102	0050
DM0103	0080
DM0104	0115
DM0105	0150
DM0106	0200
DM0107	0260
DM0108	0320
DM0109	0000
⋮	⋮
DM0114	0000

························ 01 01

Cam no.

Bank no.

Step no. 1

Step no. 2   For each step, set the ON data
first and then the OFF data.

Step no. 3

Step no. 4

If any steps are not to be used,
set either "0000" or "0FFF."

(ON for 1 cycle.)

```
   25315   10801      10806      10804
   ┤├──────┤├─────────┤├─────────┤/├──────────(10005)    For memory downloading, one DM word at a time
        (RUN mode) (Memory load (Memory load                 is transferred in a cycle.
                    enabled.)    completed.)
   10005
   ┤├

                              [ END(01) ]
```

4-3-3 Program Example to Set 48-point Cam ON/OFF Data

The following example shows how to set ON/OFF data for cam output numbers 1 to 48 for bank 1. The source data is moved to DM 0000 to DM 0119 from the dedicated DM Area words for the 48 cam output numbers starting at DM 3000, i.e., at total of 720 words, and then downloaded to the Unit.

Here, the unit number is 0 (allocated IR Area words: IR 100 to IR 109) and the operating mode of the CPU Unit is RUN mode.

Overview

Data for up to 8 cam output numbers, or 120 words (16 words per output number x 8) can be downloaded from the CPU Unit to the Cam Positioner Unit in one transfer. A total of 6 transfers is thus required to download the data for 48 cam outputs. The cam ON/OFF data is prepared in 6 blocks of 15 words each

as shown below, the data in each block is copied in turn to normal DM Area words and downloaded to the Cam Positioner Unit. The process must be repeated 6 times.
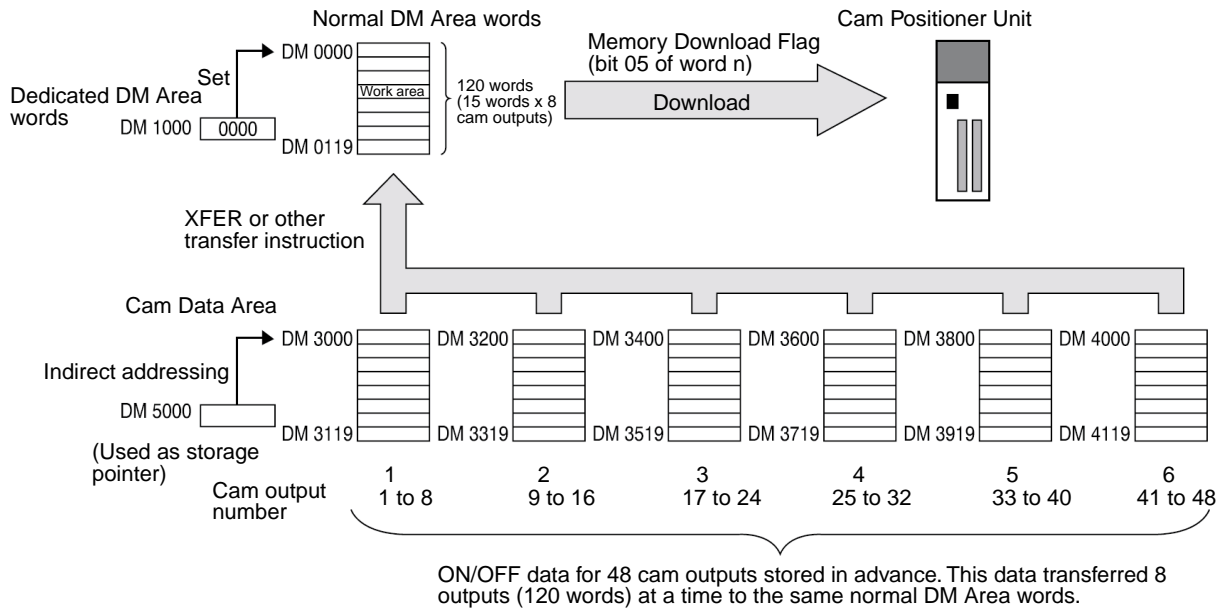
Initial Setup

The following dedicated DM Area word data and the ON/OFF data for the 48 cam outputs must be stored in advance using a Programming Console or other Programming Device. Do not store the cam ON/OFF data in normal DM Area words at this time. The data will be copied from the cam ON/OFF data area in sequence by the program for downloading.

Dedicated DM
Area Words

DM 1000	0000	Address of first word to hold the cam data.
DM 1001	0008	Number of cam outputs that has been stored. (Number of cam outputs to be downloaded at once.

• Set the address of the first word in the DM Area that will be used to hold the cam ON/OFF data for downloading. Here, the address is DM 0000.

• Set the number of cam outputs that will be downloaded for each data transfer. Here, the maximum number (8) is used.

Normal DM
Area Words

|		
DM 0000	0000	These 120 words are used to hold the cam data for 8 cam outputs
to		at a time so that data for all 48 cam outputs can be downloaded in
DM 0119	0000	succession.

Cam Data   The cam ON/OFF data is set in blocks of 8 words starting at DM 3000 as shown below.

Address	Block	Cam output numbers
DM 3000 to DM 3119	1	1 to 8
DM 3200 to DM 3319	2	9 to 16
DM 3400 to DM 3519	3	17 to 24
DM 3500 to DM 3719	4	25 to 32
DM 3600 to DM 3919	5	33 to 40
DM 4000 to DM 4119	6	41 to 48
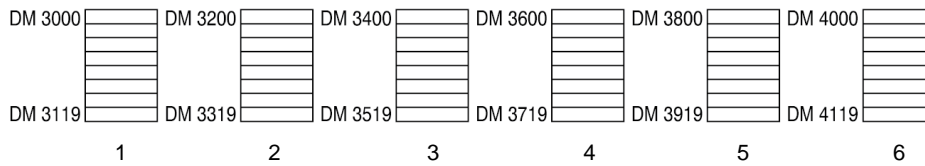
The following table shows example data for one block, i.e., cam ON/OFF data for 15 words.

Address	Contents	Meaning
DM 3000	0101	Upper 2 digits: Bank number (1 to 8) Lower 2 digits: Cam output number (1 to 8)
DM 3001	0030	Step 1 ON data
DM 3002	0050	Step 1 OFF data
DM 3003	0080	Step 2 ON data
DM 3004	0115	Step 2 OFF data
DM 3005	0150	Step 3 ON data
DM 3006	0200	Step 3 OFF data
DM 3007	0260	Step 4 ON data
DM 3008	0320	Step 4 OFF data
DM 3009	0000	Step 5 ON data
DM 3010	0000	Step 5 OFF data
DM 3011	0000	Step 6 ON data
DM 3012	0000	Step 6 OFF data
DM 3013	0000	Step 7 ON data
DM 3014	0000	Step 7 OFF data

Note   Set 0000 or 0FFF for steps that are not being used.

Program Execution Procedure   The program functions as follow to transfer the data:

1,2,3...
1. Block 1 of data starting at DM 5000 is transferred to the normal DM Area words starting at DM 0000.
2. The Memory Download Bit (bit 05 of word n) is turned ON to download the data from the normal DM Area words to the Cam Positioner Unit.
3. When the transfer has been completed, block 2 of data is transferred to the normal DM Area words and the process is repeated.
4. The same processing is performed for blocks 3 to 6.

Program Example

```
25315
─┤├─                                    ┌─────────────┐
First Scan Flag                          │   MOV(21)   │
                                         ├─────────────┤
                                         │    #3000    │
                                         ├─────────────┤
                                         │   DM 5000   │ Storage
                                         └─────────────┘ pointer


25315           d
─┤├────────────┤/├────────────┬───────  ┌─────────────┐
First Scan Flag Download       │         │    RSET     │
                completed      │         ├─────────────┤
                               │         │    10804    │ Memory Load
     c                         │         └─────────────┘ Completed Flag
─┤├───────────────────────────┤         ┌─────────────┐ (n + 8 bit 04)
Change data incam                        │   XFER(70)  │
data storage words                       ├─────────────┤
                                         │    #0120    │ No. of words
                                         ├─────────────┤
                                         │   #DM 5000  │ Storage
                                         ├─────────────┤ pointer
                                         │   DM 0000   │ First word
                                         └─────────────┘ for cam data
                                                         storage

                               ( a )


     a          10801     10806     10804
─┤├────────────┤├────────┤├────────┤/├──────────────── ( 10005 )
Copying        RUN Mode  Memory Load Memory Load
completed      Flag      Enabled Flag Completed Flag
               (n + 8    (n + 8 bit 06) (n + 8 bit 04)
               bit 01)
  10005        Memory Download Bit
─┤├─           (n bit 05)


  10804     Memory Load Com-
─┤├─        pleted Flag (n + 8 bit 04)      ┌─────────────┐
                                            │  DIFU(13) b │
                                            └─────────────┘


     b
─┤├────────────┬──────────────────────── ┌─────────────┐
               │                          │   CLC(41)   │
               │                          └─────────────┘
               │                          ┌─────────────┐
               │                          │   ADD(30)   │
               │                          ├─────────────┤
               │                          │    #0200    │
               │                          ├─────────────┤
               │                          │   DM 5000   │ Storage
               │                          └─────────────┘ pointer
               │
               └───────────────────────  ( c )   Change data incam
                                                  data storage words


  25313
─┤├────────────┬──────────────────────── ┌─────────────┐
Always ON Flag │                          │   CMP(20)   │
               │                          ├─────────────┤
               │                          │   DM 5000   │ Storage
               │                          ├─────────────┤ pointer
               │                          │    #4200    │
               │                          └─────────────┘
               │   25506
               └──┤├─────────────────────  ( d )   Download
                  Equals Flag                       completed


                                         ┌─────────────┐
                                         │   END(01)   │
                                         └─────────────┘
```

#3000 stored in DM 5000 at startup. DM 5000 is the pointer to the storage area.

Memory Load Completed Flag (IR 10804) reset at startup or when c is ON and d is OFF.

Also, contents of 120 words of data starting at the address in DM 5000 (initially DM 3000) are copied to DM 0000 to DM 0119.

If the data to be downloaded has been copied to DM 0000 to DM 0119, the Cam Positioner Unit is in RUN mode, downloading is enabled, and the current download has not been completed, the Memory Download Bit is turned ON to download the data in DM 0000 to DM 0119 to the Cam Positioner Unit.

When the download has been completed, the Memory Load Completed Flag (IR 10804) turns ON and b is turned ON for one scan.

When b turns ON, #0200 is added to the pointer value in DM 5000 to change the first word for transfer to DM 0000 to DM 0119.

c turns ON when the pointer value has been changed.

Contents of pointer value in DM 5000 compared to #4200 to see if all the data has been downloaded.

If DM 5000 contains #4200, d is turned ON and the download processing is stopped.

4-3-4 Monitoring Cam ON/OFF Data

Example

Monitor the "bank number = 1" and the "cam number = 1" cam ON/OFF data. The monitor data is stored in DM 0200 to DM 0214.

Conditions

Unit number = 0 (Allocated word numbers: 100 to 109)

Operation mode selector is set to RUN. (C200H□)

Program Example

Preset the following data, using a peripheral device such as the Programming Console.

(Turn AR 0100 OFF and ON or turn the C200H□ ON, OFF, and ON after setting.)

Dedicated DM

DM1000	0200	········· Leading DM number for cam data storage
DM1001	0001	········· Number of cam data storage combinations
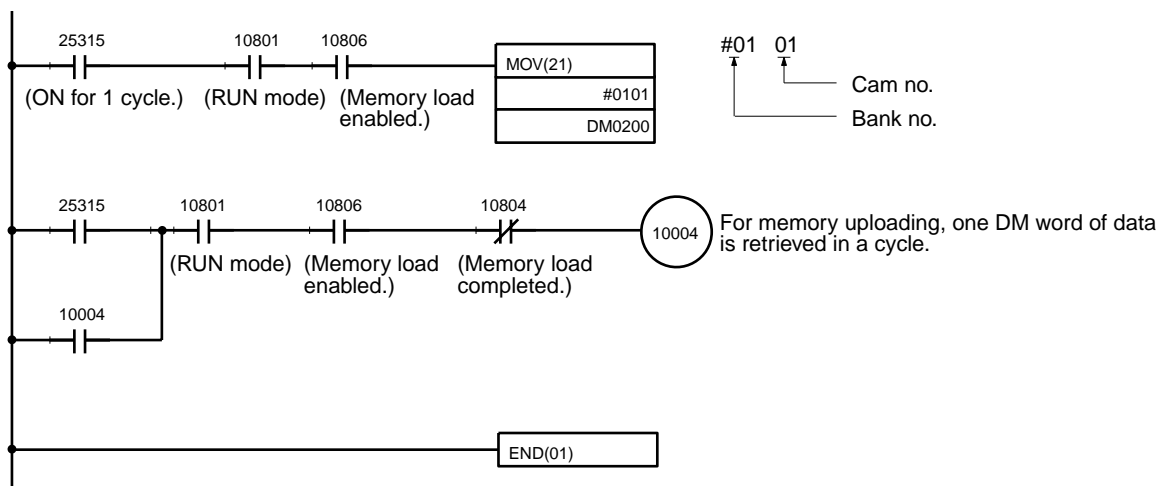
When memory uploading is complete, set the ON/OFF data.

DM0201	0030	Step no. 1
DM0202	0050	
DM0203	0080	Step no. 2
DM0204	0115	
DM0205	0150	Step no. 3
DM0206	0200	
DM0207	0260	Step no. 4
DM0208	0320	
DM0209	0FFF	
⋮	⋮	For words with no cam data, "0FFF" is stored.
DM0214	0FFF	

For each step, set the ON data first and then the OFF data.

43

4-3-5 Setting the Number of Revolutions per Process

Example   With input A, set the number of revolutions required for a single process for Bank 1 to "1.00," and start operation with Bank 1. Stop operation with input B.

Conditions   Unit number = 0 (Allocated word numbers: 100 to 109)

Operation mode selector is set to RUN. (C200H□)

Program Example   Preset the following data in the dedicated DM Area words using a peripheral device such as the Programming Console.

Dedicated DM

| DM1002 | 0001 | ········ Transfer permitted |
| DM1003 | 4100 | ········ 4 100 Setting data for number of revolutions required for a single process |

Actual numeric data

2 digits to right of decimal point.

```
      A      10801    10000
   ┤├──────┤├─────────┤/├────●──────┌──────────────┐
          (RUN mode)             │   MOV(21)      │
                                 │        #0001   │   Sets "bank number = 1" to word 101.
                                 │        101     │
                                 │                │
                                 ●──────┌──────────────┐
                                        │   CMP(20)      │
                                        │        #0001   │   Waits for word 107 (bank number monitor)
                                        │        107     │   to be set to "0001." (See note below.)
                                        │                │

              25506
            ──┤├────────────(23200)     When word 107 is set to "0001," 23200 turns ON.
              (=)

    23200    B
 ──┤├──────┤/├──────────────(10000)     Operation instruction

    10000
 ──┤├──

 ────────────────────────┌──────────────┐
                          │   END(01)      │
                          └──────────────┘
```
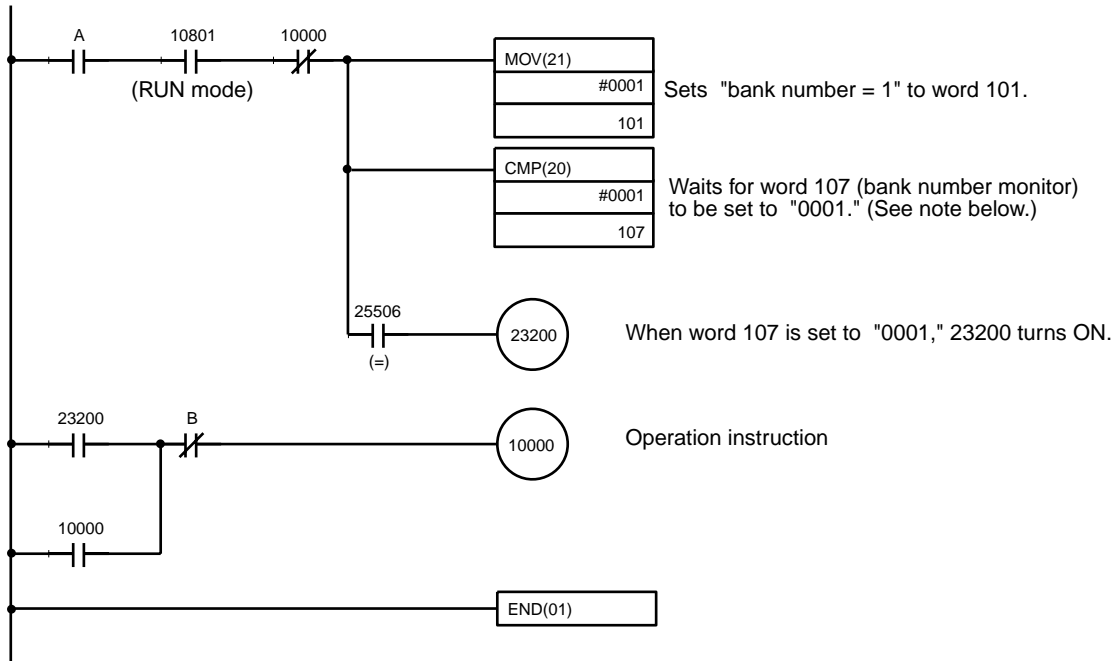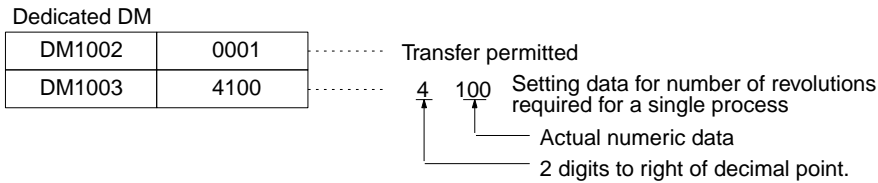
Note   It takes approximately 100 ms for the bank number data to be transferred. Therefore, as shown in the example, verify that the transfer has been completed before turning ON the Operation Flag.

SECTION 5
Troubleshooting

This section provides possible errors and corrections.

Error Detection

When an error occurs with resolver input or at the Cam Positioner Unit, the content of the error is output to the Data Setting Console and to an input relay to notify the user.

Errors, Causes and Corrections

Status at time of error:

Refers to the operation status and the cam output status when the error occurs.
O: Operation or cam output continues.
X: Operation or cam output stops.

Display	Error	Operation mode		Status at time of error		Probable cause	Possible correction
		PRG	RUN	Oper-ating	Cam output		
E0 1	Memory error	O	O	×	×	There is an error in the EEPROM of the Cam Positioner Unit.	Clear the error (see page 48). Replace the Unit.
E02	Communica-tion error	O	O	O	O	There is an error in the communications between the Cam Positioner Unit and the Data Setting Console.	Clear the error (see page 48). Replace the connection cable. Replace the Unit.
E03	Power failure error	O	O	×	×	Power was interrupted during data setting or origin adjustment.	Clear the error (see page 48), and then make the settings again.
E20	Bank change error	×	O	×	×	The bank number data in word n + 1 is not set from 00 to 08. The cam setting data is corrupted.	Clear the error (see page 48), and then set the bank number correctly.

Display	Error	Operation mode		Status at time of error		Probable cause	Possible correction
		PRG	RUN	Oper-ating	Cam output		
E21	Data transfer error	❍	❍	❍	❍	The cam data is not set from 000 to 359 or 0FFF.	Clear the error (see page 48), and then check the probable causes listed on the left. Correct the problem and execute the transfer again.
						The data for setting the number of revolutions required for a single cycle is outside of the allowable range.	
						The decimal point position data is other than 1, 2, or 4.	
						The numeric data is not in BCD.	
						The memory upload and memory download points were turned ON simultaneously.	
						The Data Setting Console was operated during data transmission.	
						Data transfer was executed during Data Setting Console operation.	
						The transfer bank number was not from 1 to 8 or the transfer cam number was not 1 to 48.	
						The transfer of the required number of revolutions for a single process (i.e., bank selection) was executed while the display on the Data Setting Console was flashing.	
E22	Parameter error	❍	❍	❍	❍	The DM m and DM m + 1 set values are not correct. 0999 is exceeded in the general DM area.	Correct the set values in DM m and DM m + 1, and then clear the error and try again.
E10	Resolver disconnection error	Δ (see note 2)	❍	×	×	The resolver connection cable is faulty.	Replace the resolver connection cable.

Note 1. Display:
Refers to the display on the Data Setting Console.

2. Operation mode:
Refers to the setting of the operation mode selector when the error occurs. If there is a circle in both the PRG and RUN columns, it indicates that the error applies to both modes. A triangle for the resolver disconnection error indicates that the error applies only in PRG mode and when the power is turned on.

Display and Output to the Input Relay

(n = 100 + 10 x Unit No.)

Error	Cam Positioner Unit display		Data Setting Console display				Output to input relay		Bit 07 to 00 of word (n+9)
							Word (n+8)		
	RUN	ALM	DATA	RUN	ALM1	ALM2	Bit 14	Bit 15	
Memory error	Lit	Lit	*E01* (Blinking)	Not lit	Not lit	Lit	OFF	ON	01
Communication error	Lit	Lit	*E02*	Lit	Not lit	Lit	OFF	ON	02
Power failure error	Lit	Lit	*E03*	Not lit	Not lit	Lit	OFF	ON	03
Bank change error	Lit	Lit	*E20*	Not lit	Not lit	Lit	OFF	ON	20
Data transfer error	Lit	Lit	*E21*	Lit	Not lit	Lit	OFF	ON	21
Parameter error	Lit	Lit	*E22*	Lit	Not lit	Lit	OFF	ON	22
Resolver disconnection error	Lit	Lit	*E10*	Not lit	Lit	Not lit	ON	OFF	10

Error Clearing Methods

When any of the above errors occurs, first remove the cause of the error and then apply one of the following methods to clear the error. Only methods (3) and (4) are valid for parameter errors (*E22*). When either of these two methods is used to clear an error, the bank number reverts to "0" and must then be reset.

- Press the CLR key on the Data Setting Console.
- Turn the Error Reset Flag (bit 03 of word n) from OFF to ON.
- Turn the C200H□'s power supply from ON to OFF and then back ON.
- Turn the Special I/O Restart Flag (AR 0100 to AR 0109) from OFF to ON.

Duplicate I/O Unit

The Unit number duplicates the number of another Special I/O Unit. The SR bit 25415 turns ON when an Duplicate I/O Unit error occurs. Refer to AR 0000 to AR 0011 for the duplicated Unit number. The C200H□ PC will not operate during a duplicate I/O error.

Set the Unit number to a unique number.

Special I/O Unit Error

I/O refresh not operating correctly between the CPU Unit and Cam Positioner Unit. Operation in not interrupted when a Special I/O Unit error occurs. Refer to AR 0000 to AR 0015 for the Unit number where the error occurred. After correcting the cause of the error, set the Special I/O Unit Restart Flag (AR 0100 to AR 0109) to restart operation.

RUN Indicator Unlit

The C200H□ power supply is turned on but the RUN indicator is not lit. None of the errors described previously is the cause. Replace the Unit.

No Data Detting console Display

- No 24 VDC power supply is connected to the Cam Positioner Unit input terminals A10 and B10.
- The connecting cable connector is disconnected.
- The connecting cable is broken.
- A circuit in the Data Setting Console is defective.
- A circuit in the Cam Positioner Unit is defective.

After determining the cause of the error, repair the problem or replace the Unit.

Appendix A
Specifications

General Specifications

Conforms to the C200H□ PC specifications.

Performance Specifications

Item	Specifications
Cam output points	Total: 48 points Internal/external outputs: 16 points (cam outputs 1 to 16) Internal outputs: 32 points (cam outputs 17 to 48)
External output	NPN transistor, open collector (with photocoupler insulation) Switching capacity: 100 mA at 24 VDC Simultaneous ON points: 8 points max.
External output terminal	24-pin connector (Fujitsu's FCN-360-series connector)
Resolver	3F88L-RS17 3F88L-RS17T 3F88L-RS15 3F88L-RS15W Note: The 3F88L-RS15 and 3F88L-RS15W each require a resolver cable.
Resolver input terminal	8-pin round connector (The 20-cm-long 3F88L-CROR2A Auxiliary Connection Cable is provided with the Cam Positioner Unit.)
Resolver response r/min	800 r/min max.
Angle detection cycle	200 μs (at a sampling frequency of 5 kHz)
Cam output response time	450 μs (800 r/min)
Control unit (resolver resolution)	1°
Origin adjustment	1° to 359°
Number of ON/OFF control operations	Maximum of 7 per cam output
Number of cam output data banks	8 banks A single bank contains 48 points of cam output data. Cam data is stored in EEPROM. The bank No. to be used is specified via the C200H□ using the user's program or Programming Console.
Data input present value display	Set by the Data Setting Console or via the C200H□ using the Programming Console or appropriate device, or the user's program.
Selectors	Front panel: Origin adjustment setting, operation mode selection Rear panel: CW or CCW selection, cam data protect permitted/not permitted, adjustment operation permitted/not permitted
Internal current consumption	5 VDC 0.3 A max.
External power supply	24 VDC $^{+10\%}/_{-15\%}$ 2 A min.
Dimensions (mm)	34.5 x 130 x 101 (W x H x D)
Weight	Approx. 350 g

Output Specifications

Item	Specifications
Switching capacity	24 VDC 100 mA
Leakage current	160 µA max.
Residual voltage	1.8 V max.
ON response time	20 µs max. (see note)
OFF response time	20 µs max. (see note)
Number of circuits	16 pts./common, 1 circuit
Simultaneous ON points	8 points
External power supply	24 VDC at 2 A max. (including load)

Note The ON and OFF response times are numbers that depend on the hardware and are not times that can be controlled by software.

Appendix B
Resolvers

Resolver and Resolver Cable Models

Resolver Models

Specifications		Model
Axle 10 dia.	Standard type	3F88L-RS17
	High-torque type	3F88L-RS17T
Axle 6 dia.	Connector type	3F88L-RS15
	Lead-wire type	3F88L-RS15W

Resolver Cable Models

Specifications	Cable length	Model
Extension cable	2 m	3F88L-CR002C
	5 m	3F88L-CR005C
	10 m	3F88L-CR010C
	20 m	3F88L-CR020C
Both connectors (for 3F88L-RS15)	3 m	3F88L-CR003NA
	5 m	3F88L-CR005NA
	10 m	3F88L-CR010NA
	15 m	3F88L-CR015NA
	20 m	3F88L-CR020NA
One connector (for 3F88L-RS15W)	3 m	3F88L-CR003SA
	5 m	3F88L-CR005SA
	10 m	3F88L-CR010SA

Resolver Specifications

Item	3F88L-RS15	3F88L-RS15W	3F88L-RS17	3F88L-RS17T
Axial diameter	6 dia. mm		10 dia. mm	
Axial load	Radial: 10 kgf {98 N} Thrust: 10 kgf {98 N}		Radial: 20 kgf {196 N} Thrust: 20 kgf {196 N}	
Friction torque	30 gf • cm {2.9 mN • m} max.		120 gf • cm {12 mN • m} max.	500 to 1,500 gf • cm {49 to 147 mN • m} max.
Vibration resistance	Frequency range: 10 to 500 Hz Total amplitude: 1.5 mm or 98 m/s^2, whichever is less Test time: 3 directions: X, Y, Z (2 hrs each)			
Impact resistance	4,900 m/s^2 in $\pm$X, $\pm$Y, and $\pm$Z directions, 3 times each			
Protective structure	Drip proof, oil proof IP52F (JEM)			
Maximum cable length	Can be extended up to 100 m.			
Frequency	5 kHz			
Electrical malfunction	10 min			
Maximum speed	3,000 rpm (Mechanical)			
Mounting method	Servo-mount (mounting hooks included)		Flange-mounting (Flange strength: 25 kgf {245 N})	
Coupling	3F88L-RL6		3F88L-RL10	
Wiring method	Connector	Lead wire (350 mm)	Cable (3 m, end connector included)	
Color	Munsell N1.5		Munsell 5Y3/1	
Ambient operating temperature	−10° to 80°C			

Resolver Dimensions

3F88L-RS17/RS17T

Dimensions at end of axle

Four, 4.5-dia.

45

45

50±0.3 dia.

9

9.5

28±0.5

3   4

72(81)
(See note)

$35^{+0}_{-0.05}$ dia.

$10^{-0.005}_{-0.017}$ dia.

40 dia.

16

21

59

37   Extension cable

59

Cable length:
approx. 3 m
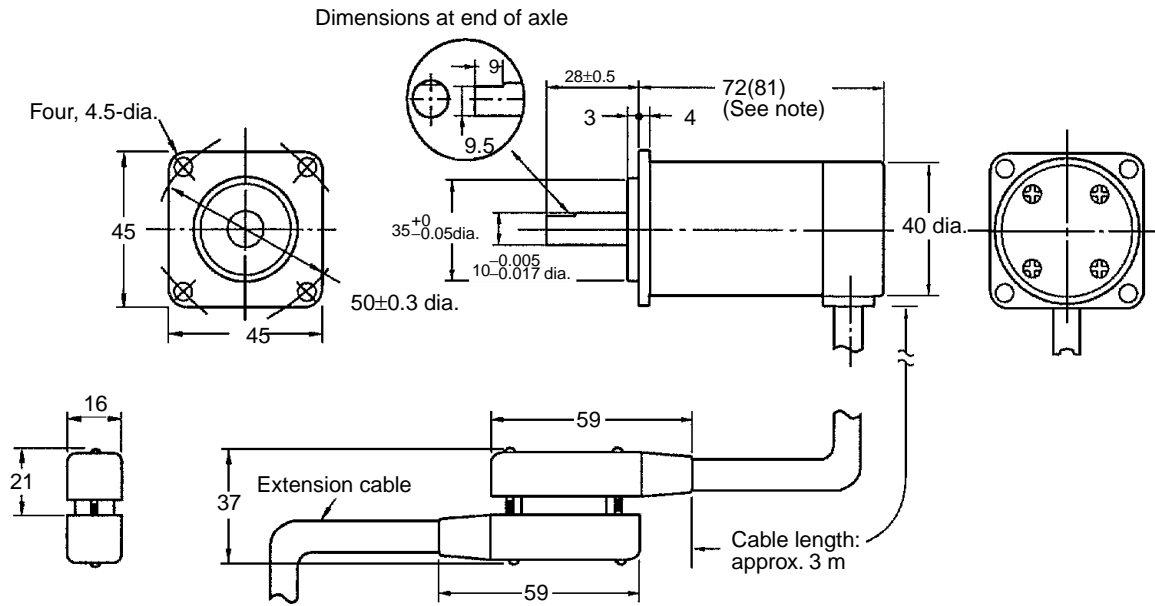
Note: The numbers in parentheses ( ) are
the dimensions for the 3F88L-RS17T.

3F88L-RS15

Dimensions at end of axle

9

5.5

16.5±0.5

3   2.5

72

65 max.

43 dia.

$6^{+0.004}_{-0.016}$ dia.

$33.32^{+0}_{-0.05}$ dia.

39 dia.

RM15WTP-10P
connector (Hirose)

RM15WTP-10S-(8) connector (Hirose)

3F88L-RS15W

Dimensions at end of axle

9

5.5

16.5±0.5

3   2.5

64

16 max.   350 max.

43 dia.

$6^{+0.004}_{-0.016}$ dia.

$33.32^{+0}_{-0.05}$ dia.

39 dia.
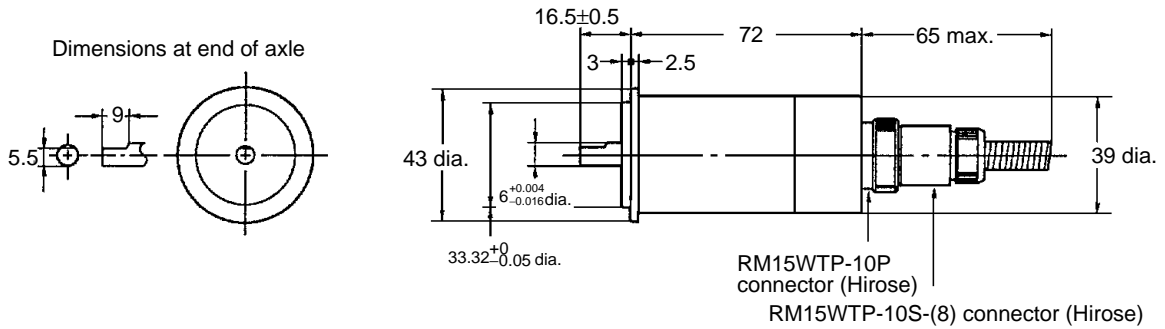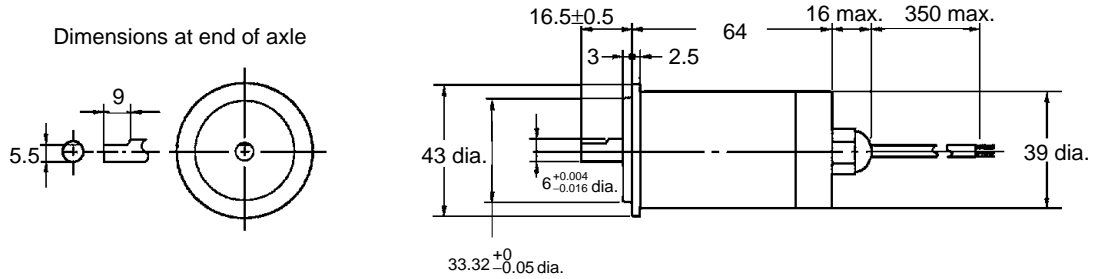
Resolver Mounting Dimensions

3F88L-RS17/RS17T (Flange Mounting)
Recommended mounting holes

$35^{+0.025}_{+0.009}$ dia.
(Recommended dimensions)

50±0.3 dia.

Four M4

Mounting

50 dia.

Four, M4 screws
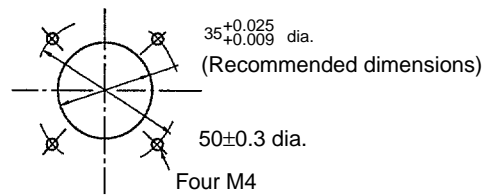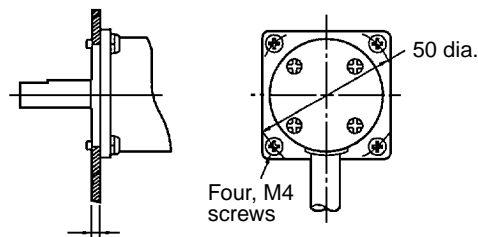
Plate thickness: 3 mm min.

Note The flange can withstand a force of 25 kgf (245 N) on the center of the resolver.

3F88L-RS15/RS15W (Flange Mounting)
Recommended mounting holes

$33.32^{+0.025}_{+0.009}$ dia.
(Recommended dimensions)
52 dia.

120°

Three M4

Mounting

Three M4

Mounting hooks (included with resolver)

52 dia.

12
6

2.6
10
4.4 dia.

Mounting hooks
(External diameter: φ:67)

Plate thickness: 3 mm min.
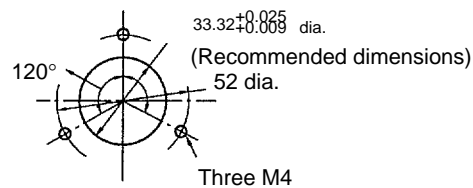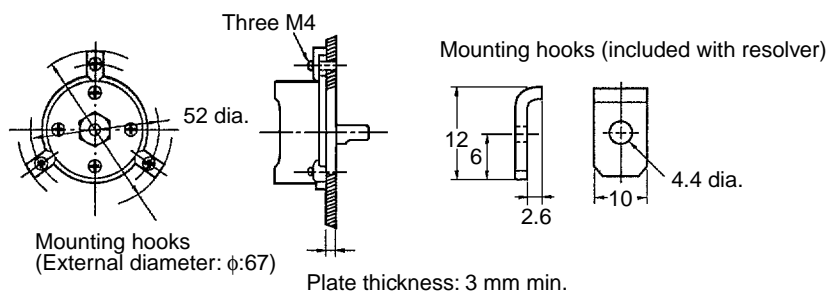
Linking the Resolver Directly to the Mechanical System

Using the coupling (3F88L-RL6/RL10) provided with the resolver, link the rotational system's axle to the resolver's axle. If a torque of 1.7 to 2 times the allowable torque transfer is applied, damage will occur at the central region of the coupling, and the resolver alone will be given the maximum load. Keep the coupling's axial core misalignment and bending angle within the specifications.

Outer Shape of Coupling
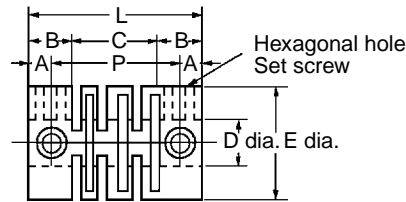
Coupling model	Resolver model	D dia.	E dia.	L	P	A	B	C	Set screws
3F88L-RL10	RS17(T)	10	22	26.2	19	3.6	7.1	12	M4x6 (four)
3F88L-RL6	RS15(W)	6	15	22	16.4	2.8	5.5	11	M3x4 (four)

Coupling Specifications

Coupling model	Bending angle: θ1 (see note 1)	Axial core misalignment: t1 (see note 2)	Allowable torque transfer		Set screws	
			+20°C	+80°C	Size	Tightening torque
3F88L-RL10	10°max.	1.0 mm max.	30 kgf • cm {2.94 N • m}	18 kgf • cm {1.76 N • m}	M4 × 6	4.5 kgf • m {0.44 N • m}
3F88L-RL6	10°max.	1.2 mm max.	10 kgf • cm {0.98 N • m}	6 kgf • cm {0.58 N • m}	M3 × 5	2.5 kgf • m {0.24 N • m}
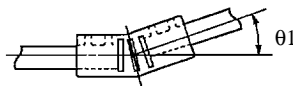
Note 1:   Note 2: Axial core misalignment
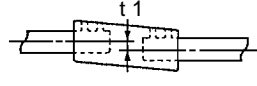
Coupling Linkage Specifications
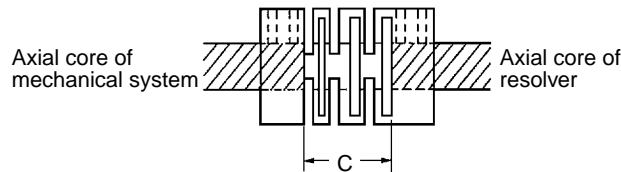
Note 1. In the diagram above, perform the linkage in the space indicated by C, such that the axial core does not protrude. If rotation occurs with the axial core protruding, the coupling will loosen and damage the machinery.

2. If the the bending angle or axial core misalignment is too large, not only will the service life of the coupling be shortened but the accuracy of the resolver rotation angle will be adversely affected.

Wiring Resolver Cables

For the resolver cable, use a special cable to protect against external noise. If wiring or repeater connections are used in the middle of the cable, adverse effects can easily occur.

If an extension is required, use the special-purpose 3F88L-CR☐☐☐C Extension Cable.

Secure the resolver cable so that no external force is applied to the cable.

Correct Connection Example

Resolver's 3F88L-CR0R2A Auxiliary Connection Cable (provided with the Cam Positioner Unit).
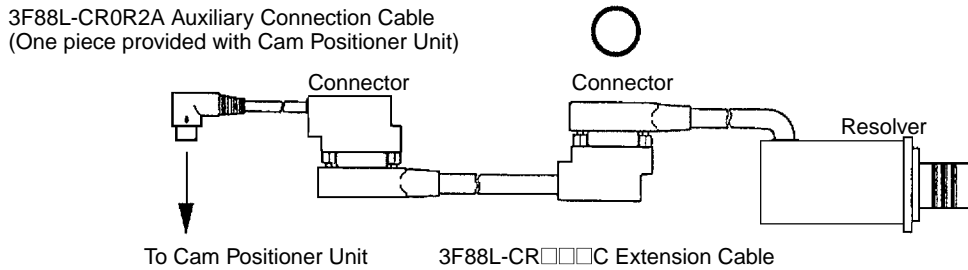
Incorrect Connection Example
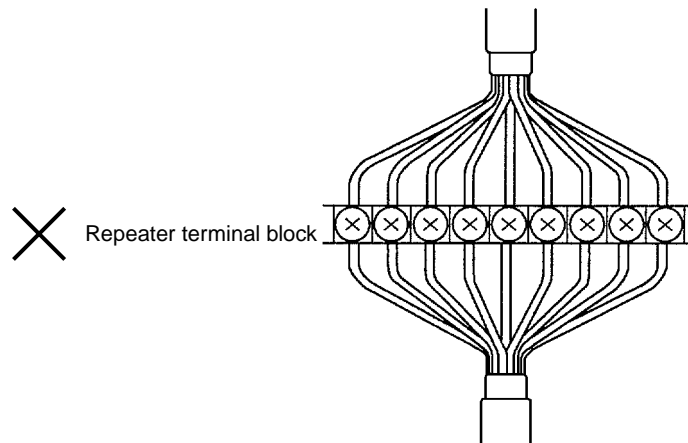
The resolver cable transmits signals that require precision at low voltage. In order to avoid receiving inductive noise that could adversely affect these signals, it is recommended that resolver cables be wired as far as possible from other lines.

Keep in-panel wiring as far away as possible from control wires and power lines.

External wiring should be contained in a weak-current duct used exclusively for that purpose, and it should be covered with a grounded metal plate.

Appendix C
Dimensions

Cam Positioner Unit

Weight: 350 g

Unit Dimensions
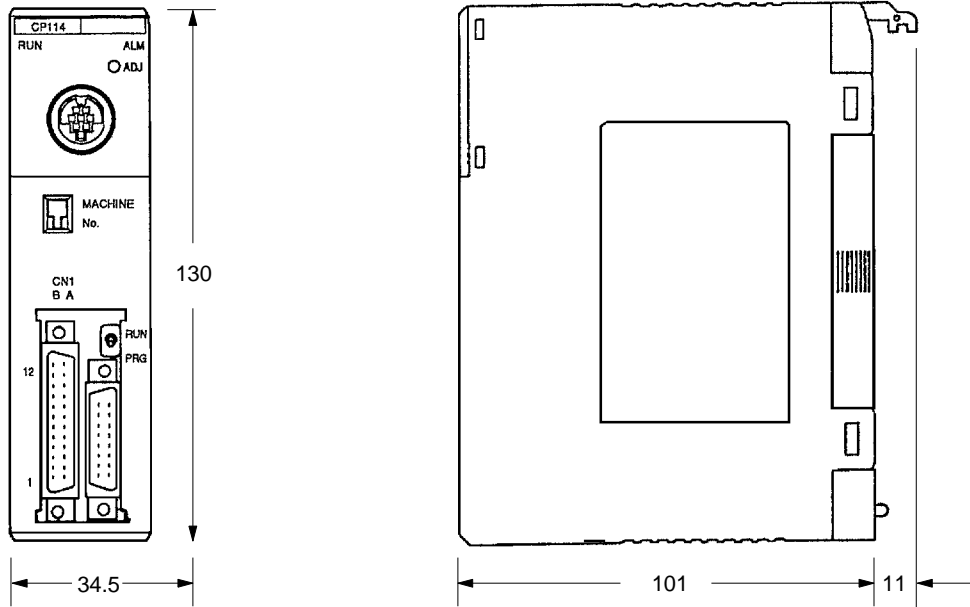
Mounting Dimensions
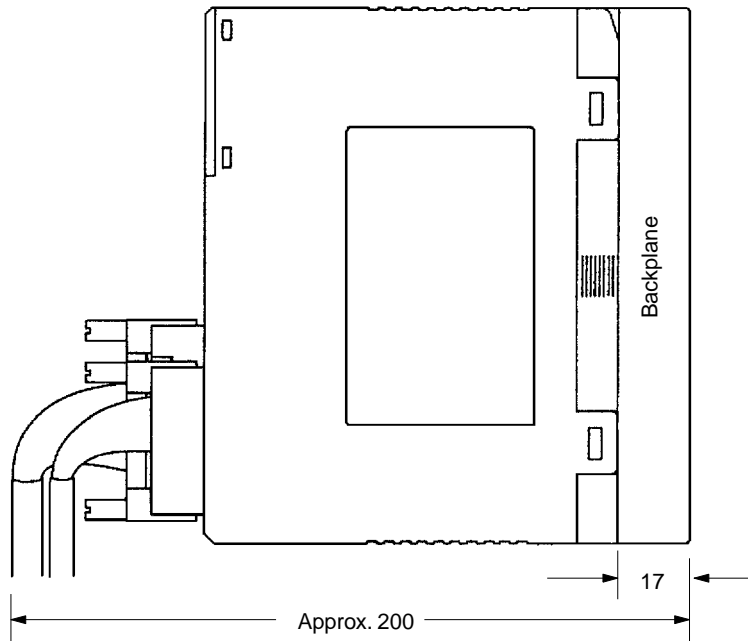
Data Setting Console

Weight: 120 g

Unit Dimensions

Mounting Dimensions

Panel Cutout	Clearance

$92^{+0.8}_{0}$

$45^{+0.6}_{0}$

Panel thickness 1 to 4 mm
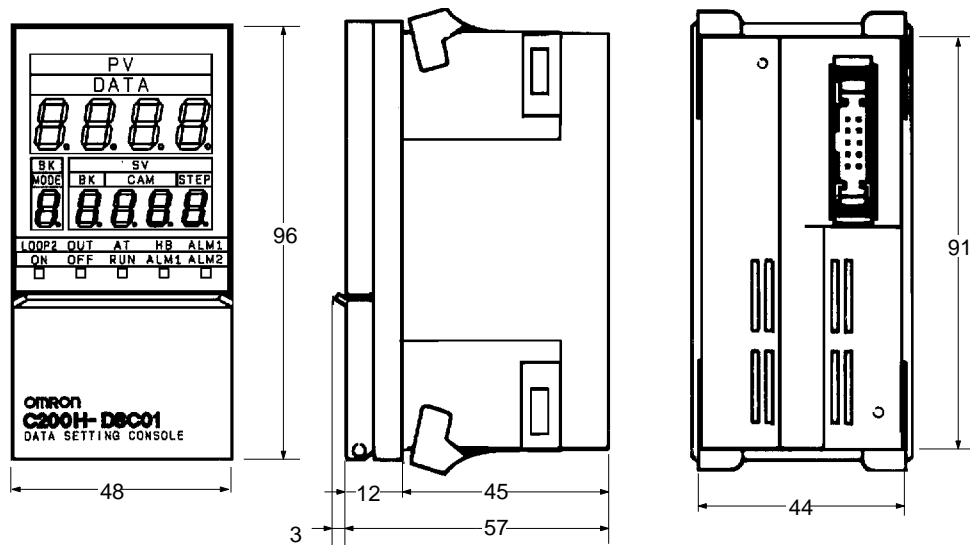
Clearance of at least 150 mm
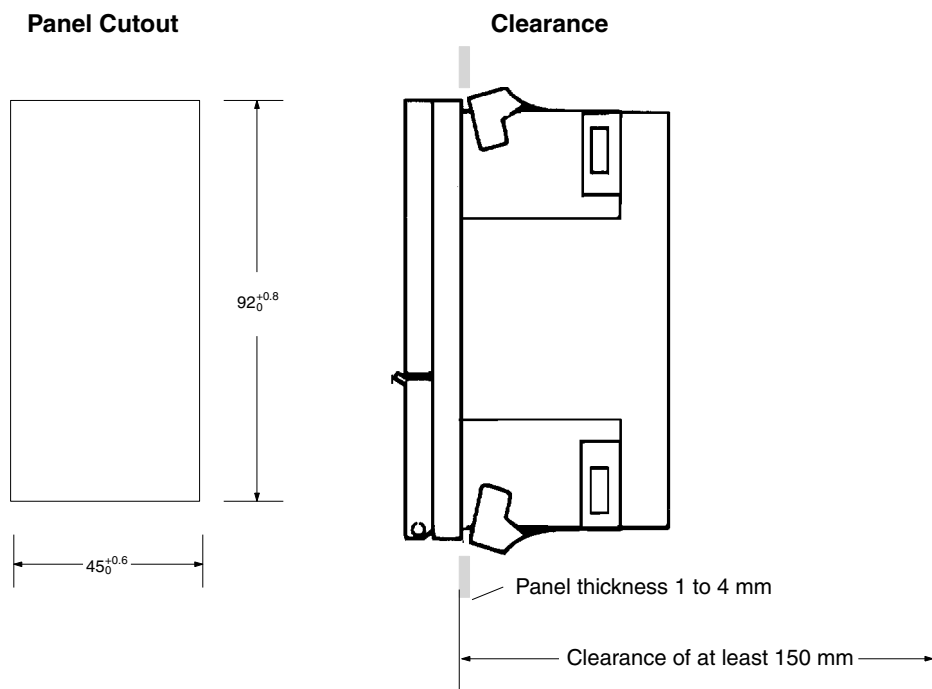
Allow a clearance of at least 150 mm behind the Data Setting Console when it is installed in the panel to allow cable connectors to be inserted. A clearance of 50 mm is sufficient if the rear panel can be opened.

Index

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. W224-E1-2
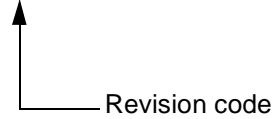
— Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	September 1993	Original production
1A	July 1995	**Page 48:** The maximum speed in *Resolver Specifications* corrected from 300 rpm to 3,000 rpm.
2	January 2001	PLP section added to the front of the manual. "C200H" changed to "C200H□" where appropriate to indicate the applicable PCs. **Pages 2, 16, 17, 27, 28 and 45:** "External outputs" changed to "internal/external outputs." **Page 8:** Note added. **Pages 22, 28:** "Per unit time" changed to "per minute." **Page 28:** Information added to description for n+6. **Page 33:** "Bit 05" corrected to "bit 04" and "bit 07" corrected to "bit 06." **Page 34:** "Bit 07" corrected to "bit 06." **Page 35:** Information added to step 2 in the middle of the page. **Page 37:** Section added. **Pages 37 and 38:** "Dedicated DM Area words" added. **Page 48:** G's changed to m/s^2.