Oriental motor

HP-13014-7

Controller Module

CM10 Series

OPERATING MANUAL

CE

Thank you for purchasing an Oriental Motor product.
This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

This Operating Manual supports the firmware version 2.1x.

Table of Contents

1 Before Use

1.1 Main Features

The **CM10** Series controller module is a programmable controller that instantly makes a conventional driver a powerful indexer/driver and network ready.

■ Easy Installation, Easy Operation

- Snap on style
  Just snap **CM10** on to your driver and you are done. You no longer need to hassle with complicated wiring and installation. Everything you need to perform position control is now at your fingertips, by combining Oriental Motor's standard motor/actuator and driver packages. Oriental Motor's extensive product lineup includes stepping motor/gear/brake and driver packages, servo motor/gear/brake and driver packages, and linear sliders/actuators and driver packages.
- Friendly GUI
  While all commands for the **CM10** can be executed using any general terminal software, a Windows based utility software, the **Immediate Motion Creator for CM/SCX Series (IMC)**, is provided. The **IMC** features include instant operation, easy programming and configuration without needing to know the **CM10** commands. Real time monitoring of position and feedback, I/O status are also provided. Everything is intuitive. Once you install the **IMC** on your computer, you can make your desired motion in a few seconds.
- User Unit
  In the **CM10**, actual motion distance of user application, such as "mm," "inch" and "revolution" is used, instead of pulse unit that is commonly used in pulse generates and motor controllers. The **CM10** converts it to pulses for you. Any unit can be used.

■ Versatile Connections

- USB
  The **CM10** has a USB port on the front panel. When you perform the initial setup of the **CM10**, directly connect it to your computer. Commercially available USB2.0 cables (mini-B type) are compatible. This becomes an advantage during maintenance, since a special cable or converter is not required, unlike RS-485/232C products. USB can also be used for all functions, including network operation.
- CANopen
  The **CM10** comes equipped with CANopen as standard. Sequence selection and execution can be made through CANopen as well as commanding incremental motion. CANopen for the **CM10** is certified by CiA (CAN in Automation).
- RS-232C Daisy Chain (Multi Axis Control)
  While RS-232C is available as a standard connection to the master controller, daisy chain connection is also supported for multi axis control. Other Oriental Motor products such as the **αSTEP-One** can be connected together.
- External Encoder Input
  The **CM10** has external encoder input. Feedback position is always monitored, and can be used for general purpose as well as miss-step detection and mechanical home seeking (zero position). The external encoder inputs are compatible with line driver, open collector and TTL Signals. A 5V output for encoder power is also included.
- Configurable I/O
  While all connections to the drivers are included, the **CM10** has 9 general inputs and 4 general outputs. Various commands such as start, stop, pause, end, brake and current can be assigned to any I/O point. Sequence programs can also be selected through these inputs. Connect these I/O to PLC, switches, sensors and even other actuators. By using the powerful programming functions of the **CM10**, simple systems can be configured without a PLC or computer.

■ Simple Operations

- Immediate and Program
  You may directly command each motion by a computer or PLC via serial ports, and immediately operate a motor. You may also store programs in the **CM10**, and execute them via serial ports or I/Os. The motor will automatically be operated according to the stored sequence. For your freedom, there is no limitation to number of lines in each program and up to 100 programs can be stored.
- Over 250 Commands
  The **CM10** has various commands including motion control, I/O control, sequence control and status monitoring. Subroutines, math/logical operators and user variables are ready for sophisticated program creation. Motion control is versatile with 6 types of stopping and pausing, 13 types of mechanical home seeking. With these, you can do almost anything you wish.

1.2 About Function Improvements

The **CM10** is continuously improving functions and adding new features. The following lists show the major changes that have been made until now. Note that the utility software and the EDS file for CANopen are also changed in conjunction with updating the firmware of the main unit.

Added and changed functions with the firmware Ver.2.0x (Released in August to October, 2011)

Feature	Content	Page	Controller Module Model
Reading the drivers' current position (absolute position) and home preset functions are added	8.6 Driver Current Position Reading (**CM10-1**, **3**, **5**)	71	**CM10-1**, **3**, **5**
Torque limiting/push-motion operation functions are added	8.5 Torque Limiting/Push-motion Operation (**CM10-1**, **5**)	68	**CM10-1**, **5**
	12 Command Reference ・TL: Torque Limiting/Push-motion Operation/Current Cutback Release	321	
Limiting condition output (torque limiting/push-motion operation) is added	8.5 Torque Limiting/Push-motion Operation (**CM10-1**, **5**)	68	**CM10-1**, **2**, **5**
	6.4.3 Output Signals ・LC (limiting condition) Output	31	
	A.2 Input Signals for Driver ・LC (limiting condition) Input	357	
Sensor-less (push-motion type) home seeking operation is added	8.2.5 Mechanical Home Seeking ・Sensor-less Mechanical Home Seeking Operation for "HOMETYP=12"	59	**CM10-3**
Driver operation ready (READY) /motor moving (MOVE) can be input	6.4.3 Output Signals ・READY (operation ready) Output ・MOVE (motor moving) Output	31	**CM10-1**, **3**, **5**
Expanded the deviation counter clear selections during mechanical home seeking operation	8.2.5 Mechanical Home Seeking ・HOMEDCL (deviation counter clear select at mechanical home seeking operation)	58	**CM10-1**, **2**, **3**, **4**, **5**
Stopping sequence in addition to motion, by PSTOP (panic stop) command or input (previously stopping motion only)	6.4.2 Input Signals ・PSTOP (panic stop) Input	27	**CM10-1**, **2**, **3**, **4**, **5**
Name change of TIMING signal	See the following table*	-	**CM10-1**, **2**, **3**, **4**, **5**
Expansion of the applicable drivers and addition of the automated assignment function for the optimal driver I/O signals to each function/driver	6.5 Driver I/O Setting (**CM10-1** and **CM10-3**)	35	**CM10-1**, **3**
Program memory is expanded to 6 kB from 2 kB	15 Specifications ・"Programs" - "Size"	344	**CM10-1**, **2**, **3**, **4**, **5**

∗ Name Change of TIMING Signal

Function	Previous Firmware (Ver1.xx)	New Firmware (Ver.2.0x)
Assignment of the timing signal (differential)	DINTIM1	DINTIMDEXTZ
Assignment of the timing signal (single-ended)	DINTIM2	DINTIMS
Input status of the timing signal (differential)	DSIGTIM1	DSIGTIMDEXTZ
Input status of the timing signal (single-ended)	DSIGTIM2	DSIGTIMS

The previous command names cannot be used in the new firmware. The functions of these new commands remain the same.

Added and changed functions with the firmware Ver.2.10 (Released in October, 2012)

Feature	Content	Page	
Assignment of the resuming function from a pause status (CONT function) is added to I/O and Remote I/O.	6.4.2 Input Signals ・CONT (continue motion) Input	28	**CM10-1,2,3,4,5**
A choice for "no action when inputting SENSOR during continuous operation" (SENSORACT=3) is added to SENSORACT. (In this choice, the SENSOR input is used with return-to-mechanical home operation only.)	8.2.3 Continuous Motions 8.2.5 Mechanical Home Seeking	51 55	**CM10-1,2,3,4,5**
Sensor-less mechanical home seeking operation (HOMETYP=12) can be performed in the sequence, and also the MEND function can be used with HOMETYP=12.	8.2.5 Mechanical Home Seeking ・Sensor-less Mechanical Home Seeking Operation for "HOMETYP=12" 12.3 Command Description ・MEND: Wait for Motion End	59 255	**CM10-3**
PABS, ABSSTS, DD, DIN, DOUT, DINSG, DOUTSG are added to the function that can be used via CANopen, and also PF becomes writable.	10.7 Object Dictionary (SDO)	120	**CM10-1,2,3,4,5**
The encoder count (EC) becomes writable, and MAXEC as the maximum encoder count value is added.	8.9 Encoder Function	77	**CM10-1,2,3,4,5**
ENDWAIT is added as the setting function of the waiting time for the motion end signal (END).	8.8 END (motion end) Signal	76	**CM10-1,2,3,4,5**

■ Be Sure to Use the Latest Version of the Utility Software Immediate Motion Creator for CM/SCX Series (IMC)

Since the functions of the **CM10** were expanded, the previous version of the **IMC** cannot be used. If the previous version of the **IMC** was installed in your PC, update it by using the CD-ROM provided. The new version of the **IMC** (Ver.2.10 or later) can be used with the previous versions of the **CM10** firmware (Ver.1.xx to 2.02).

- To check the version of the **IMC** and the firmware version of the **CM10**, use the "Help" - "Version Information" (or "About" for previous version) function of the **IMC**. (When checking the firmware version, it is required to connect the **CM10** to your PC.)
- To update to the latest version of **IMC**, do so only when the previous version of the **IMC** is not running.
- The latest version of the **IMC** can be downloaded from the Oriental Motor Website. Check by the function for "Help" - "Check New Version" (or "Check Version") of the **IMC**.
- The latest **IMC** (Ver. 2.10 or later) does not support the Windows 2000 since the considerable period has past after the Microsoft discontinued to support it. The Windows XP, Windows Vista and Windows 7 are continuously supported.

■ Be Sure to Use the Correct Version 2.1 of CANopen EDS Files

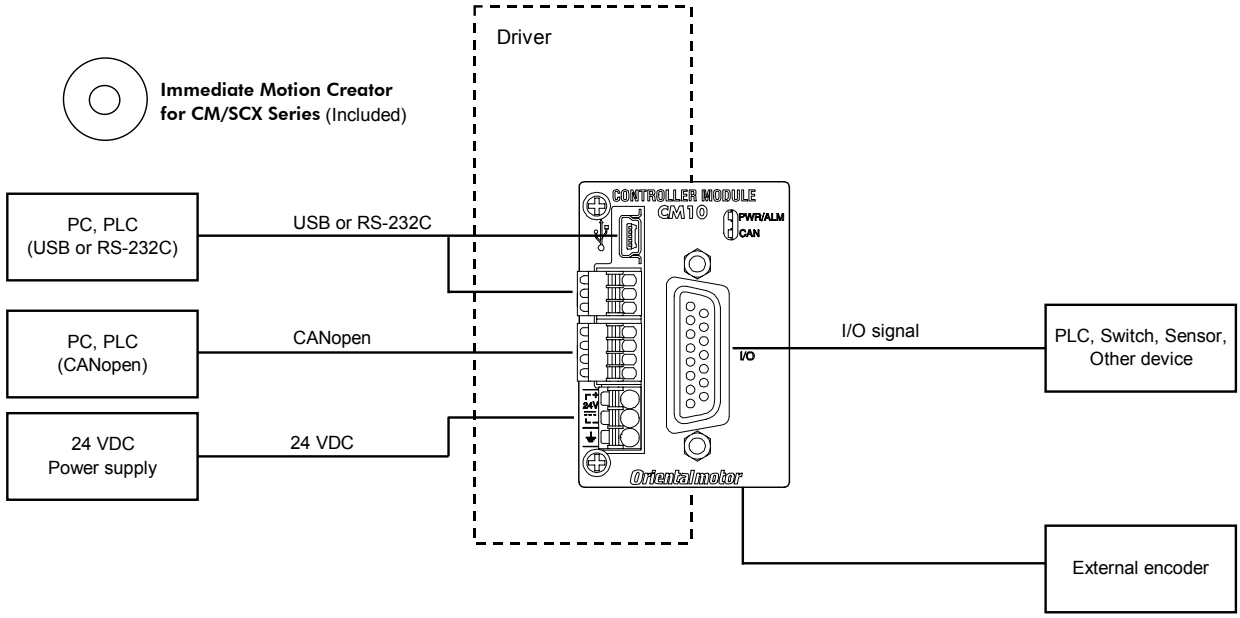
The version of the EDS file that can be used depends on the firmware of the main unit. If the wrong combination is used, there may be the functions that cannot be used or the product may not work properly. Be sure to use the EDS file with the version that is applicable.

The following table is the combinations of the firmware and EDS file for CANopen.

Firmware	Applicable EDS files
1.xx	CM10.eds
2.0x	CM10_2_1.eds
2.1x	CM10_3_0.eds

1.3 System Configuration

A sample system configuration using the **CM10** is provided below.

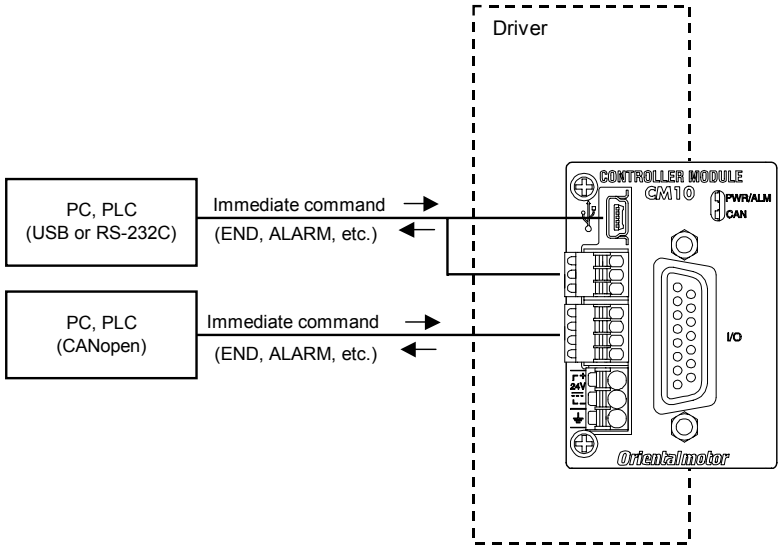


1.4 Operating Methods

There are two ways to make the motor move, immediate command and program execution.

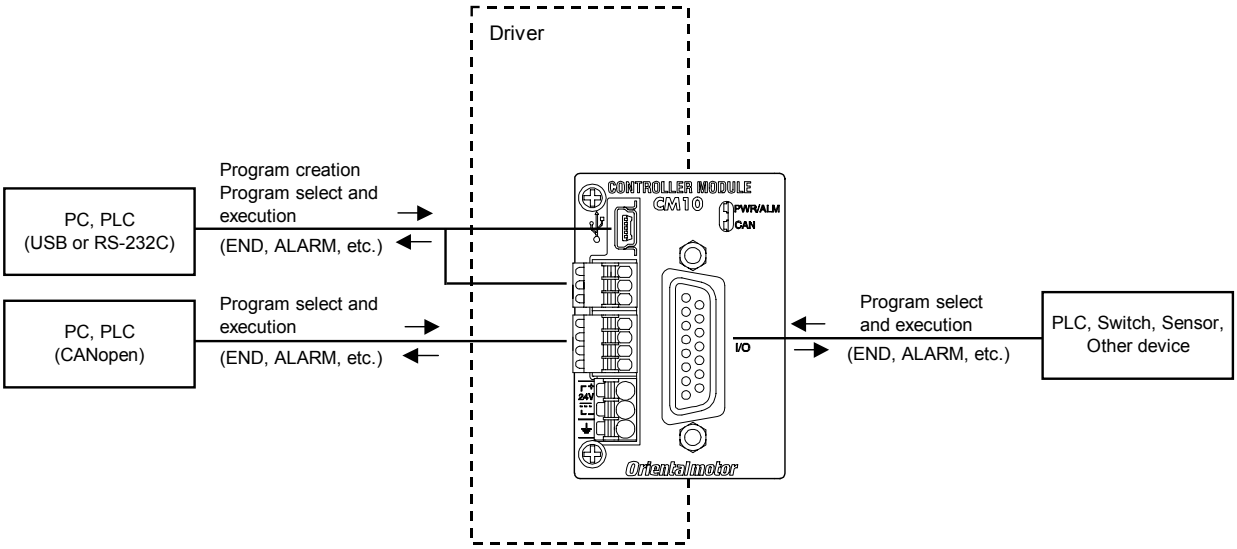
■ Immediate Command

Operate the motor by sending each command immediately from the master controller such as a computer or PLC via RS-232C, USB or CANopen. See "7 Start Up (Immediate Command)" on page 42 for more detail.



■ Program Execution

Create sequences using a computer, save the programs into the built-in memory of the **CM10**, specify which sequence name or number to run, and input the start signal to execute the sequence. The program creation is made via USB or RS-232C, the program selection and execution are made via USB, RS-232C, CANopen or I/O selection. See "9 Program Creation and Execution" on page 87.



	Immediate Command	Program Creation	Program Select and Execution
USB	✓	✓	✓
RS-232C	✓	✓	✓
CANopen	✓	-	✓
I/O	-	-	✓

Note
- USB and RS-232C cannot be connected and used at the same time.
- Do not use two or more masters (ex. a CANopen master and a RS-232C master) at the same time to avoid confusion.

Memo USB or RS-232C can be used for monitor and maintenance purposes while the **CM10** is being operated by CANopen master.

1.5 Immediate Motion Creator for CM/SCX Series

General terminal software programs (ex. Windows HyperTerminal) can be used for all commands. If you install the exclusive utility software, **Immediate Motion Creator for CM/SCX Series** on your PC, just clicking your mouse can do test operations, program creation, position teaching, parameter setup and I/O configuration. Real time monitoring of position and feedback, along with I/O status and alarm status are also provided.
See "6.3 Connecting the USB and Installation of Utility Software" on page 22.

1.6 Standards and CE Marking

The CE Marking (EMC Directive) is affixed to the product is accordance with EN standards.

■ Installation Conditions (EN Standard)

This product is to be used as a component within other equipment.
Overvoltage category: Ⅰ
Pollution degree: Ⅱ
Protection against electric shock: Class Ⅲ

■ For EMC Directive

This product has received EMC compliance under the conditions specified in "5.3 Installing and Wiring in Compliance with EMC Directive" on page 18. The compliance of the final machinery with the EMC Directive will depend on such factors as the configuration, wiring, layout and risk involved in the control-system equipment and electrical parts. It therefore must be verified through EMC measures by the customer of the machinery.

Applicable Standards

EMI	Emission Tests Radiated Emission Test	EN61000-6-4 EN55011 Group1 ClassA
EMS	Immunity Tests Radiation Field Immunity Test Electrostatic Discharge Immunity Test Fast Transient / Burst Immunity Test Conductive Noise Immunity Test	EN61000-6-2 EN61000-4-3 EN61000-4-2 EN61000-4-4 EN61000-4-6

■ Hazardous Substance

RoHS (Directive 2002/95/EC 27Jan.2003) compliant

2 Safety Precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product.
Use the product only after carefully reading and fully understanding these instructions.

⚠ Warning	Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.
⚠ Caution	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
Note	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.
Memo	This contains information relative to the description provided in the main text.

⚠ Warning

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- When the device's protective function is triggered, first remove the cause and then clear the protective function. Continuing the operation without determining the cause of the problem may cause malfunction of the device, leading to injury or damage to equipment.

Installation

- Install the device in an enclosure in order to prevent injury.

Connection

- Keep the device's input-power voltage within the specified range to avoid fire.
- For the device's power supply use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire.

Operation

- Turn off the device power in the event of a power failure, or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.

Repair, Disassembly and Modification

- Do not disassemble or modify the device. This may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠ Caution

General

- Do not use the device beyond its specifications, or injury or damage to equipment may result.

Transportation

- Do not hold the device cable. This may cause damage or injury.

Installation

- Keep the area around the device free of combustible materials in order to prevent fire or a skin burn (s).

Conneciton

- When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and PC to short, damaging both.

Operation

- To avoid injury, remain alert during operation so that the device can be stopped immediately in an emergency.
- Before supplying power to the device, turn all start inputs to the device to "OFF." Otherwise, the device may start suddenly and cause injury or damage to equipment.
- When an abnormality is noted, stop the operation immediately, or fire or injury may occur.

Disposal

- When disposing of the device, treat it as ordinary industrial waste.

3 Precautions for Use

This section covers limitations and requirements the user should consider when using this product.

■ Preventing Electrical Noise

See "5.3 Installing and Wiring in Compliance with EMC Directive" on page 18 for measures with regard to noise.

■ EEPROM Write Cycle

Do not turn off the 24 VDC power supply while data is being written to the EEPROM and 5 seconds after the completion of data write. Doing so may abort the data write and cause an EEPROM error alarm to generate. The EEPROM can be rewritten approx. 100,000 times.

■ Temperature Rise

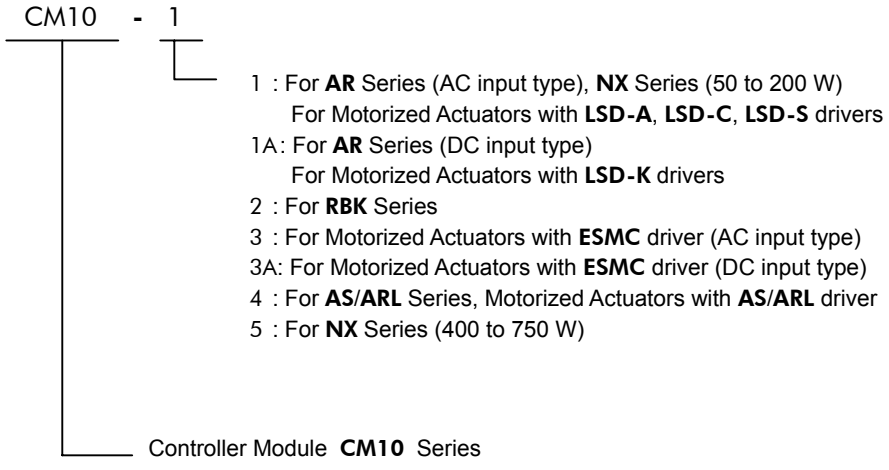
The **CM10** is carefully designed so that the installation of the **CM10** does not affect the temperature rise in the driver. However, greater temperature rise in the driver may occur depending on the conditions such as airflow. Changing the operating/environmental condition may be required

4 Preparation

4.1 Checking the Product

Product Name	CM10-1	CM10-1A	CM10-2	CM10-3	CM10-3A	CM10-4	CM10-5
Controller Module Name	CM10-1		CM10-2	CM10-3		CM10-4	CM10-5
CD-ROM - **IMC** (utility software) - Startup manual - Operating manual - CANopen EDS file - USB driver - .NET Framework 2.0	✓	✓	✓	✓	✓	✓	✓
Connector set ・RS-232C connector (3 pins): 1 ・CANopen connector (4 pins): 1 ・Power connector (3 pins): 1	✓	✓	✓	✓	✓	✓	✓
Encoder connector housing /contact (8 pins)	✓	✓	✓	✓	✓	✓	✓
Mounting plate set							
・Mounting bracket: 1	For **CM10-1**	For **CM10-1A**	For **CM10-2**	For **CM10-3**	For **CM10-3A**	For **CM10-4**	For **CM10-5**
・M2.6, Pan head screw with spring washer: 2	✓	✓	-	✓	✓	✓	✓
・M3, Flat head screw: 1	-	-	✓	-	-	-	-
・Tape fastener: 1	25.4 mm width	22 mm width	15 mm width	25.4 mm width	25.4 mm width	22 mm width	25.4 mm width
Startup manual	HP-13010		HP-13011	HP-13012		HP-13025	HP-13026
Warning sticker	✓	-	-	-	-	-	✓

4.2 How to Identify the Product Model

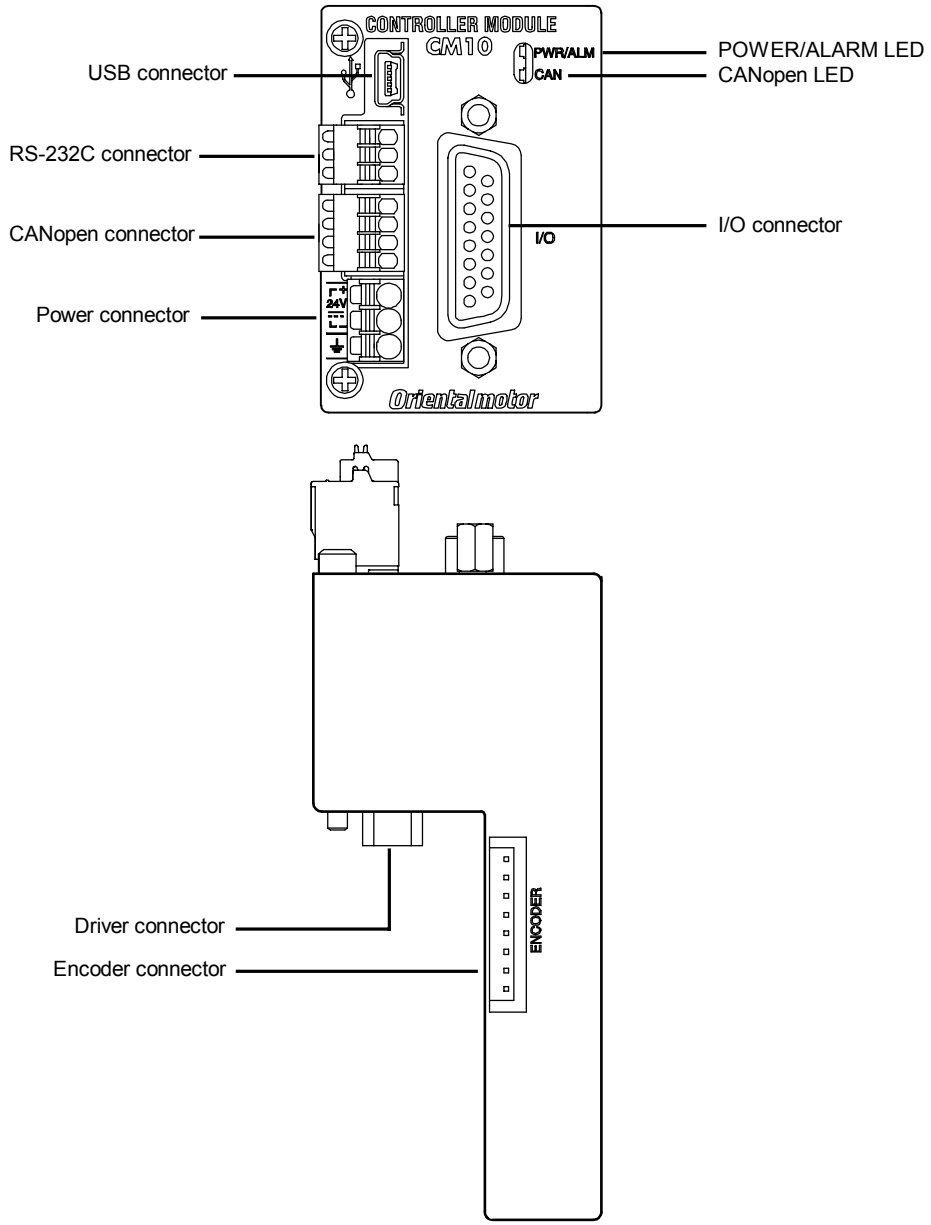


4.3 Combinations of CM10 and Drivers

Product Model	Controller Module Model	Driver Model
CM10-1	**CM10-1**	ARD-A, ARD-C, ARD-S LSD-A, LSD-C, LSD-S NXD20-A, NXD20-C
CM10-1A		ARD-K LSD-K
CM10-2	**CM10-2**	RBD215A-K, RBD228A-K, RBD242A-V, RBD245A-V
CM10-3	**CM10-3**	ESMC-A2, ESMC-C2
CM10-3A		ESMC-K2
CM10-4	**CM10-4**	ASD13A-A, ASD13B-A, ASD13C-A ASD24A-A, ASD24B-A, ASD24C-A ASD30A-A, ASD30B-A, ASD30C-A, ASD30D-A, ASD30E-A ASD12A-C, ASD12B-C, ASD12C-C ASD16A-C, ASD16B-C, ASD16C-C, ASD16D-C ASD20A-C ASD12A-S, ASD12B-S, ASD12C-S ASD16A-S, ASD16B-S, ASD16C-S, ASD16D-S ASD20A-S ARLD13A-A, ARLD13B-A, ARLD13C-A ARLD24A-A, ARLD24B-A, ARLD24C-A ARLD30A-A, ARLD30B-A, ARLD30C-A, ARLD30D-A, ARLD30E-A ARLD07A-C, ARLD07B-C, ARLD07C-C ARLD12A-C, ARLD12B-C, ARLD12C-C ARLD16A-C, ARLD16B-C, ARLD16C-C, ARLD16D-C, ARLD20A-C ARLD07A-S, ARLD07B-S, ARLD07C-S ARLD12A-S, ARLD12B-S, ARLD12C-S ARLD16A-S, ARLD16B-S, ARLD16C-S, ARLD16D-S ARLD20A-S LSD20A-S, LSD20A-W, LSD20B-S, LSD20B-W
CM10-5	**CM10-5**	NXD75-S

Note The **NX** Series driver can be used only in the position control mode.

4.4 Names and Functions of Parts



Name	Description
POWER/ALARM LED (green/red)	Green: Lit when the power is on. Red: The LED blinks when a protective function is triggered. The cause triggering the protective function can be identified by the number of blinks the LED emits. See "13 Troubleshooting" on page 338.
CANopen LED (green/red)	Green: Run Red: Error (See "10.3 LED Indication" on page 104 for detail.)
Power connector	Connects to the power supply cable
I/O connector	Connects to the sensors, switches and/or master controller
RS-232C connector	Connects to the RS-232C cable
USB connector	Connects to the USB2.0 cable (mini-B type)
CANopen connector	Connects to the CANopen cable
Encoder connector	Connects to the external encoder
Driver connector	Connects to the driver

5 Installation

5.1 How to Install CM10 on the Driver

Note

- See each driver operating manual for the following instructions.
- Before installing the **CM10-1**, **3**, **4**, **5** are sure to set the driver pulse mode switch according to the pulse mode on the **CM10**. The factory setting of **CM10-1**, **3**, **4**, **5** is 1 pulse mode.
- Because the step angle switch on the driver will be partially covered by the **CM10-2**, it is recommended that to set the step angle before installing the **CM10-2**.
- For use of the **CM10-3**, the **ESMC** controller should be set to the "driver mode." If the **ESMC** controller is used in the "controller mode (factory setting)," unexpected motion may occur due to unmatched I/O assignments.

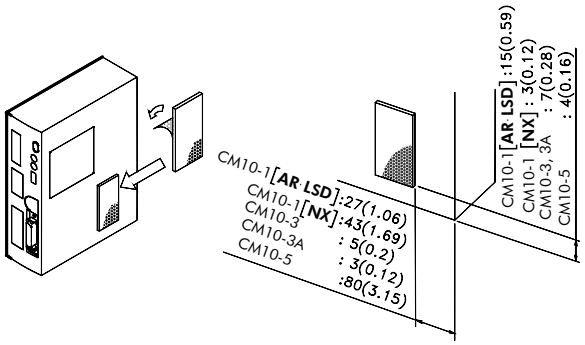
1. Attaching the tape fastener to the driver

a. Remove grease from the pasting position on the driver surface with alcohol and a cloth.

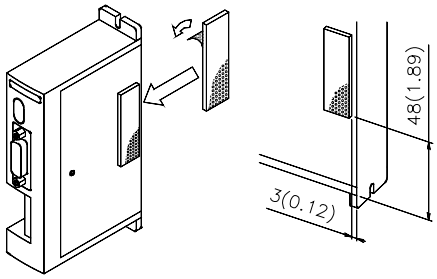
b. Peel off the red delaminating tape.

Paste the tape fastener well on the driver being careful not to bend or crease the tape. The other part of the tape fastener is attached to the mounting bracket before shipping. Unit: mm (inch)

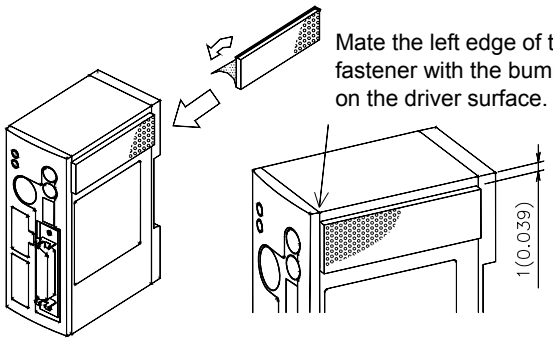
• CM10-1, 3, 3A, 5



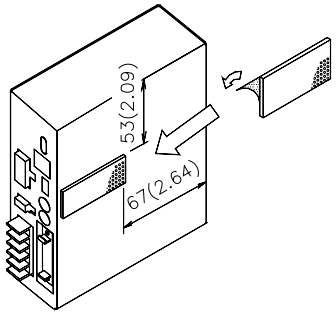
• CM10-2



• CM10-1A



• CM10-4



Note

Do not apply any peeling force that may influence the adhesive surface immediately after adhesion. The adhesive strength gradually increases and reaches its maximum in 72 hours. For the best results, allow one day or more after adhesion, and then go to next step of assembly.

2. Mounting the mounting bracket

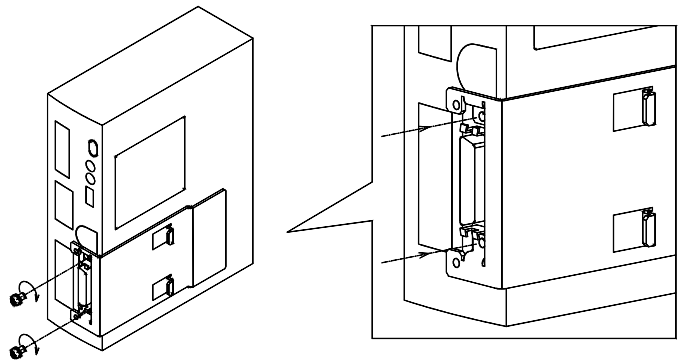
- **CM10-1, 2, 3, 3A, 5**

a. Set the mounting bracket over the I/O terminal of the driver, and tighten the mounting bracket with the 2 screws provided. (Only 1 screw for **CM10-2**)

b. Push the mounting bracket to mesh the two parts of the tape fastener together.

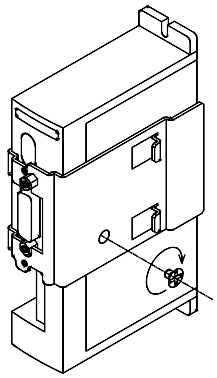
- **CM10-1, 3, 3A, 5**

Tightening torque: 0.4 N·m (M2.6)



- **CM10-2**

Tightening torque: 0.5 N·m (M3)



Note Do not use a screw other than the supplied screw.

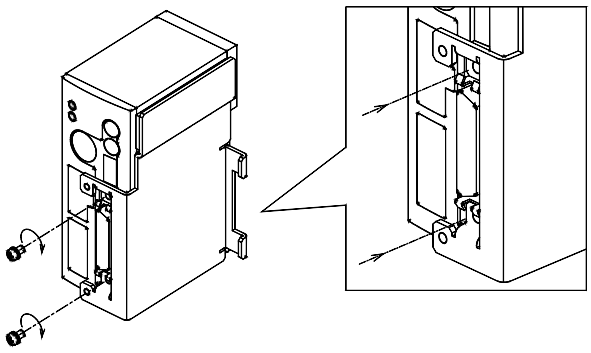
- **CM10-1A, 4**

a. Set the mounting bracket over the I/O terminal of the driver so as to mate the screw holes, and push the mounting bracket to mesh the two parts of the tape fastener together. (For ease of mating the screw holes, lightly twist two screws in before meshing the tape fasteners together. Do not tighten them at this point.)

b. Tighten the mounting bracket with the 2 screws provided.

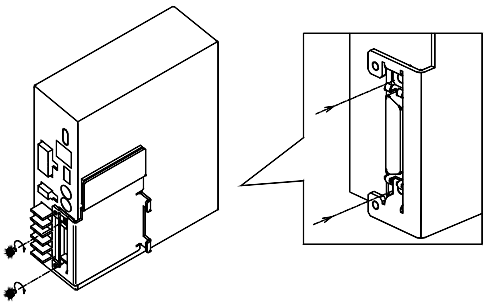
- **CM10-1A**

Tightening torque: 0.4 N·m (M2.6)



- **CM10-4**

Tightening torque: 0.4 N·m (M2.6)

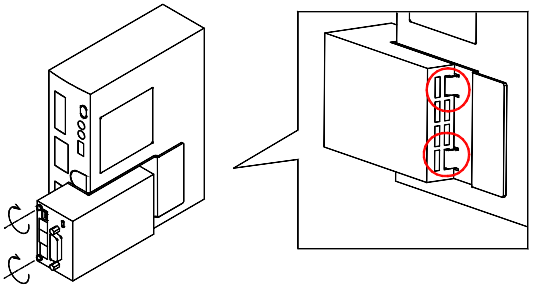


3. Mounting **CM10** on the mounting bracket

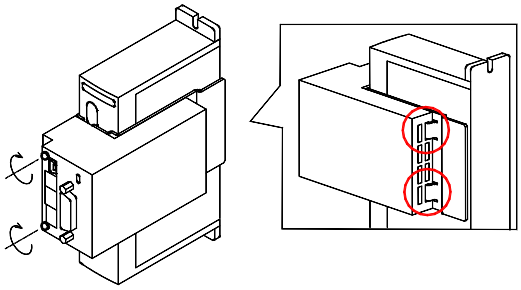
a. Put the rails of the mounting bracket in the slits of the **CM10**, insert the connector of the **CM10** into the driver connector on the **CM10**.

b. Tighten the two screws on top of the **CM10** into the mounting bracket. ∗ Tightening torque: 0.4 N·m (M2.6)

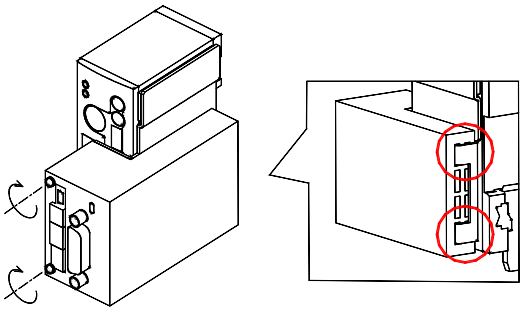
- **CM10-1, 3, 3A, 5**



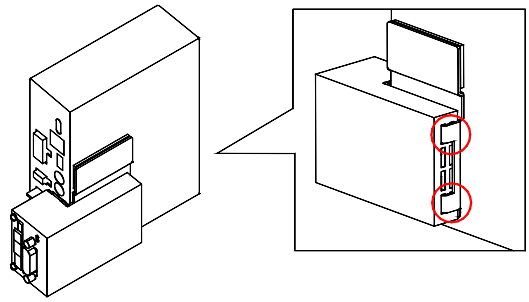
- **CM10-2**



- **CM10-1A**



- **CM10-4**

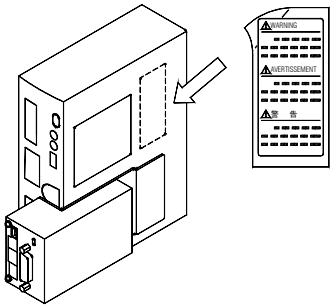


Note Be sure that the **CM10** is not powered ON when it is installed to, or uninstalled from the driver. The installation or uninstallation with powered ON may damage the interface circuit in the **CM10**.

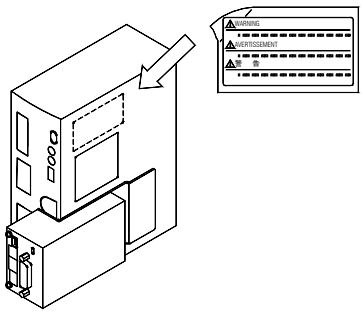
4. Paste the warning sticker on the driver (only for **AR** Series driver AC input type/**LSD** driver AC input type and **NX** Series driver)

Note Be sure to paste an attached new warning sticker since the warning sticker on the **AR** Series driver/**LSD** driver or NX Series driver is covered by the **CM10**.

- **AR** Series driver (AC input type)
- **LSD** driver (AC input type)



- **NX** Series driver

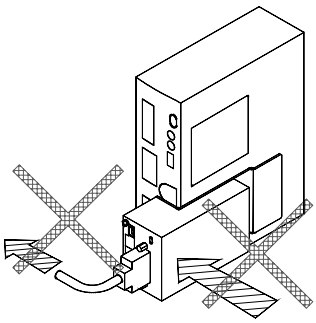


This completes the installation.

Please confirm that the controller module is mounted securely and that no miss-alignment or gaps exist.

Memo When removing the **CM10**, unscrew the two screws on top of the **CM10** only a few turns just enough to release it from the bracket and leave the screws as they are in the **CM10**. Unscrewing any more may cause the screws to not protrude out of the housing holes.

Note Always avoid applying a force toward the left direction on the I/O cable or the front panel. It may cause breaking the adhesion of the tape fastener.



5.2 Installing the Driver

Refer to the driver's Operating Manual and install it at an appropriate distance from other equipment

5.3 Installing and Wiring in Compliance with EMC Directive

This device has been designed and manufactured for incorporation in general industrial machinery. The EMC Directive requires that the equipment incorporating this product comply with the directive.
The installation and wiring method for the motor and device are the basic methods that would effectively allow the customer's equipment to be compliant with the EMC Directive.
The compliance of the final machinery with the EMC Directive will depend on such factors as configuration, wiring, layout and risk involved in the control-system equipment and electrical parts. It therefore must be verified through EMC measures by the customer of the machinery. For the EMC Directives, see "1.6 Standards and CE Marking" on page 8.

■ Connecting Mains Filter for Power Source Line

Install a mains filter on the input side of the DC power supply in order to prevent the noise generated within the driver from propagating outside via the DC power-source line.

- Install the mains filter as close to the AC input terminal of the DC power source as possible, and use cable clamps and other means to secure the input and output cables (AWG18: 0.75 mm^2 or more) firmly to the surface of the enclosure.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short a wire as possible.
- Do not place the AC input cable (AWG18: 0.75 mm^2 or more) parallel with the mains filter output cable (AWG18: 0.75 mm^2 or more). Parallel placement will reduce mains filter effectiveness if the enclosure's internal noise is directly coupled to the power-supply cable by means of stray capacitance.

■ Connecting the 24 VDC Power Supply

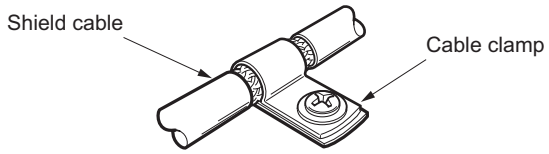
Use a 24 VDC power supply conforming to the EMC Directive.
Use a shielded cable for wiring and wire/ground the 24 VDC power supply over the shortest possible distance.
Refer to "Wiring the Power Supply Cable and I/O Signals Cable" below for how to ground the shielded cable.

■ How to Ground

The cable used to ground the driver, motor and mains filter must be as thick and short as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.

■ Wiring the Power Supply Cable and I/O Signals Cable

Use a shielded cable of AWG24 (0.2 mm^2) or more for the power supply cable and signal cable, and keep it as short as possible.
To ground a shielded cable, use a metal clamp or similar device that will maintain contact with the entire circumference of the shielded cable. Attach a cable clamp as close to the end of the cable as possible, and connect it as shown in the figure.

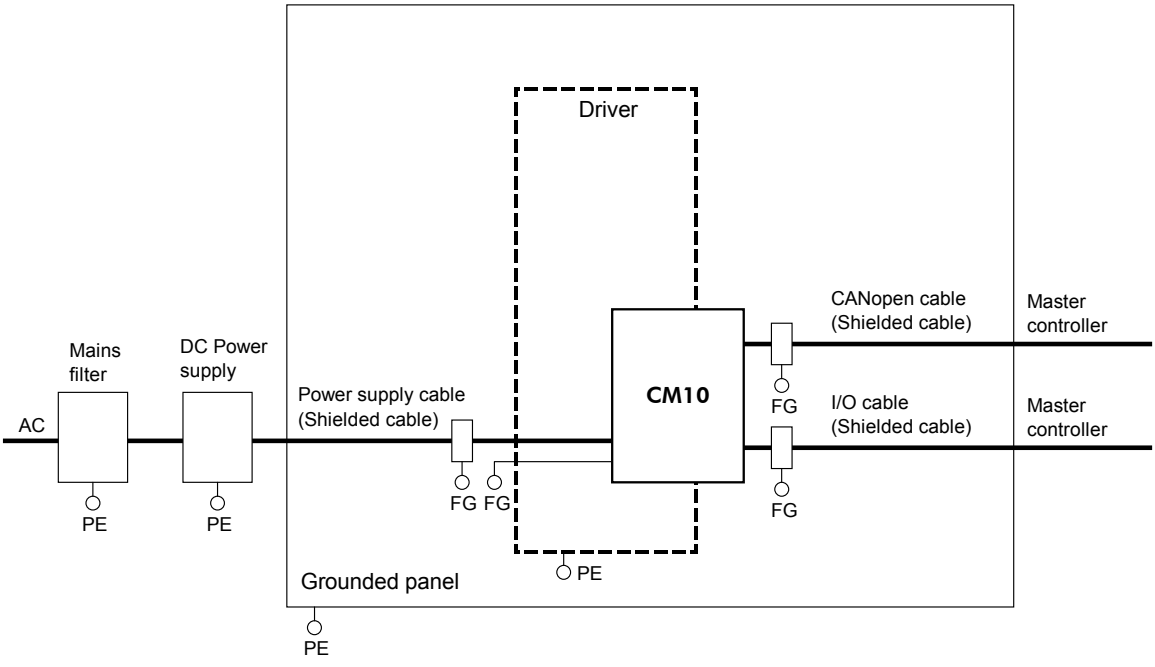


■ Notes about Installation and Wiring

- Connect the motor, driver and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use mains filters and CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Place the power cables such as the motor and power supply cables as far apart [100 to 200 mm (3.94 to 7.87 in.)] as possible from the signal cables. If they have to cross, cross them at a right angle. Place the AC input cable and output cable of a mains filter separately from each other.

Note Be sure to connect the protective earth lead wire of the motor cable to the protective earth terminal of the driver. If not connected, an error via USB communication may occur.

■ Example of CM10 Module and Driver Installation and Wiring



■ Precautions about Static Electricity

Static electricity may cause the **CM10** to malfunction or suffer damage. While the **CM10** is receiving power, handle the **CM10** with care and do not come near or touch the **CM10**.

Note The **CM10** uses parts that are sensitive to electrostatic charge. Before touching the **CM10**, turn off the power to prevent electrostatic charge from generating.
If an electrostatic charge is impressed on the **CM10**, the **CM10** may be damaged.

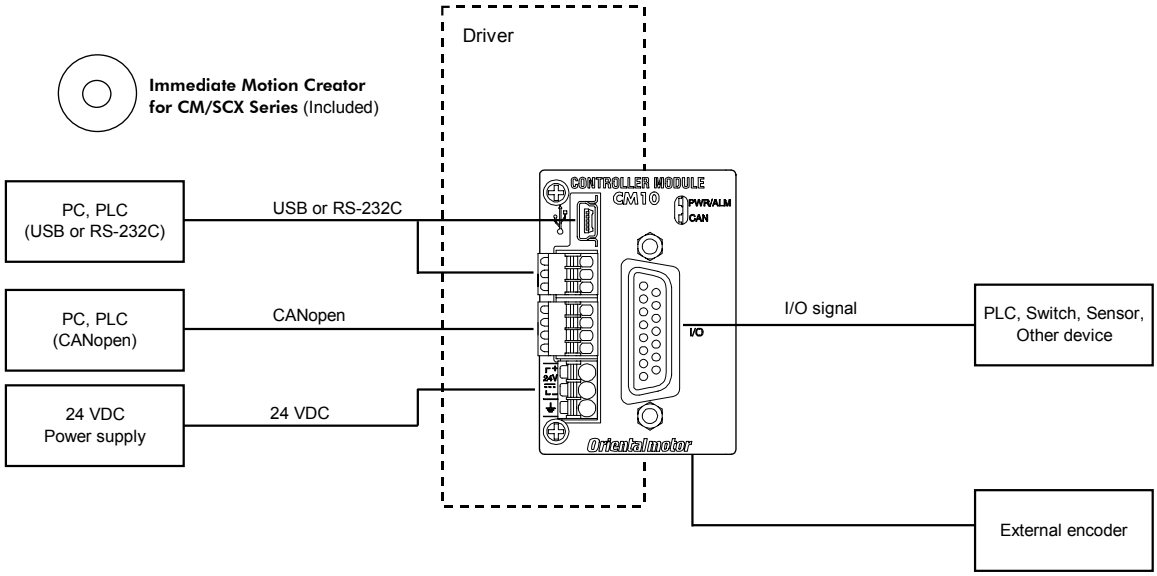
6 Connection

This chapter explains the methods for connecting to the computer, PLC, sensors, switches, external encoder, and the power supply, as well as the grounding method, connection examples and control inputs/outputs.

6.1 Overview

■ System Configuration

A sample system configuration using the **CM10** is provided below.



Memo

- Making all connections is not necessary. Choose the necessary connections according to your needs by referring the contents and the chart below.
- For the initial set up, only a power supply and a computer (USB or RS-232C connection) are required. See "7 Start Up (Immediate Command)" on page 42.

■ Contents

Interface and Availability

	Immediate Command	Program Creation	Program Select and Execution
USB	✓	✓	✓
RS-232C	✓	✓	✓
CANopen	✓	-	✓
I/O	-	-	✓

Memo

The **CM10** is designed so that users can operate drivers without needing to know the connections between the **CM10** and the driver. However, the pin assignments and signal descriptions for the connector driver are provided for users who are familiar with the driver terminal functions. See "Appendix A Signals for Driver" on page 351.

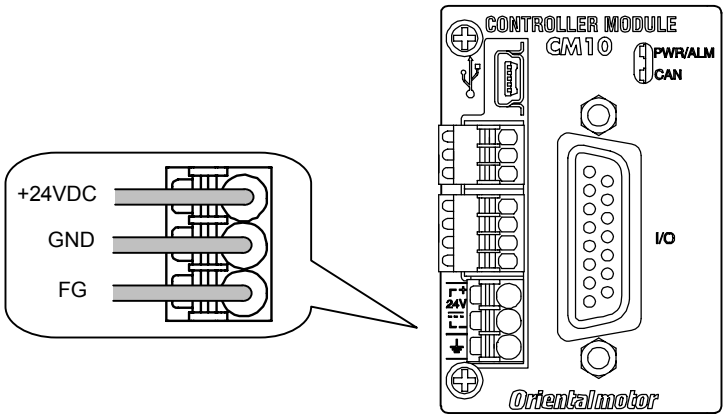
6.2 Connecting the Power Supply

■ Connecting to the Power Supply

Use the power supply connector (3 pins) to connect the power supply cable (AWG24 to 16: 0.2 to 1.5 mm^2) to the main power supply connector on the **CM10**.

■ Grounding CM10

Ground the driver's Frame Ground Terminal (FG) as necessary.
Use a grounding wire of a size equivalent to or larger than the power-supply cable (AWG24 to 16: 0.14 to 1.5 mm^2).



Applicable Lead Wire

Connector	FMC 1,5/3-ST-3,5 (PHOENIX CONTACT)
Applicable lead wire size	AWG24 to 16 (0.2 to 1.5 mm^2)

■ Connection Method

1. Strip the lead wire insulation by 10 mm.
2. Push the spring (orange) of the connector with a flat-tip screwdriver, to open a terminal port.
   Recommended flat-tip screwdriver: a tip of 2.5 mm in width, 0.4 mm in thickness
3. Insert the cable while pushing down the flat-tip screwdriver.
4. Release the flat-tip screwdriver. The lead wire will be attached.

6.3 Connecting the USB and Installation of Utility Software

The USB connection can be used for all the operations including initial setup, test operation, program creation, I/O configuration and real time monitoring, using general terminal software or supplied utility software as well as user program. Everything you can perform via USB can also be performed via RS-232C.

■ Specification

∗ The USB on the **CM10** talks to the virtual COM port on the computer.

Item	Description
Electrical characteristics	In conformance with USB2.0 (Full Speed)
Transmission method	Start-stop synchronous method, NRZ (Non-Return Zero), full-duplex
Data length	8 bits, 1 stop bit, no parity
Transmission speed	9600, 19200, 38400, 57600, 115200 bps (9600 is factory setting.) Selected by the USBBAUD parameter
Protocol	TTY (CR+LF)

Terminal Specification

- ASCII mode
- VT100 compatible recommended
- Handshake: None
- Transmission CR: C-R
- Word wrap: None
- Local echo: None
- Beep sound: ON

Conncector

- USB mini-B

Note Be aware that Windows automatically changes the COM port number when a **CM10** is replaced.

Memo Generally, the maximum number of COM ports in a Windows PC is 256. Since the COM port number on a PC increases every time different **CM10** is connected via USB, setting data to more than 256 pieces of **CM10** cannot be accomplished using a PC. When it is required such as for mass production, use RS-232C connection or USB to RS-232C converter so as to be RS-232C connection on the **CM10**.

■ USB Driver Installation

Insert the supplied CD-ROM into the CD-ROM drive of the computer, power on the **CM10** and connect to a USB port using a mini-B cable. (Prepare a commercially available USB2.0 cable (mini-B type). A cable with ferrite cores that has the effect of exogenous noise suppression is recommended.) You will then be asked to install the USB driver. See the procedure according to the type of Windows as follows.

Windows 7:

1. Open "Devices and Printers" in the control panel.
2. Right click on "FT232R USB UART" and select "Update Driver Software."
3. Select "Browse my computer for driver software."
4. Click "Browse" and select the applicable CD-ROM drive, check the box next to "Include subfolders" and Click "Next."
5. After successful installation, click "Close."
6. Go back to the Device Manager, right click on "USB Serial Port" and select "Update Driver Software." Repeat same procedure as the above FT232R USB UART installation.

Windows Vista:

1. The installation of the FT232R USB UART is asked by Windows when the **CM10** is connected. Select "Locate and install driver software," and click "Next." After successful installation, click "Close."
2. The installation of the USB Serial Port is then asked for by Windows.
3. Click "Next." After successful installation, click "Close."

Windows XP:

1. The installation of the FT232R USB UART is asked for by Windows when the **CM10** is connected. Select "Install the software automatically," and click "Next." After successful installation, click "Finish."
2. The installation of the USB Serial Port is then asked for by Windows. Select "Install the software automatically," and click "Next."
3. After successful installation, click "Finish."

■ Installation of Utility Software "Immediate Motion Creator for CM/SCX Series (IMC)"

While all commands for the **CM10** can be made using general terminal software, the supplied Windows based utility software, **Immediate Motion Creator for CM/SCX Series (IMC)**, gives you instant operation, easy programming and configuration without having to know any commands. Since important settings and functions (such as I/O assignment, automatic setting of the driver I/O, etc.) are included, it is recommended to use the **IMC**.

Functions:

- Motion Creator: Select motion type, put desired values in and click the start button to begin motions instantly.
- Program Editor: Double click listed commands in a desired order to create a sequence program, and click a button to save it to the device or your PC.
- Terminal: Use as a general terminal software. Most commands can be used by typing.
- Teach/Jog: Move motors and store positions. Stored positions can be used for programmed motions.
- System Config: Indicate and Set system parameters and I/O assignments
- Real Time Monitor: I/O, Alarms (including history), Busy, Motor Position and Encoder Position

- System Requirements

- Windows XP SP2 or later, Windows Vista, Windows 7
- .NET Framework 2.0
- SVGA monitor 800 x 600 or greater
- USB or RS-232C port
- CD-ROM drive

- Installation and Uninstallation

Insert the supplied CD-ROM into your CD-ROM drive. Open the Explorer, select the applicable CD-ROM drive, open the **IMC** folder, double click on "setup.exe" and follow the on screen instructions.
To uninstall, use the "Add/Remove Programs" function in the Windows Control Panel.

Note When updating the installed version of the **IMC**, do so when the existing **IMC** is not running.

- .NET Framework 2.0 Installation (For Windows XP)

IMC runs on the Microsoft .NET Framework 2.0. While Windows Vista and Windows 7 normally install the .NET Framework 2.0, Windows XP requires a separate installation. If the .NET Framework 2.0 is not installed on the computer, install it prior to the **IMC** installation. The .NET Framework 2.0 software is on the supplied CD-ROM, under the DotNet_Framework2_0 folder.

System Requirements for .NET Framework 2.0

- Supported Operating Systems: Windows XP SP2 or later
- Disk Space: 280 MB (x86)

Visit the Microsoft .NET 2.0 Framework website if detailed information is required.

- Start

1. Connect the **CM10** by USB2.0 cable (mini-B type)
2. Power on the **CM10**
3. Click "Start" - "All Programs"- "ORIENTAL MOTOR" - "IMC for CM SCX" - "Immediate Motion Creator for CM SCX Series." The COM port selection window will appear.
4. Select the COM port that is connected to the **CM10**. The **IMC** will be launched.

The **IMC** is made to be intuitive to use. For instructions, refer to the HELP menu in the **IMC**, as necessary. Right click on the **IMC** screen and select [Help] will launch the **IMC** Help with the description of function that the mouse cursor is on.

- Update

After installation, click "Help" - "Check New Version" on the pull down menu with the Internet connection. If a newer version of this software is available, continue to the download and update actions.

- About VERBOSE and ECHO

The **IMC** may alter automatically the ECHO (Echo ON/OFF) and VERBOSE (respond with data and description/respond with data only) parameters of the **CM10** for communications and ease of use. The ECHO and VERBOSE parameters cannot be set in the System Config window on the **IMC**. When changing the ECHO and/or VERBOSE setting is required, follow the procedure below.

1. Turn on the power to the **CM10**
   (If the message of reconnection attempt failure has shown while using the **IMC**, first turn off the power, wait for a few seconds and restart.)
2. Launch the **IMC** software
3. Click the [Terminal] tab
4. Type "ECHO=0" or "ECHO=1", press the Enter key and "VERBOSE=0" or "VERBOSE=1", then press the Enter key (both parameters must be typed)
5. Type "SAVEPRM" and press the Enter key, then type "Y" and press the Enter key
6. After "OK" is indicated, exit the **IMC** (Do not operate other functions before exiting)
7. Turn off the power to the **CM10** for the new settings to become effective

■ Setting the Baud Rate

Since the USB on the **CM10** talks to the virtual COM port on the computer, the baud rate for the COM port and the baud rate for the **CM10** need to be the same.
The default USB baud rate of the **CM10** is 9600 bps, same as the default baud rate of a general Windows computer. If the baud rate on the computer or the **CM10** is changed, the baud rate must also be changed on the other.

- When Using the **IMC**, Provided Utility Software

Use of the highest baud rate, 115200 bps is recommended if there is no problem for the usage environment. Set it to the **CM10** according to the following steps.

1. Turn on the power for the **CM10** and connect to the computer.
2. Launch the **IMC**.
3. Click the [System Config] tab.
4. Click the "USB Baud rate "located at the upper-center, and select "115200 bps" from the drop-down list.
5. Click the [SAVE and RESET] to enable the change. At that time, the **IMC** also change the baud rate of computer side to 115200 bps.

The setting is completed. The **CM10** is already communicating with your computer at 115200 bps.

Note When starting communication with the **CM10**, be sure to set the baud rate of the **IMC** to the same baud rate that has been set to the **CM10**. If you are unsure about the baud rate of the **CM10**, use the [Scan Baud Rate] button on the Serial Port Settings window. If the wrong baud rate has been set in the Serial Port Settings window, not only will the communication not be established, but it may also be possible that the communication will never be established even if the baud rate is correctly set afterwards. If this communication problem occurs, turn off the power to the **CM10**, wait for a few seconds and restart. Take the same action any time when communication is likely to be disconnected.

- When Using Other Software than the **IMC**

- The Computer:
  Check the baud rate of the computer application that is used to communicate with the **CM10**, or check the COM port property of Windows if the application does not have the baud rate function.
- The **CM10**:
  The USBBAUD is the command used to change the baud rate for the USB connection. Always set the **CM10** baud rate first, then set the baud rate on the master to the same baud rate.

6.4 Connecting the I/O Signals

Connect the PLC, switch, sensor etc. to the I/O connector (D-sub connector on the front panel of the **CM10**).

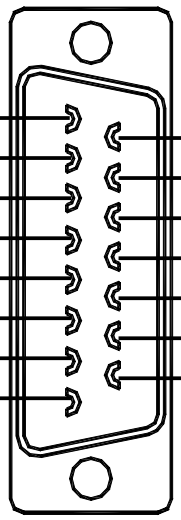
6.4.1 Pin Assignments

At the time of shipment, any signals that have specific functions are not assigned to the I/O connector, which functions as general input "IN1 to IN9" and general output "OUT1 to OUT4." As necessary, assign signals and connect accordingly (The connector is not supplied. Provide 15 Pin D-Sub connector separately). Those become "system xxx signal."

■ Connector Function Table

See the following pin assignments for a solder type connector.

Description	Signal	Pin No.
Input common	IN-COM	1
General input	IN2	2
General input	IN4	3
General input	IN6	4
General input	IN8	5
General output	OUT1	6
General output	OUT3	7
Output common	OUT-COM	8

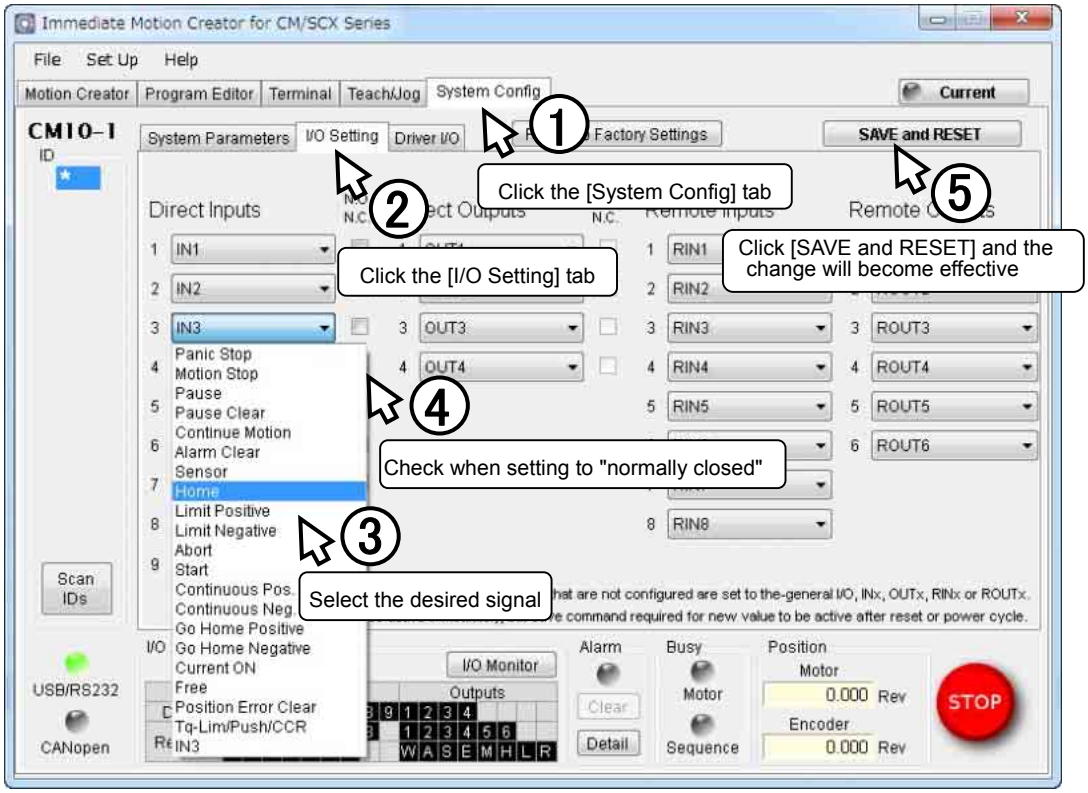


Pin No.	Signal	Description
9	IN1	General input
10	IN3	General input
11	IN5	General input
12	IN7	General input
13	IN9	General input
14	OUT2	General output
15	OUT4	General output

Memo The connector shell is connected to the FG terminal.

■ Assigning Signals

Assign necessary signals to the I/O using the provided utility software, **Immediate Motion Creator for CM/SCX Series (IMC)**.
Connect the **CM10** to a computer and activate the **IMC**. Connect the **CM10** to a computer, launch the **IMC** and follow the steps below.



The setting can also be performed by command input, using the terminal mode of **IMC** or general terminal software. See the following chart for the command for assignment and logic level. After executing command, enter "SAVEPRM" and press the Enter key to save the parameter. New value becomes active after reset or power cycle.

- Input

Signal	Command for Assignment	Command for Logic Level Setting
PSTOP (panic stop)	INPSTOP	PSTOPLV
MSTOP (motor stop)	INMSTOP	MSTOPLV
SENSOR (sensor)	INSENSOR	SENSORLV
PAUSE (pause motion)	INPAUSE	PAUSELV
PAUSECL (pause clear)	INPAUSECL	PAUSECLLV
CONT (continue motion)	INCONT	CONTLV
LSP (limit switch positive)	INLSP	OTLV
LSN (limit switch negative)	INLSN	OTLV
HOME (home sensor)	INHOME	HOMELV
CON (current on)	INCON	CONLV
ALMCLR (alarm clear)	INALMCLR	ALMCLRLV
START (start sequence)	INSTART	STARTLV
ABORT (abort motion and sequence execution)	INABORT	ABORTLV
MCP (move continuously positive)	INMCP	MCPLV
MCN (move continuously negative)	INMCN	MCNLV
MGHP (move go home positive)	INMGHP	MGHPLV
MGHN (move go home negative)	INMGHN	MGHNLV
FREE (current off, magnetic brake free)	INFREE	FREELV
PECLR (position error clear)	INPECLR	PECLRLV
TL (torque limiting/push-motion operation)	INTL	TLLV

- Output

Signal	Command for Assignment	Command for Logic Level Setting
ALARM (alarm)	OUTALARM	ALARMLV
END (motion end)	OUTEND	ENDLV
RUN (sequence running)	OUTRUN	RUNLV
MOVE (motor moving)	OUTMOVE	MOVELV
READY (operation ready)	OUTREADY	READYLV
LC (limiting condition)	OUTLC	LCLV
PSTS (pause status)	OUTPSTS	PSTSLV
HOMEP (home position)	OUTHOMEP	HOMEPLV
MBFREE (magnetic brake free)	OUTMBFREE	-

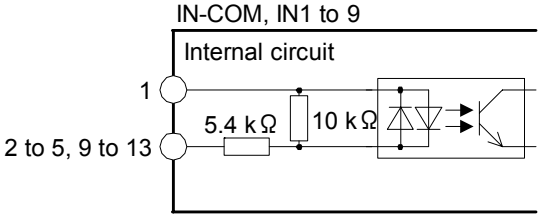
The following example is a command to assign the FREE input to the IN3 and set to "normally closed."

```
>INFREE=3
>FREELV=1  (0: Normally Open, 1: Normally Closed)
>SAVEPRM
>RESET
```

6.4.2 Input Signals

■ Internal Input Circuit

All input signals of the device are photo coupler inputs. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photo coupler rather than the voltage level of the signal.



Note

- All input signals are "normally open" under the factory settings. When setting the logic level to "normally closed," ON/OFF will be opposite in the description of the following signals.
- Set the voltage between IN-COM and INx to be 4.25 VDC to 26.4 VDC when the photo coupler is ON.

■ Signals

- IN1-IN9 Input (unassigned)

The IN1 through IN9 inputs can be used as input ports for general signals when they are not assigned to a specific signal.
The status of each port can be read using an IN command or INx (x=1-9) command, and directly commanded or used in a sequence program.
A sequence program can be selected by the binary value of the general inputs when a START signal is input.
See "9.6 Executing a Sequence" on page 96.

- PSTOP (panic stop) Input

This signal is used to forcibly stop motion and the sequence. Also the deviation counter in the driver is cleared for stopping servo motors and αSTEP products immediately. The action of the motor current and the alarm state after the PSTOP operation is determined by the ALMACT command, either alarm or no alarm.
The leading edge of the signal will cause the action.

- MSTOP (motor stop) Input

This signal is used to forcibly stop motion. This command does not stop a sequence program.
While the motor is operating, when MSTOP input is turned ON, the motion will be stopped as configured by the MSTOPACT command, either hard stop or soft stop.
The leading edge of the signal will cause the action.

- SENSOR (sensor) Input

  This signal is used for:
  - Stopping motion during continuous operation.
  - Offset motion on the fly during continuous operation.
  - Secondary home input for better accuracy during the mechanical homing operation.

  Set the operation (hard stop, soft stop, soft stop at fixed distance from SENSOR signal, no action) using the SENSORACT command.
  The leading edge of the signal will cause the action.

- PAUSE (pause motion) Input

  This signal is used to stop motion temporarily. If the PAUSE input is turned ON during any motion, motion is stopped and the device retains the motion type (positioning, continuous, etc) and remaining distance to the original target position if the paused operation is a positioning motion.
  If CONT command or input is executed, while in a paused situation, the remaining motion will be started.
  If START input is turned ON while in a paused situation only during sequence execution, the remaining motion will be started (STARTACT=0).
  Linked motions, return-to-electrical home operation and mechanical home seeking cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.
  If the PAUSECL input is turned ON or the PAUSECLR is commanded, the remaining motion will be canceled.
  Only the on-going motion is paused. The program execution will not stop.
  The leading edge of the signal will cause the action.

- PAUSECL (pause clear) Input

  This signal clears the on-going operation state that has been paused by the input of a PAUSE signal. (The remaining motion is canceled.)
  If this signal is activated while a sequence is running, only remaining portion of the current motion is cleared and the next step of the sequence will be executed, since the PAUSE does not stop the sequence.
  The leading edge of the signal will cause the action.

- CONT (continue motion) Input

  If CONT input is executed, while in a paused situation by PAUSE input, the remaining motion will be started
  The leading edge of the signal will cause the action.

- LSP (limit switch positive) Input/LSN (limit switch negative) Input

  These signals are used to limit travel range. The stopping action is determined by the OTACT command.
  If OTACT=0, the system will stop the motor as quickly as possible (hard stop). Also the deviation counter in the driver is cleared for stopping servo motors and α_{STEP} products immediately.
  If OTACT=1, the system will stop the motor by a controlled deceleration over time (soft stop).
  While LSP/LSN input is active, system LSP/LSN signal/status is active.

- HOME (home sensor) Input

  This signal is used to set the home position when executing mechanical home seeking operation using sensor etc.
  While HOME input is active, system HOME signal/status is active.

- CON (current on) Input

This signal is used to toggle the motor current: the motor is in an excited state when ON (servo ON in the case of a servo motor), while freeing the motor shaft when OFF.
This signal also controls the power to the MBFREE (magnetic brake free) output. When the CON is on, the MBFREE output is on. When the CON is off, the MBFREE output is off (locked).
The leading edge of this signal will supply the current to the motor.

Note

- When the CON input is ON, the motor current can be toggled by the CURRENT command. When CON is OFF, the CURRENT command is ignored.
- If the CON input is not assigned to any input and the CANopen is not active, the motor current at power on is determined by the STRSW setting.
- If the CON input is assigned to the I/O connector and/or the CANopen is active, the motor current becomes ON only when both CON signals are ON.
- During the CON input is OFF (motor current is off), PC (position command) is continuously overwritten by PF (position feedback) value. This is to track the actual position.
- If the operation is made immediately after CON input is ON, position error may occur since the motor current rising time will be late. (**CM10-2**, **3**, **4**) Allow a time interval according to the timing chart for each driver. Care should be taken especially when using CURRENT command in sequence program, or controlling CURRENT command, CON/COFF terminal or CON in CANopen by the host controller programs. (A position error will not occur with **CM10-1**, **5** even in the above situation, since **AR** (**LSD**)**/NX** Series driver has READY output and **CM10** starts motion after driver READY signal comes on.)

- ALMCLR (alarm clear) Input

This signal is used to reset the alarm that has been generated by the system protective function or the driver alarm. Input the ALMCLR signal once after removing the cause that has triggered the protective function.
The leading edge of the signal will cause the action.

Note For a description of the protective functions, see "13 Troubleshooting" on page 338.

- START (start sequence) Input

This signal is used to start the sequence execution as determined by the selected IN1 to IN7. See "9.6 Executing a Sequence" on page 96.
Set the starting method using the STARTACT command.

STARTACT	Operation
0	Setting START input from OFF to ON starts sequence execution. When sequence is running, paused motion is resumed. (Setting START input from ON to OFF does not stop sequence.)
1	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF aborts the sequence.

- ABORT (abort motion and sequence execution) Input

This signal is used to terminate a sequence execution and a motion. The motor will decelerate and stop.
The leading edge of the signal will cause the action.

- MCP (move continuously positive) Input/MCN (move continuously negative) Input

This signal is used to cause continuous motion. When the MCP input is detected, continuous operation in the forward direction (+ coordinate direction) will occur. When the MCN input is detected, continuous operation in the negative direction (- coordinate direction) will occur. It is not necessary to define the final position to start motion. The leading edge of the signal will cause the action.

- MGHP (move go home positive) Input/MGHN (move go home negative) Input

This signal is used to start the mechanical home seeking. When the MGHP input is detected, mechanical home seeking will be performed in the positive direction. When MGHN input is detected, mechanical home seeking will be performed in the negative direction.
The leading edge of the signal will start the home seeking.

- FREE (current off, magnetic brake free) Input
  - For **CM10-1**, **3**, **5**: When turning this signal (the FREE input) ON, the motor current will be turned OFF and the electromagnetic brake will be released (The FREE input of the connected driver is turned ON).
  - The MBFREE (magnetic brake free) output on the I/O connector: When turning this signal (the FREE input) ON, the MBFREE output on the I/O connector becomes ON.

  The FREE input is also available on the remote I/O (CANopen), and the FREE function will occur when either of those inputs becomes ON. The FREE command can also be used for this function regardless of the state of those inputs.
  While FREE input is active, system FREE signal/status is active.

- PECLR (position error clear) Input

  This signal is used to reset the PE (position error) value to zero (0).
  When PECLR input is turned ON, the PC (position command) value is set to equal to PF (feedback position) value. As a result, the PE is reset to zero. For **CM10-1**, **4**, **5**: Also the deviation counter in the driver is cleared, when the driver alarm is inactive. This function can be used when the motor moved away from the PC such as overload alarm condition.
  The leading edge of the signal will cause the action.

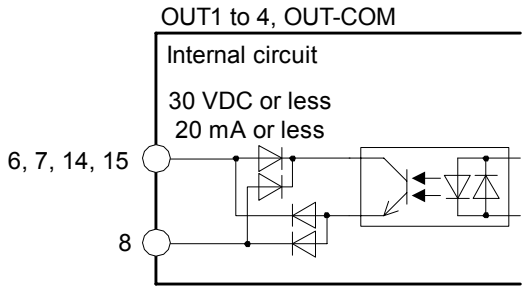
- TL (torque limiting/push-motion operation) Input (**CM10-1**, **5**)

  This signal is used to perform the following functions.
  - **AR** Series driver/**LSD** driver: push-motion operation
  - **NX** Series driver: torque limiting

6.4.3 Output Signals

■ Internal Output Circuit

All output signals of the device are open-collector outputs.
The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal transistor rather than the voltage level of the signal.



Note All input signals are "normally open" under the factory settings. When setting the logic level to "normally closed," ON/OFF will be opposite in the description of the following signals.

■ Signals

- OUT1-OUT4 Output (unassigned)

  The OUT1 through OUT4 outputs are used as output ports for general signals when they are not assigned to a specific signal. The status of each port is read and toggled using an OUT command or OUTx (x=1-4) command, and can be directly commanded or used in a sequence program.

- ALARM (alarm) Output

  When an alarm generates, the ALARM output will change. You can check the cause of the alarm by counting the number of times the ALARM LED blinks or by executing the ALM command.
  To reset the ALARM output, remove the cause of the alarm and then perform one of the following procedures after ensuring safety:
  - Input the ALMCLR signal once or enter the ALMCLR command.
  - Turn off the power, wait at least 10 seconds, and then turn it back on.

Memo For a description of the protective functions, see "13 Troubleshooting" on page 338.

- END (motion end) Output

When in the following condition, END signal will be active. See "8.8 END (motion end) Signal" on page 76.

Definition of END Signal (Source)	ENDACT Parameter	DEND Parameter	Typical Motor Type
End of pulse	0	0	Stepping motor
End of pulse and within end area	0<n (END area)	0	Stepping motor with an encoder
Driver END signal	Unrelated	1	αSTEP/servo motor

- RUN (sequence running) Output

This signal is output during sequence program execution.

Memo
- When the last command of the sequence program is a motor operation command (e.g. MI), the RUN output will be turned OFF as soon as the command is executed and motion is started.
- When turning this signal OFF after completing an operation is desired, insert the MEND (Wait for Motion End) command at the end of the sequence program.

- MOVE (motor moving) Output

This signal is output while the motor is moving. Motion commands are not accepted while the signal is ON.

Memo This signal is ON during pulses are being sent. The signal is also ON when sensor-less home seeking (HOMETYP=12) is being performed with the **CM10-3**, though the pulse is not being sent, since the motor is moving.

- READY (operation ready) Output

This signal is turned ON when the **CM10** is ready to operate (other than MOVE, RUN and ALARM status). A sequence program or a motion command (MA, MI, MCP, MCN, MGHP, MGHN, MIx, EHOME, CONT) can be executed.
For **CM10-1**, **5**: When the driver is ready to operate (the driver's READY output signal is ON) in addition to above condition, this signal will be turned ON. (When the factory setting DREADY=1 has not been changed) See the READY input on page 357 for the operation.

- LC (limiting condition) Output

This signal is turned ON under the following conditions.
- **CM10-1** + **AR** Series driver/**LSD** driver: When the motor is in a state of push condition (the position deviation is 1.8 degrees or more) in the normal operating mode, or when the motor torque reaches to the preset value in the current control operating mode.
  *This signal directly reflects the TLC output of the driver.
- **CM10-1**, **5** + **NX** Series driver: When the motor torque reaches the preset value while the torque limiting function is used. (Also when the motor torque reaches 300% of rated torque even while the torque limiting function is not used.)
  *This signal directly reflects the TLC output of the driver.
- **CM10-2** (**RBK** Series driver): Under current cutback condition
  *This signal directly reflects the CD output of the driver.
- **CM10-3** (**ESMC** controller): While pressing the mechanical home when performing sensor-less mechanical home seeking operation.
  *This signal directly reflects the T-UP output of the **ESMC** controller.

- PSTS (pause status) Output

This signal is output while the device is pausing with the PAUSE command or PAUSE input signal and can be cancelled by the CONT, PAUSECL, START (when sequence is running) or ABORT input signals or commands.

- HOMEP (home position) Output

This signal is output when a mechanical home seeking motion is successfully completed. This position is set to the origin (PC=0). Once this signal is ON, stopping on this position by operations such as EHOME or MA 0 sets this signal to ON.

- MBFREE (magnetic brake free) Output

This signal is used to control the electromagnetic brake
The MBFREE output is ON under normal operating condition and the system power is ON (CURRENT=1).
The MBFREE output turns OFF when the motor loses its holding torque due to a current cutoff or alarm (CURRENT=0). Configure the circuit so that the holding torque of the electromagnetic brake is generated when this signal is OFF.
The MBFREE output can also be manually controlled with the FREE input signals on the system I/O connector (if assigned) and on the remote I/O (CANopen), as well as the FREE command. If any of those inputs is ON, the state of the FREE function becomes 1, and the MBFREE output becomes ON.
The relationship among the status of CURRENT, FREE and MBFREE is as below.

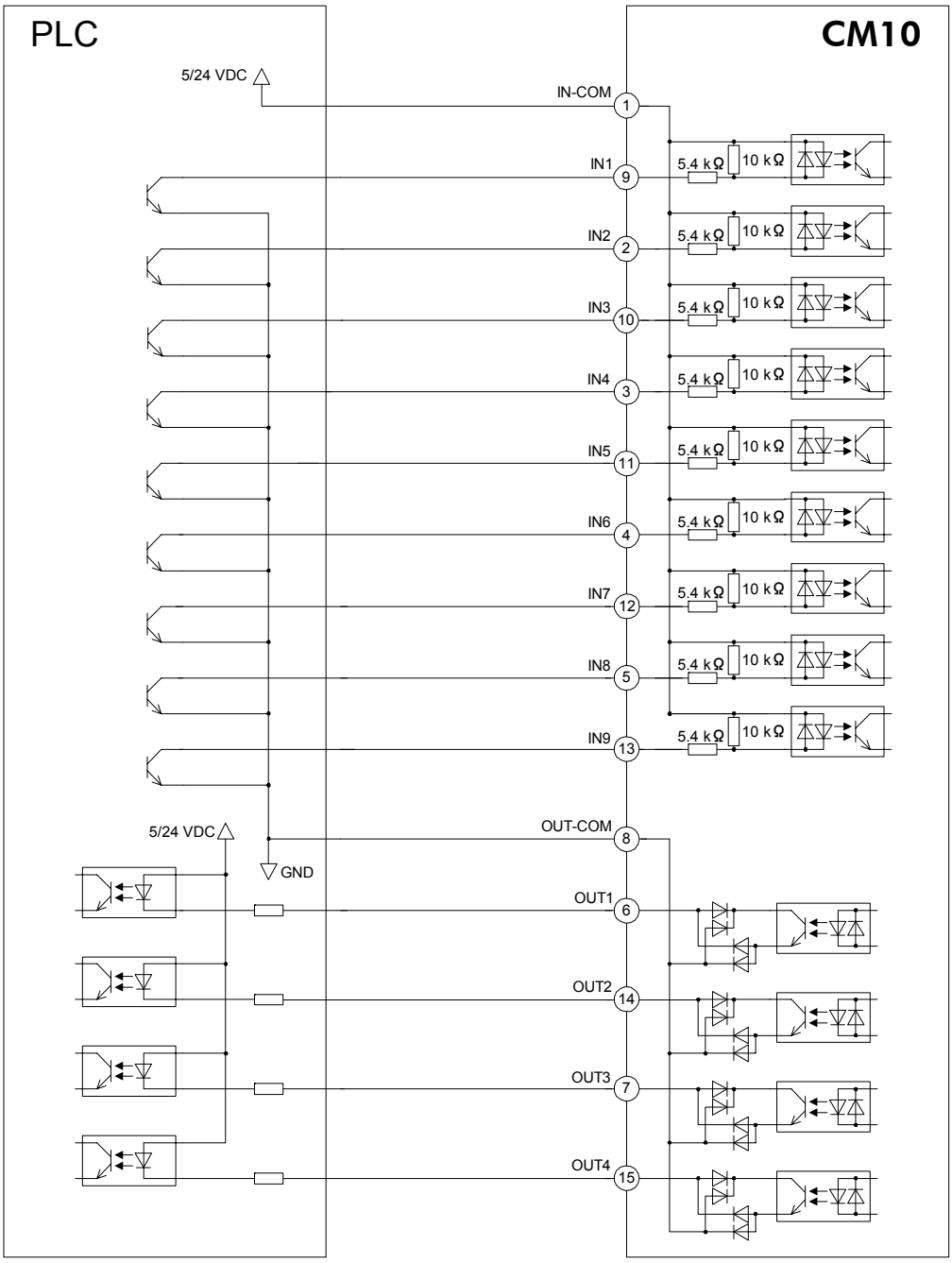
CURRENT	FREE	MBFREE
0	0	0 (Lock)
0	1	1 (Free)
1	0	1 (Free)
1	1	1 (Free)

∗ The state of MBFREE output on the I/O connector is always the same as the state of the MBFREE output on the driver connector of the **CM10**.

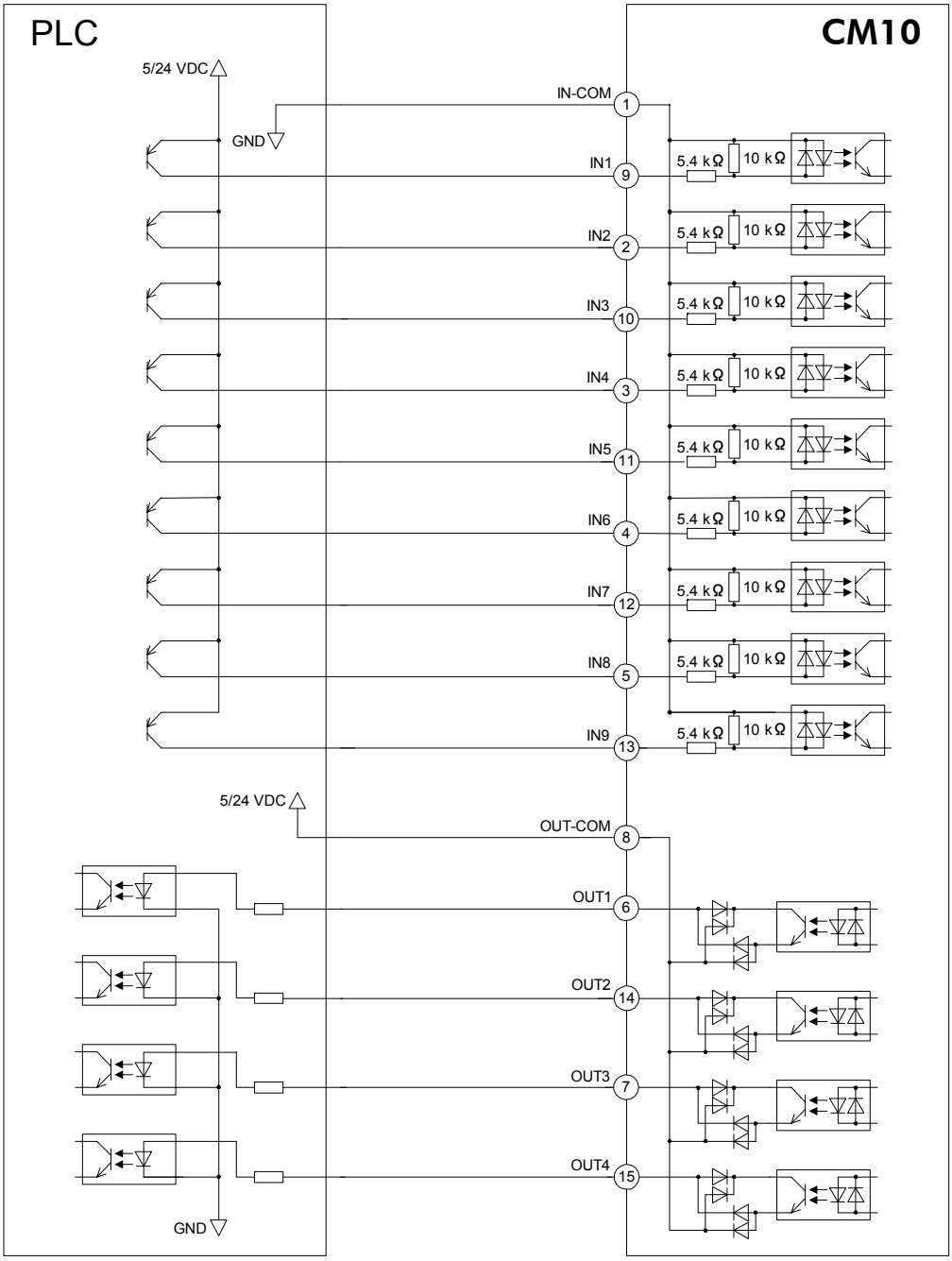
Note Once the motor has lost its holding torque, the equipment that is attached to the motor shaft may move due to gravity or the presence of a load before the electromagnetic brake generates holding force.

6.4.4 Connection Example of I/O

■ Current Sink



■ Current Source



6.5 Driver I/O Setting (CM10-1 and CM10-3)

The **CM10** can be used without any setting in most cases. However, the driver I/O setting is required to change in the following cases.

CM10-1

-With the **AR** Series driver/**LSD** driver (AC and DC power input type), when push-motion operation is used

-With the **NX** Series driver, when torque limiting function is used, when current position reading function is used, or when accurate mechanical home seeking operation using the Z-phase signal (timing signal) etc. is required

CM10-3

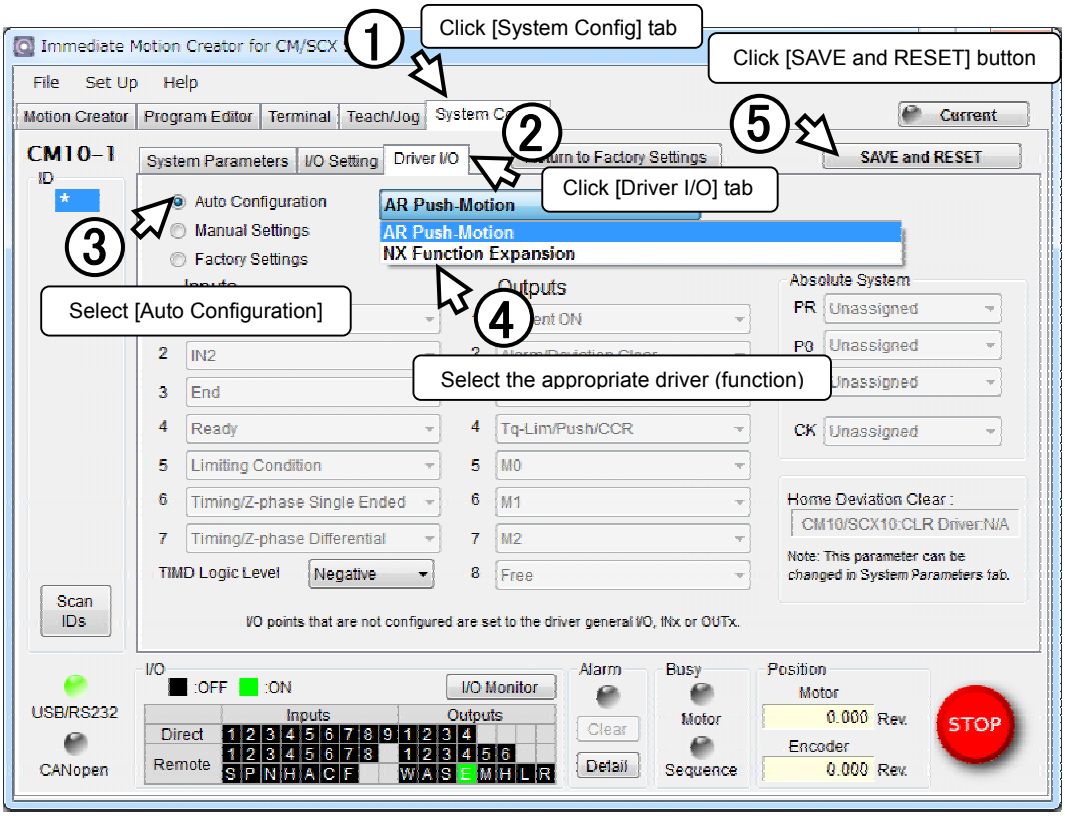
-When the PRESET signal that sets the home position at an arbitrary position is required to be enabled while current position reading function of the **ESMC** controller is used (sensor-less mechanical home seeking operation will be disabled)

Change the driver I/O using the "Automatic Setting" function of the provided utility software, **Immediate Motion Creator CM/SCX Series (IMC)**. With this automatic setting function, the necessary signals will be assigned to the I/O for driver.

Note Push-motion, torque limiting, current reading functions and sensor-less mechanical home seeking are implemented in the firmware Ver.2.00 or later of the **CM10**. The automatic setting of **IMC** (Ver.2.00 or later) is a function that is available for the firmware Ver.2.00 or later of the **CM10**. With the Ver.1.07 or older model, only the manual setting and the initialization to the factory setting are available. (The firmware version can be confirmed by [Help] - [Version Information] on the **IMC** or "VER" command.)

■ Setting Procedure

Connect the **CM10** to a computer and activate the **IMC**.



■ Setting Type

The following selections are available for setting.

- **CM10-1**

Selection	Description
AR Push-Motion	With the **AR** Series driver/**LSD** driver, when using the push-motion operation function (disabling the resolution switching function)
NX Function Expansion	With the **NX** Series driver, when torque limiting function and/or current position reading function is used, and/or when accurate mechanical home seeking operation is required such as using Z-phase pulse (timing signal)

- **CM10-3**

Selection	Description
ESMC PRESET Signal Enable	When the PRESET signal that sets the home position at an arbitrary position is required to be enabled while the current position reading function of the **ESMC** controller is used (sensor-less mechanical home seeking operation will be disabled)

Memo

- When using other functions than the driver's factory setting such as driver current position reading, torque limiting, push-motion operation, etc., the setting is also required to the driver. Refer to page 71 "8.6 Driver Current Position Reading (**CM10-1**, **3**, **5**)" or page 68 "8.5 Torque Limiting/Push-motion Operation (**CM10-1**, **5**)" for details.
- Refer to the "driver I/O" setting or the "I/O status monitor" of the **IMC** for the driver I/O assignment by each automatic setting.
- If the automatic setting is executed, unnecessary signals will be unassigned to assign necessary signals for the selected driver and function.
- When setting to "NX Function Expansion," HOMEDCL will automatically be set to "1" in addition to the driver I/O change. By setting this, when detecting the home position at mechanical home seeking operation, the driver deviation counter will be cleared and thus the motor will stop immediately. (The motor will be able to stop at the home position accurately and reset home position.) Refer to page 58 "8.2.5 Mechanical Home Seeking, HOMEDCL (deviation counter clear select at mechanical home seeking operation)." When setting manually, set "Home Deviation Clear" it under [System Config] - [System Parameters] tab of the **IMC**.
- The driver I/O setting can also be done for each signal individually (manual setting). The manual setting is used in special cases such as using the driver functions that is not supported. Refer to "memo" for "A.2 Input Signals for Driver" (page.356-) or "A.3 Output Signals for Driver" (page.359-).

6.6 Connecting the RS-232C

The RS-232C connection can be used for all the operations including initial setup, test operation, program creation, I/O configuration and real time monitoring, using general terminal software or supplied utility software as well as user program. Everything you can perform via RS-232C can also be performed via USB, except daisy chain connection.

■ Specification

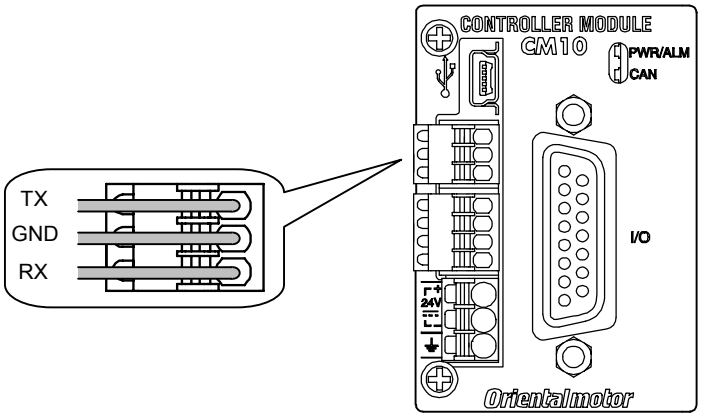
Item	Description
Electrical characteristics	In conformance with RS-232C
Transmission method	Start-stop synchronous method, NRZ (Non-Return Zero), full-duplex
Data length	8 bits, 1 stop bit, no parity
Transmission speed	9600, 19200, 38400, 57600, 115200 bps (9600 is factory setting.) Selected by the BAUD parameter
Protocol	TTY (CR+LF)

Terminal Specification

- ASCII mode
- VT100 compatible recommended
- Handshake: None
- Transmission CR: C-R
- Word wrap: None
- Local echo: None
- Beep sound: ON

Memo All commanding to the **CM10** can be made using general terminal software, such as Windows Hyper Terminal. For the quick start up, supplied utility software, the **Immediate Motion Creator for CM/SCX Series** is recommended. See "6.3 Connecting the USB and Installation of Utility Software" on page 22.

■ Connector and Applicable Lead Wire



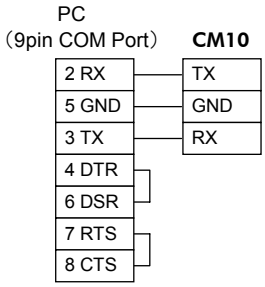
Connector and Applicable Lead Wire

Connector	FK-MC 0,5/3-ST-2,5 (PHOENIX CONTACT)
Applicable lead wire size	AWG26 to 20 (0.14 to 0.5 mm^2)

■ Connection Method

1. Strip the lead wire insulation by 8 mm.
2. Push the spring (orange) of the connector with a flat-tip screwdriver, to open a terminal port.
   Recommended flat-tip screwdriver: a tip of 2 mm in width, 0.4 mm in thickness
3. Insert the cable while pushing down the flat-tip screwdriver.
4. Release the flat-tip screwdriver. The lead wire will be attached.

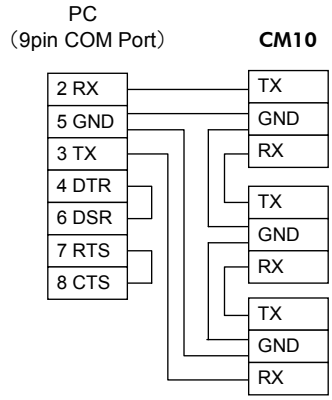
■ Single Axis Connection



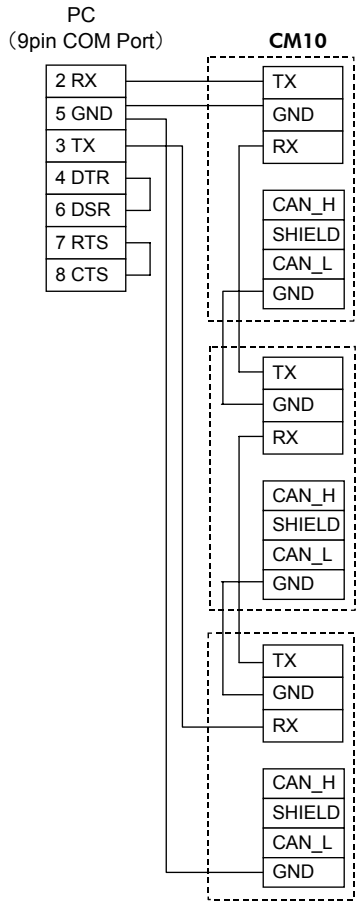
■ Daisy Chain Connection

You can connect multiple controllers with either of the two methods shown below.

Using only the RS-232C connector

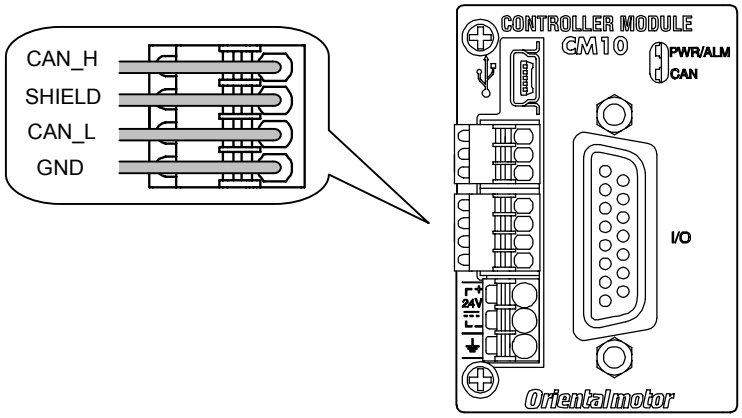


Using RS-232C and CANopen connector
(If this method is used, it is not required to connect two lead wires to one GND terminal on the **CM10**.)



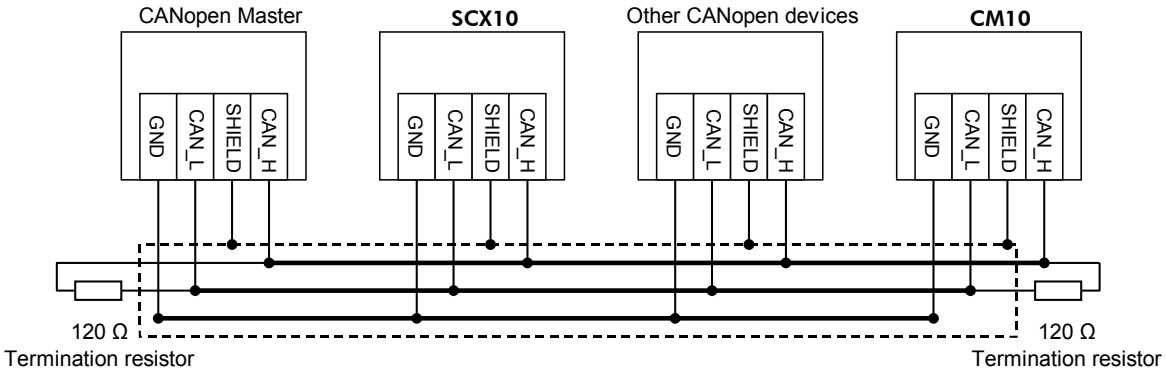
6.7 Connecting the CANopen

■ Connector, Applicable Lead Wire and Connecting Example of CANopen



Connector and Applicable Lead Wire

Connector	FK-MC 0,5/4-ST-2,5 (PHOENIX CONTACT)
Applicable lead wire size	AWG26 to 20 (0.14 to 0.5 mm^2)



- The **CM10** can be connected on the same network as other CANopen devices.
- Connect a terminating resistor (120 Ω 1/4 W) on both ends of the line. Termination resistors are not provided.

■ Connection Method

1. Strip the lead wire insulation by 8 mm.
2. Push the spring (orange) of the connector with a flat-tip screwdriver, to open a terminal port.
   Recommended flat-tip screwdriver: a tip of 2 mm in width, 0.4 mm in thickness
3. Insert the cable while pushing down the flat-tip screwdriver.
4. Release the flat-tip screwdriver. The lead wire will be attached.

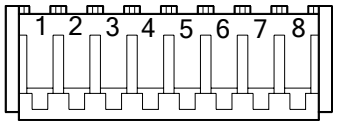
6.8 Connecting the External Encoder

Use the terminals and housing provided in the package for the external encoder connection.

■ Connector and Lead Wire

Connector housing	EHR-8 (manufactured by JST)
Terminals	BEH-001T-P0.6 (manufactured by JST)
Applicable lead wire size	AWG30 to 22 (0.05 to 0.33 mm^2)
Crimping tool	YC-260R (manufactured by JST)

■ Pin Assignments and Signal Table



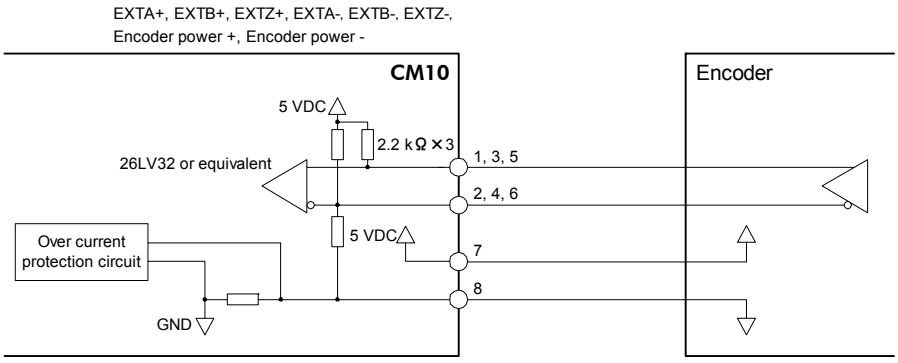
Pin No.	Signal Name	Description
1	EXTA+	External encoder ASG input
2	EXTA-	
3	EXTB+	External encoder BSG input
4	EXTB-	
5	EZTZ+	External encoder ZSG input
6	EXTZ-	
7	Encoder power +	External encoder power output (+5 V)
8	Encoder power -	External encoder power output (0 V)

Note

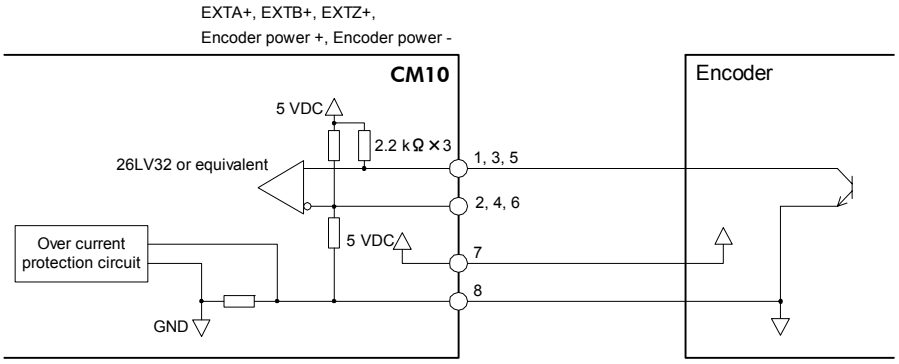
- This encoder power output should be used for the external encoder only.
- Connect the encoder input power "-" (ground) line to the "Encoder Power -" terminal as instructed below. Do not connect it to the "GND" terminal on the other connectors on the **CM10**. The **CM10** has a dedicated encoder power supply and the protection circuit on the "Encoder Power-" line detects the over current. The maximum current is 150 mA.

■ Connection Example

- Line Driver Output Encoder Connection

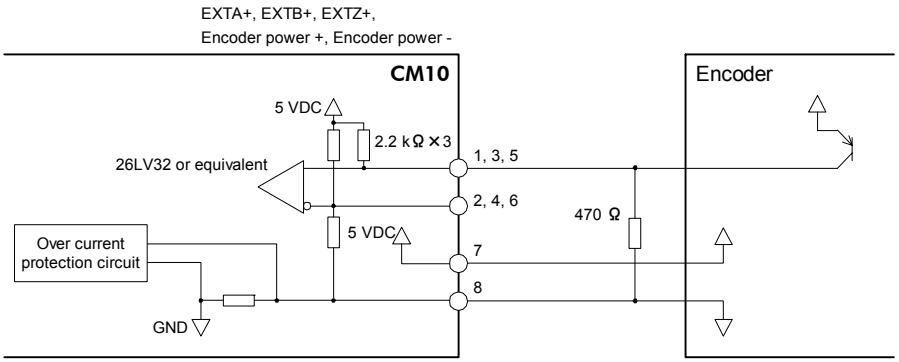


- Open Collector Output Encoder Connection (NPN Type)

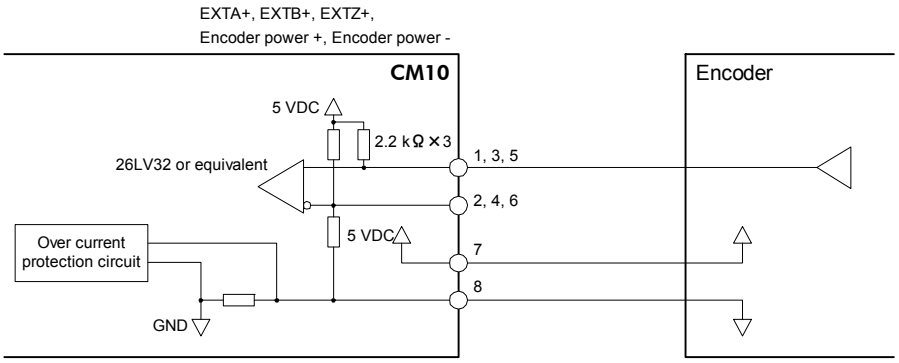


- Open Collector Output Encoder Connection (PNP Type)

Connect a pull-down resistor (470 Ω). The pull-down resistors are not provided.



- TTL Output Encoder Connection



7 Start Up (Immediate Command)

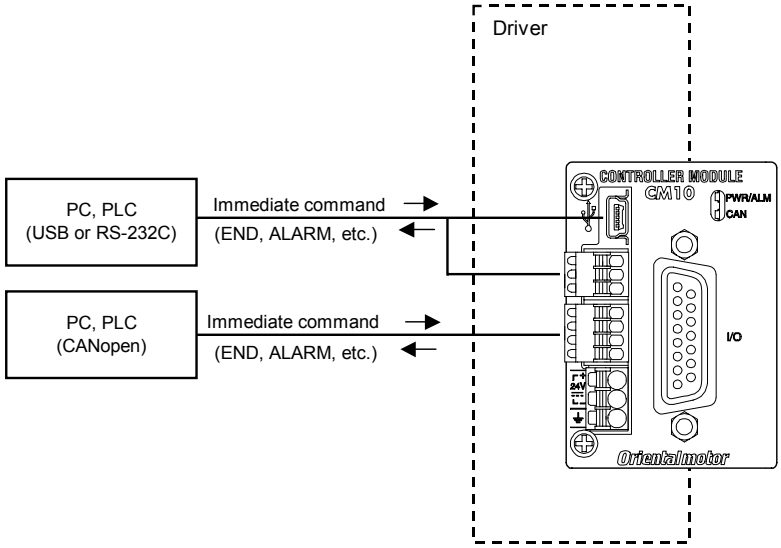
This chapter explains the initial set up, how to operate the device immediately from the terminal as well as command format. These are basic skills and are applied to many modes and functions that the **CM10** has. All users should read this chapter for start up.

Memo Start Up by command input is explained here, the method for using the supplied utility software (**IMC**) is introduced in a separate STARTUP MANUAL.

7.1 Overview

■ What is an Immediate Command?

You can operate the motor by sending commands immediately from the master controller such as a computer or PLC via RS-232C, USB or CANopen.



■ Contents

7.2 Preparation

1. Connect a personal computer via USB or RS-232C.
   See "6.3 Connecting the USB and Installation of Utility Software" on page 22 or "6.6 Connecting the RS-232C" on page 37 as necessary.
2. Power ON the **CM10** and the driver.
   See "6.2 Connecting the Power Supply" on page 21 as necessary.
3. Launch the supplied utility software (**IMC**) or any general terminal software.
   See "6.3 Connecting the USB and Installation of Utility Software" on page 22 as necessary.
   Communication Setting for the general terminal software
   8 bits, 1 stop bit, no parity
   Baud rate: 9600 bps
   ∗ The default USB/RS-232C baud rate of the **CM10** is 9600 bps.

Memo If DALARM is set to 1 and the power on timing of the driver is delayed from the **CM10**, the LED on the **CM10** becomes red and blinks (means alarm) until the driver power comes on. This action is normal and will be cleared automatically when the driver is powered on. For more detail, see ALM command on page 154.

7.3 Setting the User Unit

In the **CM10**, the actual motion distance of the user application, such as "mm," "inch," "revolution" and "degree" is used, instead of the pulse unit that is commonly used in pulse generators and motor controllers. This is called "user unit" and is set initially by the following steps as with the motor resolution. (Pulse unit can also be used within this user unit system. See following pages.)

- DPR, UU: The number of user units per motor revolution is determined by the DPR parameter (Distance per Revolution), and the text information used for unit is set with UU (User Units). DPR should be configured before programming motions. DPR can be set to any value between 0.500 and 51200.000 user units per motor revolution, in increments of 0.001. Choose a meaningful value, appropriate for the application. (The factory settings, DPR=1 and UU=Rev (**CM10-1**, **2**, **4**, **5**) or mm (**CM10-3**) assuming motions are programmed in revolutions.) Some examples appear on the following page.
- MR: The MR parameter must also be set according to the motor resolution that is set on the driver. (See the driver operating manual about the driver resolution and the setting.)

- Example

(Using "deg" unit, Motor resolution is 500/rev.)

1. Set the user unit

Enter "UU=deg," and press the Enter key.
(A space can be used and replaced with an equal sign between command and parameter.)

```
>UU=deg
 UU=deg
```

2. Set the distance per revolution

Enter "DPR=1," and press the Enter key.

```
>DPR=360
 DPR=1(360) deg
 Position range = +/- 500000(499680)
 Velocity range = 0.001 - 1240(446400)
 Minimum Movable Distance = +/- 0.001(0.36)
```

3. Set the motor resolution

Enter "MR=500," and press the Enter key.

```
>MR=500
 MR=1000(500)
 Position range = +/- 500000(499680)
 Velocity range = 0.001 - 1240(892800)
 Minimum Movable Distance = +/- 0.001(0.72)
```

4. Save to the EEPROM

Enter "SAVEPRM," and press the Enter key.

```
>SAVEPRM
 (EEPROM has been written 5 times)
 Enter Y to proceed, other key to cancel.
```

Enter "Y," and press the Enter key.

```
 Enter Y to proceed, other key to cancel.Y
 Saving Parameters........OK.
```

5. Reset the system

Enter "RESET," and press the Enter key.

```
>RESET
 Resetting system.
```

The parameter setting is finished.

Check if the parameters are properly set.

6. Enter DIS and press the Enter Key

```
>DIS
 DIS=0 deg
```

Distance is now indicated in the user unit, "deg"

7. Enter VR and press the Enter Key

```
>VR
 VR=1 deg/sec
```

Velocity is now indicated in the user unit, "deg/sec"

Note The new value is shown in parenthesis after the active value. The new value will become effective only after saving (with SAVEPRM command) and resetting (with RESET command, or by cycling power) the device.

- Parameters for User Unit

Parameter	Parameter Value	Function
DPR	0.500 - 51200.000 (1)	Distance per revolution [user unit] {mm, deg, etc.}
MR	10 - 51200 (1000) **CM10-1**, **4**, **5** (200) **CM10-2** (100) **CM10-3**	Motor resolution [pulse/rev]
GA	1 - 100 (1)	Electric gear {Numerator}
GB	1 - 100 (1)	Electric gear {Denominator}
UU	String (Rev) **CM10-1**, **2**, **4**, **5** (mm) **CM10-3**	User unit text. 20 chars max. Cleared (NULL) by "UU 0"
DIRINV	0, 1 (0)	0: Motor rotates clockwise for positive distances 1: Motor rotates counterclockwise for positive distances

( ): factory setting

Note Changing DPR and MR changes the physical distances and velocities of any previously programmed motions. Generally, DPR and MR should be configured once, and not changed afterward, unless the mechanics of the application also change.

Memo
- When setting the output shaft of the motor gearhead or transmission of the equipment to the reference of user unit (one revolution), the motor can be operated by compensating the gear ratio electronically. The electrical gear ratio is set via the GA and GB parameters and the applied gear ratio equals GA/GB. When a 3:1 reduction gearhead is used, set GA=3 and GB=1. (The numerator and the denominator of the electric gear are set to opposite to the mechanical gear. The motor must rotate 3 times as far to complete one revolution at the gearhead output. Therefore, the GA value is 3 to compensate for the gear ratio's reduction in distance and velocity.)
- Electronic gearing can also be used when the distance per revolution is less than 0.5 (less than lower limit value of the DPR), or when the exact ratio cannot be specified (can not be divided) in three decimal places (e.g. if the distance per revolution is 1/3 user unit). Setting DPR=1, electronic gear numerator GA=3 and denominator GB=1 will result in three motor rotations per one user unit, for an effective DPR of exactly 1/3 user unit.
- If electronic gearing is used, DPR represents the distance per revolution of the output of the gear head (or other transmission device).
- The convention for positive vs. negative motion and torque can be changed with DIRINV.
- User unit text can be suppressed by setting UU to 0 (zero).

■ Application Examples

- Ball screw, lead 10 mm (Desired unit: mm)
  UU=mm, DPR=10
- Ball screw, lead 10 mm, with 10:1 gear (Desired unit: mm)
  - UU=mm, DPR=1

  or UU=mm, DPR=10, GA=10, GB=1
- Ball screw, lead 10 mm, with 3:1 gear (Desired unit: mm)
  ∗ Distance per motor revolution approximately 3.333, exact value cannot be set with DPR alone
  UU=mm, DPR=10, GA=3, GB=1
- Rotating table (Desired unit: Revolution)
  UU=Revolution, DPR=1
- Rotating table, with 100:1 gear (Desired unit: Degree)
  UU=Degree, DPR=360, GA=100, GB=1
- Rotating table, with 3:1 gear (Desired unit: Degree)
  UU=Degree, DPR=120
  or UU=Degree, DPR=360, GA=3, GB=1

- Examples when combining the **CM10** with actuator products (**CM10-3**, **4**) -

- Products which resolution is 0.01 mm when combining the **CM10-3** and **ESMC** controller (**EZSII** Series, **EZCII** Series, **EZA** Series)
  UU=mm, DPR=1, MR=100
  (Since the resolution of the actuator/**ESMC** controller is based on one millimeter while the resolution of other motors/drivers are based on one revolution. Therefore, the "distance per revolution" parameter on the **CM10** works as a "distance per millimeter" for the **ESMC** controller.)
- Products which resolution is 0.01 mm when combining the **CM10-3** and **ESMC** controller (unit: inch)
  UU=inch, DPR=3.937, GA=100, GB=1, MR=100
  (Since 1 inch equals to 25.4 mm, "1 divided by 25.4" (0.0393700…..) is the travel distance of "1 mm" in terms of the user unit. Since DPR can use up to 3 decimal places, an electronic gear is used here in order to increase the accuracy by using as greater number of digits as possible.)
- Products which resolution is 0.001 mm when combining the **CM10-3** and **ESMC** controller (**ESR** Series, **SPR4**, **PWA8**)
  UU=mm, DPR=1, MR=1000
- Products which lead is 12 mm when combining with the **EAS** Series
  UU=mm, DPR=1, MR=1000, GA=3, GB=250
- Products which lead is 6 mm when combining with the **EAS** Series
  UU=mm, DPR=1, MR=1000, GA=3, GB=500
- When combining the **CM10-4** and **LAS** Series Rack and Pinion Systems (example of **LAS2B500**)
  UU=mm, DPR=9.997 (Multiply the resolution by the travel distance per one pulse for the **LAS2B500** described in the operating manual of the **LAS** Series.), MR=500 (Factory Setting)
  (When using all of five digits in order to increase more accuracy, using the electronic gear, set GA=10 and GB=1, and then set to DPR=99.974.)
- When combining the **CM10-4** and **DG/DGII** Series Hollow Rotary Actuators (unit: Rev)
  UU=Rev, GA=18, GB=1 (The electronic gear is an inverse number of the gear ratio 18:1), DPR=1
  (Because the electronic gear is used), MR=1000 (Factory Setting)
- When combining the **CM10-4** and **DG/DGII** Series Hollow Rotary Actuators (unit: deg)
  UU=deg, GA=18, GB=1, DPR=360, MR=1000

■ Parameter Range and Least Input Increment

The maximum position range in user units is –500,000 to +500,000 and the maximum speed range in user units is 2,147,483.647. Both can be used to three decimal places (0.001).
When the DPR, MR, ER, GA, GB is changed, position and velocity ranges also change due to internal calculation limits and pulse output speed limit. The new ranges are shown when the DPR, MR, ER, GA, GB is changed. The values can also be queried independently using the MAXVEL and MAXPOS: The MAXVEL is the maximum value for any velocity-based parameter, and position-based parameters must be between −MAXPOS and +MAXPOS.

■ How to Use Pulse Unit

Pulse unit can also be configured in this user unit system. Set the DPR equal to the MR (motor resolution).
Ex. Set the UU=Pulse, MR =1000, DPR=1000.

Note When DPR=MR, the maximum position that can be commanded is limited to 500,000 (pulses). If a greater maximum position (number of output pulses) is required, set DPR to a lower number and keeping in mind that the number of output pulses is the user unit multiplied by (MR/DPR).

Ex. Set the UU=Pulse (1000x), MR=1000, DPR=1.

When "500,000" user unit is commanded, 500,000,000 pulses are output. Since the user unit can be used with three decimal places (0.001), commanding the increment of 1 pulse can still be done.

7.4 Making the Motor Move (Immediate Command)

■ Set the Motor Current ON (Only for CM10-1)

Enter "CURRENT=1," and press the Enter key.
(A space can be used and replaced with an equal sign between command and parameter.)

```
>CURRENT=1
 CURRENT=1
```

Memo The **AR** Series driver/**LSD** driver (the **CM10** to be installed) is designed so that the motor current at driver start up is OFF. The motor current can be controlled by the **CM10** using the CURRENT parameter. While the state of the CURRENT at system start up of the **CM10-1** is set to "OFF" to match with the **AR** Series driver/**LSD** driver, it can be changed using the STRSW parameter.

■ Experience the Operation

1. Set the move distance

Enter "DIS=360," and press the Enter key.

```
>DIS=360
 DIS=360 deg
```

2. Set the running velocity

Enter "VR=360," and press the Enter key.

```
>VR=360
 VR=360 deg/sec
```

3. Make the motor move

Enter "MI," and press the Enter key.
The motor starts to move in clockwise direction, and will rotate 1 revolutions in 1 second.

```
>MI
>
```

4. Invert the direction

Enter "DIS= -360" and "MI," both followed by pressing the Enter key.
The motor will rotate 1 revolution in 1 second in reverse direction.

```
>DIS=-360
 DIS=-360 deg
>MI
>
```

5. Change the running velocity

Enter "VR=720" and "MI," both followed by the Enter key.
The motor will rotate in 0.5 seconds.

```
>VR=720
 VR=720 deg/sec
>MI
>
```

You now know the basics of incremental motion the **CM10**. See "8.2 Motion Types" on page 49 for a variety of other motions.

7.5 Command Format

This section shows the command format. Case {Upper/Lower} of the character does not a matter unless specified. Decimal point number is accepted in some of the parameters.

Note The decimal point is defined as "." (period), and "," (comma) cannot be used.

Memo See "Appendix B How to Send Commands Using ASCII Strings" on page 361 for information on ASCII string construction and for an automated communication.

■ Parameters

An "=" between a parameter and parameter value is required. If the parameter value is a constant, a space can be used instead of an "=".

- Format

[Parameter] [=] [Parameter value]
[Parameter] [Space] [Parameter value (constant)]

- Examples

Condition	Example	Remarks
Parameter value is constant	`DIS=1.234, DIS 1.234`	"=" can be replaced with the space
Parameter value is variable (Available in sequence only)	`DIS=A`	"=" is required
Parameter value is equation (Available in sequence only)	`DIS=A*1.5`	"=" is required

■ Commands

Spacing between command and argument (if needed argument) by at least a space is required.

- Format

[Command] [Space] [Argument]

- Examples

Condition	Example	Remarks
No argument	`MI`	-
Argument is constant	`MA 1.234`	"=" is not accepted
Argument is variable	`MA POS[1]`	"=" is not accepted
Argument is string	`RUN Test`	"=" is not accepted

■ Multiple-statement on a Line

Multiple statements can be written on a single line. A ";" (semicolon) divides each statement on the line. Spaces around semicolon are accepted. The maximum number of characters on a one line is 80.

- Example

```
>DIS 1.234; VR 3; TA 0.5; TD 0.1; MI
```

Memo VERBOSE parameter defines the response display. The following shows some example.

VERBOSE=1 (Factory Setting)

```
>PC
 PC=0.123 Rev
>DIS=5.678
 DIS=5.678 Rev
>HOMETYP
 HOMETYP=0
```

VERBOSE=0

```
>PC
 0.123
>DIS=5.678
 5.678
>HOMETYP
 0
```

Note The ECHO command defines the echo back ON/OFF for entered ASCII data. Factory setting is ECHO=1 (ON) echo back. If ECHO=0 (OFF), there will no reply for the entered ASCII data. Display of parameter readout or SAS command from sequence is not affected by ECHO=, they are always displayed (See page 300 for SAS command).

8 Features

This chapter introduces the main features of **CM10**.

8.1 Overview

The **CM10** device is designed to make motion control simple and convenient. At the same time, the system has the versatility to adopt various types of operation, powerful features to maximize performance of the motor and driver, and support functions to accelerate successful system integration. The following subjects are discussed in the sections which follow:

■ Contents

Note DPR and MR should be set before making any motions. See "7.3 Setting the User Unit" on page 43.

8.2 Motion Types

The **CM10** supports three basic types of motion: point-to-point motions, continuous motions, and electrical and mechanical home seeking. Also, linked operation that combines multiple sets of PTP-motion (point to point) is possible. This section explains each of these basic motion types.

8.2.1 PTP (Point-to-Point) Motions

Point-to-point motions cause the motor to start moving from one position to another position, using a preset distance or destination. Motion begins at starting speed VS, accelerates to VR over acceleration time TA, and finally decelerates back to VS over deceleration time TD before stopping.

- Commands and Parameters for Point-to-Point Motions

Command/Parameter	Argument/Parameter Value	Function
MA	−MAXPOS - +MAXPOS	Start absolute motion to the specified destination [user unit]
MI	None	Start incremental motion, distance DIS
DIS	−MAXPOS - +MAXPOS (0)	Distance for incremental motion [user unit]
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
TA	0.001 - 500.000 (0.5)	Acceleration time [sec]
TD	0.001 - 500.000 (0.5)	Deceleration time [sec]

( ): factory setting

Note See "8.3 Stopping Motion and Sequence" on page 64 for information on stopping motions before they finish.

Memo
- See the description of "8.2.2 Linked Motions" (below) for information on more complex motion profiles.
- The minimum output frequency on the **CM10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

- Point-to-Point Motion Types

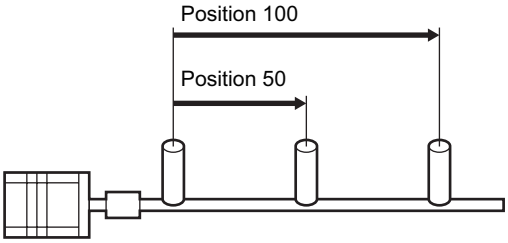
Two positioning modes are available for use in the positioning operation: absolute mode and incremental mode. In the absolute mode, set the target position by the distance from electrical home. For example, if absolute operation is performed from the electrical home toward the target position 100, it will stop after moving a distance of 100. However, if the current position is 30 from the electrical home, it will move a distance of 70 and stop. The operation is performed by the command and argument which shows target position.

Example: `MA 100` (Start absolute move to target position 100)

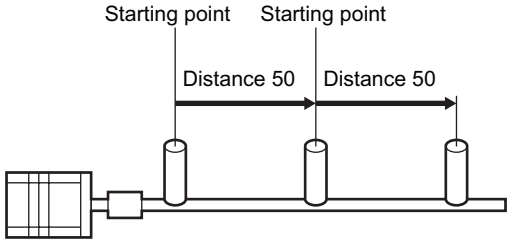
In incremental mode, set the target position by the distance from the current position. Since each device destination becomes the starting point for the next movement, this mode is suitable when the same distance is repeatedly used. Travel distance is set by the parameter "DIS" in advance, and the operation is performed by MI command.

Example: `DIS 100` (Set the distance to 100)
`MI` (Start move incremental)

• Absolute Mode



• Incremental Mode

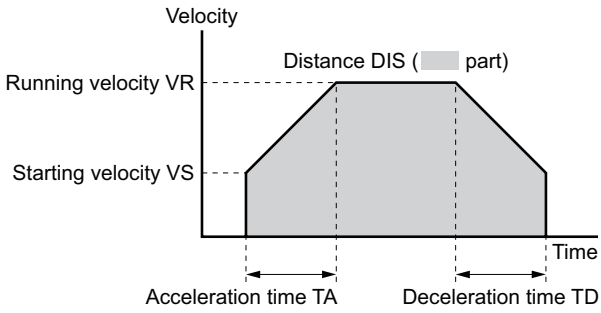


Before starting operation, set VR (running velocity), VS (starting velocity), TA (acceleration time), TD (deceleration time).

- Example

Conditions:
Ball screw: lead 10 mm (See "7.3 Setting the User Unit" on page 43.)
Distance: 60 mm (Incremental)
Running velocity: 5 mm/sec
Starting velocity: 1 mm/sec
Acceleration time: 0.5 sec
Deceleration time: 0.5 sec

```
>DIS=60
 DIS=60 mm
>VR=5
 VR=5 mm/sec
>VS=1
 VS=1 mm/sec
>TA=0.5
 TA=0.5
>TD=0.5
 TD=0.5
>MI
>
```



8.2.2 Linked Motions

Linked motions are point-to-point motions which may be more complex than motions started with MA (move absolute) or MI (move incremental). Linked motions use up to four (4) running speeds between the start and stop position, and each segment of the motion has its own distance or destination. Segments can be (optionally) linked together: when two segments are linked, the system accelerates (or decelerates) to the second segment's running velocity when the first segment's distance has been traveled or destination has been reached. Motion does not stop between linked segments.
The maximum number of linked segments is four (4).

- Commands and Parameters for Linked Motions

Command/ Parameter	Argument/Parameter Value	Function
MIx (x=0 - 3)	None	Start linked motion at link segment 'x'
DISx (x=0 - 3)	−MAXPOS - +MAXPOS (0)	Distance or destination for link segment 'x' [user unit]
VRx (x=0 - 3)	0.001 - MAXVEL (1)	Running velocity of link segment 'x' [user unit/sec]
INCABSx (x=0 - 3)	0, 1 (1)	Link type for link segment 'x' 0: Absolute 1: Incremental
LINKx (x=0 - 2)	0, 1 (0)	Link control for link segment 'x' 0: segment terminates linked motion 1: motion continues with next segment
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
TA	0.001 - 500.000 (0.5)	Acceleration time [sec]
TD	0.001 - 500.000 (0.5)	Deceleration time [sec]

( ): factory setting

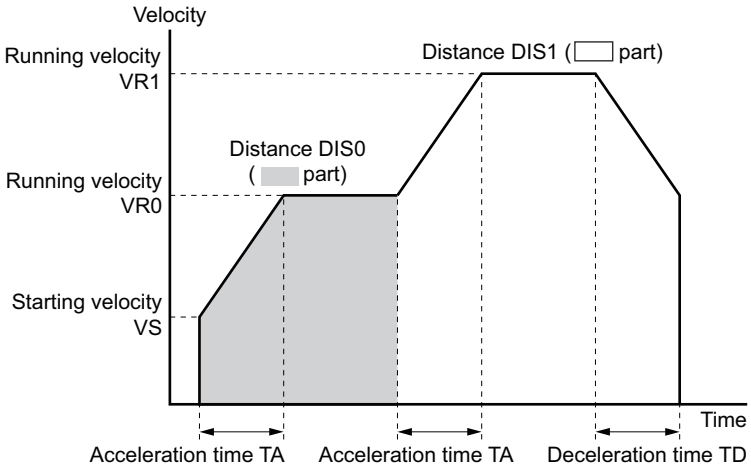
Note See "8.3 Stopping Motion and Sequence" on page 64 for information on stopping motions before they finish.

Memo
- Acceleration and deceleration times TA and TD are the same for each segment.
- Link segments can be absolute or incremental, but all segments must execute in the same direction.
- Linked Motions cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.
- The minimum output frequency on the **CM10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

- Example

Conditions:
Number of linked segments: 2
Link segment 0: Distance: 20 mm, Running velocity: 3 mm/sec
Link segment 1: Distance: 60 mm, Running velocity: 5 mm/sec
Starting velocity: 1 mm/sec

```
>DIS0=20
 DIS0=20 mm
>DIS1=60
 DIS1=60 mm
>VR0=3
 VR0=3 mm/sec
>VR1=5
 VR1=5 mm/sec
>INCABS0=1
 INCABS0=1 [INC]
>INCABS1=1
 INCABS1=1 [INC]
>LINK0=1
 LINK0=1
>LINK1=0
 LINK1=0
>TA=0.1
 TA=0.1
>TD=0.1
 TD=0.1
>VS=1
 VS=1 mm/sec
>MI0
>
```



8.2.3 Continuous Motions

Continuous motions cause the motor to accelerate or decelerate to a new constant speed and maintain that speed, with no predetermined final position. Motion continues until changed by a new (continuous) motion command, a stop command, or input signal.
Two continuous motion commands are available: MCP (Move Continuously Positive) and MCN (Move Continuously Negative). The new target velocity is determined by the value of running velocity VR at the time the command executes.

Velocity can be changed by setting a new value of running velocity VR and executing a continuous motion while running. Direction changes are not allowed: MCP is only permitted after a previous MCP, and MCN is only permitted after a previous MCPN
The SENSOR input can be used to change speed and eventually stop after a predetermined distance: see the example and discussion below.

- Commands and Parameters for Continuous Operation

Command/ Parameter	Argument/ Parameter Value	Function
MCP	None	Move continuously positive
MCN	None	Move continuously negative
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
TA	0.001 - 500.000 (0.5)	Acceleration time [sec]
TD	0.001 - 500.000 (0.5)	Deceleration time [sec]
SENSORACT	0 - 3 (2)	SENSOR input action 0: Hard stop 1: Soft stop 2: Soft stop at fixed distance from SENSOR signal 3: No action
SCHGPOS	0 - MAXPOS (0)	Distance from SENSOR input to the stop position [user unit] if SENSORACT=2
SCHGVR	0.001 - MAXVEL (1)	Velocity after SENSOR input [user unit/sec] if SENSORACT=2

( ): factory setting

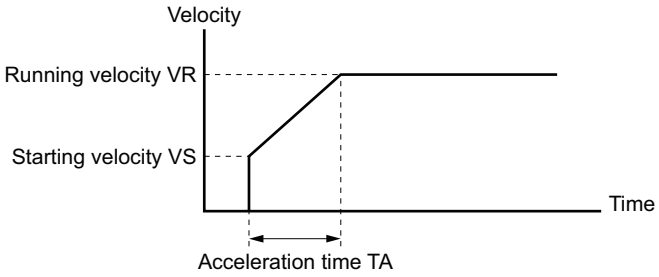
Note See "8.3 Stopping Motion and Sequence" on page 64 for information on stopping motions before they finish.

Memo The minimum output frequency on the **CM10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

- Example

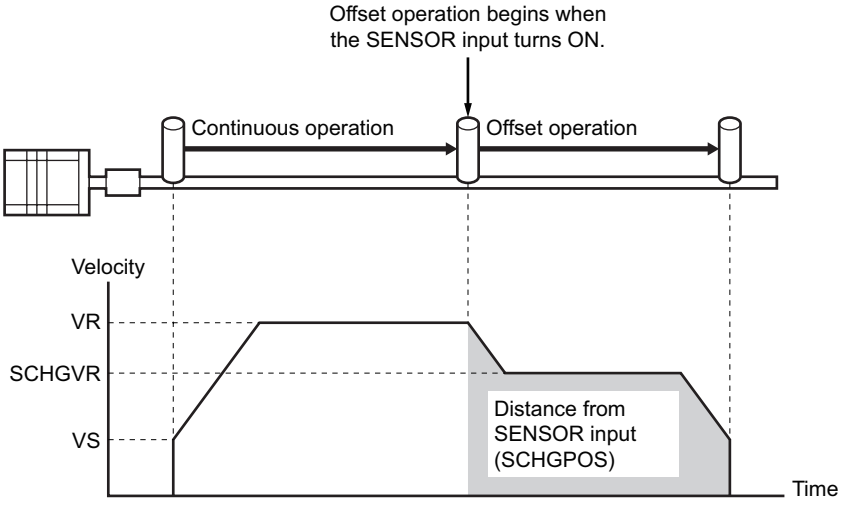
Conditions:
Ball screw: lead 10 mm (See "7.3 Setting the User Unit" on page 43.)
Running velocity: 5 mm/sec
Starting velocity: 1 mm/sec
Direction: Positive

```
>VR=5
 VR=5 mm/sec
>VS=1
 VS=1 mm/sec
>TA=0.5
 TA=0.5
>MCP
>
```



- SENSOR Action

If the SENSOR input is configured, it can be used to stop continuous motions, with stop action determined by SENSORACT. If SENSORACT=0, the system performs a hard stop. If SENSORACT=1, the system performs a soft stop. If SENSORACT=2, the system changes velocity to SCHGVR, and stops at a distance SCHGPOS after the position at which the SENSOR signal was set. If SENSORACT=3, the system does not stop.
See "8.3 Stopping Motion and Sequence" on page 64 for information on hard stops and soft stops. The picture below illustrates stopping action when SENSORACT=2.

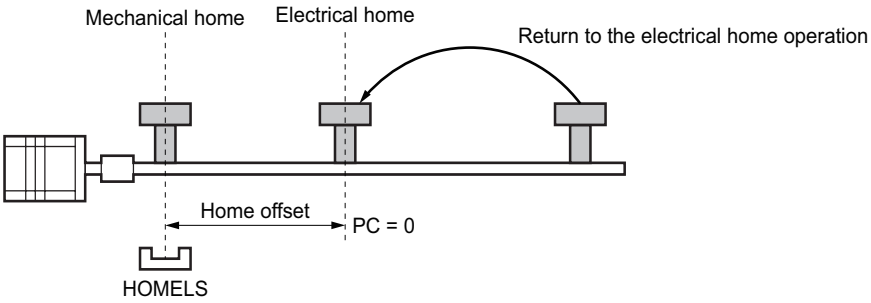


8.2.4 Electrical Home Position and Mechanical Home Position

The **CM10** is operated based on the position command (PC). The position command can be read and indicates the current position.
When the **CM10** is powered on or reset, PC is set to position zero (0).

- Setting of the Electrical Home Position

The physical position at which PC=0 is called "electrical home." The electrical home position can be aligned with an external reference signal (or signals) through a process called "mechanical home seeking," in which the system moves until a predefined home input signal pattern has been found, or then moves a predefined distance (OFFSET) from that position. (Mechanical home seeking is described in more detail in the next section.) When mechanical home seeking completes successfully, the final position is redefined as the new electrical home: PC is reset to zero (0).



The electrical home position can be set in an arbitrary position regardless of the mechanical home position. When executing the PRESET (reset home position) command, the current position will be set to the electrical home position and reset to "PC=0." Also, if the EHOME (return-to-electrical home operation) command is executed when the electrical home position has never been set, the position of "PC=0" will be set to the electrical home position.

- Function of the Electrical Home Position

Once the electrical home position is set, the software position limits (LIMP, LIMN) will become effective. Whenever returning to the electrical home position, the HOMEP (home position) output of the I/O connector will be turned ON (when assigned).

- Returning to the Electrical Home Position

When returning to the electrical home position from an arbitrary position, use the EHOME (return-to-electrical home operation) command or command "MA 0" (move to the absolute position 0). The EHOME operating pattern is determined by VR (operating speed), VS (starting speed), TA (acceleration time) and TD (deceleration time) as well as other operations.

- Commands and Parameters Related to the Electrical Home Position

Command/Parameter	Parameter Value	Description
PC	−MAXPOS - +MAXPOS (0)	Reference and setting of the position command (current position)
PRESET	-	Reset of the position command, setting current position to be the electrical home position
EHOME	-	Start return-to-electrical home operation (When the electrical home position is not set, setting PC=0 position to be the electrical home position)
OUTHOMEP	0 - 4 (0)	Assign the HOMEP (home position) output to the OUTx of the I/O connector (the parameter 0 is unassigned)
HOMEPLV	0, 1 (0)	Home position output logic (0: Normally open, 1: Normally closed)
SIGHOMEP	0, 1	Home position output status (0: Not-active, 1: Active (at home)
LIMP	−MAXPOS - +MAXPOS (0)	Setting of software position limit (Positive direction)
LIMN	−MAXPOS - +MAXPOS (0)	Setting of software position limit (Negative direction)
SLACT	0, 1(0)	Software position limit enable (0: Disabled, 1: Enabled)

( ): factory setting

Note

- See "8.3 Stopping Motion and Sequence" on page 64 for information on stopping motions before they finish.
- An arbitrary value can be written to PC but avoid a careless change because the reference point of all operation will be changed.
- Return-to-electrical home operation cannot be paused and then resumed: PAUSE causes a soft stop, and CONT is ignored.

Memo

- When turning on the power or when resetting, PC is set to zero (PC=0), but the electrical home position will not be set. Similarly, although "PC=0" is commanded at an arbitrary position, the electrical home position will not automatically be set. To use the software position limit and home position output functions without executing mechanical home seeking operation, set the electrical home position using EHOME or PRESET.
- When combining with a driver that has a function to read the current position (**NX** Series driver or **ESMC** controller etc.) and if the reading driver current position/updating internal position (ABSREQPC) is performed, the electrical home position will be set without executing mechanical home seeking operation. See "8.6 Driver Current Position Reading (**CM10-1**, **3**, **5**)" on page 71.

8.2.5 Mechanical Home Seeking

Mechanical home seeking is an operation in which the motor moves in a specific pattern, seeking a valid mechanical home position determined by external signals. Thirteen patterns are available, differing in their signal requirements and response. See the HOMETYP table (below) and the motion chart for each homing type on pages 60 to 63.
The SENSOR input and the TIM input can be used to increase the repeatability of the final home position. The TIM input is connected to the TIM (excitation timing) output of the stepping motor driver, and is considered ON in fifty (50) or one hundred (100) fixed, evenly spaced locations per motor revolution. If a SENSOR and/or a TIM input are used, they are ANDed with the designated home position signal to form a valid mechanical home input signal set.

- Commands and Parameters for Mechanical Home Seeking

Command/ Parameter	Argument/Parameter Value	Function
MGHP	None	Move go home positive
MGHN	None	Move go home negative
OFFSET	−MAXPOS - +MAXPOS (0)	Offset for mechanical home seeking [user unit]
HOMETYP	0 - 11 (0): **CM10-1**, **2**, **4**, **5** 0 - 12 (0): **CM10-3**	Mechanical home seeking mode: see table "HOME Seeking Pattern"
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
TA	0.001 - 500.000 (0.5)	Acceleration time [sec]
TD	0.001 - 500.000 (0.5)	Deceleration time [sec]
HOMEDCL	0 - 2 (0): **CM10-1**, **2**, **3**, **4** 0 - 2 (1): **CM10-5**	Select the deviation counter clear during mechanical home seeking operation (refer to P.58 in details)
SENSORACT	0 - 3 (2)	SENSOR input action 0: Hard stop 1: Soft stop 2: Soft stop at fixed distance from SENSOR signal 3: No action If the SENSOR input, which is used in mechanical home seeking operation, is not used in normal operation, set "SENSORACT=3."

( ): factory setting

Note

- See "8.3 Stopping Motion and Sequence" on page 64 for information on stopping motions before they finish.
- Return-to-electrical home operation cannot be paused and then resumed: PAUSE causes a soft stop, and CONT is ignored.

Memo

- Mechanical home seeking normally uses starting velocity VS for the final approach to the home signal(s). If VS=0, the final approach will be internally set to 0.001 user unit. If the TIM signal is used and VS is more than 200 Hz pulse output speed, the final approach will be 200Hz=200/MR "user unit/sec."
- The minimum output frequency on the **CM10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.
- System END signal is referenced at the end of each motion. An error occurs if the END signal is not found. "See 8.8 END (motion end) Signal" on page 76 in more detail of END signal.
- The TIM (excitation timing) signal of the driver is based on position command (or set point), not on position feedback information.
- The ACL/DCL signal on the driver connector of the **CM10** is momentarily output when a limit sensor (+LS or -LS) is found during mechanical home seeking, and it clears the deviation counter in the driver for an immediate stop.

- HOME Seeking Pattern

HOMETYP	Home Position Detector				Mode (Motion Pattern)
	HOME	+LS, −LS	SENSOR	TIM (excitation timing)	
0	Not used	Required for valid home	-	-	2-sensor mode (See p.60)
1			-	Required for valid home	
2			Required for valid home	-	
3			Required for valid home	Required for valid home	
4	Required for valid home	Reverse direction	-	-	3-sensor mode (See p.61)
5			-	Required for valid home	
6			Required for valid home	-	
7			Required for valid home	Required for valid home	
8		Stop: Alarm	-	-	1-sensor mode (See p.62)
9			-	Required for valid home	
10			Required for valid home	-	
11			Required for valid home	Required for valid home	
12*	Not used	Not used	-	-	Sensor-less mode (See p.63) * See also p.59.

Note ∗ "HOMETYP=12" is can be selected by the **CM10-3**.

- Example: Mechanical Home Seeking with HOMETYP=4

Conditions:
Ball screw, lead 10 mm (See "7.3 Setting the User Unit" on page 43.)

Starting velocity: 1 mm/sec
Running velocity: 5 mm/sec
Starting direction: positive
Acceleration time: 0.1 sec
Deceleration time: 0.1 sec

```
>HOMETYP=4
 HOMETYP=4
>VR=5
 VR=5 mm/sec
>VS=1
 VS=1 mm/sec
>TA=0.1
 TA=0.1
>TD=0.1
 TD=0.1
>MGHP
>
```

- Operation and Function at Mechanical Home Seeking

When mechanical home seeking operation is completed (when the operation for OFFSET is completed if OFFSET is set), the final position will be redefined as the new electrical home position, and the position counter PC will be reset to zero (0). (Refer to the previous section "Electrical home position and mechanical home position") Once the electrical home position is set, the software position limit (LIMP, LIMN) will become effective. Whenever returning to the electrical home position, the HOMEP (home position) output will be turned ON (when assigned).
When connecting to a driver that has a function to read the current position, **CM10** resets the driver internal position to the home position. (The PRESET output of the driver connector on the **CM10** is turned ON)

Note When connecting to a driver that has a function to read the current position and using the driver current position reading function, assign the PRESET (reset home position) output to the driver connector on the **CM10**, and set the PRESET input of the driver to be enabled. (Refer to page 71 "8.6 Driver current position reading (**CM10-1**, **3**, **5**)" in details) When the parameter for OFFSET in the driver is set to other than 0 (zero), execute a ABSREQPC command after completing the mechanical home seeking operation or executing PRESET command. EC (encoder count), PF (feedback position) and PC (position command) in the **CM10** are aligned with the HOME parameter of the driver. However, if setting the electrical home position other than the mechanical home position is required as described above, it is recommended to set the offset value in the **CM10** (use the OFFSET command) but not in the driver.

(Under "HOMETYP=12," the reset of the home position will automatically be performed in the driver after completing mechanical home seeking operation. Even when using the driver current position reading function, the PRESET signal is not required in mechanical home seeking operation and the PRESET signal from the **CM10** will not output.)

- Selection of the Timing Source When Using the Timing Signal

The TIM (timing) signal that is used in mechanical home seeking operation can be selected to be either the driver timing signal (Z-phase output signal in case of a servo motor) or Z-phase signal of an external encoder. Also, the timing signal of the driver can be selected either the single-ended signal or differential signal. The ENC (encoder selection) command and TIM (timing signal selection) command are used to select.

TIMING Source Selection

TIMING Source	ENC	TIM
Timing signal･Z-phase pulse differential input TIMD	1 (Driver)	0 (TIMD/EXTZ)
Timing signal･Z-phase pulse single ended input TIMS	Unrelated	1 (TIMS)
External encoder ZSG EXTZ	2 (External encoder)	0 (TIMD/EXTZ)
No source is selected*	0 (Not used)	0 (TIMD/EXTZ)

* If ENC is set to 0 (zero) and TIM is set to 0, the system alarm status will be active when executing MGHP or MGHN command when the selected home seeking type requires the timing signal.

Signal Flow Path

Timing signal･Z-phase pulse differential input TIMD-------1
ENC--------0 (TIMD/EXTZ)
External encoder ZSG EXTZ-------2 **TIM**----------→TIMING signal
Timing signal･Z-phase pulse single ended input TIMS----------1 (TIMS)

- HOMEDCL (deviation counter clear select at mechanical home seeking operation)

  Select whether the deviation counter of the **CM10** and/or driver is cleared at the time of detecting the home position, and you can perform an accurate home seeking operation with a servo motor or you can acquire accurate feedback information when using an encoder.

  Setting of HOMEDCL

Setting Value	Deviation Counter of the **CM10**	Deviation Counter of the Driver
0	Clear	-
1	Clear	Clear
2	-	-

  Factory setting: "0 (zero)" for the **CM10-1**, **2**, **3**, **4** and "1" for the **CM10-5**

Note When HOMEDCL is set to 2, both deviation counters are not reset when limit swiches are found or PSTOP (panic stop) is performed even under other than mechanical home seeking operation. The motor may not stop immediatly depending on the setting of velocity filter in the driver when uing α_{STEP} product.

- Example 1: When using a stepping motor with an encoder (including the α_{STEP}, the **ESMC** controller)
  → Set to "HOMEDCL=0."

  When there is no problem for little deviation caused by a load, or when there is no load at the time of mechanical home seeking operation even if accurate deviation is necessary, set to "HOMEDEL=0." When performing mechanical home seeking operation, the deviation will automatically be cleared, then PC (position command) and PF (feedback position) will be identically set to "0 (zero)."
  The motor shaft may turn up to ±3.6° when turning on the power because the first state of the excitation sequence for the stepping motor (excluding the α_{STEP}) is pre-determined in the driver. PC will follow PF when executing the motor current OFF, but the motor shaft may shift when executing the motor current ON the next time since the motor is excited to the last excitation sequence at the time of turning the motor current off regardless of the motors' current position. In these cases, PC will not change, but PF will change to the appropriate value. If "HOMEDCL=0" is set, the deviation counter will be cleared when a mechanical home seeking operation is performed, and PC and PF will become the same.
  In case of the α_{STEP}, the current shaft position is excited when turning on the power or executing the motor current ON. Therefore, the above-mentioned problem does not occur, but the motor shaft may become free from generated alarms for overload or others. In this case, if the motor shaft will rotate, PF will change while PC will not change. However, if "HOMEDCL=0" is set, the deviation will be cleared when executing mechanical home seeking operation, then PC and PF will become same.

- Example 2: When using a servo motor
  → Set to "HOMEDCL=1."

  Since the servo motor has a deviation counter in the driver, the motor may not stop immediately even if the pulse input is stopped. If "HOMEDCL=1" is set, the driver deviation counter will be cleared simultaneously when detecting the home position sensor. Therefore, it will be able to stop at the position of the home position sensor accurately. The deviation counter in the **CM10** is also cleared simultaneously, and the driver deviation is reflected to PE (position deviation) of the **CM10** correctly.

- Example 3: When an accurate deviation is required to be observed with the stepping motor plus encoder (including the α_{STEP}, **ESMC** controller) while the load is applied to the shaft at mechanical home seeking operation
  → Set to "HOMEDCL=2."

  The stepping motor generates its torque by shifting the rotor position to within 1.8 degree corresponding to the amount of load. When the load is always applied to the shaft, such as a gravity load in vertical axis, the motor excitation position and rotor position are out of alignment even if mechanical home seeking operation was performed. It is an expected condition that the position command (PC) and feedback position (PF) are out of alignment the same exact amount. If "HOMEDCL=2" is set, the deviation is maintained precisely as the deviation in the **CM10** will not be cleared at mechanical home seeking operation. However, in advance, PC and PF are required to be matched without a load on the motor shaft (the excitation position and rotor position to be the same). Execute PECLR (deviation counter clear) in a no load condition. The PC value will be matched the PF value without a deviation. Then, perform mechanical home seeking operation. When it is difficult to do the above in vertical drive (gravitational operation), refer to the following steps.
  When using the α_{STEP} : Once execute the motor current OFF (CURRENT=0), PC and PF will be the same (PC=PF) in no load condition. Then, execute the current ON and perform mechanical home seeking operation.

When the stepping motor other than the αSTEP is combined with an encoder: Measure the correct value of the deviation in advance, such as comparing the difference of deviations (PE) between PC and PF in horizontal condition and vertical condition. In the current ON state, execute PECLR (deviation counter clear), overwrite the PF value with the value of the measured deviation added to the current PF value when the motor current is ON. This is required to be done whenever executing the motor current ON if the motor current may be OFF.

Memo

- When using a stepping motor without using an encoder or feedback information, the setting of HOMEDCL is unrelated and is not required.
- A servo motor or the αSTEP will not misstep. Therefore, there is no need to see the deviation (HOMEDCL=2) in general.
- When HOMETYP is set to use the driver timing signal during mechanical home seeking operation with the αSTEP, set HOMEDCL to "0" or "2." If HOMEDCL is set to "1," the motor shaft may be shifted from the timing signal position by the delay with the speed filter in the αSTEP driver.

- Sensor-less Mechanical Home Seeking Operation for "HOMETYP=12"

"HOMETYP=12" is sensor-less (push-motion) type mechanical home seeking operation, and can be used only when combining the **CM10-3** with the **ESMC** controller. See the following steps to use.

Memo This mode is available only when the controller is used in combination with an **EZSII** Series, **EZCII** Series or **EZA** Series actuator.

1. Check the HOME input of the driver is effective

Setting to HOME in the I/O parameter for "HOME/PRESET switching" is required. The factory setting is the HOME input. Use the **EZT1** teaching pendant or the **EZED2** data editing software for checking and setting.

2. Set the home parameters of the driver

Set the return direction, home offset, return method, starting speed of return and operating speed of return.

Memo Check that the "Push-motion 1" or "Push-motion 2" is selected as the return method of the driver. The factory setting for the **EZSII** Series, **EZCII** Series and **EZA** Series is "Push-motion 1."

3. Check if the necessary signals in the driver connector on the **CM10-3** are assigned

Use **CM10** with its' factory settings. If the driver I/O settings of the **CM10** have been changed, set to select "Factory settings" using the automatic setting under the [System Config] tab - the [Driver I/O] tab in the provided utility software (**IMC**). The necessary I/O will be set automatically.

Commands, which are input via the keyboard, are as follows.

Command	Parameter Value (Factory Setting)	Description
DINEND	0, 3 (3)	Assign the DINx input of the driver connector on the **CM10** to the END (motion end) input (Connect to the END output of the driver)
DINMOVE	0, 4 (4)	Assign the DINx input of the driver connector on the **CM10** to the MOVE (motor moving) input (Connect to the MOVE output of the driver)
DOUTHMSTOP	0, 5 (5)	Assign the DOUTx output of the driver connector on the **CM10** to the HMSTOP (sensor-less mechanical home seeking operation stop) output (Connect to the HMSTOP input of the driver)
DOUTHOME	0, 7 (7)	Assign the DOUTx output of the driver connector on the **CM10** to the HOME (sensor-less mechanical home seeking operation start) output (Connect to the HOME input of the driver)

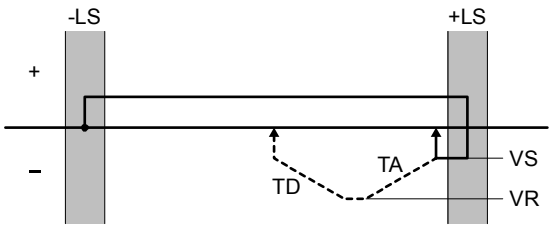
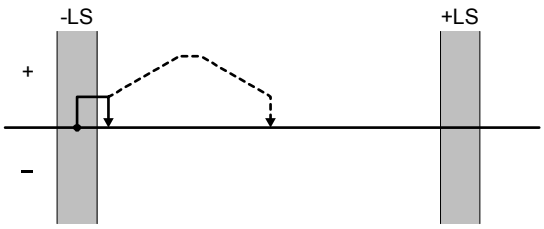
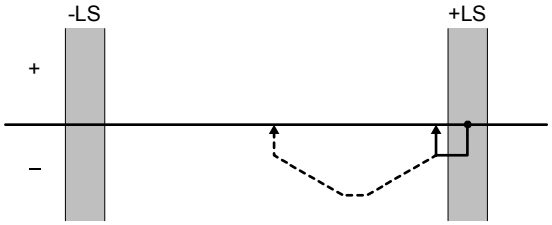
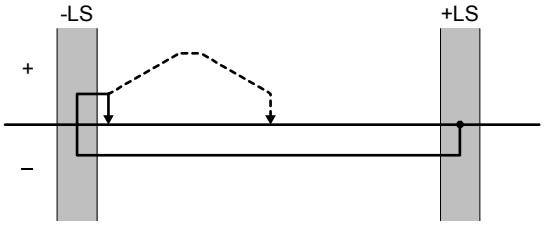
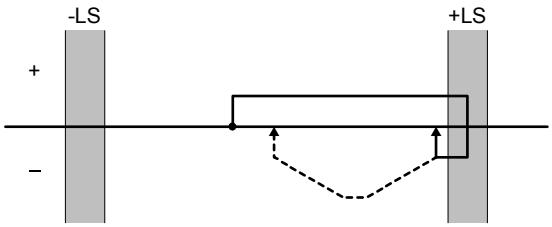
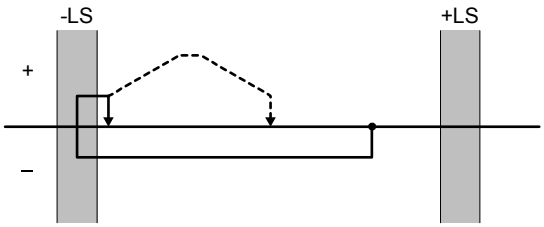
∗ Parameter 0 indicates "unassigned" (assignment cancel).

4. Select "HOMETYP=12" and command mechanical home seeking operation

Both commands for MGHP and MGHN will be the same operation.

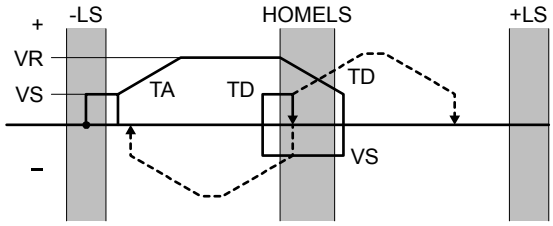
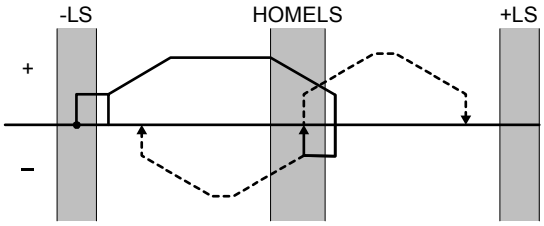
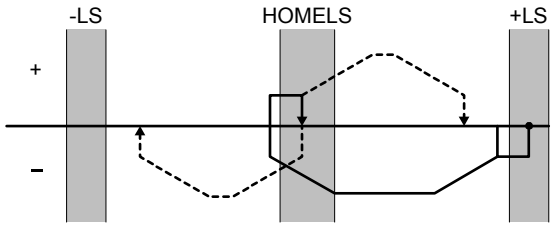
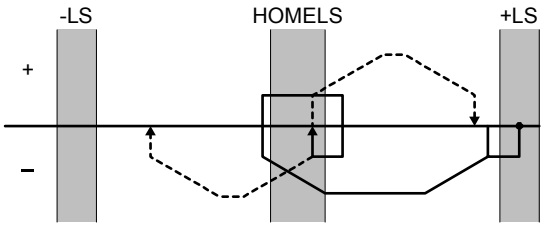
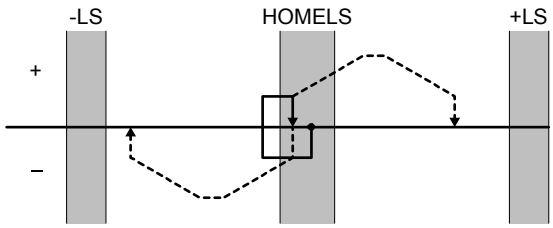
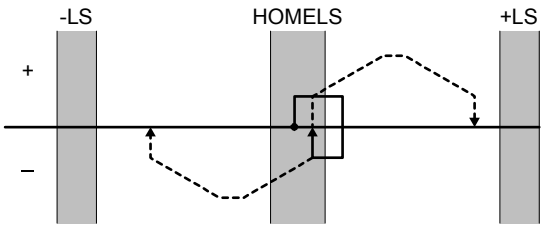
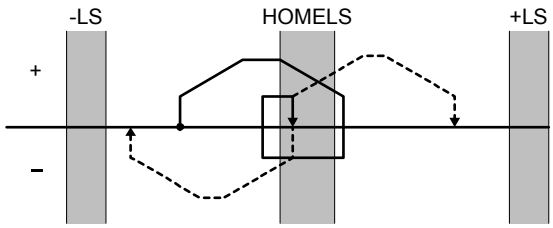
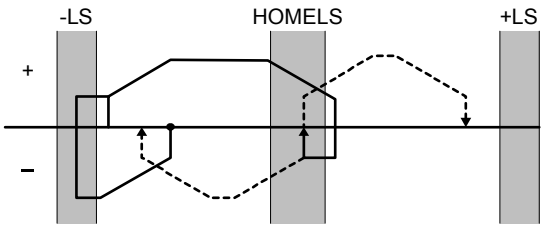
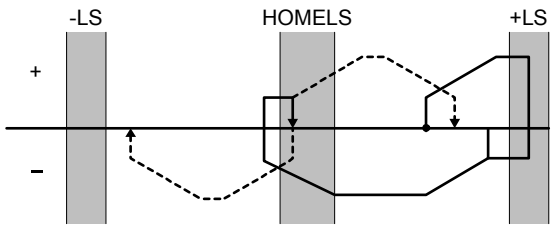
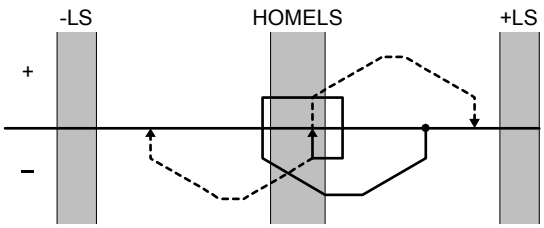
(Starting direction and speed of the operation depend on the HOME parameters that were set to the driver in "2.")

- HOME Seeking Pattern: HOMETYP 0 to 3 (2-sensor mode)

Starting position	HOME starting direction +(CW) (MGHP)	HOME starting direction –(CCW) (MGHN)
-LS		
+LS		
-LS to +LS		

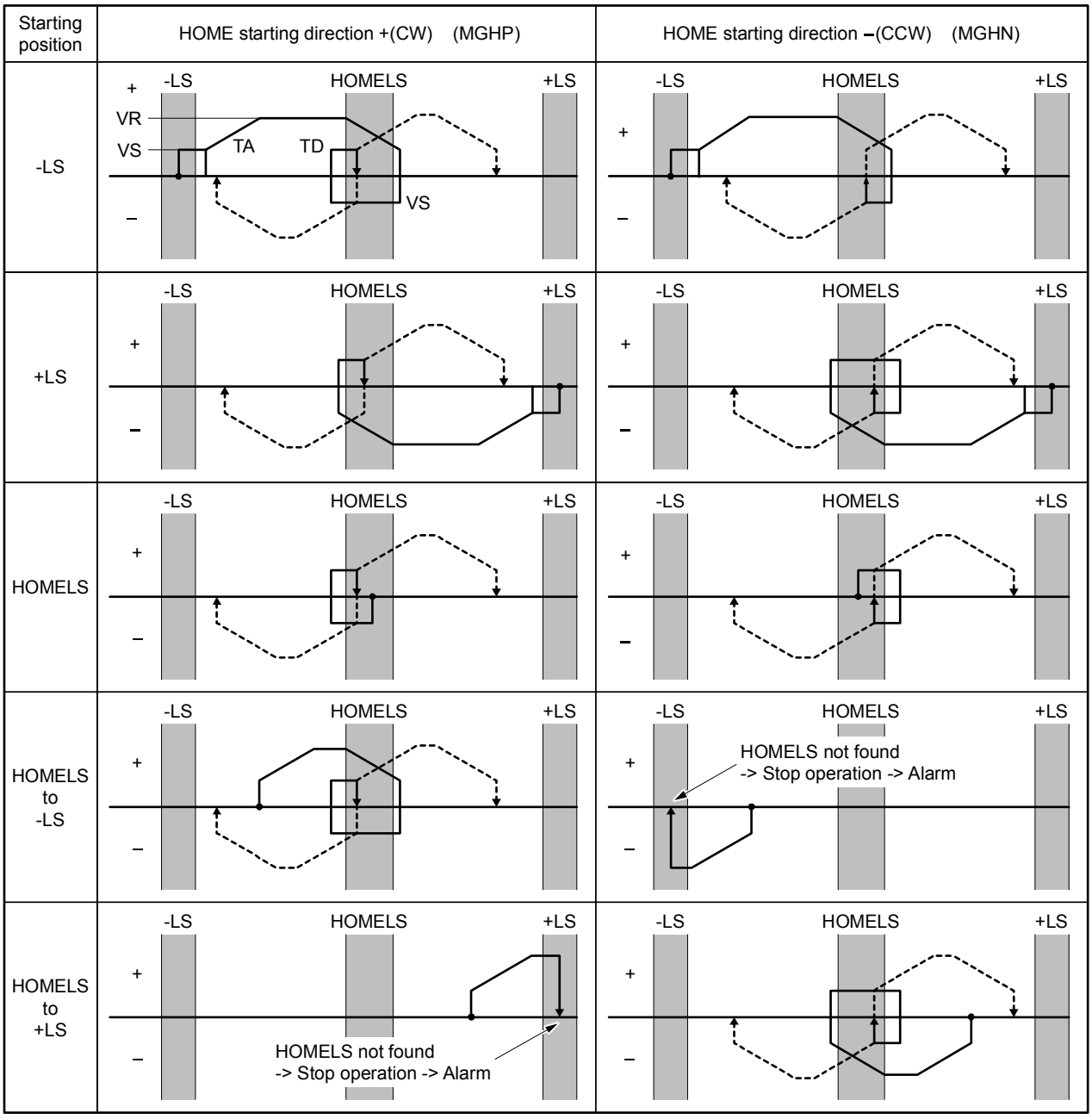
---- is operation with offset.

- HOME Seeking Pattern: HOMETYP 4 to 7 (3-sensor mode)

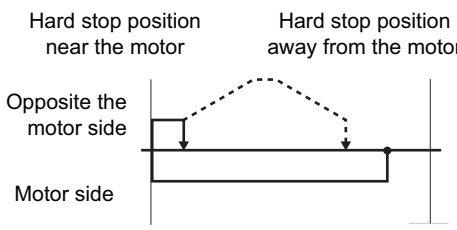
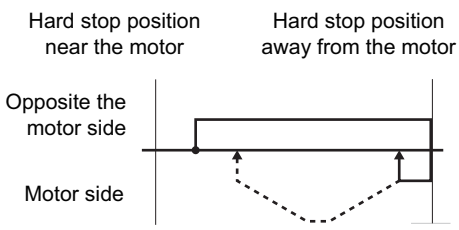
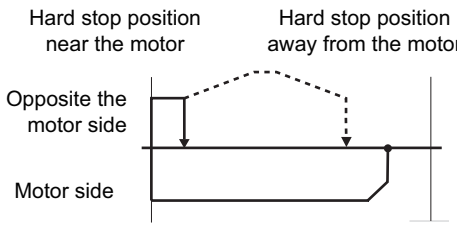
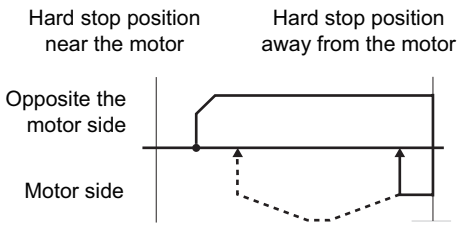
Starting position	HOME starting direction +(CW) (MGHP)	HOME starting direction –(CCW) (MGHN)
-LS		
+LS		
HOMELS		
HOMELS to -LS		
HOMELS to +LS		

---- is operation with offset.

- HOME Seeking Pattern: HOMETYP 8 to 11 (1-sensor mode)



- HOME Seeking Pattern: HOMETYP 12 (Sensor-less mode)

Sensor-less home seeking operation type	Starting direction of home seeking operation: Motor side	Starting direction of home seeking operation: Opposite the motor side
Push-motion1		
Push-motion2 (high speed)		

--- is operation with offset.

Memo The "Push-motion 1" or "Push-motion 2" is set at the **ESMC** controller.

8.3 Stopping Motion and Sequence

There are three ways to stop motion and sequence, command via serial communication ports, operate switch or PLC with I/O port, or CANopen communication. Various stop actions including soft stop, hard stop, stop motion or stop sequence are also available as below.

- Commands and Parameters for Stopping Motion

Command/ Parameter	Argument/ Parameter Value	Function	Assignable to I/O Port
SSTOP	None	Soft stop: decelerate and stop according to TD	-
HSTOP	None	Hard stop: stop as quickly as possible	-
MSTOP	None	Motor stop: Hard or soft stop, determined by MSTOPACT	Yes
PSTOP	None	Panic stop: Hard stop, stop also sequence, motor current and alarm state after stop is defined by ALMACT	Yes
ABORT	None	Abort motion and sequence execution, soft stop	Yes
PAUSE	None	Pause motion (soft stop)	Yes
CONT	None	Continue motion (resume from pause)	Yes
START	None	Setting ON to OFF abort s sequence (STARTACT=1) When sequence is running, paused motion is resumed (STARTACT=0).	Yes
PAUSECLR	None	Pause clear: While a sequence is running, only remaining portion of the paused motion is cleared and the next step of the sequence will be executed.	Yes
MSTOPACT	0 - 1 (1)	Motor stop action (affects MSTOP command or MSTOP input) 0: Hard stop (MSTOP behaves as HSTOP) 1: Soft stop (MSTOP behaves as SSTOP)	-
ALMACT	0 - 2 (2)	Alarm action (affects PSTOP command or PSTOP input) 0: No alarm triggered, motor current remains ON 1: Trigger alarm, motor current remains ON 2: Trigger alarm, motor current disabled	-

( ): factory setting

Memo

- The ESC key or character stops motion and aborts sequences, similar to ABORT.
- The SSTOP, HSTOP, MSTOP and PAUSE do not stop the sequences.
- A motion that has been stopped with the PAUSE command or input on the system I/O connector (if assigned) can be continued (resumed) using the CONT command or input or the START input on the system I/O connector (if assigned). See the descriptions for CONT (page 171), STARTACT (page 312), PAUSECLR (page 274) and PAUSE (page 273).
- The PAUSECLR command or PAUSECL input on the system I/O connector (if assigned) can be used to clear the remaining motion. If this signal becomes activated while a sequence is running, only remaining portion of the current motion is cleared and the next step of the sequence will be executed, since the PAUSE does not stop the sequence.
- Linked Motions, Return-to-electrical home operation and Mechanical Home Seeking cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.
- See "6.4.2 Input Signals" on page 27 for details on assigning signals to I/O ports.

8.4 Teaching Positions

The **CM10** includes a position data array, which can hold up to 100 pre-defined positions. Once defined, these positions can be used as targets for point-to-point motions. The positions are referenced as POS[1] through POS[100].

- Example

```
>MA POS[1]      #Start absolute motion to the position specified by POS[1].
 W=POS[100]     #Assign the value of POS[100] to variable W. (in sequence only)
```

Set the position data using the [teach/Jog] tab screen of the supplied utility software **Immediate Motion Creator for CM/SCX Series (IMC)** or the keyboard operation using any general terminal software.
When setting by using a keyboard, the position array data is entered manually, but the system also provides a utility for "teaching" the positions using the TEACH command. The TEACH command starts the teaching process. While the teaching process runs:

- the system constantly monitors and displays system position command, in user units
- motor current and power to the electromagnetic brake (if used) can be toggled on and off
- if motor current is on, the system can be commanded to move, positively or negatively, in increments of jog distance (travel distance), or continuously at running velocity VR
- if motor current is off, the system can be repositioned using external force or torque
- (while motor current is off, the system keeps monitoring position via the encoder inputs ASG and BSG, and position command (PC) is replaced by feedback position (PF). This performs position teaching by hand. Accordingly, position becomes zero (0) if ASG and BSG inputs are not connected to the encoder or the encoder output of motor driver. Teaching by hand cannot be performed.)
- at any time, the system position can be stored to any location in the position data array

Motions use starting velocity VS, running velocity VR, and acceleration and deceleration times TA and TD.

Note

- The position data array is not stored to EEPROM automatically; it must be saved using the (S) "save" key while teaching, or with the SAVEPOS command when not in the teaching mode.
- The teach function is not available while a sequence is being executed, or motion is in progress. While teaching, sequences may not be executed and only the PSTOP, +LS, −LS, and CON inputs are acknowledged, if they are configured as inputs.

- Key Functions, While Teaching

Key	Function
V	Move continuously, in the negative direction (while key pressed). Soft stop when key released.
B	Move negatively in increments that is set by "D" command (Jog negative) Jog motion in the negative direction (while key pressed)
N	Move positively in increments that is set by "D" command (Jog positive) Jog motion in the positive direction (while key pressed)
M	Move continuously, in the positive direction (while key pressed). Soft stop when key released.
Q	Toggle motor current OFF and ON
K	Set key interval detection time [msec]
D	Set jog distance in user unit (factory setting is 0.001)
F	For **CM10-1**, **3**, **5**: Toggle motor current and electromagnetic brake OFF and ON For **CM10-2**, **4**: Toggle electromagnetic brake OFF and ON
S	Save position array data to EEPROM (same as SAVEPOS)
<SPACE>	Hard stop
<Enter>	Store current position to a location in the position data array (System will prompt for location, 1-100)
<ESC>	Soft stop, terminate teaching

Note

- For freeing the shaft, use the ‘F’ key for the **CM10-1**, **3**, **5** and use the ‘Q’ key for **CM10-2**, **4**. If the driver attached to the **CM10-2**, **4** is equipped with an electromagnetic brake, use both the 'Q' key and the 'F' key for freeing the shaft.
- Be careful when using the ‘Q’ key when an encoder is not connected. Once the ‘Q’ key is pressed, the current position is set to 0.

Memo

- While teaching, continuous motions proceed while the V or M keys are pressed. The system stops the motor (over deceleration time TD) when it has not detected a key for the "key interval detection time." The key interval detection time can be adjusted. Smaller values make the system react quicker, but may result in "stuttering": motions may start and stop in a pulsing pattern. Larger values reduce the chance of stuttering, but take more time to react: controlling the final rest position is less accurate.
- Responsiveness is also very dependent on the host controller (e.g. PC or terminal) and its keyboard settings.
- Toggling current (with ‘Q’) is only recommended while the motor is stopped. A "current off" toggle may not be honored if a ‘Q’ character is sent within a stream of motion characters (‘V’, ‘B’, ‘N’, ‘M’).
- Use an English keyboard for most comfortable key locations for the operation.

- Example

After TEACH command

```
        *** Teach mode ***

(V)     : Move Cont. Neg.     (M)     : Move Cont. Pos.
(B)     : Jog Negative        (N)     : Jog Positive
(Q)     : Current ON/OFF      (F)     : FREE ON/OFF
(S)     : Save all data to EEPROM
(K)     : Change Key Interval (50-500[msec])
(D)     : Change Jog Distance (0.001-500000 [Rev])
            Minimum Movable Distance : 0.001 [Rev]
<Space> : Immediate Stop
<Enter> : Data entry mode (Input POS number, then <Enter>)
<ESC>   : Exit teach mode

PC=         0.000          <-- Current position
```

After <ENTER> received while teaching

```
        *** Teach mode ***

(V)     : Move Cont. Neg.     (M)     : Move Cont. Pos.
(B)     : Jog Negative        (N)     : Jog Positive
(Q)     : Current ON/OFF      (F)     : FREE ON/OFF
(S)     : Save all data to EEPROM
(K)     : Change Key Interval (50-500[msec])
(D)     : Change Jog Distance (0.001-500000 [Rev])
            Minimum Movable Distance : 0.001 [Rev]
<Space> : Immediate Stop
<Enter> : Data entry mode (Input POS number, then <Enter>)
<ESC>   : Exit teach mode

PC=         15.410     Save to POS[          <-- Set target position data array location: Input "1"
```

After <ENTER> received

```
        *** Teach mode ***

(V)     : Move Cont. Neg.     (M)     : Move Cont. Pos.
(B)     : Jog Negative        (N)     : Jog Positive
(Q)     : Current ON/OFF      (F)     : FREE ON/OFF
(S)     : Save all data to EEPROM
(K)     : Change Key Interval (50-500[msec])
(D)     : Change Jog Distance (0.001-500000 [Rev])
            Minimum Movable Distance : 0.001 [Rev]
<Space> : Immediate Stop
<Enter> : Data entry mode (Input POS number, then <Enter>)
<ESC>   : Exit teach mode

PC=         15.410     Save to POS[1] Data set OK.
```

After (S) received

```
        *** Teach mode ***

(V)     : Move Cont. Neg.     (M)     : Move Cont. Pos.
(B)     : Jog Negative        (N)     : Jog Positive
(Q)     : Current ON/OFF      (F)     : FREE ON/OFF
(S)     : Save all data to EEPROM
(K)     : Change Key Interval (50-500[msec])
(D)     : Change Jog Distance (0.001-500000 [Rev])
            Minimum Movable Distance : 0.001 [Rev]
<Space> : Immediate Stop
<Enter> : Data entry mode (Input POS number, then <Enter>)
<ESC>   : Exit teach mode

PC=         15.410     Saving POS[ ] Data.......OK.
```

8.5 Torque Limiting/Push-motion Operation (CM10-1, 5)

For safety operation, the maximum output torque of the servo motor can be limited. Also, push-motion operation can be performed using a αSTEP.
A driver that has the torque limiting function (the **NX** Series driver) is required when performing torque limiting, and a driver that has the push-motion operation function (**AR** Series driver/**LSD** driver) is required when performing push-motion operation.

■ Setting the Driver

Set the torque limiting value of the driver (position control mode), or set to perform push-motion operation. The data setter **OPX-2A** or data setting software **MEXE02** can be used to set the data.

- When using the **NX** Series driver:
  1. Set the analog input signal parameter [SyS-1-05] to "Disable."
  2. Recycle on the power to the driver. (When the 24 VDC is used, also recycle it.)
  3. Set the desired torque limiting value to the operation data No. 0 to 3.
- When using the **AR** Series driver/**LSD** driver:
  1. Set "push-motion operation" using the application parameter for I/O input mode [APP-2-00]. (The I/O mode of "positioning operation" under the factory setting will be changed to "push-motion operation," and the I/O terminal function of "CS (resolution selection) input" will be changed to "T-MODE (push-motion operation) input." Also, M0, M1 and M2 of the push-current select input will be enabled.)
  2. When setting the value of the push current other than the factory setting combination, set using the application parameter for push-motion current 0 [APP-2-05] to 7 [APP-2-12].

Memo With the **NX** Series driver, the **CM10** has partially overlapped with the analog I/O signals connector (CN6). Select "digital" for setting the torque limiting value. The digital selection of the torque limiting value is three points at the time of shipment, but it can be extended to four points if the analog I/O signal is set to disable.

■ Setting the CM10

When performing torque limiting/push-motion operation, when monitoring the operation status or when operating using the I/O terminals by an external signal, it is required to assign the function to the driver connector on the **CM10** and/or I/O connector as follows.

• Setting the Driver Connector on the CM10

It is required to assign the TL (torque limiting/push-motion operation) output, M0/ M1/M2* output (operation data selection) and LC (limiting condition) to the driver connector on the **CM10**.
* When using the **NX** Series driver, there is no need to assign the M2 input.

- **CM10-1**: Not assigned at the time of shipment (excluding the LC input). Execute the assignment using the "Auto Configuration" under the [System Config] tab -[Driver I/O] tab in the provided utility software (**IMC**). (See "6.5 Driver I/O setting (**CM10-1** and **CM10-3**)" on page 35. Select "NX Function Expansion" for the torque limiting of the **NX** Series driver and "AR Push-Motion" for push-motion operation of the **AR** Series driver/**LSD** driver.)
  Commands, which are executed by operating the keyboard, are as follows.
- **CM10-5**: Assigned at the time of shipment. There is no need to change the setting.

Command	Parameter Value (Factory Setting)	Description
DINLC	0, 5 (5): **CM10-1**, ***5***	Assign the driver connector on the **CM10** DINx to the LC (limiting condition) input (Connect to the TLC output of the driver)
DOUTTL	0, 4 (0): **CM10-1** 0, 4 (4): **CM10-*5***	Assign the driver connector on the **CM10** DOUTx to the TL (torque limiting/push-motion operation) output (Connect to the TL/T-Mode input of the driver)
DOUTM0	0, 5 (0): **CM10-1** 0, 5 (5): **CM10-*5***	Assign the driver connector on the **CM10** DOUTx to the M0 (data select bit 0) output (Connect to the M0 input of the driver)
DOUTM1	0, 6 (0): **CM10-1** 0, 6 (6): **CM10-*5***	Assign the driver connector on the **CM10** DOUTx to the M1 (data select bit 1) output (Connect to the M1 input of the driver)
DOUTM2	0, 7 (0): **CM10-1**	Assign the driver connector on the **CM10** DOUTx to the M2 (data select bit 2) output (Connect to the M2 input of the driver)

∗ Parameter 0 indicates "unassigned" (assignment cancel).

- Setting the I/O Connector

When commanding torque limiting/push-motion operation using the I/O connector, or when outputting the status if the motor torque reaches the set torque value/if the motor is in push-motion state, it is required to assign the signals. The signals can be set in the [I/O setting] tab under the [System Config] tab using the provided utility software (**IMC**). Commands, which are set by operating the terminal, are as follows.

Command	Parameter Value (Factory Setting)	Description
INTL	0, 1 - 9 (0)	Assign the I/O connector INx to the TL (torque limiting/push-motion operation) input
OUTLC	0, 1 - 4 (0)	Assign the I/O connector OUTx to the LC (limiting condition) output

∗ Parameter 0 indicates "unassigned" (assignment cancel).

Memo When selecting push-motion operation, the TL (torque limiting/push-motion operation) output of the driver connector on the **CM10** is enabled. And the CS (resolution selection) output is canceled and disabled.

■ Performing Torque Limiting/Push-motion Operation

See the following steps.

- When Performing Torque Limiting Operation:

1. Select the desired torque limiting value using the DD (driver operation data) parameter.
2. When setting the TL command (torque limiting) to "1" (TL=1) or turning the TL input of the I/O connector ON while executing positioning operation, the maximum output torque is limited by the set torque limiting value.
   When reaching the set torque limiting value, The LC output of the I/O connector will be turned ON (you can notice also by the DSIGLC command).

- When Performing Push-motion Operation

1. Select the desired motor current value using the DD (driver operation data) parameter.
2. Set the TL command (push-motion operation) to "1" (TL=1) or turn the TL input of the I/O connector ON.
3. Operate CW or CCW direction.
   A load is pressed continuously by selected current value while turning TL ON. The push-force is increased with the deviation and if the push-motion operation is continued and the position deviation becomes 1.8 degrees or more, the LC output of the I/O connector will be turned ON (you can notice also by the DSIGLC command).
4. When the press operation is finished, stop the motion (stop pulses). After that, execute the deviation counter clear (PECLR) or move in the negative direction and return to the position where the motion started.
5. Set the TL command to 0 (zero) or turn the TL input of the I/O connector OFF.

Command/Parameter	Parameter Value (Factory Setting)	Description
TL	0, 1 (0)	Performs torque limiting/push-motion operation while setting to "1."
DD	0-3 (0) **NX** Series driver 0-7 (0) **AR** Series driver/**LSD** driver	Driver operation data

Memo

- Since pulses are accumulated in the driver during push condition, a prolonged push condition may generate an excessive position deviation alarm of the driver. If the push condition continues for a prolonged period, stop the operation. You can check whether it is the push condition or not using the LC output or DSIGLC command.
- When performing push-motion operation, the LC output may be turned ON during acceleration/deceleration.
- The LC output is turned ON when the motor torque reaches 300% of rated torque even while the torque limiting function is not used.
- Torque limiting/push-motion operation can be performed via CANopen. Assign TL to any bit of the byte [0] in RPDO using the RINTL command in advance. To execute torque limiting/push-motion operation, set DD by the command code and start by the assigned TL. The limiting condition will be output by LC (byte [1], bit [4]) that is pre-assigned in the TPDO.
- TL can be set to 1 (ON) or 0 (OFF) by the command, I/O or CANopen, and the later command will be given priority.
- When setting the driver operation data "DD," the M0, M1 and M2 output of the driver connector on the **CM10** will be changed as follows.

DD	M2	M1	M0
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

8.6 Driver Current Position Reading (CM10-1, 3, 5)

When combining with a driver that has a function to read the current position (**NX** Series driver or **ESMC** controller etc.), the current position data of the driver can be read by a dedicated command. The current position data is indicated by the user unit. The current position in the **CM10** is automatically updated by the value read.

■ Setting the Driver

Connect the battery and set the driver to the status that can read the current position.

- When using the **NX** Series driver, set the switch on the front panel (SW1-3) to ON (enable the absolute function).
- When using the **ESMC** controller, you can use the factory setting, but if you use the preset (reset home position) function, select the PRESET function using the I/O parameter "HOME/PRESET switching." (After the PRESET is selected, the HOME signal cannot be used and sensor-less mechanical home seeking operation cannot be performed.)

Note When selecting the "ESMC PRESET Signal Enable" on the **CM10-3** (as below), be sure to select the PRESET in the HOME/PRESET switching of the **ESMC** controller. If the PRESET is not selected, the **ESMC** controller will start sensor-less mechanical home seeking operation when operating the PRESET on the **CM10-3**.

Memo With the **ESMC** controller, when performing sensor-less mechanical home seeking operation, select HOME (enable sensor-less mechanical home seeking operation start signal) by "HOME/PRESET switching." (The driver current position reading function can be performed even with this setting.) In sensor-less mechanical home seeking operation, executing the PRESET input is not required because the reset (setting the home position) is automatically performed in the driver when finishing a mechanical home seeking operation. The PRESET input is required when performing mechanical home seeking operation with external sensors etc. (other than sensor-less mechanical home seeking operation). (The PRESET signal is output from the **CM10**.)

■ Setting the CM10

To read the drivers' current position, it is required to assign the necessary signals to the driver connector on the **CM10**. Perform the following assignments using the automatic setting under [System Config] tab of the supplied utility software (**IMC**) as needed. (See "6.5 Driver I/O Setting (**CM10-1** and **CM10-3**)" on page 35.)

-**CM10-1**: Select "NX Function Expansion"
-**CM10-3**: These signals are assigned at the time of shipment (factory setting). However, if the PRESET function is used, select the "ESMC PRESET Signal Enable."
-**CM10-5**: These signals are assigned at the time of shipment (factory setting).

- When operating by a keyboard and not using the **IMC**, see the followings (commands are introduced on the next page).
  It is required to assign each signal of the REQ (position data transmission request) output, CK (position data transmission clock) output, PR (position data output ready) input, P0 (position data bit 0) input and P1 (position data bit 1) input to the driver connector on the **CM10** respectively. Also, it is required to assign the PRESET (reset home position) output signal when using the preset function.

-**CM10-1**: Assign signals for REQ, CK, PR, P0, P1 and PRESET are not assigned.
-**CM10-3**: Signals for REQ, CK, PR, P0 and P1 are assigned at the time of shipment. When the PRESET signal is required, unassign the HOME signal first (OUTHOME=0), then assign the PRESET signal.
-**CM10-5**: These signals are assigned at the time of shipment (factory setting).

Commands, which are executed via the keyboard, are as follows.
The non-zero parameters indicate the port number of I/O. For example, when assigning the PRESET signal is required, type DOUTPRESET=7. To unassign, type DOUTPRESET=0.

Command	Parameter Value (Factory Setting)	Description
DINPR	0, 3 (3): **CM10-3** 0, 4 (0): **CM10-1** 0, 4 (4): **CM10-5**	Assign the PR (position data output ready) input to the driver connector on the **CM10** DINx (Connect to the OUTR output of the driver)
DINP0	0, 5 (0): **CM10-1** 0, 5 (5): **CM10-5** 0, 6 (6): **CM10-3**	Assign the P0 (position data bit 0) input to the driver connector on the **CM10** DINx (Connect to the OUT0 output of the driver)
DINP1	0, 5 (5): **CM10-3** 0, 6 (0): **CM10-1** 0, 6 (6): **CM10-5**	Assign the P1 (position data bit 1) input to the driver connector on the **CM10** DINx (Connect to the OUT1 output of the driver)
DOUTCK	0, 2 (0): **CM10-1** 0, 2 (2): **CM10-3**, **5**	Assign the CK (position data transmission clock) output to the driver connector on the **CM10** DOUTx (Connect to the CK input of the driver)
DOUTREQ	0, 3 (0): **CM10-1** 0, 3 (3): **CM10-3**, **5**	Assign the REQ (position data transmission request) output to the driver connector on the **CM10** DOUTx (Connect to the REQ input of the driver)
DOUTPRESET	0, 7 (0): **CM10-1** 0, 7 (7): **CM10-3**, **5**	Assign the PRESET (reset home position) output to the driver connector on the **CM10** DOUTx (Connect to the PRESET input of the driver)

■ Reading the Driver Current Position

Memo When turning the power ON for the first time after connecting a battery to the driver, start operating with the next section "Releasing the Absolute Position Loss Alarm/Setting the Home Position."

The driver's current position is read using the following commands. (The operation can be done with the attached utility software, **IMC**. Click the [Absolute System] button under the [Motion Creator] tab.)

Command/Parameter	Description
ABSREQ (Reading driver current position)	Read the driver current position data, driver status code and driver alarm code, and then indicate (The current position data is converted to the user unit and written to PABS, while the driver status code and driver alarm code are written to ABSSTS)
ABSREQPC (Reading driver current position /updating internal position)	In addition to the ABSREQ function, ・PC (position command) of the **CM10** is overwritten by the driver current position that was read, PF (feedback position) and EC (encoder count) of the **CM10** will be updated maintaining the deviation ・Set the electrical home position and enable LIMP and LIMN when the software position limit control is set to 1 (SLACT=1)
PABS (Driver current position)	Driver current position (User unit)
ABSSTS (Driver status code/driver alarm code)	Driver status code (2 digits), driver alarm code (2 digits) example) 1C48 1C: driver status code (Hexadecimal) 48: driver alarm code (Hexadecimal)

<Steps>

1. Execute "CURRENT=0" (servo OFF/current OFF)
   CURRENT=0 causes to release any load on the shaft by the motor generating torque to be zero, and the deviation in the **CM10** is always forced to be zero.
   * The driver current position can be read in servo ON/current ON state. However, when a load is applied, the position read may not be equal to the actual machine position due to the machine deflection or the deviation in the driver. When any position displacement occurs by servo OFF/current OFF such as on the vertical axis, hold the load in position using an electromagnetic brake etc.
2. Execute ABSREQPC
   Read the driver current position and update the position information (PC,PF, EC) in the **CM10**.
   If only reading the driver current position is required and updating the position information in the **CM10** is not required, execute ABSREQ.
3. Execute "CURRENT=1" (servo ON/current ON)
   To prevent the position displacement from reading the current position, execute servo ON/current ON immediately after reading the driver current position.

* Once the ABSREQ or ABSREQPC commands have been executed, the driver current position will be written to PABS, and the driver statue code and driver alarm code will be written to ABSSTS. They can be referred to at anytime.

<Example>

Command	Description
>PC	Confirm the PC value
PC=3.05 Rev	3.05 Rev
>PF	Confirm the PF value
PF=3.04 Rev	3.04 Rev
>CURRENT=0	Servo OFF/current OFF (release of a load, deviation zero)
>ABSREQPC	Read driver information, Overwrite PC and PF (EC)
PABS=124.35 Rev	Current position
Driver Status Code = 1C	Driver status code
Driver ALARM Code = 48	Driver alarm code
>PC	Confirm the PC value
PC=124.35 Rev	124.35 Rev (rewritten)
>PF	Confirm the PF value
PF=124.35 Rev	124.35 Rev (rewritten)
>PABS	Position when executed the current position reading
PABS=124.35 Rev	124.35 Rev
>ABSSTS	Driver Status Code/Driver Alarm Code
ABSSTS=1C48	1C48 (Indicates status code in 2 digits + alarm code in 2 digits)

Memo

- The range of the driver's current position can be read is "-2,147,483.648 to +2,147,483.647," which is the value after converting to the user unit. The range to be written to PC and PF is limited by MAXPOS (maximum position value).
- When only referring to the current position (and not overwriting PC, PF EC), use the ABSREQ (reading driver current position) command. Also, ABSREQ can be used at any time while an error will occur when ABSREQPC is used during pulse generation.
- When executing ABSREQPC, the PC (position command) of the **CM10** is overwritten by the driver current position that was read. The value for PF (feedback position) and EC (encoder count) of the **CM10** will be updated maintaining the deviation. However, as PC will always follow PF with "deviation-zero" during servo OFF/current OFF, PC and PF will be updated with the same value.
- The driver's current position reading can be commanded via CANopen. If the data is required to be loaded to the master of CANopen, first command ABSREQPC or ABSREQ, and execute PABS and/or ABSSTS when the ABSDATA (driver current position data ready) output becomes "1." The ABSDATA output can be assigned to the remote output (in TPDO) of CANopen using the **IMC** software or ROUTABSDATA command.

■ Releasing the Absolute Position Loss Alarm/Setting the Home Position

The absolute position loss alarm will generate when turning the power ON for the first time after connecting a battery to the driver. This is because the home position has not yet been set to the driver. When the battery voltage is decreased or the coordinate control range is exceeded, this alarm will generate. Referring to the following steps, release the absolute position loss alarm and set/reset the home position.

Command/Parameter	Description
PRESET (Reset home position)	・Set PC (position command) to 0 (zero) and the set position will become the electrical home position. Since PF (feedback position) and EC (encoder count) will follow PC maintaining PE (deviation), they will become the deviation value as a result. ・When connecting a driver that has a PRESET input (the **NX** Series driver, **ESMC** controller etc.), the driver current position is reset to the home position.
ABSPLSEN (Enable driver operation after absolute position loss alarm release)	Enable mechanical home seeking operation after the absolute position loss alarm of the driver is released. (This command will turn ON the P-REQ output assigned to the driver connector on the **CM10** for about 1 msec.) ∗ This operation is required only when **NX** Series driver is used, while there is no need to do with the **ESMC** controller.

<Steps> (Start from the step 3. when turning the power ON first time)

1. Execute ABSREQ and read the cause of the alarm
2. Eliminate the cause of the alarm
3. Execute ALMCLR (alarm clear)
4. Execute ABSPLSEN (enable operation at driver absolute position loss alarm release) ∗ for the **NX** Series driver only
5. Execute mechanical home seeking operation
   (When mechanical home seeking operation is finished, the PRESET output is automatically output and the home position is set to the driver.)

Memo

- When setting the current position to the home position without mechanical home seeking operation, or when performing mechanical home seeking manually, skip the steps 4 and 5, and execute PRESET command.
- If the PRESET command is executed when the parameter for PRESET value (offset value from the home position) on the driver is set to a value other than zero, the current position of the **CM10** (PC and PF) will not match the driver's current position. In this case, they will be matched by executing the ABSREQPC command. However, if setting the electrical home position other than the mechanical home position is desired, it is recommended to set the OFFSET value in the **CM10** (adjust “Home Offset” with the **IMC** software or the OFFSET command) but not in the driver.
- When using the **NX** Series driver, set to "HOMEDCL=1." When finishing mechanical home seeking operation, ACLDCL signal on the driver connector will be output and the driver deviation counter will be cleared.

8.7 Multi Axis Operation

User or the master controller can operate more than one **CM10** at a time via serial communication.

■ RS-232C (Daisy Chain)

- Maximum Nodes: 36
- Address ID: command "ID n"
- Addressing method: Command "@n" or "TALKn" to select device. This makes a logical connection to a specific device, whose ID is "n" in a daisy chain connection.
- Reference section: "6.6 Connecting the RS-232C" on page 37, ID (page 224), @ (page 146), TALK (page 316).

The **CM10** can also be daisy chained with the **SCX10** and the **αSTEP-One**. Commands are limited by each device, though they are very similar.

Note When a **αSTEP-One** is daisy chained, provided utility software, **Immediate Motion Creator for CM/SCX Series** cannot be used.

- Daisy Chain Communication Example

Call the **CM10** used for communication using the @ command.

Example) Connection to a device whose axis number is 1 on the communication line.

- When more than one device is connected to be communication line and the device power is first turned on, the terminal program or utility software will not be connected to any of the devices on the communication line. As a result, no prompt (">") is displayed on the screen. The @ command must be used to make a connection to one of the devices on the communication line.

Command	Description
`@1`	#Executing a "@1" command connects device 1.
`1>`	#A prompt ("1>") is output.
`@2`	#Connect to device 2.
`2>`	#A prompt ("2>") is output.
`2>ID`	#Query the ID of the connected device.
`ID=2`	#The axis ID is returned (2).

Note The communications echo control must be ON (ECHO=1) when daisy chain is performed.

■ CANopen

- Maximum Nodes: 127
- Address ID: command "CANID n" via USB or RS-232C
- Addressing method: The master calls the device by following the CANopen specifications.
- Reference section: "6.7 Connecting the CANopen" on page 39.

■ USB

- Maximum Nodes: Up to the number of COM ports on the master controller (PC)
- Addressing method: One **CM10** pairs with one COM port on the master controller (PC). Command any target **CM10** through the assigned port, each **CM10** acts as a single node to one COM port. No ID is necessary. If desired, ID can be named by the command, "ID n".

Memo
- If the computer does not have an extra USB port, a USB hub can be used.
- The **IMC** or general terminal software is operated in one-on-one relationship with the COM port. To connect multiple units of the **CM10** to USB and drive each unit using PC, it is required to switch the setting of the **IMC** or terminal software to the COM port corresponding to each **CM10** or to launch the software being an equal number of the connected **CM10**.

Note Be aware that Windows automatically changes the COM port number when a **CM10** is replaced.

8.8 END (motion end) Signal

The END (motion end) signal is output when a motion was completed. This signal is used as a trigger to start the next motion or to perform other operations by confirming the completion of the present motion.
Customers can use this signal as an output of the END signal or a sequence program, and also this signal is utilized as an internal function of the **CM10**.

■ Definition of END Signal (Source)

There are two methods to generate the END signal/status of the **CM10**: One is to use the driver END signal and another is to create the END signal internally in the **CM10**.
The source of the END signal/status can be selected from the following three types with a combination of the ENDACT (system end action) parameter and DEND (driver end signal enable) parameter. The factory settings are "Driver END signal" for **CM10-1**, **3**, **4**, **5** and "End of pulse" for **CM10-2**.

Definition of END Signal (Source)	ENDACT Parameter	DEND Parameter	Typical Motor Type
End of pulse	0	0	Stepping motor
End of pulse and within end area	0<n (END area)	0	Stepping motor with an encoder
Driver END signal	Unrelated	1	αSTEP/servo motor

Memo

- The "End of pulse and within end area" is generally used to confirm that the positioning of the stepping motor has completed without having a loss of synchronism. With this selection, END signal/status is active when PE (position error) is within the ENDACT value. See "8.9 Encoder Function" on page 77. Connecting the encoder to the **CM10** is required. See "6.8 Connecting the External Encoder" on page 40.
- "Driver END signal" is used to confirm that the driver has completed the operation of the αSTEP or a servo motor system that have the position deviation in the driver.
- When "Driver END signal" is chosen, there may be the case where END signal intermittently outputs during motor is moving at very slow speed. This is because the motor has been instantaneously entering the end area of the driver. Adjust the END related parameters in the driver or choose "End of pulse" or "End of pulse and within end area" (DEND=0) to avoid intermittent END signal.

Signal Flow Path

CM10 internal END creation

End of pulse generation---------- 0

ENDACT---------- 0

End of pulse generation
and motor is within end area--- n (END area)

DEND ----→END status

Driver END signal---------- 1

■ Output of END Signal, and How END Signal/Status is Internally Used in the CM10

The END signal/status, which was created and selected in the definition of END signal, is used by the following three methods.

- END (motion end) Signal

The signal is output as the END (motion end) signal of the I/O connector. (See "6.4 Connecting the I/O Signals" on page 25.) The operation completion can be sent to the host controller by the END signal. The END signal can be checked continuously via CANopen, and also it can be checked using the SIGEND command via serial communication.

- MEND (wait for motion end) Command

The MEND command is a command to be used in a sequence program. This command stops the sequence program until the motor operation completes. The sequence moves on the next one when the **CM10** detects the END status internally. Therefore, the sequence program that starts the next motion or operation after confirming the present motion completion can be constructed by using the MEND command.

- Mechanical Home Seeking

When performing mechanical home seeking operation (MGHP, MGHN), the motor stops a few times during operation and the **CM10** checks the END status.

Memo

- In the case of the MEND command or mechanical home seeking operation, if the pulse signal output is completed and the END signal is not output in a certain time, an alarm is generated. The alarm status is "Excessive Position Deviation (10h)" when the definition of END is set to the end area, and "Driver Connection Error (6Fh)" when the definition is set to the driver END signal.
- The waiting time until an alarm generates can be set using the ENDWAIT (END wait time) parameter (the factory setting is 6 seconds).
- The cause, that the END does not establish is the position deviation by overload in many cases. For example, the **AR** Series driver/**LSD** driver has the overload alarm function, and the time to decide whether or not to output the alarm is 5 seconds in the factory setting. The factory setting of ENDWAIT is 6 seconds in order to give the priority to the driver setting, and the driver alarm is generated if an overload is occurred (when the driver alarm is connected and it is set to enable).

8.9 Encoder Function

The **CM10** has an encoder input that is used to check the actual position of the motor or device, or to perform an operation according to the actual position. The PF (feedback position) and PE (position error) are generated by the encoder input and those can directly be observed as figures, or used in a program. The PE can also be used to determine whether the position error is in the allowable range when the operation completes, in order to generate the END status using mainly a stepping motor with an encoder. Using these functions, it is possible to detect loss of synchronism for the stepping motor.

■ Connecting an Encoder and Selecting Inputs

There are two encoder inputs, on the driver connector of the **CM10** and independent encoder connector. Choose one of them by ENC parameter, and connect it by referring "ASG/BSG Input" in "6.8 Connecting the External Encoder" on page 40. The factory settings are "On driver connector" for **CM10-1**, **3**, **4**, **5** and "Not used" for **CM10-2**.

ENC Parameter	Description	Typical Motor Type	Reference Page
0	Not used	Stepping motor	-
1	On driver connector (ASG/BSG, TIMD/TIMS)	αSTEP/servo motor	Appendix A Signals for Driver
2	Independent encoder connector (EXTA, EXTB, EXTZ)	Stepping motor with an encoder/external Encoder	6.8 Connecting the External Encoder

Memo

- To use the encoder information correctly, it is required to adjust zero positions for the PC (position command) and PF. See "HOMEDCL (deviation counter clear select at mechanical home seeking operation) of 8.2.5 Mechanical Home Seeking" on page 55 and set properly for the conditions of use.
- The "Z" channel (zero position) of the selected encoder input by the ENC parameter is regard as TIMD/EXTZ (timing signal·Z-phase pulse differential input/external encoder ZSG) in the **CM10**, and can be used to seek the mechanical home position. See "8.2.5 Mechanical Home Seeking" on page 55.

■ Parameters and Relations

The **CM10** counts above selected signals by encoder count (EC), and convert it to user unit and continuously monitored as the feedback position (PF). The difference between PC (position command) and PF becomes the PE (position error). These relationships are shown by the following formula. Be sure to set the ER (encoder resolution) parameter first.

PE=PC-PF
PF=EC/ER*DPR*GB/GA

PE: position error (user unit)
PC: position command (user unit)
PF: feedback position (user unit)
EC: encoder count
ER: encoder resolution
DPR: distance per revolution
GA, GB: electrical gear ratio (GA/GB)

■ How to Use

- Position confirmation after positioning operation

When the DEND (driver end signal enable) parameter is set to 0 (internal END signal), the position check using the encoder feedback information (PE) is performed by setting the positioning completion signal range using the ENDACT (system end action). See "8.8 END (motion end) Signal" on page 76.

- Detection of loss of synchronism for stepping motor

When using a stepping motor with an encoder, it is possible to check whether loss of synchronism is generated or not by monitoring the PE.
In the case of the basic step angle 1.8° of 2-phase stepping motor and 0.72° of 5-phase stepping motor, if the offset of the small teeth on the stator and rotor (PE) at motor standstill condition exceeds ±1.8 degrees (±0.9 degrees for the basic step angle 0.9° of 2-phase stepping motor and 0.36° of 5-phase stepping motor), loss of synchronism may be generated because the force to synchronize the motor becomes very unstable condition (the acceptable value varies depending on the operating condition such as operating speed etc.).

・How to use the END (motion end) signal: See "8.8 END (motion end) Signal" on page 76.
If the value exceeding just 1.8 degrees at the motor output shaft is set using the ENDACT command, loss of synchronism can be determined by the END signal or the SIGEND command. (In this case, set "DEND=0" to enable the internal END signal.) For example, if the DPR (distance per resolution) is set to 360, set "ENDACT=1.81."

・When programming with the PE (position error):
Loss of synchronism can be detected using the position error if the END area (value of ENDACT) is required to set individually regardless of loss of synchronism. Programming example to show the result on the terminal is as follows.

Command	Description
(1) MI	#Start incremental motion
(2) MEND	#Wait for motion to end
(3) IF (PE<-1.8)	#When the PE is smaller than -1.8°
(4) SAS MISS-STEP MAY HAVE OCCURRED	#Transmit a message
(5) ENDIF	#End the IF statement
(6) IF (PE>1.8)	#When the PE is greater than -1.8°
(7) SAS MISS-STEP MAY HAVE OCCURRED	#Transmit a message
(8) ENDIF	#End the IF statement

* As another example, the sample program which urges maintenance of the equipment when a load is increased is introduced in the explanation of the PE command (page 277).

- Perform operation and judgement based on a operation of the other parts for the device.

By installing an encoder to the different parts other than the motor such as the shaft of the belt conveyor or the float to measure liquid etc., it is possible to operate or stop the motor, to operate according to the EC (encoder count) value, or to determine OK or NG when the EC reaches the set value. Examples are shown below.

Command	Description
Example to operate the motor when the EC becomes the set value.	
(1) WHILE (EC<100);WEND	#When the EC becomes greater than 100
(2) MI	#Start incremental motion
Example to operate the motor by the motion distance according to the EC value	
(1) DIS=EC/100	#Assign a value of hundredth part of the EC to the incremental motion distance
(2) MI	#Start incremental motion

Memo

- The value of EC can be set such as to set "EC=0" as an initial value. The setting range of EC is "-MAXEC to +MAXEC."
- The PF can be used instead of the EC, but the user unit becomes in common with the motor and it is affected by the DPR, GA and GB. Use the encoder resolution (ER) to adjust the magnification. And the PE will have no meaning in many cases.

8.10 Math/Logical/Conditional Operators

You can use math/logical/conditional operators in a sequence program. For command reference of math/logical/conditional Operators, see "■ Math/Logical/Conditional Operators (In Sequence only)" on page 138.

■ Math/Logical Operators

The following math/logical operators can be used in a program:

- + : Addition
- - : Subtraction
- * : Multiplication
- / : Division
- % : Modulo (remainder)
- & : AND (Boolean)
- | : OR (Boolean)
- ^ : XOR (Boolean)
- << : Left arithmetic shift (Shift to left bit)
- >> : Right arithmetic shift (Shift to right bit)

- Example

Command	Description
`>LIST 1`	#List the user entered sequence
`(  1) X=2`	#The variable X is set equal to two
`(  2) Y=PC`	#Variable Y is set equal to the Position Command Value
`(  3) X=X*Y`	#X equals the previous value of X multiplied by Y
`(  4) X`	#Print the current value of X to the terminal
`(  5) END`	#End the sequence
`>PC`	#Query the PC value
`PC=10 Rev`	#Device response
`>RUN 1`	#Run sequence #1
`>20`	#Device response
`>`	

■ Conditional Operators

The following conditional operations may be used in a sequence, as part of an IF or WHILE statement. a and b can be constants or any variable available within sequences.

- a!=b : a is not equal to b
- a<=b : a is less than or equal to b
- a<b : a is less than b
- a=b, a==b : a is equal to b
- a>=b : a is greater than or equal to b
- a>b : a is greater than b

- Example

Command	Description
`>LIST 2`	#List sequence 2
`(  1) IF (IN1!=0)`	#If Input #1 does not equal the logic OFF state or 0, then;
`(  2)  DIS=1`	#Set the distance to 1 User Unit
`(  3)  MI`	#Move Incrementally
`(  4) ENDIF`	#End the IF Statement
`(  5) END`	#End the sequence
`>`	

8.11 User Variables

As opposed to the variables (parameters) which roles are fixed such as PC and PF, there are general purpose numeric variables that can be used in various uses such as calculation etc. Variables that can be named freely and variables that can treat a character string are also provided. For command reference of user variables, see "■ User Variables" on page 139.

■ User Variables

- A to Z

General purpose numeric variables.
Upper and lower case are permitted, but 'A' and 'a' reference the same variable.
In immediate mode, A to Z may only be set and queried.
Within a sequence, variables may also be used in the following conditions:
• Targets or arguments for assignments (e.g. A=TIMER; DIS=A)
• Loop Counters (e.g. LOOP Q)
• Conditional Statement Values (e.g. if (VR>X))
• Arguments for a subroutine CALL (e.g. CALL S)
• Parts of Mathematical Expressions
• Targets for interactive data entry commands (e.g. X=KBQ)

- Example

Command	Description
`( 1) MCP`	#Start continuous motion
`( 2) WHILE (IN1=0)`	#Repeat while IN1=1
`( 3) D=PE-E`	#PE: Position error, E: user variable
`( 4) D=0.01*D`	#D: user variable
`( 5) E=E+D`	
`( 6) WEND`	#End of WHILE block
`( 7) SSTOP`	#Soft Stop
`( 8) MEND`	#Wait for motion end
`( 9) IF (E>3)`	#If E>3
`( 10) SAS Load increasing, clean machine.`	#Transmit comment
`( 11) ENDIF`	#End of IF block

■ User-defined Variables

- N_xxx :

General purpose, user-defined numeric variables.
A user-defined variable must be created with CREATEVAR before it can be used. After it has been created, it can be used in the same way as the general purpose variables A to Z, except that it cannot be used as the argument for a CALL statement.

- S_xxx :

General purpose, user-defined string variables.
A user-defined string variable must be created with CREATEVAR before it can be used. After it has been created, it can be used to store or display text.

- Associated commands

CLEARVAR: Clears all user-defined variables from memory.
DELETEVAR: Deletes a specific user-defined variable.
LISTVAR: Lists the names and values of all user-defined variables.

- Example

Command	Description

`>CREATEVAR N_COUNTS=0`
` New variable N_COUNTS is added.`
` N_COUNTS=0`
	#Create user-defined numeric variable named N_COUNTS

`>CREATEVAR N_TOTAL=10`
` New variable N_TOTAL is added.`
` N_TOTAL=10`
	#Create user-defined numeric variable named N_TOTAL

`>LIST MAIN`	#List sequence MAIN
`( 1) WHILE (N_COUNTS < N_TOTAL)`	#N_COUNTS, N_TOTAL user-defined variables
`( 2) MI; MEND`	#Start incremental motion; wait until complete
`( 3) OUT4 = 1`	#Set output 4 on
`( 4) WHILE (IN6=0); WEND`	#Wait for input 6 to go off
`( 5) OUT4 = 0`	#Set output 4 off
`( 6) WHILE (IN6=1); WEND`	#Wait for input 6 to go on
`( 7) N_COUNTS=N_COUNTS+1`	#Increment N_COUNTS by 1
`( 8) WEND`	#End of WHILE block
`>`	

8.12 View and Test Functions

The **CM10** has various support functions, such as functions to display ON-OFF status and test the connection of I/O, to display the system status (parameters etc.), and to display online HELP letting you know the command names and brief descriptions without reading this manual.

■ I/O Test

OUTTEST starts a utility process to check I/O connections and levels. Inputs are continuously monitored and displayed, and outputs can be set or cleared, to confirm proper external connections.
Inputs and outputs are displayed as active (1) or inactive (0).
OUTTEST temporarily disables the actions of all assigned system input and output signals. The system will not react to inputs, and will not automatically control outputs. All output control is from the serial port. Signal assignments are restored when the OUTTEST process terminates, and all outputs are restored to the state they were in when the OUTTEST process was started.
Outputs can be toggled, using the character displayed next to the signal name in the OUTTEST screen. Toggling an output changes its state as displayed, and changes the electrical state of the associated output port. Toggle keystrokes or characters for each output are:

OUT1 (1)	OUT2 (2)	OUT3 (3)	OUT4 (4)	
MOVE (M)	RUN (R)	END (E)	HOMEP (H)	ALARM (A)
PSTS (P)	MBFREE (B)	READY (D)	LC (L)	

A SPACE key sets all outputs to inactive (0).
An <ESC> key or character exits the OUTTEST process.

Memo

- Only keys for assigned output signals are available.
- OUTTEST is not permitted while a sequence is running, while a motion is in progress, or if the system is in an alarm state. While OUTTEST is running, sequences are not executable.

- Example

```
        *** Input Monitor - Output Simulator ***
Inputs  (1-9) = RUN ABORT IN3 IN4 IN5 -LS +LS HOME PSTOP
Outputs (1-4) = OUT1(1) OUT2(2) END(E) ALARM(A)

  - Use (x) Keys to toggle Outputs.
  - Use <space> to set all outputs to zero.
  - Use <esc> to exit OUTTEST mode.

           I/O Status Monitor
--Inputs--                Outputs
1 2 3 4 5 6 7 8 9 -(SEQ#)- 1 2 3 4
0 0 0 0 0 0 0 0 0 -(  0 )- 0 0 1 0
```

■ Signal Status

All I/O status can be reported by SIG__commands. For example, the SIGHOME replies "1" when an external HOME input signal is ON (active), and replies "0" when it is OFF (not active).

- Example

Command	Description
>LIST SLIPCHECK	#List sequence SLIPCHECK
(1) EHOME	#Return to home position (PC=0)
(2) MEND	#Wait for motion to complete
(3) IF (SIGHOME!=1)	#If HOME input not active…
(4) SAS No home input at home position.	#…Problem. Transmit messages
(5) SAS Check linkage and sensor.	
(6) ALMSET	#Set an alarm
(7) ENDIF	#End of IF block
>	

While SIG__ commands are generally used in a sequence programs, they are also convenient for monitoring purposes.
See "Continuous Display" below.

Applicable Commands:
SIGPSTOP, SIGMSTOP, SIGABORT, SIGSTART, SIGMCP, SIGMCN, SIGMGHP, SIGMGHN, SIGPAUSE, SIGCONT, SIGPAUSECL, SIGPECLR, SIGALMCLR, SIGSENSOR, SIGHOME, SIGHOMEP, SIGLSP, SIGLSN, SIGCON, SIGFREE, SIGMOVE, SIGRUN, SIGEND, SIGALARM, SIGPSTS, SIGMBFREE, SIGREADY, SIGTL
DSIGACLDCL, DSIGALARM, DSIGEND, DSIGTIMS, DSIGTIMDEXTZ, DSIGCON, DSIGCOFF, DSIGCS, DSIGMBFREE, DSIGFREE, DSIGLC, DSIGMOVE, DSIGM0, DSIGM1, DSIGM2, DSIGTL

Note The display by the SIG_commands represents ON/OFF (active or not active) of signals but not ON/OFF of photocouplers. Take note because it depends on the setting of I/O logic level (LV command). If "1" is received when inquiring "SIGHOME" while setting to "HOMELV=0", "0" will be received when inquiring "SIGHOME" while setting "HOMELV=1."

■ Continuous Display

A forward slash character (/) following certain variables causes the system to continuously display the value of those elements utilizing these rules:
· Only one command may be displayed simultaneously
· A space must separate the command from the / character
· This data is updated every 0.15 seconds
· Keyboard <ESC> terminate the display loop

- Example

Command	Description
>UU=Degrees	#Set the User Units to Degrees
UU=Degrees	
>VR=10	#Set the running velocity to 10 User Units/second.
VR=10 Degrees/sec	
>MCP	#Begin moving continuously
>PC /	#Continuously display the position command
72.639 Degrees	#Device response at one moment in time
	#<ESC> sent: display terminates
>	

Applicable Displayed Commands:
IN, INSG, INx, OUT, OUTSG, OUTx, IO, RIO, DIO, PC, PCI, PE, PF, PFI, EC,
SIGPSTOP, SIGMSTOP, SIGABORT, SIGSTART, SIGMCP, SIGMCN, SIGMGHP, SIGMGHN, SIGPAUSE, SIGCONT, SIGPAUSECL, SIGPECLR, SIGALMCLR, SIGSENSOR, SIGHOME, SIGHOMEP, SIGLSP, SIGLSN, SIGCON, SIGFREE, SIGMOVE, SIGRUN, SIGEND, SIGALARM, SIGPSTS, SIGMBFREE, SIGREADY, SIGTL
DIN, DINx, DINSG, DOUT, DOUTx, DOUTSG, DSIGACLDCL, DSIGALARM, DSIGEND, DSIGTIMS, DSIGTIMDEXTZ, DSIGCON, DSIGCOFF, DSIGCS, DSIGMBFREE, DSIGFREE, DSIGLC, DSIGMOVE, DSIGM0, DSIGM1, DSIGM2, DSIGTL

The ESC key will cause the termination of the / (forward slash) command execution. While the forward slash command is executing and motion is occurring, the ESC key will first cause the termination of the forward slash command execution. The ESC must be transmitted to the device a second time to cause the motion to cease.

Note

- Do not confuse this special command with the division operator, "/."
- When this command is used in the RS-232C with daisy chain connection, line feeds will occur and the bottom line will indicate the current value.

■ System Status

The system status summary including all I/O assignments, active level and status, values of important parameters, current position, and alarm condition are displayed by the REPORT command. The next page will be displayed by pressing the SPACE key. The REPORT command can be an effective tool for troubleshooting problems with the system.

```
/ I/O REPORT /---(NO:Normally Open, NC:Normally Closed)-----------
   IN1(NO) = 0   IN2(NO) = 0   IN3(NO) = 0   IN4(NO) = 0
   IN5(NO) = 0   IN6(NO) = 0   IN7(NO) = 0   IN8(NO) = 0
   IN9(NO) = 0
   OUT1(NO) = 0   OUT2(NO) = 0   OUT3(NO) = 0   OUT4(NO) = 0

/ REMOTE I/O REPORT /-----------------------------------------------
   IN1 = 0   IN2 = 0   IN3 = 0   IN4 = 0
   IN5 = 0   IN6 = 0   IN7 = 0   IN8 = 0
   ABORT = 0   START = 0   MCP = 0   MCN = 0
   MGHN = 0   CON = 0   FREE = 0
   OUT1 = 0   OUT2 = 0   OUT3 = 0   OUT4 = 0
   OUT5 = 0   OUT6 = 0
   END = 0   MOVE = 0   HOMEP = 0   LC = 0   READY = 0

/ DRIVER I/O REPORT /-----------------------------------------------
   ALM(NC) = 1   IN2(NO) = 0   END(NO) = 0   READY(NO) = 0
   LC(NO) = 0   TIMS(NO) = 0   TIMD/EXTZ(TIMDLV=1, EXTZLV=0) = 0
   CON(NO) = 0   ACL/DCL(NO) = 0   REQ(NO) = 0   TL(NO) = 0
   M0(NO) = 0   M1(NO) = 0   PRESET(NO) = 0   FREE(NO) = 0

   Enter [SPACE] to continue, other key to quit.

 /PARAMETER REPORT /-----------------------------------------------
   UU = Rev
   STRSW = 0   DPR = 1   MR = 1000   GA = 1   GB = 1
   ER = 1000   DIRINV = 0
   VS = 0.1   VR = 1   TA = 0.5   TD = 0.5   DIS = 0
   LIMP = 0   LIMN = 0   SLACT = 0
   STARTACT = 0   MSTOPACT = 0   SENSORACT = 2   OTACT = 0
   ALMACT = 2   ALMMSG = 0   HOMETYP = 0   HOMEDCL = 1
   INCABS0 = 1   VR0 = 1   DIS0 = 0   LINK0 = 0
   INCABS1 = 1   VR1 = 1   DIS1 = 0   LINK1 = 0
   INCABS2 = 1   VR2 = 1   DIS2 = 0   LINK2 = 0
   INCABS3 = 1   VR3 = 1   DIS3 = 0
   DALARM = 1   DREADY = 1   STRDSC = 0   TIM = 1   ENC = 1
   DEND = 1   ENDACT = 0   MBFREEACT = 0
   PULSE = 1   PLSINV = 0   CANID = 1   CANBAUD = 1

/ POSITION REPORT /-------------------------------------------------
   PC = 0   PF = 0   PE = 0   EC = 0   PABS = 0

/ ALARM HISTORY /--------------------------------------------------
   ALARM = 6E ,  RECORD : 6E 6E 00 00 00 00 00 00 00 00
   ALM_DRIVER_ALARM , 15.123 [sec] past.
   Driver Status Code = 00   Driver ALARM Code = 00
```

■ Commands

Type HELP to display the command syntax and brief description. The SPACE key on the keyboard lists the next HELP screen. Any other keyboard key will exit the HELP screen mode.

```
--- Command List ---

   TALK*       : Select unit in multi-unit communications
   @*          : Select unit in multi-unit communications
   MI          : Move Incrementally
   MA          : Move Absolutely (-MAXPOS - +MAXPOS[UU])
   CV          : Change Velocity for Index (0.001 - MAXVEL[UU/sec])
   MCP         : Move Continuous Positive
   MCN         : Move Continuous Negative
   DIS         : Incremental motion distance (-MAXPOS - +MAXPOS[UU])
   VR          : Running velocity (0.001 - MAXVEL[UU/sec])
   VS          : Starting velocity (0 - MAXVEL[UU/sec])
   TA          : Acceleration time (0.001-500.000[sec])
   TD          : Deceleration time (0.001-500.000[sec])
   PSTOP       : Stop immediately, stop sequence, follow ALMACT setting
   HSTOP       : Stop immediately (hard stop)
   MSTOP       : Stop according to MSTOPACT
   SSTOP       : Stop, decelerating (soft stop)
   SCHGPOS     : Distance from SENSOR on MCx (0 - +MAXPOS[UU])
   SCHGVR      : Velocity on SCHGPOS motion (0.001 - MAXVEL[UU/sec])

   Enter [SPACE] to continue, other key to quit.
```

8.13 Protective Functions

For some alarm conditions, the action(s) taken when the condition is detected can be controlled by ALMACT, to suit the application

- Alarm Conditions Effected by ALMACT

Condition	Description	Alarm Code
Hardware over travel	Positive or negative position limit signal detected	66h
Software over travel	Position outside of programmed positive and negative software position limits LIMP and LIMN	67h
Panic stop	System executed a panic stop because of a PSTOP input or command	68h

ALMACT controls the system response when any of the alarm conditions (above) are detected.

ALMACT	Action
0	Motor current ON, alarm OFF.
1	Motor current ON, alarm ON.
2	Motor current OFF, alarm ON. (factory setting)

Memo See "9.7 Error Messages Displayed on the Terminal" on page 98 for details of each alarm condition and system response.

The system can also be configured to automatically transmit a message when alarms or warnings are detected. Automatic message transmission is controlled by ALMMSG:

ALMMSG	Action
0	Do not automatically transmit alarm and warning messages (factory setting)
1	Automatically transmit messages for alarms, but not warnings
2	Automatically transmit messages for alarms and warnings

Memo
- See "9.7 Error Messages Displayed on the Terminal" on page 98 for message details.
- Warnings are for informational purposes only, and do not effect system operation.

The ALM command shows the current alarm status, and the last 10 alarms and warnings.

- Example

```
>ALM
 ALARM =30 ,RECORD: 23 23 30 30 30 23 23 10 23 23

 ALM_OVER_LOAD , 3.234 [sec] past.

 WARNING =00 ,RECORD: 00 00 00 00 00 00 00 00 00 00

 No warning.
>
```

Note The alarm history is automatically saved in non-volatile EEPROM, as a troubleshooting aid (warnings are not saved). The EEPROM has a nominal expected lifetime of 100,000 write cycles. Alarm conditions should be treated as exceptional, and not generated routinely by an application, if they could possibly occur at high frequency.

9 Program Creation and Execution

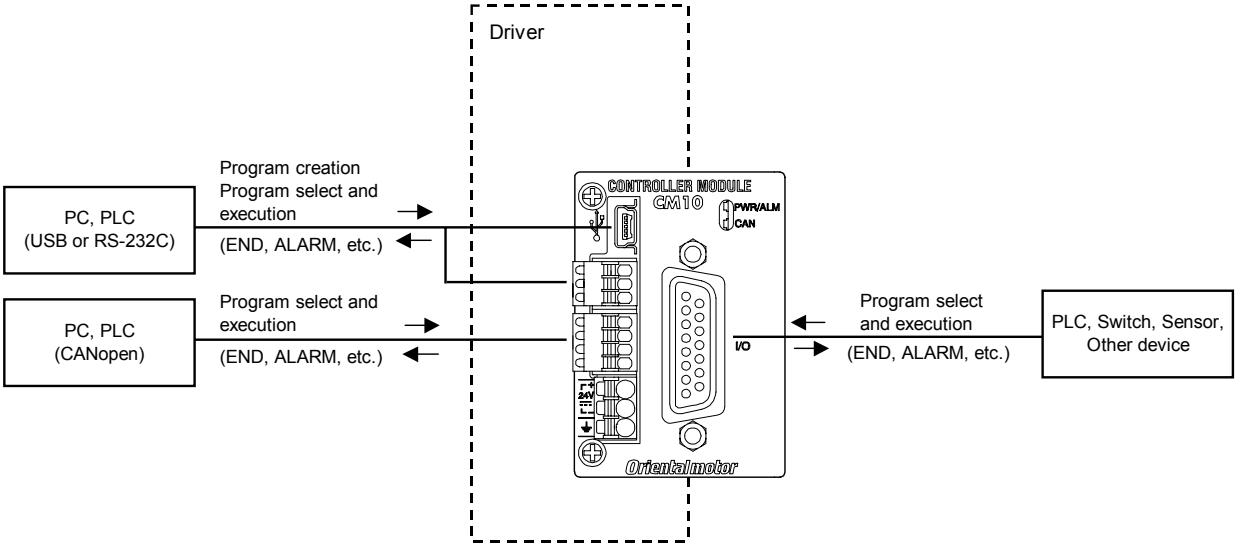
This chapter explains the methods used to create new programs, edit existing programs and execute programs.

Memo Although these functions are introduced as keyboard operation using any general terminal software in this chapter, most of the operations can be done by using the [Program Editor] tab screen on the supplied **Immediate Motion Creator for CM/SCX Series** utility software.

9.1 Overview

■ What is Program Execution?

You create sequences using a computer, save the programs into the built-in memory of the **CM10**, specify which sequence number to run, and input the start signal to execute the sequence. The program creation is made via USB or RS-232C, the program selection and execution are made via USB, RS-232C, CANopen or I/O selection.



	Immediate Command (Monitor Mode)	Program Creation (Program Edit Mode)	Program Select and Execution (Sequence Mode)
USB	✓	✓	✓
RS-232C	✓	✓	✓
CANopen	✓	-	✓
I/O	-	-	✓

■ Contents

9.2 Operating Modes

Choose one of three operating modes (monitor mode, program-edit mode and sequence mode) to begin a desired task from a terminal.

■ Operation from Terminal (Monitor Mode)

Operation from the terminal is available when the device's power is input. When operating from the terminal, you can create, delete, copy, lock and execute sequences. Additionally, motion can be started, stopped and the status of the device and I/O signals can be monitored.

■ Sequence Editing (Program Edit Mode)

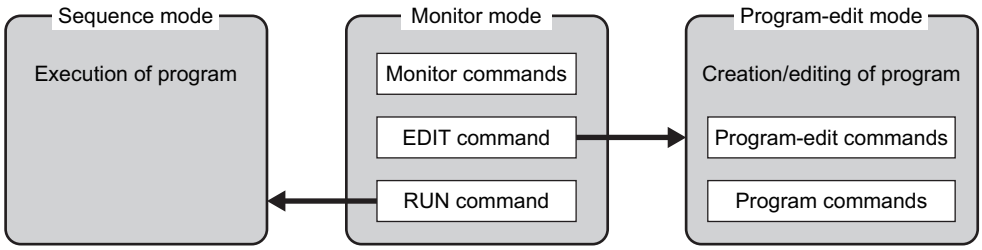
Sequences can be edited by either,
- Editing from the terminal.
- Editing from supplied utility software, the **Immediate Motion Creator for CM/SCX Series (IMC)**.

In this chapter, "Editing from the terminal" is explained.
The system enters this mode when "EDIT" is entered from the terminal.
In the sequence-edit mode, you can edit a sequence by changing, inserting or deleting specified lines. You can also perform a syntax check.

■ Executing Sequences (Sequence Mode)

Sequences can be executed by either,
- Using the "RUN" command from the terminal.
- From the I/O or the CANopen using the "START" and "INx" inputs.

Sequence execution ends when any of the following conditions are satisfied:
- The END command or ABORT command written in the sequence is executed
- The PSTOP or ABORT input is turned ON
- The ESC key is pressed
- An alarm has been detected.



9.3 Preparation

1. Connect a personal computer via USB or RS-232C
   See "6.3 Connecting the USB and Installation of Utility Software" on page 22 or "6.6 Connecting the RS-232C" on page 37 as necessary.

2. Power ON the **CM10** and the driver
   See "6.2 Connecting the Power Supply" on page 21 as necessary.

3. Launch any general terminal software or the supplied utility software (**IMC**)
   See "6.3 Connecting the USB and Installation of Utility Software" on page 22 as necessary.

   Communication Settings for general terminal software
   8 bits, 1 stop bit, no parity
   Baud rate: 9600 bps (first connection)
   * The default USB and RS-232C baud rate of the **CM10** is 9600 bps. After connecting initially, you can change the baud rate as necessary.

9.4 Creating a New Sequence

Programs contain data with which to define device operation, such as the running velocity and travel distance. When a sequence is started, the commands included in the sequence are executed sequentially.
Sequences are stored in the device's memory. Program must adhere to the following specifications.

■ Sequence Specifications

Maximum number of programmable sequences	100 sequences (Name is use configurable)
Maximum sequence size	Total sequences: 6 kB (compiled) 21 kB (text + compiled) 1 sequence: 6 kB (text) 2 kB (compiled)
Sequence execution by external input	START input executes a sequence selected by binary combination of IN1 to IN7.
Automatic sequence execution at power up.	Sequence named CONFIG is executed at power up.
Sequence program name	10 characters maximum. 0 to 9, A to Z, a to z, _(underscore) can be used as characters. Upper and lower case are permitted, not case sensitive. **Name cannot begin with number, or "N_," "S_," "n_," "s_."** Using command name and/or parameter names for sequence names can cause confusion, and is not recommended. If sequence is saved by name, system assigns sequence number within 0 to 99. Assigned number is used for selection to start sequence by I/O.

Memo Device memory status can be checked either by the "DIR" command from the terminal or by the "M" command while editing sequence.

■ Sequence Commands

The majority of commands on the **CM10** can be used in a sequence. See "12 Command Reference" on page 131.
For sequence specific commands, refer to "■ Sequence Commands" on page 138 and "■ Math/Logical/Conditional Operators (In Sequence only)" on page 138.

■ Example of Creating a New Sequence

1. Enter the monitor command "EDIT ∗," and press the Enter key.
(∗ indicates the sequence name or number (optional). Insert a space between "EDIT" and them.)
The system enters the sequence-edit mode, and a message indicating a blank sequence (New sequence) is displayed.
Enter "I" (Insert).
Subsequently, the line number "(1)" is displayed and you can now create a sequence.

```
>EDIT SAMPLE1

New Sequence

Sequence Name  : SAMPLE1
Sequence Number: 0
Lines:         : 0
Bytes:         : 0
Bytes Free     : 6144

>>Command: I

( 1)_
```

2. Enter commands and parameters by referring to "12 Command Reference," to create a program.
The following shows a sample program. This program, SAMPLE1, executes an absolute positioning operation at a starting velocity of 1 rev/sec and running velocity of 3 rev/sec, with the target position of 5 revolution from PC=0. (When setting the user unit (UU) to "rev" and the distance per revolution (DPR) to 1")
Insert a space or equal sign between the command and the parameter. See "7.5 Command Format" on page 47 as a reference. ("=" is not used because the MA is not a parameter)

```
( 1) VS=1
( 2) VR=3
( 3) MA 5
( 4) _
```

Memo The semicolon (;) allows for multiple command statements to be used on a single command line. See "7. Command Format" on page 47 for more details.

3. When the program entry is complete, press the Enter key, enter "S" and press the Enter key to save the program.

Finally, enter "Q" to complete the program and exit edit mode.

```
( 4)

>>Command: S

Compiling...OK
Saving........OK

>>Command: Q
>_
```

Memo If "S" is input, syntax check will be executed before saving the program. If a syntax error is found, the error type and the line number that was found an error will be displayed.

■ Editing an Existing Sequence

In the sequence-edit mode, existing sequences can be edited by alter inserting and deleting lines. The method used to enter commands is the same as when creating a new sequence.

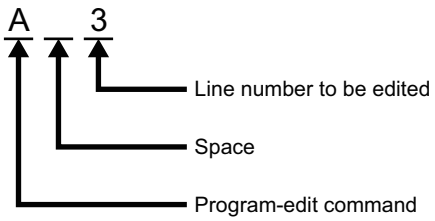
1. Enter the monitor command "EDIT ∗," and press the Enter key.
(∗ indicates the sequence name or number (optional). Insert a space between "EDIT" and them.)
The system enters the sequence-edit mode.

```
>EDIT PROGRAM1

Sequence Name   : PROGRAM1
Sequence Number: 1
Lines:          : 5
Bytes:          : 23
Bytes Free      : 6121

>>Command:_
```

2. Enter an editor command and a line number according to the edit operation you wish to perform.
Insert a space between the editor command and the line number. Two or more lines can also be specified depending on the editor command.



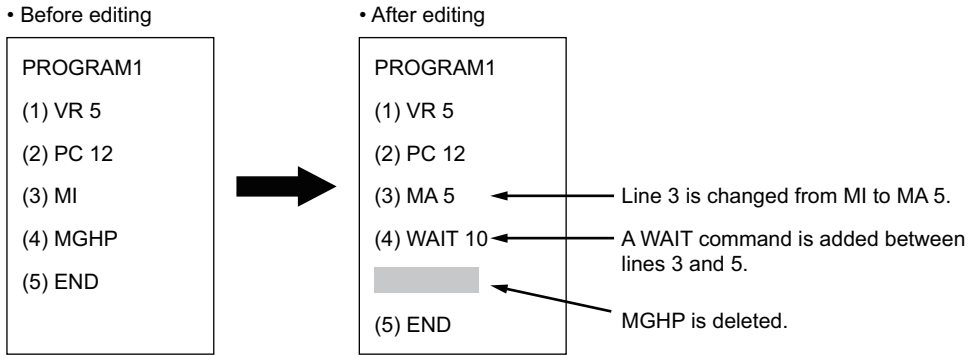
Command	Description
I	Insert
A	Alter(Change)
D	Delete
L	List
X	Cut
C	Copy
P	Paste
S	Save, Compile
M	Display memory status
H	Display help
Q	Quit

Memo The "H" command will show the command help (above list) while editing a sequence.

```
>>Command: H
     I [x]      | Insert line(s) before line x (end of sequence if no x)
     A  x  [y]  | Alter  line(s) x, or x to y
     D  x  [y]  | Delete line(s) x, or x to y
     L [x] [y]  | List   line(s). All, or x to end, or x to y
     X  x  [y]  | Cut    line(s) to clipboard. x, or x to y
     C [x] [y]  | Copy   line(s) to clipboard. All, or x, or x to y
     P  x       | Paste  lines from clipboard, ahead of x
     S          | Save   sequence, to existing location
     S  x       | Save   sequence, by number (0-99)
     S sss      | Save   sequence, by name (10 char max)
     M          | Display memory status
     H          | Display this help reminder
     Q          | Quit sequence editor
```

■ Example of Line Editing

This section explains the steps to edit PROGRAM1 as follows:



1. Enter "EDIT PROGRAM1" and press the Enter key.
   After the contents of PROGRAM1 are displayed, ">>Command:" is displayed and the monitor waits for editing input.

```
>EDIT PROGRAM1

Sequence Name   : PROGRAM1
Sequence Number: 1
Lines:          : 5
Bytes:          : 23
Bytes Free      : 6121

>>Command:_
```

2. Enter "L" to list the entire sequence, make sure which line to edit.

```
>>Command: L

( 1) VR 5
( 2) PC 12
( 3) MI
( 4) MGHP
( 5) END

>>Command:_
```

3. Change line 3 from "MI" to "MA 5" using the following steps:

   a.Enter "A 3" and press the Enter key.
   Line 3 becomes editable.

```
>>Command:_ A 3
( 3) MI_
```

   b. Delete "MI" with the Backspace key.

```
( 3) _
```

   c.Enter "MA 5."

```
( 3) MA 5_
```

   d. Press the Enter key.
   Line 3 of PROGRAM1 is changed to "MA 5." The command prompt is displayed and the monitor waits for the next editor command.

```
( 3) MA 5_
>>Command: _
```

4. Insert "WAIT 10" below line 3 using the following steps:

a.Enter "I 4" and press the Enter key.

Line 4 is added, and the monitor waits for a command.

```
>>Command: I 4
( 4)_
```

b. Enter "WAIT 10."

```
( 4) WAIT 10_
```

c.Press the Enter key.

"WAIT 10" is added to line 4 of PROGRAM1.

You will now insert a new line at line 5.

```
( 4) WAIT 10
( 5) _
```

d. Press the ENTER key.

A new line is inserted and each of the subsequent line numbers increases by one. The command prompt is displayed and the monitor waits for the next editor command.

```
( 5)

>>Command:_
```

5. Delete "MGHP" from line 5 using the following steps:

Enter "D 5" and press the Enter key.

Line 5 is deleted, and each of the subsequent line numbers decreases in turn.

The command prompt is displayed and the monitor waits for the next editor command.

```
>>Command: D 5
>>Command:_
```

■ Ending the Edit Session

1. Enter the command "S" to end the session after saving the edited contents, and then press the Enter key.

The edited contents are saved.

```
>>Command: D 5
>>Command: S

Compiling...OK
Saving........OK

>>Command:_
```

2. Enter "Q" to quit the sequence editor.

a ">" (command prompt) is displayed.

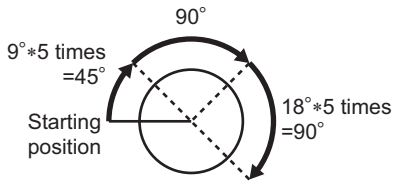
```
>>Command: Q
>_
```

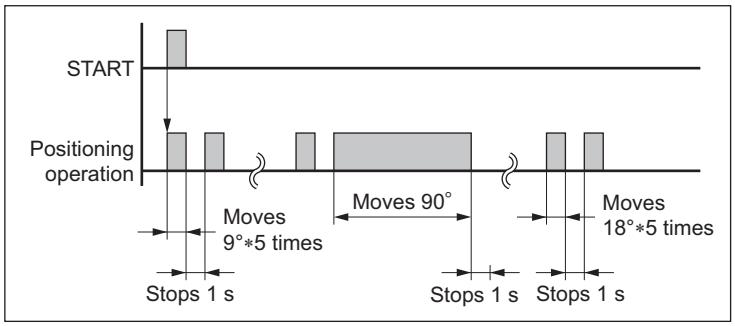
9.5 Sample Programs

This section provides sample programs.

■ Repeated Positioning Operation

- Motion Pattern





- Main Program

Applicable device: Rotary table

Resolution: 360 deg/rev (DPR=360)
UU: degrees

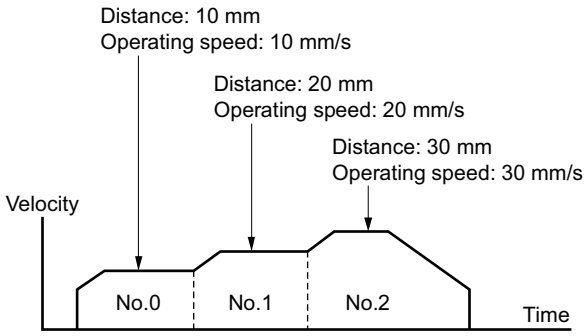
```
( 1) TA 0.1          The acceleration time is set to 0.1sec.
( 2) TD 0.1          The deceleration time is set to 0.1sec.
( 3) VS=10           The starting velocity is set to 10 deg/sec.
( 4) VR=360          The running velocity is set to 360 deg/sec.
( 5) LOOP 5          Lines 6 through 9 are repeated five times.
( 6)   DIS=9         The distance is set to 9 degrees.
( 7)   MI            Incremental positioning operation is executed.
( 8)   MEND          The program waits until the motion is ended.
( 9)   WAIT 1        The program waits 1 sec.
(10) ENDL            The LOOP statement is ended.
(11) DIS=90          The distance is set to 90 degrees.
(12) MI              Incremental positioning operating is executed.
(13) MEND            The program waits until the motion is ended.
(14) WAIT 1          The program waits 1 sec.
(15) LOOP 5          Lines 16 through 19 are repeated five times.
(16)   DIS=18        The distance is set to 18 degrees.
(17)   MI            Incremental positioning operation is executed.
(18)   MEND          The program waits until the motion is ended.
(19)   WAIT 1        The program waits 1 sec.
(20) ENDL            The LOOP statement is ended.
(21) END             The program is ended.
```

■ Executing Linked Operation

- Motion Pattern

Resolution: 10 mm/rev (DPR=10)
UU=mm

LINKx	Setting Value
LINK0	1 (linked)
LINK1	1 (linked)
LINK2	0 (one-shot)



- Main Program

```
(  1) DIS0=10
(  2) DIS1=20
(  3) DIS2=30
(  4) VR0=10
(  5) VR1=20
(  6) VR2=30
(  7) INCABS0=1
(  8) INCABS1=1
(  9) INCABS2=1
( 10) LINK0=1
( 11) LINK1=1
( 12) LINK2=0
( 13) MI0
( 14) END
```

The distance for segment number 0 is set to 10 mm.
The distance for segment number 1 is set to 20 mm.
The distance for segment number 2 is set to 30 mm.
The operating speed for segment number 0 is set to 10 mm/sec.
The operating speed for segment number 1 is set to 20 mm/sec.
The operating speed for segment number 2 is set to 30 mm/sec.
The positioning mode for segment number 0 is set to incremental.
The positioning mode for segment number 1 is set to incremental.
The positioning mode for segment number 2 is set to incremental.
Segment number 0 is set to linked.
Segment number 1 is set to linked.
Segment number 2 is set to termination.
Start the operation to start at segment number 0. (Numbers 0 through 2 are linked.)
The sequence program is ended.

9.6 Executing a Sequence

You can execute sequences stored in the device's memory. There are two ways to execute a sequence.
To perform this via CANopen, refer to "■ Executing a sequence" on page 112.

■ Executing a Sequence from the Terminal

1. Connect the **CM10** to the terminal by USB or RS-232C. Start the **Immediate Motion Creator for CM/SCX Series** (included) or terminal software.
2. Enter the monitor command "RUN ∗," and press the Enter key.
   (∗ indicates the sequence name or number. Insert a space between "RUN" and them.)
   When the command is entered, the system executes the sequence.

■ Executing a Sequence from I/O

1. Assign START input signal (and ABORT signal, as needed) to IN1 to IN9 of the system I/O connector.
   Set it using the [System Config] - [I/O setting] tab screens of the provided utility software, **IMC**.

Memo
- Assign it to the high number input so that the START input and the inputs used for program selection (see below) do not overlap each other.
- If terminal operation is preferred rather than using the **IMC**, use INSTART command. (ex. INSTART=5)

2. Connect the START input (and ABORT input as needed) to the host controller.
3. Assert IN1 to IN7 inputs to select the sequence to execute.
   Sequence is selected by the binary value of IN1 to IN7. (see the chart) Inputs assigned to other functions (MSTOP, HOME, etc) are read always as OFF. (e.g. INPAUSE=3 means IN3 is always read as OFF.)

Example of Selection (Empty section means OFF)

Sequence Number	Input Port						
	IN1 (1)	IN2 (2)	IN3 (4)	IN4 (8)	IN5 (16)	IN6 (32)	IN7 (64)
0							
1	ON						
2		ON					
4			ON				
8				ON			
16					ON		
32						ON	
64							ON
3	ON	ON					
63	ON	ON	ON	ON	ON	ON	
99	ON	ON				ON	ON

Memo
- The rotary digital switch may conveniently be used when sequence selection is performed by switches.
- This chart does not mean all seven inputs are always necessary to select sequence number. If the number of sequences to select are limited, such as eight, only IN 1 to IN 4 are necessary, and IN5 to IN9 can be assigned to any specific system input such as the SENSOR, ABORT and CON.
- The sequence tracing command, "TRACE" is available to check sequence action. When TRACE=1, while the sequence is processing, sequence statements can be displayed as they are executed, one statement at a time. See TRACE (page 322) in more detail.

■ Stop the sequence execution

When stopping the sequence execution is required, use the ABORT input or signal. The START input also has the ABORT function when configured. Set "START Action" to "Level", under [System Config]-[System Parameters] of the **IMC**.

STARTACT	Operation
0 (edge)	Setting START input from OFF to ON starts sequence execution. When sequence is running, paused motion is resumed. Setting START input from ON to OFF does not stop sequence. ABORT input is required for aborting sequence.
1 (level)	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF aborts the sequence.

Memo

- If the terminal operation is preferred, use the STARTACT command to configure as above.
- A variety of stopping methods is introduced in "8.3 Stopping Motion and Sequence" on page 64.

9.7 Error Messages Displayed on the Terminal

This section lists error messages that may be displayed on the terminal during program creation, syntax checking and program execution.

■ Error Messages for Editing

Unknown command: xxxx.	
Cause/action:	Input at Editor prompt did not match any of the single-character Editor commands (which can be seen by entering 'H' for [H]elp).
Invalid sequence name.	
Cause/action:	The sequence name is invalid (Given sequence name exceeds 10 characters, the first character is N, S, n, s, etc.)
Sequence is locked.	
Cause/action:	At "D x" (delete), "E x" (edit), "S x" (save) execution, sequence x is locked.
Sequence directory full.	
Cause/action:	Tried to create a sequence, by [C]opy an existing sequence or [S]ave from the editor. No free directory entries available: all 100 are used.
Sequence editor memory full.	
Cause/action:	Editor memory is full, cannot add any more text.
Sequence storage memory full.	
Cause/action:	Sum of stored sequences + this attempt to [C]opy or [S]ave (from editor) would overflow available sequence storage memory. (EEPROM).
Invalid line number.	
Cause/action:	Editor command prompt expecting a line number. Found text, but wasn't a valid line number.
Invalid editor syntax.	
Cause/action:	The syntax of the editor command is invalid. (Extra text is found after an editor command, etc.)
End line must follow start line	
Cause/action:	While many Editor commands can take both start and end line numbers (Alter, Delete, List, Copy, Cut), the start line number must be before the end line number.
Missing argument.	
Cause/action:	Editor command prompt expecting and did not find a valid line number.

■ Error Messages for Syntax

Array index out of range.	
Cause/action:	Reference to POS[ ] data, index out of range. Can happen in any of MA POS[ ], POS[ ], POS[ ]=, =POS[ ].
Invalid argument.	
Cause/action:	Argument is invalid for the command. (MA xxx, WAIT xxx, VIEW xxx, etc.)
Block depth too deep.	
Cause/action:	Net is too deep. "Blocks" (WHILE−WEND, LOOP−ENDL, IF−ENDIF) can be "nested" inside each other up to 8 levels.
BREAKL outside LOOP block.	
Cause/action:	BREAKL is entered at the outside of LOOP block.
BREAKW outside WHILE block.	
Cause/action:	BREAKW is entered at the outside of WHILE block.
Conditional expression expected.	
Cause/action:	IF or WHILE statements require a conditional expression.
Invalid sequence number.	
Cause/action:	CALL by number detected invalid sequence number, number out of range (0 to 99), or fraction.
Invalid sequence reference.	
Cause/action:	Argument to CALL was not a valid sequence name.
Invalid text (missing separator?).	
Cause/action:	After a valid statement, found text before end-of-line. No separator (;), and not in comment.

Invalid Operator Cause/action: Math operator not an allowable operator.
Invalid user parameter name. Cause/action: Too many characters or invalid characters are entered as user parameter name.
Loop count must be positive integer. Cause/action: Negative number is entered as argument for LOOP.
Invalid assignment. Cause/action: Found something untranslatable involving an assignment. Note that '=' is required for all math operators.
Conditional expression expected. Cause/action: Missing parenthesis, or miss-spelled parameter names, typo in number, etc.
Invalid ELSE−ENDIF block. Cause/action: ELSE must be followed by ENDIF. ENDIF must be preceded by IF or ELSE.
Invalid IF block. Cause/action: IF must be followed by ELSE or ENDIF. ELSE must be preceded by IF. ENDIF must be preceded by IF or ELSE.
Invalid LOOP block. Cause/action: LOOP must be followed by ENDL. ENDL must be preceded by LOOP.
Invalid number. Cause/action: Something that looked like a constant number contained unexpected text, or was out of range.
Invalid operation. Cause/action: Operation contained elements that are not constants or known parameters.
Invalid WHILE block. Cause/action: WHILE must be followed by WEND. WEND must be preceded by WHILE.
Sequence needs block closure. Cause/action: Compiler was still expecting ENDIF, ENDL, WEND when finished processing sequence.
String too long. Cause/action: Assignment to user string variable, SAS, SACS arguments exceed limit of string length.
String argument not allowed here. Cause/action: MA S_name, WAIT S_name, LOOP S_name, etc is detected.
Strings not allowed in conditionals. Cause/action: String entry is detected at conditional expression.
Strings not allowed in operations. Cause/action: String entry is detected at math operator.
Text beyond END. Cause/action: (Non-commented) text found beyond END statement.
Unknown command or parameter. Cause/action: Command or parameter is not found.
Unsupported precision. Cause/action: Numeric constant specified with too much precision (e.g. 1.2345).
Read-only parameter. Cause/action: Attempt to modify a read-only parameter (e.g. SIGEND)
Parameter cannot be displayed. Cause/action: Attempt to "View" a non-viewable parameter (e.g. KB, KBQ).
Wait time must be positive. Cause/action: Negative number is entered as argument for WAIT.

■ Error Messages Displayed during Program Execution

These are not displayed in multi axis mode.

EEPROM data corrupt.	
	Cause/action: EEPROM data is destroyed.
Both +LS, −LS ON.	
	Cause/action: Both the +LS and −LS are ON simultaneously. Check the logic setting for hardware limit sensors Normally Open (N.O.) or Normally Closed (N.C.).
LS detected, opposite HOME direction.	
	Cause/action: Opposite LS is detected from HOME direction. Connect the +LS and −LS correctly.
Abnormal LS status detected on HOME.	
	Cause/action: Abnormal hardware limit is detected during mechanical home seeking. Check the hardware limits, installation of HOMELS, wiring, and operation data used for the mechanical home seeking.
HOMELS not detected between +LS and –LS on HOME (3 sensor mode).	
	Cause/action: Check the hardware limits, installation of HOMELS, wiring, and operation data used for the mechanical home seeking.
TIM, SENSOR not detected on HOMELS at HOME	
	Cause/action: Check that the SENSOR input signal is wired correctly.
Over travel: +LS or −LS detected.	
	Cause/action: The device has exceeded its hardware limit. Check the equipment.
Over travel: software position limit detected	
	Cause/action: The device has exceeded its software limit. Revise the operation data or change the software limit range.
PSTOP input detected.	
	Cause/action: Device has detected PSTOP input. Motion and sequence have stopped. Check your system for this PSTOP cause.
+LS or –LS detected during OFFSET motion	
	Cause/action: LS detection on offset motion.
Attempted to start unpermitted motion.	
	Cause/action: Impossible motion pattern is selected on motion start. Revise the operation data.
Sequence stack overflow	
	Cause/action: Stack area for user program has overflowed. Reduce the number of nested commands.
Attempted to call non-existent sequence.	
	Cause/action: Non-existent program is called.
Calculation result overflow	
	Cause/action: Calculation result over flow.
Parameter out of range	
	Cause/action: Parameter exceeds its setting range.
Division by Zero detected	
	Cause/action: Divide by zero was executed. Revise the program.
Attempted to modify PC while moving.	
	Cause/action: "PC" command is updated while the device is operating or loses its holding torque. Execute the PC command while the device is at a standstill in the energized state.
Attempted to access non-existent user parameter	
	Cause/action: Non-exist variable is accessed.
Attempted to write to read-only parameter	
	Cause/action: Accessed to read only parameter. (Include prohibit access while motion, etc)
ALMSET command detected	
	Cause/action: ALMSET command is detected.
Attempted to start motion while moving.	
	Cause/action: Prohibit motion command from being executed while motion.

Unexpected interrupt occurred.
Cause/action: Unexpected interrupted has occurred.

Sequence system internal error (xx)
Cause/action: Other error (program compatibility, etc)

■ Error Messages Relating to Monitor Commands

Error: Command or parameter is unknown.
Cause/action: Text entered at the command prompt is not recognized (e.g. "DIV," "VY").

Error: Action is not allowed. (Motor is moving)
Cause/action: Not feasible (while motor is running.)
Attempted to modify a parameter that may not be modified while motor is moving.

Error: Action is not allowed. (Sequence is running)
Cause/action: Not feasible (Command that starts motion is attempted while a sequence is running.)

Error: Action is not allowed. (Alarm is ON)
Cause/action: Not feasible (Command is attempted that is not executable while alarm is ON.)

Error: Action is not allowed. (Motion or I/O settings incompatible)
Cause/action: Not feasible (discrepancy of operation, discrepancy of I/O setting, and discrepancy between operation and I/O setting)
One of following situations is detected.
- Motion command attempted while current is OFF.
- CV command is attempted while decelerating at MI, MA, EHOME motion.
- MGHP, MGHN is attempted with VS=0.
- MGHP, MGHN is attempted with HOMETYP=0 to 3 (2 sensor mode) and INLSP=INLSN=0 (±LS not configured).
- MGHP, MGHN is attempted with HOMETYP=4 to 11 (1, 3 sensor mode) and INHOME=0 (HOME not configured).

Error: Value is invalid.
Cause/action: Attempt to set parameter, non-numeric text found where numeric value expected (e.g. "DIS=abcde," "VR=3∗4").

Error: Argument is invalid.
Cause/action: Attempt to execute command, non-numeric text found where numeric argument expected (e.g. "MA abcde").

Error: Parameter is out of range.
Cause/action: Attempt to set parameter, value is out of range. (e.g. "VR=−0.1")

Error: Argument is out of range.
Cause/action: Attempted to execute command, argument is out of range.
(e.g. "MA 500001," "CURRENT 3")

Error: String is too long.
Cause/action: Length of string entered to user string parameter (S_xxx) exceeds 20 characters.

Error: Name is too long.
Cause/action: Length of string entered as the name of parameter (N_xxx, S_xxx) or sequence name exceeds 10 characters.

Error: Unsupported precision.
Cause/action: Numeric constant specified with precision over 3 decimal places. (e.g. "A=1.2345")
Numeric constant specified with too much precision for its scale.
Supported precision: 3 decimal places within ±500000
2 decimal places within ±5000000
1 decimal places within ±50000000
0 decimal places within ±500000000

Error: Parameter is read-only.
Cause/action: Attempted to write a read only parameter (e.g. "VC 10")

Error: EEPROM write failed.
Cause/action: Data writing failed while saving parameter to EEPROM (by CLEARALL, SAVEPRM, etc).

Error: Source sequence does not exist.	
Cause/action:	Sequence copy: source sequence does not exist.(e.g. "COPY X Y": Sequence X does not exist.)"
Error: Sequence already exists.	
Cause/action:	Rename: (new name) already exists.(e.g. "REN X Y": Sequence Y already exists.)
Error: Could not delete previous sequence.	
Cause/action:	Copy a sequence "over" another sequence, and could not delete the target sequence (maybe locked).
Error: Could not modify sequence. Executing?	
Cause/action:	Rename: Sequences cannot be changed. Sequences executing. Delete: Sequences cannot be changed. Sequences executing. Tried to modify sequences in some way, while a sequence was executing. Not permitted.
Error: Sequence directory full.	
Cause/action:	Copy: Required creating a new sequence, all 100 sequences exist already. Tried to create a sequence, by copying an existing sequence or saving from the editor. No free directory entries available: all 100 sequences are used.
Error: Sequence storage memory full.	
Cause/action:	Copy: Not enough memory to create a new sequence. Sum of stored sequences and this attempt to copy or save (from editor) would overflow available sequence storage memory. (in EEPROM).
Error: Sequence executable memory full.	
Cause/action:	Copy: Not enough memory to create a new sequence. Sum of stored sequences and this attempt to copy or save (from editor) would overflow available sequence executable memory. (in RAM).
Error: Destination sequence is locked.	
Cause/action:	Sequence copy: attempt to overwrite a locked sequence. (e.g. "COPY X Y": Sequence Y already exists and is locked.)
Error: Sequence is locked.	
Cause/action:	Rename: Target sequence is locked. Delete: Target sequence is locked. (e.g. "REN X Y," "DEL X," "EDIT X," "S X" (Save in sequence editor): X is locked
Error: Sequence storage memory access failed!	
Cause/action:	EEPROM may not be in operation. Failed to properly pass data to or from sequence storage. Data may be corrupt or unusable.
Error: Invalid sequence name.	
Cause/action:	Sequence name may exceed 10 characters. Sequence name may contain unpermitted letters. (e.g. Name starting with digit, "N_," "S_" etc)
Error: XXX(###) is out of range.	
Cause/action:	Parameter "XXX" is out of range. This may be caused by DPR, GA, GB change, followed by SAVEPRM or SAVEALL, and RESET.
Warning: XXX(###) is out of range.	
Cause/action:	Parameter "XXX" become out of range after DPR, GA, GB change.

10 Control by CANopen Communication

This chapter explains how to control the **CM10** using CANopen communication.
In this manual, physical I/O is defined as "Direct I/O" and CANopen I/O is defined as "Remote I/O."
The EDS file can be found on the attached CD-ROM. (File name: CM10_x_x.eds, under CANopen_EDS folder)

10.1 Overview

The **CM10** uses CANopen CiA 301 protocol and the product is tested and certified by the CiA (CAN in Automation).

- Via CANopen, you can make the motor move either by an immediate command or by program execution. All the functions for CANopen are the same as for USB and RS-232C. Refer to "6.4.2 Input Signals" on page27, "6.4.3 Output Signals" on page 30 and "8 Features" on page 48 for signals and commands.
- All the settings related to CANopen or program creation are done by the supplied utility software, **Immediate Motion Creator for CM/SCX Series** or a general terminal software via USB or RS-232C. Refer to "■ CANopen settings" in "12 Command Reference" on page 140 for commands related to the CANopen and "9 Program Creation and Execution".
- While both the PDO (Process Data Object) and SDO (Service Data Object) are supported with the **CM10**, the PDO is mainly explained in this manual.

10.2 Transmission Speed and ID Setting

First, be sure to set the communication baud rate and the ID. The setting is done by the supplied utility software, **Immediate Motion Creator for CM/SCX Series** via USB or RS-232C. If a general terminal software is used, use the CANBAUD command (page 165) and CANID command (page 166).

Item	Description
Protocol	CiA 301 Ver.4.02 compliant
Transmission speed	Software setting Selectable: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps
ID setting	Software setting (1 to 127)

10.3 LED Indication

The **CM10** has bicolor CAN LED to indicate communication statuses including run and error.

■ Red: Error

The CANopen error LED indicates the status of the CAN physical layer and errors due to missing CAN messages (sync, guard or heartbeat). If at a given time several errors are present, the error with the highest number is indicated (e.g. if NMT error and sync error occur, the sync error is indicated)

LED	State	Description
Off	No error	The device is in working condition
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
Double flash	Error control event	A guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
On	Bus off	The CAN controller is bus off

■ Green: Run

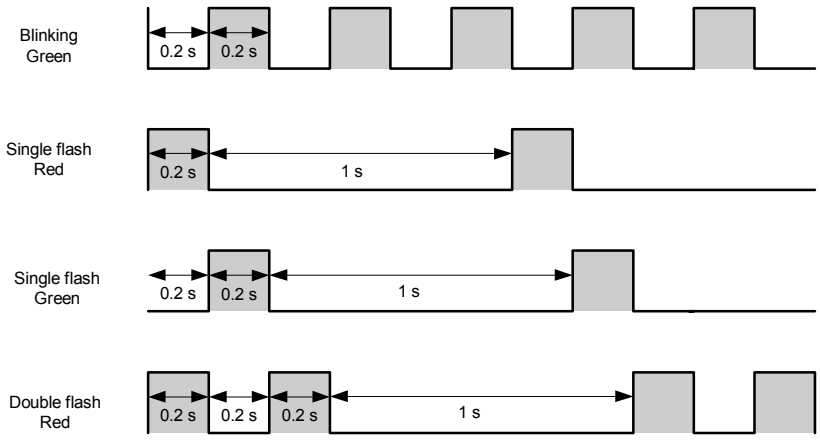
The CANopen run LED indicates the status of the CANopen network state machine.
If CAN has not been connected after turn the power on or the device is executing a reset, the CANopen run LED is off.

LED	State	Description
Blinking	Preoperational	The device is in a preoperational state
Single flash	Stopped	The device is in a stopped state
On	Operational	The device is in an operational state

Note In case there is a conflict between the LED being green versus red, the LED will be turned on red because errors have a higher priority.

■ LED Indicator States and Flash Rates

The following indicator states are defined.



10.4 Controlling I/O Message (PDO)

■ I/O Message Format

The **CM10** is controlled via CANopen by the following 8 byte I/O message formats; master to the **CM10**, and the **CM10** to a master, respectively.

- RPDO (Receive Process Data Object) : Master to **CM10**

The RPDO acts as an input of the **CM10**.

RPDO Mapping (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

- TPDO (Transmit Process Data Object) : **CM10** to Master

The TPDO acts as an output of the **CM10**.

TPDO Mapping (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	COMMAND _R							
Byte [3]	STATUS	TRIG_R						
Byte [4]	DATA_R							
Byte [5]								
Byte [6]								
Byte [7]								

■ Using as a Switch

- RPDO (INPUT of **CM10**)

Each bit in the Byte [0] and Byte [1] acts exactly the same as a physical switch used to control a signal on the I/O connector on the **CM10**. For example, to make the RIN1 turned ON, set the bit, Byte [0]-Bit [0] in RPDO to "1" (ON). The **CM10** receives this command and takes it as the "remote input 1 is turned ON."

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

In the Byte [1] area, signals that are commonly used are pre-assigned. For example, set the bit, Byte [1]-Bit [5] to 1. The motor current will be turned ON.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

Before any motion can occur, the motor current needs to be turned ON. Always keep this bit ON under normal operating conditions.

The functions of all pre-assigned I/Os are the same as the I/O signals on the I/O connector on the **CM10**. See "6.4.2 Input Signals" on page 27 and "6.4.3 Output Signals" on page 30 - for details of each signal.

- TPDO (OUTPUT of **CM10**)

Each bit in the Byte [0] and Byte [1] acts exactly the same as a physical switch or an output signal on the I/O connector on the **CM10** to control a master controller. For example, if the ROUT1 is 1 (ON), that means the remote output ROUT1 on the **CM10** is turned ON, and the remote input signal 1 of the master controller is turned ON.

TPDO (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	COMMAND_R							
Byte [3]	STATUS	TRIG_R						
Byte [4]	DATA_R							
Byte [5]								
Byte [6]								
Byte [7]								

In the same manner, if the READY is 1 (ON), it indicates that the **CM10** is in the ready status.

TPDO (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	COMMAND_R							
Byte [3]	STATUS	TRIG_R						
Byte [4]	DATA_R							
Byte [5]								
Byte [6]								
Byte [7]								

■ Assigning Signals

While the RIN1-RIN8 in the RPDO and ROUT1-ROUT6 in the TPDO are used as general I/O, you may also assign any of these I/Os to specific system inputs/outputs such as the ALMCLR (alarm clear), MSTOP (motor stop), MBFREE (magnetic brake free) and PSTS (pause status) in addition to pre-assigned I/Os explained before, and use these signals as the signals on the I/O connector on the **CM10**.

Example: MSTOP is assigned to RIN1

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	MSTOP
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

The signals assignable to remote I/Os are listed below. All assignments are done by the supplied utility software, **Immediate Motion Creator for CM/SCX Series** via a USB or RS-232C connection. If a general terminal software is used, refer to the chart below.
The functions of all system I/Os are the same as the I/O signals on the I/O connector on the **CM10**. See "6.4.2 Input Signals" on page 27 and "6.4.3 Output Signals" on page 30 - for details of each signal.

	Signal		Command for Assignment
INPUT (RPDO)	ALMCLR	(alarm clear)	RINALMCLR
	CONT	(continue motion)	RINCONT
	HOME	(home sensor)	RINHOME
	LSP	(limit switch positive)	RINLSP
	LSN	(limit switch negative)	RINLSN
	MSTOP	(motor stop)	RINMSTOP
	MGHP	(move go home positive)	RINMGHP
	PAUSE	(pause motion)	RINPAUSE
	PAUSECL	(pause clear)	RINPAUSECL
	PECLR	(position error clear)	RINPECLR
	PSTOP	(panic stop)	RINPSTOP
	SENSOR	(sensor)	RINSENSOR
	TL	(torque limiting/push-motion operation)	RINTL
OUTPUT (TPDO)	ABSDATA	(driver current position data ready)	ROUTABSDATA
	MBFREE	(magnetic brake free)	ROUTMBFREE
	PSTS	(pause status)	ROUTPSTS
	RUN	(sequence running)	ROUTRUN

■ Sending Message Commands

Let's make the motor move, starting with an index motion. The following procedure is required to make an incremental move, as same as the communication via the USB/RS-232C. Assume the user unit is set to "Rev" (revolution).

1. Set the starting velocity, VS=0.1. (0.1Rev/sec)
2. Set the running velocity, VR=1. (1Rev/sec)
3. Set the acceleration time, TA=0.2. (0.2Rev/sec)
4. Set the deceleration time, TD=0.2. (0.2Rev/sec)
5. Set the motion distance, DIS=1. (1Rev)
6. Set the move index command, MI.

- Sending a Message Command

The message command code is formed by 14 bits. The parameter following the command is written in the DATA area.
To set the first parameter VS=0.1, find the command code for a "Write" of the VS from the following "10.6 I/O Message Command Code list (PDO)." "1142h" is found to be the command code for a write of the VS. The command code is written as a hexadecimal number (last digit "h" means hexadecimal).
The parameter (0.1) following the command (VS) is set in the DATA area. The data format is a signed integer and little endian (start from least significant bytes). Since the user unit can be up to three decimal places, you must always multiply the user unit value by 1000. Thus, "0.1" becomes "100." It is 64h.

Set these command code and data into designated areas as follows.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1142h							
Byte [3]	-	TRIG						
Byte [4]	64h							
Byte [5]								
Byte [6]								
Byte [7]								

* The CON needs to be kept ON for motor operation.

The data is set to the **CM10** when the trigger (TRIG) bit is set to 1 (ON).

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1142h							
Byte [3]	-	TRIG						
Byte [4]	64h							
Byte [5]								
Byte [6]								
Byte [7]								

Note that all the command codes and data need to be kept until the TRIG to be set to 1, since all data is read by the **CM10** when the trigger state is changed from 0 to 1.

- Confirming a Message Receipt and Status

After sending message command, a confirmation of receipt is done by checking the TPDO message.
The TRIG_R (trigger response) indicates that the process is completed (the message is received), and COMMAND_R areas show what are received. (It is right response that the data of the DATA_R area is 0 when a write command is issued in the RPDO.)

TPDO (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	1142h							
Byte [3]	STATUS	TRIG_R						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

If the STATUS is 1 (ON), that means that there is a process error.

TPDO (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	1142h							
Byte [3]	STATUS	TRIG_R						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

Errors occur if the condition is not allowed such as the parameter is out of range or the parameters are sent when it is not allowed.
After confirming TRIG_R, you may clear all the data from the RPDO, except Byte [0] and Byte [1].

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	0h							
Byte [3]	-	TRIG						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

The **CM10** is now ready to receive next parameters.

Set other parameters including the VR, TA, TD, DIS by using the same procedure.
Note that the time is in milliseconds. In other words, always multiply by 1000 when seconds are used for the time unit. For setting TA=0.2, 200 should be set in the DATA area.
After setting all parameters, set the move index command MI, and then set the TRIG to 1.
When the TRIG to 1, the motor will start to move and will rotate one revolution.

■ Requesting Current Parameter and Status

Not only can you send commands to the **CM10**, but you may also ask the **CM10** about a parameter's value/status.

For instance, if a verifying the current VS value is required, find the command code for a "Read" of the VS from the following "IO Message command code list." "0142h" is found to be the command code for a read of the VS. Set the command code as previously explained.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	0142h							
Byte [3]	-	TRIG						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

∗ The DATA value is not required in a read command.

Set the TRIG to 1. After setting the TRIG to 1, the **CM10** will send the value of the requested parameter to the master using TPDO as follows.

TPDO (**CM10** → Master)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	0142h							
Byte [3]	STATUS	TRIG_R						
Byte [4]	64h							
Byte [5]								
Byte [6]								
Byte [7]								

By using same method as writing the parameter, this is read as VS=0.1.

Set the TRIG back to "0" for the next command execution.

■ I/O Command and Message Command

In some cases, the same command can be set by either I/O command or message command.

- Using an I/O Command

For an example of an I/O command, the MCP (move continuously positive) can be commanded by just setting the bit, Byte [1]-Bit [1] to 1 (ON). The motor starts to move as soon as MCP is set to 1.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

To stop the motion, set the ABORT bit, Byte [1]-Bit [4] to 1 (ON). The MSTOP, PAUSE and PSTOP commands can also be used if they are assigned to any of the RIN1-RIN8.

- Using a Message Command

For an example of using a message command, set the command code for the MCP "1C12h."
∗ Note that digit "C" in hexadecimal is defined as "1100" in binary.
∗ The data area is blank (set to zero), since MCP does not require a parameter.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1C12h							
Byte [3]	-	TRIG						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

The motor starts to rotate in positive direction when TRIG bit is set to 1.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1C12h							
Byte [3]	-	TRIG						
Byte [4]	0h							
Byte [5]								
Byte [6]								
Byte [7]								

Set the TRIG bit back to "0" for the next command execution.

Memo Various message commands can also be used to stop the motion instead of using I/O command such as the ABORT as explained above. See "■ Motion Commands" on page 132. Set the command code of each stop command and then set the TRIG bit to 1.

■ Executing a Sequence

There are two ways to make a sequence execute, one is to select a sequence using remote inputs and the other one is using a message command.

- Using I/O Commands (Remote Inputs)

Set the program number (in decimal format) in Byte [0] area in binary format.
For instance, if the program number 3 needs to be executed, set the program number as below.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

When the START bit is set to 1, the program number 3 is executed.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	TART
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

After the program is started, set the START bit back to "0" for the next command execution.

Note

- When any of the RIN1-RIN8 is assigned to specific system inputs such as the ALMCLR (alarm clear) and MSTOP (motor stop), these bits (inputs) cannot be used to select the program number. The value of an assigned input is always 0.
- Try to avoid a use of the same input both in the program and for the program selection. For example, If the program is written so that it refers RIN1 in the beginning of the sequence, you must clear RIN1 status right after executing the program. (Otherwise, the **CM10** reads RIN1 as ON in the program if the RIN is set to 1 at the program selection.) In order to avoid it, the method that performs a program selection using the message command shown as follows is effective.

- Using a Message Command

Set the command code for run sequence, the RUN (1C05h) in COMMAND area, and set program number 3 (03h) in the DATA area as below.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1C05h							
Byte [3]	-	TRIG						
Byte [4]	03h							
Byte [5]								
Byte [6]								
Byte [7]								

When the TRIG bit is set to 1, program number 3 is executed.

RPDO (Master → **CM10**)

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	1C05h							
Byte [3]	-	TRIG						
Byte [4]	03h							
Byte [5]								
Byte [6]								
Byte [7]								

Set the TRIG bit back to "0" for the next command execution.

10.5 I/O Message Format (PDO)

■ RPDO Mapping: Master → CM10

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	RIN8	RIN7	RIN6	RIN5	RIN4	RIN3	RIN2	RIN1
Byte [1]	-	FREE	CON	ABORT	MGHN	MCN	MCP	START
Byte [2]	COMMAND							
Byte [3]	-	TRIG						
Byte [4]	DATA							
Byte [5]								
Byte [6]								
Byte [7]								

Signals	Description	Range
RIN1 to RIN8	1) Remote General Inputs All inputs can be assigned to system remote input signals. (PSTOP, MSTOP, MGHP, PAUSE, CONT, PAUSECL, ALMCLR, SENSOR, HOME, +LS, -LS, PECLR, TL). 2) Sequence Number Select If RINx is assigned to a system remote input signal, RINx is 0.	0: Not Active 1: Active
START	Start Sequence When the signal level is changed from 0 to 1, start the sequence whose sequence number (0-99) is determined by the selected RIN1 to RIN7. (Edge trigger start) Set the starting method using the STARTACT command.	<STARTACT=0> 0: No Action 1: Start Sequence <STARTACT=1> 0: Abort Sequence 1: Start Sequence
MCP	Move Continuously Positive	0: No Action 1: Start Motion Positive
MCN	Move Continuously Negative	0: No Action 1: Start Motion Negative
MGHN	Move Go Home Negative (HOMETYP command determines the type of home seeking motion.)	0: No Action 1: Go Home
ABORT	Abort Motion and Sequence Execution	<Motion> 0: No Action 1: Stop Motions <Sequence Program> 0: No Action 1: Abort
CON	Motor Current ON/OFF	0: Motor Current OFF 1: Motor Current ON
FREE	Motor Current OFF, Magnetic Brake Free	0: Normal Condition 1: Motor Shaft Free
COMMAND	Command Code for Parameter, Monitor or Maintenance Command	See I/O Message Command Code List in detail.
TRIG	Trigger for Handshake When parameter for reading and writing parameter and when monitor and maintenance command are transmitted, this bit is set from 0 to 1 to indicate data is ready for loading	0: No Action 1: Execute
DATA	Data for Parameter Writing or Argument of a Command.	See I/O Message Command Code List in detail.

■ TPDO Mapping: CM10 → Master

	Bit [7]	Bit [6]	Bit [5]	Bit [4]	Bit [3]	Bit [2]	Bit [1]	Bit [0]
Byte [0]	ALM	WNG	ROUT6	ROUT5	ROUT4	ROUT3	ROUT2	ROUT1
Byte [1]	0	1	READY	LC	HOME_P	MOVE	END	START_R
Byte [2]	COMMAND_R							
Byte [3]	STATUS	TRIG_R						
Byte [4]	DATA_R							
Byte [5]								
Byte [6]								
Byte [7]								

Signals	Description	Range
ROUT1 to ROUT6	Remote General Outputs All outputs can be assigned to system output signals. (RUN, PSTS, MBFREE, ABSDATA)	0: Not Active 1: Active
WNG	Warning	0: No Warning 1: Warning Occurred
ALM	Alarm	0: No Alarm 1: Alarm Occurred
START_R	Echo of START Input Signal	0: START input signal is 0 1: START input signal is 1
END	Motion End	When ENDACT=0, DEND=0 ·0: Pulse Generating ·1: End of Pulse Generating When ENDACT>0 (End area), DEND=0 ·0: Pulse Generating or not in END Area ·1: End of Pulse and within END Area When DEND=1 (ENDACT: Unrelated) ·0: Driver END Signal Inactive ·1: Driver END Signal Active
MOVE	Motor Moving	0: Stopped 1: Moving (pulses are generating or sensor-less mechanical home seeking is in a operation)
HOME_P	Home Position	0: Not in HOME Position 1: At HOME Position
LC	Limiting Condition -**CM10-1** + **AR** Series driver/**LSD** driver: When the motor is in a state of push condition (the position deviation is 1.8 degrees or more) in the normal operating mode, or when the motor torque reaches to the preset value in the current control operating mode. -**CM10-1**, **5** + **NX** Series driver: When the motor torque reaches the preset value while the torque limiting function is used. -**CM10-2** + **RBK** Series driver: Under current cutback condition -**CM10-3** + **ESMC** controller: While pressing the mechanical home when performing sensor-less mechanical home seeking operation.	0: Not in Limiting Condition 1: Limiting Condition
READY	Operation Ready - Possible to execute sequence program - Possible to start motion command (MA, MI, MCP, MCN, MGHP, MGHN, MIx, EHOME, CONT) ∗ This bit is 1 when RUN, MOVE and ALM outputs are 0.	0: Not Ready 1: Ready
COMMAND_R	Echo of Command Code	See I/O Message Command Code List in detail.

TRIG_R	Echo of Trigger	0: Not yet Process 1: Processing Completed
STATUS	If sequence program cannot be executed, this bit is 1.	0: Normal 1: Process Error
DATA_R	Result of Read Parameter, Monitor or Maintenance Command	See I/O Message Command Code list in detail.

10.6 I/O Message Command Code List (PDO)

■ Format

Data formats for user unit and time: For user unit, always multiply the user unit by 1000, since the decimal point is not used in message commands. The unit of time is in millisecond.

Ex. Incremental motion distance=12.7 mm (user unit): Set the value, 12700 in the command message.

Running velocity=10 mm/sec (user unit): Set the value, 10000 in the command message.

The MAXPOS and MAXVEL in the chart below are also 1000 times greater than the formula in the command description and shown on the terminal window.

Acceleration time=1 sec: Set the value, 1000 in the command message.

■ Motion Data

Memo Refer to the "12 Command Reference" and "8 Features" for the detail of commands.

Command Code		Description	Range	Factory Setting	Command
Read	Write				
0140h	1140h	Acceleration Time	1 to 500,000 [msec]	500	TA
0141h	1141h	Deceleration Time	1 to 500,000 [msec]	500	TD
0142h	1142h	Starting Velocity	0 to MAXVEL [UU/sec]	100	VS
0160h	1160h	Mechanical Home Seeking Mode	0 to 12	0	HOMETYP
0164h	1164h	Offset for Mechanical Home Seeking	-MAXPOS to +MAXPOS [UU]	0	OFFSET
0380h	1380h	Driver Operation Data	0 to 7	0	DD
0400h	1400h	Distance for Incremental Motion	-MAXPOS to +MAXPOS [UU]	0	DIS
0401h	1401h	Position Array Data No.1	-MAXPOS to +MAXPOS [UU]	0	POS[1]
:	:	:	:	:	:
0464h	1464h	Position Array Data No.100	-MAXPOS to +MAXPOS [UU]	0	POS[100]
0480h	1480h	Running Velocity	1 to MAXVEL [UU/sec]	1000	VR
04A0h	14A0h	Distance from SENSOR Input to the Stop Position	0 to MAXPOS [UU]	0	SCHGPOS
04A1h	14A1h	Velocity after SENSOR Input	1 to MAXVEL [UU/sec]	1000	SCHGVR
0500h	1500h	Distance or Destination for Link Segment '0'	-MAXPOS to +MAXPOS [UU]	0	DIS0
0501h	1501h	Distance or Destination for Link Segment '1'	-MAXPOS to +MAXPOS [UU]	0	DIS1
0502h	1502h	Distance or Destination for Link Segment '2'	-MAXPOS to +MAXPOS [UU]	0	DIS2
0503h	1503h	Distance or Destination for Link Segment '3'	-MAXPOS to +MAXPOS [UU]	0	DIS3
0510h	1510h	Running Velocity of Link Segment '0'	1 to MAXVEL [UU/sec]	1000	VR0
0511h	1511h	Running Velocity of Link Segment '1'	1 to MAXVEL [UU/sec]	1000	VR1
0512h	1512h	Running Velocity of Link Segment '2'	1 to MAXVEL [UU/sec]	1000	VR2
0513h	1513h	Running Velocity of Link Segment '3'	1 to MAXVEL [UU/sec]	1000	VR3
0520h	1520h	Link Type for Link Segment '0'	0: Absolute 1: Incremental	1	INCABS0
0521h	1521h	Link Type for Link Segment '1'	0: Absolute 1: Incremental	1	INCABS1
0522h	1522h	Link Type for Link Segment '2'	0: Absolute 1: Incremental	1	INCABS2
0523h	1523h	Link Type for Link Segment '3'	0: Absolute 1: Incremental	1	INCABS3
0530h	1530h	Link Control for Link Segment '0'	0: No link 1: Link	0	LINK0
0531h	1531h	Link Control for Link Segment '1'	0: No link 1: Link	0	LINK1
0532h	1532h	Link Control for Link Segment '2'	0: No link 1: Link	0	LINK2
0900h	1900h	Running Timer	0 to 500,000,000 [msec]	-	TIMER

■ Motion Commands

Command Code	Description	Range	Command
1C00h	Soft Stop	n/a	SSTOP
1C01h	Hard Stop	n/a	HSTOP
1C02h	Panic Stop	n/a	PSTOP
1C03h	Motor Stop	n/a	MSTOP
1C04h	Abort Motion and Sequence Execution	n/a	ABORT
1C05h	Run Sequence (Sequence number is set in DATA.)	0 to 99	RUN
1C10h	Start Incremental Motion, Distance DIS	n/a	MI
1C11h	Start Absolute Motion to the Specified Destination	1 to 100	MA [POSx]
1C12h	Move Continuously Positive	n/a	MCP
1C13h	Move Continuously Negative	n/a	MCN
1C14h	Move Go Home Positive	n/a	MGHP
1C15h	Move Go Home Negative	n/a	MGHN
1C16h	Start Linked Motion at Link Segment 'x'	0 to 3	MI[x]
1C17h	Start Return-to-electrical Home Operation	n/a	EHOME
1C18h	Pause Motion	n/a	PAUSE
1C19h	Continue Motion	n/a	CONT
1C1Ah	Pause Clear	n/a	PAUSECLR
1C1Bh	Change Velocity (Change velocity is set in DATA.)	0.001 to MAXVEL [UU/sec]	CV
1C1Ch	Position Error Clear	-	PECLR
1C1Dh	Reading Driver Current Position	-	ABSREQ
1C1Eh	Reading Driver Current Position/Updating Internal Position	-	ABSREQPC
1C1Fh	Torque Limiting/Push-motion Operation/Current Cutback Release	0, 1	TL

n/a: Not Applicable.

■ Monitor Commands

Command Code	Description	Range	Command
2040h	Alarm Status	0 to 255	ALM
2063h	Position Command	-MAXPOS to +MAXPOS [UU]	PC
2064h	Velocity Command	-MAXVEL to +MAXVEL [UU/sec]	VC
2066h	Feedback Position	-MAXPOS to +MAXPOS [UU]	PF
206Ah	General Input Status	0 to 511	IN
206Bh	Driver Current Position	-2,147,483.648 to +2,147,483.647 [UU]	PABS
206Ch	Driver Status Code/Driver Alarm Code	(driver-dependent)	ABSSTS
2080h	Position Error	-MAXPOS to +MAXPOS [UU]	PE
2081h	Encoder Count	-MAXEC to +MAXEC	EC
2091h	System Signal Input Status	0 to 2,096,127	INSG
2092h	General Output Status	0 to 15	OUT
2093h	System Signal Output Status	0 to 1,983	OUTSG
20A0h	Remote General Input Status	0 to 255	RIN
20A2h	Remote General Output Status	0 to 63	ROUT
20B0h	Driver General Input Status	0 to 127	DIN
20B1h	Driver System Signal Input Status	0 to 127	DINSG
20B2h	Driver General Output Status	0 to 255	DOUT
20B3h	Driver System Signal Output Status	1 to 16,382	DOUTSG

■ Maintenance Command

Command Code	Description	Range	Command
30C0h	Alarm Clear	0: Not Reset 1: Reset	ALMCLR
30C5h	Reset Home Position	-	PRESET
30CAh	Enable Driver Operation after Absolute Position Loss Alarm Release	-	ABSPLSEN

Note The minimum output frequency on the **CM10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

10.7 Object Dictionary (SDO)

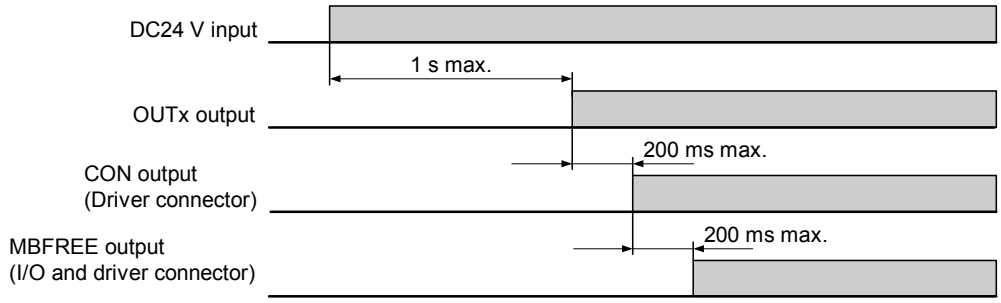
Index (hex)	Sub Index (Hex)	Name	Data Type	Access	Factory Setting	Comment
1000	00	Device Type	UNSIGNED32	R	00000000h	
1001	00	Error Register	UNSIGNED8	R	-	generic error (bit 0) only
1008	00	Manufacturer Device Name	Visible String	R		**CM10** **SCX10**
1009	00	Manufacturer Hardware Version	Visible String	R	1	
100A	00	Manufacturer Software Version	Visible String	R	2	
100C	00	Guard Time	UNSIGNED16	R W	0	msec
100D	00	Life Time Factor	UNSIGNED8	R W	0	
1010		Store Parameters				Signature "save"
	00	Largest Subindex Supported	UNSIGNED8	R	2	
	01	Save all Parameters	UNSIGNED32	R W	-	
	02	Save Communication Parameters	UNSIGNED32	R W	-	
1011		Restore Default Parameters	UNSIGNED32		-	Signature "load"
	00	Largest Subindex Supported	UNSIGNED8	R	2	
	01	Restore all Default Parameters	UNSIGNED32	R W	-	
	02	Restore Communication Default Parameters	UNSIGNED32	R W	-	
1014	00	COB-ID Emergency Object	UNSIGNED32	R	Node-ID+00000080h	
1017	00	Producer Heartbeat Time	UNSIGNED16	R W	0	
1018		Identity Object				
	00	Number of Entries	UNSIGNED8	R	2	
	01	Vendor ID	UNSIGNED32	R	000002BEh	Oriental Motor (Europa) GmbH
	02	Product Code	UNSIGNED32	R		**CM10**: 5001 **SCX10**: 5002
1400		Receive PDO Communication Parameter				
	00	Largest Sub-index Supported	UNSIGNED8	R	2	
	01	COB-ID Used by PDO	UNSIGNED32	R	Node-ID+200h	
	02	Transmission type	UNSIGNED8	R	254	Manufacturer specific (immediately)
1600		Receive PDO Mapping Parameter			-	
	00	Number of Mapped Application Objects in PDO	UNSIGNED8	R	3	
	01	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E000110h	INP (Index=2E00h, Sub Index= 01h, 16bit)
	02	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E000210h	AID (Index=2E00h, Sub Index= 02h, 16bit)
	03	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E000320h	DATA (Index=2E00h, Sub Index =03h, 32bit)
1800		Transmit PDO Communication Parameter				
	00	Largest Sub-index Supported	UNSIGNED8	R	5	
	01	COB-ID Used by PDO	UNSIGNED32	R W	Node-ID+180h	Bit 31 is 1, if inhibit time and/or event timer is changed.
	02	Transmission Type	UNSIGNED8	R	254	Manufacturer specific (Event: COS, Time over)
	03	Inhibit Time	UNSIGNED16	R W	0	The value is defined as multiple of 100 µsec.
	05	Event Timer	UNSIGNED16	R W	0	The event timer elapses as multiple of 1 msec.

Index (hex)	Sub Index (Hex)	Name	Data Type	Access	Factory Setting	Comment
1A00		Transmit PDO Mapping Parameter			-	
	00	Number of Mapped Application Objects in PDO	UNSIGNED8	R	3	
	01	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E100110 h	OUTP (Index=E10h, Sub Index=01h, 16bit)
	02	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E100210 h	ID_R (Index=2E10h, Sub Index=02h, 16bit)
	03	PDO Mapping for the nth Application to be Mapped	UNSIGNED32	R	2E100320 h	DATA_R (Index=2E10h, Sub Index=03h, 32bit)
2040	00	Alarm Status	UNSIGNED8	R	0	ALM
2063	00	Position Command	SIGNED32	RW	-	PC (-MAXPOS to +MAXPOS) UU
2064	00	Velocity Command	SIGNED32	R	-	VC (-MAXVEL to +MAXVEL) UU/sec
2066	00	Feedback Position	SIGNED32	RW	-	PF (-MAXPOS to +MAXPOS) UU
206A	00	General Input Status	UNSIGNED32	R		IN (0 to 511)
206B	00	Driver Current Position	SIGNED32	R	-	PABS (-2,147,483.648 to 2,147,483.647)
206C	00	Driver Status Code/Driver Alarm Code	UNSIGNED16	R	-	ABSSTS
2080	00	Position Error	SIGNED32	R	-	PE (-MAXPOS to +MAXPOS) UU
2081	00	Encoder Count	SIGNED32	RW	-	EC (-MAXEC to +MAXEC)
2091	00	System Signal Input Status	UNSIGNED32	R	-	INSG (0 to 2,096,127)
2092	00	General Output Status	UNSIGNED32	R	-	OUT (0 to 15)
2093	00	System Signal Output Status	UNSIGNED32	R	-	OUTSG (0 to 1,983)
20A0	00	Remote General Input Status	UNSIGNED8	R	-	RIN (0 to 255)
20A2	00	Remote General Output Status	UNSIGNED8	R	-	ROUT (0 to 63)
20B0	00	Driver General Input Status	UNSIGNED8	R	-	DIN (0 to 127)
20B1	00	Driver System Signal Input Status	UNSIGNED32	R	-	DINSG (0 to 127)
20B2	00	Driver General Output Status	UNSIGNED8	R	-	DOUT (0 to 255)
20B3	00	Driver System Signal Output Status	UNSIGNED32	R	-	DOUTSG (1 to 16,382)
20C0	00	Alarm Clear	UNSIGNED8	W	-	ALMCLR
2140	00	Acceleration Time	UNSIGNED32	RW	500	TA (1 to 500,000) msec
2141	00	Deceleration Time	UNSIGNED32	RW	500	TD (1 to 500,000) msec
2142	00	Starting Velocity	UNSIGNED32	RW	100	VS (0 to MAXVEL) UU/sec
2160	00	Mechanical Home Seeking Mode	UNSIGNED8	RW	0	HOMETYP (0 to 12)
2164	00	Offset for Mechanical Home Seeking	SIGNED32	RW	0	OFFSET (-MAXPOS to +MAXPOS) UU
2380	00	Driver Operation Data	UNSIGNED8	RW	0	DD (0 to 7)
2400	00	Distance for Incremental Motion	SIGNED32	RW	0	DIS (-MAXPOS to +MAXPOS) UU
2401		Absolute Position				
	00	Number of Entries	UNSIGNED8	R	100	
	01	Position Array Data No.1	SIGNED32	RW	0	POS[1] (-MAXPOS to +MAXPOS) UU
	:		SIGNED32	RW	0	:
	64	Position Array Data No.100	SIGNED32	RW	0	POS[100] (-MAXPOS to +MAXPOS) UU
2480	00	Running Velocity	UNSIGNED32	RW	1000	VR (1 to MAXVEL) UU/sec
24A0	00	Distance from SENSOR Input to the Stop Position	UNSIGNED32	RW	0	SCHGPOS (0 to MAXPOS) UU
24A1	00	Velocity after SENSOR Input	UNSIGNED32	RW	1000	SCHGVR (1 to MAXVEL) UU/sec

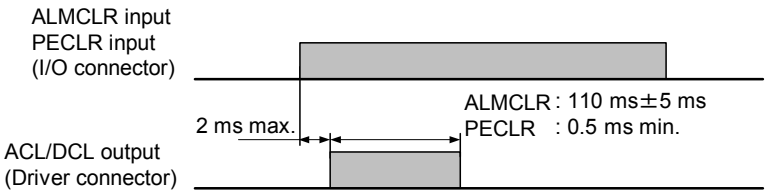
Index (hex)	Sub Index (Hex)	Name	Data Type	Access	Factory Setting	Comment
2500		Linked Motion Distance or Destination	SIGNED32	RW		
	00	Number of Entries	UNSIGNED8	R	4	
	01	Distance or Destination for Link Segment '0'	SIGNED32	RW	0	DIS0 (-MAXPOS to +MAXPOS) UU
	02	Distance or Destination for Link Segment '1'	SIGNED32	RW	0	DIS1 (-MAXPOS to +MAXPOS) UU
	03	Distance or Destination for Link Segment '2'	SIGNED32	RW	0	DIS2 (-MAXPOS to +MAXPOS) UU
	04	Distance or Destination for Link Segment '3'	SIGNED32	RW	0	DIS3 (-MAXPOS to +MAXPOS) UU
2510		Linked Motion Running Velocity				
	00	Number of Entries	UNSIGNED8	R	4	
	01	Running Velocity of Link Segment '0'	SIGNED32	RW	1000	VR0 (1 to MAXVEL) UU/sec
	02	Running Velocity of Link Segment '1'	SIGNED32	RW	1000	VR1 (1 to MAXVEL) UU/sec
	03	Running Velocity of Link Segment '2'	SIGNED32	RW	1000	VR2 (1 to MAXVEL) UU/sec
	04	Running Velocity of Link Segment '3'	SIGNED32	RW	1000	VR3 (1 to MAXVEL) UU/sec
2520		Linked Move Type				
	00	Number of Entries	UNSIGNED8	R	4	
	01	Link Type for Link Segment '0'	BOOLEAN	RW	1	INCABS0 (0:Absolute, 1:Incremental)
	02	Link Type for Link Segment '1'	BOOLEAN	RW	1	INCABS1 (0:Absolute, 1:Incremental)
	03	Link Type for Link Segment '2'	BOOLEAN	RW	1	INCABS2 (0:Absolute, 1:Incremental)
	04	Link Type for Link Segment '3'	BOOLEAN	RW	1	INCABS3 (0:Absolute, 1:Incremental)
2530		Link Control				
	00	Number of Entries	UNSIGNED8	R	3	
	01	Link Control for Link Segment '0'	BOOLEAN	RW	0	LINK0 (0:No Link, 1:Link-to-next)
	02	Link Control for Link Segment '1'	BOOLEAN	RW	0	LINK1 (0:No Link, 1:Link-to-next)
	03	Link Control for Link Segment '2'	BOOLEAN	RW	0	LINK2 (0:No Link, 1:Link-to-next)
2900	00	Running Timer	UNSIGNED32	RW	-	TIMER (0 to 500,000,000) msec
2E00		Command				
	00	Number of Entries	UNSIGNED8	R	3	
	01	INP	UNSIGNED16	RW	-	CANINP
	02	CANID	UNSIGNED16	RW	-	CANID
	03	DATA	UNSIGNED32	RW	-	CANDATA
2E10		Response				
	00	Number of Entries	UNSIGNED8	R	3	
	01	OUTP	UNSIGNED16	R	-	CANOUTP
	02	CANID_R	UNSIGNED16	R	-	CANID_R
	03	DATA_R	UNSIGNED32	R	-	CANDATA_R

11 Timing Charts

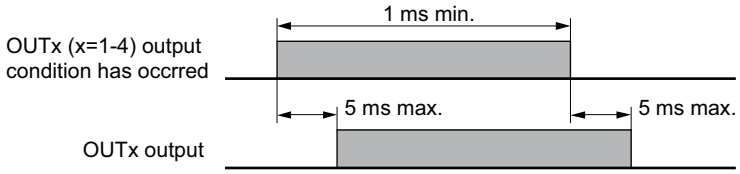
■ Power Input



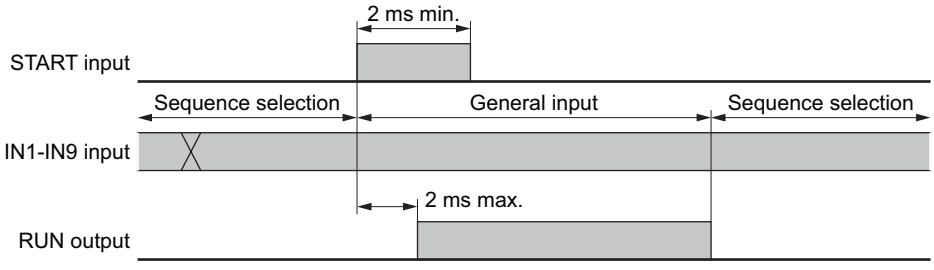
■ Driver Alarm Clear and Deviation Counter Clear



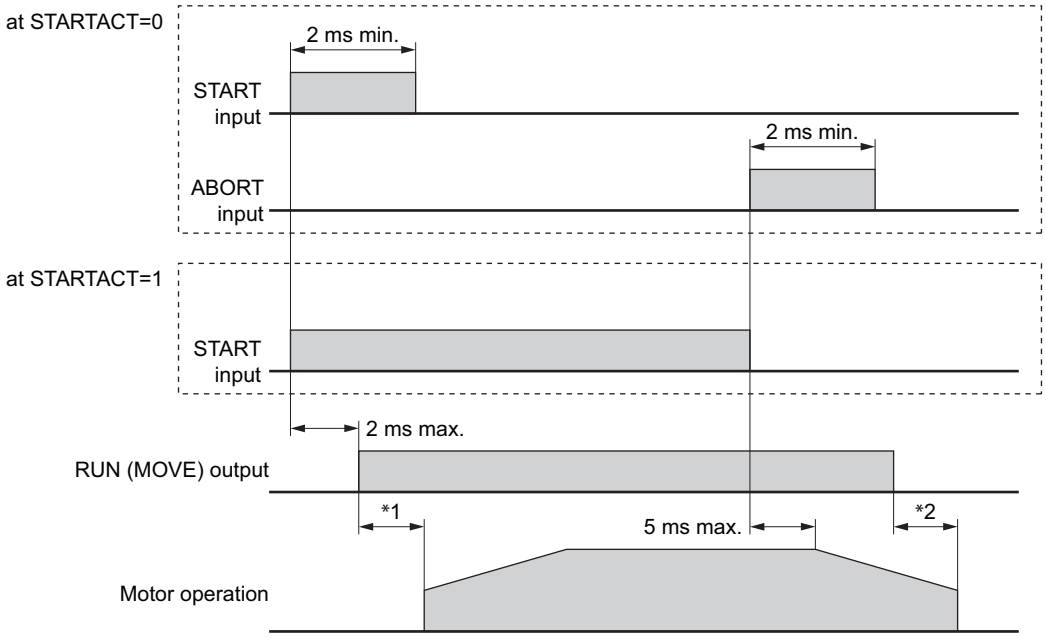
■ General Output



■ Selection and Execution of a Sequence

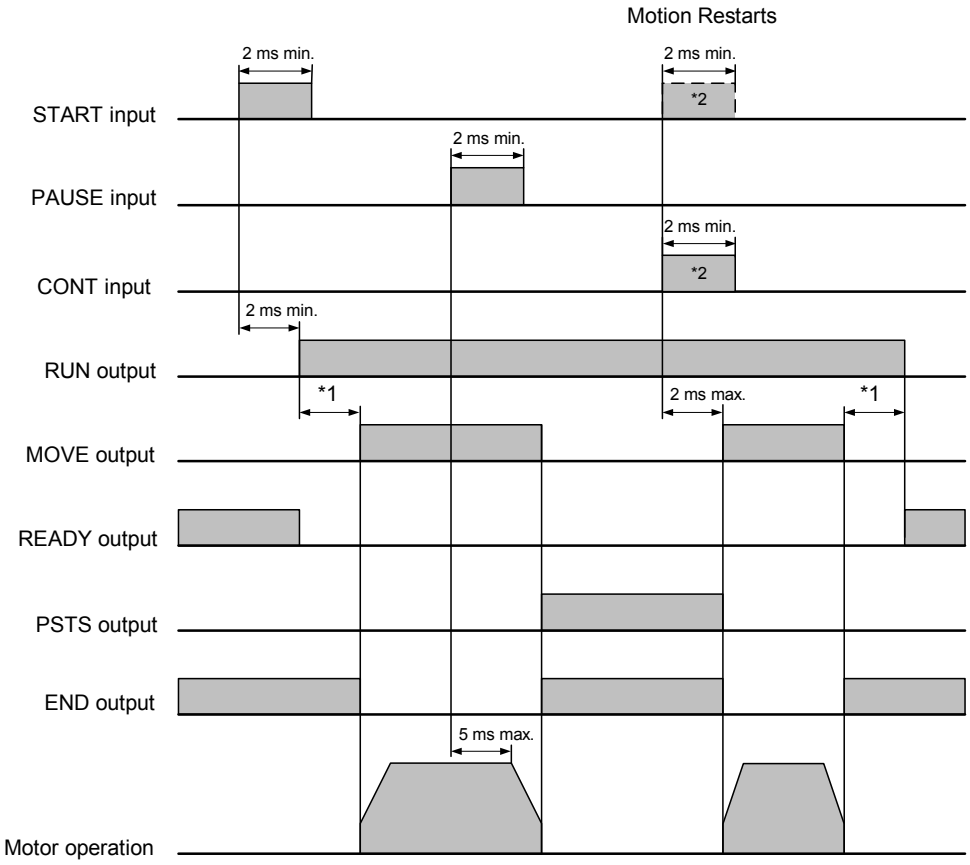


■ Execution and Stopping a Sequence (START, ABORT, RUN, MOVE)



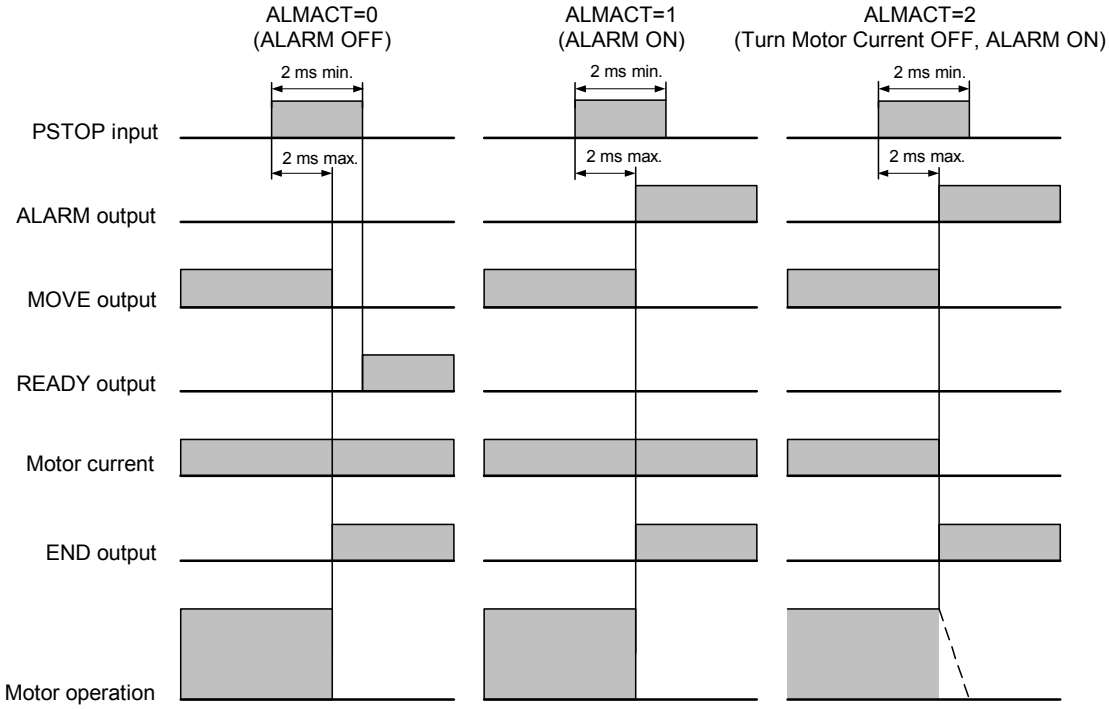
∗1 Depend on the program.
∗2 Depend on the load condition and settling time at stop.

■ Pausing Index Operation (PAUSE, PSTS)

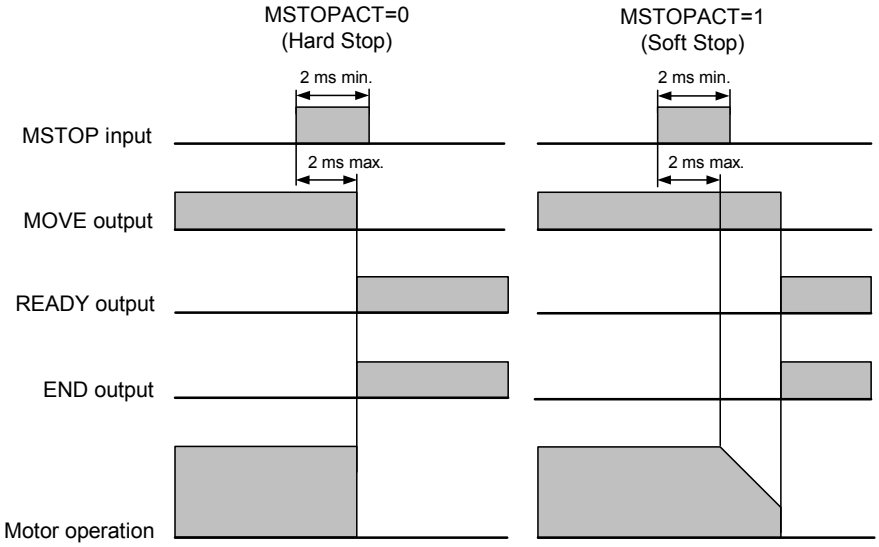


∗1 Depend on the program.
∗2 CONT input always resumes the paused motion while START input resumes the paused motion only when sequence is running and STARTACT is set to 0. Either one of them is used.

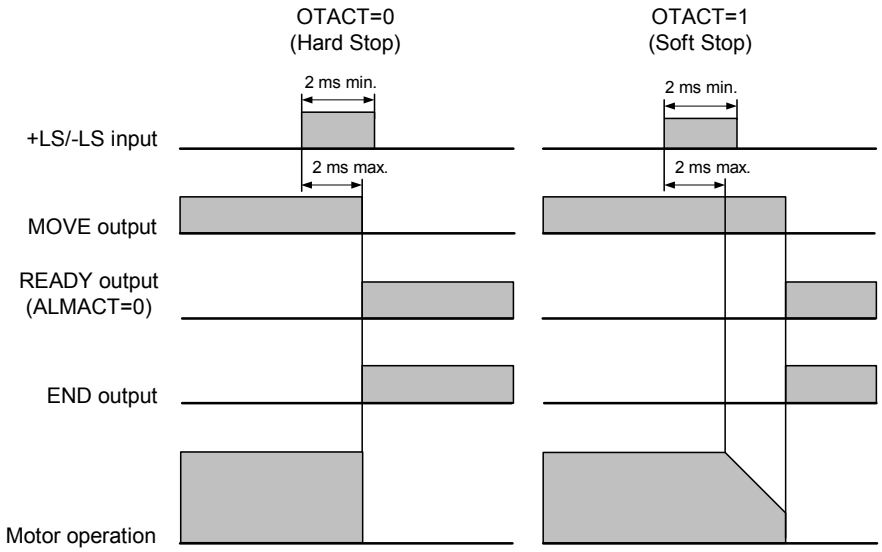
■ When the PSTOP Input is Turned ON



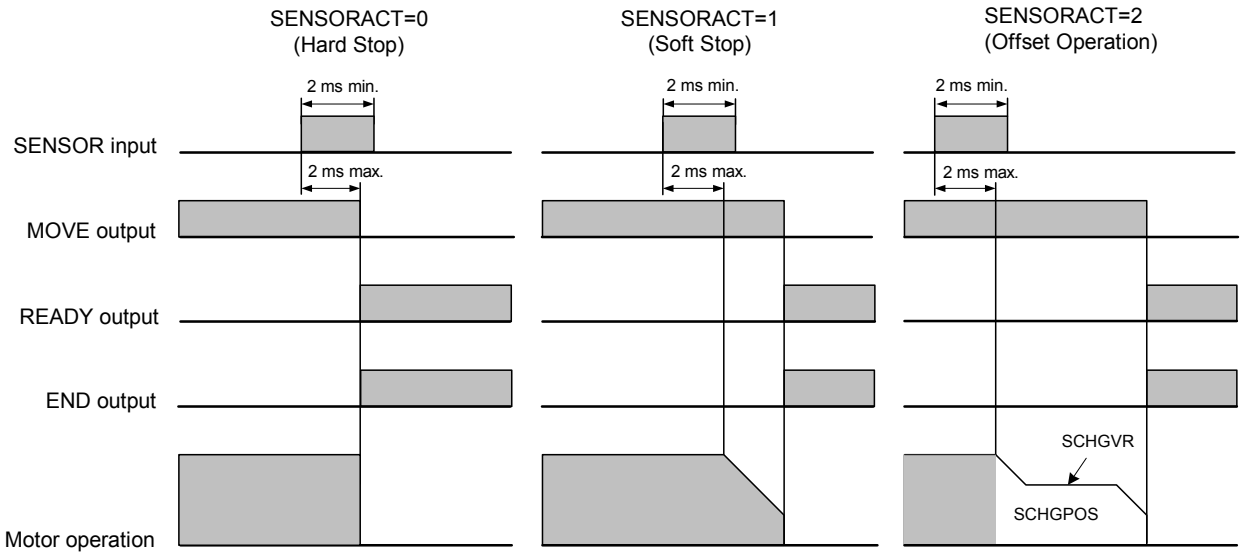
■ When the MSTOP Input is Turned ON



■ When the (+LS, −LS) Input is Used

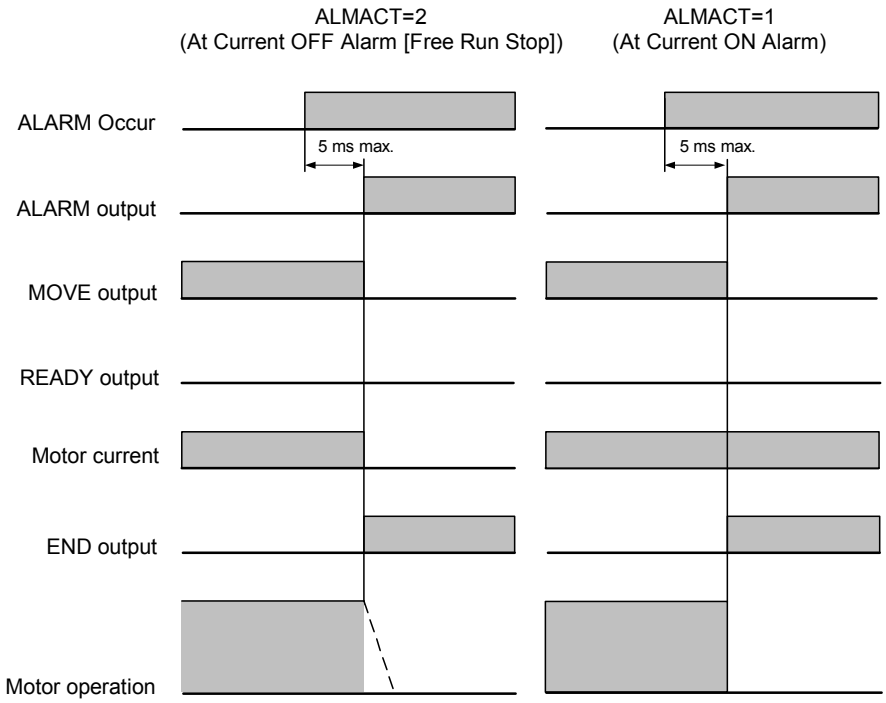


■ When the SENSOR Input is Used

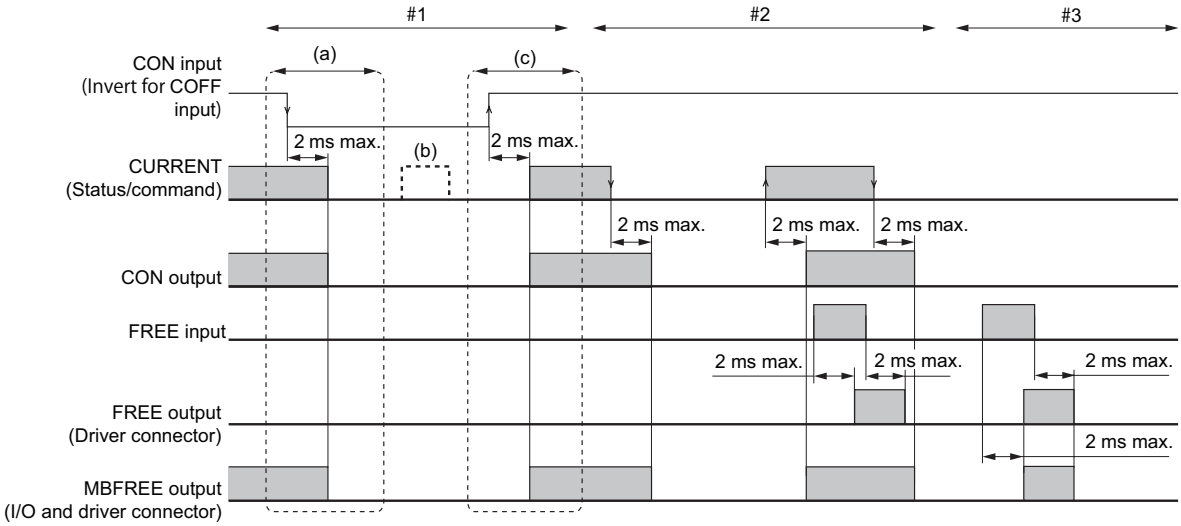


If SENSORACT=3, even when the SENSOR input is detected, the motor does not stop. Set SENSORACT=3 when using the SENSOR input only in the return-to-mechanical home operation.

■ When an ALARM is Occurred



■ Operation for Motor Excitation and Electromagnetic Brake



Operation using the CON input and CURRENT command

#1 Operation using the CON input

(a) The falling edge of the CON input (the leading edge of the COFF input) is detected in excitation state.
CURRENT=1→0, the CON output is OFF, the MBFREE output is OFF (magnetic brake lock)

(b) When the CON input is OFF (the COFF input is ON
Writing to the CURRENT command is invalid. (read only)

(c) The leading edge of the CON input (the falling edge of the COFF input) is detected in non-excitation state.
CURRENT=0→1, the CON output is ON, the MBFREE output is ON (magnetic brake free)

#2 Operation using the CURRENT command when the CON input is ON (the COFF input is OFF)

CURRENT=1→0, the CON output is OFF, the MBFREE output is OFF (magnetic brake lock)
CURRENT=0→1, the CON output is ON, the MBFREE output is ON (magnetic brake free)

Operation using the FREE input and CURRENT command

#2 Operation using the FREE input at CURRNET=1

When the leading edge of the FREE input is detected, the FREE output is ON (non-excitation state)
When the falling edge of the FREE input is detected, the FREE output is OFF, the MBFREE output is ON (magnetic brake free)

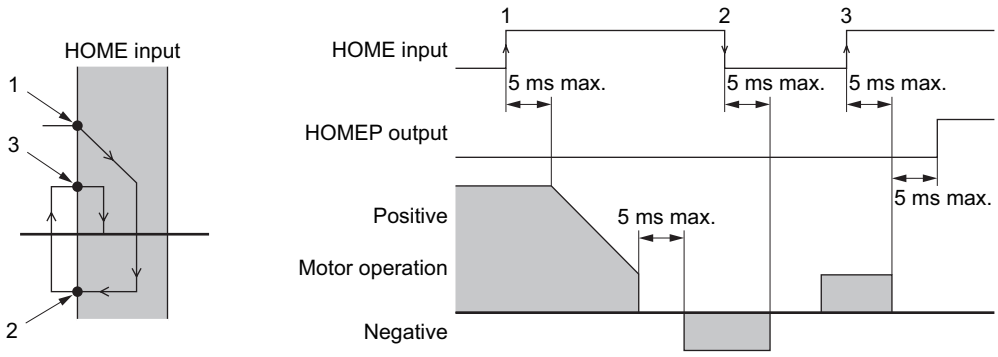
#3 Operation using the FREE input at CURRNET=0

When the leading edge of the FREE input is detected, the FREE output is ON, the MBFREE output is ON (magnetic brake free)
When the falling edge of the FREE input is detected, the FREE output is OFF, the MBFREE output is OFF (magnetic brake lock)

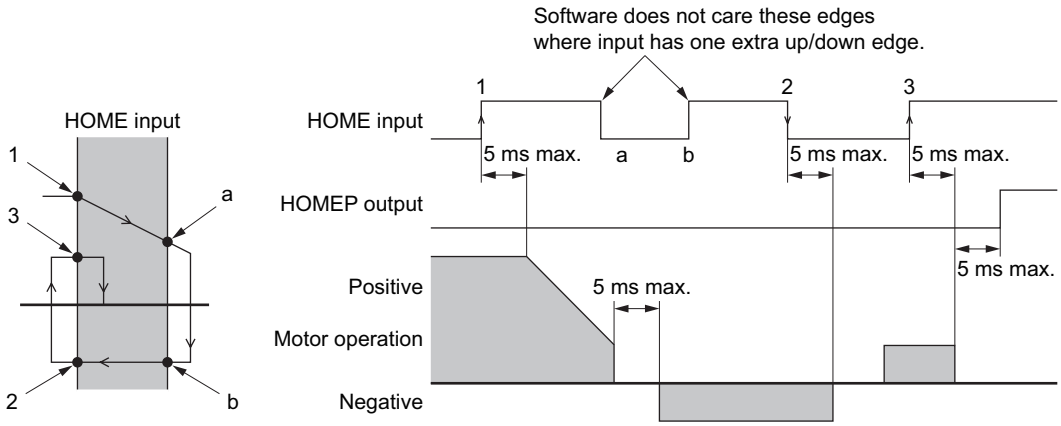
■ Mechanical Home Seeking

(Except HOMETYP=12)

- When the Mechanical Home Seeking Operation is Completed without Passing the HOME Input.

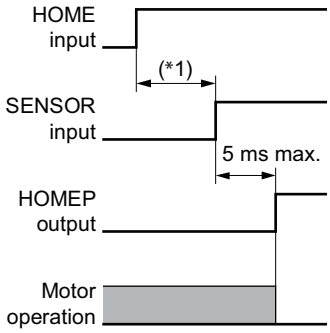


- When the Mechanical Home Seeking Operation is Completed with Passing the HOME Input Once.

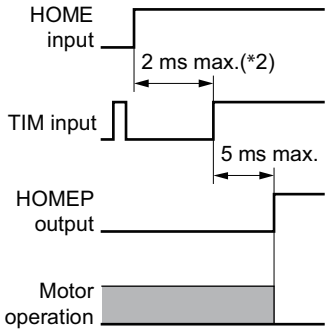


- Stopping Operation

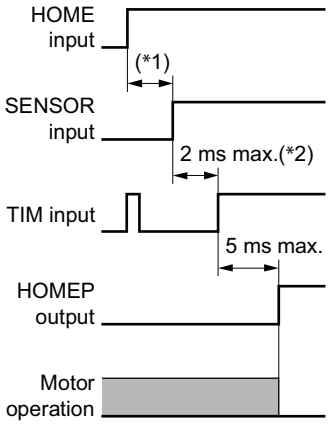
Using HOME and SENSOR



Using HOME and TIM signal



Using HOME, SENSOR and TIM signal

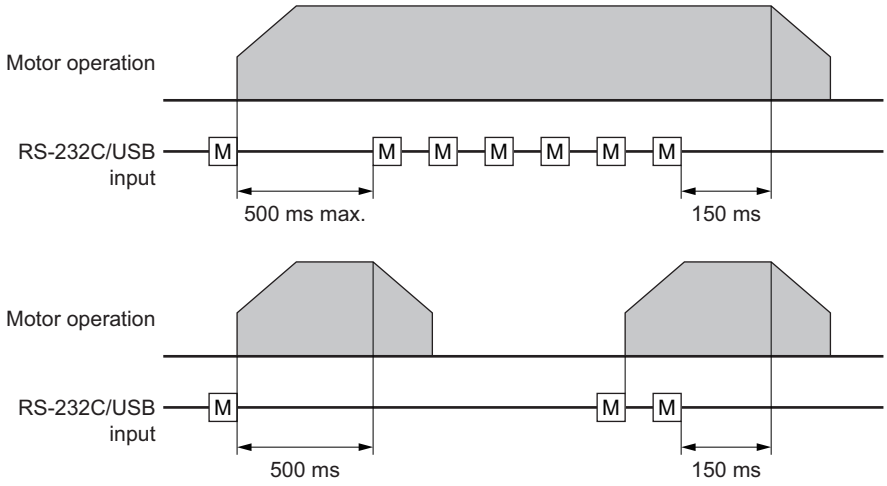


*1 Depends on the HOME and SENSOR positions.
*2 Depends on the SENSOR, rotor position and VS.

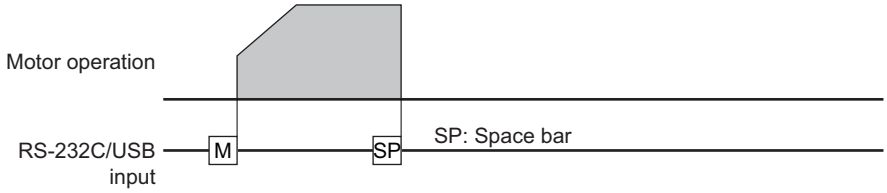
■ Teaching Operation

- When Holding the Key Down

  M : CW scan input key on query keyboard.



- To Stop Motion Immediately



12 Command Reference

This chapter provides detailed information about each command and parameter.
In the tables below, the commands are grouped by functionality, for quick reference. After the tables, each command or parameter is described in detail, in alphabetical order.

■ Table of Contents

12.1 Command List

■ Table Keys

n/a	not applicable	
MAXVEL	Maximum permissible velocity value, in user units per second. MAXVEL can be queried directly, see MAXVEL for details.	
MAXPOS	Maximum permissible position or distance value, in user units. MAXPOS can be queried directly, see MAXPOS for details.	
Max. Number	Maximum permitted numeric value. Max. Number depends on precision: higher precision requires lower numeric range. Max. Number = 500000000 500 million, no decimal places 50000000.0 50 million, one decimal place 5000000.00 5 million, two decimal places 500000.000 500 thousand, three decimal places	
/ Parameter	yes : - :	A forward slash following certain variables causes the system to continuously display the value of those elements. (Example: If "PF /" is entered, the feedback position displays continuously.) See "■Continuous Display" on page 83. / parameter cannot be used.
SAVE & RESET REQUIRED	n/a : S : R : SR :	For parameters, new value becomes active immediately. New value becomes active immediately, but save command required for new value to be active after reset or power cycle. Reset or power cycle required before new value becomes active. Save and Reset (or save and power cycle) required before new value becomes active.
Immediate?	yes : read : - :	Command or parameter can be used in immediately. Command or parameter can be used in immediately. (Read only) Command or parameter cannot be used in immediately.
IN sequences?	yes : read : - :	Command or parameter can be used within sequences. Command or parameter can be used within sequences. (Read only) Command or parameter cannot be used within sequences.
CANopen?	yes : read : - :	Command or parameter can be used via CANopen. Command or parameter can be used via CANopen. (Read only) Command or parameter cannot be used via CANopen.
Commands not Allowed	MOVE RUN MVRO	Command is not accepted while the motor is moving. Command is not accepted while the sequence is running. Command is not accepted while the motor is moving. (Read only)
h	(after a value) Value is shown in hexadecimal notation.	
UU	User units. Value shown in units determined by the user. See "7.3 Setting the User Unit" on page 43 for more details.	

Memo ⋮ See "7.5 Command Format" on page 47 for verifying rules when commanding.

■ Motion Commands

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
CONT	Continue Motion	n/a	n/a	-	n/a	yes	yes	yes	-	171
CV	Change Velocity	n/a	0.001 to MAXVEL	-	n/a	yes	yes	yes	-	176
EHOME	Start Return-to-electrical Home Operation	n/a	n/a	-	n/a	yes	yes	yes	MOVE	206
HSTOP	Hard Stop	n/a	n/a	-	n/a	yes	yes	yes	-	223
MA	Start Absolute Motion to the Specified Destination	n/a	-MAXPOS to +MAXPOS	-	n/a	yes	yes	yes	MOVE	247
MCP, MCN	Move Continuously Positive, Move Continuously Negative	n/a	n/a	-	n/a	yes	yes	yes	-	253
MGHP, MGHN	Move Go Home Positive, Move Go Home Negative,	n/a	n/a	-	n/a	yes	yes	yes	MOVE	256
MI	Start Incremental Motion, Distance DIS	n/a	n/a	-	n/a	yes	yes	yes	MOVE	258
MIx (x=0 to 3)	Start Linked Motion at Link Segment 'x'	n/a	n/a	-	n/a	yes	yes	yes	MOVE	259
MSTOP	Motor Stop	n/a	n/a	-	n/a	yes	yes	yes	-	262
PAUSE	Pause Motion	n/a	n/a	-	n/a	yes	yes	yes	-	273
PAUSECLR	Pause Clear	n/a	n/a	-	n/a	yes	yes	yes	-	274
PSTOP	Panic Stop	n/a	n/a	-	n/a	yes	yes	yes	-	284
SSTOP	Soft Stop	n/a	n/a	-	n/a	yes	yes	yes	-	311

■ Motion Variables

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
DIS	Distance for Incremental Motion	0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	191
DISx (x=0 to 3)	Distance or Destination for Link Segment 'x'	0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	192
INCABSx (x=0 to 3)	Link Type for Link Segment 'x'	1	0: Absolute 1: Incremental	-	S	yes	yes	yes	-	227
LINKx (x=0 to 2)	Link Control for Link Segment 'x'	0	0: No Link 1: Link-to-Next	-	S	yes	yes	yes	-	242
OFFSET	Offset for Mechanical Home Seeking	0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	265
POS[x] (x=1 to 100)	Position Array Data	0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	282
SCHGPOS	Distance from SENSOR Input to the Stop Position	0	0 to MAXPOS	-	S	yes	yes	yes	-	304
SCHGVR	Velocity after SENSOR Input	1	0.001 to MAXVEL	-	S	yes	yes	yes	-	305
TA	Acceleration Time	0.5	0.001 to 500.000 [s]	-	S	yes	yes	yes	-	315
TD	Deceleration Time	0.5	0.001 to 500.000 [s]	-	S	yes	yes	yes	-	317
VR	Running Velocity	1	0.001 to MAXVEL	-	S	yes	yes	yes	-	330
VRx (x = 0 to 3)	Running Velocity of Link Segment 'x'	1	0.001 to MAXVEL	-	S	yes	yes	yes	-	331
VS	Starting Velocity	0.1	0 to MAXVEL	-	S	yes	yes	yes	-	332

■ System Control

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
;	Statement Separator for Multi-statement	n/a	n/a	-	n/a	yes	yes	-	-	145
<ESC>	(Escape): Abort Operation(s)	n/a	n/a	-	n/a	yes	-	-	-	147
ABORT	ABORT Motion and Sequence Execution	n/a	n/a	-	n/a	yes	yes	yes	-	149
ABSPLSEN	Enable Driver Operation after Absolute Position Loss Alarm Release	n/a	n/a	-	n/a	yes	yes	yes	-	150
ABSREQ	Reading Driver Current Position	n/a	n/a	-	n/a	yes	yes	yes	-	151
ABSREQPC	Reading Driver Current Position/Updating Internal Position	n/a	n/a	-	n/a	yes	yes	yes	MOVE	152
ALMACT	ALARM Action	2	0: Current On, Alarm Off 1: Current On, Alarm On 2: Current Off, Alarm On	-	SR	yes	-	-	-	155
ALMCLR	ALARM Clear	n/a	n/a	-	n/a	yes	-	yes	-	156
ALMMSG	ALARM Message Action	0	0: No Messages 1: Messages, Alarms only 2: Messages, Alarms and Warnings	-	S	yes	-	-	-	157
ALMSET	Set User ALARM	n/a	n/a	-	n/a	yes	yes	-	-	158
CLEARALL	Return to Factory Condition	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	167
CLEARPOS	Clear POS[x] Position Array Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	168
CURRENT	Current On/Off	0: **CM10-1**, **5** 1: **CM10-2**, **3**, **4**, **SCX10**	0: Motor Current Off 1: Motor Current On	-	n/a	yes	yes	yes	-	175
DD	Driver Operation Data	0	0 to 3: Torque Limiting 0 to 7: Push-motion Operation	-	S	yes	yes	yes	-	178
DIRINV	Direction Invert	0	0: Positive Motion is Clockwise 1: Positive Motion is Counter-clockwise	-	SR	yes	read	-	-	190
DPR	Distance per Revolution	1	0.500 to 51200.000	-	SR	yes	read	-	-	198
ENC	Encoder Selection	0: **CM10-2**, **SCX10** 1: **CM10-1**, **3**, **4**, **5**	0: Not Used 1: Driver Encoder 2: External Encoder	-	SR	yes	read	-	-	208
ENDACT	System End Action	0	0: End of Pulse Generation 0.001 to (+MAXPOS/2): END Area	-	SR	yes	read	-	-	211
ENDWAIT	END wait time	6	0.1 to 40.0	-	SR	yes	-	-	-	214
ER	Encoder Resolution	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**, **4**, **5**, **SCX10**	10 to 51200	-	SR	yes	read	-	-	215
FREE	Current Off, Magnetic Brake Free	0	0: Normal Condition 1: Motor Shaft Free	-	n/a	yes	yes	-	-	217
GA, GB	Electrical Gear Ratio	1	1 to 100	-	SR	yes	read	-	-	218
HOMEDCL	Select the Deviation Counter Clear during Mechanical Home Seeking Operation	0: **CM10-1**, **2**, **3**, **4**, **SCX10** 1: **CM10-5**	0: Clear **CM10/SCX10** and Driver 1: Clear **CM10/SCX10** 2: Not Clear	-	SR	yes	read	-	-	221
HOMETYP	Mechanical Home Seeking Mode	0	0 to 11: **CM10-1**, **2**, **4**, **5** 0 to 12: **CM10-3**, **SCX10**	-	S	yes	yes	yes	MVRO	222

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
INITPRM	Initialize Parameters	n/a	n/a	-	R	yes	-	-	MOVE RUN	231
LIMP, LIMN	Setting of Software Position Limits (Positive Direction, Negative Direction)	0	-MAXPOS to +MAXPOS	-	SR	yes	read	-	-	240
MBFREEACT	Magnetic Brake Free Action	0: **CM10-1**, **2**, **3**, **4**, **5** 1: **SCX10**	0: Driver Alarm is Unrelated 1: MBFREE Outputs on Both the Driver Connector on the **CM10**/**SCX10** and the I/O Connector Become Active When a Driver Alarm is Active (Electromagnetic Brake is Locked)	-	SR	yes	-	-	-	252
MR	Motor Resolution	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**, **4**, **5**, **SCX10**	10 to 51200	-	SR	yes	read	-	-	261
MSTOPACT	Motor Stop Action	0	0: Hard Stop 1: Soft Stop	-	SR	yes	-	-	-	263
OTACT	Overtravel Action	0	0: Hard Stop 1: Soft Stop	-	SR	yes	-	-	-	266
PECLR	Position Error Clear	n/a	n/a	-	n/a	yes	yes	yes	MOVE	278
PRESET	Reset Home Position	n/a	n/a	-	n/a	yes	yes	yes	MOVE	283
PULSE	Pulse Output Mode	1	0: 2PULSE Mode 1: 1PULSE Mode	-	SR	yes	-	-	-	285
RESET	Reset Device	n/a	n/a	-	n/a	yes	-	-	-	288
SAVEALL	Save All Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	301
SAVEPOS	Save Position Array Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	302
SAVEPRM	Save Parameters	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	303
SENSORACT	SENSOR Input Active	2	0: Hard Stop 1: Soft Stop 2: Soft Stop at Fixed Distance from SENSOR Signal 3: No Action	-	SR	yes	-	-	-	306
SLACT	Software Position Limit Enable	0	0: Disabled 1: Enabled after Homing	-	SR	yes	read	-	-	309
STARTACT	START Input Action	0	0: Start Sequence When Set Active 1: Start Sequence When Set Active, Abort When Set Inactive	-	SR	yes	-	-	-	312
STRDCS	Driver Step Angle at System Start	0	0:CS Output Off at System Start 1:CS Output On at System Start	-	SR	yes	read	-	-	313
STRSW	Current State at System Start	0: **CM10-1**, **5** 1: **CM10-2**, **3**, **4**, **SCX10**	0: Current Off at System Start 1: Current On at System Start	-	SR	yes	-	-	-	314
TL	Torque Limiting /Push-motion Operation /Current Cutback Release	0	0: OFF 1: ON	-	n/a	yes	yes	yes	-	321

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
UU	User Units	Rev: **CM10-1**, **2**, **4**, **5**, **SCX10** mm: **CM10-3**	ASCII Characters, 20 Characters Maximum, Except ";" and "@"	-	S	yes	-	-	-	325

■ System Status

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
ABSSTS	Driver Status Code/Driver Alarm Code	n/a	n/a	-	n/a	read	read	read	-	153
EC	Encoder Count	0	-MAXEC to +MAXEC	yes	n/a	yes	yes	yes	MV RO	203
MAXEC	Maximum Encoder Count	500000000: **CM10-1**, **4**, **5**, **SCX10** 100000000: **CM10-2** 50000000: **CM10-3**	-	-	n/a	read	-	-	-	249
MAXPOS	Maximum Position Value	500000	n/a	-	n/a	read	-	-	-	250
MAXVEL	Maximum Velocity Value	1240: **CM10-1**, **4**, **5**, **SCX10** 6200: **CM10-2** 12400: **CM10-3**	n/a	-	n/a	read	-	-	-	251
PABS	Driver Current Position	n/a	-2,147,483.648 to 2,147,483.647	-	n/a	read	read	read	-	272
PC	Position Command	0	-MAXPOS to +MAXPOS	yes	n/a	yes	yes	yes	MV RO	275
PCI	Incremental Position Command	n/a	-2*MAXPOS to +2*MAXPOS	yes	n/a	read	read	-	-	276
PE	Position Error	n/a	-MAXPOS to +MAXPOS	yes	n/a	read	read	read	-	277
PF	Feedback Position	0	-MAXPOS to +MAXPOS	yes	n/a	yes	yes	yes	MV RO	279
PFI	Incremental Feedback Position	n/a	-2*MAXPOS to +2*MAXPOS	yes	n/a	read	read	-	-	280
TIM	Select Timing Input Signal	1	0: Use the TIMD/EXTZ Input 1: Use the TIMS Input	-	SR	yes	read	-	-	319
TIMER	Running Timer	0	0.000 to 500000.000	yes	n/a	yes	yes	yes	-	320
VC	Velocity Command	n/a	-MAXVEL to +MAXVEL	yes	n/a	read	read	read	-	326

■ I/O

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
DALARM	Driver ALARAM Signal Enable	0: **SCX10** 1: **CM10-1**, **2**, **3**, **4**, **5**	0: Not-use the DALARM Signal Input 1: Use the DALARM Signal Input	-	SR	yes	read	-	-	177
DEND	Driver END Signal Enable	0: **CM10-2**, **SCX10** 1: **CM10-1**, **3**, **4**, **5**	0: Internal End Area 1: Driver END Signal	-	SR	yes	read	-	-	182
DIN	Driver General Input Status	n/a	0 to 127	yes	n/a	read	read	read	-	183
DINSG	Driver System Signal Input Status	n/a	0 to 127	yes	n/a	read	read	read	-	184
DINx (X=1 to 7)	Individual Driver General Input Status	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	185
DINxxx	Driver System Signal Input Assignment	See Page 186 for DINxxx Command	See Page 186 for DINxxx Command	-	SR	yes	-	-	-	186
DIO	Driver I/O Status	n/a	0: Not Active 1: Active	-	n/a	read	-	-	-	188
DOUT	Driver General Output Control	n/a	0 to 255	yes	n/a	yes	yes	read	-	193
DOUTSG	Driver System Signal Output Status	n/a	1 to 16382	yes	n/a	read	read	read	-	194
DOUTx (x=1 to 8)	Individual Driver General Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	195
DOUTxxx	Driver System Signal Output Assignment	See Page 196 for DOUTxxx Command	See Page 196 for DOUTxxx Command	-	SR	yes	-	-	-	196
DREADY	Driver READY Signal Enable	0: **CM10-2**, **3**, **4**, **SCX10** 1: **CM10-1**, **5**	0: Disable 1: Enable	-	SR	yes	read	-	-	200
DSIGxxx	Status for Driver System Input Signal/Driver System Output Signal	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	201
EVx (x=1, 2)	Configure Event Output	n/a	See Page 216 for EVx Command	-	n/a	yes	yes	-	-	216
IN	General Input Status	n/a	0 to 511	yes	n/a	read	read	read	-	226
INITDIO	Initialize Driver I/O	n/a	n/a	-	SR	yes	-	-	-	228
INITIO	Initialize I/O	n/a	n/a	-	SR	yes	-	-	-	229
INSG	System Signal Input Status	n/a	0 to 2096127	yes	n/a	read	read	read	-	233
INx (x=1 to 9)	Individual General Input Status	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	234
INxxx	System Signal Input Assignment	0	0: Unassigned 1 to 9: Assigned	-	SR	yes	-	-	-	235
IO	Input/Output Status	n/a	n/a	yes	n/a	yes	-	-	-	237
OUT	General Output Status	0	0 to 15	yes	n/a	yes	yes	read	-	267
OUTSG	System Signal Output Status	n/a	0 to 1983	yes	n/a	read	read	read	-	268
OUTTEST	I/O Test Utility	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	269
OUTx (x=1 to 4)	Individual General Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	270
OUTxxx	System Signal Output Assignment	0	0: Unassigned 1 to 4: Assigned	-	SR	yes	-	-	-	271
PLSINV	Pulse Output Invert	0	0: Positive Logic 1: Negative Logic	-	SR	yes	-	-	-	281
SIGxxx	Status for System Input Signal/System Output Signal	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	307

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
xxxLV	System Input Level/System Output Level	See Page 336 for xxxLV command	See Page 336 for xxxLV Command	-	SR	yes	-	-	-	336

■ Monitor Commands

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	immediate?	IN sequences?	CAN open?	Commands not Allowed	PAGE
ALM	Alarm Status and History	n/a	n/a	-	n/a	yes	-	yes	-	154
HELP	Display Help Information	n/a	n/a	-	n/a	yes	-	-	-	220
REPORT	Display System Status	n/a	n/a	-	n/a	yes	-	-	-	287
TEACH	Teach Positions	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	318
TRACE	Sequence Trace Control	0	0: Trace is Disabled 1: Trace is Enabled	-	n/a	yes	-	-	-	322
VER	Display Firmware Version	n/a	n/a	-	n/a	yes	-	-	-	327

■ Communications

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
\	Global Command	n/a	[command]	-	n/a	yes	-	-	-	144
@	Select Device	n/a	*, 0 to 9, A to Z	-	n/a	yes	-	-	-	146
BAUD	RS-232C BAUD Rate	0	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 115200 bps	-	SR	yes	read	-	-	161
ECHO	Communications Echo Control	1	0: Echo Off 1: Echo On	-	S	yes	-	-	-	204
ID	Device ID	*	*, 0 to 9, A to Z	-	S	yes	-	-	-	224
TALK	Select Device	n/a	*, 0 to 9, A to Z	-	n/a	yes	-	-	-	316
USBBAUD	USB BAUD Rate	0	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 115200 bps	-	SR	yes	read	-	-	324
VERBOSE	Command Response Control	1	0: Respond with Data only 1: Respond with Data and Descriptive Text	-	S	yes	-	-	-	328

■ Sequence Commands

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
#	Sequence Comment	n/a	Alphanumeric Characters	-	n/a	-	yes	-	-	142
BREAKL	Break LOOP Block	n/a	n/a	-	n/a	-	yes	-	-	162
BREAKW	Break WHILE Block	n/a	n/a	-	n/a	-	yes	-	-	163
CALL	Call Sequence as Subroutine	n/a	Valid Sequence Name or Number, or Variable	-	n/a	-	yes	-	-	164
ELSE	Begin ELSE Block: execute if IF is false	n/a	n/a	-	n/a	-	yes	-	-	207
END	Motion End	n/a	n/a	-	n/a	-	yes	-	-	210
ENDIF	End of IF Block	n/a	n/a	-	n/a	-	yes	-	-	212
ENDL	End of LOOP Block	n/a	n/a	-	n/a	-	yes	-	-	213
IF	Begin IF Block: execute if IF is true	n/a	Conditional Expression	-	n/a	-	yes	-	-	225
KB	Keyboard Input	n/a	-Max.Number to +Max.Number	-	n/a	-	yes	-	-	238
KBQ	Keyboard Input (Quiet)	n/a	-Max.Number to +Max.Number	-	n/a	-	yes	-	-	239
LOOP	Begin Counted LOOP Block	n/a	1 to Max.Number	-	n/a	-	yes	-	-	246
MEND	Wait for Motion End	n/a	n/a	-	n/a	-	yes	-	-	255
RET	Sequence Return	n/a	n/a	-	n/a	-	yes	-	-	289
SACS	Send ASCII Control String	n/a	String: A Series of ASCII Characters or Control Codes, Maximum 70 Characters, Except @	-	n/a	-	yes	-	-	299
SAS	Send ASCII String	n/a	String: A Series of ASCII Characters, Maximum 70 Characters, Except @	-	n/a	-	yes	-	-	300
VIEW	View Parameter	n/a	Valid Parameter or Variable Name	-	n/a	-	yes	-	-	329
WAIT	Wait for Specified Time	n/a	0.0 to 500000.0	-	n/a	-	yes	-	-	333
WEND	End of WHILE Block	n/a	n/a	-	n/a	-	yes	-	-	334
WHILE	Begin WHILE Block	n/a	Conditional Expression	-	n/a	-	yes	-	-	335

■ Math/Logical/Conditional Operators (In Sequence only)

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
+, -, *, /, %	Addition, Subtraction, Multiplication, Division, Modulo	n/a	n/a	-	n/a	-	yes	-	-	143
&, |, ^, <<, >>	AND, OR, XOR, Left Arithmetic Shift, Right Arithmetic Shift	n/a	n/a	-	n/a	-	yes	-	-	143
a < b	a is smaller than b	n/a	n/a	-	n/a	-	yes	-	-	148
a <= b	a is equal to or smaller than b	n/a	n/a	-	n/a	-	yes	-	-	148
a = b, a = = b	a is equal to b	n/a	n/a	-	n/a	-	yes	-	-	148
a > b	a is greater than b	n/a	n/a	-	n/a	-	yes	-	-	148
a >= b	a is equal to or greater than b	n/a	n/a	-	n/a	-	yes	-	-	148
a! = b	a is not equal to b	n/a	n/a	-	n/a	-	yes	-	-	148

■ User Variables

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
A to Z	User Variables	0	-Max. Number to +Max.Number	-	S	yes	yes	-	-	159
CLEARVAR	Clear User-defined Variables	n/a	n/a	-	S	yes	-	-	RUN	170
CREATEVAR	Create User-defined Variable	n/a	N_xxx [Numeric Type] or S_xxx [String Type]	-	S	yes	-	-	RUN	173
DELETEVAR	Delete User-defined Variable	n/a	N_xxx [Numeric Type] or S_xxx [String Type]	-	S	yes	-	-	RUN	180
LISTVAR	Lists all User-defined Variables	n/a	n/a	-	n/a	yes	-	-	-	244
N_xxx	User-defined Numeric Variables	0 when created	-Max.Number to +Max.Number	-	S	yes	yes	-	-	264
S_xxx	User-defined String Variables	empty when created	Text String, 20 Characters Maximum	-	S	yes	yes	-	-	298

■ Sequence Management

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
CLEARSEQ	Clear Sequences	n/a	n/a	-	n/a	yes	-	-	RUN	169
COPY	Copy Sequence	n/a	Valid Sequence Name or Number	-	n/a	yes	-	-	RUN	172
DEL	Delete Sequence	n/a	Valid Sequence Name or Number	-	n/a	yes	-	-	RUN	179
DIR	Sequence Directory	n/a	n/a or Valid Sequence Name or Number	-	n/a	yes	-	-	-	189
EDIT	Edit Sequence	n/a	Valid Sequence Name (Consisting of Letters, Numbers and Underscore, up to 10 Characters, the First Character is not N, S, n, s) or Number (0-99)	-	n/a	yes	-	-	RUN	205
LIST	List Sequence Contents	n/a	Valid Sequence Name or Number (Optional: Start and End Line Number)	-	n/a	yes	-	-	-	243
LOCK	Lock Sequence	n/a	Valid Sequence Name or Number	-	n/a	yes	-	-	RUN	245
REN	Rename Sequence	n/a	Valid Sequence Name or Number	-	n/a	yes	-	-	RUN	286
RUN	Sequence Running	n/a	Valid Sequence Name or Number	-	n/a	yes	-	yes	RUN	297
UNLOCK	Unlock Sequence	n/a	Valid Sequence Name or Number	-	n/a	yes	-	-	RUN	323

■ CANopen Setting

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
CANBAUD	CANopen BAUD Rate	1	0: 10 kbps 1: 20 kbps 2: 50 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 800 kbps 7: 1 Mbps	-	SR	yes	-	-	-	165
CANID	CANopen Node ID	1	1 to 127	-	SR	yes	-	-	-	166
INITRIO	Initialize Remote I/O	n/a	n/a	-	SR	yes	-	-	-	232
RIN	Remote General Input Status	n/a	0 to 255	yes	n/a	read	read	read	-	290
RINx (x=1 to 8)	Individual Remote General Input Status	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	291
RINxxx	Remote System Signal Input Assignment	0	0: Unassigned 1 to 8: Assigned	-	SR	yes	-	-	-	292
RIO	Remote I/O Status	n/a	n/a	yes	n/a	yes	-	-	-	293
ROUT	Remote General Output Control	0	0 to 63	yes	n/a	yes	yes	read	-	294
ROUTx (x=1 to 6)	Individual Remote General Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	295
ROUTxxx	Remote System Signal Output Assignment	0	0: Unassigned 1 to 6: Assigned	-	SR	yes	-	-	-	296

12.2 I/O Signal and Command Structure

This table represents the corresponding relations for a series of command groups that are used when assigning or displaying I/O signals. Immediate commands that have same functions as the I/O signals are also shown with the corresponding relations.

Immediate Command	I/O Assignment	CANopen Remote I/O Assignment	Action	Logic Level	Signal Status	Description
ABORT	INABORT	(Default Assignment)	-	ABORTLV	SIGABORT	Abort Motion and Sequence Execution
ALMCLR	INALMCLR	RINALMCLR	-	ALMCLRLV	SIGALMCLR	Alarm Clear
CONT	INCONT	RINCOMT	-	CONTLV	SIGCONT	Continue Motion
CURRENT	INCON	(Default Assignment)	-	CONLV	SIGCON	Current ON
FREE	INFREE	(Default Assignment)	-	FREELV	SIGFREE	Current OFF, Magnetic Brake Free
MCP	INMCP	(Default Assignment)	-	MCPLV	SIGMCP	Move Continuously Positive
MCN	INMCN	(Default Assignment)	-	MCNLV	SIGMCN	Move Continuously Negative
MGHP	INMGHP	RINMGHP	-	MGHPLV	SIGMGHP	Move Go Home Positive
MGHN	INMGHN	(Default Assignment)	-	MGHNLV	SIGMGHN	Move Go Home Negative
MSTOP	INMSTOP	RINMSTOP	MSTOPACT	MSTOPLV	SIGMSTOP	Motor Stop
PAUSE	INPAUSE	RINPAUSE	-	PAUSELV	SIGPAUSE	Pause Motion
PAUSECLR	INPAUSECL	RINPAUSECL	-	PAUSECLLV	SIGPAUSECL	Pause Clear
PECLR	INPECLR	RINPECLR	-	PECLRLV	SIGPECLR	Position Error Clear
PSTOP	INPSTOP	RINPSTOP	ALMACT	PSTOPLV	SIGPSTOP	Panic Stop
RUN	INSTART	(Default Assignment)	STARTACT	STARTLV	SIGSTART	Start Sequence
TL	INTL	RINTL	-	TLLV	SIGTL	Torque Limiting/Push-motion Operation /Current Cutback Release
-	INHOME	RINHOME	-	HOMELV	SIGHOME	Home Sensor
-	INLSP	RINLSP	OTACT	OTLV	SIGLSP	Limit Switch Positive
-	INLSN	RINLSN	OTACT	OTLV	SIGLSN	Limit Switch Negative
-	INSENSOR	RINSENSOR	SENSORACT	SENSORLV	SIGSENSOR	Sensor
-	OUTALARM	(Default Assignment)	-	ALARMLV	SIGALARM	Alarm
-	OUTEND	(Default Assignment)	ENDACT	ENDLV	SIGEND	Motion End
-	OUTHOMEP	(Default Assignment)	-	HOMEPLV	SIGHOMEP	Home Position
	OUTLC	(Default Assignment)	-	LCLV	SIGLC	Limiting Condition
-	OUTMBFREE	ROUTMBFREE	MBFREEACT	-	SIGMBFREE	Magnetic Brake Free
-	OUTMOVE	(Default Assignment)	-	MOVELV	SIGMOVE	Motor Moving
-	OUTPSTS	ROUTPSTS	-	PSTSLV	SIGPSTS	Pause Status
-	OUTREADY	(Default Assignment)	-	READYLV	SIGREADY	Operation Ready
-	OUTRUN	ROUTRUN	-	RUNLV	SIGRUN	Sequence Running

12.3 Command Description

The details of commands are explained in alphabetical order.

: Sequence Comment

Execution Mode	Sequence
Syntax	#Commenting Text
Range	Alphanumeric Characters (not case sensitive), space and sign (! " # $ % & ' ( ) * + - . / : ; < = > ? @ [\ ] ^ _)
See Also	EDIT, LIST
Description	All text entered between the # symbol and the end of the line will not execute, but will be saved with the sequence. The # symbol is a means for commenting the commands within a sequence in order to describe the function of the commented sequence. Comments within a sequence are saved in EEPROM when the sequence is saved within the Editor Mode. Comments should not follow SAS or SACS commands on the same line. The text intended to be a comment will be transmitted as part of the SAS or SACS string.

Example

Command	Description
`>LIST 1`	#List sequence 1
`(1) TA=0.5`	#Acceleration time, seconds
`(2) TD=0.5`	#Deceleration time, seconds
`(3) VS=1`	#Starting velocity, user units/second
`(4) VR=2`	#Running velocity, user units/second
`(5) DIS=10`	#Distance of the move equals 10 user units
`(6) MI`	#Begin the index move
`(7) END`	#End the sequence
`>`	

+, -, *, /, %, &, |, ^, <<, >>

Execution Mode	Sequence
Syntax	Z = X n Y X = Numeric Value or Variable n = Math Operator Y = Numeric Value or Variable Z = Variable
See Also	A to Z

Description

The following math operators can be used in a program:
+ : Addition
- : Subtraction
* : Multiplication
/ : Division
% : Modulo (remainder)
& : AND (Boolean)
| : OR (Boolean)
^ : XOR (Boolean)
<< : Left arithmetic shift (Shift to left bit)
>> : Right arithmetic shift (Shift to right bit)

Division by zero (0) or numeric overflow will cause an Alarm condition, stopping motion and halting sequence operation.

Note on Modulo operations: A%B = A - (B * sign (A/B) * floor (|A/B|))

Example

Command	Description
`>LIST 1`	#List the user entered sequence
`(  1) X=2`	#The variable X is set equal to two
`(  2) Y=PC`	#Variable Y is set equal to the position command value
`(  3) X=X*Y`	#X equals the previous value of X multiplied by Y
`(  4) X`	#Print the current value of X to the terminal
`(  5) END`	#End the sequence
`>PC`	#Query the PC value
`PC=10 Rev`	#Device response
`>RUN 1`	#Run sequence 1
`>20`	#Device response
`>`	

\ : Global Command

Execution Mode	Immediate
Syntax	\Command
See Also	@, ID, TALK, VERBOSE

Description

Global command operator. Attaching this operator before the command enables command to all the units.

"\ID" is for checking all devices assigned ID numbers currently active on the daisy chain communication network.

Applicable Commands:
ABORT, CONT, CURRENT, CV, EHOME, HSTOP, ID, MA, MCP, MCN, MGHP, MGHN, MI, MIx, MSTOP, PAUSE, PAUSECLR, PSTOP, RESET, RUN, SSTOP

Example

Command	Description
2>\ID	#Send the global ID query command to all devices
3 1 2 0 2>	#Device response

; : Statement Separator

Execution Mode	Immediate and Sequence
Syntax	Command; Command
Description	The semicolon (;) allows for multiple command statements to be used on a single command line. The maximum number of characters per one line is 80 characters.
Note	The semicolon cannot be used as a separator after an SACS or SAS command. The SAS and SACS commands transmit all following text (until the end of a line): no other statements can follow SAS or SACS on the same line.

Example

Command	Description
>UU mm	#Set the user units to mm (millimeters)
UU=mm	#Device response
>VR 10;DIS 2;MI	#Set the running velocity to 10, distance to 2 and then perform an index move
VR=10 mm/sec	#Device response
DIS=2 mm	#Device response
>	

@ : Select Device

Execution Mode	Immediate
Syntax	@id
Range	id = *, 0 to 9 and A to Z (not case sensitive)
See Also	TALK, ID, \ (BACKSLASH)
Description	Makes a logical connection to a specific device in a multiple device, e.g. daisy chain configuration. That device can then be uniquely addressed and programmed. If the device ID is anything other than the default ID (*), communication with the device requires using the @ or TALK commands to establish communication
Note	Each device used in a daisy chain communication configuration requires a unique device ID.

Example

Command	Description
`0>MGHP`	#Device 0 go home
`0>@A`	#Talk to device A
`A>MGHP`	#Device A go home

<ESC> : (Escape) Abort Operation(s)

Execution Mode	Immediate
Syntax	<ESC> (Escape Key or Character (1Bh))
See Also	ABORT, ALMACT, HSTOP, MSTOP, MSTOPACT, PSTOP, SSTOP, TD

Description

<ESC> represents an escape key or character (1Bh).

<ESC> will abort motion, decelerating to a stop.

<ESC> will abort an executing sequence.

<ESC> will also abort continuous display of a parameter via the (/) command.

The function to display the sequence progress by the TRACE command is canceled.

<ESC> will discard any characters on a line and send a carriage return and line feed (CR + LF), and new prompt.

Example

Command	Description
`>UU mm`	#Set the user units to mm (millimeters)
`UU=mm`	#Device response
`>VR 10`	#Set the running velocity to 10 mm/second
`VR=10 mm/sec`	#Device response
`>MCN`	#Move continuously in the negative rotation direction
`>`	#<ESC> received, motion begins decelerating to a stop
`>`	#New prompt

a!=b, a<=b, a<b, a=b, a==b, a>=b, a>b : Conditional Operators

Execution Mode	Sequence
See Also	IF, WHILE

Description

The following conditional operations may be used in a sequence, as part of an IF or WHILE statement. a and b can be constants or any variable available within sequences.

- a!=b : a is not equal to b
- a<=b : a is less than or equal to b
- a<b : a is less than b
- a=b, a==b : a is equal to b
- a>=b : a is greater than or equal to b
- a>b : a is greater than b

Example

Command	Description
`( 1) DIS=0;VS=1;VR=10;TA=0;TD=0.1`	#Set motion parameters
`( 2) LOOP`	#Start infinite loop
`( 3) IF (IN6==1)`	#If input 6 is active
`( 4) DIS=1`	#Distance equals 1 user units
`( 5) MI`	#Move incremental
`( 6) MEND`	#Wait for motion to end
`( 7) DIS=0`	#Distance equals 0 user units
`( 8) ENDIF`	#End of IF block
`( 9) IF (IN7==1)`	#If input 7 is active
`( 10) BREAKL`	#Exit the loop and execute the line after the ENDL command
`( 11) ENDIF`	
`( 12) ENDL`	#Terminate the LOOP
`( 13) END`	#End the sequence

ABORT : ABORT Motion and Sequence Execution

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABORT
See Also	<ESC>, ALMACT, HSTOP, MSTOP, MSTOPACT, PSTOP, SSTOP

Description

The ABORT command stops the motion and the execution of a sequence. If the motor is running, the motor decelerates to start velocity VS over deceleration time TD, and then stops completely.

The ABORT function may also be executed via the ABORT input on the I/O connector if assigned and/or the CANopen remote I/O. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

Example

Command	Description
`>LIST 9`	#List sequence 9
`(  1) TA=0.5`	#Acceleration time, seconds
`(  2) TD=0.1`	#Deceleration time, seconds
`(  3) VR=20`	#Set the running velocity to 20 user units/second
`(  4) MCP`	#Move continuously in the positive direction
`(  5) MEND`	#Wait for stop to complete
`(  6) END`	#End the sequence
`>RUN 9`	#Execute sequence 9
`>ABORT`	#Abort sequence execution and decelerate the motor to a stop
`>`	

ABSPLSEN : Enable Driver Operation after Absolute Position Loss Alarm Release

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSPLSEN
See Also	PRESET, ALMCLR, MGHP, MGHN, DSIGxxx (DSIGREQ), DOUTxxx (DOUTREQ)

Description

When the **NX** Series driver is used in the absolute system, executing this command after releasing the absolute position loss alarm will enable mechanical home seeking operation. This command will turn ON the P-REQ output assigned to the driver connector on the **CM10**/**SCX10** for about 1 msec.

When setting the home position (by executing the PRESET command) without performing a mechanical home seeking operation, the ABSPLSEN command is not required to be executed. With the **ESMC** controller, the ABSPLSEN command is not required to execute even when mechanical home seeking operation is performed.

Example

Command	Description
>ALMCLR	#Release the driver absolute position loss alarm
>ABSPLSEN	#Operation enabled
>HOMETYP 4	#Set the pattern of mechanical home seeking operation. Use HOME, LSP and LSN
HOMETYP=4	
>MGHP	#Start in the positive direction of mechanical home seeking operation

ABSREQ ：Reading Driver Current Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSREQ
See Also	PABS, ABSSTS, PRESET, ABSREQPC, DINxxx (DINPR, DINP0, DINP1), DOUTxxx (DOUTREQ, DOUTCK), ROUTxxx (ROUTABSDATA), DSIGxxx (DSIGREQ)

Description

This command reads and indicates the current position data, driver status code and driver alarm code from the driver that has the current position output function (the **NX** Series driver, **ESMC** controller etc.).

The driver current position is converted to the user unit and written to the PABS, and driver status code and driver alarm code are written to the ABSSTS (driver status code/driver alarm code) parameters.

The ABSREQ command can be used at any time regardless of the motor operation.

Assign the (PR, P0, P1, REQ and CK) I/Os to the driver connector on the **CM10**/**SCX10** when using this command.

Memo

・The range of the driver current position that can be read is "-2,147,483.648 to +2,147,483.647," which is the value after converting to the user unit.

・When updating the position command (PC) with the driver current position is required, please use the ABSREQPC command.

Example

Command	Description
>PC	#Confirm the PC value
PC=0 Rev	#PC=0
>ABSREQ	#Read current position, driver status and driver alarm
PABS=124.35 Rev	#Current position
Driver Status Code = 00	#Driver status code
Driver ALARM Code = 00	#Driver alarm code
>PC	#Confirm the PC value
PC=0 Rev	#PC=0 (no rewrite)

ABSREQPC : Reading Driver Current Position/Updating Internal Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSREQPC
Commands not Allowed	MOVE
See Also	PABS, ABSSTS, PRESET, ABSREQ, DINxxx (DINPR, DINP0, DINP1), DOUTxxx (DOUTREQ, DOUTCK), ROUTxxx (ROUTABSDATA), DSIGxxx (DSIGREQ)

Description

This command reads and indicates the current position data, driver status code and driver alarm code from the driver that has the current position output function (the **NX** Series driver, **ESMC** controller etc.), and it also updates the value of PC (position command). (The Value of PF (feedback position) follows PC while maintaining position error.)

The current position data will be converted to the user unit and written to the PABS (driver current position) parameter. The driver status and alarm will be written to the ABSSTS (driver status code/driver alarm code) parameter. When the electrical home is set and the software position limit control is set to 1 (SLACT=1), LIMP and LIMN (software position limits) will be enabled.

Assign the (PR, P0, P1, REQ and CK) I/Os to the driver connector on the **CM10**/**SCX10** when using this command.

Note

- When only referring to the current position, use the ABSREQ (reading driver current position) command. The current position can be referred to using ABSREQPC (reading driver current position/updating position command), but PC and PF (EC) will be overwritten. Also, an error will occur when ABSREQPC is used during pulse generating.
- Use the ABSREQPC command in the current-off/servo-off status. If the ABSREQPC command is executed in the current-on/servo-on status, the value may be the wrong value. Refer to "8.6 Driver Current Position Reading (**CM10-1**, **3**, **5**)" on page 71.

Memo

- The range of the driver current position can be read is "-2,147,483.648 to +2,147,483.647," which is the value after converting to the user unit. The range to be written to PC is limited by MAXPOS (maximum position value).

Example

Command	Description
>PC	#Confirm the PC value
PC=0 Rev	#PC=0 (no rewrite)
>PF	#Confirm the PF value
PF=0 Rev	#PF=0 (no rewrite)
>ABSREQPC	#Read driver information and overwrite PC, PF and EC
PABS=124.35 Rev	#Current position
Driver Status Code = 1C	#Driver status code
Driver ALARM Code = 48	#Driver alarm code
>PC	#Confirm the PC value
PC=124.35 Rev	#PC=124.35 (rewritten)
>PF	#Confirm the PF value
PF=124.35 Rev	#PF=124.35 (rewritten)

ABSSTS : Driver Status Code/Driver Alarm Code

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSSTS
Access	READ
See Also	ABSREQ, ABSREQPC, PABS, ROUTxxx (ROUTABSDATA)

Description

This is a variable to which the driver status code and driver alarm code acquired by ABSREQ or ABSREQPC is written.

When referring to the status code or alarm code from the host controller, refer to ABSSTS after executing the ABSREQ (reading driver current position) command or ABSREQPC (reading driver current position/updating internal position) command.

When reading ABSSTS via CANopen, execute the ABSREQ command or ABSREQPC command first and then execute ABSSTS after confirming that the ABSDATA output was 1 (ON) by remote I/O of CANopen.

When PABS and ABSSTS can be referred to if the ABSDATA output is assigned, the ABSDATA output will be 1 (ON).

ABSSTS cannot be read under the following conditions:
· Current position has not been read yet since the power is ON.
· Data is being read
· Although the data was read, a range that could be written was exceeded.

Example

Command	Description
`>ABSREQPC`	#After reading the current position, driver status and driver alarm, overwrite PC and PF (EC)
`PABS=124.35 Rev`	#Current position
`Driver Status Code = 1C`	#Driver status code
`Driver ALARM Code = 48`	#Driver alarm code
`>ABSSTS`	
`ABSSTS=1C48`	#Driver status code, driver alarm code

ALM : Alarm Status and History

Execution Mode	Immediate and CANopen (Recent Alarm Only)
Syntax	ALM
See Also	xxxLV (ALARMLV), ALMACT, ALMCLR, ALMMSG, ALMSET, CURRENT, OUTxxx (OUTALARM), DALARM, INxxx (INALMCLR), RINxxx (RINALMCLR), DOUTxxx (DOUTACLDCL)
Description	The ALM command displays the current alarm code, history of the last 10 alarm and warning issues, a brief alarm code description, and the elapsed time for the latest alarm code and warning message. See "13 Troubleshooting" for a list of all ALARM codes and causes. The current ALM code is overwritten upon device power up or reset. The Alarm history is automatically saved in EEPROM.
Memo	If DALARM=1, the "driver alarm" may occur each time the **CM10/SCX10** and driver are powered ON, depending on the power on timing between the **CM10/SCX10** and the driver, and it will be recorded on alarm history. (The alarm output of the driver is negative logic = OFF during an alarm condition. If the power on timing of driver is later than the **CM10/SCX10**, the alarm output is OFF at the start up, and that is identical to "driver alarm." The driver alarm status is cleared automatically when the driver alarm output becomes ON, meaning alarm OFF.)

Example

Command	Description
>ALM ALARM =68 , RECORD : 68 00 00 00 00 00 00 00 00 00 ALM_PSTOP , 67.156 [sec] past. WARNING =00 , RECORD : 00 00 00 00 00 00 00 00 00 00 No warning. >	#Query the current ALARM code

ALMACT : ALARM Action

Execution Mode	Immediate
Syntax	ALMACT=n
Range	n = 0: Motor Current Remains ON (ALARM OFF) 1: Motor Current Remains ON (ALARM ON) 2: Turn Motor Current OFF (ALARM ON)
Factory Setting	2
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	xxxLV (ALARMLV), DALARM, ALM, ALMCLR, OUTxxx (OUTALARM), PSTOP, INxxx (INALMCLR, INPSTOP), RINxxx (RINPSTOP)

Description

Establishes the action of the motor current and alarm state after a PSTOP operation, or hardware or software overtravel errors.

Memo

The ALMACT is effective only in limited types of alarms as above. See "13.1 Protective Functions and Troubleshooting" on page 338.

Example

Command	Description
>ALMACT=1 ALMACT=2(1)	#Set the ALMACT to 1
>SAVEPRM (EEPROM has been written 10 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>ALMACT >ALMACT=1(1) >	#Query new value

ALMCLR : ALARM Clear

Execution Mode	Immediate and CANopen
Syntax	ALMCLR
See Also	INxxx (INALMCLR), RINxxx (RINALMCLR), DALARM, ALM, xxxLV (ALARMLV), ALMACT, ALMMSG, ALMSET, OUTxxx (OUTALARM), CURRENT
Description	The ALMCLR command attempts to clear the system alarm status. If the alarm condition is no longer present, the system will become fully operational again. The ALMCLR function may also be executed via the ALMCLR input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.
Note	Before issuing an ALMCLR command, remove the cause of the alarm. If the ALARM condition persists, the **CM10/SCX10** will enter the ALARM state again. Please see the troubleshooting section for a description of the causes of specific ALARM codes. Some alarm conditions cannot be cleared. Refer to see "13 Troubleshooting" to see which conditions can and cannot be cleared.
Memo	If the system alarm status is active and it is caused by a driver alarm , the system alarm status becomes inactive when the driver alarm becomes inactive. If the system also has an alarm by anything other than a driver alarm at the same time, the system alarm status will remain active even after the driver alarm becomes inactive.

Example

Command	Description
>ALM	#Query ALM
ALARM =68 , RECORD : 68 68 66 60 66 66 60 68 66 66	
ALM_PSTOP , 3.062 [sec] past.	
WARNING =00 , RECORD : 00 00 00 00 00 00 00 00 00 00	
No warning.	
>ALMCLR	#Clear the alarm condition, if possible
>ALM	
ALARM =00 , RECORD : 68 68 66 60 66 66 60 68 66 66	
No alarm.	
WARNING =00 , RECORD : 00 00 00 00 00 00 00 00 00 00	
No warning.	
>	

ALMMSG : ALARM Message Action

Execution Mode	Immediate
Syntax	ALMMSG=n
Range	n = 0: No Messages 1: Messages, Alarms only 2: Messages, Alarms and Warnings
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	xxxLV (ALARMLV), ALM, ALMACT, ALMCLR, ALMSET, OUTxxx (OUTALARM), INxxx (INALMCLR), DALARM, DSIGxxx (DSIGALARM)

Description

The system can automatically transmit a message when alarms or warnings are detected. ALMMSG controls what types of messages are automatically transmitted.

Warning messages are sent only if the detected warning condition is different from the last reported warning.

Example

Command	Description

`>ALMMSG=1`
`ALMMSG=1 [Alarm]`
`>SAVEPRM`
`(EEPROM has been written 10 times)`
`Enter Y to proceed, other key to cancel. Y`
`Saving Parameters.....OK.`
	#Set the ALMMSG to messaging alarm only
	#Save the parameter assignments
	#Device response

ALMSET : Set User ALARM

Execution Mode	Immediate and Sequence
Syntax	ALMSET
See Also	xxxLV(ALARMLV), ALM, ALMACT, ALMCLR, ALMMSG, OUTxxx (OUTALARM), SIGxxx (SIGALARM)
Description	The ALMSET command allows the user to place the device in a forced alarm state.

Example

Command	Description
`>LIST CHKINPUT`	#List sequence CHKINPUT
`(  1) DIS 10; VR 1`	#Set distance to 10, run velocity to 1
`(  2) MI`	#Start incremental motion
`(  3) WHILE (SIGMOVE=1)`	#While system is moving…
`(  4)   IF (IN1=1)`	#If general purpose input #1 is active
`(  5)    SAS Illegal sensor input entry!`	#Transmit a message
`(  6)    SSTOP`	#Stop motion
`(  7)    MEND`	#Wait for stop to complete
`(  8)    ALMSET`	#Force an alarm: sequence halts.
`(  9)   ENDIF`	#Terminate IF block
`( 10) WEND`	#Terminate WHILE loop
`( 11) SAS Motion succeeded`	#Send a success message
`>ALMMSG=1`	
` ALMMSG=1 [Alarm]`	
`>RUN CHKINPUT`	#Run sequence CHKINPUT
`>Motion succeeded`	#Successful
`>RUN CHKINPUT`	#Run again
`>Illegal sensor input entry!`	#Sequence aborted
`>ALMSET command detected.`	#Check alarm
`>ALM`	
`  ALARM =E0 ,  RECORD : E0 30 23 9A 23 68 68 66 60 66`	
`  ALM_USR_ALARM , 12.887 [sec] past.`	
`  WARNING =00 ,  RECORD : 00 00 00 00 00 00 00 00 00 00`	
`  No warning`	
`>SIGALARM`	#Query the ALARM status signal
` SIGALARM=1`	#The device is in an ALARM state
`>ALMCLR`	#Clear the alarm
`>`	#Device response

A to Z : User Variables

Execution Mode	Immediate and Sequence
Syntax	A=n (in sequence only : expression) : Z=n Upper and lower case are permitted, but 'A' and 'a' reference the same variable. There are 26 variables.
Range	n = -Maximum Number to +Maximum Number expression must evaluate to a value within the same range as n, and can be any of: - constant numeric value - any variable available to sequences - math expression
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CLEARVAR, CREATEVAR, DELETEVAR, N_xxx, POS[x], S_xxx, SAVEALL, SAVEPRM, VIEW, SAS, SACS

Description

General purpose numeric variables.

In immediate mode, A to Z may only be set and queried.

Within a sequence, variables may also be used in the following conditions:
· Targets or arguments for assignments (e.g. A=TIMER; DIS=A)
· Loop Counters (e.g. LOOP Q)
· Conditional Statement Values (e.g. if (VR>X))
· Arguments for a subroutine CALL (e.g. CALL S)
· Parts of Mathematical Expressions (e.g. VR=VS+C)
· Targets for interactive data entry commands (e.g. X=KBQ)

User variables may be saved by issuing the SAVEPRM (Save all parameter values) command while in immediate mode. If the variables values are not saved upon the next RESET or power cycle of the product, the variables will be cleared to the value of zero.

A sequence will not show the name of the variable (A to Z) when the value is displayed to the terminal. The reason for this operation is to reduce the amount of ASCII information sent out of the device to an external host controller or terminal.

For example:
Sequence 1

```
( 1) A=2    #Set the value of variable A
( 2) A      #Display the value of A
```

When sequence 1 executes the device displays the following:

```
>RUN 1
 2          #Device response to line 2 (shown above)
>
```

If the variable name must be displayed on the same line as the value, use the SACS command followed *on the next line* by the display command.
Like all other variables, these variables have global scope. If, for instance, variable "T" will be used to hold a particular dwell time, then variable "T" should not be used for anything else in the application.

Example

Command	Description
>B 0.1	#Set the variable B to a value of 0.1
B=0.1	#Device response
>LIST 1	#List sequence 1
(1) A=KB	#Query the user for the value of the variable A via the serial port
(2) LOOP A	#Use A as a loop count
(3) MI	#Move incrementally
(4) MEND	#Wait for motion to end
(5) WAIT B	#Time delay, 'B' seconds
(6) ENDL	#Terminate the LOOP
>DIS 1	#Set distance to 1
DIS=1 Rev	
>RUN 1	#Run sequence 1
>? 4	#Prompt the user for the value of A
	#Motion executes 4 times

BAUD : RS-232C BAUD Rate

Execution Mode	Immediate and Sequence
Syntax	BAUD=n
Range	n = 0: 9600 (bps) 1: 19200 2: 38400 3: 57600 4: 115200
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	@, ECHO, ID, TALK, VERBOSE

Description

Establishes the RS-232C communication baud rate for the device.

Note

The default RS-232C baud rate of the **CM10/SCX10** is 9600 bps, same as the default baud rate of a general Windows computer. If the baud rate on the computer or the **CM10/SCX10** is changed, the baud rate must also be changed on the other. (Always set the **CM10/SCX10** baud rate first, then set the baud rate of the computer.)

Check the baud rate of the computer always set the **CM10/SCX10** baud rate first, then set the baud rate of the computer application that is used to communicate with the **CM10/SCX10**, or check the COM port property of windows if the application does not have a baud rate function. (The supplied utility software, **IMC** is set to 9600 bps when it is installed and no change is required for initial connection to the **CM10/SCX10**.)

When daisy chaining several devices, a higher baud rate reduces the amount of time required for communicating with each device on the chain. However, when using a daisy chain longer than 30 m (10 feet), a high baud rate (greater than 9600 bps) may not operate properly because of communication signal deterioration over the line.
All units in a daisy chain configuration must have the same BAUD setting.

Example

Command	Description
`>BAUD 1`	#Set the Baud Rate to 19200 Bits per second (bps)
`BAUD=0(1) [9600bps(19200bps)]`	
`>SAVEPRM`	#Save the parameter assignments

`(EEPROM has been written 21 times)`
`Enter Y to proceed, other key to cancel. y`
`Saving Parameters.....OK.`	

`>RESET`	#Reset the system to establish the new baud value
`Resetting system.`	#NOTE: change baud rate of host system before proceeding!

`----------`
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`Controller Module`
`Software Version: *.**`
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`----------`	

`>BAUD`	#Query the Baud Rate
`BAUD=1(1) [19200bps(19200bps)]`	#Baud is set as 19200

BREAKL : Break LOOP Block

Execution Mode	Sequence
Syntax	BREAKL
See Also	BREAKW, ELSE, ENDIF, ENDL, IF, LOOP, WEND, WHILE
Description	Exits the innermost LOOP block. Often used to exit a LOOP based on the value of a conditional statement.

Example

```
>LIST 7                 #List sequence 7

(  1) LOOP               #Loop indefinitely
(  2)   IF (IN2=1)       #If input 2 is 1 (ON), the sequence proceeds to line 3
(  3)     BREAKL         #Exit the loop and execute the line after the ENDL command
(  4)     ELSE           #Branch here if not true
(  5)     SAS HELLO      #Send HELLO via the ASCII Communication port
(  6)   ENDIF            #End the IF statement
(  7) ENDL               #End the loop and return to the beginning of the loop at line 1
(  8) END                #End the sequence
>
```

BREAKW : Break WHILE Block

Execution Mode	Sequence
Syntax	BREAKW
See Also	BREAKL, ELSE, ENDIF, ENDL, IF, LOOP, WEND, WHILE
Description	Exits the innermost WHILE block. Often used to exit a WHILE block based on the value of a conditional statement.

Example

Command	Description
`>LIST 8`	#List sequence 8
`(  1) MCP`	#Move continuously (positive)
`(  2) WHILE (IN1=0)`	#Start WHILE block. Execute lines 3 through 5 while condition is true
`(  3)   IF (IN2=1)`	#If input 2 is 1 (ON), execute line 4
`(  4)     BREAKW`	#Exit the WHILE loop and execute the line after the WEND command
`(  5)   ENDIF`	#End the IF block
`(  6) WEND`	#End the WHILE block, return to line 2
`(  7) SSTOP`	#Slow down and stop the motor
`(  8) END`	#End the sequence

CALL : Call Sequence as Subroutine

Execution Mode	Sequence
Syntax	CALL n
Range	n = Valid Sequence Name or Number, or Variable
See Also	DIR, RET

Description

Executes a sequence as a subroutine, then returns to the calling sequence.

If target is a variable name (e.g. CALL Q), then Q must be equal to a valid sequence number.

Calling sequences by name can make sequences more readable, but requires an internal name lookup operation. That operation takes an unpredictable amount of time, which depends on system activity and the number of sequences that have been programmed.

Calling sequences by number is fast and always executes in the same elapsed time, but is less readable.

Calling by variable is just slightly slower than calling by number, and always executes in the same elapsed time. Calling by variable should only be used if necessary, to avoid calling the wrong (or a nonexistent) sequence.

If the CALL'ed sequence executes without error, control returns to the CALL'ing sequence, at the statement following the CALL.

Nesting is permitted. Sequence 1 can CALL sequence 2, which can CALL sequence 3, etc. Each CALL requires some internal memory, however, which is drawn from a dedicated "sequence stack."

The sequence stack is also used by block operations (IF, WHILE, LOOP). If many calls are nested, and/or blocks are nested deeply within a sequence, the sequence stack may become exhausted, resulting in alarm condition: "Sequence stack overflow."

If the target sequence does not exist, an alarm is triggered, and all sequence processing stops.

Example

Command	Description
`>LIST 1`	#List sequence 1
`( 1) LOOP`	#Start of an infinite loop
`( 2)  CALL 2`	#Call the sequence number 2
`( 3)  OUT1=1`	#Turn on output 1
`( 4)  WAIT 0.5`	#Wait 0.5 seconds
`( 5)  IF (IN1=1)`	#If input 1 is ON
`( 6)  BREAKL`	#Break out of the loop
`( 7)  ENDIF`	#End the IF statement
`( 8) ENDL`	#End the loop
`( 9) END`	#End sequence
`>LIST 2`	#List sequence 2
`( 1) DIS=1000`	#Distance equals 1000 user units
`( 2) MI`	#Begin the index move
`( 3) MEND`	#Wait for motion to end before the call command in the calling program.
`( 4) RET`	In this example the line after the CALL command in sequence 1 is line 3
`>`	and is the next line to execute after the subroutine sequence 2 completes executing.

CANBAUD : CANopen BAUD Rate

Execution Mode	Immediate
Syntax	CANBAUD=n
Range	n = 0: 10 (kbps) 1: 20 (kbps) 2: 50 (kbps) 3: 125 (kbps) 4: 250 (kbps) 5: 500 (kbps) 6: 800 (kbps) 7: 1 (Mbps)
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CANID
Description	Establishes the CANopen communication baud rate for the device.
Note	If the CANopen baud rate on the computer or the **CM10/SCX10** is changed, the baud rate must also be changed on the other.

Example

Command	Description
>CANBAUD=1 CANBAUD=0(1) [10kbps(20kbps)]	#Set the baud rate to 20 kbits per second (kbps)
>SAVEPRM (EEPROM has been written 21 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Reset the system to establish the new baud value #NOTE: change baud rate of host system before proceeding!
>CANBAUD CANBAUD=1(1) [20kbps(20kbps)]	#Query the baud rate #Baud is set as 20 kbps

CANID : CANopen Node Address

Execution Mode	Immediate
Syntax	CANID=n
Range	n = 1 to 127
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CANBAUD
Description	Sets the CANopen node address.

Example

Command	Description
>CANID=10	#Set CANID=10
CANID=1(10)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 10 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>CANID	#CANID request
CANID=10(10)	
>	

CLEARALL : Return to Factory Condition

Execution Mode	Immediate
Syntax	CLEARALL
Commands not Allowed	MOVE, RUN
See Also	CLEARPOS, CLEARSEQ, CLEARVAR, INITPRM
Description	Clears all parameters, POS[x] position array data and all sequences. The CLEARALL command will clear all of the input and output assignments.
Caution	**The CLEARALL command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The CLEARALL command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**
Note	Once the information is cleared, it cannot be restored. Since the baud rate and ID restore to the factory settings when executing CLEARALL, the communication cannot be performed if these settings have been changed. Note this point. A locked sequence will be cleared by CLEARALL: the lock status offers no protection for these operations.

Example

Command	Description
>CLEARALL (EEPROM has been written 12 times) Enter Y to proceed, other key to cancel. y Initializing Parameters..OK. Clearing POS[ ] Data.....OK. Clearing.....OK. >	#Initialize all parameters, clear all position array data and sequences

CLEARPOS : Clear POS[x] Position Array Data

Execution Mode	Immediate
Syntax	CLEARPOS
Commands not Allowed	MOVE, RUN
See Also	CLEARALL, CLEARSEQ, CLEARVAR, TEACH
Description	Clears all POS[x] position array data. Position data will set to 0.
Caution	**The CLEARPOS command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The CLEARPOS command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**
Note	Once the data points are cleared, they cannot be restored.

Example

Command	Description

`>CLEARPOS`
`(EEPROM has been written 13 times)`
`Enter Y to proceed, other key to cancel. y`
`Clear POS[ ] Data.....OK.`
`>`
	#Clear all position array data to 0

CLEARSEQ : Clear Sequences

Execution Mode	Immediate
Syntax	CLEARSEQ
Commands not Allowed	RUN
See Also	CLEARALL, CLEARPOS, CLEARVAR, DEL, EDIT
Description	Clears all sequences from the nonvolatile memory (EEPROM). The amount of time required to delete the sequences varies based on the number of sequences saved in memory.
Caution	**The CLEARSEQ command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The CLEARSEQ command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**
Note	Once the sequences are deleted, they cannot be restored. A locked sequence will be cleared by CLEARSEQ: the lock status offers no protection for these operations.

Example

```
>DIR                                                    #List all sequences

   ##  Name         TextSize  Locked
   ==  ==========   ========  ======
    0  <nameless>   10
    1  <nameless>   37

  Total:   2
  Executable memory:     43 bytes used of  6144 bytes total,     1 percent.
  Storage memory:        98 bytes used of 21775 bytes total,     0 percent.
>CLEARSEQ                                              #Delete all sequences from memory
 (EEPROM has been written 14 times)
 Enter Y to proceed, other key to cancel. y            #Device response sent to the terminal
 Clearing.................OK.                          #Device response sent to the terminal
>DIR                                                   #List all sequences

No Sequence(s) found.
>
```

CLEARVAR : Clear User-defined Variables

Execution Mode	Immediate
Syntax	CLEARVAR
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Commands not Allowed	RUN
See Also	CLEARALL, CLEARPOS, CLEARSEQ, DELETEVAR, LISTVAR, INITPRM, N_xxx, S_xxx
Description	CLEARVAR clears all user-defined variables from memory.
Caution	**The CLEARVAR command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The CLEARVAR command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**
Note	Once the variables are cleared, they cannot be restored.

Example

```
>LISTVAR                                          #List all user-defined variables

   ##  N_name      Numeric Data
   ==  ==========  ============
    1  LOOPS       10
    2              0
    3              0
    4              0
    5              0
    6              0
    7              0
    8              0
    9              0
   10              0
   ##  S_name      String Data
   ==  ==========  ====================
    1  LABEL       OMUSA
    2
    3
    4
    5
    6
    7
    8
    9
   10
>CLEARVAR                                         #Clear all user-defined variables from
 Enter Y to proceed, other key to cancel. y       memory
 All user parameters are deleted.
>
```

CONT : Continue Motion

Execution Mode	Immediate, Sequence and CANopen
Syntax	CONT
See Also	PAUSE, PAUSECLR, INxxx (INPAUSE, INPAUSECL), OUTxxx (OUTPSTS)

Description

Resumes a motion after a PAUSE command or PAUSE input has caused a motion to pause.

The remaining portion of the interrupted motion is completed. If the paused motion was a point-to-point index (MI, MA), the former destination becomes the destination for the resumed motion.

If the paused motion was a continuous motion, the former direction is assumed for the continued motion. Acceleration and deceleration times TA and TD, and start and running velocities VS and VR determine the motion profile while changing speed.

The CONT command has no effect if motion has not been previously PAUSE'd.

The CONT function may also be executed via the CONT input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "8.3 Stopping Motion and Sequence" on page 64.

If "STARTACT=0" is set, the START input can cause the same action as the CONT command, while sequences are running.

Note

PAUSE and CONT may effect processing time of sequences. For instance: if a sequence executes a MEND (wait for motion end) command, the sequence will be suspended while the motion is paused, and will not proceed beyond the MEND until the next end of motion (via a CONT, or new motion).
Linked motions, return-to-electrical home operation and mechanical home seeking cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.

Example

Command	Description
`>LIST WATCHPAUSE`	#List sequence WATCHPAUSE
`( 1) MA X`	#Start motion, to position in variable 'X'
`( 2) WHILE (PC!=X)`	#While position command still not 'X'
`( 3)  IF (SIGPAUSE=1)`	#If PAUSE input detected
`( 4)  WHILE (SIGPAUSE=1); WEND`	#Wait for PAUSE input to clear
`( 5)  CONT`	#Resume motion
`( 6)  ENDIF`	#End of IF block
`( 7) WEND`	#End of WHILE block
`>`	

COPY : Copy Sequence

Execution Mode	Immediate
Syntax	COPY source target
Range	source and target can be any valid sequence number (0-99) or name (consisting of letters, numbers or underscore, 10 characters maximum, must start with a letter except n, s, N, S, with no distinction of a capital letter or small letter.)
Commands not Allowed	RUN
See Also	DEL, EDIT, REN
Description	Makes a copy of a sequence. The original program will still exist in memory upon execution of the COPY command. If the destination program already exists, a confirmation message, "Destination exists, overwrite? [y/n]" is displayed to prompt the user for confirmation.

Example

Command	Description
`>COPY 1 MASTER`	#Copy sequence 1 to sequence named MASTER
`>COPY MASTER 2`	#Copy sequence MASTER to sequence 2

CREATEVAR : Create User-defined Variable

Execution Mode	Immediate
Syntax	CREATEVAR {N_xxx | S_xxx} {value | string}
Range	xxx = Variable Name: 1 to 10 Alphanumeric Characters value | string (optional): initial numeric value (N_xxx) or string value (S_xxx). If empty, N_xxx variables are initialized to 0 and S_xxx variables are initially empty.
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. If SAVEPRM is not executed after a variable has been created, that variable will not exist after a RESET or power cycle.
Commands not Allowed	RUN
See Also	A to Z, CLEARALL, CLEARVAR, DELETEVAR, LISTVAR, N_xxx, S_xxx, INITPRM
Description	Create a user-defined variable. A numeric variable (N_xxx) has a numeric value, while a string variable (S_xxx) can store a string of up to 20 characters. 10 variables are allowed for each type, numeric and string. Numeric type variable must start with "N_," and string type variable must start with "S_." Variables are initialized as they are created. If no initialization constant is present, numeric variables (N_xxx) are automatically initialized to 0, and string variables (_xxx) are automatically initialized as "empty." In order to avoid "careless" creation by variable access, new variable creation requires this command, and new variables cannot be created in a sequence. New variables can be created only in immediate mode.
Note	Using user-defined variables can make sequences more readable, but accessing these variables requires an internal name lookup operation. That operation takes an unpredictable amount of time, which depends on system activity and the number of user-defined variables that have been created. For applications with tight timing requirements, consider using general purpose variables A to Z instead.

Example

Command	Description

`>CREATEVAR N_DEPTH`
` New variable N_DEPTH is added.`
` N_DEPTH=0`
	#Create user-defined numeric variable named N_DEPTH

`>N_DEPTH 10.02` ` N_DEPTH=10.02`	#Set user-defined numeric variable value

`>CREATEVAR S_LABEL IDLE`
` New variable S_LABEL is added.`
` S_LABEL=IDLE`
	#Create user-defined string variable named S_LABEL, initialize to "IDLE"

`>S_LABEL RUNNING` ` S_LABEL=RUNNING`	#Set user-defined string variable value
`>LISTVAR`	#List all user-defined variables

```
   ##  N_name      Numeric Data
   ==  ==========  ============
    1  DEPTH       10.02
    2              0
    3              0
    4              0
    5              0
    6              0
    7              0
    8              0
    9              0
   10              0
   ##  S_name      String Data
   ==  ==========  ====================
    1  LABEL       RUNNING
    2
    3
    4
    5
    6
    7
    8
    9
   10
>
```

CURRENT : Current On/Off

Execution Mode	Immediate, Sequence and CANopen
Syntax	CURRENT=n
Range	n = 0: Motor Current is OFF 1: Motor Current is ON
Factory Setting	0: If the STRSW is set to zero(0) (**CM10-1**, **5**) 1: If the STRSW is set to 1 (**CM10-2**, **3**, **4**, **SCX10**)
Access	READ and WRITE
See Also	STRSW, INxxx (INCON), xxxLV (CONLV), SIGxxx (SIGCON)
Description	Enables or disables the motor current.
Note	If the operation is made immediately after Current ON is commanded, position error may occur. Allow a time interval according to the timing chart for each driver. Care should be taken especially when using CURRENT command in sequence program, or controlling CURRENT command, CON/COFF terminal or CON in CANopen by the host controller programs
Memo	If the CON input is assigned to the I/O connector and/or the CANopen is active, the CURRENT command is available only when all active CON inputs are ON. If the CON input is not assigned to the I/O connector and CANopen is not active, the CURRENT status at power on is determined by the STRSW setting. If the CON input is assigned to the I/O connector and/or the CANopen is active, the CURRENT status (motor current) at power on is determined by those inputs. The "Current OFF" always has higher priority than "Current ON" among CON in system input, CON in remote (CANopen) input and CURRENT command. During CURRENT is 0 (motor current is off), PC (position command) is continuously overwritten by PF (position feedback) value. This is to track the actual position.

Example

Command	Description
>CURRENT 0 CURRENT=0	#Turn motor current OFF. Motor has no holding torque
>CURRENT 1 CURRENT=1 >	#Turn motor current ON. Motor now has holding torque

CV : Change Velocity

Execution Mode	Immediate, Sequence and CANopen
Syntax	CV=n
Range	n = 0.001 to MAXVEL (user units/second) (In sequences, the maximum value is further limited by "Max. Number.")
See Also	DPR, MA, MCP, MCN, MI, MIx, VR, VS, UU, MAXVEL, SCHGVR, SCHGPOS

Description

The CV command can be used to change the running velocity during an incremental positioning index (MI) or absolute positioning index (MA). Velocity changes over acceleration time TA if speed is increasing (away from zero) and deceleration time TD if speed is decreasing (toward zero).

The CV command can only be used when the motor is accelerating or at running velocity. The CV command is not executable while the motor is decelerating to the final target position. If CV is attempted in communications mode while the motor is decelerating, the device will send out a error message. If CV is attempted within a sequence while the motor is decelerating, an alarm is set (70h).

CV is only available.

Changing the running velocity via the CV command will affect the time required to complete the original commanded motion profile.

There are several other ways to change speeds while moving:
- If moving continuously by MCP, set new VR, and execute MCP again.
- If moving continuously by MCN, set new VR, and execute MCN again
- If all motion parameters are known, use linked index motions. Refer to MIx.
- Use the SENSOR input with SCHGVR and SCHGPOS

Memo

If successful, a CV command modifies running velocity VR. The new value of VR will be "n" (the argument to the CV command).

Example

Command	Description
>UU mm UU=mm	#Set user units (UU) to mm (millimeters)
>VR 3 VR=3 mm/sec	#Set the running velocity to 3 mm/second
>DIS 10 DIS=10 mm	#Set the distance to 10 mm
>MI	#Start the index move
>CV 5	#Change the running velocity to 5 mm/second
>MSTOP	#Stop motion
>LIST 5	#List sequence 5
(1) TA=0.1	#Set the acceleration time, seconds
(2) TD=0.1	#Set the deceleration time, seconds
(3) VS=5	#Set the starting velocity, UU/second
(4) VR=10	#Set the running velocity, UU/second
(5) DIS=100	#Set the distance, UU
(6) MI	#Execute an index move
(7) WHILE (IN3=0)	#While input 3 is OFF, wait
(8) WEND	#If Input 3 is OFF to back to line 7, otherwise go to line 8
(9) CV 15	#Change the running velocity of the index move to 15 UU/second
(10) SAS SPEED CHANGE	#Transmit ASCII string
(11) END	#End the program
>	

DALARM : Driver ALARM Signal Enable

Execution Mode	Immediate and Sequence
Syntax	DALARM=n
Range	n = 0: Do not use the ALARM signal input on the driver connector of the **CM10**/**SCX10** 1: Use the ALARM signal input on the driver connector of the **CM10**/**SCX10**
Factory Setting	0: **SCX10** 1: **CM10-1**, **2**, **3**, **4**, **5**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DINxxx (DINALARM), DSIGxxx (DSIGALARM)

Description

DALARM command enables the use of the ALARM signal input on the driver connector of the **CM10**/**SCX10**. If this function is active and a driver alarm has occurred, the system ALARM signal/status becomes active (alarm code 6Eh: driver alarm).

The alarm status automatically becomes inactive when the driver alarm becomes inactive.

Example

Command	Description
>DALARM=0 DALARM=1(0) [Enable(Disable)]	#Set DALARM=0
>SAVEPRM (EEPROM has been written 80 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>DALARM DALARM=0(0) [Disable(Disable)] >	#Confirm the new assignment

DD : Driver Operation Data

Execution Mode	Immediate, Sequence and CANopen
Syntax	DD=n
Range	n = 0 to 3 (torque limiting) 0 to 7 (push-motion operation)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ, WRITE
See Also	TL, DOUTxxx (DOUTM0, DOUTM1, DOUTM2), DSIGxxx (DSIGM0, DSIGM1, DSIGM2)

Description

This is a parameter to set the driver operation data such as the push-motion operation current, torque limiting value etc.

Assign the following signals to the driver connector on the **CM10**/**SCX10**.
・Torque limiting: M0, M1
・Push-motion operation: M0, M1, M2

M0, M1 and M2 that were assigned to the driver connector on the **CM10**/**SCX10** will vary as follows by DD value.

DD	M2	M1	M0
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

Example

Command	Description
>DD=1	#Assign the data 1 (M0 is set to ON, and M1 and M2 are set to OFF)
DD=1	
>TL=1	#Torque limiting operation or push-motion operation is enabled
TL=1	

DEL : Delete Sequence

Execution Mode	Immediate
Syntax	DEL target
Range	target can be the name or number of any existing sequence.
Commands not Allowed	RUN
See Also	CLEARALL, CLEARSEQ, COPY, DIR, EDIT, LOCK, UNLOCK

Description

Deletes a sequence from EEPROM. The system will request confirmation of the DEL action.

A deleted sequence cannot be recovered.

If the sequence is locked, it cannot be deleted. Use the UNLOCK command to unlock the sequence before deleting.

Sequences cannot be deleted while any sequence is running.

Note

To delete all sequences see the CLEARSEQ command.

Example

Command	Description
>DIR	#Display the stored programs

```
   ##  Name         TextSize  Locked
   ==  ==========   ========  ======
    0  test1               8
    1  <nameless>         32
  Total:   2
  Executable memory:     27 bytes used of  6144 bytes total,    0 percent.
  Storage memory:        87 bytes used of 21775 bytes total,    0 percent.
>DEL TEST1                                  #Delete program TEST1 from memory
 Enter Y to proceed, other key to cancel. y  #Device response
>
```

DELETEVAR : Delete User-defined Variable

Execution Mode	Immediate
Syntax	DELETEVAR {N_xxx | S_xxx}
Range	xxx = Variable Name: 1 to 10 Alphanumeric Characters
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Commands not Allowed	RUN
See Also	CLEARALL, CLEARSEQ, CLEARVAR, N_xxx, S_xxx, CREATEVAR

Description Deletes a specific user-defined variable.

Example

Command | Description

```
>LISTVAR                                          #List user-defined variables

   ##  N_name      Numeric Data
   ==  ==========  ============
    1  LOOPS       10
    2              0
    3              0
    4              0
    5              0
    6              0
    7              0
    8              0
    9              0
   10              0
   ##  S_name      String Data
   ==  ==========  ====================
    1  LABEL       OM USA
    2
    3
    4
    5
    6
    7
    8
    9
   10
>DELETEVAR N_LOOPS                                #Delete user-defined numeric variable
 Enter Y to proceed, other key to cancel. Y
 Variable N_LOOPS is deleted.
>LISTVAR
```

```
   ##  N_name      Numeric Data                #N_LOOPS is gone
   ==  ==========  ============
    1              0
    2              0
    3              0
    4              0
    5              0
    6              0
    7              0
    8              0
    9              0
   10              0
   ##  S_name      String Data
   ==  ==========  ====================
    1  LABEL       OM USA
    2
    3
    4
    5
    6
    7
    8
    9
   10                                      #SAVEPRM required to make this
>SAVEPRM                                   change permanent
 (EEPROM has been written 17 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.
>
```

DEND : Driver END Signal Enable

Execution Mode	Immediate and Sequence
Syntax	DEND=n
Range	n = 0: Internal End Area 1: Driver END Signal
Factory Setting	0: **CM10-2**, **SCX10** 1: **CM10-1**, **3**, **4**, **5**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DINxxx (DINEND), DSIGxxx (DSIGEND), ENDACT, MEND
Description	DEND command selects the source of the END signal, either driver end signal or the internal end signal. The selected signal becomes the system END signal/status, and used for the MEND command, END output, and mechanical home seeking. See "8.8 END (motion of end) Signal" on page 76.
Memo	The internal end signal is generated by end area and/or end of pulse generation. (See ENDACT.) When DEND is set to 1, there may be the case where END signal intermittently outputs during motor is moving at slow speed. This is because the END signal of the driver is intermittently outputting. Set DEND to 0 and use the internal END signal of **CM10**/**SCX10** to avoid intermittent END signal.

Example

Command	Description
>DEND=0	#Set DEND=0
DEND=1(0) [Enable(Disable)] >SAVEPRM (EEPROM has been written 80 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK. >RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>DEND	#Confirm the new assignment
DEND=0(0) [Disable(Disable)] >	

DIN : Driver General Input Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	DIN
Range	0 to 127 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	DIO, DINx, DOUT, DOUTx, DINxxx (DINALARM), INITDIO, REPORT

Description

The DIN command displays the current status of all the general purpose inputs on the driver connector of the **CM10**/**SCX10**, as one integer number.

The general purpose inputs on the driver connector of the **CM10**/**SCX10** contribute to the value of DIN as follows:

DINx	Contribution to DIN If Active
DIN7	64
DIN6	32
DIN5	16
DIN4	8
DIN3	4
DIN2	2
DIN1	1

For example, if the driver general input 2 (2), driver general input 3 (4) and driver general input 4 (8) are active, while all other signals are not active, "DIN=14" is set (2+4+8=14).

When inputting DIN, "DIN=14" is replied.

∗ To check the status of a single general input, use the DINx command.

∗ If an input is assigned to a system driver input signal (ALARM, END, etc) the DIN command will always read that particular input OFF or 0. Use the DINSG command to read the status of the assigned system input signals on the driver connector of the **CM10**/**SCX10**.

Example

Command	Description
>DIN	#Query the status of the general inputs
DIN=20	#Device response indicating input 3 and 5 are ON
>	

DINSG : Driver System Signal Input Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	DINSG
Range	0 to 127 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	DIN, DOUTSG, DIO, DSIGxxx

Description

The DINSG command displays the current status of all of the system driver inputs, as one integer number. The system driver inputs contribute to the value of the DINSG as follows:

Bit Location	DIN	Contribution to DIN If Active
Bit 6	READY	64
Bit 5	LC	32
Bit 4	MOVE	16
Bit 3	TIMD/EXTZ	8
Bit 2	TIMS	4
Bit 1	END	2
Bit 0	ALARM	1

DINSG is the sum of the contribution of all active signals.

For example, if the ALARM (1) and TIMS (4) signals are active, while all other signals are not active, "DINSG=5" is set (1+4=5).

When inputting DIN, "DIN=5" is replied.

* When checking the status of a single driver system input signal use the DSIGxxx command.
* Be careful not to confuse DINSG with DIN (driver general input status). DIN reports the status of general purpose inputs (those inputs which are not assigned to a specific signal) on the driver connector of the **CM10/SCX10**.

Example

Command	Description

`>DIO`
` Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ`
` Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE`
 	
` --Inputs-- --Outputs--`
` 1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8`
` 1 0 0 0 1 1 0 - - 0 0 0 0 0 0 0 0`
	#Display DIO status
	#Device response

`>DINSG` ` DINSG=5`	#Check DINSG #Device response: the ALM signal, the TIMS signal and LC signal are active

DINx : Individual Driver General Input Status

Execution Mode	Immediate and Sequence
Syntax	DINx (INx is a signal: IN1 to IN7)
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Access	READ
See Also	DIN, DIO, DINSG

Description

DINx returns the state of general purpose input "x" on the driver connector of the **CM10**/**SCX10**.

If the input on the driver connector has been assigned to a system input signal, such as ALARM input, then it is no longer a "general purpose" input. DINx for these inputs will always return 0 (not active).

Use the DSIGxxx command to check the status of the system input signals on the driver connector of the **CM10**/**SCX10**.

Example

Command	Description

`>DIN6`
` DIN6=1`
`>`
	#Query the status of the individual driver general input 6

DINxxx : Driver System Signal Input Assignment

Execution Mode	Immediate
Syntax	DINxxx=n "xxx" represents the signal name to be assigned, and "n" represents the assigned terminal number ("that" becomes the INn general when unassigned).
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE (READ only for the command with the parameter range = 0)
See Also	DSIGxxx, DIO, INITDIO, CLEARALL, DIN, DINSG, DINx and "See Also" column in the chart below.

Description Assign the driver system input signal to the INn of the driver connector of the **CM10**/**SCX10**. The driver system signal input assignment is released by "DINxxx=0" and it becomes the driver general input INn. When executing the INITDIO command, the parameter restores to the factory setting.

Command	Signal	Description	Factory Setting (n)	Range (n)	See Also
DINALARM	ALARM	Alarm	1	0, 1: **CM10-1**, **2**, **3**, **4**, **5** 0 to 5: **SCX10**	DALARM
DINEND	END	Motion End	0: **CM10-2** 2: **SCX10** 3: **CM10-1**, **3**, **4**, **5**	0: **CM10-2** 0, 3: **CM10-1**, **3**, **4**, **5** 0 to 5: **SCX10**	DEND
DINLC	LC	Limiting Condition	0: **CM10-4** 4: **SCX10** 5: **CM10-1**, **2**, **3**, **5**	0: **CM10-4** 0, 5: **CM10-1**, **2**, **3**, **5** 0 to 5: **SCX10**	LC
DINMOVE	MOVE	Motor Moving	0: **CM10-1**, **2**, **4**, **5**, **SCX10** 4: **CM10-3**	0: **CM10-2**, **4** 0, 2: **CM10-1**, **5** 0, 4: **CM10-3** 0 to 5: **SCX10**	-
DINP0	P0	Position Data Bit 0	0: **CM10-1**, **2**, **4**, **SCX10** 5: **CM10-5** 6: **CM10-3**	0: **CM10-2**, **4** 0, 5: **CM10-1**, **5** 0, 6: **CM10-3** 0 to 5: **SCX10**	ABSREQ, ABSREQPC
DINP1	P1	Position Data Bit 1	0: **CM10-1**, **2**, **4**, **SCX10** 5: **CM10-3** 6: **CM10-5**	0: **CM10-2**, **4** 0, 5: **CM10-3** 0, 6: **CM10-1**, **5** 0 to 5: **SCX10**	ABSREQ, ABSREQPC
DINPR	PR	Position Data Output Ready	0: **CM10-1**, **2**, **4**, **SCX10** 3: **CM10-3** 4: **CM10-5**	0: **CM10-2**, **4** 0, 3: **CM10-3** 0, 4: **CM10-1**, **5** 0 to 5: **SCX10**	ABSREQ, ABSREQPC
DINREADY	READY	Operation Ready	0: **CM10-2**, **3**, **4** 4: **CM10-1**, **5**, **SCX10**	0: **CM10-2**, **3**, **4** 0, 4: **CM10-1**, **5** 0 to 5: **SCX10**	DREADY
DINTIMDEXTZ	TIMD	Timing Signal·Z-phase Pulse Differential Input	7	0, 7	TIM, ENC
DINTIMS	TIMS	Timing Signal·Z-phase Pulse Single Ended Input	3: **SCX10** 6: **CM10-1**, **2**, **3**, **4**, **5**	0 to 5: **SCX10** 0, 6: **CM10-1**, **2**, **3**, **4**, **5**	TIM, ENC

Example

Command	Description
>DINALARM=0	#Unassign the ALARM input
DINALARM=1(0)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 2 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter value
Resetting system.	

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Controller Module	
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>DINALARM	#Confirm new value
DINALARM=0(0)	
>	

DIO : Driver I/O Status

Execution Mode	Immediate
Syntax	DIO
Range	n = 0: Not Active 1: Active /: real time monitor
Access	READ
See Also	DIN, DOUT, DINx, DOUTx, DSIGxxx, DINSG, DOUTSG, IO, RIO

Description

DIO displays the current status of general purpose inputs and outputs on the driver connector of the **CM10/SCX10** and assigned system input/output signals on the driver connector of the **CM10/SCX10**.

∗ For TIMD/EXTZ, the status of the signal selected by the ENC command (0: External encoder ZSG, 1: Timing signal･Z-phase pulse differential input) is displayed

Example

Command	Description
>DIO	#Display the DIO status
Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ	#Device response
Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE	
--Inputs-- --Outputs--	
1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8	
0 0 1 1 0 0 1 - - 1 0 0 0 0 0 0 0	
>	

DIR : Sequence Directory

Execution Mode	Immediate
Syntax	DIR target
Range	target is optional. If given, it should be a valid sequence number or name
See Also	COPY, EDIT, REN
Description	Lists directory information for one or all sequences in memory. If target is given, lists information for that sequence only, with summary. If target is not given, lists information for all sequences, with summary.

Example

Command	Description
>DIR	#List the entire sequence directory

```
   ##  Name         TextSize  Locked
   ==  ==========  ========  ======
    1  Master            940
    2  ReSync             93
    3  FastReturn         32

  Total:   3
  Executable memory:    690 bytes used of  6144 bytes total,   11 percent.
  Storage memory:      2259 bytes used of 21775 bytes total,   10 percent.
>
```

>DIR RESYNC	#List directory information for one sequence only

```
   ##  Name         TextSize  Locked
   ==  ==========  ========  ======
    2  ReSync             93

  Executable memory:    690 bytes used of  6144 bytes total,   11 percent.
  Storage memory:      2259 bytes used of 21775 bytes total,   10 percent.
>
```

DIRINV : Direction Invert

Execution Mode	Immediate and Sequence
Syntax	DIRINV n
Range	n = 0: Motor rotates in the Clockwise (CW) direction for positive distance values. 1: Motor rotates in the Counter-Clockwise (CCW) direction for positive distance values.
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DIS, MA, MCP, MCN, MGHP, MGHN, MI, EHOME

Description

Inverts the direction of motor rotation.

∗ When using a gearhead, the direction of the gearhead output shaft may rotate in the opposite direction of the motor's rotation.

Example

Command	Description
>DIRINV 1	#Invert the motor direction
DIRINV 0(1)	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	
>RESET	#Execute a RESET operation to activate the saved parameters
Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>DIS 1000	#Set the distance value
DIS=1000 rev	#Device response
>MI	#The motor rotates 1000 in the CCW direction
>	

DIS : Distance for Incremental Motion

Execution Mode	Immediate, Sequence and CANopen
Syntax	DIS=n
Range	n = -MAXPOS to +MAXPOS (user units)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	MI, MAXPOS, TA, TD, VS, VR, CV, DIRINV, DPR, MA

Description

Determines the distance to be moved for the MI (move incremental) command. The sign of DIS determines the direction of motion.

Example

Command	Description
>DPR	#Query the DPR value
DPR=1(1) Rev	#Device response
Position range = +/- 500000(500000)	#Device response
Velocity range = 0.001 - 2480(2480)	#Device response
>DIS 2000	#Set distance to 2000 user units in the positive direction
DIS=2000 Rev	
>MI	#Execute the index move
>DIS -2000	#Set distance to 2000 user units in the negative direction
DIS=-2000 Rev	
>MI	#Execute the index move
>	

DISx : Distance or Destination for Link Segment 'x'

Execution Mode	Immediate, Sequence and CANopen
Syntax	DISx=n (x is a number of linked segments: x=0 to 3.)
Range	n = -MAXPOS to +MAXPOS (user units)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INCABSx, MIx, LINKx, VRx
Description	Determines the incremental distance or absolute destination for the linked index (MIx) motion commands. For incremental links, the sign of DISx determines the direction of motion. Linked motions can only be run in one direction: all linked must have the same effective direction of travel.

Example

Command	Description
>UU in	#Set user units to in. (inches)
UU=in	#Device response
>VR1 5	#Set the velocity for linked move 1 to 5 user units/s
VR1=5 in/sec	#Device response
>DIS1 10	#Set the distance for linked move 1 to 10 user units
DIS1=10 in	#Device response
>INCABS1 1	#Set the move type for linked motion 1 to incremental
INCABS1=1 [INC]	#Device response
>LINK1 1	#Enable the linked operation for motion 1
LINK1=1	#Device response
>VR2 10	#Linked move 2 velocity equals 10 user units/s
VR2=10 in/sec	#Device response
>INCABS2 0	#Set the move type for linked motion 2 to absolute
INCABS2=0 [ABS]	#Device response
>DIS2 20	#Linked move 2: destination is position 20 user units
DIS2=20 in	#Device response
>LINK2 0	#"Unlink" link 2 from link 3
LINK2=0	#Device response
>MI1	#Start the linked operation motion
>	

DOUT : Driver General Output Control

Execution Mode	Immediate, Sequence and CANopen
Syntax	DOUT=n
Range	n = 0 to 255 (integer values) /: real time monitor (immediate mode only)
Access	READ and WRITE READ only in CANopen
See Also	DIO, DOUTx, DIN, DINx, DSIGxxx, DOUTSG, REPORT

Description

The DOUT command displays or controls the current status of all the general purpose outputs on the driver connector of the **CM10**/**SCX10**, as one integer number.

The general purpose outputs on the driver connector of the **CM10**/**SCX10** contribute to the value of DOUT as follows:

DOUTx	Contribution to DOUT If Active
DOUT8	128
DOUT7	64
DOUT6	32
DOUT5	16
DOUT4	8
DOUT3	4
DOUT2	2
DOUT1	1

For example, if the driver general output 2 (2), driver general output 3 (4) and driver general output 4 (8) are active, while all other signals are not active, "DOUT=14" is set (2+4+8=14). When inputting DOUT, "DOUT=14" is replied.

And when inputting "DOUT=14," the driver general output 2 (2), driver general output 3 (4) and driver general output 4 (8) become active regardless of the present output status.

∗ To check or control the status of a single general output, use the DOUTx command.

∗ The DOUT value always indicates the internal status of the all driver general output signals DOUT1 to DOUT8. For the output signal assigned the system output signal (CON, FREE etc.), the DOUT command recognizes the signal as inactive or zero (except when the signal has become active by the DOUT, DOUTx command). Use the DOUTSG command in order to refer to the status of all output signals assigned the specific function.

Example

Command	Description
>DIO	#Display the DIO status
Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ	
Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE	#Device response
---Inputs--- ----Outputs----	
1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8	
0 0 0 0 0 0 0 - - 0 0 1 0 0 1 0 0	
>DOUT	#Check DOUT Status
DOUT=32	#DOUT6 is active
>DOUT=16	#DOUT5 to be active
DOUT=16	#Device response
>DIO	
Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ	
Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE	
--Inputs-- --Outputs--	
1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8	
0 0 0 0 0 0 0 - - 1 0 0 0 1 0 0 0	
>	

DOUTSG : Driver System Signal Output Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	DOUTSG
Range	1 to 16382 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	DOUT, DINSG, DIO, DSIGxxx, REPORT

Description

The DOUTSG command displays the current status of all the system driver outputs, as one integer number.

The driver outputs contribute to the value of DOUTSG as follows:

Bit Location	Signal Name of the Driver Connector on the **CM10/SCX10**	Contribution to DOUTSG If Active
Bit 13	M2	8192
Bit 12	M1	4096
Bit 11	M0	2048
Bit 10	TL	1024
Bit 9	REQ	512
Bit 8	HMSTOP	256
Bit 7	PRESET	128
Bit 6	HOME	64
Bit 5	MBFREE	32
Bit 4	FREE	16
Bit 3	CS	8
Bit 2	ACL/DCL	4
Bit 1	COFF	2
Bit 0	CON	1

DOUTSG is the sum of the contribution of all active signals:

For example, if the CON (1) and CS (8) signals are active, while all other signals are not active, "DOUTSG=9" is set (1+8=9). When inputting DOUTSG, "DOUTSG=9" is replied.

* When checking the status of a single driver system output signal, use the DSIGxxx command.
* The DOUTSG value always indicates the status of the all driver system output signals. Note that the signals, which are not output actually due to not assigned to the driver connector terminal, are also counted in the DOUTSG value.
* Be careful not to confuse DOUTSG with DOUT (driver general output control). DOUT reports the status of general purpose outputs (those outputs which are not assigned to a specific signal) on the driver connector of the **CM10/SCX10**.

Example

Command	Description
`>DIO`	#Display DIO status

`Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ`
`Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE`
 	
`--Inputs-- --Outputs--`
`1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8`
`1 0 0 0 0 0 0 - - 1 0 1 0 1 0 0 1`
	#Device response

`>DOUTSG`	#Check DOUTSG status
`DOUTSG=529`	

DOUTx : Individual Driver General Output Control

Execution Mode	Immediate and Sequence
Syntax	DOUTx=n (OUTx is signal name: OUT1 to OUT8) * "=n" is required only when controlling.
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE
See Also	INIDTIO, DOUT, DOUTSG, DIO, DIN, DINSG, DINx, DSIGxxx, REPORT
Description	DOUTx displays or controls the state of general purpose output 'x' on the driver connector of the **CM10/SCX10**. If the output on the driver connector has been assigned to a specific system output signal such as CS, then it is no longer a "general purpose" output. DOUTx for these outputs will always return 0 (not active). Use the DSIGxxx command to check the status of the assigned system output signal on the driver connector of the **CM10/SCX10**.
Memo	Even the output signal assigned the system output signal can become active (1) as the general driver output status using the DOUTx command. For example, even when the OUT1 of the driver connector is assigned to CON, DOUT1=1 can be commanded. However, the actual output terminal of the driver connector that is assigned to CON will not become active. Note that the DOUT (driver general output control) value becomes 1 at this time.

Example

Command	Description

`>DOUT5=1`
` DOUT5=1`
`>DIO`
` Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ`
` Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE`
 	
` --Inputs-- --Outputs--`
` 1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8`
` 0 0 1 1 0 0 1 - - 1 0 0 0 1 0 0 0`
	#Driver general output 5 active
	#Display DIO status
	#Device response

`>DOUT5=0`
` DOUT5=0`
`>DIO`
` Inputs (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ`
` Outputs (1-8) = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE`
 	
` --Inputs-- --Outputs--`
` 1 2 3 4 5 6 7 - - 1 2 3 4 5 6 7 8`
` 0 0 1 1 0 0 1 - - 1 0 0 0 0 0 0 0`
	#Driver general output 5 inactive
	#Display DIO status
	#Device response

DOUTxxx : Driver System Signal Output Assignment

Execution Mode	Immediate
Syntax	DOUTxxx=n "xxx" represents the signal name to be assigned, and "n" represents the assigned terminal number ("that" becomes the OUTn general output when unassigned).
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE (READ only for the command with the parameter range = 0)
See Also	DSIGxxx (except: ACLDCL, HMSTOP, HOME), DIO, INITDIO, DOUT, DOUTSG, DOUTx, and "See Also" column in the chart below.

Description Assign the driver system output signal to the OUTn of the driver connector of the **CM10**/**SCX10**. The driver system signal output assignment is released by "DOUTxxx=0" and it becomes the driver general output OUTn. When executing the INITDIO command, the parameter restores to the factory setting.

Command	Signal	Description	Factory Setting (n)	Range (n)	See Also
DOUTACLDCL	ACL/DCL	Driver Alarm Clear /Deviation Counter Clear	0: **CM10-2** 2: **CM10-1**, **3**, **4**, **5** 3: **SCX10**	0: **CM10-2** 0, 2: **CM10-1**, **3**, **4**, **5** 0 to 8: **SCX10**	ALMCLR, PECLR
DOUTCK	CK	Position Data Transmission Clock	0: **CM10-1**, **2**, **4**, **SCX10** 2: **CM10-3**, **5**	0: **CM10-2**, **4** 0, 2: **CM10-1**, **3**, **5** 0 to 8: **SCX10**	ABSREQ, ABSREQPC
DOUTCOFF	COFF	Current OFF	0: **CM10-1**, **5** 1: **CM10-2**, **3**, **4**, **SCX10**	0: **CM10-1**, **5** 0, 1: **CM10-2**, **3**, **4** 0 to 8: **SCX10**	DOUTCON, CURRENT, FREE, DOUTFREE
DOUTCON	CON	Current ON	0: **CM10-2**, **3**, **4** 1: **CM10-1**, **5** 2: **SCX10**	0: **CM10-2**, **3**, **4** 0, 1: **CM10-1**, **5** 0 to 8: **SCX10**	DOUTCOFF, CURRENT, FREE, DOUTFREE
DOUTCS	CS	Resolution Selection	0: **CM10-3**, **5** 4: **CM10-1**, **2**, **4**, **SCX10**	0: **CM10-3**, **5** 0, 4: **CM10-1**, **2**, **4** 0 to 8: **SCX10**	STRDCS
DOUTFREE	FREE	Current OFF, Magnetic Brake Free	0: **CM10-2**, **4** 5: **SCX10** 8: **CM10-1**, **3**, **5**	0: **CM10-2**, **4** 0, 8: **CM10-1**, **3**, **5** 0 to 8: **SCX10**	FREE, CURRENT
DOUTHMSTOP	HMSTOP	Sensor-less Home Seeking Operation Stop	0: **CM10-1**, **2**, **4**, **5**, **SCX10** 5: **CM10-3**	0: **CM10-1**, **2**, **4**, **5** 0, 5: **CM10-3** 0 to 8: **SCX10**	HOMETYP, ABORT, PSTOP, HSTOP, MSTOP, SSTOP, PAUSE
DOUTHOME	HOME	Sensor-less Home Seeking Operation Start	0: **CM10-1**, **2**, **4**, **5**, **SCX10** 7: **CM10-3**	0: **CM10-1**, **2**, **4**, **5** 0, 7: **CM10-3** 0 to 8: **SCX10**	HOMETYP, MGHP, MGHN
DOUTMBFREE	MBFREE	Magnetic Brake Free	0: **CM10-1**, **2**, **3**, **4**, **5** 6: **SCX10**	0: **CM10-1**, **2**, **3**, **4**, **5** 0 to 8: **SCX10**	FREE, CURRENT, OUTMBFREE, ROUTMBFREE
DOUTM0	M0	Data Select Bit 0	0: **CM10-1**, **2**, **3**, **4**, **SCX10** 5: **CM10-5**	0: **CM10-2**, **3**, **4** 0, 5: **CM10-1**, **5** 0 to 8: **SCX10**	DD, TL

Command	Signal	Description	Factory Setting (n)	Range (n)	See Also
DOUTM1	M1	Data Select Bit 1	0: **CM10-1**, **2**, **3**, **4**, **SCX10** 6: **CM10-5**	0: **CM10-2**, **3**, **4** 0, 6: **CM10-1**, **5** 0 to 8: **SCX10**	DD, TL
DOUTM2	M2	Data Select Bit 2	0	0: **CM10-2**, **3**, **4**, **5** 0, 7: **CM10-1** 0 to 8: **SCX10**	DD, TL
DOUTPRESET	PRESET	Reset Home Position	0: **CM10-1**, **2**, **3**, **4**, **SCX10** 7: **CM10-5**	0: **CM10-2**, **4** 0, 7: **CM10-1**, **3**, **5** 0 to 8: **SCX10**	PRESET, ABSREQ, ABSREQPC
DOUTREQ	REQ	Position Data Transmission Request	0: **CM10-1**, **2**, **4**, **SCX10** 3: **CM10-3**, **5**	0: **CM10-2**, **4** 0, 3: **CM10-1**, **3**, **5** 0 to 8: **SCX10**	ABSREQ, ABSREQPC, ABSPLSEN
DOUTTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	0: **CM10-1**, **2**, **3**, **4** 4: **CM10-5** 7: **SCX10**	0: **CM10-2**, **3**, **4** 0, 4: **CM10-1**, **5** 0 to 8: **SCX10**	TL

Example

Command	Description
>DOUTACLDCL=0 DOUTACLDCL=2(0)	#Unassign the ACL/DCL output
>SAVEPRM (EEPROM has been written 80 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>DOUTACLDCL DOUTACLDCL=0(0) >	#Confirm the new assignment

DPR : Distance per Revolution

Execution Mode	Immediate and Sequence
Syntax	DPR=n
Range	n = 0.500 to 51200.000 (user units per revolution)
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	GA, GB, UU, MR, MAXPOS, MAXVEL
Description	The value of DPR sets the distance per revolution in terms of user units (mm, degrees, etc.). DPR allows programming all distances, positions and velocities in terms of real world units. For instance, a lead screw with a lead of 10 millimeters per revolution may use a DPR value of 10. When setting the DPR parameter, concurrently be sure to set the user unit by the UU command and the motor resolution by the MR command. Once they are set, all of operation parameters such as the distance, target position, velocity and others can be commanded by user units (this example is mm, mm/sec). (The motor resolution or step angle no longer be used.) DPR also effects the minimum and maximum numeric range of many variables. In particular, it effects position range limit MAXPOS, velocity range limit MAXVEL.
Note	If DPR is changed, MAXPOS (maximum position=position range), MAXVEL (maximum velocity=velocity range) or minimum travel distance (minimum movable distance) may automatically be changed. When executing the DPR command, these pre-change and post-change values are shown. Position parameters (DIS, DISx, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) and velocity parameters (VS, VR, VRx, SCHGVR) are automatically checked whether or not to be within the MAXPOS (maximum position) and MAXVEL (maximum velocity) respectively, and if they are outside the range, the warning message will be sent. Note that the position/velocity parameters in the sequence program and the position array data POS[x] will not be checked. Check whether the required resolution is obtained. The minimum movable distance, which is the actual travel distance, can be checked by the TEACH command. If DPR is changed, the actual travel distance or velocity is changed. Check whether the present settings of the position/velocity parameters or those values in the program are appropriate. If electronic gearing is used (GA/GB≠1), DPR reflects the distance moved, in user units, at the output of a hypothetical gear train with ratio GA/GB. The actual motor shaft (rotor shaft) will rotate GA/GB times this distance.

Example

Command	Description
>UU mm UU=mm	#Set the user units to mm (millimeters)
>DPR 10 DPR=1(10) mm Position range = +/- 500000(500000) Velocity range = 0.001 - 2480(24800) Minimum Movable Distance = +/- 0.001(0.001)	#Set the distance per revolution to 10 user units, device responds with rescaled limits and new ranges
>SAVEPRM (EEPROM has been written 21 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>MAXPOS MAXPOS=500000(500000) mm	#Query the maximum position value
>MAXVEL MAXVEL=24800(24800) mm/sec >	#Query the maximum velocity value

DREADY : Driver READY Signal Enable

Execution Mode	Immediate and Sequence
Syntax	DREADY=n
Range	n = 0: Disable 1: Enable
Factory Setting	0: **CM10-2**, **3**, **4**, **SCX10** 1: **CM10-1**, **5**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DINxxx (DINREADY), DSIGxxx (DSIGREADY), OUTxxx (OUTREADY)

Description

Set "enable" or "disable" for the READY (driver operation ready) input signal of the driver connector on the **CM10**/**SCX10**.

When set to "enable":

1. When operation is commanded starting, check the driver READY (operation ready). When it is ON, operation (pulse generation) is started immediately. When it is OFF, operation will be started after turning ON. If it is not turned ON after three seconds, an alarm will generate (6Fh=driver connection error).
2. When the **CM10** or **SCX10** is ready to operate (other than MOVE, RUN and ALARM status) while the driver is ready to operate, the READY signal on the I/O connector (including remote I/O) will be output.

When set to "disable":

When the **CM10** or **SCX10** is ready to operate (other than MOVE, RUN and ALARM status), the READY signal on the I/O connector (including remote I/O) will be output.

Example

Command	Description
>DREADY=0	#Change to "DREADY=0"
DREADY=1(0) [Enable(Disable)]	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 80 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter value
Resetting system.	

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>DREADY	#Confirm new value
DREADY=0(0) [Disable(Disable)]	
>	

DSIGxxx : Status for Driver System Input Signal/Driver System Output Signal

Execution Mode	Immediate and Sequence
Syntax	DSIGxxx ("xxx" indicate the signal name on the driver connector. of the **CM10**/**SCX10**. ex: DSIGALARM)
Range	0: "xxx" input/output is not active 1: "xxx" input/output is active /: real time monitor (immediate mode only)
Access	READ
See Also	DINxxx/DOUTxxx, DIO, and "See Also" column in the chart below.
Description	DSIGxxx is the status of system "xxx" input/output (included EXTZ input signal of the external encoder connector) signal on the driver connector of the **CM10**/**SCX10**. DSIGxxx becomes "0 (zero)" when not active, while DSIGxxx becomes "1" when active. Only the internal status of system "xxx" driver output signal is shown even when it is not assigned.

<Input>

Command	Signal	Description	Controller	See Also
DSIGALARM	ALARM	Alarm	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	ALARM, DALARM
DSIGEND	END	Motion End	**CM10-1**, **3**, **4**, **5**, **SCX10**	END, DEND, MEND, ENDACT
DSIGLC	LC	Limiting Condition	**CM10-1**, **2**, **3**, **5**, **SCX10**	TL
DSIGMOVE	MOVE	Motor Moving	**CM10-1**, **3**, **5**, **SCX10**	-
DSIGREADY	READY	Operation Ready	**CM10-1**, **5**, **SCX10**	DREADY
DSIGTIMDEXTZ	TIMD	Timing Signal･Z-phase Pulse Differential Input	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	TIM, ENC
DSIGTIMS	TIMS	Timing Signal･Z-phase Pulse Single Ended Input	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	TIM, ENC

DSIGTIMDEXTZ is the status of system TIMD/EXTZ (timing) input signal.

The DSIGTIMDEXTZ indicates the timing signal TIMD on the driver connector of the **CM10**/**SCX10** or the Z signal on the encoder connector, as selected by the ENC parameter.

Signal Flow Path

Timing signal･Z-phase pulse differential input TIMD-----1

ENC--------DSIGTIMDEXTZ

External encoder Z EXTZ-----2

<Output>

Command	Signal	Description	Controller	See Also
DSIGCOFF	COFF	Current OFF	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	CURRENT
DSIGCON	CON	Current ON	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	CURRENT
DSIGCS	CS	Resolution Selection	**CM10-1**, **2**, **4**, **SCX10**	STRDCS
DSIGFREE	FREE	Current OFF, Magnetic Brake Free	**CM10-1**, **3**, **5**, **SCX10**	FREE, CURRENT
DSIGMBFREE	MBFREE	Magnetic Brake Free	**SCX10**	FREE, CURRENT
DSIGM0	M0	Data Select Bit 0	**CM10-1**, **5**, **SCX10**	DD, TL
DSIGM1	M1	Data Select Bit 1	**CM10-1**, **5**, **SCX10**	DD, TL
DSIGM2	M2	Data Select Bit 2	**CM10-1**, **5**, **SCX10**	DD, TL
DSIGTL	TL	Torque Limiting/Push-motion Operation /Current Cutback Release	**CM10-1**, **5**, **SCX10**	TL

Example

Command	Description
(1) CURRENT 1	#Motor current ON
(2) WHILE (DSIGREADY!=1);WEND	#Wait for driver READY signal ON
(3) EHOME	#Move to position zero
(4) MEND	#Wait for motion to complete

EC : Encoder Count

Execution Mode	Immediate, Sequence and CANopen
Syntax	EC
Range	-MAXEC to +MAXEC /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ, WRITE READ only while motion is in progress.
See Also	PF, ENC, ER, MR, PC, PE, ENDACT
Description	EC is the value of the encoder counter, created from the A and B signals in the encoder. The EC is converted into user unit and used as the PF (feedback position) value. EC get changed when PF is changed. Changing PC also affects EC since PF get changed when PC is changed. The driver encoder signal can be used with the **CM10-1**, **3**, **4**, **5** and **SCX10**. The ENC command selects use of either driver encoder or an external encoder. See "8.9 Encoder Function" on page 71 for more details.

Example

Command	Description
>EC	#Query the encoder count
EC=-2147483647	#Device response

ECHO : Communications Echo Control

Execution Mode	Immediate
Syntax	ECHO=n
Range	n = 0: OFF, Commands are suppressed and not shown on the terminal 1: ON, Commands are echoes back to the terminal
Factory Setting	1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	VERBOSE

Description

Allows or suppresses the display of any characters being sent to the terminal via the device's communication port.

The ECHO command is useful when the device is used with an operator interface (OIT or HMI) or a Host Controller where the echoing (repeating) of the entered characters is not necessary. The ECHO command defines the device's echo back setting (ON/OFF) for the user entered ASCII data on the terminal. If ECHO=0 (OFF), the device will send no response for the entered ASCII data to the terminal.

The function of displaying the queried parameter value or SAS (Send ASCII String) command from a program is not affected by ECHO=0. The queried parameter values and the SAS command entries will display on the terminal with ECHO=0.

Example

Command	Description
>ECHO 1	#Turn ON the ECHO
ECHO=1	#Device response
>VS	#Query the starting velocity
VS=0.1 rev/sec	#Device response
>ECHO 0	#Turn OFF the ECHO
ECHO=0	#Device response
>VS=0.1 rev/sec	#Query the starting velocity. Again, query doesn't show: just response.
>	

EDIT : Edit Sequence

Execution Mode	Immediate
Syntax	EDIT target
Range	target (optional): any valid sequence number (0-99) or name (consisting of letters, numbers or underscore, 10 characters maximum, must start with a letter except n, s, N, S, with no distinction of a capital letter or small letter.)
Commands not Allowed	RUN
See Also	DIR, COPY, DEL, REN, LOCK, UNLOCK

Description

Enters the sequence editor, where sequences can be created or modified.

Every sequence must have a unique number. If [target] is unspecified, or specified as a new name, EDIT automatically assigns the lowest unused sequence number to the new sequence.

The editor uses its own prompt (>>Command:). Editing operations are performed by entering a one character command, and any relevant arguments. The editor commands are listed below: this information is also available by entering 'H' at the editor prompt ([] indicates an optional argument).

The sequence program cannot be edited when it is locked. When an edit is required, edit the sequence program after releasing the lock of the sequence program using the UNLOCK command.

The ESCAPE character can also be used to quit the sequence editor.

Editor Command	Description
I [x]	Insert line(s) before line x (end of sequence if no x)
A x [y]	Alter line(s) x, or x to y
D x [y]	Delete line(s) x, or x to y
L [x] [y]	List line(s). All, or x to end, or x to y
X x [y]	Cut line(s) to clipboard. x, or x to y
C [x] [y]	Copy line(s) to clipboard. All, or x, or x to y
P x	Paste lines from clipboard, ahead of x
S	Save sequence, to existing location
S x	Save sequence, by number (0-99)
S sss	Save sequence, by name (10 char max)
M	Display memory status
H	Display this help reminder
Q	Quit sequence editor

Note

- A sequence named CONFIG will run automatically at power up of the device or after a RESET command has been issued.
- While the sequence editor is active, sequences cannot be executed. The START input will have no affect. Likewise, when sequences are executing, sequences cannot be edited (an attempt to edit will result in an error message).

Example

Command	Description
`>EDIT 0`	#Create (or modify) sequence 0
`New Sequence`	#Device response
`Sequence Name : <no name>`	#Device response
`Sequence Number : 0`	#Device response
`Lines : 0`	#Device response
`Bytes : 0`	#Device response
`Bytes Free : 6144`	#Device response
`>>Command:`	#<ESC> is sent to exit the editor
`>`	#Back to the main system prompt

EHOME : Start Return-to-electrical Home Operation

Execution Mode	Immediate, Sequence and CANopen
Syntax	EHOME
Commands not Allowed	MOVE
See Also	HOMETYP, LIMP, LIMN, MGHP, MGHN, PC, SLACT

Description

EHOME starts an absolute motion to position 0 (PC=0)

The motion caused by EHOME is equivalent to an "MA 0" command (move to position zero), but there is one important difference: If the electrical home has not been set, EHOME establishes position 0 as the "home" position, and can make software limit checking possible.

The EHOME motion is defined by stop velocity VS, running velocity VR, and acceleration and deceleration times TA and TD.

EHOME will not execute while the motor is moving. The motor must come to a stop before an EHOME operation will execute. The EHOME function will not execute while the MOVE output is ON.

Software position limit checking is configured by setting appropriate values for positive and negative software position limits (LIMP, LIMN), requesting software position limit checking (setting SLACT=1), and establishing a valid home position. Software position limit checking does not start until a valid home position has been established. If limit sensors and a home input are used, this can be done with mechanical home seeking (using MGHP or MGHN). If an application uses some other means to establish home, EHOME is required as part of the process of enabling software position limit checking.

Note

EHOME is a "starting" command for return-to-electrical home operation. Therefore, just after commanding (without waiting for the end of motion), the prompt will be displayed with the immediate command and the sequence will proceed to next command (line) with the sequence execution.

The commands except motion commands can be executed during motion, but all of the motion commands cannot be executed until the motion completes. To check the motion completion, execute the SIGMOVE command or SIGEND command, and monitor. It is convenient to use the MEND (wait for motion end) command in the sequence program.

Example

Command	Description
`>EHOME`	#Initiates the motor moving to the EHOME (PC=0) location
`>LIST 6`	#List use entered sequence 6
`( 1) EHOME`	#Execute an EHOME operation
`( 2) MEND`	#Wait for motion to end
`( 3) DIS=10`	#Distance equals 10 user units
`( 4) MI`	#Move incremental
`( 5) MEND`	#Wait for motion to end
`( 6) END`	#End the sequence
`>`	

ELSE : Begin ELSE Block: execute if IF is false

Execution Mode	Sequence
Syntax	ELSE
See Also	IF, ENDIF, WHILE, WEND
Description	Branches to an alternate operation if the preceding conditional IF statement is not true.

Example

Command	Description
`>LIST 5`	#List sequence 5
`(  1) IF (IN1=1)`	#If input #1 is ON, then do line 2
`(  2)   VR=2`	#Running velocity=2 user units/second
`(  3)   MA 0`	#Move Absolute to position 0
`(  4) ELSE`	#Branch on not true, if line 1 is not true, then do line 5
`(  5)   MGHN`	#Seek home in the negative direction
`(  6) ENDIF`	#End of IF block
`>`	

ENC : Encoder Selection

Execution Mode	Immediate, Sequence
Syntax	ENC=n
Range	n = 0: Not Used 1: Driver Encoder 2: External Encoder
Factory Setting	0: **CM10-2**, **SCX10** 1: **CM10-1**, **3**, **4**, **5**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	EC, PF, PE, TIM

Description

Select the source of EC (encoder count) signal, either external encoder or the driver encoder. The EC is then converted into user unit and used as the PF (feedback position) value.

Signal Flow Path

Driver Encoder A, B-------1

ENC---→ EC --→ PF value

External Encoder A, B------2

∗ When ENC is set to zero (0), the EC (encoder count) value will always be zero. ENC=0 is used when a indication of PF=0 is desired such as when using the utility software and always indicates the PF value. (If ENC=1 or 2, even though an encoder is not connected, the PF can be nonzero when PC is intentionally changed.) While the A and B signals in the encoder is used for the PF, the Z (zero position) signal is used as the TIMING signal for a mechanical home seeking. The driver timing signal TIMD and the Z signal in the external encoder are selected by the ENC parameter, and then the selected output is sent to TIM parameter.

TIMING Source Selection

TIMING Source	ENC	TIM
Timing signal·Z-phase pulse differential input TIMD	1 (Driver)	0 (TIMD/EXTZ)
Timing signal·Z-phase pulse single ended input TIMS	Unrelated	1 (TIMS)
External encoder ZSG EXTZ	2 (External Encoder)	0 (TIMD/EXTZ)
No source is selected*	0 (Not Used)	0 (TIMD/EXTZ)

∗ If ENC is set to 0 (zero) and TIM is set to 0, the system alarm status will be active when executing MGHP or MGHN command when the home seeking type uses the timing signal.

Signal Flow Path

Timing signal·Z-phase pulse differential input TIMD------1

ENC--------0 (TIMD/EXTZ)

External encoder ZSG EXTZ------2 **TIM**----------→TIMING signal

Timing signal·Z-phase pulse single ended input TIMS----------1 (TIMS)

Example

Command	Description
>ENC=1	#Changing the ENC
ENC=0(1) [Not use(Driver)]	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

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Controller Module	
Software Version: *.**	
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>ENC	#Query the ENC setting
ENC=1(1) [Driver(Driver)]	#Device response

END : Motion End

Execution Mode	Sequence
Syntax	END
See Also	RET

Description

The END statement can be used to formally terminate sequence text.

END behaves exactly the same as a return statement (RET), but END, if used, must be the last statement in the sequence. Any text following the END statement will cause an error when attempting to save the sequence.

END is provided for compatibility with other Oriental Motor products. Its use is strictly optional: a sequence does not need an END as its last statement.

Example

Command	Description
`>LIST 5`	#List sequence 5
`( 1) IF (IN1=1)`	#If input 1 is ON, then do line 2
`( 2)  MCP`	#Move continuously, positive direction
`( 3) ELSE`	#Branch on not true, if line 1 is not true, then do line 5
`( 4)  MCN`	#Move continuously, negative direction
`( 5) ENDIF`	#End of IF block
`( 6) END`	#End of sequence: optional
`>`	

ENDACT : System End Action

Execution Mode	Immediate and Sequence
Syntax	ENDACT=n
Range	n = 0: End of Pulse Generation Greater than 0.001 to Max.pos/2: End Area (end of pulse generation AND motor is within end area)
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DEND, MEND, OUTxxx (OUTEND), SIGxxx (SIGEND), PE

Description

If n is set to zero, the internal end status only references the end of pulse generation.

If n is set to nonzero, the internal end status references both the end of pulse generation and the end area.

Set ENDACT to the END range that is "allowable PE (position error) absolute value." PE is the error between PC (commanded position) and PF (feedback position).

Example) When setting "ENDACT=1," the system is determined as an internal END status when pulse output is completed and the PE is in "-1<PE<1."

See "8.8 END (motion end) Signal" on page 76.

Example

Command	Description
>ENDACT=0.01	#Set the ENDACT
ENDACT=0.001(0.01)	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

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ENDIF : End of IF Block

Execution Mode	Sequence
Syntax	ENDIF
See Also	IF, ELSE, WHILE, WEND
Description	Indicates the completion of innermost conditional IF statement.

Example

Command	Description
`>LIST 5`	#List sequence 5
`( 1) IF (IN1=1)`	#If input 1 is ON, then do line 2
`( 2)  MCP`	#Move continuously, positive direction
`( 3) ELSE`	#Branch on not true, if line 1 is not true, then do line 4
`( 4)  MCN`	#Move continuously, negative direction
`( 5) ENDIF`	#End of IF block
`( 6) END`	#End of sequence: optional
`>`	

ENDL : End of LOOP Block

Execution Mode	Sequence
Syntax	ENDL
See Also	LOOP, BREAKL
Description	Terminates the innermost LOOP block

Example

Command	Description
>LIST 5	#List sequence 5
(1) DIS=1	#Distance equals 1 user unit
(2) LOOP 5	#Loop the following 5 times
(3) MI	#Do an Index Move
(4) MEND	#Wait for the move to end before executing the next command
(5) WAIT 1.0	#Wait 1 second
(6) ENDL	#End the loop block
>	

ENDWAIT : END wait time

Execution Mode	Immediate
Syntax	ENDWAIT=n
Range	n = 0.1 to 40.0 (seconds)
Factory Setting	6
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	DEND, ENDACT,

Description

ENDWAIT sets the waiting time to establish the END status after the pulse signal output is completed (depend on ENDACT setting) when a mechanical home seeking operation or a motion with MEND command used in the sequence is executing. If the END status does not establish within the time that is set by ENDWAIT, an alarm is generated according to the following table.

DEND Parameter	ENDACT Parameter	Alarm
0	0	n/a
0	0<n (END area)	Excessive Position Deviation 10h
1	Unrelated	Driver Connection Error 6Fh

See "8.8 END (motion end) Signal" on page 76 in more detail of END signal.

Example

Command	Description
>ENDWAIT=3	#Set the ENDACT
ENDWAIT=6(3) sec	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 72 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

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>	

ER : Encoder Resolution

Execution Mode	Immediate and Sequence
Syntax	ER=n
Range	n = 10 to 51200
Factory Setting	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**, **4**, **5**, **SCX10**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	EC, PF, MR, PC, PE

Description Set the encoder resolution.

Note If ER is changed, MAXPOS (maximum position=position range) may be changed. When executing the ER command, the pre-change and post-change values of MAXPOS are displayed. Position parameters (DIS, DISx, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) are automatically checked whether or not to be within the MAXPOS (maximum position), and if they are outside the range, the warning message will be sent. Note that the position parameters in the program and the position array data POS[x] will not be checked.

Example

Command	Description
>ER=1000	#Set the encoder resolution
ER=100(1000)	#Device response
Position range = +/- 500000(500000)	
Velocity range = 0.001 - 1240(1240)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	#Device response

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Controller Module	
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>ER	
ER =1000(1000)	

EVx : Configure Event Output

Execution Mode	Immediate and Sequence
Syntax	EVx OUTy=z m=n or EVx 0
Range	x: Event Channel Number; 1 or 2 y: Output Number; 1 to 4 (general purpose output 'OUT1 to OUT4' on the I/O connector) z: Output Logic Level after Trigger; 0 (OFF) or 1 (ON) m: Event Trigger Source (T, D, V) T: Trigger n seconds after motion start; n=0 to 500 (second) D: Trigger after moving distance n from motion start; n=-MAXPOS to +MAXPOS (user units) V: Trigger after reaching speed set point n; n=0.001 to MAXVEL (user units/second)
Access	READ and WRITE
See Also	OUTx, OUTTEST

Description

During a motion, the event is recognized to be occurred when either one of the position, velocity or time has reached the specified value, the specified general output signal is changed to the desired level. It works either by the immediate command or sequence execution.

Up to 2 events can be configured and active at the same time, using both event channels 1 and 2.

The setting of the event is not released when the operation has completed, and it is continued until being cleared. To clear the event, input "EVx 0. "Even if the event has been disappeared or the setting of the event has been cleared, the output will not return automatically. To set the output status or to return to the status before the event was occurred, use the OUTx command etc.

Event checking restarts at the beginning of a motion.

To detect the transition, assure that the designated output is in the opposite state prior to the event occurring.

If the output has been assigned to a system output signal, no event-driven transitions will occur on the output.

Example

Command	Description
>OUT1=0;OUT2=0	#Set the output to the opposite direction of the event occurring
OUT1=0	
OUT2=0	
>EV1 OUT2=1 V=10	#Turn ON output 2 when reach speed of 10 user units/second
EV1 OUT2=1 V=10	
>EV2 OUT1=1 T=2	#Turn on output 1 2 seconds after motion starts
EV2 OUT1=1 T=2	
>MCP	#Execute a continuous move in the positive direction
>OUT1=0;OUT2=0	#Reset output#1 and #2
OUT1=0	
OUT2=0	
>EV1 0; EV2 0	#Clear events number 1 and 2
>	

FREE : Current OFF, Magnetic Brake Free

Execution Mode	Immediate, Sequence and CANopen
Syntax	FREE=n
Range	n = 0: Normal Condition 1: Motor Shaft Free
Factory Setting	0
Access	READ and WRITE
See Also	INxxx (INFREE), SIGxxx (SIGFREE), xxxLV (FREELV), CURRENT

Description

The FREE command is used to control the state of the FREE signal that is tied with the FREE and MBFREE output on the driver connector of the **CM10**/**SCX10** and the MBFREE output on the I/O connector (if assigned).

The FREE function may also be executed via the FREE input on the I/O connector if assigned and/or the CANopen remote I/O. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

The FREE command can be used to control the state of the FREE function regardless of the states of those inputs.

Additionally, when the state of FREE function becomes 1, the PC (position command) value will be set equal to the PF (position feedback) value. This function is utilized when positioning without motor current such as when teaching positions is required.

- If the driver has a "FREE" input (**CM10-1**, **3**, **5**, **SCX10** with applicable drivers):

  The FREE output on the driver connector of the **CM10**/**SCX10** is used. When the state of the FREE function is set to 1, the motor current will be turned OFF and the electromagnetic brake will be released (The FREE input of the connected driver is turned ON).

- If the driver has a "M.B.FREE" input (**SCX10** with applicable drivers):

  The MBFREE output on the driver connector of the **SCX10** is used. When the state of the FREE is set to 1, the electromagnetic brake will be released. (The M.B.FREE does not affect the motor current.) (Additionally, the MBFREE output turns OFF when the motor loses its holding torque due to a current cutoff or alarm.)

  Be sure that the M.B.FREE input on the driver is enabled prior to controlling the FREE function status if controlling an electromagnetic brake is desired. Example: With the **RK** Series Five-phase stepping motor and driver unit, the brake function switch is located on the front panel. The factory setting is the "power-failure position-holding mode" and the M.B.FREE input is disabled.

- If the driver does not have either of the above inputs and an external electromagnetic brake is used (**CM10-2**, **4**, **SCX10**):

  The MBFREE output on the I/O connector can be used. When the state of the FREE function is set to 1, the electromagnetic brake will be released. (Additionally, the MBFREE output turns OFF when the motor loses its holding torque due to a current cutoff or alarm.)

Example

Command	Description
>FREE=1	#Turn motor current OFF and release electro magnetic brake. Motor has no holding torque
FREE=1	
>FREE=0	#Back to normal
FREE=0	

GA, GB : Electrical Gear Ratio (GA/GB)

Execution Mode	Immediate and Sequence
Syntax	GA=n {Numerator} GB=n {Denominator}
Range	n = 1 to 100 (integer values)
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DPR, UU, MAXVEL

Description	The distance and velocity of the motor may be adjusted to compensate for a gearhead or gear assembly. The gear ratio is set via the GA and GB parameter. The applied gear ratio equals GA/GB. The numerator and the denominator of the electric gear are set to opposite to the mechanical gear.
	For example, if a ball screw with a lead of 10 mm/rev is combined with a 3:1 reduction gearhead, the following parameters would be used:
	UU=mm #User units
	DPR=10 #Distance per rev
	GA=3 #Electronic gear ratio numerator value
	GB=1 #Electronic gear ratio denominator value
	The motor must rotate 3 times as far to complete one revolution at the gearhead output. Therefore the GA value is 3 to compensate for the gear ratio's reduction in distance and velocity.
	Electronic gearing can also be used when the distance per revolution is less than 0.5, or when the exact ratio cannot be specified in three decimal places (e.g. if the distance per revolution is 1/3 user unit).
	Setting DPR=1, electronic gear numerator GA=3 and denominator GB=1 will result in three motor rotations per one user unit, for an effective DPR of exactly 1/3 user unit.

Note	If GA and/or GB are changed, MAXPOS (maximum position=position range), MAXVEL (maximum velocity=velocity range) or minimum travel distance (minimum movable distance) may automatically be changed. When executing the GA and/or GB command, these pre-change and post-change values are shown. Position parameters (DIS, DISx, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) and velocity parameters (VS, VR, VRx, SCHGVR) are automatically checked whether or not to be within the MAXPOS (maximum position) and MAXVEL (maximum velocity) respectively, and if they are outside the range, the warning message will be sent. Note that the position/velocity parameters in the program and the position array data POS[x] will not be checked. Check whether the required resolution is obtained. The minimum movable distance, which is the actual travel distance, can be checked by the TEACH command. If GA and/or GB are changed, the actual travel distance or velocity is changed. Check whether the present settings of the position/velocity parameters or those values in the program are appropriate.

Example

Command	Description
>UU mm UU=mm	#Set user units to mm (millimeters)
>DPR 10 DPR=1(10) mm Position range = +/- 500000(500000) Velocity range = 0.001 - 2480(24800) Minimum Movable Distance = +/- 0.001(0.001)	#Set the distance per revolution to 10 mm
>GA 3 GA=1(3)	#Set the electrical gear ratio numerator to 3: system rescales again
>GB 1 GB=1(1)	#Set the electrical gear ratio denominator to 1, system rescales again
>MAXVEL MAXVEL=2480(8266.666) mm/sec	#Query the MAXVEL value
>SAVEPRM (EEPROM has been written 28 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>DPR DPR=10(10) mm Position range = +/- 500000(500000) Velocity range = 0.001 - 8266.666(8266.666) Minimum Movable Distance = +/- 0.001(0.001)	#Check new effective values
>GA GA=3(3)	
>GB GB=1(1) >	

HELP : Display Help Information

Execution Mode	Immediate
Syntax	HELP
Description	Displays help information. Each screen displays the command syntax and a brief description. The SPACE key on the keyboard lists the next HELP screen. Any other keyboard key will exit the HELP screen mode.

Example

Command	Description

```
>HELP

  --- Command List ---

  TALK*      : Select unit in multi-unit communications
  @*         : Select unit in multi-unit communications
  MI         : Move Incrementally
  MA         : Move Absolutely (-MAXPOS - +MAXPOS[UU])
  CV         : Change Velocity for Index (0.001 - MAXVEL[UU/sec])
  MCP        : Move Continuous Positive
  MCN        : Move Continuous Negative
  DIS        : Incremental motion distance (-MAXPOS - +MAXPOS[UU])
  VR         : Running velocity (0.001 - MAXVEL[UU/sec])
  VS         : Starting velocity (0 - MAXVEL[UU/sec])
  TA         : Acceleration time (0.001-500.000[sec])
  TD         : Deceleration time (0.001-500.000[sec])
  PSTOP      : Stop immediately, stop sequence, follow ALMACT setting
  HSTOP      : Stop immediately (hard stop)
  MSTOP      : Stop according to MSTOPACT
  SSTOP      : Stop, decelerating (soft stop)
  SCHGPOS    : Distance from SENSOR on MCx (0 - MAXPOS[UU])
  SCHGVR     : Velocity on SCHGPOS motion (0.001 - MAXVEL[UU/sec])

  Enter [SPACE] to continue, other key to quit.    #[SPACE] entered

  MI0        : Move via linked index, begin at linked index 0
  MI1        : Move via linked index, begin at linked index 1
  MI2        : Move via linked index, begin at linked index 2
  MI3        : Move via linked index, begin at linked index 3
  DIS0       : (-DIS3) Distance/Destination for linked index 'x' (x=0-3)
                 (-MAXPOS - +MAXPOS[UU])
  VR0        : (-VR3) Velocity for linked index 'x' (x=0-3)
                 (0.001 - MAXVEL[UU/sec])
  INCABS0    : (-INCABS3) Set positioning mode for index 'x' (x=0-3)
                 (0:Absolute/1:Incremental)
  LINK0      : Configure link: linked index 0 and 1 (0:Link off/1:Link on)
  LINK1      : Configure link: linked index 1 and 2 (0:Link off/1:Link on)
  LINK2      : Configure link: linked index 2 and 3 (0:Link off/1:Link on)
  PAUSE      : Pause Motion
  CONT       : Resume Motion
  PAUSECLR   : Clear Paused Motion
  EHOME      : Move to position 0
  MGHP       : Find Home, start in Positive direction
  MGHN       : Find Home, start in Negative direction
  OFFSET     : Distance from HOME on MGHx (-MAXPOS - +MAXPOS[UU])

  Enter [SPACE] to continue, other key to quit.    #non-space entered
>
```

HOMEDCL : Select the Deviation Counter Clear During Mechanical Home Seeking Operation

Execution Mode	Immediate and Sequence
Syntax	HOMEDCL=n
Range	n = 0: Clear Deviation Counter in **CM10**/**SCX10** at Homing 1: Clear Deviation Counter in both **CM10**/**SCX10** and Driver at Homing 2: Not Clear Deviation Counter neither **CM10**/**SCX10** nor Driver at Homing
Factory Setting	0: **CM10-1**, **2**, **3**, **4**, **SCX10** 1: **CM10-5**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the default (initial).
Access	READ and WRITE READ only in Sequences
See Also	HOMETYP

Description

HOMEDCL establishes the ACL/DCL output action at the end of mechanical home seeking.

If the HOMEDCL is set to 1, the ACL/DCL signal is momentarily output to the driver when a mechanical home position is found.

If a servo motor is used, set the HOMEDCL to 1. The deviation counter in the driver is cleared to perform an immediate stop, and that causes accurate homing.

If the αSTEP products is used and the HOMETYP is set so that the timing signal is used for a mechanical home seeking, set the HOMEDCL to 0. Setting the HOMEDCL to 1 may cause a position deviation from the timing signal at the final approach due to a delay in the velocity filter of the αSTEP driver.

When an accurate deviation is required to be seen with the stepping motor plus encoder (including the αSTEP, **ESMC** controller) while the load is applied to the shaft at mechanical home seeking operation, set to "HOMEDCL=2." See "HOMEDCL (deviation counter select at mechanical home seeking operation" on page 58.

Setting Value	Deviation Counter of the **CM10**/**SCX10**	Deviation Counter of the Driver
0	Clear	-
1	Clear	Clear
2	-	-

Example

Command	Description
>HOMEDCL=1	#Set the HOMEDCL to 1
HOMEDCL=0(1)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 10 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>HOMEDCL	#Query new value
>HOMEDCL=1(1)	
>	

HOMETYP : Mechanical Home Seeking Mode

Execution Mode	Immediate, Sequence and CANopen
Syntax	HOMETYP=n
Range	n = 0 to 11 (0): **CM10-1**, **2**, **4**, **5** 0 to 12 (0): **CM10-3**, **SCX10**
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only while motion is in progress
See Also	HOMEDCL, INxxx (INHOME, INLSP, INLSN, INSENSOR), RINxxx (RINHOME, RINLSP, RINLSN, RINSENSOR), MGHP, MGHN, OFFSET, OUTxxx (OUTHOMEP)

Description

HOMETYP configures system operation when seeking a mechanical home position with the MGHP or MGHN commands. Mechanical home seeking reacts to various inputs differently, depending on HOMETYP, and according to the following table:

<table>
<tr><th rowspan="2">HOMETYP</th><th colspan="4">Home Position Indicator Signals</th></tr>
<tr><th>HOME</th><th>+LS, -LS</th><th>SENSOR</th><th>TIMING</th></tr>
<tr><td>0</td><td rowspan="4">not used</td><td rowspan="4">Required for valid home</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>-</td><td>Required for valid home</td></tr>
<tr><td>2</td><td>Required for valid home</td><td>-</td></tr>
<tr><td>3</td><td>Required for valid home</td><td>Required for valid home</td></tr>
<tr><td>4</td><td rowspan="8">Required for valid home</td><td rowspan="4">Reverse direction</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td>-</td><td>Required for valid home</td></tr>
<tr><td>6</td><td>Required for valid home</td><td>-</td></tr>
<tr><td>7</td><td>Required for valid home</td><td>Required for valid home</td></tr>
<tr><td>8</td><td rowspan="4">Stop: Alarm</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>-</td><td>Required for valid home</td></tr>
<tr><td>10</td><td>Required for valid home</td><td>-</td></tr>
<tr><td>11</td><td>Required for valid home</td><td>Required for valid home</td></tr>
<tr><td>12</td><td>not used</td><td>not used</td><td>not used</td><td>not used</td></tr>
</table>

See "8.2.5 Mechanical Home Seeking" on page 55 for details.

Memo

SENSORACT does not affect the use of the SENSOR input while seeking mechanical home with MGHP or MGHN.

Example

Command	Description
>HOMETYP 6	#Use HOME and SENSOR
HOMETYP=6	#LSx causes reversal
>MGHP	#Seek mechanical home, approach from the positive direction. Home determined by
>	HOME and SENSOR both active

HSTOP : Hard Stop

Execution Mode	Immediate, Sequence and CANopen
Syntax	HSTOP
See Also	<ESC>, ABORT, MSTOP, MSTOPACT, PSTOP, SSTOP, PAUSE
Description	HSTOP stops the motor as quickly as possible. This command does not stop a sequence program. The HSTOP command operates independently of the motor stop action setting (MSTOPACT).
Caution	**The HSTOP command will attempt to cause the motor to stop rotating immediately. Use caution when stopping a high speed load using the HSTOP command.**
Note	At high speeds, or with high inertial loads, HSTOP may cause an alarm condition.

Example

Command	Description
>MCP	#Move the motor continuously in the positive direction
>HSTOP	#Stop the motor as quickly as possible
>	

ID : Device ID

Execution Mode	Immediate
Syntax	ID=n
Range	n = *, 0 to 9 and A to Z (upper or lower case, not case sensitive)
Factory Setting	*
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	@, \ (BACKSLASH), ECHO, TALK, VERBOSE, BAUD

Description

ID sets a device address identifier, for serial communications in a multi-axis daisy chain configuration.

In a daisy chain configuration, each device must have a unique ID. That ID (along with other Communications parameters) should be configured before inserting the device into the daisy chain, using single-axis communications.

The factory setting (*) signifies "no ID." The system is configured for single-axis operation.

When a device has an ID that is not "*," it must be specifically addressed before it will process commands or transmit information. Addressing the device can be accomplished in two ways:

- Use the TALK command: TALKid (note no space between TALK and id) will signal that the device with ID=id (and no other) should respond to communications
- Use the @ command prefix: @id, (note no space between @ and id) will also select the device with ID=id, similar to TALK.

When a device has been selected, it remains selected. The device changes its command line prompt to show its ID. If a device with ID=A is selected, the prompt changes from ">" to "A>." All commands will be processed by that device, until another TALK command or @ prefix is sent with a different ID.

When a device is selected, and its ID is changed, the device remains selected (even with the new ID). The new prompt should return immediately, and communications can continue.

Because devices with a non-* ID must be addressed before communicating, these devices will not transmit any sign-on information or prompts after a power cycle or reset. Use TALK or @ to call the device.

To return a device to the default single-axis configuration, select the device, and then set ID=*.

If a device's ID is not known, connect for single-axis communications, and use \ID. Backslash (\) is a "global" selector: all units will respond. If the "unknown" device is the only connected device, the missing ID should be revealed.

Note

It is usually most efficient to fully configure each device in stand-alone, single-axis mode. Configure the device ID last. Issue the SAVEPRM command, reset the system, and confirm proper ID and operation before inserting a device into the daisy chain.

Example

Command	Description
>ID	#System has default prompt…
ID=*	#…and ID
>ID C	#Set ID to 'C'
ID=C	
C>SAVEPRM	#Save parameters
(EEPROM has been written 36 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
C>RESET	#Reset the system
Resetting system.	#Note no sign-on banner or prompt
@CVER	#Address C, query version
CM10-*/*.**/Mar 9 2010	#Version response
C>	#Prompt from device with ID=C

IF : Begin IF Block: execute if IF is true

Execution Mode	Sequence
Syntax	IF (element1 {Conditional Operator} element2)
Range	Conditional Expression
See Also	ELSE, ENDIF, WHILE, BREAKW, WEND, LOOP, BREAKL, ENDL

Description

Executes the conditional branching of an IF statement. Parentheses are required.

Element1 and element2 may be any numeric variable available to sequences, or any numeric constant within the range -(Maximum Number) to +(Maximum Number). (If POS[x] is used, refer to "POS[x]" on page 282.)

Valid conditional operators are:

=, == : Equal to
!= : Not equal to
< : Less than
<= : Less than or equal to
> : Greater than
>= : Greater than or equal to

IF statements must be followed (at some point) by a corresponding ENDIF statement, forming an IF "block." An ELSE statement may appear within the IF block.

When executed, the conditional expression is evaluated. If it evaluates to TRUE, sequence processing proceeds to the statement following the IF. If it evaluates to FALSE, sequence processing proceeds to the statement following the next ELSE (if used) or ENDIF (if ELSE is not used).

lock structures (IF-ENDIF, WHILE-WEND, LOOP-ENDL) may be nested, to eight (8) levels deep.

Example

Command	Description
`>LIST 8`	#List sequence 8
`( 1) MCP`	#Move continuously (positive)
`( 2) WHILE (IN1=0)`	#Start WHILE block. Execute lines 3 through 5 while condition is true
`( 3)  IF (IN2=1)`	#If IN2 is 1 (ON), execute line 4
`( 4)  BREAKW`	#Exit the WHILE loop and execute the line after the WEND command
`( 5)  ENDIF`	#End the IF block
`( 6) WEND`	#End the WHILE block, return to line 2
`( 7) SSTOP`	#Slow down and stop the motor
`( 8) END`	#End the sequence

IN : General Input Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	IN
Range	0 to 511 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	IO, INx, xxxLV (INxLV), OUT, OUTx, INxxx, INSG, INITIO, REPORT, OUTTEST

Description

The IN command displays the current status of all the general purpose inputs, as one integer number.

The general purpose inputs contribute to the value of IN as follows:

INx	Contribution to IN If Active
IN9	256
IN8	128
IN7	64
IN6	32
IN5	16
IN4	8
IN3	4
IN2	2
IN1	1

For example, if the general input 2 (2), general input 3 (4) and general input 4 (8) are active, while all other signals are not active, "IN=14" is set (2+4+8=14).

When inputting IN, "IN=14" is replied.

∗ To check the status of a single general input, use the INx command.

∗ If an input is assigned to a system input signal (HOME, LSN, LSP etc.) the IN command will always read that particular input OFF or 0. Use the INSG command in order to refer to the status of all input signals assigned the specific function.

Example

Command	Description
>IN	#Query the status of the general inputs
IN=32	#Device response indicating input 6 is ON
>	
>LIST 8	#List sequence 8
(1) SAS PRESS START	#Notify user to press start
(2) IF (IN=18)	#If inputs 2 and 5 are ON then,
(3) MGHN	#Go home in the negative direction
(4) ELSE	#If the value of IN does not equal 18, then
(5) WHILE (IN=0)	#While all the inputs are OFF
(6) MI	#Execute an Index Move
(7) MEND	#Wait for move to complete
(8) WAIT 0.15	#Wait an additional 0.15 seconds
(9) WEND	#End the WHILE loop
(10) ENDIF	#End the IF block
>	

INCABSx : Link Type for Link Segment 'x'

Execution Mode	Immediate, Sequence and CANopen
Syntax	INCABSx=n (x is a number of linked segments: x=0 to 3.)
Range	n = 0: Absolute 1: Incremental
Factory Setting	1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	DISx, VRx, LINKx, MIx, TA, TD, VS

Description

INCABSx determines whether DISx represents a distance or an absolute destination for linked index (MIx) motion commands.

Note

Each of the four links can be incremental or absolute.

Incremental and absolute can be used in combination, but all links executed together must move in the same direction.
- For incremental links, motion direction is determined by the arithmetic sign of DIS.
- For absolute links, motion direction is determined by the motor position at the start of that motion link.

Generally, absolute links are not recommended when the motor position before linked operation cannot be predicted.

Example

Command	Description
>UU in	#Set user units to in. (inches)
UU=in	#Device response
>VR1 5	#Set the velocity for linked move 1 to 5 user units/second
VR1=5 in/sec	#Device response
>DIS1 10	#Set the distance for linked move 1 to 10 user units
DIS1=10 in	#Device response
>INCABS1 1	#Set the move type for linked motion 1 to incremental
INCABS1=1 [INC]	#Device response
>LINK1 1	#Enable the linked operation for motion 1
LINK1=1	#Device response
>VR2 10	#Linked move 2 velocity equals 10 user units/second
VR2=10 in/sec	#Device response
>INCABS2 0	#Set the move type for linked motion 2 to absolute
INCABS2=0 [ABS]	#Device response
>DIS2 20	#Linked move 2: destination is position 20 user units
DIS2=20 in	#Device response
>LINK2 0	#"Unlink" link 2 from link 3
LINK2=0	#Device response
>MI1	#Start the linked operation motion
>	

INITDIO : Initialize Driver I/O

Execution Mode	Immediate
Syntax	INITDIO
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
See Also	DINxxx, DOUTxxx, INITPRM, CLEARALL
Description	Cancel all driver input or driver output assignments. All driver system input signal assignment values and all driver system output signal assignment values are set to zero (0), unassigned. When having executed the INITDIO command accidentally, execute the RESET command without executing the SAVEPRM command. It returns to the setting before having executed the INITDIO command.
Caution	**The INITDIO command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The INITDIO command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**

Example

Command	Description
>INITDIO	#Reset the current DIO assignment to factory settings
Enter Y to proceed, other key to cancel. Y	
1(1)	#Device response
3(3)	
6(6)	
7(7)	
0(0)	
5(5)	
4(4)	
4(0)	
5(0)	
6(0)	
0(0)	
1(1)	
2(2)	
0(4)	
8(8)	
0(0)	
0(0)	
0(0)	
3(0)	
7(0)	
2(0)	
4(0)	
5(0)	
6(0)	
0(0)	
All driver I/O configurations are set to factory default.	
Execute SAVEPRM then RESET to activate new settings.	
>SAVEPRM	#Save the assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>	

INITIO : Initialize I/O

Execution Mode	Immediate
Syntax	INITIO
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
See Also	INxxx, OUTxxx, OUTTEST, INITRIO, INITPRM, CLEARALL
Description	Cancels all input or output assignments. All system input signal assignment values and all system output signal assignment values are set to zero (0), unassigned. All inputs and outputs are reset for general purpose use. If the command is executed accidentally, RESET without SAVEPRM. The old I/O assignments remain effective until SAVEPRM and RESET execute. INITIO does not change any signal level assignments (e.g. HOMELV, etc.).
Caution	**The INITIO command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The INITIO command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**

Example

Command	Description
>INITIO Enter Y to proceed, other key to cancel. Y 1(0) 0(0) 5(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 7(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 9(0) 1(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0) 0(0)	#Reset the current IO assignment to factory settings #Device response

```
 All I/O configurations are set to factory    #Device response
default.
 Execute SAVEPRM then RESET to activate new   #Save the parameter assignments
settings.                                     #Device response
>SAVEPRM
 (EEPROM has been written 21 times)           #Establish the saved parameter values
 Enter Y to proceed, other key to cancel. y
 Saving Parameters.........OK.
>RESET
 Resetting system.
-----------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-----------------------------------------
>
```

INITPRM : Initialize Parameters

Execution Mode	Immediate
Syntax	INITPRM
RESET	Reset required before new value becomes active.
Commands not Allowed	MOVE, RUN
See Also	CLEARALL, CLEARPOS, CLEARSEQ, CLEARVAR, INITIO, INITDIO, INITRIO
Description	When executing the INITPRM command, the all parameters except position array data (POS[x]) and sequence programs restore to the factory setting. The all parameters contain the user variables, user-defined variables, all I/O setting and communication settings.
Caution	**The INITPRM command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The INITPRM command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**
Note	Since the baud rate and ID restore to the factory settings when executing INITPRM, the communication cannot be performed if these settings have been changed. Note this point.

Example

Command	Description

`>INITPRM`
` (EEPROM has been written 45 times)`
` Enter Y to proceed, other key to cancel. y`
` Initializing Parameters..OK.`
`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
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`----------`
`>`
	#Reset all of the motion parameters to factory settings
	#Once confirmed, memory overwritten, old values lost
	#Reset required to activate new factory default settings

INITRIO : Initialize Remote I/O

Execution Mode	Immediate
Syntax	INITRIO
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
See Also	RINxxx, ROUTxxx, INITIO, INITPRM, CLEARALL
Description	Cancels all remote input or remote output assignments. All remote input signal assignment values and all remote output signal assignment values are set to zero (0), unassigned. All remote inputs and outputs are reset for general purpose use. If the command is executed accidentally, RESET without SAVEPRM. The old I/O assignments remain effective until SAVEPRM and RESET execute.
Caution	**The INITRIO command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The INITRIO command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. The number of times for accumulated write cycles is displayed when executing.**

Example

Command	Description
>INITRIO	#Reset the current RIO assignment to factory settings
Enter Y to proceed, other key to cancel. Y	#Device response
0(0)	
0(0)	
0(0)	
0(0)	
1(0)	
0(0)	
0(0)	
0(0)	
0(0)	
0(0)	
0(0)	
7(0)	
0(0)	
0(0)	
0(0)	
4(0)	
0(0)	
All I/O configurations are set to factory default.	#Device response
Execute SAVEPRM then RESET to activate new settings.	
>	

INSG : System Signal Input Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	INSG
Range	0 to 2096127 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	IN, xxxLV, OUTSG, IO, SIGxxx, REPORT, OUTTEST

Description

The INSG command displays the current status of all the system input signals, as one integer number.

The system input signals contribute to the value of INSG as follows:

Bit Location	Signal	Contribution to INSG If Active
Bit 20	CONT	1048576
Bit 19	TL	524288
Bit 18	PECLR	262144
Bit 17	MGHN	131072
Bit 16	MGHP	65536
Bit 15	MCN	32768
Bit 14	MCP	16384
Bit 13	FREE	8196
Bit 12	CON	4096
Bit 11	ALMCLR	2048
Bit 10	-	-
Bit 9	PAUSECL	512
Bit 8	PAUSE	256
Bit 7	SENSOR	128
Bit 6	HOME	64
Bit 5	LSN	32
Bit 4	LSP	16
Bit 3	MSTOP	8
Bit 2	PSTOP	4
Bit 1	ABORT	2
Bit 0	START	1

INSG is the sum of the contribution of all active signals.

For example, if the HOME (64) and SENSOR (128) signals are active, while all other signals are not active, "INSG=192" is set (64+128=192). When inputting INSG, "INSG=192" is replied.

* When checking the status of a single system input signal use the SIGxxx command.

* Be careful not to confuse INSG with IN (general input status). IN reports the status of general purpose inputs (those inputs which are not assigned to a signal).

Example

Command	Description
>INSG	#Query the current input signal value
INSG=52834	#Device response: the CON signal and TL signal are active

INx : Individual General Input Status

Execution Mode	Immediate and Sequence
Syntax	INx (INx is a signal name: IN1 to IN9)
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Access	READ
See Also	IN, INSG, INxLV, IO, OUTTEST, OUTx, SIGxxx, REPORT

Description

INx returns the state of general purpose input INx.

If the input has been assigned to a system input signal, then it is no longer "general purpose." INx for these inputs will always return 0 (Not Active). Use the SIGxxx command to check the status of the individual system input signal.

Example

Command	Description
`>LIST JOG`	#List sequence named "JOG"
`(  1) TA= 0.1; TD=0.1; VS=0; VR=5`	#Set motion parameters
`(  2) LOOP`	#Start infinite loop
`(  3)   IF (IN1=1)`	#If input 1 is active
`(  4)     MCP`	#Move continuous, positive
`(  5)     WHILE (IN1=1); WEND`	#Wait for input 1 to clear
`(  6)     SSTOP`	#Soft stop
`(  7)     MEND`	#Wait for stop to complete
`(  8)   ENDIF`	#End of IF block
`(  9)   IF (IN2=1)`	#If input 2 is active
`( 10)     MCN`	#Move continuous, negative
`( 11)     WHILE (IN2=1); WEND`	#Wait for input 2 to clear
`( 12)     SSTOP`	#Soft stop
`( 13)     MEND`	#Wait for stop to complete
`( 14)   ENDIF`	#End of IF block
`( 15) ENDL`	#End of LOOP block
`>`	

INxxx : System Signal Input Assignment

Execution Mode	Immediate
Syntax	INxxx=n ("xxx" represents the signal name to be assigned, and "n" represents the assigned terminal number ("n" becomes the INn input at the time of general input)
Range	n = 0 to 9
Factory Setting	0 (unassigned)
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	xxxLV (except: LSP/LSN), SIGxxx, IO, INITIO, CLEARALL, INSG, INx, OUTTEST, REPORT, RINxxx, and "See Also" column in the chart below.

Description Assign the system input signal to the INn of the I/O connector of the **CM10**/**SCX10**. The system signal input assignment is released by "INxxx=0" and it becomes the general input INn. When executing the INITIO command, the parameter restores to the factory setting.

Command	Signal	Description	See Also
INABORT	ABORT	Abort Motion and Sequence Execution	ABORT, <ESC>
INALMCLR	ALMCLR	Alarm Clear	ALMCLR
INCON	CON	Current ON	CON, CURRENT, STRSW
INCONT	CONT	Continue Motion	PAUSE, PAUSECLR, STARTACT
INFREE	FREE	Current OFF, Magnetic Brake Free	FREE, CURRENT
INHOME	HOME	Home Sensor	HOMETYP, MGHP, MGHN
INLSP/INLSN	LSP/LSN	Limit Switch Positive /Limit Switch Negative	ALM, ALMACT, ALMCLR, OTLV
INMCP/INMCN	MCP/MCN	Move Continuously Positive /Move Continuously Negative	-
INMGHP/INMGHN	MGHP/MGHN	Move Go Home Positive /Move Go Home Negative	MGHP, MGHN, HOMETYP
INMSTOP	MSTOP	Motor Stop	MSTOP, MSTOPACT
INPAUSE	PAUSE	Pause Motion	PAUSE, CONT, PAUSECLR, INPAUSECL,
INPAUSECL	PAUSECL	Pause Clear	PAUSE, PAUSECLR, CONT, OUTPSTS
INPECLR	PECLR	Position Error Clear	PECLR, PC, PE, PF
INPSTOP	PSTOP	Panic Stop	PSTOP, ABORT, <ESC>, ALMACT, HSTOP, MSTOP, SSTOP, PAUSE
INSENSOR	SENSOR	Sensor	SENSORACT, MGHP, MGHN, SCHGPOS, SGHGVR
INSTART	START	Start Sequence	STARTACT
INTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL, DOUTTL

Example

Command	Description
>INABORT 2	#Assign the ABORT signal to input 2
INABORT=0(2)	#Save the parameter assignments
>SAVEPRM	
(EEPROM has been written 2 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter value
Resetting system.	

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>INABORT	#Confirm new value
INABORT=2(2)	
>	

IO : Input/Output Status

Execution Mode	Immediate
Syntax	IO
Range	/: real time monitor (immediate mode only)
See Also	xxxLV, INxxx, OUTxxx, IN, OUT, OUTTEST, INx, OUTx, SIGxxx, DIO, RIO, REPORT

Description

IO displays the current status of general purpose inputs and outputs and system input signals and system output signals. Values are reported as 0: inactive or 1: active.

A START input can start a sequence, determined by the binary value of IN. This value is shown in the I/O response under (SEQ#), and is the number of the sequence that would start if a START signal became active in this I/O state.

In the example below, input 1 and input 7 to 9, output 4 remains general purpose: all other I/O have been assigned to system signals. General purpose input 1 is active, so IN=1, and sequence 1 would start if the alarm condition were cleared and START became active.

Example

Command	Description
>IO	#Display IO status
Inputs (1-9) = IN1 SENSOR HOME PSTOP -LS +LS IN7 IN8 IN9 Outputs (1-4) = END RUN ALARM OUT4 --Inputs-- Outputs 1 2 3 4 5 6 7 8 9 -(SEQ#)- 1 2 3 4 1 1 0 0 0 0 0 0 0 -(1)- 1 0 0 0 >	#Device response

KB : Keyboard Input

Execution Mode	Sequence
Syntax	*variable* = KB
Range	*variable* refers to any numeric *variable* which sequences can write to. Actual permitted range depends on *variable* -Max.Num to +Max.Num
See Also	KBQ, SAS, SACS, VIEW

Description

KB transmits a data entry prompt over the serial port, accepts a numeric value from the serial port, and assigns that value to *variable*.

The data entry prompt consists of a question mark and a space. The sequence waits for a valid numeric entry, terminated by any of (CR, LF, CR+LF, or LF+CR).

If the data is not a valid numeric value (e.g. alphabetic text), the system retransmits the data entry prompt, and waits for a new entry.

If the data is a valid numeric value, but represents an invalid value for the designated *variable* because of range or precision limits, an alarm will be triggered and sequence processing will stop.

Sequence execution is effectively suspended while waiting to receive a valid numeric value.

For similar operation without prompting, see KBQ (Keyboard Input Quiet).

KB and KBQ are provided to enable interactive sequence operation when connected with a host computer, PLC, touch panel, etc. via the serial port. Along with normal *variable* display responses (which include extra characters), the VIEW command can be used to transmit a *variable*'s value without extra characters. SAS (send ASCII string) and SACS (send ASCII control string) can be used to transmit text information (with and without extra characters, respectively). Taken together, a complete interactive serial interface can be implemented.

Memo

In a daisy chain configuration (ID other than *), all output from sequence commands is suppressed unless the device has been previously addressed (via TALK or @). The KB and KBQ commands will not receive input unless the device has been previously addressed.

Example

Command	Description
`>LIST 9`	#List sequence 9
`( 1) VR=10`	#Set running velocity
`( 2) SACS How far do you want to go`	#Prompt user to enter desired distance
`( 3) DIS=KB`	#Output ? and wait for new value
`( 4) DIS`	#Distance equals the entry value (KB)
`( 5) MI`	#Execute an index move of DIS user units
`( 6) MEND`	#Wait for motion to end.
`>RUN 9`	#Execute sequence 9
`>How far do you want to go? 20`	#Line 2 text, and numeric entry from line 3
`20`	#The distance value is displayed
`>`	#Motor moves 20 user units

KBQ : Keyboard Input (Quiet)

Execution Mode	Sequence
Syntax	*variable* = KBQ
Range	*variable* refers to any numeric *variable* which sequences can write to. Actual permitted range depends on *variable* -Max.Num to +Max.Num
See Also	KB, SAS, SACS, VIEW
Description	KBQ accepts a numeric value from the serial port, and assigns that value to *variable*. The sequence waits for a valid numeric entry, terminated by any of (CR, LF, CR+LF, or LF+CR). If the data is not a valid numeric value (e.g. alphabetic text), the data is ignored: the system continues to wait for a new entry. If the data is a valid numeric value, but represents an invalid value for the designated *variable* because of range or precision limits, an alarm will be triggered and sequence processing will stop. Sequence execution is effectively suspended while waiting to receive a valid numeric value. KBQ operation is essentially the same as for KB, without the leading prompt or trailing CR+LF pair. KBQ permits tighter control of serial output for applications requiring exact character-by-character control. KB and KBQ are provided to enable interactive sequence operation when connected with a host computer, PLC, touch panel, etc. via the serial port. Along with normal *variable* display responses (which include extra characters), the VIEW command can be used to transmit a *variable*'s value without extra characters. SAS (send ASCII string) and SACS (send ASCII control string) can be used to transmit text information (with and without extra characters, respectively). Taken together, a complete interactive serial interface can be implemented.
Memo	In a daisy chain configuration (ID other than *), all output from sequence commands is suppressed unless the device has been previously addressed (via TALK or @). The KB and KBQ commands will not receive input unless the device has been previously addressed.

Example

Command	Description
`>LIST 10`	#List sequence 10
`(  1) VR=10`	#Set running velocity
`(  2) SACS How far do you want to go?`	#Prompt user: append ? and trailing space
`(  3) DIS=KBQ`	#Wait for new value
`(  4) SACS ^M^JMoving :`	#Transmit CR, LF, text
`(  5) VIEW DIS`	#Transmit DIS value, no extra text
`(  6) MI`	#Move incrementally, new DIS distance
`(  7) MEND`	#Wait for motion to end.
`>RUN 10`	#Execute sequence 10
`>How far do you want to go? -37.5`	#Line 2 text, and numeric entry from line 3
`Moving :-37.5`	#Exact output of lines 4 and 5 Motor moves 20 user units

LIMP, LIMN : Setting of Software Position Limits (Positive Direction, Negative Direction)

Execution Mode	Immediate and Sequence
Syntax	LIMP n: Maximum Permitted Position LIMN n: Minimum Permitted Position
Range	n = -MAXPOS to +MAXPOS (user units)
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	SLACT, PC, MGHP, MGHN, EHOME, ALM, ALMACT, OTACT

Description

When SLACT=1, software position limits LIMP and LIMN are enforced, provided the electrical home is set by a homing action (EHOME, MGHP, MGHN).

The action of software position limits depends on the type of operation as following chart.

	Continuous Motion (MCN/MCP)	Index Motion (MI)	Absolute Motion (MA)	Homing Motion* (MGHN/MGHP/ EHOME)
Software limit action	Motion stops when exceeding software limits	Motion does not start if target position is out of software limits		Software limits are disabled during motion
Stopping motion	Immediate stop or deceleration stop depending on OTACT parameter	-	-	-
Condition after above action	Activate ALARM (67h) and/or disable motor current depending on ALMACT parameter		Display error message	-

* A software position limit alarm may be triggered after a homing operation if PC=0 is not between LIMP and LIMN.

If the system is outside the software position limits, motions may still be started. After any alarm is cleared, MI or MA can be executed if their destination would bring the motor within limits. MCP or MCN can be executed, if the motor would move in the direction of the operational range.

Note

If LIMP=LIMN=0, software position limit checking is disabled, even if SLACT=1. LIMP and LIMN should be set to appropriate values before enabling software position limit checking.

Example

Command	Description
>LIMP 10	#Set positive motion limit
LIMP=0(10) Rev	
>LIMN -10	#Set negative motion limit
LIMN=0(-10) Rev	
>SLACT 1	#Set software limit enable
SLACT=0(1)	
>INHOME 1	#Configure HOME input only
INHOME=0(1)	
>HOMETYP 8	#Set Home type. Use software limit instead of LSP, LSN
HOMETYP=8	
>SAVEPRM	
(EEPROM has been written 2 times)	
Enter Y to proceed, other key to cancel. y	#"y" entered to proceed
Saving Parameters.....OK.	
>RESET	#Reset device to activate changes
Resetting system.	

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Software Version: *.**	
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>LIMP	#Confirm settings
LIMP=10(10) Rev	
>LIMN	
LIMN=-10(-10) Rev	
>SLACT	
SLACT=1(1)	
>ALMMSG 2	#Enable alarm messages
ALMMSG=2 [Alarm+Warning]	
>MGHP	#Start seek mechanical home
>SIGHOMEP	#MGHP finished, check HOMEP signal
SIGHOMEP=1	
>MCP	#Move continuously, positive
>Over travel: software position limit detected.	#Limir detected
>PC	#Check PC
PC=10.001 Rev	#Just over LIMP
>	

LINKx : Link Control for Link Segment 'x'

Execution Mode	Immediate, Sequence and CANopen
Syntax	LINKx=n (x is a number of linked segments: x=0 to 2.)
Range	n = 0: Segment (x) Terminates Motion 1: Link Segment (x) to Segment (x+1)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	DISx, INCABSx, MIx, TA, TD, VRx, VS

Description

LINKx control whether linked motion segment x is linked to the next segment, or not.

If LINKx=0, the motion segment defined by DISx and VRx will terminate.

If LINKx=1, the motion segment defined by DISx and VRx will not terminate: motion will proceed to motion segment (x+1).

Example

Command	Description
>VR0 5	#Set the velocity for link segment 0 to 5 user units/second
VR0=5 in./sec	#Device response
>DIS0 10	#Set the distance for link segment 0 to 10 user units
DIS0=10 in.	#Device response
>INCABS0 1	#Set the move type for link segment 0 to incremental
INCABS0=1 [INC]	#Device response
>LINK0 1	#Enable the link between link segments 1 and 2
LINK0=1	#Device response
>VR1 10	#Link segment 1 velocity equals 10 user units/s
VR1=10 in./sec	#Device response
>DIS1 20	#Link segment 1 distance equals 20 user units
DIS1=20 in.	#Device response
>INCABS1 0	#Set the move type for link segment 1 to absolute
INCABS1=0 [ABS]	#Device response
>LINK1 0	#Unlink segment 1 from segment 2
LINK1=0	#Device response
>MI0	#Start the linked operation motion

LIST : List Sequence Contents

Execution Mode	Immediate
Syntax	LIST target [startline] [endline]
Range	target can be the name or number of any existing sequence [startline] is an optional line number. [endline] is an optional line number, if [startline] is specified. If given, it must not be less than [startline].
See Also	DIR, EDIT
Description	LIST lists the contents of a stored sequence. If [startline] and [endline] are not specified, the entire sequence is listed. If [startline] is specified, output starts with line [startline]. If [endline] is specified, output ends after line [endline]. If [startline] and [endline] are specified, the sequence between [startline] and [endline] is listed.

Example

Command	Description
`>LIST PROGRAM10 2 5`	#List sequence PROGRAM10, from line 2 through 5

`( 2) LOOP 5`
`( 3) MI`
`( 4) MEND`
`( 5) WAIT 1.0`
`>`
	#Partial contents of sequence PROGRAM10

LISTVAR : Lists all User-defined Variables

Execution Mode	Immediate
Syntax	LISTVAR
See Also	CLEARVAR, CREATEVAR, N_xxx, S_xxx
Description	LISTVAR lists the names and values of all user-defined variables (String – S_xxx and Numeric – N_xxx)

Example

Command	Description
>LISTVAR	#List all user-defined variables

```
   ##  N_name      Numeric Data
   ==  ==========  ============
    1  PRICE       0
    2  QUANTITY    0
    3  LOT         32
    4  SERIAL      4583274
    5  SIZE        0
    6  LENGTH      106
    7  WIDTH       60
    8  WEIGHT      0.95
    9              0
   10              0
   ##  S_name      String Data
   ==  ==========  ====================
    1  NAME        IIM
    2  STATUS      Same day shipping OK
    3  MESSAGE
    4  UNIT        Kilogram
    5  COUNTRY     USA
    6
    7
    8
    9
   10
>
```

#List for numeric user-defined variables

#Variables created but not assigned a value show 0

#Empty (available) slots have no name

#List for string user-defined variables

LOCK : Lock Sequence

Execution Mode	Immediate
Syntax	LOCK target
Range	target can be the name or number of any existing sequence.
Commands not Allowed	RUN
See Also	DEL, DIR, EDIT, UNLOCK

Description

LOCK prevents changes to a sequence.

A locked sequence cannot be deleted, renamed, or overwritten (by COPY or EDIT).

A locked sequence can be unlocked with the UNLOCK command.

The sequence directory listing (DIR command) shows the lock status for all sequences.

Caution

A locked sequence will be cleared by CLEARSEQ or CLEARALL: the lock status offers no protection for these operations.

Example

Command	Description
`>LOCK PROG1`	#Lock the sequence named PROG1 from deletion
`>DEL PROG1`	#Attempt to delete the PROG1 sequence
`Error: Sequence is locked.`	#Device's response, unable to delete PROG1
`>DIR`	#Query the directory sequence

```
   ##  Name         TextSize  Locked
   ==  ==========  ========  ======
    0  PROG1             37  Locked

  Total:   1
  Executable memory:    32 bytes used of  6144 bytes total,    1 percent.
  Storage memory:       77 bytes used of 21775 bytes total,    0 percent.
>
```

LOOP : Begin Counted LOOP Block

Execution Mode	Sequence
Syntax	LOOP n
Range	n = 1 to Max.Num (integer values), Loop Count
See Also	BREAKL, ENDL, WHILE, WEND

Description

LOOP begins a "loop block" structure, which must be terminated later in the sequence by a corresponding ENDL (end loop) command.

The statements between the LOOP and ENDL commands and will be executed 'n' times unless terminated (by a break loop (BREAKL) command, a return (RET), an alarm condition, etc).

Loop count 'n' is optional. If 'n' is not given, the block may execute forever. 'n' may be a positive constant, or any variable which a sequence can read. If the variable has a fractional component, it is ignored. The variable must have a positive value.

Block structures (IF-ENDIF , LOOP-ENDL, WHILE-WEND) can be nested up to 8 levels deep.

Example

Command	Description
`>LIST 27`	#List sequence 27
`( 1) DIS=1`	#Distance equals 1 user unit
`( 2) LOOP 5`	#Loop the following 5 times
`( 3) MI`	#Do an index move
`( 4) MEND`	#Wait for the move to end before executing the next command
`( 5) WAIT 1.0`	#Wait 1 second
`( 6) ENDL`	#End the loop
`>`	

MA : Start Absolute Motion to the Specified Destination

Execution Mode	Immediate, Sequence and CANopen
Syntax	MA n
Range	n = -MAXPOS to +MAXPOS (user units) In immediate mode, 'n' can be a constant or any POS [x] position array variable. In a sequence, 'n' can be a constant or any variable which can be read within a sequence.
Commands not Allowed	MOVE
See Also	DPR, MCP, MCN, MI, PC, TEACH, UU, MEND, CV
Description	MA starts a point-to-point motion to position "n." Motion velocity is determined by running velocity (VR). Start velocity (VS), acceleration time (TA), and deceleration time (TD) are effective. The speed may be changed while the motion is in progress, using the change velocity command (CV). If the motion finishes successfully, the position set point (PC) should equal 'n.' Some combinations of effective distance, speeds and acceleration and deceleration times are not feasible. For instance: if VR is very high, and TA and TD are very long, but the effective distance is very short, the system could cover too much distance accelerating to velocity VR over time TA. The system monitors for these conditions, and starts decelerating early if necessary. (Under these conditions, peak speed will be less than VR, and acceleration and deceleration times will be less than TA and TD.) The system is careful to preserve the actual motion distance, and the effective acceleration and deceleration rates. MA is not accepted while the motor is moving, when current is off, or when the system has an active alarm condition. An attempt to execute MA while the motor is moving causes an error message in immediate mode, and causes an alarm and sequence termination (alarm code: A0h) if executed from a sequence.
Note	MA starts an index motion, but does not wait for motion to end. Other commands can be issued in immediate mode or executed by a sequence while the motion is running, although motion commands cannot be executed until the motion is complete. To check that motion is finished, monitor SIGMOVE or SIGEND. In a sequence, the MEND command provides a convenient way to suspend sequence processing until motion is finished.

Example

Command	Description
>LIST MOVEABS	
(1) PC=0	#Set PC=0
(2) TA=0.1; TD=0.1	#Set ramp times
(3) VS=0; VR=10	#Set velocities
(4) LOOP	
(5) SAS Position 1	#Message-1
(6) MA 0.25	#Move to 0.25 user unit
(7) MEND; WAIT 1	
(8) SAS Position 2	#Message-2
(9) MA 0.75	#Move to 0.75 user unit
(10) MEND; WAIT 1	
(11) SAS Position 3	#Message-3
(12) MA 0.5	#Move to 0.5 user unit
(13) MEND; WAIT 1	
(14) SAS Position 4	#Message-4
(15) MA 0.75	#Move to 0.75 user unit
(16) MEND; WAIT 1	
(17) SAS Position 5	#Message-5
(18) MA 1.0	#Move to 1.0 user unit
(19) MEND	
(20) SAS End Session. Go to next.	#Message-6
(21) WAIT 2	
(22) ENDL	
>RUN MOVEABS	
>Position 1	#Message-1
>Position 2	
>Position 3	
>Position 4	
>Position 5	#Message-5
>End Session. Go to next.	#Message-6
>Position 1	
>Position 2	
>Position 3	
>Position 4	
>Position 5	
>End Session. Go to next.	
>	

MAXEC : Maximum Encoder Count

Execution Mode	Immediate
Syntax	MAXEC
Factory Setting	500000000: **CM10-1**, **4**, **5**, **SCX10** 100000000: **CM10-2** 50000000: **CM10-3**
Access	READ
See Also	EC, MAXPOS, ER
Description	MAXEC is the largest permitted value for encoder count (EC). EC must be between -MAXEC and +MAXEC. MAXEC is determined by MAXPOS (maximum position value) and ER (encoder resolution).

Example

```
Command                                          Description
>MAXEC                                           #Query the maximum encoder count
 MAXEC=500000000(500000000)
>MAXPOS                                          #Query the maximum position value
 MAXPOS=500000(500000) Rev
>ER 100                                          #Set the encoder resolution
 ER=1000(100)
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 1240(1240)
>saveprm                                         #Save the parameter assignments
 (EEPROM has been written 14 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters.........OK.
>reset                                           #Establish the saved parameter values
 Resetting system.
------------------------------------------
    CM10-*
    Controller Module
    Software Version: *.**
    Copyright 2010
    ORIENTAL MOTOR CO., LTD.
------------------------------------------
>MAXEC                                           #Query the maximum encoder count
 MAXEC=50000000(50000000)
>
```

MAXPOS : Maximum Position Value

Execution Mode	Immediate
Syntax	MAXPOS
Factory Setting	500000 (user units)
Access	READ
See Also	DPR, GA, GB, MAXVEL

Description

MAXPOS (maximum position) is the largest permitted value for position-related parameter entry. Position related parameters (DIS, DISx, PC, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) must be between –MAXPOS and +MAXPOS.

MAXPOS also defines the limit for absolute motions from initial starting position. If the system moves outside of –MAXPOS to +MAXPOS, the position command (PC) is reset to zero (0). The new zero position is located exactly at the former –MAXPOS or +MAXPOS position.

MAXPOS is determined by DPR (distance per revolution), GA and GB (electric gear ratio), MR (motor resolution), ER (encoder resolution), and is automatically updated when these parameters are changed. Both active and future values of MAXPOS are shown as "position range" when MAXPOS is queried, and the new value becomes effective after SAVEPRM and RESET are performed. At the same time, the values of the position parameters (DIS, DISx, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) are automatically checked whether or not to be within the MAXPOS (maximum position), and if they are outside the range, the warning message will be sent. Note that the position parameters in the program and the position array data POS[x] will not be checked. The new values will become effective after executing save and reset.

Example

Command	Description
`>UU in.` ` UU=in.`	#Set the user units to in. (inches)

`>MR 10000`
` MR=1000(10000)`
` Position range = +/- 500000(214748)`
` Velocity range = 0.001 - 1240(124)`
` Minimum Movable Distance = +/- 0.001(0.001)`
	#Set the motor resolution to 1000 user units: device responds with ranges, active and (future)

`>SAVEPRM`
` (EEPROM has been written 68 times)`
` Enter Y to proceed, other key to cancel. y`
` Saving Parameters.....OK.`
	#Save the parameter assignments

`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
`Copyright 2010`
`ORIENTAL MOTOR CO., LTD.`
`----------`
	#Establish the saved parameter values

`>DPR`
` DPR=10(10) in.`
` Position range = +/- 500000(500000)`
` Velocity range = 0.001 - 24800(24800)`
` Minimum Movable Distance = +/- 0.001(0.001)`
	#Confirm the new DPR setting

`>MAXPOS` ` MAXPOS=500000(500000) in.`	#Query the maximum position value

`>MAXVEL`
` MAXVEL=24800(24800) in./sec`
`>`
	#Query the maximum velocity value

MAXVEL : Maximum Velocity Value

Execution Mode	Immediate
Syntax	MAXVEL
Factory Setting	1240: **CM10-1**, **4**, **5**, **SCX10** 6200: **CM10-2** 12400: **CM10-3**
Access	READ
See Also	DPR, GA, GB, MAXPOS

Description

MAXVEL (maximum velocity) is the largest permitted value for velocity-related parameter entry. Velocity related parameters (VS, VR, etc.) must be less than or equal to MAXVEL.

MAXVEL is determined by DPR (distance per revolution), and electronic gearing parameters GA, GB and MR. It is automatically updated when any of these values are changed. The new value becomes effective after SAVEPRM and RESET; both active and future values of MAXVEL are shown as "velocity range" when MAXVEL is queried. At the same time, the values of the velocity parameters (VS, VR, VRx, SCHGVR) are automatically checked whether or not to be within the MAXVEL (maximum velocity), and if they are outside the range, the warning message will be sent. Note that the velocity parameters in the sequence program will not be checked. The new values will become effective after executing save and reset.

Formula of MAXVEL is as follows,

MAXVEL=1,240,000*DPR*GB/(MR*GA)

Ex. DPR=1, GA=1, GB=1, MR=1000

MAXVEL=1240

Example

Command	Description
`>UU in.` ` UU=in.`	#Set the user units to in. (inches)

`>DPR 10`
` DPR=1(10) in.`
` Position range = +/- 500000(500000)`
` Velocity range = 0.001 - 2480(24800)`
` Minimum Movable Distance = +/- 0.001(0.001)`
	#Set the distance per revolution to 10 user units: device responds with ranges, active and (future)

`>SAVEPRM`
` (EEPROM has been written 68 times)`
` Enter Y to proceed, other key to cancel. y`
` Saving Parameters.....OK.`
	#Save the parameter assignments

`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
`Copyright 2010`
`ORIENTAL MOTOR CO., LTD.`
`----------`
	#Establish the saved parameter values

`>DPR`
` DPR=10(10) in.`
` Position range = +/- 500000(500000)`
` Velocity range = 0.001 - 24800(24800)`
` Minimum Movable Distance = +/- 0.001(0.001)`
	#Confirm the new DPR setting

`>MAXPOS` ` MAXPOS=500000(500000) in.`	#Query the maximum position value

`>MAXVEL`
` MAXVEL=24800(24800) in./sec`
`>`
	#Query the maximum velocity value

MBFREEACT : Magnetic Brake Free Action

Execution Mode	Immediate
Syntax	MBFREEACT=n
Range	n = 0: Driver alarm is unrelated. 1: MBFREE outputs on both the driver connector of the **CM10**/**SCX10** and the I/O connector become inactive when a driver alarm is active (electromagnetic brake is locked).
Factory Setting	0: **CM10-1**, **2**, **3**, **4**, **5** 1: **SCX10**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the default (initial).
Access	READ and WRITE
See Also	OUTxxx (OUTMBFREE), SIGxxx (SIGMBFREE), ROUTxxx (ROUTMBFREE), DOUTxxx (DOUTMBFREE), DSIGxxx (DSIGMBFREE), DALARM

Description

The MBFREEACT is used to select the action of the magnetic brake during a driver alarm condition.

If the MBFREEACT is set to 0, a driver alarm does not affect the MBFREE outputs both on the driver connector of the **CM10**/**SCX10** and I/O connector.

If the MBFREEACT is set to 1, the MBFREE outputs on both the driver connector of the **CM10**/**SCX10** and the I/O connector become inactive (The electromagnetic brake is locked.) when a driver alarm is active. This setting is used if the automatic current off function on the driver is set to ON (motor current becomes OFF during an alarm).

∗ If the DALARM is set to 0, driver alarm signal has no effect on the MBFREE outputs and the MBFREE loses its function.

Example

Command	Description
>MBFREEACT=0	#Set the MBFREEACT to 0
MBFREEACT=1(0)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 10 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>MBFREEACT	#Query new value
MBFREEACT=0(0) >	

MCP, MCN : Move Continuously Positive, Move Continuously Negative

Execution Mode	Immediate, Sequence and CANopen
Syntax	MCP, MCN
See Also	<ESC>, ABORT, DIRINV, DPR, PSTOP, INxxx (INLSP, INLSN, INMSTOP, INPAUSE), xxxLV (INxLV, MSTOPLV), LIMP, LIMN, MSTOPACT, PAUSE, TA, TD, UU, VR, VS
Description	MCP and MCN start continuous motions, with no defined final position. MCP starts moving in the positive direction, and MCN starts moving in the negative direction. Motion velocity is determined by running velocity (VR). Start velocity (VS), acceleration time (TA) and deceleration time (TD) are effective. Motion continues until the system is commanded to stop or an alarm condition occurs. Velocity can be changed while a continuous motion is in progress, by changing the value of VR and re-issuing the MCP or MCN command. The direction cannot be changed: MCP cannot be issued while an MCN motion is active, or vise versa. These conditions cause an error message if attempted at the command prompt, and an alarm (alarm code: A0h) if attempted in a sequence. MCP and MCN cannot be used while other motions are in progress (e.g. MI, MA, EHOME), or while current is off, or while the system has an active alarm condition. These conditions also cause an error message if attempted at the command prompt, and an alarm (alarm code: A0h) if attempted in a sequence. The MCP/MCN function may also be executed via the MCP/MCN input on the I/O connector if assigned and/or the CANopen remote I/O. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.
Note	MCP and MCN start continuous motions, but do not wait for motion to end. Other commands can be issued in immediate mode or executed by a sequence while the motion is running, although motion commands cannot be executed until the motion is complete. To check that motion is finished, monitor SIGMOVE or SIGEND. In a sequence, the MEND command provides a convenient way to suspend sequence processing until motion is finished.

Example

Command	Description
>LIST VCHANGE	
(1) TA 0.5; TD 0.5; VR 1	
(2) MCP	#Move continuously (positive)
(3) LOOP	
(4) IF (IN1=1)	
(5) VR=VR+1; MCP	#Increase speed
(6) SAS Increase speed by 1 rev/sec	#Send message 1
(7) WAIT TA	
(8) WHILE (IN1=1); WEND	
(9) ENDIF	
(10) IF (IN2=1)	
(11) IF (VR!=1)	
(12) VR=VR-1; MCP	#Decrease speed
(13) SAS Decrease speed by 1 rev/sec	#Send message 2
(14) WAIT TD	
(15) WHILE (IN2=1); WEND	
(16) ELSE	
(17) SSTOP	#Soft stop
(18) SAS Reached endpoint, End Process	#Send message 3
(19) RET	
(20) ENDIF	
(21) ENDIF	
(22) ENDL	
>RUN VCHANGE	
>Increase speed by 1 rev/sec	#Message 1
>Increase speed by 1 rev/sec	#Message 1
>Increase speed by 1 rev/sec	#Message 1
>Decrease speed by 1 rev/sec	#Message 2
>Decrease speed by 1 rev/sec	#Message 2
>Decrease speed by 1 rev/sec	#Message 2
>Reached endpoint, End Process	#Message 3: stopped
>	

MEND : Wait for Motion End

Execution Mode	Sequence
Syntax	MEND
See Also	SIGxxx (SIGMOVE, SIGEND), WHILE, WEND, IF, ENDIF

Description

MEND suspends sequence processing until motion is complete.

Motion commands start motions, but do not wait for motion to complete. Other operations can be performed while the motor is moving. MEND provides a simple way of synchronizing sequence execution with the end of a motion. When the motion completes (or if no motion is in progress), sequence execution proceeds to the statement following MEND.

MEND is equivalent to WHILE (SIGMOVE=1); WEND

All motion commands cannot be executed while another motion is in progress. To avoid errors, sequences should be designed to assure that each motion is complete before proceeding to another motion.

MEND refers to the system END signal at the end of each motion. An alarm condition (alarm code: 6Fh) occurs if the END signal is not found.

Example

Command	Description
`>LIST MOVEABS`	
`(  1) PC=0`	#Set PC=0
`(  2) TA=0.1; TD=0.1`	#Set ramp times
`(  3) VS=0; VR=10`	#Set velocities
`(  4) LOOP`	
`(  5)   SAS Position 1`	#Message-1
`(  6)   MA 0.25`	#Move to 0.25 user unit
`(  7)   MEND; WAIT 1`	
`(  8)   SAS Position 2`	#Message-2
`(  9)   MA 0.75`	#Move to 0.75 user unit
`( 10)   MEND; WAIT 1`	
`( 11)   SAS Position 3`	#Message-3
`( 12)   MA 0.5`	#Move to 0.5 user unit
`( 13)   MEND; WAIT 1`	
`( 14)   SAS Position 4`	#Message-4
`( 15)   MA 0.75`	#Move to 0.75 user unit
`( 16)   MEND; WAIT 1`	
`( 17)   SAS Position 5`	#Message-5
`( 18)   MA 1.0`	#Move to 1.0 user unit
`( 19)   MEND`	
`( 20)   SAS End Session. Go to next.`	#Message-6
`( 21)   WAIT 2`	
`( 22) ENDL`	
`>RUN MOVEABS`	
`>Position 1`	#Message-1
`>Position 2`	
`>Position 3`	
`>Position 4`	
`>Position 5`	#Message-5
`>End Session. Go to next.`	#Message-6
`>Position 1`	
`>Position 2`	
`>Position 3`	
`>Position 4`	
`>Position 5`	
`>End Session. Go to next.`	
`>`	

MGHP, MGHN : Move Go Home Positive, Move Go Home Negative

Execution Mode	Immediate, Sequence and CANopen
Syntax	MGHP (move go home positive) MGHN (move go home negative)
Commands not Allowed	MOVE
See Also	DIRINV, INxxx (INHOME, INLSP, INLSN), RINxxx (RINHOME, RINLSP, RINLSN), HOMETYP, xxxLV (HOMELV), PC, OFFSET, OUTxxx (OUTHOMEP), OUTSG, SIGxxx (SIGHOMEP)
Description	MGHP and MGHN start motion patterns, attempting to find a mechanical home position which links position zero (PC=0) to an application reference signal. MGHP starts moving in the positive direction, and MGHN starts moving in the negative direction. (When HOMETYP=12 is selected, direction is determined by the driver setting.) The process may involve moving in both directions before concluding. MGHP and MGHN differ in starting direction, and in direction upon final approach to the designated home signal (final approach is in the same direction as starting direction). The actual motion pattern and signal requirements are determined by HOMETYP. Depending on HOMETYP, one or more of system input signals LSP, LSN, and HOME must be assigned to an input, before executing MGHP or MGHN. If the signal requirements are not met, the home process will not start, and an error message will be sent (immediate mode) or an alarm will be set (Sequence: alarm code 70h). See HOMETYP in this chapter, and "8.2.5 Mechanical Home Seeking" on page 55 for more information. The velocities and acceleration and deceleration times used for the home seeking process are determined by start velocity VS and run velocity VR, and acceleration and deceleration times TA and TD, at the time the process starts. If the home process completes successfully, the position command (PC) is set to zero (0) and system output signal SIGHOMEP is set to one (1). If configured, the HOMEP output becomes active. It is possible to set the position that has moved from the mechanical home to an electrical home using the OFFSET command. Software position limits LIMP and LIMN are disabled while the homing process is active. If the system has been configured to used software position limits (SLACT=1) and the limits have been configured (LIMP and LIMN not both 0), the limits are enabled after successful completion of a homing process. MGHP and MGHN cannot be used while other motions are in progress (e.g. MI, MA, EHOME), or while current is off, or while the system has an active alarm condition. These conditions also cause an error message if attempted at the command prompt, and an alarm (alarm code: A0h) if attempted in a sequence. The MGHP/MGHN function may also be executed via the MGHP/MGHN input on the I/O connector if assigned and/or the CANopen remote I/O. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.
Note	MGHP and MGHN start the home seeking process, but do not wait for the process to end. Other commands can be issued in immediate mode or executed by a sequence while the process is running, although motion commands cannot be executed until the process is complete. To check that motion is finished, monitor SIGMOVE or SIGEND. In a sequence, the MEND command provides a convenient way to suspend sequence processing until motion is finished.

Example

Command	Description
>INHOME	#Check HOME input configuration
INHOME=1(1)	
>VS 1	#Set start velocity VS to 1 mm/second
VS=1 mm/sec	
>VR 20	#Set run velocity VR to 20 mm/second
VR=20 mm/sec	
>HOMETYP 4	#Use HOME, LSP, LSN
HOMETYP=4	
>MGHP	#Start seeking home, positive direction
>SIGMOVE	#Check MOVE signal (after motion)
SIGMOVE=0	#MOVE is OFF
>SIGHOMEP	#Check HOMEP signal
SIGHOMEP=1	#HOMEP is ON (home is found, success)
>PC	#Check position command PC
PC=0 mm	#Automatically zeroed when homing succeeded
>	

MI : Start Incremental Motion, Distance DIS

Execution Mode	Immediate, Sequence and CANopen
Syntax	MI
Commands not Allowed	MOVE
See Also	DPR, DIS, MA, TA, TD, UU, VR, VS, CV

Description

MI starts a point-to-point incremental motion.

The distance moved is determined by DIS, in user units. The direction of motion is determined by the arithmetic sign of DIS.

Motion velocity is determined by running velocity (VR). Start velocity (VS), acceleration time (TA), and deceleration time (TD) are effective.

The speed may be changed while the motion is in progress, using the change velocity command (CV). Some combinations of distance, speeds and acceleration and deceleration times are not feasible. For instance: if VR is very high, and TA and TD are very long, but the distance is very short, the system could cover too much distance accelerating to velocity VR over time TA. The system monitors for these conditions, and starts decelerating early if necessary. (Under these conditions, peak speed will be less than VR, and acceleration and deceleration times will be less than TA and TD.) The system is careful to preserve the actual motion distance, and the effective acceleration and deceleration rates.

MI is not accepted while the motor is moving, current is off, or while the system has an active alarm condition. An attempt to execute MI while the motor is moving causes an error message in immediate mode, and causes an alarm and sequence termination (alarm code: A0h) if executed from a sequence.

Note

MI starts an index motion, but does not wait for motion to end. Other commands can be issued in immediate mode or executed by a sequence while the motion is running, although most motion commands cannot be executed until the motion is complete.

To check that motion is finished, monitor SIGMOVE or SIGEND. In a sequence, the MEND command provides a convenient way to suspend sequence processing until motion is finished.

Example

Command	Description
`>LIST UPANDDOWN`	#List sequence UPANDDOWN
`( 1) VS 0.1`	#Start velocity: 0.1
`( 2) VR 10`	#Run velocity: 10
`( 3) DIS 150`	#Distance: 150
`( 4) TA 1`	#Going up: long acceleration time, compared to…
`( 5) TD 0.1`	#…short deceleration time
`( 6) MI`	#Start incremental motion
`( 7) MEND`	#Wait for motion to finish
`( 8) TA 0.1`	#Going down: short acceleration time, compared to…
`( 9) TD 1`	#...long deceleration time
`( 10) MA 0`	#Start absolute motion, back to 0
`( 11) MEND`	#Wait for motion to complete
`>`	

MIx : Start Linked Motion at Link Segment 'x'

Execution Mode	Immediate, Sequence and CANopen
Syntax	MIx
Range	x = 0: Start with Link Segment 0 1: Start with Link Segment 1 2: Start with Link Segment 2 3: Start with Link Segment 3
Commands not Allowed	MOVE
See Also	DISx, DPR, INCABSx, LINKx, MIx, TA, TD, UU, VRx, VS

Description

MIx starts a linked index motion beginning with link segment 'x' (0-3).

The motion is point-to-point, but may be more complex than motions started with MA (Move Absolute) or MI (Move Incremental). Linked index motions can use up to four (4) running speeds between the start and stop position.

The motion profile for each segment is defined by start velocity VS, acceleration and deceleration times TA and TD, and linked index parameters:

- INCABSx determines whether segment 'x' is an absolute motion segment (INCABSx=0, move to a destination) or an incremental motion segment (INCABSx=0, move by a distance).
- DISx is the destination (INCABSx=0) or distance (INCABSx=1) of segment 'x'
- VRx is the running speed for the segment 'x'.

The segments can be linked together using LINKx. LINKx determines whether segment 'x' should stop (LINKx=0), or continue without stopping to execute the next segment (LINKx=1). (Note: There is no LINK3.)

Motion can start with any link segment. The motor accelerates from VS to VRx over time TA. If LINKx=0, the motor will decelerate to a stop over time TD, after moving by or to DISx. If LINKx=1, the motor will continue at velocity VRx until the proper distance is covered or destination is reached (depending on DISx and INCABSx). Then, it will begin to execute the next segment, changing speeds as required.

When changing speeds, acceleration time TA is used if speed is increasing away from zero, and deceleration time TD is used if speed is decreasing towards zero.

Some combinations of distance, speeds, and acceleration and deceleration times are not feasible. For instance: if VRx is very high, and TA and TD are very long, but the effective distance is very short, the system could cover too much distance changing speed to velocity VRx. The system monitors for these conditions, and adjusts the motion profile if necessary. (Under these conditions, peak speed may be less than VRx, and acceleration and deceleration times may be less than TA and TD.) The system is careful to preserve the total motion distance or destination and attempts to preserve the effective acceleration and deceleration *rates*. A sharp deceleration can occur if the effective distance of the last linked segment is small, and the previous link segment had a high running velocity. The system will stop at the correct final position, but cannot maintain the effective deceleration rate.

Note

MIx requires that all segments have the same effective direction of travel. If the first segment moves in the positive direction, then all linked segments which follow must move in the positive direction.

If a MIx command is attempted which would result in both positive and negative motion, the MIx command is rejected. (An error message is generated in immediate mode. In a sequence, alarm 70h is set, and sequence processing terminates.)

When using absolute links (INCABSx=0), motion direction depends on the motor position before the linked motion starts: careful planning is required to avoid an error or alarm.

MIx starts an index motion, but does not wait for motion to end. Other commands can be issued in immediate mode or executed by a sequence while the motion is running, although most motion commands cannot be executed until the motion is complete.

To check that motion is finished, monitor SIGMOVE or SIGEND. In a sequence, the MEND command provides a convenient way to suspend sequence processing until motion is finished.

Example

Command	Description
>UU in	#Set user units to in. (inches)
UU=in	#Device response
>VR1 5	#Set the velocity for linked move 1 to 5 user units/second
VR1=5 in/sec	#Device response
>DIS1 10	#Set the distance for linked move 1 to 10 user units
DIS1=10 in	#Device response
>INCABS1 1	#Set the move type for linked motion 1 to incremental
INCABS1=1 [INC]	#Device response
>LINK1 1	#Enable the linked operation for motion 1
LINK1=1	#Device response
>VR2 10	#Linked move #2 velocity equals 10 user units/second
VR2=10 in/sec	#Device response
>INCABS2 0	#Set the move type for linked motion 2 to absolute
INCABS2=0 [ABS]	#Device response
>DIS2 20	#Linked move 2: destination is position 20 user units
DIS2=20 in	#Device response
>LINK2 0	#"Unlink" link 2 from link 3
LINK2=0	#Device response
>MI1	#Start the linked operation motion
>	

MR : Motor Resolution

Execution Mode	Immediate and Sequence
Syntax	MR=n
Range	n = 10 to 51200
Factory Setting	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**, **4**, **5**, **SCX10**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DPR, UU, EC, ER, PC, PE

Description

Sets the motor resolution (pulse/rev).

This is required when setting the user unit (DPR, UU).

Note

If MR is changed, MAXPOS (maximum position=position range), MAXVEL (maximum velocity=velocity range) or minimum travel distance (minimum movable distance) may automatically be changed.

When executing the MR command, these pre-change and post-change values are shown. Position parameters (DIS, DISx, OFFSET, SCHGPOS, LIMP, LIMN, ENDACT) and velocity parameters (VS, VR, VRx, SCHGVR) are automatically checked whether or not to be within the MAXPOS (maximum position) and MAXVEL (maximum velocity) respectively, and if they are outside the range, the warning message will be sent. Note that the position/velocity parameters in the sequence program and the position array data POS[x] will not be checked. Check whether the required resolution is obtained. The minimum movable distance, which is the actual travel distance, can be checked by the TEACH command.

If MR is changed, the actual travel distance or velocity is changed. Check whether the present settings of the position/velocity parameters or those values in the program are appropriate.

Example

Command	Description
>MR=51200	#Set the motor resolution
MR=500(51200) Position range = +/- 500000(41943) Velocity range = 0.001 - 2480(24.218) Minimum Movable Distance = +/- 0.001(0.001)	#Device response
>SAVEPRM (EEPROM has been written 21 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	#Save the parameter assignments #Device response
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>MR	#Confirm new value
MR =51200(51200) Position range = +/- 41943(41943) Velocity range = 0.001 - 24.218(24.218) Minimum Movable Distance = +/- 0.001(0.001)	

MSTOP : Motor Stop

Execution Mode	Immediate, Sequence and CANopen
Syntax	MSTOP
See Also	<ESC>, ABORT, HSTOP, INxxx (INMSTOP), MSTOPACT, xxxLV (MSTOPLV), PSTOP, SSTOP

Description

MSTOP causes the motor to stop. This command does not stop a sequence program.

Stop action can be a soft stop with controlled deceleration, or a hard stop (as quickly as possible), depending on motor stop action (MSTOPACT).

The MSTOP function may also be executed via the MSTOP input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O Signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

If the MSTOP (sequence, assignment of the I/O signal input) is used to stop the motion, all of the stop action can be changed at a time using MSTOPACT. MSTOP (command or input) can be used with MSTOPACT in a multi-axis setting, if multiple devices need to be stopped, but some devices need to soft stop and some need to hard stop.

Caution

Ensure the MSTOPACT is set properly prior to asserting the MSTOP input or executing the MSTOP command.

If MSTOPACT=0, the MSTOP command will attempt to cause the motor to stop rotating immediately. Use caution when stopping a high speed load using the MSTOP command. The actual distance traveled during a Motor Stop depends on velocity, load, and current settings.

Example

Command	Description
`>MSTOPACT`	#Check MSTOPACT
`MSTOPACT=1(1)`	#MSTOPACT: soft stop
`>VR 10`	#Set the running velocity to 10 user units/second
`VR=10 Rev/sec`	
`>MCP`	#Start the motor moving in the positive direction
`>MSTOP`	#Stop the motor based on MSTOPACT setting
`>`	

MSTOPACT : Motor Stop Action

Execution Mode	Immediate
Syntax	MSTOPACT=n
Range	n = 0: Hard Stop (stop as quickly as possible) 1: Soft Stop (controlled deceleration over time)
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INxxx (INMSTOP), xxxLV (MSTOPLV), SIGxxx (SIGMSTOP), MSTOP, HSTOP, SSTOP

Description

MSTOPACT establishes the motor action upon activation of the MSTOP (motor stop) input and the MSTOP command.

If MSTOPACT=0, the MSTOP input and command stop the motor as quickly as possible (hard stop). MSTOP behaves exactly the same as HSTOP.

If MSTOPACT=1, the MSTOP input and command stop the motor by controlled deceleration (soft stop). MSTOP behaves exactly the same as SSTOP.

Caution

Ensure the MSTOPACT is set properly prior to asserting the MSTOP input or executing the MSTOP command.

Example

Command	Description
>MSTOPACT	#Check the MSTOPACT setting
MSTOPACT=1(1)	#Set for soft stop action
>VS 0; VR 4.25	#Set start velocity 0, run velocity 4.25 RPS
VS=0 Rev/sec	
VR=4.25 Rev/sec	
>TA 0.05; TD 0.025	#Acceleration time 0.05, Deceleration time 0.025
TA=0.05	
TD=0.025	
>MCP	#Start continuous motion, positive direction
>VC	#Check velocity command
VC=4.25 Rev/sec	#Velocity has reached running speed
>MSTOP	#Stop: will be a soft stop because MSTOPACT is 1
>	

N_xxx : User-defined Numeric Variables

Execution Mode	Immediate and Sequence
Syntax	N_xxx=n xxx=Variable Name: 1 to 10 Alphanumeric Characters (N_xxx can be the name of any existing user-defined numeric variable)
Range	n = -Maximum Number to +Maximum Number
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	A to Z, CREATEVAR, DELETEVAR, LISTVAR, S_xxx

Description

General purpose, user-defined numeric variables. A user-defined variable must be created with CREATEVAR before it can be used. After it has been created, it can be used in the same way as the general purpose variables A to Z, except that it cannot be used as the argument for a CALL statement. (CALL N_xxx attempts to call a sequence named N_xxx, not sequence number N_xxx.)

User-defined variables have names, to increase readability. They allow constructs such as:
LOOP N_COUNT
DIS = N_LONGMOVE
- which help to make the variable's context and purpose clear.

Using user-defined variables in a sequence is slightly slower than using general purpose variable A to Z, because the system requires extra time to search for the variable by name before accessing it. This may be important in applications with very tight timing requirements.

In immediate mode, user-defined variables may only be set and queried.

Within a sequence, user-defined variables may also be used in the following conditions:
・Targets or arguments for assignments (e.g. N_TIME=TIMER; DIS=N_LONGMOVE)
・Loop Counters (e.g. LOOP N_COUNT)
・Conditional Statement Values (e.g. IF (VR>N_NOMINAL))
・Parts of Mathematical Expressions (N_SPEED=N_SPEED+N_INCREMENT)
・Targets for interactive data entry commands (N_DISTANCE=KBQ)

Refer to the description of A to Z for more information on general variable use.

Example

Command	Description

`>CREATEVAR N_COUNTS=0`
`New variable N_COUNTS is added.`
`N_COUNTS=0`
	#Create user-defined numeric variable named N_COUNTS

`>CREATEVAR N_TOTAL=10`
`New variable N_TOTAL is added.`
`N_TOTAL=10`
	#Create user-defined numeric variable named N_TOTAL

`>LIST MAIN`	#List sequence MAIN
`( 1) WHILE (N_COUNTS < N_TOTAL)`	#N_COUNTS, N_TOTAL user-defined variables
`( 2) MI; MEND`	#Start incremental motion; wait until complete
`( 3) OUT4 = 1`	#Set output 4 ON
`( 4) WHILE (IN6=0); WEND`	#Wait for input 6 to go OFF
`( 5) OUT4 = 0`	#Set output 4 OFF
`( 6) WHILE (IN6=1); WEND`	#Wait for input 6 to go on
`( 7) N_COUNTS=N_COUNTS+1`	#Increment N_COUNTS by 1
`( 8) WEND`	#End of WHILE block
`>`	

OFFSET : Offset for Mechanical Home Seeking

Execution Mode	Immediate, Sequence and CANopen
Syntax	OFFSET=n
Range	n = -MAXPOS to +MAXPOS (user units)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	HOMETYP, MGHP, MGHN

Description

OFFSET is the distance to be moved as the last step of a mechanical home seeking operation (MGHP, MGHN).

After the home seeking operation has established a valid home signal (or signal combination: see HOMETYP), the motor moves by the OFFSET distance, sets that final position to be the origin (PC=0), and sets SIGHOMEP true (which will cause the HOMEP output to become active, if configured) . The OFFSET motion has start velocity VS, running velocity VR, and acceleration and deceleration times TA and TD.

The factory setting of OFFSET is zero (0): the origin is established at the position where a valid home I/O signal pattern is found. Use OFFSET if the natural system origin differs from the home I/O signal location.

Example

Command	Description
>HOMETYP 6	#Use HOME and SENSOR. LSx causes reversal
HOMETYP=6	
>OFFSET -30	#OFFSET origin -30 degree from HOME+SENSOR inputs
OFFSET=-30 deg	
>MGHP	#Seek mechanical home, approach from the positive direction
>SIGHOME	#AFTER operation complete: check HOME input
SIGHOME=0	#Input is inactive. We have moved away from the signal
>SIGHOMEP	#Check HOMEP output
SIGHOMEP=1	#Signal is active. We are at PC=0 after a valid homing operation
>PC	#Check position command PC
PC=0	#Origin. Expected position count after home
>MA 30	#Absolute move to 30 degrees
>PC	#After motion completes… check PC
PC=30 deg	#PC is 30 degrees
>SIGHOME	#Check home input
SIGHOME=1	#Active. Home input and origin are separated by OFFSET
>	

OTACT : Overtravel Action

Execution Mode	Immediate
Syntax	OTACT=n
Range	n = 0: Hard Stop (stop as quickly as possible) 1: Soft Stop (controlled deceleration over time)
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	HSTOP, SSTOP, ALMACT, SIGxxx (SIGLSP, SIGLSN), INxxx (INLSP, INLSN), xxxLV (OTLV), LIMP, LIMN, SLACT

Description

OTACT establishes the stop action taken, when the system detects an over travel input signal (LSP or LSN) or when position exceeds position limits set with LIMP and LIMN.

If OTACT=0, the system will stop the motor as quickly as possible (hard stop). Also the ACL/DCL signal on the driver connector of the **CM10**/**SCX10** is momentarily output for stopping servo motors and α_{STEP} products immediately.

If OTACT=1, the system will stop the motor by a controlled deceleration over time (soft stop). Stop action is exactly the same as SSTOP.

Action after stop (alarm or no alarm, current on or off) is controlled by ALMACT.

Caution

Use caution when using the Soft Stop option. The additional distance traveled during a Soft Stop depends on system speed and other parameters. Be sure that the load will not strike any physical obstacles for a significant range beyond the over travel detectors.

Example

Command	Description
`>INLSN 1` ` INLSN=0(1)`	#Assign the negative direction limit sensor to input 1
`>INLSP 6` ` INLSP=0(6)`	#Assign the positive direction limit sensor to input 6
`>OTACT 1` ` OTACT=0(1)`	#Set the over travel action to hard stop
`>ALMACT 1` ` ALMACT=2(1)`	#Set Alarm Action to 1 (alarm, current on)
`>LIMN -50` ` LIMN=0(-50) Rev`	#Set negative position limit(typically inside hardware limit)
`>LIMP 50` ` LIMP=0(50) Rev`	#Set positive position limit (typically inside hardware limit)
`>SLACT 1` ` SLACT=0(1)`	#Enable software limit checking (after home operation)

`>SAVEPRM`
` (EEPROM has been written 80 times)`
` Enter Y to proceed, other key to cancel. Y`
` Saving Parameters.....OK.`
	#Save the parameter assignments

`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
`Copyright 2010`
`ORIENTAL MOTOR CO., LTD.`
`----------`
	#Establish the saved parameter values

`>MGHP` `>`	#Seek home, start in positive direction (if successful, LIMP and LIMN position limits become active)

OUT : General Output Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	OUT=n ∗ "=n" is required only when controlling.
Range	n = 0 to 15 (integer values) /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE READ only in CANopen
See Also	INITIO, IO, IN, OUTTEST, OUTxxx, OUTSG, OUTx, REPORT, OUTTEST

Description

OUT displays or sets the value of all the general purpose outputs, as one integer number.

The general purpose outputs contribute to the value of OUT as follows:

OUTx	Contribution to OUT If Active
OUT4	8
OUT3	4
OUT2	2
OUT1	1

For example, if the general output 2 (2) and general output 4 (8)are active, while all other signals are not active, "OUT=10" is set (2+8=10). When inputting OUT, "OUT=10" is replied.

And when inputting "OUT=10," the general output 2 (2) and general output 4 (8) become active regardless of the present output status.

∗ To check or control the status of a single general output, use the OUTx command.

∗ The OUT value always indicates the internal status of the all general output signals OUT1 to OUT4. For the output signal assigned the system output signal (HOMEP, ALARM, END etc.), the OUT command recognizes the signal as inactive or zero (except when the signal has become active by the OUT, OUTx command). Use the OUTSG command in order to refer to the status of all output signals assigned the specific functions.

∗ All general purpose outputs are in the inactive (OFF) state immediately following system startup.

Note

All outputs are OFF when device power is off.

Example

Command	Description
>IO	#Check IO status
Inputs (1-9) = -LS IN2 IN3 IN4 IN5 +LS IN7 IN8 IN9	#Response: Note that ALARM has been assigned to output 1. outputs 2 to 4 are general purpose.
Outputs (1-4) = ALARM OUT2 OUT3 OUT4	
--Inputs-- Outputs	
1 2 3 4 5 6 7 8 9 -(SEQ#)- 1 2 3 4	
0 0 0 0 0 0 0 0 0 -(0)- 0 0 0 0	#All outputs reported off.
>OUT 15	#Set OUT to 15 (all outputs on)
OUT=15	
>IO	#Check IO status again
Inputs (1-9) = -LS IN2 IN3 IN4 IN5 +LS IN7 IN8 IN9	
Outputs (1-4) = ALARM OUT2 OUT3 OUT4	
--Inputs-- Outputs	
1 2 3 4 5 6 7 8 9 -(SEQ#)- 1 2 3 4	
0 0 0 0 0 0 0 0 0 -(0)- 0 1 1 1	#All outputs are on… expect output 1. Output 1 active state cannot be effected by OUT
>	

OUTSG : System Signal Output Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	OUTSG
Range	n = 0 to 1983 /: real time monitor (immediate mode only)
Access	READ
See Also	SIGxxx, OUT, xxxLV, IO, REPORT, OUTTEST

Description

OUTSG displays the current status of all the system output signals, as one integer number.

The system output signals contribute to the value of OUTSG as follows:

Bit Location	Signal	Contribution to OUTSG If Active
Bit 10	ABSDATA	1024
Bit 9	LC	512
Bit 8	READY	256
Bit 7	MBFREE	128
Bit 6	-	-
Bit 5	PSTS	32
Bit 4	ALARM	16
Bit 3	HOMEP	8
Bit 2	END	4
Bit 1	RUN	2
Bit 0	MOVE	1

OUTSG is the sum of the contribution of all active signals:
For example, if the END (4) and MBFREE (128) signals are active, while all other signals are not active, "OUTSG=132" is set (4+128=132). When inputting OUTSG, "OUTSG=132" is replied.

* When checking the status of a single system output signal, use the SIGxxx command.
* The OUTSG value always indicates the status of the all system output signals. Note that the signals, which are not output actually due to not assigned to the I/O connector terminal, are also counted in the OUTSG value.
* Be careful not to confuse OUTSG with OUT (general output status). OUT reports the status of general purpose outputs (those outputs which are not assigned to a signal).

Example

Command	Description
>OUTSG	#Query the status of the system output signals
OUTSG=3	#OUTSG equals 3, when sequence is running or motor is moving
>	

OUTTEST : I/O Test Utility

Execution Mode	Immediate
Syntax	OUTTEST
Commands not Allowed	MOVE, RUN
See Also	IN, INx, INSG, SIGxxx, OUT, OUTx, OUTSG, IO, REPORT, xxxLV

Description

OUTTEST starts a utility process to check I/O connections and levels.

Inputs are continuously monitored and displayed, and outputs can be set or cleared, to confirm proper external connections.

Inputs and outputs are displayed as active (1) or inactive (0).

OUTTEST temporarily disables the actions of all assigned system input and output signals. The system will not react to inputs, and will not automatically control outputs. All output control is from the serial port. Signal assignments are restored when the OUTTEST process terminates, and all outputs are restored to the state they were in when the OUTTEST process was started.

Outputs can be toggled, using the character displayed next to the signal name in the OUTTEST output.

Toggling an output changes its state as displayed, and changes the electrical state of the associated output port. Toggle keystrokes or characters for each output are:

OUT1	1	OUT2	2
OUT3	3	OUT4	4
MOVE	M	RUN	R
END	E	HOMEP	H
ALARM	A	PSTS	P
MBFREE	B	READY	D
LC	L		

A SPACE key or character sets all outputs to inactive (0).

An ESCAPE key or character exits the OUTTEST process.

OUTTEST is not permitted while a sequence is running, while a motion is in progress, or if the system is in an alarm state.

Example

Command	Description
`>OUTTEST`	#Start the OUTTEST process
`*** Input Monitor -- Output Simulator ***`	
`Inputs (1-9) = IN1 IN2 -LS +LS HOME PSTOP IN7 IN8 IN9` `Outputs(1-4) = OUT1(1) OUT2(2) END(E) ALARM(A)`	#Assignments and toggle keys shown here

`- Use (x) keys to toggle Outputs.`
`- Use <space> to set all outputs to zero.`
`- Use <esc> to exit OUTTEST mode.`	

`I/O Status Monitor`
`--Inputs---  Outputs`
`1 2 3 4 5 6 7 8 9 -(SEQ#)- 1 2 3 4`
`0 0 0 0 1 0 0 0 0 -( 0 )- 0 0 1 0`
	#Active (1) or inactive (0) states shown here

`>`	#Escape entered: OUTTEST ends

OUTx : Individual General Output Control

Execution Mode	Immediate and Sequence
Syntax	OUTx=n (OUTx is a signal name: OUT1 to OUT4) * "=n" is required only when controlling.
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE
See Also	INITIO, OUT, OUTSG, OUTTEST

Description

OUTx displays or controls the state of general purpose OUTx.

If the output has been assigned to a system output signal, then it is no longer "general purpose." OUTx for these outputs has no affect on the output pins. Use SIGxxx to check the status of assigned system output signals.

Memo

Even the output signal assigned the system output signal can become active (1) as the general output status using the OUTx command. For example, even when the OUT1 of the I/O connector is assigned to ALARM, OUT1=1 can be commanded. However, the actual output terminal of the I/O connector that is assigned to ALARM will not become active. Note that the OUT (general output control) value becomes 1 at this time.

Example

Command	Description
`>LIST HOMEDIR`	#Sequence to output motion direction while seeking home
`( 1) WHILE (SIGMOVE=1)`	#While system is moving
`( 2) IF (VC>0)`	#If moving in positive direction
`( 3) OUT1=1`	#General purpose output 1 active
`( 4) ELSE`	
`( 5) OUT1=0`	#Else, general purpose output 1 inactive
`( 6) ENDIF`	
`( 7) IF (VC<0)`	#If moving in negative direction
`( 8) OUT2=1`	#General purpose output 2 active
`( 9) ELSE`	
`( 10) OUT2=0`	#Else, general purpose output 2 inactive
`( 11) ENDIF`	#End of IF block
`( 12) WEND`	#End of WHILE block
`( 13) OUT1=0; OUT2=0`	#No longer moving: set both general purpose outputs inactive
`>`	

OUTxxx : System Signal Output Assignment

Execution Mode	Immediate
Syntax	OUTxxx=n "xxx" represents the signal name to be assigned, and "n" represents the assigned terminal number ("that" becomes the OUTn general output when unassigned).
Range	n = 0 to 4
Factory Setting	0 (unassigned)
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	xxxLV, SIGxxx, INITIO, CLEARALL, IO, OUT, OUTSG, OUTx, OUTTEST, REPORT, ROUTxxx, and "See Also" column in the chart below.

Description

Assign the system output signal to the OUTn of the I/O connector of the **CM10/SCX10**. The system signal output assignment is released by "OUTxxx=0" and it becomes the general output OUTn. When executing the INITIO command, the parameter restores to the factory setting.

Command	Signal	Description	See Also
OUTALARM	ALARM	Alarm	ALM, ALMCLR
OUTEND	END	Motion End	END, DEND, ENDACT
OUTHOMEP	HOMEP	Home Position	MGHN, MGHP, EHOME
OUTLC	LC	Limiting Condition	DINLC
OUTMBFREE	MBFREE	Magnetic Brake Free	FREE, CURRENT
OUTMOVE	MOVE	Motor Moving	MEND
OUTPSTS	PSTS	Pause Status	PAUSE, PAUSECLR, CONT
OUTREADY	READY	Operation Ready	DREADY
OUTRUN	RUN	Sequence Running	RUN

Example

Command	Description
>OUTALARM	#Check ALARM assignment
OUTALARM=1(1)	#Assigned to output 1
>OUTALARM 3	#Change the ALARM signal assignment to output 3
OUTALARM=1(3)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 80 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>OUTALARM	#Confirm the new assignment
OUTALARM=3(3)	
>	

PABS : Driver Current Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	PABS
Range	-2,147,483.648 to +2,147,483.647
Access	READ
See Also	ABSREQ, ABSREQPC, ABSSTS, ROUTxxx (ROUTABSDATA)

Description

This is a variable to which the driver current position acquired by ABSREQ or ABSREQPC is written. The variable unit is the user unit.

When referring to the driver current position from the host controller, refer to PABS after executing the ABSREQ (reading driver current position) command or ABSREQPC (reading driver current position/updating internal position) command.

When reading PABS via CANopen, execute the ABSREQ command or the ABSREQPC command first and then execute PABS command after confirming that the ABSDATA output has become 1 (ON) via the remote I/O of CANopen. PABS can be referred to if the ABSDATA output is assigned and the ABSDATA output is 1 (ON).

PABS cannot be read under the following conditions:
・Current position has not been read yet since the power is ON.
・Data is being read
・Although the data was read, a range that could be written was exceeded.

Memo

The range of the driver current position can be read is "-2,147,483.648 to +2,147,483.647," which is the value after converting to the user unit.

Example

Command	Description
`>ABSREQ`	Read current position, status and alarm
`PABS=124.35 Rev`	Current position
`Driver Status Code = 00`	Driver status code
`Driver ALARM Code = 00`	Driver alarm code
`>PABS`	
`PABS=124.35 Rev`	Current position

PAUSE : Pause Motion

Execution Mode	Immediate, Sequence and CANopen
Syntax	PAUSE
See Also	SSTOP, CONT, INITIO, INxxx (INPAUSE, INPAUSECL), OUTxxx (OUTPSTS), OUTSG, xxxLV (PAUSECLLV, PAUSELV, PSTSLV), SIGxxx (SIGPAUSE, SIGPAUSECL, SIGPSTS), PAUSECLR

Description

PAUSE interrupts a motion, stopping the motor by controlled deceleration (soft stop). The applicable motion includes incremental motion (MI), absolute motion (MA) and continuous motion (MCP, MCN). This command does not stop a sequence program. See SSTOP for details on the velocity profile during deceleration.

A motion that has been stopped with the PAUSE can be continued (resumed) using the CONT command or input. If START input is turned ON while in a paused situation only during sequence execution, the remaining motion will be started (STARTACT=0).

Linked motions, return-to-electrical home operation and mechanical home seeking cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.

The system remembers the motion that was in process, so that it may be resumed later. See the CONT (continue motion) command for details on continuing motions after a PAUSE command. Use the PAUSECLR command to clear the remaining motion and not restarting the motion.

The system remains in a "paused" state, until motion is continued (see CONT), or the state is explicitly cleared (with a PAUSECL input), or another motion command is executed.

After a PAUSE command, the system sets system output signal SIGPSTS to one (1). If SIGPSTS has been assigned to an output, that output is set to its active state.

If no motion is in process when a PAUSE command is issued, the PAUSE command has no effect.

The PAUSE function may also be executed via the PAUSE input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

Note

PAUSE and CONT may effect processing time of sequences. For instance: if a sequence executes a MEND (wait for motion end) command, the sequence will be suspended while the motion is paused, and will not proceed beyond the MEND until the next end of motion (via a CONT, PAUSECL input , or new motion). Linked motions, return-to-electrical home Operation and mechanical home seeking cannot be paused and resumed: PAUSE causes a soft stop, and CONT is ignored.

Example

Command	Description
>MCP	#Move continuously (positive)
>PAUSE	#Pause motion
>CONT	#Resume motion
>	

PAUSECLR : Pause Clear

Execution Mode	Immediate, Sequence and CANopen
Syntax	PAUSECLR
See Also	PAUSE, CONT, INxxx (INPAUSECL), RINxxx (RINPAUSECL), SIGxxx (SIGPAUSECL), OUTxxx (OUTPSTS)

Description

PAUSECLR clears the on-going operation state that has been paused by the input of a PAUSE signal or a PAUSE command. Any remaining motion is canceled.

If the PAUSECLR is commanded while the sequence is running, only remaining portion of the current motion is cleared and the next step of the sequence will be executed, since the PAUSE does not stop the sequence. The PAUSECLR function may also be executed via the PAUSECL input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

Note

A motion that has been stopped with the PAUSE command or input can be continued (resumed) using the CONT command or input, while the PAUSECLR command or PAUSECL input clears remaining motion. See the entries for CONT, PAUSECLR and PAUSE in "6.4.2 Input Signals," "8.3 Stopping Motion and Sequence."

Example

Command	Description
>MCP	#Move continuously (positive)
>PAUSE	#Pause motion
>PAUSECLR	#Clear paused motion
>	

PC : Position Command

Execution Mode	Immediate, Sequence and CANopen
Syntax	PC=n
Range	n = -MAXPOS to +MAXPOS (user units) /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE READ only while motion is in progress
See Also	EHOME, MA, MGHP, MGHN, MI, PCI, PE, PF, PFI, MAXPOS

Description

PC is the position command (or set point), in user units.

PC is the position that the system has been instructed to go to. The actual motor position is maintained as PF=Position Feedback (when an encoder is connected). The difference between PC and PF is the position error, PE.

PC is set to zero (0) at system startup.

PC is continuously updated by the system:

- In normal operations, PC is updated by the internal motion profiler.
- If current is off, PC is continuously set to actual position PF (to maintain zero position error while the system is freewheeling).
- PC is automatically set to zero (0) after successful completion of a home seeking operation (EHOME, MGHP, MGHN).

PC can be modified directly, if no motion is in progress (in immediate mode or in sequences). If PC is changed in this way, PF (Position Feedback, actual motor position) is simultaneously changed by the same amount. Changing PC by direct assignment does not cause motion.

Example

Command	Description
`>LIST ORIGIN`	#List sequence named "ORIGIN"
`( 1) MGHP`	#Seek home: start in the positive direction
`( 2) MEND`	#Wait for home operation to finish: home operation sets PC to 0
`( 3) PC=45`	#This position is actually 45 degrees
`( 4) MA 0`	#Go to position zero (PC=0), 45 degrees away from HOME input location
`>`	

PCI : Incremental Position Command

Execution Mode	Immediate and Sequence
Syntax	PCI
Range	-2*MAXPOS to +2*MAXPOS /: real time monitor (immediate mode only)
Access	READ
See Also	PC, PE, PF, PFI

Description

PCI is the change in position command PC (position command) since the last motion started.

PCI is continuously updated by the system.

PCI is set to zero (0) at system startup and the start of motion. PCI is undefined immediately after a mechanical home seeking operation completes (MGHP, MGHN).

Example

Command	Description
`>LIST AREAOUT2`	#List sequence AREAOUT2
`(  1) DIS 100; VR=10`	#Set distance, velocity
`(  2) MI`	#Start move incremental
`(  3) SAS Motion started`	#Send message 1
`(  4) WHILE (PCI<30)`	#Wait for PCI to reach 30
`(  5) WEND`	
`(  6) SAS Passed 30mm`	#Send message 2
`(  7) WHILE (PCI<60)`	#Wait for PCI to reach 60
`(  8) WEND`	
`(  9) SAS Passed 60mm`	#Send message 3
`( 10) MEND`	#Wait for motion end
`( 11) SAS Reached target`	#Send message 4
`( 12) END`	
`>`	
`>RUN AREAOUT2`	#Start sequence
`>Motion started`	#Message 1
`>Passed 30mm`	#Message 2
`>Passed 60mm`	#Message 3
`>Reached target`	#Message 4
`>`	

PE : Position Error

Execution Mode	Immediate, Sequence and CANopen
Syntax	PE
Range	-MAXPOS to +MAXPOS /: real time monitor (immediate mode only)
Access	READ
See Also	ENDACT, PC, PCI, PF, PFI

Description

PE is the position error, the difference between position command (PC) and actual position (PF), in user unit.

PE=PC- PF.

PE is continuously updated by the system, and can be used to monitor the systems response to load conditions. The PE command is used for position confirmation referenced by the ENDACT command and/or a user program.

When using a stepping motor with an encoder, the status for loss of synchronism can be checked by monitoring PE. See "8.9 Encoder Function" on page 77, "HOMEDCL (deviation counter clear select at mechanical home seeking operation" on page 58.

Example

Command	Description
`( 1) MI`	#Start incremental motion
`( 2) MEND`	#Wait for motion to end
`( 3) IF (PE<-1.8)`	#When the PE is smaller than -1.8°
`( 4)  SAS MISS-STEP MAY HAVE OCCURRED`	#Transmit a message
`( 5) ENDIF`	#End the IF statement
`( 6) IF (PE>1.8)`	#When the PE is greater than -1.8°
`( 7)  SAS MISS-STEP MAY HAVE OCCURRED`	#Transmit a message
`( 8) ENDIF`	#End the IF statement

PECLR : Position Error Clear

Execution Mode	Immediate, Sequence and CANopen
Syntax	PECLR
Commands not Allowed	MOVE
See Also	INxxx (INPECLR), xxxLV (PECLRLV), SIGxxx (SIGPECLR), RINxxx (RINPECLR), EC, PC, PE, PF, ENDACT

Description

PECLR command resets the PE (position error) value to zero (0).

When PECLR command is executed, the PC value is set to equal to PF value. As a result, the PE is reset to zero. When the PC value was differed from the PF value for any cause, the error can be cleared with this command.

Concurrently, the ACL/DCL signal on the driver connector of the **CM10**/**SCX10** is momentary turned ON (when the driver alarm is not generated) and the deviation counter in the driver is cleared. Therefore the error in the **CM10**/**SCX10** and in the driver will be matched (when the driver has a deviation counter clear input and it is connected).

When using a stepping motor with an encoder, once the PECLR command is executed in a condition that no external turning force is applied to the motor shaft, the accurate deviation between the stator and rotor (depends on the size of load) can always be checked by monitoring PE. See "HOMEDCL (deviation counter clear select at mechanical home seeking operation" on page 58.

The PECLR function may also be executed via the PECLR input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

Example

Command	Description
>PC	#Query the position counter
PC=1000	#Device response
>PF	#Query the position feedback
PF=1234	#Device response
>PE	#Query the position error
PE=-234	#Device response
>PECLR	#PECLR command
>PC	#Query the position counter
PC=1234	#Device response
>PF	#Query the position feedback
PF=1234	#Device response
>PE	#Query the position error
PE=0	#Device response

PF : Feedback Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	PF=n
Range	n = −MAXPOS to +MAXPOS (user units) /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ, WRITE READ only while motion is in progress.
See Also	EC, ER, PC, PCI, PE, PFI, ENC, ENDACT

Description

PF is the actual motor position, measured by the position sensor in the motor or the external encoder. (selected by ENC)

PF is generated by EC (encoder count) by the following formula.

PF=EC/ER*DPR*GB/GA

* Note that PF is in user units where EC (encoder count) is actual number of pulses.

PF is continuously updated by the system.

PF can deviate from the PC (position command), depending on load conditions. The difference between PC and PF is the position error PE, and used for position confirmation referenced by the ENDACT command and/or a user program.

PF get changed when PC is changed. For example, if PC=0 and PF=0.001 with some constant load, setting PC=10 adjusts PF to 10.001 (exact value may vary with load and any small shaft motion).

Note

When the motor has no internal position sensor or external encoder, or when setting "ENC=0" (no use), the PF value is always zero.

Example

Command	Description
`>LIST AREAOUT3`	
`( 1) DIS 100; VR=10`	#Set distance, velocity
`( 2) PC=0`	#Reset PC to zero (PF also adjusted)
`( 3) MI`	#Start move incremental
`( 4) SAS Motion started`	#Send message 1
`( 5) WHILE (PF<30)`	#Wait for PF to reach 30
`( 6) WEND`	
`( 7) SAS Passed 30mm`	#Send message 2
`( 8) WHILE (PF<60)`	#Wait for PF to reach 60
`( 9) WEND`	
`( 10) SAS Passed 60mm`	#Send message 3
`( 11) MEND`	#Wait for motion end
`( 12) SAS Reached target`	#Send message 4
`( 13) END`	
`>`	
`>RUN AREAOUT3`	#Start sequence
`>Motion started`	#Message 1
`>Passed 30mm`	#Message 2
`>Passed 60mm`	#Message 3
`>Reached target`	#Message 4
`>`	

PFI : Incremental Feedback Position

Execution Mode	Immediate and Sequence
Syntax	PFI
Range	−2*MAXPOS to +2*MAXPOS (user units) /: real time monitor (immediate mode only)
Access	READ
See Also	PC, PCI, PE, PF

Description

PFI is the difference between actual motor position PF and the value of position command PC at the beginning of the last motion.

PFI is continuously updated by the system.

PFI is set to zero (0) at system startup and the start of motion. PFI is undefined immediately after a mechanical home seeking operation completes (MGHP, MGHN).

See also PF.

Example

Command	Description
`>LIST AREAOUT4`	#List sequence AREAOUT4
`(  1) DIS 100; VR=10`	#Set distance, velocity
`(  2) MI`	#Start move incremental
`(  3) SAS Motion started`	#Send message 1
`(  4) WHILE (PFI<30)`	#Wait for PFI to reach 30
`(  5) WEND`	
`(  6) SAS Passed 30mm`	#Send message 2
`(  7) WHILE (PFI<60)`	#Wait for PFI to reach 60
`(  8) WEND`	
`(  9) SAS Passed 60mm`	#Send message 3
`( 10) MEND`	#Wait for motion end
`( 11) SAS Reached target`	#Send message 4
`( 12) END`	
`>`	
`>RUN AREAOUT4`	#Start sequence
`>Motion started`	#Message 1
`>Passed 30mm`	#Message 2
`>Passed 60mm`	#Message 3
`>Reached target`	#Message 4
`>`	

PLSINV : Pulse Output Invert

Execution Mode	Immediate
Syntax	PLSINV=n
Range	n = 0: Positive Logic 1: Negative Logic
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	PULSE

Description Invert the pulse output logic.

Example

Command	Description
>PLSINV=0	#Set pulse output invert
PLSINV=0(1)	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	#Device response
Saving Parameters.....OK.	
>RESET	
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>PLSINV	#Confirm the new value
PLSINV=1(1)	

POS[x] : Position Array Data

Execution Mode	Immediate, Sequence and CANopen
Syntax	POS[x]=n (x is a number of position array data: x=1 to 100.)
Range	n = -MAXPOS to +MAXPOS
Factory Setting	0
SAVEPOS	The new value takes effect immediately. However, SAVEPOS is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	MA, PC, TEACH, CLEARPOS, CLEARALL, SAVEPOS, SAVEALL

Description

The POS[x] variables provide an array of 100 data values, intended primarily to store predefined positions.

The POS[x] variables may be used in immediate mode as arguments to the MA (Move Absolute) command, e.g.:

MA POS[7]

…will start an absolute motion to the position stored in POS[7].

POS[x] data may be entered directly if known, or positions can be interactively found and stored using the TEACH function. See "8.4 Teaching Positions" on page 65 for more information.

All POS[x] data can be cleared (initialized to zero) with the CLEARPOS command.

Note

POS[x] command cannot be used in the IF statement or the WHILE statement.

Use after substituting POS[x] for General variable or user defined variable.

Wrong) WHILE (PC!=POS[1])

Correct) A=POS[1]

WHILE (PC!=A)

Example

Command	Description
>POS[1]	#Query the value established for POS [1]
POS[1]=1.12	
>MA POS[1]	#Move to POS[1]
>PC	#When motion is finished, query the position command value
PC=1.12	#Moved as expected, PC=POS[1]
>POS[2] 2.36	#Set POS [2] to 2.36 user units
POS[2]=2.36	
>MA POS[2]	#Move to POS[2]
>PC	#When motion is finished, query the position command value
PC=2.36	#Moved as expected, PC=POS[2]
>	

PRESET : Reset Home Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	PRESET
Commands not Allowed	MOVE
See Also	DOUTxxx (DOUTPRESET), PC, PF, OUTxxx (OUTHOMEP), SLACT, LIMP, LIMN, ABSPLSEN

Description

When the PRESET command is executed, PC (position command) is set to zero. This position will be the electrical home. PF (feedback position) and EC (encoder count) will follow maintaining PE (error), and as the result, they will be the value of the error. At the same time, when using a driver that has a preset (reset home position) function, the home position of the driver will also be reset (The PRESET output assigned to the driver connector on the **CM10**/**SCX10** will be turned ON for about 6 ms). When software position limit control is set to 1 (SLACT=1), LIMP and LIMN (software position limits) will be enabled.

・When the driver that has a PRESET input (the driver has a current position reading function)

Set the home position to the driver by the PRESET command for using the current position reading function.

The assignment of the PRESET output to the driver connector on the **CM10**/**SCX10** is required. When the PRESET output is not assigned, the home position of the driver will not reset, though PC will be set to 0 (zero) and this position will be the electrical home.

・When the driver does not have a PRESET input

PC is set to zero, and this position will be the electrical home.

Caution

With the ESMC controller, the HOME input and PRESET input are assigned to the same pin. The factory setting is the HOME input. Change the driver setting to the PRESET input from the HOME input before using the PRESET command.

Note

If the PRESET command is executed when the parameter for PRESET (reset home position) of the **ESMC** controller is set to the value other than zero, the PC value will not match the driver's current position. In this case, they will be matched by executing the ABSREQPC (driver current position reading/updating internal position) command. However, if setting the electrical home position other than the mechanical home position is required as described above, it is recommended to set the offset value in the **CM10**/**SCX10** (use the OFFSET command) but not in the driver.

Example

Command	Description
>PRESET	#Set the current position to the home position
>PC	#Confirm the PC value
PC=0 Rev	#PC=0
>SIGHOMEP	#Confirm whether the current position was set to the electrical home
SIGHOMEP=1	#The current position was set to the electrical home
>ABSREQ	#Reading the driver's current position, driver status and driver alarm
PABS=0 Rev	#Current position
Driver Status Code = 00	#Driver status code
Driver ALARM Code = 00	#Driver alarm code

PSTOP : Panic Stop

Execution Mode	Immediate, Sequence and CANopen
Syntax	PSTOP
See Also	<ESC>, MA, MCP, MCN, MGHP, MGHN, MI, EHOME, SSTOP, HSTOP, MSTOP, INxxx (INPSTOP), ALMACT, ABORT

Description

PSTOP stops the motor as quickly as possible (hard stop) and stop sequence, and then takes the alarm action determined by ALMACT, which may involve setting an alarm (alarm 68h), aborting sequences, and possibly disabling motor current. Also the ACL/DCL signal on the driver connector of the **CM10**/**SCX10** is momentarily output for stopping servo motors and αSTEP products immediately.

The PSTOP function may also be executed via the PSTOP input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O Signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

Caution

The PSTOP command will attempt to cause the motor to stop rotating immediately. Use caution when stopping a high speed load using the PSTOP command. The actual distance traveled during a Panic Stop depends on velocity, load, and current settings.

Example

Command	Description
`>VR 4`	#Set the velocity to 4 mm/second
`VR=4 mm/sec`	#Device response
`>MCP`	#Move continuously in the positive direction
`>PSTOP`	#Stop the motor as quickly as possible
`>`	

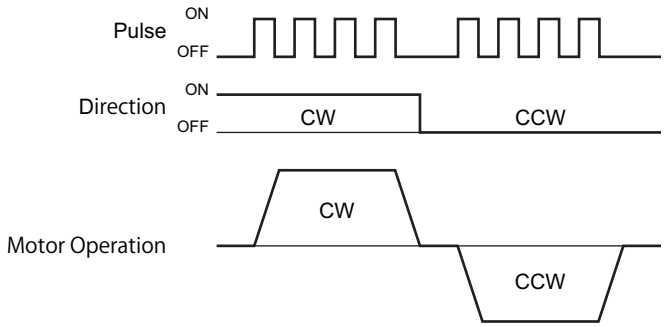
PULSE : Pulse Output Mode

Execution Mode	Immediate
Syntax	PULSE=n
Range	n = 0: 2 Pulse Mode 1: 1 Pulse Mode
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	PLSINV, DIRINV

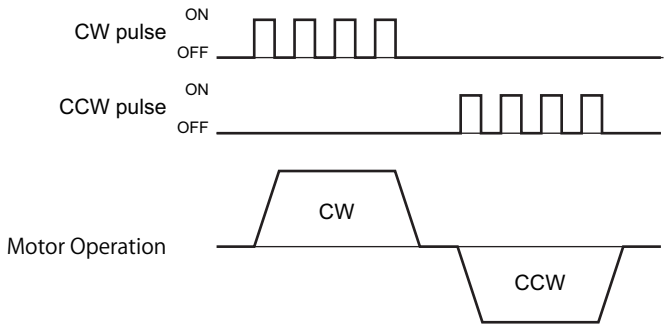
Description

Set the pulse output mode. Check the pulse input mode of the driver, and set the driver and the **CM10/SCX10** to the same pulse input mode.

1 pulse mode



2 pulse mode



Example

Command	Description
>PULSE=0	#Set pulse output invert
PULSE=1(0)	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>PULSE	#Confirm the new value
PULSE=0(0)	

REN : Rename Sequence

Execution Mode	Immediate
Syntax	REN target newname
Range	'target' must be the name or number of an existing sequence. 'newname' must be a valid sequence name (consisting of letters, numbers or underscore, 10 characters maximum, must start with a letter except n, s, N, S, with no distinction of a capital letter or small letter.)
Commands not Allowed	RUN
See Also	COPY, DIR, EDIT, DEL, LOCK, UNLOCK

Description

REN renames an existing sequence. The new name must be unique.

REN can also be used to name a sequence which was created by number only, and has no name.

'target' cannot be renamed if it is locked. Change the name after releasing the lock of the sequence program using the UNLOCK command.

Example

Command	Description
>DIR	#Check the names of all sequences

```
   ##  Name         TextSize  Locked
   ==  ==========  ========  ======
    0  PROG1             37
    1  MOVE1             24

  Total:   2
  Executable memory:     4 bytes used of  6144 bytes total,     0 percent.
  Storage memory:       18 bytes used of 21775 bytes total,     0 percent.
>REN PROG1 PROG2                    #Rename PROG1 to the new name of PROG2
>DIR

   ##  Name         TextSize  Locked
   ==  ==========  ========  ======
    0  PROG2             37
    1  MOVE1             24

  Total:   2
  Executable memory:     4 bytes used of  6144 bytes total,     0 percent.
  Storage memory:       18 bytes used of 21775 bytes total,     0 percent.
>REN PROG2 MOVE1                    #Can't rename if new name exists already

Error: Sequence already exists.
>
```

REPORT : Display System Status

Execution Mode	Immediate
Syntax	REPORT
See Also	ALM, IO, OUTTEST

Description

REPORT displays a system status summary.

The REPORT command can be an effective tool for troubleshooting problems with the system. The REPORT command displays the status and active level of all of the inputs and outputs, the values of important parameters, the value of position command PC, and the alarm and warning history.

The report is displayed on two pages, and pressing the space key to go to the next page.

Example

Command Description

```
>REPORT                 #Get a system status summary: sample result follows
/ I/O REPORT /---(NO:Normally Open, NC:Normally Closed)-----------
   IN1(NO) = 0   IN2(NO) = 0   IN3(NO) = 0   IN4(NO) = 0
   IN5(NO) = 0   IN6(NO) = 0   IN7(NO) = 0   IN8(NO) = 0
   IN9(NO) = 0
   OUT1(NO) = 0   OUT2(NO) = 0   OUT3(NO) = 0   OUT4(NO) = 0

/ REMOTE I/O REPORT /-----------------------------------------------
   IN1 = 0   IN2 = 0   IN3 = 0   IN4 = 0
   IN5 = 0   IN6 = 0   IN7 = 0   IN8 = 0
   ABORT = 0   START = 0   MCP = 0   MCN = 0
   MGHN = 0   CON = 0   FREE = 0
   OUT1 = 0   OUT2 = 0   OUT3 = 0   OUT4 = 0
   OUT5 = 0   OUT6 = 0
   END = 0   MOVE = 0   HOMEP = 0   LC = 0   READY = 0

/ DRIVER I/O REPORT /-----------------------------------------------
   ALM(NC) = 1   IN2(NO) = 0   END(NO) = 0   READY(NO) = 0
   LC(NO) = 0   TIMS(NO) = 0   TIMD/EXTZ(TIMDLV=1, EXTZLV=0) = 0
   CON(NO) = 0   ACL/DCL(NO) = 0   REQ(NO) = 0   TL(NO) = 0
   M0(NO) = 0   M1(NO) = 0   PRESET(NO) = 0   FREE(NO) = 0

   Enter [SPACE] to continue, other key to quit.

 /PARAMETER REPORT /-----------------------------------------------
   UU = Rev
   STRSW = 0   DPR = 1   MR = 1000   GA = 1   GB = 1
   ER = 1000   DIRINV = 0
   VS = 0.1   VR = 1   TA = 0.5   TD = 0.5   DIS = 0
   LIMP = 0   LIMN = 0   SLACT = 0
   STARTACT = 0   MSTOPACT = 0   SENSORACT = 2   OTACT = 0
   ALMACT = 2   ALMMSG = 0   HOMETYP = 0   HOMEDCL = 1
   INCABS0 = 1   VR0 = 1   DIS0 = 0   LINK0 = 0
   INCABS1 = 1   VR1 = 1   DIS1 = 0   LINK1 = 0
   INCABS2 = 1   VR2 = 1   DIS2 = 0   LINK2 = 0
   INCABS3 = 1   VR3 = 1   DIS3 = 0
   DALARM = 1   DREADY = 1   STRDSC = 0   TIM = 1   ENC = 1
   DEND = 1   ENDACT = 0   MBFREEACT = 0
   PULSE = 1   PLSINV = 0   CANID = 1   CANBAUD = 1

/ POSITION REPORT /-------------------------------------------------
   PC = 0   PF = 0   PE = 0   EC = 0   PABS = 0

/ ALARM HISTORY /--------------------------------------------------
   ALARM = 6E ,  RECORD : 6E 6E 00 00 00 00 00 00 00 00
   ALM_DRIVER_ALARM , 15.123 [sec] past.
   Driver Status Code = 00   Driver ALARM Code = 00
```

RESET : Reset Device

Execution Mode	Immediate
Syntax	RESET
See Also	STRSW, VERBOSE, SAVEPRM, SAVEPOS, SAVEALL

Description

RESET resets the device.

Performing a RESET operation is similar to cycling power, but may respond quicker.

Several events occur when the device is reset:

1) Motor current is disabled, and the Magnetic Brake Control (MBFREE) output, if configured, is set to its open, non-conducting state. The motor may move, depending on load conditions: ensure the device is not supporting a vertical load as the load may drop when the device is reset.
2) The system transmits a message: "Resetting system."
3) All outputs are set to an open (non-conducting) state.
4) The parameters and position array data saved in EEPROM are established. Any parameter or position array data that was not saved is lost. (Use SAVEPRM to save parameter data, SAVEPOS to save position array data, or SAVEALL to save both, if desired, before issuing a RESET command.)
5) Alarm conditions are checked, and the alarm code is updated accordingly.
6) If motor current is permitted (depending on alarm state, if used, and STRSW setting, CON on the remote I/O and CON input on the I/O connector), current is enabled.
7) Outputs (other than MBFREE) are set to appropriate states.
8) The immediate mode command prompt is transmitted (>). If VERBOSE=1, a system startup banner message appears before the prompt. If a terminal or terminal emulation program is communicating with the system, the terminal screen may clear prior to the banner, depending on emulation mode.
9) If current is enabled, and the MBFREE output is configured, the MBFREE output is set to its closed.
10) Inputs are read and appropriate actions taken.
11) If no alarm is set, no sequences are running, and a sequence named CONFIG exists, the CONFIG sequence will begin running automatically.

Many parameters do not become effective until the new values have been saved and the system reset or power cycled. RESET is a convenient way to finish reconfiguring the system without cycling power.

Caution

When the device is reset motor current is disabled (at least momentarily), resulting in no holding torque. Be sure that the load cannot move accidentally. Vertical loads which can freefall should be supported via mechanical brake or other means.

Note

When the device is reset, any parameter or position array data that was not saved is lost. Use SAVEPRM to save parameter data, SAVEPOS to save position array data, or SAVEALL to save both, if desired, before issuing a RESET command.

Example

Command	Description

`>ALMACT 1`
` ALMACT=2(1)`
`>ALMMSG 2`
` ALMMSG=2 [Alarm+Warning]`
`>SAVEPRM`
` (EEPROM has been written 95 times)`
` Enter Y to proceed, other key to cancel. Y`
` Saving Parameters.....OK.`
	#New value of alarm action: alarm, keep current on. Active (future) values
	#New value for alarm messaging: transmit message for alarm and warning
	#Save all parameters

`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
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`----------`
	#Reset the system to make new value of ALMACT active (ALMMSG change was effective immediately). Reset messages follow

`>ALMACT; ALMMSG`
` ALMACT=1(1)`
` ALMMSG=2 [Alarm+Warning]`
`>`
	#Confirm new values of ALMACT and ALMMSG

RET : Sequence Return

Execution Mode	Sequence
Syntax	RET
See Also	ABORT, CALL, END

Description

RET terminates processing of the sequence that is currently running as a subroutine.

If the sequence that contains "RET" was CALL'ed from another sequence, the original sequence will resume at the statement following the CALL statement. If the sequence that contains "RET" was started with the START input or the RUN command, RET terminates all sequence execution.

To unconditionally terminate all sequence processing, use ABORT.

All sequences automatically return when all statements have been processed: a RET is not required at the end of sequences (but may be used, if desired).

Example

Command	Description
`>LIST MAIN`	#List sequence MAIN
`( 1) VR 10`	#Set running velocity to 10
`( 2) LOOP 10`	#Do contents, 10 times
`( 3) MI`	#…Start incremental motion
`( 4) CALL WATCHER`	#…Call sequence WATCHER
`( 5) ENDL`	#End of LOOP block
`( 6) MA 0`	#Start absolute move back to 0
`( 7) CALL WATCHER`	#Call sequence WATCHER
`>LIST WATCHER`	#List sequence WATCHER
`( 1) WHILE (SIGMOVE=1)`	#While moving…
`( 2) IF (IN4=1)`	#…If input 4 is asserted
`( 3) CV 5`	#……Change speed to 5
`( 4) MEND`	#……Wait for motion to end
`( 5) RET`	# and return to caller
`( 6) ENDIF`	#…End of IF block
`( 7) WEND`	#End of WHILE block
`>`	

RIN : Remote General Input Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	RIN
Range	0 to 255 /: real time monitor (immediate mode only)
Access	READ
See Also	RIO, RINx, ROUT, ROUTx, RINxxx, INITRIO, REPORT

Description

The RIN command displays the current status of all the general purpose remote inputs, as one integer number.

The remote general purpose inputs contribute to the value of RIN as follows:

RINx	Contribution to RIN If Active
RIN8	128
RIN7	64
RIN6	32
RIN5	16
RIN4	8
RIN3	4
RIN2	2
RIN1	1

For example, if the remote general input 2 (2), remote general input 3 (4) and remote general input 4 (8) are active, while all other signals are not active, "RIN=14" is set (2+4+8=14).

When inputting RIN, "RIN=14" is replied.

∗ To check the status of a single remote general input, use the RINx command.

∗ If remote input is assigned to a system input signal (HOME, LSP, LSN, etc) the RIN command will always show that input as OFF or 0. Inputs which have been assigned to system input signals do not affect RIN.

Example

Command	Description
>RIN	#Query the status of the remote general inputs
RIN=32	#Device response indicating remote input 6 is ON
>	
>LIST 8	#List sequence 8
(1) SAS PRESS START	#Notify user to press start
(2) IF (RIN=18)	#If remote inputs 2 and 5 are ON then,
(3) MGHN	#Go home in the negative direction
(4) ELSE	#If the value of RIN does not equal 18, then
(5) WHILE (RIN=0)	#While all the inputs are OFF
(6) MI	#Execute an index move
(7) MEND	#Wait for move to complete
(8) WAIT 0.15	#Wait an additional 0.15 seconds
(8) WEND	#End the WHILE loop
(9) ENDIF	#End the IF block
>	

RINx : Individual Remote General Input Status

Execution Mode	Immediate and Sequence
Syntax	RINx (RINx is a signal name: RIN1 to RIN8)
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Access	READ
See Also	RIN, RIO, ROUT, ROUTSG, ROUTx, REPORT

Description

RINx returns the state of the remote general purpose input "x."

If the input has been assigned to a system input signal, then it is no longer "general purpose." RINx for these inputs will always return 0 (not active).

Example

Command	Description
>RIN1 RIN1=0	#Query the status of the individual remote general input

RINxxx : Remote System Signal Input Assignment

Execution Mode	Immediate
Syntax	RINxxx=n "xxx" represents the signal name to be assigned, and "n" represents the assigned terminal number ("that" becomes the RINn remote general input when unassigned).
Range	n = 0 to 8
Factory Setting	0 (unassigned)
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	SIGxxx, RIO, INITRIO, CLEARALL, RINx, REPORT and "See Also" column in the chart below.

Description

Assign the system input signal to the RINn on the remote I/O. The remote system signal input assignment is released by "RINxxx=0" and it becomes the remote general input RINn. When executing the INITRIO command, the parameter restores to the factory setting.

Command	Signal	Description	See Also
RINALMCLR	ALMCLR	Alarm Clear	ALMCLR
RINCONT	CONT	Continue Motion	PAUSE, PAUSECLR
RINHOME	HOME	Home Sensor	HOMETYP, MGHP, MGHN
RINLSP/RINLSN	LSP/LSN	Limit Switch Positive /Limit Switch Negative	ALM, ALMACT, ALMCLR
RINMGHP	MGHP	Move Go Home Positive	MGHP, HOMETYP
RINMSTOP	MSTOP	Motor Stop	MSTOP, MSTOPACT
RINPAUSE	PAUSE	Pause Motion	PAUSE, CONT, PAUSECLR, RINPAUSECL, ROUTPSTS
RINPAUSECL	PAUSECL	Pause Clear	PAUSECLR, CONT, PAUSE, RINPAUSE, SIGPSTS, ROUTPSTS
RINPECLR	PECLR	Position Error Clear	PECLR, EC, PC, PE, PF
RINPSTOP	PSTOP	Panic Stop	PSTOP, ABORT, <ESC>, ALMACT, HSTOP, MSTOPLV, SSTOP, PAUSE
RINSENSOR	SENSOR	Sensor	SENSORACT, MGHP, MGHN, SCHGPOS, SCHGVR
RINTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL, DOUTTL

Memo

The xxxLV does not invert the logic level of RINxxx.

Example

Command	Description
>RINALMCLR 3 RINALMCLR=0(3)	#Assign remote input number 3 as the ALMCLR signal
>SAVEPRM (EEPROM has been written 2 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>RINALMCLR RINALMCLR=3(3) >	#Confirm new value

RIO : Remote I/O Status

Execution Mode	Immediate
Syntax	RIO
Range	/: real time monitor (immediate mode only)
See Also	RINxxx, ROUTxxx, RIN, ROUT, RINx, ROUTx, DIO, IO, REPORT

Description

RIO displays the current status of general purpose remote inputs and remote outputs and system remote input signals and system remote output signals.

Values are reported as 0: inactive or 1: active.

For inputs and outputs that have been assigned to a system input or output signal, the signal state is shown. A START input can start a sequence, determined by the binary value of IN. This value is shown in the I/O response under (SEQ#), and is the number of the sequence that would start if a START signal became active in this I/O state.

In the example below, general purpose input 1 is active, so IN=1, and sequence 1 would start if the alarm condition were cleared and START became active.

Example

Command	Description
`>RIO`	#Display the RIO status

`Inputs (1-8) = IN1 SENSOR IN3 IN4 IN5 IN6 IN7 IN8`
`Outputs (1-6) = MBFREE OUT2 OUT3 OUT4 OUT5 OUT6`
 	
`--Inputs---  --Outputs--`
`1 2 3 4 5 6 7 8 -(SEQ#)- 1 2 3 4 5 6`
`1 1 0 0 0 0 0 0 -( 1 )- 0 0 0 0 0 0`
`>`
	#Device response

ROUT : Remote General Output Control

Execution Mode	Immediate, Sequence and CANopen
Syntax	ROUT=n ∗ "=n" is required only when controlling
Range	n = 0 to 63 (integer values) /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE READ only in CANopen
See Also	RINSG, ROUTSG, RIN, ROUTxxx, RIO

Description

ROUT displays or sets the value of all the general purpose remote outputs, as one integer number.

The general purpose remote outputs contribute to the value of ROUT as follows:

ROUTx	Contribution to ROUT If Active
ROUT6	32
ROUT5	16
ROUT4	8
ROUT3	4
ROUT2	2
ROUT1	1

For example, if the remote general output 2 (2) and remote general output 4 (8) are active, while all other signals are not active, "ROUT=10" is set (2+4=10).

When inputting ROUT, "ROUT=10" is replied.

∗ To check or control the status of a single remote general output, use the ROUTx command.

∗ The ROUT value always indicates the internal status of the all remote general output signals ROUT1 to ROUT8. For the output signal assigned the system output signal (RUN, MBFREE etc.), the ROUT command recognizes the signal as inactive or zero (except when the signal has become active by the ROUT, ROUTx command).

∗ All general purpose outputs are in the inactive (OFF) state immediately following system startup.

Example

Command	Description
>RIO	#Display the RIO status
Inputs (1-8) = IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 Outputs (1-6) = OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 --Inputs--- --Outputs-- 1 2 3 4 5 6 7 8 -(SEQ#)- 1 2 3 4 5 6 0 0 0 0 0 0 0 0 -(0)- 0 0 0 0 0 0	#Device response
>ROUT	#Check ROUT status
ROUT=0	
>ROUT=15	#Set ROUT to 15
ROUT=15	
>RIO	#Display the RIO status
Inputs (1-8) = IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 Outputs (1-6) = OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 --Inputs--- --Outputs-- 1 2 3 4 5 6 7 8 -(SEQ#)- 1 2 3 4 5 6 0 0 0 0 0 0 0 0 -(0)- 1 1 1 1 0 0	#Device response

ROUTx : Individual Remote General Output Control

Execution Mode	Immediate and Sequence
Syntax	ROUTx=n (ROUTx is a signal name: ROUT1 to ROUT6) * "=n" is required only when controlling.
Range	n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Factory Setting	0
See Also	INITRIO, ROUT, ROUTSG, RIO, RIN

Description

ROUTx displays or controls the state of remote general purpose output 'x'. If the remote output has been assigned to a system output signal such as RUN and MBFREE, then it is no longer "general purpose." ROUTx for these outputs has no affect on the output levels.

Memo

Even the output signal assigned the system output signal can become active (1) as the remote general output status using the ROUTx command. For example, even when the ROUT1 is assigned to PSTS, ROUT1=1 can be commanded. However, the PSTS signal will not become active. Note that the ROUT (remote general output control) value becomes 1 at this time.

Example

```
>LIST 8

(  1) VS=0;VR=1;TA=0.001;TD=0.001
(  2) DIS=10;PC=0
(  3) ROUT=0
(  4) MI
(  5) LOOP                          #Start infinite loop
(  6)   IF (PC>=2)                  #If PC is equal to or greater than 2
(  7)     ROUT1=1                   #ROUT1 is active
(  8)   ENDIF                       #End of IF block
(  9)   IF (PC>=4)                  #If PC is equal to or greater than 4
( 10)     ROUT2=1                   #ROUT2 is active
( 11)   ENDIF                       #End of IF block
( 12)   IF (PC>=6)                  #If PC is equal to or greater than 6
( 13)     ROUT3=1                   #ROUT3 is active
( 14)   ENDIF                       #End of IF block
( 15)   IF (PC>=8)                  #If PC is equal to or greater than 8
( 16)     ROUT4=1                   #ROUT4 is active
( 17)   ENDIF                       #End of IF block
( 18)   IF (PC==DIS)                #If PC is equal to DIS
( 19)     ROUT5=1                   #ROUT5 is active
( 20)     BREAKL                    # Exit the loop and execute the line after the ENDL
( 21)   ENDIF                       command
( 22) ENDL                          # End of IF block
( 23) MEND                          #Terminate the LOOP
                                    #Wait for stop to complete
```

ROUTxxx : Remote System Signal Output Assignment

Execution Mode	Immediate
Syntax	ROUTxxx=n
Range	n = 0 to 6
Factory Setting	0 (unassigned)
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	OUTxxx (except: ABSDATA), SIGxxx, RIO, INITRIO, CLEARALL, ROUT, ROUTx, REPORT and "See Also" column in the chart below.

Description

Assign the system output signal to the ROUTn of the remote I/O. The remote system signal output assignment is released by "ROUTxxx=0" and it becomes the remote general output ROUTn.

When executing the INITRIO command, the parameter restores to the factory setting.

Command	Signal	Description	See Also
ROUTABSDATA	ABSDATA	Driver Current Position Data Ready	ABSREQ, ABSREQPC, PABS, ABSSTS
ROUTMBFREE	MBFREE	Magnetic Brake Free	CURRENT, FREE
ROUTPSTS	PSTS	Pause Status	PAUSE, PAUSECLR, CONT
ROUTRUN	RUN	Sequence Running	RUN

Example

Command	Description
>ROUTRUN 3 RINALMCLR=0(3)	#Assign remote input number 3 as the RUN signal
>SAVEPRM (EEPROM has been written 2 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	#Save the parameter assignments
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Establish the saved parameter values
>ROUTRUN RINALMCLR=3(3) >	#Confirm new value

RUN : Run Sequence

Execution Mode	Immediate and CANopen
Syntax	RUN target
Range	'target' must be the name or number of an existing sequence.
Commands not Allowed	RUN
See Also	EDIT, DIR, ABORT, <ESC>, INxxx (INSTART)

Description

RUN starts execution of a sequence.

Sequences can also be started with the dedicated START input if assigned on the I/O connector and/or the CANopen remote I/O. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O. Sequences cannot be started if the system has an active alarm condition.

Control returns to the command prompt, and sequence execution continues in the background until complete or aborted. Sequences abort automatically if an alarm is detected or the dedicated ABORT input is activated. Sequences can be manually aborted with the ABORT command or an ESCAPE key or character.

RUN cannot be used inside sequences. To execute one sequence from within another, use the CALL command.

Memo

Sequences cannot be edited while a sequence is executing. The system prevents the editor from starting.

Example

Command	Description
`>LIST DIS200`	#List sequence DIS200
`( 1) DIS=200`	#Sequence listing
`( 2) VS=0;VR=10`	
`( 3) TA=0.5;TD=1`	
`( 4) MI`	
`( 5) MEND`	
`>RUN DIS200`	#Run sequence DIS200
`>SIGRUN`	#Commands can still be executed, while…
`SIGRUN=1`	#…sequences execute (SIGRUN=1)
`>`	

S_xxx : User-defined String Variables

Execution Mode	Immediate and Sequence
Syntax	S_xxx=text xxx = 1 to 10 Alphanumeric Characters (S_xxx can be the name of any existing user-defined string variable.)
Range	text = 20 Characters Maximum
Factory Setting	Text is Empty.
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CLEARVAR, CREATEVAR, DELETEVAR, LISTVAR, SAS, SACS, VIEW, N_xxx

Description

General purpose, user-defined string variables.

A user-defined string variable must be created with CREATEVAR before it can be used. After it has been created, it can be used to store or display text.

Within sequences, the VIEW command can be used to display string contents without entering repeated carriage returns, linefeeds or by reprompting.

Example

Command	Description
>CREATEVAR S_QUAD	
NEW variable S_QUAD is added.	
S_QUAD=	
>LIST MAIN	#List contents of sequence MAIN
(1) LOOP	#Start infinite loop
(2) WAIT 0.05	#Wait 50 milliseconds
(3) MI	#Start incremental motion
(4) MEND	#Wait for motion to end
(5) CALL QUADRANT	#Call sequence QUADRANT as subroutine
(6) S_QUAD	#Show contents of user-defined string variable S_QUAD
(7) ENDL	#End of LOOP block
>LIST QUADRANT	#List contents of sequence QUADRANT
(1) R=PC%360	#R = position command, modulo 360
(2) IF (R>=270)	
(3) S_QUAD=Fourth Quadrant	#Assign text to S_QUAD, depending on quadrant
(4) RET	
(5) ENDIF	
(6) IF (R>=180)	
(7) S_QUAD=Third Quadrant	
(8) RET	
(9) ENDIF	
(10) IF (R>= 90)	
(11) S_QUAD=Second Quadrant	
(12) RET	
(13) ENDIF	
(14) S_QUAD=First Quadrant	
>DIS=75; RUN MAIN	#Set incremental distance to 75, run sequence MAIN
DIS=75 Rev	
>Third Quadrant	#Sequence MAIN transmits contents of S_QUAD after each motion
>Fourth Quadrant	
>First Quadrant	
>First Quadrant	
>Second Quadrant	
>Third Quadrant	#…etc.
>	

SACS : Send ASCII Control String

Execution Mode	Sequence
Syntax	SACS string
Range	string : a series of ASCII characters or control codes, maximum 70 characters.
See Also	KB, KBQ, SAS, VIEW

Description

SACS transmits an ASCII string out the serial port. The string begins with the first non-space character following the SACS command, and continues to the last non-space character on the line. (A space between SACS command and ASCII string is necessary.)

SACS does not append a line terminator (carriage return and linefeed), but instead allows a user to embed ASCII control codes within the string. The normal system prompt is not automatically refreshed immediately after an SACS command. SACS permits almost complete control over the actual contents of the output.

SACS supports the normal range of printable ASCII characters, plus most ASCII control codes. Control codes are entered by prefixing a printable character with a caret (^). For instance, to transmit an ASCII "BEL" code (usually interpreted as "beep speaker," or similar), use ^G. For a Carriage Return, followed by a Line Feed, use ^M^J. (SAS, Send ASCII String, automatically appends a Carriage Return + Linefeed pair, and may be easier to use in some applications.)

There are several exceptions and extensions to the normal ASCII interpretation of control codes:

- ^@: a caret followed by @ (ASCII value NULL, binary 0) is not supported.
- ^ : a caret followed by a space, transmits one space character (this permits leading or trailing space characters in the output)
- ^^: two carets transmit a single caret (^).
- ^^^: three carets transmits an ASCII CTRL-^, 1Eh.
- ^: only a caret followed by nothing does nothing.

Other commands and comments cannot follow an SACS command on the same line: they will be considered part of the ASCII string.

For other control codes and their usual interpretations, see Appendix A.

Memo

In a daisy chain configuration (ID other than *), all output from sequence commands is suppressed unless the device has been previously addressed (via TALK or @).

"@" cannot be used in an ASCII string.

Example

Command	Description
`>LIST REFRESH`	#List Sequence "REFRESH"
`( 1) # VT-100 EMULATION`	#Comments, in sequence
`( 2) # 1) CLEAR DISPLAY`	#Transmitted control codes below cause VT-100
`( 3) # 2) HOME CURSOR`	displays to clear screen and "home" the cursor.
`( 4) # 3) TRANSMIT PREFERRED PROMPT`	Then: transmit a custom prompt
`( 5) SACS ^[[2J^[[H-->`	
`>RUN REFRESH`	
`-->`	

SAS : Send ASCII String

Execution Mode	Sequence
Syntax	SAS string
Range	string : a series of ASCII characters, maximum 70 characters.
See Also	SACS, VIEW, KB, KBQ

Description

SAS transmits an ASCII string out the serial port, verbatim, appends a Carriage Return and Line Feed pair, and refreshes the system prompt. The ASCII string begins with the first non-space character following the SAS command, and continues to the last non-space character on the line. (A space between SACS command and ASCII string is necessary.)

Other commands and comments cannot follow an SAS command on the same line: they will be considered part of the ASCII string.

Memo

In a daisy chain configuration (ID other than *), all output from sequence commands is suppressed unless the device has been previously addressed (via TALK or @). The KB and KBQ commands will not receive input unless the device has been previously addressed.

"@" cannot be used in an ASCII string.

Example

```
>LIST TRANSMIT2                 #List sequence TRANSMIT2

(  1) SAS Distance:             #Send characters "Distance:," carriage return, linefeed, reprompt
(  2) DIS                       #Display value of DIS and reprompt
(  3) SACS Distance:            #Send characters "Distance:," with 1 trailing space
(  4) VIEW D                    #Display value of DIS on SAME line, no reprompt
(  5) SACS ^M^J                 #Send carriage return and line feed
>RUN TRANSMIT2
>Distance:
>1.125
>Distance: 0
```

SAVEALL : Save All Data

Execution Mode	Immediate
Syntax	SAVEALL
Commands not Allowed	MOVE, RUN
See Also	CLEARALL, RESET, SAVEPOS, SAVEPRM, INITPRM, CLEARPOS

Description

SAVEALL saves the all current parameter settings and position array data to nonvolatile memory (EEPROM). SAVEALL is the equivalent of SAVEPRM followed by SAVEPOS.

SAVEALL affects the values of most parameters at system start (following a power cycle or RESET command). The saved values become the initial values of each parameter after a restart. These parameters will have a SAVEPRM entry in this chapter.

SAVEALL requires confirmation. A 'y' (not case sensitive) must be sent before the operation proceeds: any other character aborts the operation.

Many parameters do not become effective until they are saved and the system is restarted. These parameters will have a SAVEPRM & RESET entry in this chapter, and the system displays their values in active(future) form: the active value is displayed first, and the (future) value, displayed second, will only become effective if the parameter is saved and the system restarted.

```
>DALARM=0
 DALARM=1(0) [Enable(Disable)]
```

Active value
Future value

Caution

The SAVEALL command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The SAVEALL command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency.

Example

Command	Description
`>SAVEALL`	#Save all parameters, variables, and position array data
`(EEPROM has been written 100 times)`	
`Enter Y to proceed, other key to cancel. y`	#System requires confirmation
`Saving Parameters.....OK.`	
`Saving POS[ ] Data.....OK.`	
`>`	#Note RESET required before some new settings take effect.

SAVEPOS : Save Position Array Data

Execution Mode	Immediate
Syntax	SAVEPOS
Commands not Allowed	MOVE, RUN
See Also	CLEARALL, CLEARPOS, RESET, SAVEALL, SAVEPRM, INITPRM, TEACH, POS[x]

Description

SAVEPOS saves the all position array data (POS[x]) to nonvolatile memory (EEPROM).

SAVEPOS affects the values of the position array data (following a power cycle or RESET command). The saved values become the initial values after a restart. The position array data can be modified and used freely in an application without saving, but the last saved values will become active when the system is restarted.

SAVEPOS requires confirmation. A 'y' (not case sensitive) must be sent before the operation proceeds: any other character aborts the operation.

Caution

The SAVEPOS command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The SAVEPOS command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency.

Example

Command	Description
`*** Teach mode ***`	#Enter TEACH mode to "learn" target positions

`(V) : Move Cont. Neg. (M) : Move Cont. Pos.`
`(B) : Jog Negative (N) : Jog Positive`
`(Q) : Current ON/OFF (F) : FREE ON/OFF`
`(S) : Save all data to EEPROM`
`(K) : Change Key Interval (50-500[msec])`
`(D) : Change Jog Distance (0.001-500000 [Rev])`
`Minimum Movable Distance : 0.001 [Rev]`
`<Space> : Immediate Stop`
`<Enter> : Data entry mode (Input POS number, then <Enter>)`
`<ESC> : Exit teach mode`
	#<Enter>, this PC saved to POS[23]
	#<ESC>: exit TEACH

`PC= 0.000 Save to POS[23] Data set OK.` `End teach mode`	

`>SAVEPOS`
`(EEPROM has been written 104 times)`
`Enter Y to proceed, other key to cancel. Y`
`Saving POS[ ] Data.......OK.`
`>`
	#SAVEPOS, to be sure all POS[x] data restore after restart

SAVEPRM : Save Parameters

Execution Mode	Immediate
Syntax	SAVEPRM
Commands not Allowed	MOVE, RUN
See Also	CLEARALL, SAVEALL, SAVEPOS, RESET, INITPRM

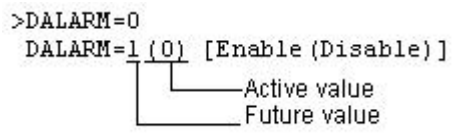
Description

SAVEPRM saves the all current parameter settings to nonvolatile memory (EEPROM).

SAVEPRM affects the values of most parameters at system start (following a power cycle or RESET command). The saved values become the initial values of each parameter after a restart. These parameters will have a SAVEALL entry in this chapter.

SAVEPRM requires confirmation. A 'y' (not case sensitive) must be sent before the operation proceeds: any other character aborts the operation.

Many parameters do not become effective until they are saved and the system is restarted. These parameters will have a SAVEPRM & RESET entry in this chapter, and the system displays their values in active(future) form: the active value is displayed first, and the (future) value, displayed second, will only become effective if the parameter is saved and the system restarted.



Caution

The SAVEPRM command writes to EEPROM. The EEPROM has a nominal expected lifetime of 100,000 write cycles. The SAVEALL command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency.

Example

Command	Description
>VR	#Check value of running velocity
VR=1 Rev/sec	#Factory setting, 1 RPS
>VR 10	#Set running velocity 10
VR=10 Rev/sec	
>RESET	#Reset the system
Resetting system.	

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>VR	#Check value of running velocity
VR=1 Rev/sec	#Didn't stick! Still default 1 RPS
>VR 10	#Set back to 10 RPS
VR=10 Rev/sec	
>SAVEPRM	#SAVEPRM: this will become new startup value
(EEPROM has been written 14 times)	
Enter Y to proceed, other key to cancel. Y	#Confirm SAVEPRM
Saving Parameters.....OK.	
>RESET	#Reset the system again
Resetting system.	

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Controller Module	
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>VR	#Check value again
VR=10 Rev/sec	#OK. We have new startup value
>	

SCHGPOS : Distance from SENSOR Input to the Stop Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	SCHGPOS=n
Range	n = 0 to MAXPOS (user units)
Factory Setting	0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INxxx (INSENSOR), RINxxx (RINSENSOR), MCP, MCN, SCHGVR, SENSORACT, xxxLV (SENSORLV), MAXPOS

Description

SCHGPOS is the distance used for SENSOR offset operation.

SENSOR offset operation allows the system to stop a continuous motion (MCP, MCN) a specified distance after a SENSOR input is detected. The system will change speed to SCHGVR, and eventually decelerate to a stop after the designated distance.

SENSORACT must be 2 (offset operation), and the system input signal SENSOR must be assigned to an input before offset operations can be used.

Example

Command	Description
`>LIST REGISTER`	#List sequence "REGISTER"
`( 1) SCHGPOS 10; SCHGVR 5`	#Set sensor offset distance to 10, and speed to 5
`( 2) VR 10; MCP`	#Set running velocity to 10, move continuous (positive)
`( 3) WHILE (SIGMOVE=1)`	#While moving
`( 4)  IF (PCI>50)`	#If we have moved more than 50…
`( 5)  ALMSET`	#Too far. Force an alarm
`( 6)  RET`	#Return: not required. Alarm will abort sequences
`( 7)  ENDIF`	#End IF block
`( 8) WEND`	#End WHILE block
`>`	

SCHGVR : Velocity after SENSOR Input

Execution Mode	Immediate, Sequence and CANopen
Syntax	SCHGVR=n
Range	n = 0.001 to MAXVEL (user units/second)
Factory Setting	1.0
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INxxx (INSENSOR), RINxxx (RINSENSOR), MCP, MCN, SCHGPOS, SENSORACT, xxxLV (SENSORLV), MAXVEL

Description

SCHGVR is the velocity used for SENSOR offset operation.

SENSOR offset operation allows the system to stop a continuous motion (MCP, MCN) a specified distance after a SENSOR input is detected. The system will change speed to SCHGVR, and eventually decelerate to a stop after the designated distance.

SENSORACT must be 2 (offset operation), and the system input signal SENSOR must be assigned to an input before offset operations can be used.

Example

Command	Description
`>LIST REGISTER`	#List sequence "REGISTER"
`( 1) SCHGPOS 10; SCHGVR 5`	#Set sensor offset distance to 10, and speed to 5
`( 2) VR 10; MCP`	#Set running velocity to 10, move continuous (positive)
`( 3) WHILE (SIGMOVE=1)`	#While moving
`( 4) IF (PCI>50)`	#If we have moved more than 50…
`( 5) ALMSET`	#Too far. Force an alarm
`( 6) RET`	#Return: not required. Alarm will abort sequences
`( 7) ENDIF`	#End IF block
`( 8) WEND`	#End WHILE block
`>`	

SENSORACT : SENSOR Input Action

Execution Mode	Immediate
Syntax	SENSORACT=n
Range	n = 0: Hard Stop (stop as quickly as possible) 1: Soft Stop (controlled deceleration over time) 2: Soft Stop at Fixed Distance from SENSOR Signal 3: No Action
Factory Setting	2
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INxxx (INSENSOR), RINxxx (RINSENSOR), MCP, MCN, SCHGPOS, SCHGVR, xxxLV (SENSORLV)

Description

SENSORACT establishes the stop action taken when the system detects a SENSOR input signal while executing a continuous motion (MCP, MCN).

- If SENSORACT=0, the system will stop the motor as quickly as possible (hard stop). Stop action is exactly the same as HSTOP.
- If SENSORACT=1, the system will stop the motor by a controlled deceleration over time (soft stop). Stop action is exactly the same as SSTOP.
- If SENSORACT=2, the system will change speed to SCHGVR, and bring the motor to a stop at a distance SCHGPOS from the position at which the SENSOR signal was detected.
- If SENSORACT=3, even when the SENSOR input is detected, the motor does not stop. Set when using the SENSOR input only in the return-to-mechanical home operation.

SENSORACT does not affect the use of the SENSOR input during home seeking.

Example

Command	Description
`>INSENSOR 4` ` INSENSOR=0(4)`	#Assign SENSOR signal to input 4
`>SENSORLV 1` ` SENSORLV=0(1)`	#Set SENSOR active level to normally closed
`>SENSORACT 1` ` SENSORACT=2(1)`	#Set SENSORACT to 1: soft stop

`>SAVEPRM`
` (EEPROM has been written 107 times)`
` Enter Y to proceed, other key to cancel. y`
` Saving Parameters.....OK.`
	#Save parameters

`>RESET`
`Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
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`----------`
	#Reset to activate new settings

`>SENSORACT` ` SENSORACT=1(1)`	#Confirm the new value

SIGxxx : Status for System Input Signal/System Output Signal

Execution Mode	Immediate and Sequence
Syntax	SIGxxx ("xxx" indicate the signal name on the I/O connector. ex: SIGABORT)
Range	0: "xxx" input/output is not active. 1: "xxx" input/output is active. /: real time monitor (immediate mode only)
Access	READ (SIGABORT, SIGSTART: in immediate mode only)
See Also	INxxx/OUTxxx, IO, xxxLV (except: LSP/LSN, MBFREE), INSG/OUTSG, OUTTEST, REPORT, and "See Also" column in the chart below.

Description

SIGxxx is the status of system "xxx" input/output (included remote input/output) signal.

SIGxxx becomes "0 (zero)" when not active, while SIGxxx becomes "1" when active.

Even if the output signals are not assigned to the output connector, you can check the internal status, using the SIGxxx commands of the output signals.

<Input>

Command	Signal	Description	See Also
SIGABORT	ABORT	Abort Motion and Sequence Execution	ABORT
SIGALMCLR	ALMCLR	Alarm Clear	ALMCLR, RINALMCLR
SIGCON	CON	Current ON	CURRENT
SIGFREE	FREE	Current OFF, Magnetic Brake Free	FREE
SIGHOME	HOME	Home Sensor	HOMETYP, MGHP, MGHN, EHOME, RINHOME
SIGCONT	CONT	Continue Motion	PAUSE, PAUSECLR
SIGLSP/SIGLSN	LSP/LSN	Limit Switch Positive /Limit Switch Negative	OTLV, OTACT, HOMETYP, MGHP, MGHN, RINLSP/RINLSN
SIGMCP/SIGMCN	MCP/MCN	Move Continuously Positive /Move Continuously Negative	MCP/MCN
SIGMGHP/SIGMGHN	MGHP/MGHN	Move Go Home Positive /Move Go Home Negative	MGHP/MGHN
SIGMSTOP	MSTOP	Motor Stop	MSTOPACT, RINMSTOP
SIGPAUSE	PAUSE	Pause Motion	PAUSE, RINPAUSE, PAUSECLR, CONT
SIGPAUSECL	PAUSECL	Pause Clear	PAUSECLR, RINPAUSECL, PAUSE, CONT
SIGPECLR	PECLR	Position Error Clear	PECLR, RINPECLR, EC, PC, PE, PF
SIGPSTOP	PSTOP	Panic Stop	PSTOP, RINPSTOP, ALMACT
SIGSENSOR	SENSOR	Sensor	RINSENSOR, SENSORACT
SIGSTART	START	Start Sequence	STARTACT
SIGTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL, RINTL

<Output>

Command	Signal	Description	See Also
SIGALARM	ALARM	Alarm	ALMACT
SIGEND	END	Motion End	DEND, ENDACT
SIGHOMEP	HOMEP	Home Position	MGHP, MGHN, EHOME, PC
SIGLC	LC	Limiting Condition	TL
SIGMBFREE	MBFREE	Magnetic Brake Free	ROUTMBFREE
SIGMOVE	MOVE	Motor Moving	SIGEND
SIGPSTS	PSTS	Pause Status	ROUTPSTS, PAUSE, CONT
SIGREADY	READY	Operation Ready	OUTMOVE, MEND
SIGRUN	RUN	Sequence Running	ROUTRUN, RUN, ABORT

Example

Command	Description
`>LIST SETTLETIME`	#List sequence SETTLETIME
`(  1) MI`	#Start incremental motion
`(  2) MEND`	#Wait for motion profile complete (SIGMOVE=0)
`(  3) Z=TIMER`	#Store TIMER value
`(  4) WHILE (SIGEND=0)`	#While SIGEND=0…
`(  5)  T=TIMER-Z`	# … make variable T be elapsed time
`(  6) WEND`	#End of WHILE block
`(  7) T`	#Display T: time between SIGMOVE=0 and SIGEND=0
`>VR 20; TD 0.005`	#Set Run velocity and Deceleration time… maybe aggressive?
`VR=20 Rev/sec`	
`TD=0.005`	
`>RUN SETTLETIME`	#Run sequence SETTLETIME
`>0.027`	#System took ~27 milliseconds to settle after motion profile finished
`>`	
`>LIST FIXLIMITS`	#List sequence FIXLIMITS
`(  1) IF (SIGLSN=1)`	#If SIGLSN=1, negative limit sensor active
`(  2)  MCP`	#Start moving continuously, positive direction
`(  3)  WHILE (SIGLSN=1); WEND`	#While the sensor is still active, wait
`(  4) ENDIF`	#End IF block
`(  5) IF (SIGLSP=1)`	#If SIGLSP=1, positive limit sensor active
`(  6)  MCN`	#Start moving continuously, negative direction
`(  7)  WHILE (SIGLSP=1); WEND`	#While the sensor is still active, wait
`(  8) ENDIF`	#End IF block
`(  9) SSTOP`	#Stop the motor (soft stop)
`( 10) MEND`	#Wait for stop to finish
`>LIST GOHOME`	#List sequence GOHOME
`(  1) SAS Home Requested`	#Transmit "Home Requested"
`(  2) IF (SIGMOVE=1)`	#If motion in progress
`(  3)  SAS System moving, please wait...`	#Transmit wait message
`(  4)  MEND`	#Wait for motion to finish
`(  5) ENDIF`	#End IF block
`(  6) SAS Returning to home position.`	#Transmit returning message
`(  7) EHOME`	#Move to position zero
`(  8) MEND`	#Wait for motion to complete
`(  9) SAS At home position.`	#Transmit finished message
`>`	

SLACT : Software Position Limit Control Enable

Execution Mode	Immediate and Sequence
Syntax	SLACT n
Range	n = 0: Software position limits are disabled. 1: Software position limits are enabled after homing.
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	LIMP, LIMN, PC, MGHP, MGHN, EHOME, ALM, ALMACT
Description	SLACT enables or disables software position limit action. When SLACT=1, software position limits LIMP and LIMN are enforced, provided the system has completed a homing action (EHOME, MGHP, MGHN). Moving outside software position limit range will cause the motor to stop, may cause an alarm (alarm code: 67h) and may disable motor current, depending on the value of ALMACT. Stop action (soft stop or hard stop) is defined by OTACT. Software limit checking is disabled while a homing operation is in process (MGHP, MGHN, EHOME). (A software position limit alarm may be triggered after a homing operation if PC=0 is not between LIMP and LIMN.) For absolute or incremental index moves (MA, MI), limit checking is performed before motion starts. If the final target position is outside the range, the motion will not occur, and in the case of absolute motion (MA), the action defined by ALMACT will trigger. For continuous motions (MCP, MCN), any out of range condition is detected only as it happens. If the system is outside the software position limits, motions may still be started. After any alarm is cleared, MI or MA can be executed if their destination would bring the motor within limits. MCP or MCN can be executed, if the motor would move in the direction of the operational range.
Memo	If LIMP=LIMN=0, software position limit checking is disabled, even if SLACT=1. LIMP and LIMN should be set to appropriate values before enabling software position limit checking.

Example

Command	Description
>LIMP 10	#Positive position limit: 10 rev
LIMP=0(10) Rev	
>LIMN -10	#Negative position limit: 10 rev
LIMN=0(-10) Rev	
>SLACT 1	#Enable position limit checking
SLACT=0(1)	
>INHOME 1	#Assign HOME input to input 1
INHOME=0(1)	
>HOMETYP 8	#Select HOME type 8
HOMETYP=8	
>ALMMSG 2	#Enable automatic transmission of alarm and warning messages
ALMMSG=2 [Alarm+Warning]	
>SAVEPRM	#Save new configuration information
(EEPROM has been written 62 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
>RESET	#Reset the system to make new settings active
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>MGHP	#Find home, start in positive dir.
>SIGHOMEP	#Check HOME input after operation completes: active
SIGHOMEP=1	
>MCP	#Start continuous motion
>Over travel: software position limit detected.	#Alarm at position limit
>PC	#Check position command
PC=10.001 Rev	#System stopped, just past limit
>	

SSTOP : Soft Stop

Execution Mode	Immediate, Sequence and CANopen
Syntax	SSTOP
See Also	TD, HSTOP, MSTOP, MSTOPACT, PSTOP, ABORT
Description	SSTOP stops the motor with a controlled deceleration. The motor decelerates to start velocity VS over deceleration time TD, and then stops completely. This command does not stop a sequence program, though the motor stops even in the sequence.

Example

Command	Description
>TD 1.0	#Set the deceleration time to 1.0 second.
TD=1.0	#Device response
>VS 2	#Set the starting velocity to 2 mm/second
VS=2 mm/sec	#Device response
>VR 4	#Set the running velocity to 4 mm/second
VR=4 mm/sec	#Device response
>MCP	#Move continuously in the positive direction
>SSTOP	#Slow down and stop the motor
>DIS 10	#Distance equals 10 mm
DIS=10 mm	#Device response
>MI	#Move incremental
>SSTOP	#Slow down and stop the motor
>	

STARTACT : START Input Action

Execution Mode	Immediate
Syntax	STARTACT=n
Range	n = 0: START input starts sequence execution when asserted. While the sequence is running, START input also resumes the motion that has been paused by PAUSE command or input 1: START input starts sequence execution when asserted, and aborts sequence execution and motion when cleared.
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	<ESC>, ABORT, xxxLV (STARTLV)

Description

STARTACT determines the action associated with the dedicated START input.

・STARTACT=0

START can be configured only to start sequences only.

If START input is turned ON while in a paused situation while the sequence continues running by waiting for the end of paused motion, the remaining motion will be started.

・STARTACT=1

START can be configured to act as a toggle: starting sequences when set to its active level and aborting sequences (and motions) when set to its inactive level.

Example

Command	Description
>STARTACT 1	#Set the START input action to level detect
STARTACT=0(1)	
>SAVEPRM	#Save new settings
(EEPROM has been written 62 times)	
Enter Y to proceed, other key to cancel. Y	
Saving Parameters.....OK.	
>RESET	#Reset to activate new settings
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>STARTACT	#Confirm new value
STARTACT=1(1)	
>	

STRDCS : Driver Step Angle at System Start

Execution Mode	Immediate and Sequence
Syntax	STRDCS=n
Range	n = 0: CS Output Off at System Start 1: CS Output On at System Start
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DOUTxxx (DOUTCS), DSIGxxx (DSIGCS)

Description

The STRDCS sets the CS output level of the driver connector on the **CM10**/**SCX10** at system power on.
This is to select the motor resolution, by CS (change step = motor resolution selection) function in the driver.

Example

Command	Description
>STRDCS=1	#Set the driver step angle at system start to level detect
STRDCS=0(1)	
>SAVEPRM	#Save new settings
(EEPROM has been written 21 times) Enter Y to proceed, other key to cancel. y Saving Parameters.....OK.	
>RESET	#Reset to activate new settings
Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	
>STRDCS	#Confirm new value
STRDCS=1(1)	

STRSW : Current State at System Start

Execution Mode	Immediate
Syntax	STRSW=n
Range	n = 0: Motor Current Off at System Start 1: Motor Current On at System Start
Factory Setting	0: **CM10-1**, **5** 1: **CM10-2**, **3**, **4**, **SCX10**
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CURRENT, INxxx (INCON)

Description

STRSW enables or disables motor current immediately after system start.

If STRSW=0, no current is supplied to the motor windings after system start (initial value of CURRENT is 0). The motor freewheels. Motor current must be explicitly enabled (by setting CURRENT to 1) to develop holding torque and permit motions. If STRSW=1, the system supplies current to the motor after a successful startup.

Memo

If the CON input is not assigned to the I/O connector and CANopen is not active, the CURRENT status at power on is determined by the STRSW setting. If the CON input is assigned to the I/O connector and/or the CANopen is active, the CURRENT status (motor current) at power on is determined by those inputs.

Example

Command	Description
>STRSW 0 STRSW=1 (0) [Current ON at start up(Current OFF at start up)]	#Configure for CURRENT=0 at start up
>SAVEPRM (EEPROM has been written 10 times) Enter Y to proceed, other key to cancel. Y Saving Parameters.....OK.	#Save new settings
>RESET Resetting system. ---------- CM10-* Controller Module Software Version: *.** Copyright 2010 ORIENTAL MOTOR CO., LTD. ----------	#Reset to activate new settings
>CURRENT CURRENT=0 >	#CURRENT=0 after restart

TA : Acceleration Time

Execution Mode	Immediate, Sequence and CANopen
Syntax	TA=n
Range	n = 0.001 to 500.000 (seconds)
Factory Setting	0.5
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CV, EHOME, MA, MCP, MCN, MGHP, MGHN, MI, MIx, TD

Description

TA affects the initial ramp time for:

- MA (move absolute)
- MI (move incremental)
- MCP and MCN (move continuously positive and move continuously negative)
- MGHP and MGHN (move go home positive and move go home negative)
- EHOME (return to PC=0)

TA also affects the time required to change speeds, when speeds are increasing (in an absolute sense), for the following motion types:

- CV (change velocity)
- MCP and MCN (move continuously positive and move continuously positive)
- MIx (linked index)

If speeds are decreasing (toward zero), deceleration time TD determines ramp time.

Example

Command	Description
`>LIST UPANDDOWN`	#List sequence UPANDDOWN
`( 1) VS 0.1`	#Start velocity: 0.1
`( 2) VR 10`	#Run velocity: 10
`( 3) DIS 150`	#Distance: 150
`( 4) TA 1`	#Going up: long acceleration time, compared to…
`( 5) TD 0.1`	#…short deceleration time
`( 6) MI`	#Start incremental motion
`( 7) MEND`	#Wait for motion to finish
`( 8) TA 0.1`	#Going down: short acceleration time, compared to…
`( 9) TD 1`	#…long deceleration time.
`( 10) MA 0`	#Start absolute motion, back to 0
`( 11) MEND`	#Wait for motion to complete.
`>`	

TALK : Select Device

Execution Mode	Immediate
Syntax	TALKid
Range	id = *, 0 to 9 and A to Z
See Also	@, ID, \ (BACKSLASH)

Description

TALK makes a logical connection to a specific device in a multiple device, e.g. daisy chain configuration. That device can then be uniquely addressed and programmed. If the device ID is anything other than the default ID (*), communication with the device requires using the @ or TALK commands to establish communication.

No space is permitted between TALK and id.

Note

Each device used in a daisy chain communication configuration requires a unique device ID.

Example

Command	Description
`0>MGHP`	#Device 0 go home
`0>TALKA`	#Talk to Device A
`A>MGHP`	#Device A go home
`A>`	

TD : Deceleration Time

Execution Mode	Immediate, Sequence and CANopen
Syntax	TD=n
Range	n = 0.001 to 500.000 (seconds)
Factory Setting	0.5
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CV, EHOME, MA, MCP, MCN, MGHP, MGHN, MI, MIx, TA

Description

TD is the time used to decelerate the motor (decrease velocity toward zero).

TD affects the final ramp time for:

- MA (move absolute)
- MI (move incremental)
- MGHP and MGHN (move go home positive and move go home negative)
- EHOME (return to PC=0)
- SSTOP (soft stop)
- MSTOP (motor stop, if MSTOPACT=1)
- ABORT (abort motion and sequence execution)
- <ESC> (ESCAPE character: equivalent to ABORT)

TD also affects the time required to change speeds, when speeds are decreasing (in an absolute sense), for the following motion types:

- CV (change velocity)
- MCP and MCN (move continuously positive and move continuously negative)
- MIx (Linked index)

If speeds are increasing (away from zero), acceleration time TA determines ramp time.

Example

Command	Description
`>LIST UPANDDOWN`	#List sequence UPANDDOWN
`(  1) VS 0.1`	#Start velocity: 0.1
`(  2) VR 10`	#Run velocity: 10
`(  3) DIS 150`	#Distance: 150
`(  4) TA 1`	#Going up: long acceleration time, compared to…
`(  5) TD 0.1`	#…short deceleration time
`(  6) MI`	#Start incremental motion
`(  7) MEND`	#Wait for motion to finish
`(  8) TA 0.1`	#Going down: short acceleration time, compared to…
`(  9) TD 1`	#…long deceleration time.
`( 10) MA 0`	#Start absolute motion, back to 0
`( 11) MEND`	#Wait for motion to complete.
`>`	

TEACH : Teach Positions

Execution Mode	Immediate
Syntax	TEACH
Commands not Allowed	MOVE, RUN
See Also	POS[x]

Description

TEACH starts a utility process to find and store target positions into the position data array (POS[x]).

While the TEACH process runs, the motor can be moved until an intended target position is reached, and then that position value can be stored in the POS[x] array. The motor can move actively, using menu keys to move continuously or by small increments. If the encoder is used, the motor can also be externally positioned after toggling the motor current off and power to the electromagnetic brake on (if used).

The POS[x] array data can be used as the target destination for absolute motions (MA). In sequences, POS[x] can be used anywhere a variable is permitted.

For a full explanation of the TEACH utility, refer to "8.4 Teaching Positions" on page 65.

Example

Command	Description
>TEACH	#Start the TEACH process

```
        *** Teach mode ***

 (V)      : Move Cont. Neg.      (M)      : Move Cont. Pos.
 (B)      : Jog Negative         (N)      : Jog Positive
 (Q)      : Current ON/OFF       (F)      : FREE ON/OFF
 (S)      : Save all data to EEPROM
 (K)      : Change Key Interval (50-500[msec])
 (D)      : Change Jog Distance (0.001-500000 [Rev])
              Minimum Movable Distance : 0.001 [Rev]
 <Space> : Immediate Stop
 <Enter> : Data entry mode (Input POS number, then <Enter>)
 <ESC>   : Exit teach mode

 PC=          0.000
```

TIM : Select Timing Input Signal

Execution Mode	Immediate and Sequence
Syntax	TIM=n
Range	n = 0: Use the TIMDEXTZ Input Signal for Mechanical home Seeking 1: Use the TIMS Input Signal for Mechanical Home Seeking
Factory Setting	1
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	DINxxx (DINTIMDEXTZ, DINTIMS), DSIGxxx (DSIGTIMDEXTZ, DSIGTIMS), ENC, HOMETYP

Description

Select the source of the TIMING signal for mechanical home seeking.

The Z signal on an external encoder is used with TIMD. The use of the driver timing signal TIMD and the external encoder signal is selected by using the ENC parameter.

TIMING Source Selection

TIMING Source	ENC	TIM
Timing signal·Z-phase pulse differential input TIMD	1 (Driver)	0 (TIMD/EXTZ)
Timing signal·Z-phase pulse single ended input TIMS	Unrelated	1 (TIMS)
External encoder ZSG EXTZ	2 (External Encoder)	0 (TIMD/EXTZ)
No source is selected*	0 (Not Used)	0 (TIMD/EXTZ)

* If ENC is set to zero (0) and TIM is set to 0, the system alarm status will be active when executing the MGHP or MGHN command when the home seeking type uses the timing signal .

Signal Flow Path

Timing signal·Z-phase pulse differential input TIMD-------1

ENC--------0 (TIMD/EXTZ)

External encoder ZSG EXTZ-------2 **TIM**----------→TIMING signal

Timing signal·Z-phase pulse single ended input TIMS----------1 (TIMS)

Example

Command	Description
>TIM=1	#Changing the TIM
TIM=0(1)	#Device response
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 21 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>TIM	#Query the TIM setting
TIM=1(1)	#Device response
>	

TIMER : Running Timer

Execution Mode	Immediate, Sequence and CANopen
Syntax	TIMER=n
Range	n = 0.000 to 500000.000 (seconds) /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ and WRITE
See Also	ALM, WAIT

Description

TIMER is a running timer, counting seconds.

TIMER is set to zero (0.000) at system start, and counts up from that time, with millisecond resolution.

TIMER overflows at 500,000 seconds (about 5.8 days), and is restarted from zero.

TIMER can be set to any value within its range, for synchronization.

Example

Command	Description
`>LIST WATCH`	#List sequence WATCH
`( 1) T=TIMER+60`	#Set T to be 60 seconds greater than timer
`( 2) WHILE (TIMER<T)`	#While TIMER < T (true for about 1 minute)
`( 3) IF (IN2=1)`	#If input 2 is asserted
`( 4) ALMSET`	#Set an alarm
`( 5) ENDIF`	#End IF block
`( 6) WEND`	#End WHILE block
`>`	

TL : Torque Limiting/Push-motion Operation/Current Cutback Release

Execution Mode	Immediate, Sequence and CANopen
Syntax	TL=n
Range	n = 0: OFF 1: ON
Factory Setting	0
Access	READ, WRITE
See Also	DD, DOUTxxx (DOUTTL, DOUTM0, DOUTM1, DOUTM2, DOUTCS), INxxx (INTL), DINxxx (DINLC), OUTxxx (OUTLC), SIGxxx (SIGTL, SIGLC), DSIGxxx (DSIGTL, DSIGLC, DSIGM0, DSIGM1, DSIGM2)

Description

・When using a driver that has a torque limiting function (**NX** Series driver etc.), the torque will be limited according to the DD setting while the parameter is set to 1.

・When using a driver that has a push-motion operation function (**AR** Series driver etc.), the push-motion operation will be performed at the current according to the DD setting while the parameter is set to 1.

・When using a driver that has a current cutback release function (**CRK**/**CMK** Series driver etc.), the current cutback will be released while the parameter is set to 1.

(While the parameters are set to 1 in each case, the TL output assigned to the driver connector on the **CM10**/**SCX10** will turn ON.)

This command is effective under the following conditions (the command and driver combination).

Torque limiting: The driver needs to have the TL input.

Push-motion operation: The driver needs to have the T-MODE input.

Current cutback release: The driver needs to have the current cut back release input.

Also, it is required to assign the each following signals to the driver connector on the **CM10**/**SCX10**.
・Torque limiting: TL, M0, M1
・Push-motion operation: TL, M0, M1, M2 (Connect TL to the T-MODE terminal of the driver)
・Current cutback release: TL (Connect TL to the current cutback release signal input of the driver)

The TL function may also be executed via the TL input on the I/O connector and/or the CANopen remote I/O if assigned. When detailed explanation is required, see "6.4 Connecting the I/O signals" on page 25 for I/O connector, and see "10.4 Controlling I/O Message (PDO)" on page 105 for CANopen remote I/O.

When the LC input is assigned to the driver connector on the **CM10**/**SCX10** and the LC output is assigned to the I/O connector, the LC output will be turned ON when torque reaches to preset value/becomes push-motion condition (position error is 1.8 degree or more). (DSIGLC command provides the same function.)

Caution

With the AR Series driver, the CS input and T-MODE input are assigned to the same pin. The factory setting is the CS input. Change the driver setting to the T-MODE input from the CS input before performing push-motion operation.

Example

Command	Description
`Torque Limiting/Push-motion Operation`	
`>DD=1`	Assign data 1 (M0 is set to ON, M1 M2 to OFF)
`>TL=1`	Torque limiting operation or push-motion operation is enabled
`>TL=0`	Release
`Current Cutback Release`	
`>TL=1`	Execute the current cutback release
`>TL=0`	Release

TRACE : Sequence Trace Control

Execution Mode	Immediate
Syntax	TRACE=n
Range	n = 0: Trace is disabled. 1: Trace is enabled.
Factory Setting	0
Access	READ, WRITE
See Also	RUN, ABORT, LIST

Description

TRACE enables or disables tracing of sequence statements.

When sequence tracing is enabled (TRACE=1), sequence statements are displayed as they are executed, one statement at time, surrounded by "curly braces" { and }.

Release the function by holding the escape key <ESC> down.

Note

Enabling sequence tracing alters sequence timing, because of the time required to transmit the trace information. Sequences execute slower when TRACE=1.

Example

Command	Description
`>LIST TOGGLEATVR`	#List sequence TOGGLEATVR
`(  1) LOOP 3`	#List output…
`(  2)   MI`	
`(  3)   WHILE (VC!=VR); WEND`	
`(  4)   OUT4=1-OUT4`	
`(  5)   MEND`	
`(  6) ENDL`	
`>TRACE 1`	#Enable tracing
`>RUN TOGGLEATVR`	#Run sequence TOGGLEATVR
`>{ LOOP 3 }`	#First executing statement, surrounded by { }
`{ MI }`	#Next statement
`{ WHILE (VC!=VR) }`	#Next statement: note NOT the entire line
`{ WEND }`	#End WHILE block…
`{ WHILE (VC!=VR) }`	#…back to WHILE statement
`{ OUT4=1-OUT4 }`	#WHILE test failed, proceed beyond WEND
`{ MEND }`	#Wait for motion end
`{ ENDL }`	#End LOOP block, back to top-of-loop
`{ MI }`	#Actual to-of-loop is first statement within loop
`{ WHILE (VC!=VR) }`	#Repeat…
`{ WEND }`	
`{ WHILE (VC!=VR) }`	
`{ OUT4=1-OUT4 }`	
`{ MEND }`	
`{ ENDL }`	
`{ MI }`	
`{ WHILE (VC!=VR) }`	
`{ WEND }`	
`{ WHILE (VC!=VR) }`	
`{ OUT4=1-OUT4 }`	
`{ MEND }`	
`{ ENDL }`	#Loop count exhausted, sequence is finished

UNLOCK : Unlock Sequence

Execution Mode	Immediate
Syntax	UNLOCK target
Range	Target can be the name or number of any existing sequence.
Commands not Allowed	RUN
See Also	DIR, EDIT, LOCK

Description

UNLOCK unlocks a sequence that has been previously locked with the LOCK command.

A locked sequence cannot be deleted, renamed, or overwritten (by COPY or EDIT).

The sequence directory listing (DIR command) shows the lock status for all sequences.

Example

Command	Description
`>DEL REGISTER`	#Delete sequence REGISTER
`Error: Sequence is locked.`	#Can't: sequence is locked
`>UNLOCK REGISTER`	#Unlock sequence REGISTER
`>DEL REGISTER`	#Delete sequence REGISTER
`Enter Y to proceed, other key to cancel. Y`	#OK now. Confirm
`>`	

USBBAUD : USB BAUD Rate

Execution Mode	Immediate and Sequence
Syntax	USBBAUD= n
Range	n = 0: 9600 (bps) 1: 19200 2: 38400 3: 57600 4: 115200
Factory Setting	0
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE READ only in Sequences
See Also	@, ECHO, ID, TALK, VERBOSE, BAUD
Description	Establishes the USB Communication BAUD Rate for the device
Note	The USB on the **CM10**/**SCX10** talks to the virtual COM port on the computer. The default USB baud rate of the **CM10**/**SCX10** is 9600 bps, same as the default baud rate of a general Windows computer. If the baud rate on the computer or the **CM10**/**SCX10** is changed, the baud rate must also be changed on the other. (Always set the **CM10**/**SCX10** baud rate first, then set the baud rate of the computer.) Check the baud rate of the computer application that is used to communicate with the **CM10**/**SCX10**, or check the COM port property of Windows if the application does not have a baud rate function. (The supplied utility software, **IMC** is set to 9600 bps when it is installed and no change is required for initial connection to the **CM10**/**SCX10**.)

Example

Command	Description
`>USBBAUD 1` ` USBBAUD=0(1) [9600bps(19200bps)]`	#Set the baud rate to 19200 bits per second (bps)

`>SAVEPRM`
` (EEPROM has been written 21 times)`
` Enter Y to proceed, other key to cancel. y`
` Saving Parameters........OK.`
	#Save the parameter assignments

`>RESET`
` Resetting system.`
`----------`
`CM10-*`
`Controller Module`
`Software Version: *.**`
`Copyright 2010`
`ORIENTAL MOTOR CO., LTD.`
`----------`
	#Reset the system to establish the new baud value
	#NOTE: change baud rate of host system before proceeding!

`>USBBAUD` ` UABBAUD=1(1) [19200bps(19200bps)]`	#Query the baud rate #Baud is set as 19200

UU : User Units

Execution Mode	Immediate
Syntax	UU=User Unit Name
Range	User Unit Name = ASCII Characters, 20 Characters Maximum, Except ";" and "@"
Factory Setting	Rev: **CM10-1**, **2**, **4**, **5**, **SCX10** mm: **CM10-3**
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	DPR, MR

Description

UU defines the units displayed with position- and velocity- related parameters, when the system is responding verbosely (VERBOSE=1). Setting UU with DPR (travel distance per one motor revolution) and MR (motor resolution), the position and velocity can be set in units such as mm, inch or degree, which users actually use. Position-related values are displayed in terms of user units; velocity-related values are displayed in terms of user units per second.

When VERBOSE=0, only values are displayed: the UU unit information is suppressed.

Changing UU has no affect on actual motion.

Setting UU to 0 (digit zero) causes null and the user unit text is cleared.

Example

Command	Description
>UU	#Check user unit text
UU=Rev	#Still default, 'Rev'
>VR	#Check running velocity
VR=1 Rev/sec	#Velocity shown in Rev/sec
>UU mm	#Set user unit text to mm (millimeters)
UU=mm	
>VR 10	#Set the running velocity to 10 mm/second
VR=10 mm/sec	
>VS 1	#Set the starting velocity to 1 mm/second
VS=1 mm/sec	
>DIS 100	#Set the distance value to 100 mm
DIS=100 mm	
>MI	#Start incremental motion
>	

VC : Velocity Command

Execution Mode	Immediate, Sequence and CANopen
Syntax	VC
Range	-MAXVEL to +MAXVEL /: real time monitor (immediate mode only) (In sequences, the maximum value is further limited by "Max. Number".)
Access	READ
See Also	VR, VS

Description

VC is the instantaneous velocity command, or set-point.

The sign reflects the motion direction.

VC reflects the velocity that the system is supposed to be running at. The actual shaft velocity may vary from VC.

Example

```
(  1) DIS=1000;VS=0;VR=70;TA=10;TD=10
(  2) MI
(  3) WHILE (PC!=DIS)                  #When the PC is not DIS
(  4)   A=0
(  5)   IF (VC>=17.5)                  #When the VC is 17.5 or more
(  6)     A=1
(  7)   ENDIF
(  8)   IF (VC>=35)                    #When the VC is 35 or more
(  9)     A=3
( 10)   ENDIF
( 11)   IF (VC>=52.5)                  #When the VC is 52.5 or more
( 12)     A=7
( 13)   ENDIF
( 14)   IF (VC==VR)                    #When the VC is VR
( 15)     A=15
( 16)   ENDIF
( 17)   OUT=A
( 18) WEND
```

VER : Display Firmware Version

Execution Mode	Immediate
Syntax	VER
Description	VER displays the system's firmware version information.

Example

Command	Description
>VER	#Display the firmware version
CM10-1 / 2.02 / Sep 6 2011	#Typical response (product name / firm ware version number / firm ware)
>	

VERBOSE : Command Response Control

Execution Mode	Immediate
Syntax	VERBOSE=n
Range	n = 0: Respond with Data only 1: Respond with Data and Descriptive Text
Factory Setting	1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	ECHO

Description

VERBOSE controls the amount of information that the system transmits in response to commands.

・When VERBOSE=1 (the default), extra information is transmitted to establish the context of the response. VERBOSE=1 is preferred for human communications.

・When VERBOSE=0, the extra information is suppressed. Fewer characters are transmitted, reducing the amount of time required to communicate, and reducing the amount of data to be interpreted. VERBOSE=0 is preferred if an intelligent host machine will be automatically controlling the system via the serial port.

Example

Command	Description
>VERBOSE	#Check VERBOSE setting
VERBOSE=1	#VERBOSE=1: extra text
>PC	#Check position set point
PC=1.5 Rev	#Response includes "PC=," value, and user units ("rev")
>VR	#Check running velocity
VR=1 Rev/sec	#Response includes "VR=," value, and "rev/sec"
>ALMMSG	#Check ALMMSG setting
ALMMSG=2 [Alarm+Warning]	#Response includes "ALMMSG=," value, and explanation
>VERBOSE 0	#Set VERBOSE=0 (suppress extra text)
0	#Immediately effective. Only new value returned
>PC	#Check position set point
1.5	#Only value returned
>VR	#Check running velocity
1	#Only value returned
>ALMMSG	#Check ALMMSG
2	#Only value returned
>	

VIEW : View Parameter

Execution Mode	Sequence
Syntax	VIEW element
Range	'element' can be the name of any parameter or variable available in sequences.
See Also	KB, KBQ, SACS, SAS, VERBOSE

Description

VIEW transmits the value of a parameter or variable without any extra characters.

When a value is transmitted in response to a simple query (using just the parameter or variable name), the system transmits the numeric value, followed by a carriage return, a linefeed, and a new prompt. The VIEW command only transmits the numeric value, permitting tighter control of the response.

Memo

In a daisy chain configuration (ID other than *), all output from sequence commands is suppressed unless the device has been previously addressed (via TALK or @). The KB and KBQ commands will not receive input unless the device has been previously addressed.

Example

Command	Description
`>LIST SAYPOS`	#List sequence SAYPOS
`(  1) SAS POSITION:`	#Send ASCII string "POSITION:," + CR + LF + prompt
`(  2) PF`	#Display value of actual position, + CR + LF + prompt
`(  3) SACS POSITION:`	#Send ASCII string "POSITION:" with trailing space
`(  4) VIEW PF`	#Display value of actual position: no extra text
`>RUN SAYPOS`	#Run sequence SAYPOS
`>POSITION:`	#SAS: results in new line, new prompt
`>14.655`	#First PF: results in new line, new prompt
`>POSITION: 14.655`	#SACS output, VIEW output: no new line, no new prompt

VR : Running Velocity

Execution Mode	Immediate, Sequence and CANopen
Syntax	VR=n
Range	n = 0.001 to MAXVEL (user units/second) (In sequences, the maximum value is further limited by "Max. Number".)
Factory Setting	1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	CV, EHOME, MA, MCP, MCN, MGHP, MGHN, MI, MAXVEL, VS, TA, TD

Description

VR is the running velocity for motions. VR specifies the peak target speed for the motion, in user units per second.

VR is always positive. The rotation direction is set by the travel distance (DIS) for incremental motion, and it is set by the position relation between the starting position and target position (MA) for absolute motion. For continuous operation and return-to-mechanical home operation, set the rotation by the individual motion commands (MCP, MCN, MGHN, MGHP)

Memo

The change velocity (CV) command overwrites VR with the value designated in the CV command.

The minimum output frequency on the **CM10/SCX10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

Example

Command	Description
>VR	#Check running velocity
VR=5 Rev/sec	
>EHOME	#Return to position 0 (PC=0)
>VC	#Check velocity set-point VC
VC=5 Rev/sec	#VC has reached VR, acceleration finished
>CV 7.5	#Change motion speed to 7.5
>VC	#Check velocity set-point VC
VC=7.5 Rev/sec	#VC has reached new speed target 7.5
>VR	#Check running velocity
VR=7.5 Rev/sec	#VR now 7.5, overwritten by CV command
>	

VRx : Running Velocity of Link Segment 'x'

Execution Mode	Immediate, Sequence and CANopen
Syntax	VRx=n (x is a number of linked segments: x=0 to 3.)
Range	n = 0.001 to MAXVEL (user units/second) (In sequences, the maximum value is further limited by "Max. Number".)
Factory Setting	1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INCABSx, MIx, LINKx, MAXVEL

Description

VRx is the running velocity for linked motion segment 'x'. VRx specifies the peak target speed for the segment, in user units per second.

VRx is always positive: the direction for the motion segment is determined by DISx (travel distance/target position) parameter.

Memo

The minimum output frequency on the **CM10/SCX10** is 1 Hz. If the running velocity in a user unit is set equivalent to less than 1 Hz, the actual pulse output frequency becomes 1 Hz.

Example

Command	Description
>VR1 5	#Set the velocity for linked motion segment 1 to 5 user units/second
VR1=5 in./sec	
>DIS1 10	#Set the distance for linked motion segment 1 to 10 user units
DIS1=10 in.	
>INCABS1 1	#Set the move type for linked motion segment 1 to incremental
INCABS1=1 [INC]	
>LINK1 1	#Enable the linked between segments 1 and 2
LINK1=1	
>VR2 10	#Linked motion segment 2 velocity equals 10 user units/second
VR2=10 in./sec	
>DIS2 20	#Linked motion segment 2 distance equals 20 user units
DIS2=20 in.	
>INCABS2 0	#Set the move type for linked motion segment 2 to absolute
INCABS2=0 [ABS]	
>LINK2 0	#Unlink segment 2 from segment 3
LINK2=0	
>MI1	#Start the linked motion, with segment 1

VS : Starting Velocity

Execution Mode	Immediate, Sequence and CANopen
Syntax	VS=n
Range	n = 0 to MAXVEL (user units/second) * Although a value of "0" can be set, the minimum value of VS is limited to 1Hz at pulse output. If a user unit value equivalent to less than 1Hz is entered, the VS is internally set to 1Hz. This is to avoid a "zero speed" or "no motion" condition when seeking the mechanical home position because VS = 0. (In sequences, the maximum value is further limited by "Max. Number.")
Factory Setting	0.1
SAVEPRM	The new value takes effect immediately. However, SAVEPRM is required to save the parameter values in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	EHOME, MA, MCP, MCN, MGHP, MGHN, MI, MIx, MAXVEL, VR, TA, TD, VRx

Description

VS is the starting velocity for all motion types.

All motions start with velocity VS and then accelerate to VR over acceleration time TA. All motions decelerate from VR to VS over deceleration time, TD, then stop.

When a motion is started, speed changes between zero (0) speed and VS instantaneously. (Note that this is a velocity command, and not actual motor velocity: the motor cannot physically change speeds instantaneously). The sudden change in speed may or may not be desirable. In applications with high static friction, VS may help the system start or finish motions better. VS might also be used to avoid any very low resonant speed.

VS is also used as the running velocity for MGHP and MGHN with HOMETYP=0-3, and used as the velocity for final HOME input detection with HOMETYP=0-11 value. See "8.2.5 Mechanical Home Seeking" on page 55 for more information on home operations.

Example

Command	Description
>LIST FINDHOME	#List sequence FINDHOME
(1) VS 0.25	#For Home operation: set low starting velocity
(2) VR 4	#Set running velocity
(3) MGHP	#Start seeking home: positive direction first
(4) MEND	#Wait for homing operation to complete
(5) VS 0	#Set start velocity to 0 for normal operation
(6) VR 10	#Set running velocity to 10 for normal operation
>	

WAIT : Wait for Specified Time

Execution Mode	Sequence
Syntax	WAIT n
Range	n = 0.0 to 500000.0 (seconds)
See Also	KB, KBQ, TIMER, MEND
Description	WAIT causes sequence execution to wait for the indicated time, before proceeding to the next statement.

Example

Command	Description
`>LIST TENTIMES`	#List sequence TENTIMES
`(  1) MA 0`	#Start absolute motion, to position 0
`(  2) MEND`	#Wait for motion to finish
`(  3) OUT4 1`	#Turn output 4 on
`(  4) WAIT 3.0`	#Wait 3 seconds before proceeding
`(  5) OUT4 0`	#Turn output 4 off
`(  6) LOOP 10`	#Loop: execute contents 10 times
`(  7)   DIS 0.1`	#Start incremental motion (distance DIS)
`(  8)   MI`	
`(  9)   MEND`	#Wait for motion to finish
`( 10)   OUT4 1`	#Turn output 4 on
`( 11)   WAIT Q`	#Wait before proceeding, wait time in variable Q
`( 12)   OUT4 0`	#Turn output 4 off
`( 13) ENDL`	#End of LOOP block
`>Q 0.5`	
` Q=0.5`	
`>RUN TENTIMES`	

WEND : End of WHILE Block

Execution Mode	Sequence
Syntax	WEND
See Also	ENDIF, ENDL, IF, LOOP, WHILE, BREAKW

Description

WEND terminates the innermost WHILE block in a sequence.

Processing returns to the WHILE which started the block, for re-evaluation. If the WHILE condition fails, processing continues with the statement following the WEND statement.

Example

```
>CREATEVAR N_COUNTS=0                    #Create user-defined numeric variable named
 New variable N_COUNTS is added.         N_COUNTS
 N_COUNTS=0
>CREATEVAR N_TOTAL=10                    #Create user-defined numeric variable named N_TOTAL
 New variable N_TOTAL is added.
 N_TOTAL=10
>LIST MAIN                               #List sequence MAIN

(  1) OUT=4
(  2) WHILE (N_COUNTS < N_TOTAL)         #N_COUNTS, N_TOTAL user-defined variables
(  3)   MI; MEND                         #Start incremental motion; wait until complete
(  4)   OUT4 = 1                         #Set output 4 on
(  5)   WHILE (IN6=0); WEND              #Wait for input 6 to go off
(  6)   OUT4 = 0                         #Set output 4 off
(  7)   WHILE (IN6=1); WEND              #Wait for input 6 to go on
(  8)   N_COUNTS=N_COUNTS+1              #Increment N_COUNTS by 1
(  9) WEND                               #End of WHILE block
>
```

WHILE : Begin WHILE Block

Execution Mode	Sequence
Syntax	WHILE (Conditional Expression) Conditional Expression: element1 {Conditional Operator} element2
Range	Conditional Expression
See Also	WEND, BREAKW, IF, LOOP

Description

WHILE begins a conditional iterative block.

Statements between the opening WHILE statement and the closing WEND statement execute while the conditional expression is true. If it evaluates to FALSE, sequence processing proceeds to the statement following the closing WEND statement. The conditional expression is evaluated at the beginning of the block only, once per iteration, and it is not tested during execution of the enclosed block statements.

Parentheses are required.

element1 and element2 may be any numeric variable available to sequences, or any numeric constant within the range -(Maximum Number) to +(Maximum Number).

Valid conditional operators are:
- =, == : Equal to
- != : Not equal to
- < : Less than
- <= : Less than or equal to
- > : Greater than
- >= : Greater than or equal to

WHILE statements must be followed (at some point) by a corresponding WEND statement.

When executed, the conditional expression is evaluated. If it evaluates to TRUE, sequence processing proceeds to the statement following the WHILE.

Block structures (IF-ENDIF, WHILE-WEND, LOOP-ENDL) may be nested, to eight (8) levels deep (nest).

Example

Command	Description

`>CREATEVAR N_COUNTS=0`
` New variable N_COUNTS is added.`
` N_COUNTS=0`
	#Create user-defined numeric variable named N_COUNTS

`>CREATEVAR N_TOTAL=10`
` New variable N_TOTAL is added.`
` N_TOTAL=10`
	#Create user-defined numeric variable named N_TOTAL

`>LIST MAIN`	#List sequence MAIN
`( 1) OUT=4`	
`( 2) WHILE (N_COUNTS < N_TOTAL)`	#N_COUNTS, N_TOTAL user-defined variables
`( 3) MI; MEND`	#Start incremental motion; wait until complete
`( 4) OUT4 = 1`	#Set output 4 on
`( 5) WHILE (IN6=0); WEND`	#Wait for input 6 to go off
`( 6) OUT4 = 0`	#Set output 4 off
`( 7) WHILE (IN6=1); WEND`	#Wait for input 6 to go on
`( 8) N_COUNTS=N_COUNTS+1`	#Increment N_COUNTS by 1
`( 9) WEND`	#End of WHILE block
`>`	

xxxLV : System Input Level/System Output Level

Execution Mode	Immediate
Syntax	xxxLV=n ("xxx" signal input/output assignment)
Range	< Except: EXTZLV, TIMDLV> n = 0: Normally Open 1: Normally Closed <EXTZLV, TIMDLV> n = 0: Positive Logic 1: Negative Logic
Factory Setting	< Except: TIMDLV> 0 <TIMDLV> 0: **CM10-4** 1: **CM10-1**, **2**, **3**, **5**, **SCX10** Set to 0 (zero) when the **CM10-1** is combined with the **AR** Series driver DC power input type.
SAVEPRM & RESET	Required to execute any changes made to the parameter value and to save in nonvolatile memory. Otherwise, the parameter value is reset to the last saved value at device power up. If no new parameter value was saved, then the value is set to the factory setting.
Access	READ and WRITE
See Also	INxxx (Except: INx, EXTZ, TIMD)/OUTxxx, SIGxxx (Except: INx, EXTZ, TIMD), INITDIO, IO, IN/OUT, INSG/OUTSG, INx/OUTx, OUTTEST, and "See Also" column in the chart below.

Description

Sets the active level of the system "xxx" input/output signal on the I/O connector and driver connector, if used.

If input x has been assigned to a system input signal, then INxLV has no affect: the active level assigned to the signal is used.

<Input>

Command	Signal	Description	See Also
ABORTLV	ABORT	Abort Motion and Sequence Execution	ABORT, <ESC>, ALMACT, HSTOP, MSTOP, MSTOPACT, PSTOP, STARTACT, SSTOP
ALMCLRLV	ALMCLR	Alarm Clear	ALMCLR, ALM, ALARMLV, ALMACT, ALMMSG, ALMSET, OUTALARM
CONLV	CON	Current ON	CURRENT
CONTLV	CONT	Continue Motion	PAUSE, PAUSECL
EXTZLV	EXTZ	External Encoder ZSG	DINTIMDEXTZ, DINTIMS, DSIGTIMDEXTZ, ENC, HOMETYP, TIM
FREELV	FREE	Current OFF, Magnetic Brake Free	FREE
HOMELV	HOME	Home Sensor	HOMETYP, MGHP, MGHN
MCPLV/MCNLV	MCP/MCN	Move Continuously Positive /Move Continuously Negative	MCP/MCN
MGHPLV/MGHNLV	MGHP/MGHN	Move Go Home Positive /Move Go Home Negative	MGHP/MGHN
MSTOPLV	MSTOP	Motor Stop	MSTOP, MSTOPACT
OTLV	LSP/LSN	Limit Switch Positive /Limit Switch Negative	-
PAUSECLLV	PAUSECL	Pause Clear	PAUSECLR
PAUSELV	PAUSE	Pause Motion	PAUSE
PECLRLV	PECLR	Position Error Clear	PECLR, EC, PC, PE, PF, RINPECLR
PSTOPLV	PSTOP	Panic Stop	PSTOP
SENSORLV	SENSOR	Sensor	SENSORACT, RINSENSOR
STARTLV	START	Start Sequence	STARTACT
TIMDLV	TIMD	Timing Signal·Z-phase Pulse Differential Input	DINTIMDEXTZ, DINTIMS, DSIGTIMDEXTZ, ENC, HOMETYP, TIM

Command	Signal	Description	See Also
TLLV	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL

<General Input>

Command	Signal	Description	See Also
INxLV (x=1 to 9)	INx	Individual General Input Status	-

<Output>

Command	Signal	Description	See Also
ALARMLV	ALARM	Alarm	ALARM, ALM, ALMCLR
ENDLV	END	Motion End	END
HOMEPLV	HOMEP	Home Position	HOMETYP, MGHP, MGHN
LCLV	LC	Limiting Condition	LC
MOVELV	MOVE	Motor Moving	-
PSTSLV	PSTS	Pause Status	-
READYLV	READY	Operation Ready	-
RUNLV	RUN	Sequence Running	-

Example

Command	Description
>ABORTLV 1	#Set the ABORT input logic to the Normally Closed logic level
ABORTLV=0(1)	
>SAVEPRM	#Save the parameter assignments
(EEPROM has been written 10 times)	#Device response
Enter Y to proceed, other key to cancel. y	
Saving Parameters.....OK.	
>RESET	#Establish the saved parameter values
Resetting system.	

CM10-*	
Controller Module	
Software Version: *.**	
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>ABORTLV	#Confirm ABORT input logic level
ABORTLV=1(1)	
>	

13 Troubleshooting

This chapter explains the system's protective functions and procedures for troubleshooting alarm conditions.

13.1 Protective Functions and Troubleshooting

This section covers the system's protective functions and methods used to recover from alarm conditions.

- Most alarm conditions cause motion and sequence processing to stop, and some of them cause the system to disable motor current and lose holding torque. The system should be used in a way that prevents personal injury or damage to equipment if an alarm condition occurs.
- When an alarm occurs, determine and correct the cause of the alarm before attempting to restore normal operation. Some alarms can be cleared with the ALMCLR command; others require resetting the system or cycling input power. (A few alarms indicate serious system malfunction, and cannot be cleared.) The cause of the alarm should always be corrected before attempting to clear the system alarm state.

■ Types of Protective Functions and Check Methods

⚠ Warning

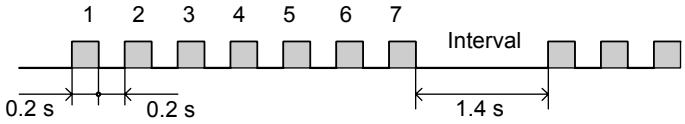
The device has protective functions to protect the user application and the device itself.
When a protective function is triggered, the ALARM LED on the device blinks and the ALARM output, if configured, is set to its active state.
Depending on the type of protective function, current to the motor may be disabled, resulting in a loss of holding torque.

- How to Check the Protective Functions

The type of protective function that has been activated can be checked using the following two methods:

1) Count how many times the ALARM LED blinks on the front side of the device.
An example of the ALARM LED's blinking cycle is shown in the figure below.

Example: Hardware over travel



2) Check the alarm code using the ALM command.

- Clearing Alarm Conditions

Before clearing alarm conditions, always correct the cause of the alarm.
To clear an alarm condition, perform one of the following:

- Enter an ALMCLR command, for alarm conditions that ALMCLR can clear (refer to table above).
- Enter a RESET command (see the RESET entry on page 288 in "12 Command Reference" for details of a system reset).
- Turn off the power, wait for a few seconds after the ALARM LED is turned off, then turn the power back on.

Note If an alarm occurs when the motor is running, clear the alarm condition after the deceleration time (TD) that is set. The motor may restart if the alarm condition is cleared within the deceleration time.

13.2 Types of Protective Functions (Alarms)

Phenomenon	Alarm Code	ALARM LED Blinks	ALMCLR Effect	Protective Function	Description	Action
Motion and sequence execution stop	32h	1	Clears alarm	Out of position range	The PABS value exceeded the coordinate control range (-2,147,483.648 to +2,147,483.647).	Check that PABS is in the range.
	90h			Stack overflow	Sequence memory "stack" exhausted	Restructure sequences to reduce the number of nested blocks or subroutine calls
	94h			Sequence reference error	Attempt to call a non-existing sequence as a subroutine	Revise the CALL statement or rename the intended target sequence
	98h			Calculation overflow	Sequence calculation result exceeded numerical limits	Check math operators, make sure they cannot overflow
	99h			Parameter range error	Attempt to set a parameter to a value outside its range	Make sure all assignments stay within defined limits
	9Ah			Zero division	Attempt to divide by zero	Check division operations, test divisor for zero before division
	9Dh			PC command execution error	Attempt to modify position counter PC while a motion was in process	Make sure that PC is only changed when motor is stopped
	9Eh			User variable reference error	Attempt to access a non-existing user-defined variable	Make sure the target user-defined variable exists: use the correct name in sequence
	9Fh			Parameter write error	Attempt to change a parameter under invalid condition	Check if you tried to write a parameter, which is not allowed to write to, during operation.
	A0h			Motion while in motion	Attempt to execute a motion while an incompatible motion is in progress	Make sure motions are not started before a previous motion is complete. Use MEND, poll SIGMOVE, or monitor the MOVE output to detect motion complete.
	E0h			User alarm	ALMSET command intentionally executed	If a user alarm was not expected, check sequence programming for inappropriate ALMSET command(s)
	10h	4		Excessive Position Deviation	When performing the MEND command or mechanical home seeking operation, the END signal was not output in the time set by ENDWAIT.	If "DEND=0," check whether the overload was occurred or ENDACT (END range) was too small. If "DEND=1," check whether the driver END signal is connected, the overload was occurred or the END signal range of the driver was too small.

Phenomenon	Alarm Code	ALARM LED Blinks	ALMCLR Effect	Protective Function	Description	Action
Motion and sequence execution stop	60h	7	Clears alarm	LS logic error	Positive and negative position limit signals on simultaneously	- Check limit sensors and wiring. - Check input signal configuration. - Check the logic setting for limit sensors (OTLV): Normally open (N.O.) or Normally closed (N.C.).
	61h			LS connected in reverse	Positive or negative position limit signal detected opposite home seeking direction	
	62h			HOME operation failed	Unstable or unexpected position limit signal detected while seeking home position	
	63h			HOMELS not found	No HOME input detected between position limit signals while seeking home position	Check HOME sensor wiring and connections
	64h			TIM, SENSOR signal error	TIM position or SENSOR input expected with HOME input: not found	Selected mechanical home seeking operation (see HOMETYP) requires a valid SENSOR input and/or a valid TIM position while HOME input active. Make sure HOME and other required input(s) can be active at the same location.
	6Ah			LS detected during home offset motion	Positive or negative position limit signal detected while moving to OFFSET position after homing	Make sure that the OFFSET distance, measured from the HOME signal position, does not trigger a limit sensor
	6Eh			Driver alarm	Driver alarm signal is active	Check the driver and see the operating manual of the driver.
	6Fh			Driver connection error	The command was canceled due to no response from the driver during executing the command or before executing the command	Be sure to check if driver and the **CM10/SCX10** are connected securely.
	70h			Motion parameter error	Attempt to execute motion with incompatible motion parameters	- Make sure current is enabled (CURRENT=1). - Home seeking: make sure required inputs are configured. - Linked indexing: make sure all linked segments execute in the same direction.

Phenomenon	Alarm Code	ALARM LED Blinks	ALMCLR Effect	Protective Function	Description	Action
Motion and sequence execution stop. Motor may or may not have holding torque, depending on ALMACT.	68h	6	Clears alarm	Panic stop	System executed a panic stop because of a PSTOP input or command	If a panic stop was unexpected: - Check PSTOP input configuration. - Check sequence programming for inappropriate PSTOP command(s).
	66h	7		Hardware over travel	Positive or negative position limit signal detected	- Check motion parameters. - Make sure home position is correct. - Check limit sensors and wiring. - Check input signal configuration. - Check the logic setting for limit sensors (OTLV): Normally open (N.O.) or Normally closed (N.C.).
	67h			Software over travel	Position outside of programmed positive and negative position limits	- Check motion parameters. - Check software position limits. - Make sure home position is correct.
The motor lacks holding torque.	41h	9	No effect	EEPROM error	User data in non-volatile EEPROM memory is corrupt	Contact Oriental Motor to arrange for inspection or repair.
	F0h	ON		System error	System detected unexpected internal logic state	
	F1h			Memory error	Internal memory access error	
	F2h			Sequence internal error	Sequence code invalid or corrupt	

14 Inspection

It is recommended that periodic inspections be conducted after each operation of the device.
If an abnormal condition is noted, discontinue any use and contact your nearest office.

■ During Inspection

- Are any of the device mounting screws loose?
- Is there any peeling of the tape fastener located between the device and the driver?
- Are there any strange smells or appearances in the device?

Note The device uses semiconductor elements, so be extremely careful when handling it. Static electricity may damage the device.

15 Specifications

Operation Mode		Immediate/Stored program
Programs	Number of Programs	100
	Size	Total sequences: 6 kB (compiled) 21 kB (text + compiled) 1 sequence: 6 kB (text) 2 kB (compiled)
	Programming Method	**Immediate Motion Creator for CM/SCX Series** (supplied software) or General terminal software
	Function Example	Subroutines, Math/Logical/Conditional operators, User variables
Control	Number of Control Axis	Single axis
	Control Modes	Incremental motion Absolute motion Move continuously JOG motion Mechanical home seeking operation Link motion (incremental motion･absolute motion･move continuously)
	Starting Velocity	0 to 1.24 MHz (1 Hz increments)
	Speed Range	1 Hz to 1.24 MHz (1 Hz increments)
	Acceleration and Deceleration Time	0.001 to 500 sec (0.001 sec increments)
	Position Range	-2,147,483,648 to +2,147,483,647 pulses
	Mode for Mechanical Home Seeking	3 sensor mode, 2 sensor mode, 1 sensor mode (+LS, -LS, HOME, SENSOR, TIM)
	Features	User unit, Teaching positions, Multi axis operation, Driver deviation counter, Protective functions
Driver Interface	Pulse Output	1 pulse /2 pulse mode Line driver output (line receiver input/photo-coupler input compatible)
	I/O	Snap-on connection
External Encoder Input		A-phase, B-phase, Index Z-phase/Timing signal Max. frequency 1 MHz Differential (AM26LV32 or equivalent) Line-driver, pen collector and TTL compatible Built-in 5 VDC power supply
I/O	Input	9 signals (configurable) Photo-coupler inputs Input voltage 4.25-26.4 V Input resistance 5.4 kΩ
	Output	4 signals (configurable) Photo-coupler open-collector outputs 30 VDC 20 mA or less
Serial Communication	USB	USB2.0 compatible (virtual COM port) USB mini-B terminal 9600, 19200, 38400, 57600, 115200 bps (9600 bps is factory setting.)
	RS-232C	Start-stop synchronous method, NRZ (non-return zero), full-duplex 8 bits, 1 stop bit, no parity 9600, 19200, 38400, 57600, 115200 bps (9600 bps is factory setting.) Daisy chain compatible (up to 36 axis)
	CANopen	CiA 301 Ver4.02 compliant 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps Certified by CiA (CiA201208-301V402/20-0155)
Power Input	Voltage	24 VDC ± 10%
	Current	0.13 A (**CM10-1**, **2**, **5**), 0.15 A (**CM10-4**), 0.16 A (**CM10-3**)
Mass		0.24 kg (0.53lb)

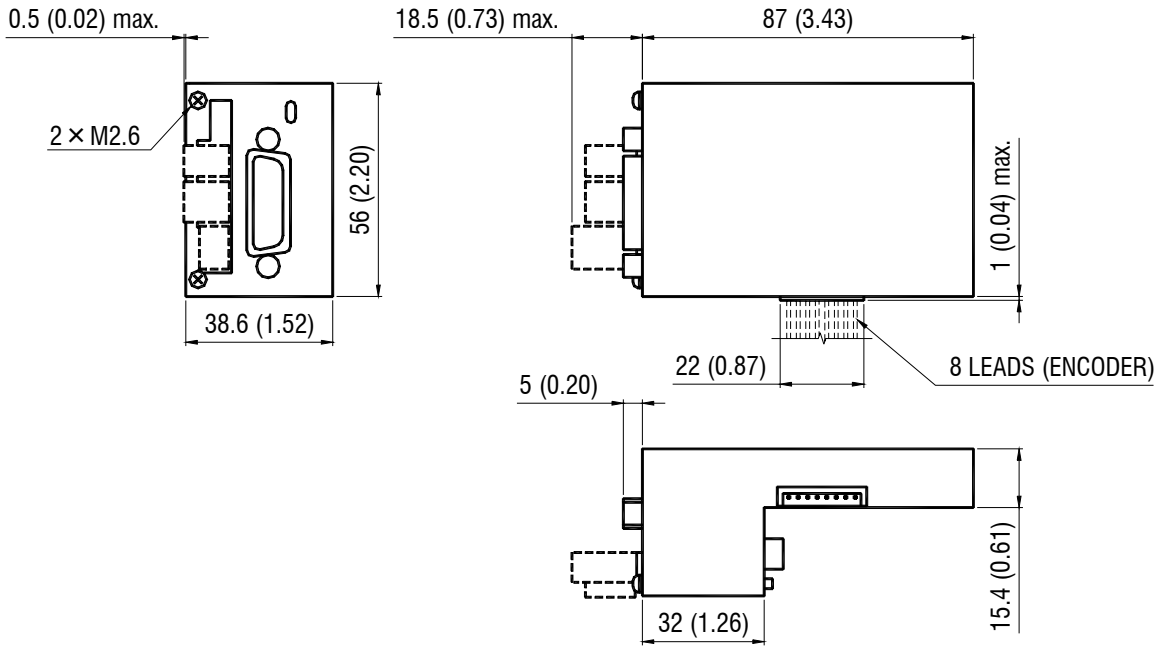
■ General Specification

Operation Environment	Degree of protection	IP20
	Ambient temperature	0 to +50 °C (+32 to +122 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage Environment	Ambient temperature	−25 to +70 °C (−13 to +158 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Shipping Environment	Ambient temperature	−25 to +70 °C (−13 to +158 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil

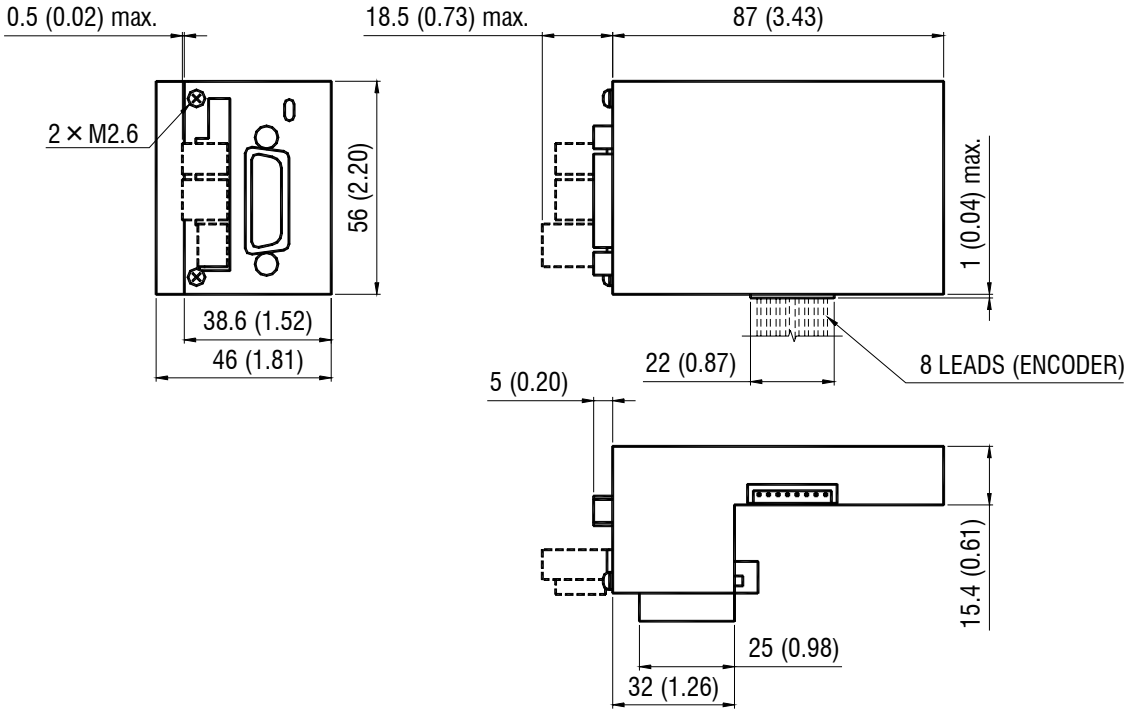
■ Dimensions

unit: mm (inch)

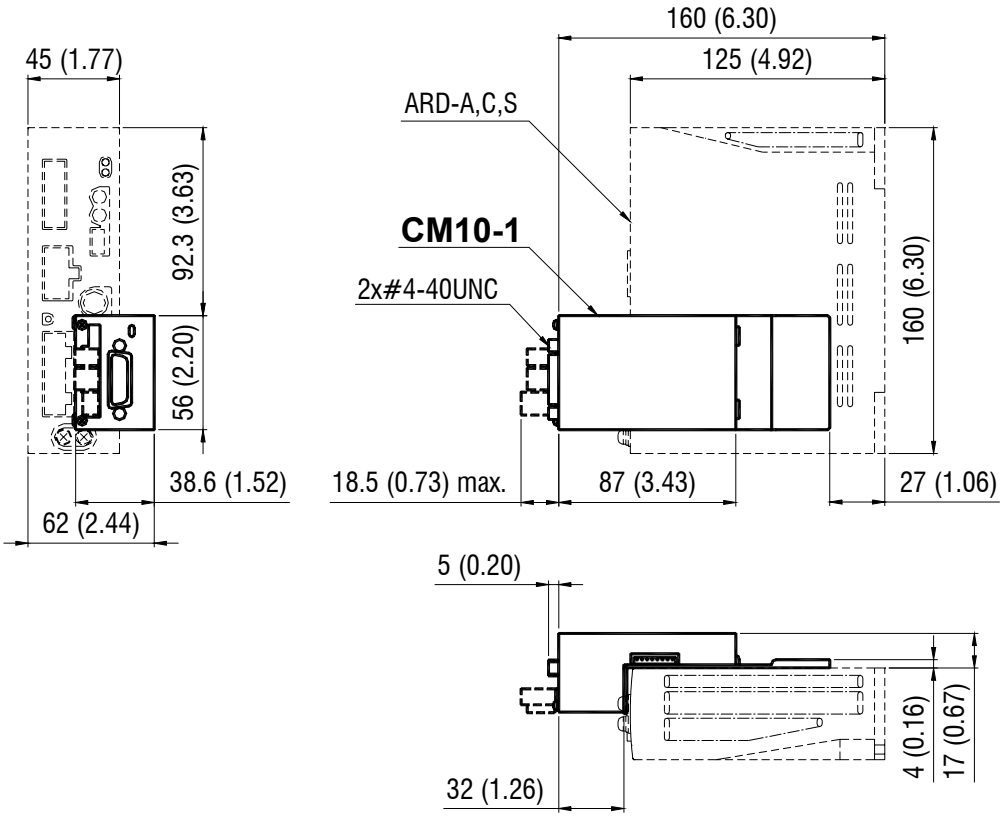
- **CM10-1**, **3**, **4**, **5**



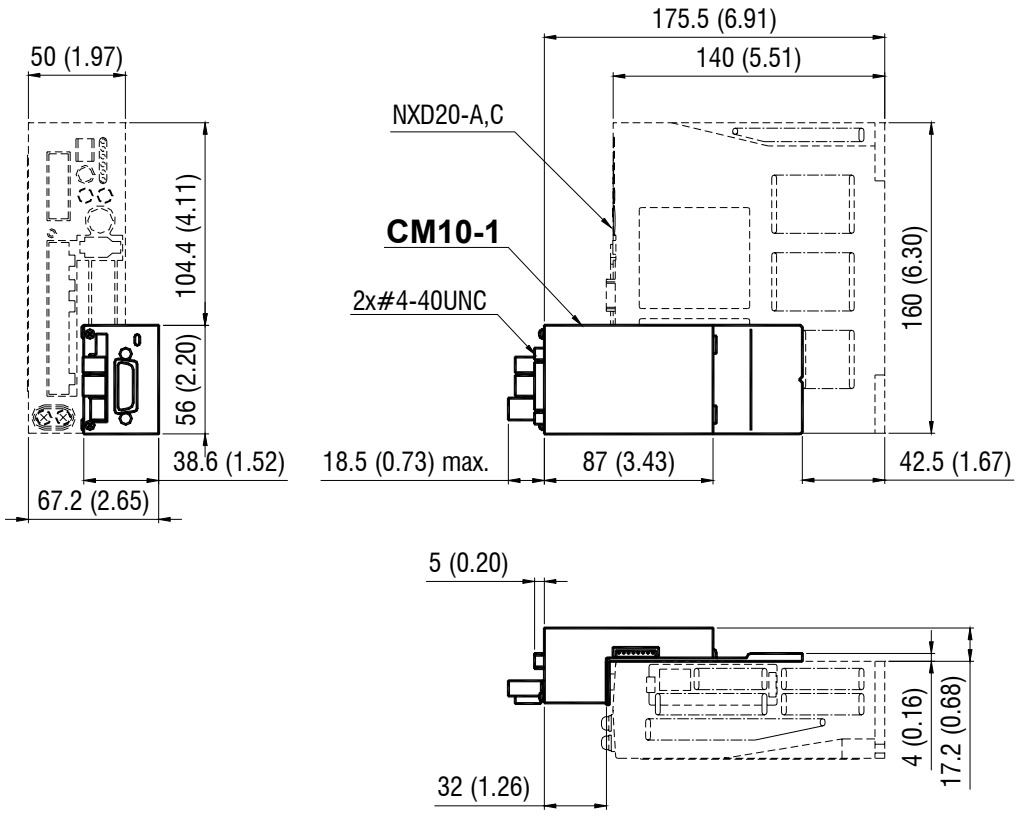
- **CM10-2**



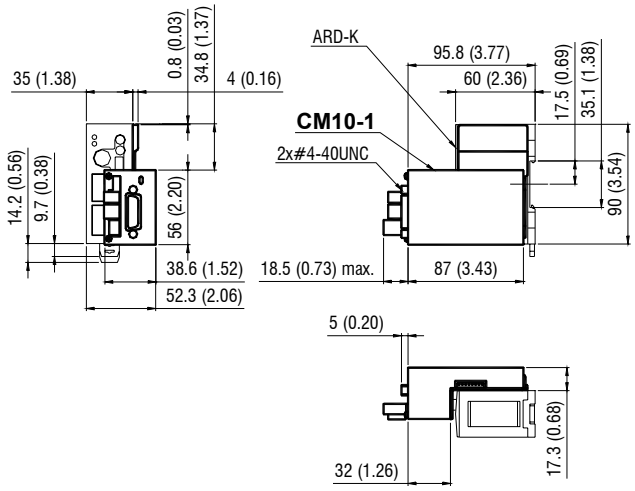
- **CM10-1** with ARD-A, C, S, LSD-A, C, S driver



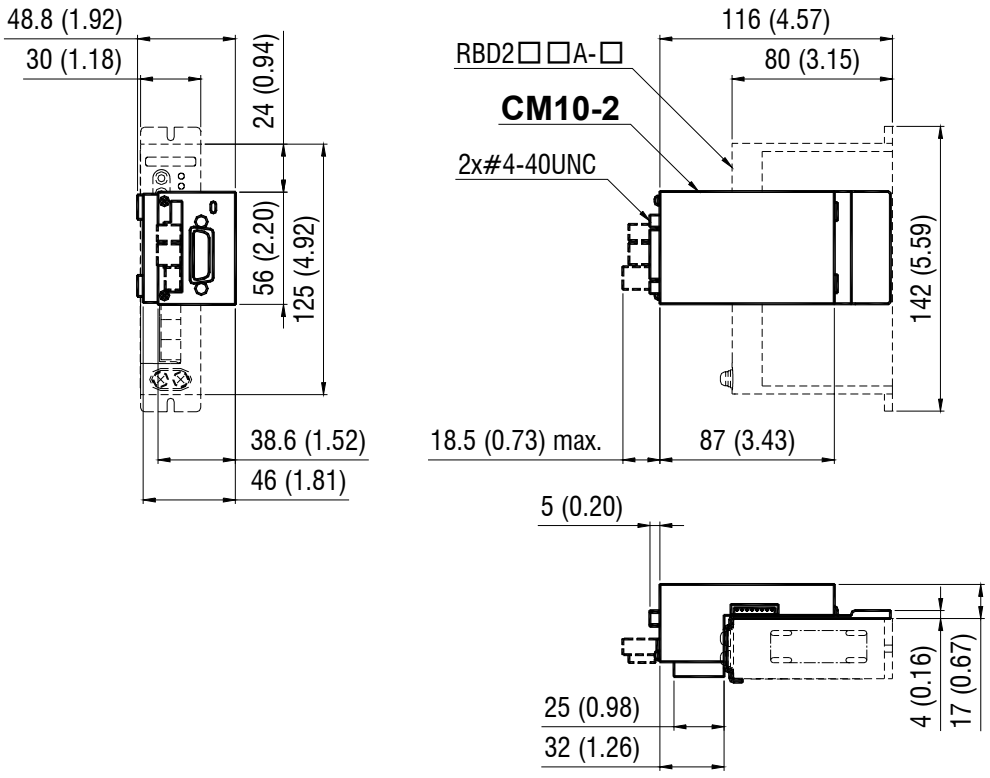
- **CM10-1** with NXD20-A, C driver



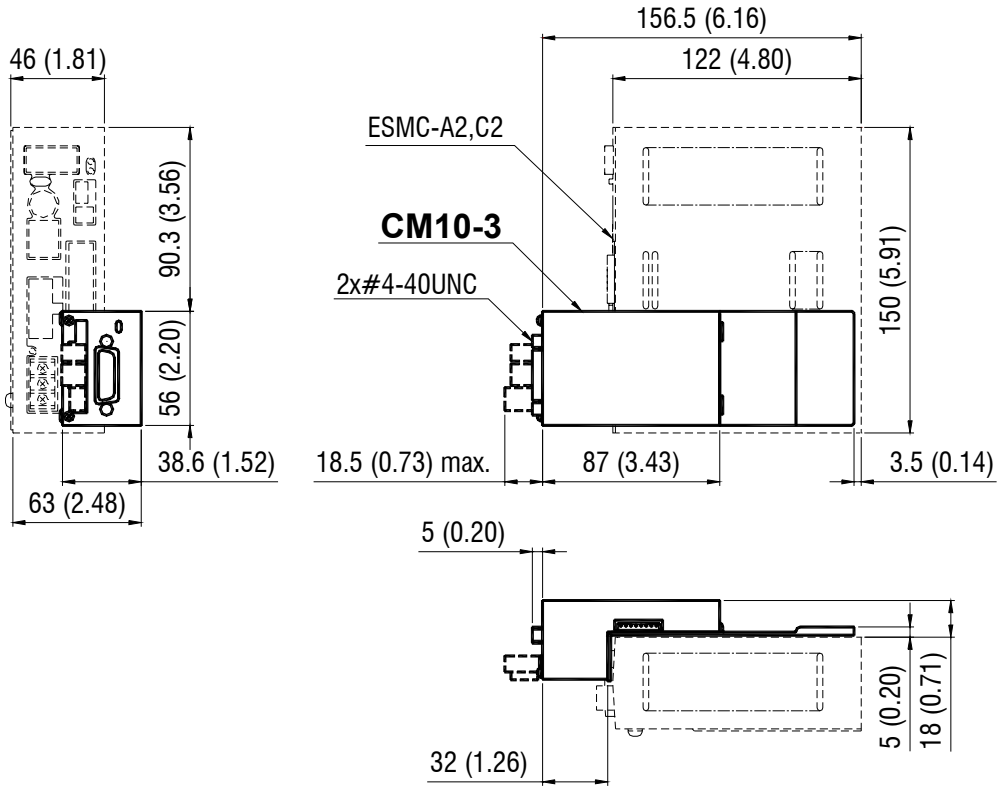
- **CM10-1A** with ARD-K, LSD-K driver



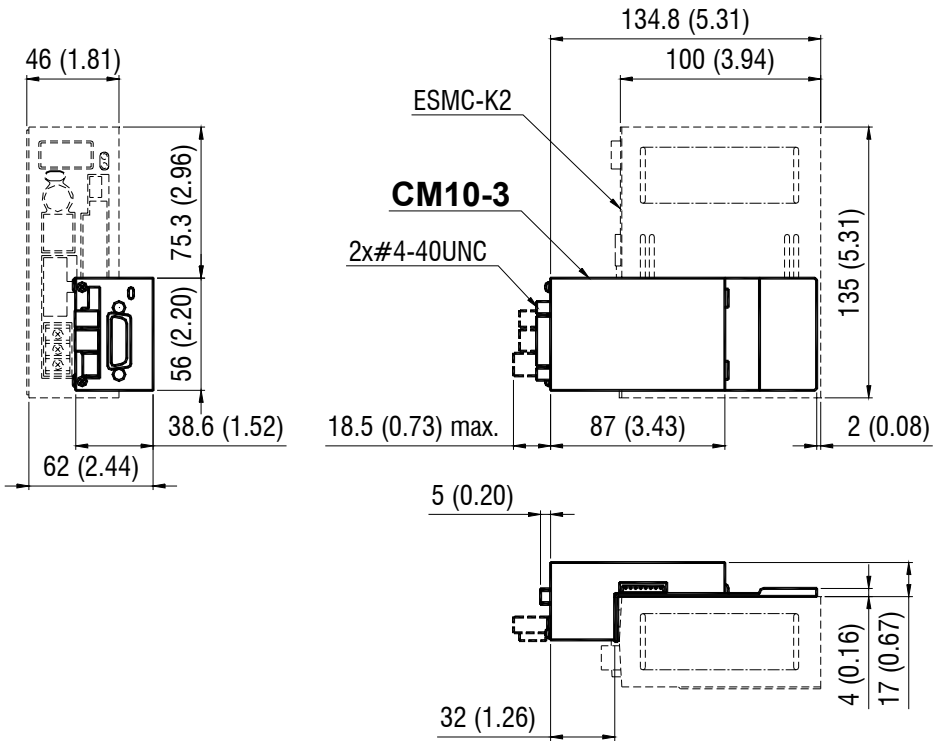
- **CM10-2** with RBD215A-K, RBD228A-K, RBD242A-V, RBD245A-V driver



- **CM10-3** with ESMC-A2, C2 controller

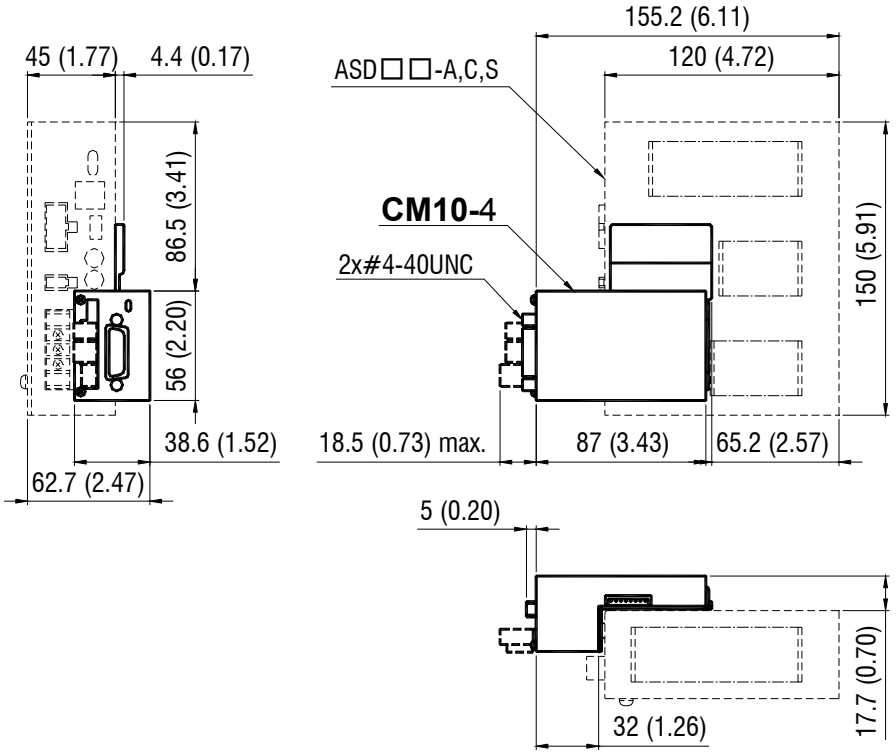


- **CM10-3** with ESMC-K2 controller

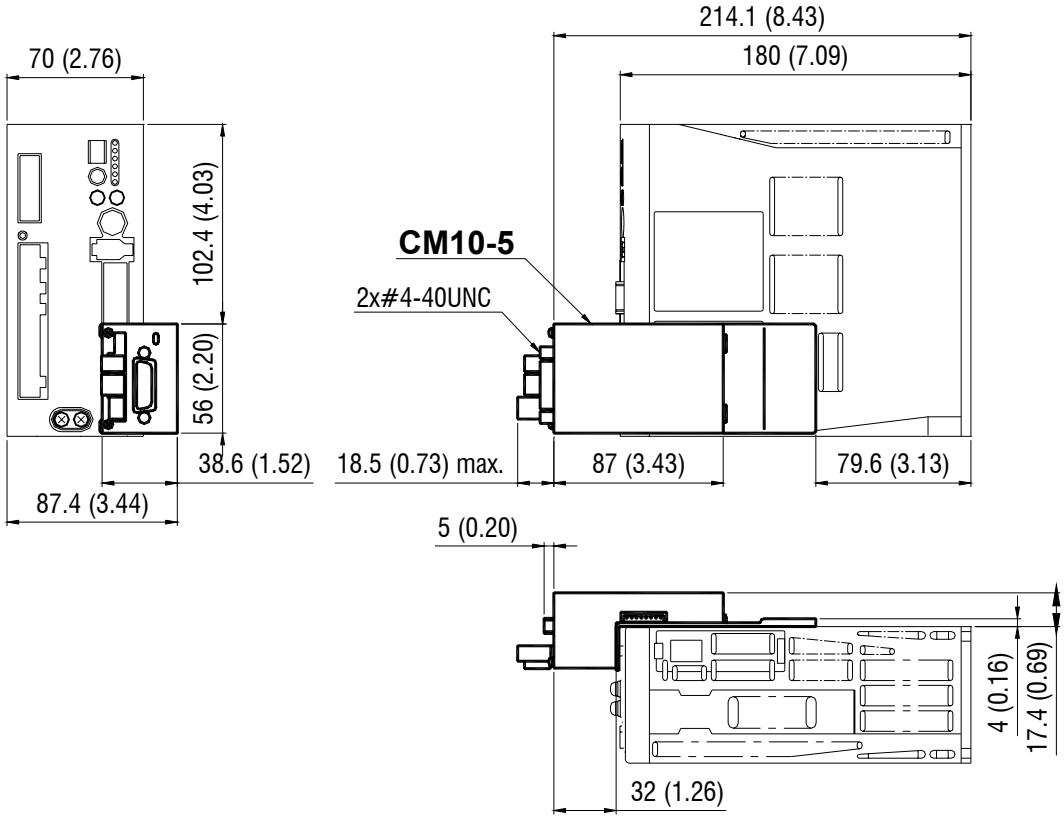


- **CM10-4** with ASDxxx-A, C, S, ARLDxxx-A, C, S driver

See "4.3 Combinations of **CM10** and Drivers" for Driver Model.



- **CM10-5** with NX75-S driver



Appendix A Signals for Driver

A.1 Connector Pin Assigment for Driver

■ CM10-1 (For AR (LSD)/NX Series driver)

Driver		Pin No.	CM10-1		
Signal Name of **AR** Series Driver/**LSD** Driver	Signal Name of **NX** Series Driver		Signal Name	Description	Driver General I/O When Releasing Assignment
-	-	1	NC	No connection	-
GND	GND	2	GND	Ground connection	-
ASG+	ASG+	3	ASG+	A-phase pulse differential input	-
ASG-	ASG-	4	ASG-		
BSG+	BSG+	5	BSG+	B-phase pulse differential input	-
BSG-	BSG-	6	BSG-		
TIM1+	ZSG+	7	TIMD+	Timing signal·Z-phase pulse differential input	IN7
TIM1-	ZSG-	8	TIMD-		
ALM+	ALM+	9	ALARM+	Alarm input	IN1
ALM-	ALM-	10	ALARM-		
WNG+	WNG+/(MOVE+)/(MBC+)	11	IN2+	General input IN2/(Motor moving input)	IN2
WNG-	WNG-/(MOVE-)/(MBC-)	12	IN2-		
END+	END+	13	END+	Motion end input	IN3
END-	END-	14	END-		
READY+/(AL0+)	READY+/(AL0+) /(P-OUTR+)	15	READY+/(PR+)	Operation ready input/(Position data output ready input)	IN4
READY-/(AL0-)	READY-/(AL0-) /(P-OUTR)-	16	READY-/(PR-)		
TLC+/(AL1+)	TLC+/(AL1+) /P-OUT0+	17	LC+/(P0+)	Limiting condition input/(Position data bit 0 input)	IN5
TLC-/(AL1-)	TLC-/(AL1-) /P-OUT0-	18	LC-/(P0-)		
TIM2+/(AL2+)	ZSG2+/(NEAR+) /(AL2+)/P-OUT1+	19	TIMS+/(P1+)	Timing signal·Z-phase pulse single ended input/(Position data bit 1 input)	IN6
TIM2-/(AL2-)	ZSG2-/(NEAR-) /(AL2-)/P-OUT1-	20	TIMS-/(P1-)		
GND	GND	21	GND	Ground connection	-
IN-COM	IN-COM	22	OUT-COM	Output common	-
C-ON	S-ON	23	CON	Current on output	OUT1
CLR/ALM-RST	CLR/ALM-RST /P-CK	24	ACL/DCL / (CK)	Driver alarm clear/Deviation counter clear output/(Position data transmission clock output)	OUT2
CCM	P-REQ	25	(REQ)	(Position data transmission request output)	OUT3
CS/(T-MODE)	TL	26	CS/(TL)	Resolution selection output/(Torque limiting ·Push-motion operation enable)	OUT4
-/(M0)	M0	27	(M0)	(Data select bit 0 output)	OUT5
RETURN/(M1)	M1	28	(M1)	(Data select bit 1 output)	OUT6
P-RESET/(M2)	P-PRESET	29	(PRESET)/(M2)	(Reset home position output)/(Data select bit 2 output)	OUT7
FREE	FREE	30	FREE	Current off, magnetic brake free output	OUT8
CW+/PLS+	CW+/PLS+	31	PLS+/(CW+)	Pulse output/(CW pulse output)	-
CW-/PLS-	CW-/PLS-	32	PLS-/(CW-)		
CW+24V/PLS+24V	CW+24V/PLS+24V	33	NC	No connection	-
CCW+24V/DIR+24V	CCW+24V/DIR+24V	34	NC		
CCW+/DIR+	CCW+/DIR+	35	DIR+/(CCW+)	Direction output/(CCW pulse output)	-
CCW-/DIR-	CCW-/DIR-	36	DIR-/(CCW-)		

( ): Disabled under factory setting

■ CM10-2 (For RBK Series driver)

RBK Series Driver	Pin No.	**CM10-2**		
Signal Name		Signal Name	Description	Driver General I/O When Releasing Assignment
PLS+ input	1	PLS+/(CW+)	Pulse output +/(CW pulse output +)	-
PLS24+ input	2	NC	No connection	-
DIR+ input	3	DIR+/(CCW+)	Direction output +/(CCW pulse output +)	-
AWO input	4	COFF	Current off output	OUT1
IN-COM	5	OUT-COM	Output common	-
CD- output	6	LC-	Limiting condition input -	IN5-
ALM- output	7	ALARM-	Alarm input -	IN1-
TIM- output	8	TIMS-	Timing signal·Z-phase pulse single ended input -	IN6+
PLS- input	9	PLS-/(CW-)	Pulse output -/(CW pulse output -)	-
DIR24+ input	10	NC	No connection	-
DIR- input	11	DIR-/(CCW-)	Direction output -/(CCW pulse output -)	-
CS input	12	CS	Resolution selection output	OUT4
CD+ output	13	LC+	Limiting condition input +	IN5-
ALM+ output	14	ALARM+	Alarm input +	IN1+
TIM+ output	15	TIMS+	Timing signal·Z-phase pulse single ended input +	IN6+

( ): Disabled under factory setting

■ CM10-3 (For ESMC controller)

ESMC Controller	Pin No.	**CM10-3**		
Signal Name		Signal Name	Description	Driver General I/O When Releasing Assignment
OUT-COM	1	IN-COM	Input common	-
ALM	2	ALARM	Alarm input	IN1
MOVE	3	MOVE	Motor moving input	IN4
END/OUTR	4	END/PR	Motion end input/Position data output ready input	IN3
TIM/OUT0	5	TIMS/P0	Timing signal·Z-phase pulse single ended input/Position data bit 0 input	IN6
T-UP/OUT1	6	LC/P1	Limiting condition input/Position data bit 1 input	IN5
-	7	NC	No connection	-
ACL/CK	8	ACL/DCL / CK	Driver alarm clear/Deviation counter clear output/Position data transmission clock output	OUT2
FREE	9	FREE	Current off, magnetic brake free output	OUT8
COFF	10	COFF	Current off output	OUT1
HMSTOP	11	HMSTOP	Sensor-less home seeking operation stop output	OUT5
-	12	NC	No connection	-
-	13			
-	14			
-	15			
-	16			
HOME/(PRESET)	17	HOME/(PRESET)	Sensor-less home seeking operation start output/(Reset home position output)	OUT7
IN-COM1	18	OUT-COM	Output common	-
I/O-GND	19	GND	Ground connection	-
ASG1	20	NC	No connection	-
BSG1	21			
ASG2	22	ASG+	A-phase pulse differential input	-
/ASG2	23	ASG-		
BSG2	24	BSG+	B-phase pulse differential input	-
/BSG2	25	BSG-		
-	26	NC	No connection	-
-	27			
-	28			
-	29			
REQ	30	REQ	Position data transmission request output	OUT3
FP+	31	PLS+/(CW+)	Pulse output/(CW pulse output)	-
FP-	32	PLS-/(CW-)		
P24-FP	33	NC	No connection	-
RP+	34	DIR+/(CCW+)	Direction output/(CCW pulse output)	-
RP-	35	DIR-/(CCW-)		
P24-RP	36	NC	No connection	-

( ): Disabled under factory setting

■ CM10-4 (For AS Series driver/ARL Series driver)

AS/ARL Series Driver	Pin No.	CM10-4		
Signal Name		Signal Name	Description	Driver General I/O When Releasing Assignment
Vcc+5V	1	5V_OUT	Power for Driver I/O	-
GND	2	GND	Ground connecton	-
Vcc+24V	3	NC	No connection	-
-	4			
-	5			
-	6			
-	7			
-	8			
CCW+/DIR.+	9	DIR+/(CCW+)	Direction output/(CCW pulse output)	-
CCW-/DIR.-	10	DIR-/(CCW-)		
CW+/PLS+	11	PLS+/(CW+)	Pulse output/(CW pulse output)	-
CW-/PLS-	12	PLS-/(CW-)		
BSG1	13	NC	No connection	-
GND	14	GND	Ground connecton	-
ASG1	15	NC	No connection	-
GND	16	GND	Ground connecton	-
BSG2+	17	BSG+	B-phase pulse differential input	-
BSG2-	18	BSG-		
ASG2+	19	ASG+	A-phase pulse differential input	-
ASG2-	20	ASG-		
ACL+	21	ACL/DCL+	Driver alarm clear/Deviation counter clear output	OUT2
ACL-	22	ACL/DCL-		
TIM.1	23	TIMS	Timing signal·Z-phase pulse single ended input	IN6
GND	24	GND		
ALARM+	25	ALARM+	Alarm input	IN1
ALARM-	26	ALARM-		
TIM.2+	27	TIMD+	Timing signal·Z-phase pulse differential input	IN7
TIM.2-	28	TIMD-		
END+	29	END+	Motion end input	IN3
END-	30	END-		
× 10+	31	CS+	Resolution selection output	OUT4
× 10-	32	CS-		
C.OFF+	33	COFF+	Current off output	OUT1
C.OFF-	34	COFF-		
-	35	NC	No connection	-
-	36			

( ): Disabled under factory setting

■ CM10-5 (NX Series driver)

NX Series Driver	Pin No.	**CM10-5**		
Signal Name		Signal Name	Description	Driver General I/O When Releasing Assignment
-	1	NC	-	-
GND	2	GND	Ground connecton	-
ASG+	3	ASG+	A-phase pulse differential input	-
ASG-	4	ASG-		
BSG+	5	BSG+	B-phase pulse differential input	-
BSG-	6	BSG-		
ZSG+	7	TIMD+	Timing signal·Z-phase pulse differential input	IN7
ZSG-	8	TIMD-		
ALM+	9	ALARM+	Alarm input	IN1
ALM-	10	ALARM-		
WNG+/(MOVE+)/(MBC+)	11	IN2+	General input IN2/(Motor moving input)	IN2
WNG-/(MOVE-)/(MBC-)	12	IN2-		
END+	13	END+	Motion end input	IN3
END-	14	END-		
READY+/(AL0+)/P-OUTR+	15	READY+/PR+	Operation ready input/Position data output ready input	IN4
READY-/(AL0-)/P-OUTR-	16	READY-/PR-		
TLC+/(AL1+)/P-OUT0+	17	LC+/P0+	Limiting condition input/(Position data bit 0 input)	IN5
TLC-/(AL1-)/P-OUT0-	18	LC-/P0-		
ZSG2+/(NEAR+)/(AL2+)/P-OUT1+	19	TIMS+/P1+	Timing signal·Z-phase pulse single ended input/Position data bit 0 input	IN6
ZSG2-/(NEAR-)/(AL2-)/P-OUT1-	20	TIMS-/P1-		
GND	21	GND	Ground connecton	-
IN-COM	22	OUTCOM	IN-COM	-
S-ON	23	CON	Current on output	OUT1
CLR/ALM-RST/(P-CK)	24	ACL/DCL / CK	Driver alarm clear/Deviation counter clear output / Position data transmission clock output	OUT2
P-REQ	25	REQ	Position data transmission request output	OUT3
TL	26	TL	Torque limiting/Push-motion operation output	OUT4
M0	27	M0	Data select bit 0 output	OUT5
M1	28	M1	Data select bit 0 output	OUT6
P-PRESET	29	PRESET	Reset home position output	OUT7
FREE	30	FREE	Current off, magnetic brake free output	OUT8
CW+/PLS+	31	PLS+/(CW+)	Pulse output/(CW pulse output)	-
CW-/PLS-	32	PLS-/(CW-)		
CW+24V/PLS+24V	33	NC	No connection	-
CCW+24V/DIR+24V	34	NC		
CCW+/DIR+	35	DIR+/(CCW+)	Direction output/(CCW pulse output)	-
CCW-/DIR-	36	DIR-/(CCW-)		

( ): Disabled under factory setting

A.2 Input Signals for Driver

■ Signals

- ALARM (alarm) Input (**CM10-1**, **2**, **3**, **4**, **5**)

  This signal is used to input the alarm signal (ALM output) from the driver.
  If a driver alarm has occurred, the system ALARM signal/status becomes active (alarm code 6Eh: driver alarm). The motor will decelerate to a stop and the sequence program will also stop. No pulse can be output while an alarm signal input is active, although any command not associated with pulse output can be executed.
  - The input logic is Normally Closed. (The **CM10** detects the OFF status of driver output as the driver is in an alarm condition.)
  - The DALARM parameter enables/disables the use of this signal. (The factory setting is active.) Set DALARM=0 to disables this input if the driver alarm signal isn't used.

  Note If DALARM is set to 1 and the power on timing of the driver is delayed from the **CM10**, the driver's alarm output is OFF at the start up, and that is identical to a "driver alarm." The driver alarm status is cleared automatically when the driver is powered on and the alarm output becomes ON, meaning alarm is now OFF. These actions cause that the alarm status history (ALM) records alarm code 6E: Driver Alarm, to be recorded each time the driver is powered on.

- END (motion end) Input (**CM10-1**, **3**, **4**, **5**)

  This signal is used to input the END signal output from the driver at the end of operation.
  The signal becomes the system END signal/status, and used for the MEND parameter, END output, and mechanical home seeking.
  - The DEND parameter selects the source of system END status, either driver end signal or the internal end signal. (The factory setting is DEND=1, the use of driver end signal.) Set DEND=0 to select this input if the driver end signal is not used.

- TIMS (timing signal·Z-phase pulse single ended input) Input (**CM10-1**, **2**, **3**, **4**, **5**)

  This signal is used to input the open collector excitation timing signal output of the stepping motor driver (Z-phase signal for the servo motor driver). The TIM signal is an excitation timing output of the stepping motor driver, and is considered ON in fifty (50) or one hundred (100) fixed, evenly spaced locations per motor revolution. The Z-phase signal of the servomotor is turned ON once per revolution of the motor.
  When mechanical home is detected in mechanical home seeking mode, an accurate home position can be found by using this signal with the SENSOR input and/or the HOME input. (See "8.2.5 Mechanical Home Seeking" on page 55.)
  - The combination of the ENC and the TIM parameters selects the source of the system TIM signal, the TIMD and the TIMS signal from the driver or the Z signal from the external encoder. (The factory setting is ENC=1 (**CM10-1**, **3**) , ENC=0 (**CM10-2**) and TIM=1 (**CM10-1**, **2**, **3**), the use of TIMS.) See "Selection of the Timing Source When Using the Timing Signal" on page 57.

- TIMD (timing signal·Z-phase pulse differential input) Input (**CM10-1**, **4**, **5**)

  This signal is used to input the differential excitation timing output signal of the stepping motor driver (Z-phase signal for the servo motor driver).
  The function of this input signal is same as the TIMS, except this terminal is differential input that allows connecting to the differential timing output on the driver.
  - Set TIM=0 to use this signal. (See above.)

- ASG/BSG (ASG pulse/BSG pulse differential) Inputs (**CM10-1**, **3**, **4**, **5**)

  These signals are used to input the pulse output signals (ASG, BSG) from the driver that correspond the motor operation.
  The **CM10** continuously monitors the feedback position (PF), calculated from encoder count (EC) that counts these input pulses. The difference between PC (position command) and PF becomes PE (position error). The PE is used for position confirmation referenced by the ENDACT command. The PE can also be used in sequence programs, and the miss-step detection function of the stepping motor can be configured. See "8.9 Encoder Function" on page 77.
  - The ENC parameter selects the source of the system EC signal, either the driver or the external encoder. (Factory setting is ENC=0, the use of driver encoder.)

- MOVE (motor moving) Input (**CM10-3**)

  This signal is used to input the MOVE signal from the driver. It is turned ON while the motor is operating. Using the DSIGMOVE command, you can check the signal status (It can also be used in a sequence). (Inside the **CM10-3**, this signal is used when performing sensor-less mechanical home seeking).

- READY (operation ready) Input (**CM10-1**, **5**)

  This signal is used to input the READY signal from the driver.
  If a command for starting the motor operation such as MI or MA etc. is executed while the READY signal is OFF, the pulse signal will output when the READY signal is turned ON. If the waiting time exceeds 3 seconds, a timeout will occur and an alarm will generate (alarm code 6F: driver connection error).
  - Select by the DREADY parameter whether the READY signal from the driver is used or not (The factory setting of the **CM10-1** and **CM10-5** is "DREADY=1," and the READY signal from the driver is used). Set the parameter to "DREADY=0" when not using the READY signal from the driver.

- PR (position data output ready) Input (**CM10-1**, **3**, **5**)

  This signal is used when the drivers' current position reading function is executed. This signal is used to input the P-OUTR signal from the **NX** Series driver or the OUTR signal from the **ESMC** controller.
  In normal operation, this input functions as another signal that is redundantly assigned to the same pin number (a general input when not assigned). And it automatically switches to the PR input only when executing the current position reading command (ABSREQ and ABSREQPC).

- P0 (position data bit 0) Input (**CM10-1**, **3**, **5**)

  This signal is used to read the drivers' current position. This signal is used to input the P-OUT0 signal from the **NX** Series driver or the OUT0 signal from the **ESMC** controller.
  In normal operation, this input functions as another signal that is redundantly assigned to the same pin number (a general input when not assigned). And it automatically switches to the P0 input only when executing the current position reading command (ABSREQ and ABSREQPC).

- P1 (position data bit 1) Input (**CM10-1**, **3**, **5**)

  This signal is used to read the drivers' current position. This signal is used to input the P-OUT1 signal from the **NX** Series driver or the OUT1 signal from the **ESMC** controller.
  In normal operation, this input functions as another signal that is redundantly assigned to the same pin number (a general input when not assigned). And it automatically switches to the P1 input only when executing the current position reading command (ABSREQ and ABSREQPC).

- LC (limiting condition) Input (**CM10-1**, **2**, **3**, **5**)

  When using the **CM10-1** or **CM10-5**, this signal is used to input the TLC signal from the driver. It is turned ON when torque reaches the preset value while the torque limiting function is used/becomes push condition (position error is 1.8 degree or more) while the push-motion operation is used.
  When using the **CM10-2**, this signal is used to input the CD signal from the driver. It is turned ON while executing the current cutback function.
  When using the **CM10-3**, this signal is used to input the T-UP signal from the driver. It is turned ON when pushing the mechanical end while sensor-less home seeking is performed.

Memo

- The warning outputs from the **AR** Series driver/**LSD** driver, **NX** Series driver and the electromagnetic brake control signal output from the **NX** Series driver are not supported. However, these signals are connected to the driver general input IN2 of the **CM10-1**/**CM10-5**. By using the DINx or DIN command, you can check whether the warning or electromagnetic brake control signal is output or not. It can also be used in a sequence. The factory setting for the electromagnetic brake control signal output of the **NX** Series driver is not enabled. Be sure to assign the electromagnetic brake control signal output by referring to the driver operating manual.
- The alarm code outputs from the **AR** Series driver/**LSD** driver and **NX** Series driver are not supported. The driver alarm code output AL0, AL1 and AL2, which are assigned to the same terminals as READY, TLC and TIM2 (ZSG2) of the driver respectively, are connected to READY, TLC and TIMS of the **CM10-1**/**CM10-5** respectively. To read the alarm code, change READY, LC and TIMS signal assignments to the driver general input, IN4, IN5 and IN6 using the provided utility software, **Immediate Motion Creator for CM/SCX (IMC)**. (The same procedure can be done by command input. Set "DINREADY=0, DINLC=0, DINTIMS=0" and execute SAVEPRM and RESET to cancel these assignments that causes the signals become the driver general input IN4, IN5 and IN6.) Using the DINx or DIN command, you can check the alarm code. They can also be used in a sequence. The factory setting for the alarm code output of the **AR** Series driver/**LSD** driver and **NX** Series driver are not enabled. Be sure to assign the alarm code output by referring to the driver operating manual.
- The positioning near output (NEAR output) from the **NX** Series driver is not supported. A similar function can be performed by setting of ENDACT of the **CM10**, or combining the command PE that returns the position deviation and an "IF" statement. See "8.8 END (motion end) Signal" on page 76 and "8.9 Encoder Function" on page 77. When using the NEAR output from the driver, see the instructions below.
  The NEAR output of the driver, which is assigned to the same terminal as the ZSG output, is connected to TIMS of the **CM10-1** and **CM10-5**. To read the NEAR output, change TIMS signal assignment to the driver general input, IN 4, IN5 and IN6 using the provided utility software, **Immediate Motion Creator for CM/SCX (IMC)**. (The same procedure can be done by command input. Set "DINTIMS=0" and execute SAVEPRM and RESET to cancel the assignment of TIMS that causes the signals becomes the driver general input IN6.) Using the DINx or DIN command, you can check whether this signal is output or not. It can also be used in a sequence. The factory setting for the NEAR output of the **NX** Series driver is not enabled. Be sure to assign the NEAR output by referring to the driver operating manual.

A.3 Output Signals for Driver

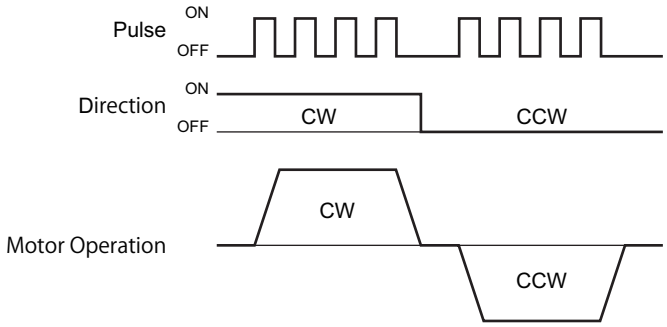
■ Signals

- PLS/CW and DIR/CCW Output (**CM10-1**, **2**, **3**, **4**, **5**)

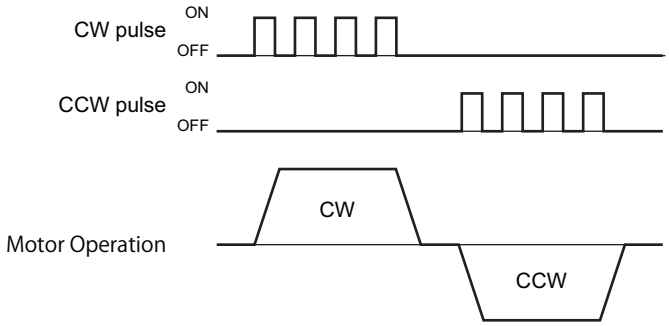
  These terminals are used to output the pulse and direction signals to the driver.
  The motor will rotate in the CW direction with the DIR (direction) output turned ON and in the CCW direction with the DIR output turned OFF. Be sure that the driver pulse mode switch is set to 1 pulse mode before installing the **CM10**.

  ∗ The 2 pulse mode can be selected via the PULSE parameter. (Set PULSE=0 for 2 pulse mode, PULSE=1 for 1 pulse mode. Factory setting of this parameter is PULSE=1.) When 2 pulse mode is selected, the pulse mode of the driver must also be changed to 2pulse mode.

  1 pulse mode



  2 pulse mode



- COFF (current off) Output (**CM10-2**, **3**, **4**)

  This signal is used to toggle the motor current. The motor current is OFF when this signal is ON. This signal is connected to the C.OFF (current off) or AWO (all windings off) input on the driver.
  This signal can be controlled using the system CON input signal on the system I/O connector (if assigned), the CURRENT command and CANopen communication. When even one of these method commands "Current Off", this signal will be turned ON.
  The STRSW parameter determines the motor current ON or OFF when the device is powered on.
  The function of this signal is exactly the same as the CON output, except the logic is opposite.

- CON (current on) Output (**CM10-1**, **5**)

  This signal is used to toggle the motor current. The motor current is ON when this signal is ON. Connect this signal to the C-ON (current ON) input or S-ON (servo ON) on the driver, if the driver has those inputs.
  This signal can be controlled using the system CON input signal on the system I/O connector (if assigned), the CURRENT command or CANopen communication. When even one of these method commands "Current Off", this signal will be turned OFF.
  If the CON input ins not assigned to the I/O connector, the STRSW parameter determines the motor current ON or OFF when the device is powered on.
  The function of this signal is exactly the same as the COFF output, except the logic is opposite.

- ACL/DCL (driver alarm clear/deviation counter clear) Output (**CM10-1**, **3**, **4**, **5**)

  This signal is used to clear the alarm status and the deviation counter of the driver.

This signal can be controlled using the ALMCLR input signal on the system I/O connector (if assigned), the ALMCLR command or CANopen communication. When the alarm is inactive, this signal functions as the deviation counter clear, and can be controlled using the PECLR input signal on the system I/O connector (if assigned), the PECLR command or CANopen communication.
This signal is also used to stop servo motors and αSTEP products immediately by clearing the deviation counter in the driver. The deviation counter clear output momentarily becomes active when the limit sensors (LSN/LSP signal) are detected (when OTACT=0), the PSTOP is commanded and a mechanical home seeking is performed (when HOMEDCL=1).

- CS (resolution selection) Output (**CM10-1**, **2**, **4**)

  This signal is used to select the motor resolution. This signal on the **CM10-1, 2** is connected to the CS signal on the driver, and the signal on the **CM10-4** is connected to the x10 signal on the driver.
  The state of this signal is set when the system power is first turned ON, and remains in that state while the system is power up. The state of CS can be changed by the STRDCS parameter.
  STRDCS=0: CS output is OFF at system start up
  STRDCS=1: CS output is ON at system start up

- FREE (current off, magnetic brake free) Output (**CM10-1**, **3**)

  This signal is used to make the motor shaft free (motor current OFF and release the electromagnetic brake at the same time).
  This signal can be controlled using the FREE input signal on the system I/O connector (if assigned) and on the remote I/O (CANopen), as well as the FREE command. If any of those inputs is ON, the FREE output becomes ON and that causes the motor current to turn OFF and a release of the electromagnetic brake. The FREE command can always be used to controls the FREE output regardless of the states of those inputs.

- HOME (sensor-less home seeking operation start) Output (**CM10-3**)

  This signal is used to start sensor-less home seeking operation.
  It becomes effective when the mechanical home seeking operation mode (homing type) is set to "HOMETYP=12." See "8.2.5 Mechanical Home Seeking" in more detail.

- HMSTOP (sensor-less home seeking operation stop) Output (**CM10-3**)

  This signal is used to stop sensor-less home seeking operation.

- REQ (position data transmission request) Output (**CM10-1**, **3**, **5**)

  This signal is used to request the driver to send the data when executing the current position reading command (ABSREQ and ABSREQPC). The PR input, P0 input, P1 input and CK output will become effective when this signal is turned ON.

- PRESET (reset home position) Output (**CM10-1**, **3**, **5**)

  This signal is used to set the driver's current position to the PRESET position (home position).

- CK (position data transmission clock) Output (**CM10-1**, **3**, **5**)

  This signal becomes effective when executing the current position reading command (ABSREQ and ABSREQPC). It is the clock signal to request the data.
  In normal operation, this signal does not function and another signal that is redundantly assigned to the same pin number (a general output signal when nothing is assigned) functions. This signal functions only when executing the current position reading command (ABSREQ and ABSREQPC).

- TL (torque limiting/push-motion operation) Output (**CM10-1**, **5**)

  This signal is used to enable the torque limiting/push-motion operation function.

- M0/M1/M2 (data select bit 0/bit 1/bit 2) Output (**CM10-1**, **5**)

  These signals are used to set the operation data (when executing the torque limiting/push-motion operation function etc.).

Memo

- Only the M0 and M1 are used when performing the torque limiting function with the **NX** Series driver.
- The current control mode ON (CCM) function of the **AR** Series driver/**LSD** driver is not supported. To use the CCM function, cancel the assignment of the REQ output of the **CM10-1** first. The assignment of CCM function will now be the driver general output OUT3. You can enable or disable this function by setting "DOUT3=0" or "DOUT3=1." Use the provided utility software, **IMC** to assign REQ. (In the case command input is required to do this procedure, set DOUTREQ=0 and execute SAVEPRM and RESET.)

Appendix B How to Send Commands Using ASCII Strings

■ Abbreviation for ASCII Data

For convenience, following expressions are used in this manual.

	Description	ASCII Hex (Dec)
[BEL]	BELL	07h (7)
[BS]	Back Space	08h (8)
[LF]	Line Feed	0Ah (10)
[CR]	Carriage Return	0Dh (13)
[SP]	SPace	20h (32)
[ESC]	ESCape	1Bh (27)
[EOL]	End Of Line Any of the following combinations [CR] [LF] [CR] [LF] [LF] [CR]	

■ Valid ASCII Data for Serial Communication

Following are the values that can be entered from the terminal. Any other value is not accepted unless it is specified for specific features.

Receiving Data	Operation	
[20h] to [7Ah]	Input data buffer count is under 80:	Echo back entered value, store into input buffer.
	Input data buffer count is 80:	Send [BEL].
[EOL]	Start parsing commands. Clear input buffer.	
[BS]	Any data exist in input buffer:	Send [BS] [SP] [BS]. Clear the last data n input buffer.
	No data exist in input buffer.	Send [BEL].
[ESC]	Send [CR][LF][‘>’]. Stop executing sequence program, stop motion. Clear input buffer.	

■ Command Format

Following shows the command format.
Case (Upper/Lower) of the character is not a matter unless specified. Decimal point number is accepted in some of the parameters.

- Parameters

No '=' (only spaces) can be accepted only for constant (immediate) value entry.

(Format) [Parameter] [=(2Dh)] [Parameter value] [EOL]
[Parameter] [SP] [Parameter value (constant)] [EOL]

■ Examples

Condition	Example	Notes
Parameter value is constant	`DIS=1.234[EOL]` `DIS 1.234[EOL]`	'=' can be replaced with [SP]
Parameter value is variable	`DIS=A[EOL]`	'=' is required
Parameter value is equation	`DIS=A*1.5[EOL]`	'=' is required

- Commands

Spacing between command and parameter by at least 1 [SP] is required. '=' is not accepted.

(Format) [Command] [SP] [Argument] [EOL]

■ Examples

Condition	Example	Notes
No argument	`MI[EOL]`	-
Argument is constant	`MA 1.234[EOL]`	'=' is not accepted
Argument is variable	`MA POS[1][EOL]`	'=' is not accepted
Argument is string	`RUN Test[EOL]`	'=' is not accepted

Appendix C TIPS

The **CM10** has useful functions that may not be found immediately. This section shows references that might conveniently be used.

■ Motion Command

- Changing velocity during motion
  - If moving for positioning by MI or MA, use the command CV to set the new desired speed .
  - If moving continuously by MCP, set the new VR, and execute the MCP command again.
  - If moving continuously by MCN, set the new VR, and execute the MCN command again.
  - Set SENSORACT=2. Moving continuously by MCP or MCP command, the system changes velocity to SCHGVR, and stops at a distance SCHGPOS after the position at which the SENSOR signal was set.
  - If all motion parameters are known, use linked index motions. Refer to the MIx command.
- Moving to an absolute position
  - Command MA with desired absolute destination.
- Making home position an offset from valid home signal
  - Use OFFSET command with desired offset value.
- Stopping with a position offset from sensor position
  - Set SENSORACT=2. Moving continuously by MCP or MCP command, the system changes velocity to SCHGVR, and stops at a distance SCHGPOS after the position at which the SENSOR signal was set.
  - Set SENSORACT=2, SCHGPOS and SCHGVR with desired offset position and velocity.
- Stopping motion or sequence while running on the fly by keyboard
  - Press ESC key.
- Verifying that the motor has not missed any steps
  - Using sequence program, check PE parameter during or at end of motion, or verify END status at end of motion.
    (Applicable when encoder is used, or driver has encoder output or END output)
- Outputting signal when distance, velocity, time reaches to desired value
  - Set EVx with desired output port and desired parameter. (No program is required)

■ System Control

- Clearing all contents (parameters, POS[x] and programs) that have been written and return to factory setting
  - Use the CLEARALL command.
- Inverting all directions at once
  - Set DIRINV followed by a desired direction, and save and reset.
- Compensating mechanical gear ratio, or handling indivisible DPR parameter
  - Set electric gear parameters, GA (numerator) and GB (denominator) opposite to mechanical gear ratio.
- Setting the motor current ON or OFF when the system is powered ON
  - Set STRSW parameter with desired state.
- Measuring time elapsed from system startup or distance between intended times
  - Use the TIMER command, or set TIMER to zero to start measuring time.
- Measuring current velocity while operating
  - Use the VC command.

■ Maintenance

- Viewing I/O status all at once
  - Use the IO command for I/O connector signals, the DIO command for driver connector on the **CM10** signals and the RIO command for remote I/Ox (CANopen) signals.
- Viewing individual input state, viewing and toggling individual output state
  - Use the INx and OUTx commands for I/O connector signals, the DINx and DOUTx commands for driver connector on the **CM10** signals, and the RINx and ROUTx commands for remote I/Ox (CANopen) signals.
- Toggling output state on the fly by keyboard (with viewing I/O status)
  - Type "OUTTEST."
- Viewing the list of commands during communication
  - Type "HELP", press space key for next page.
- Checking the present alarm condition and history
  - Type "ALM."
- Clearing an alarm condition
  - Type "ALMCLR", or type "RESET" or cycle input power.
- Checking I/O assignments and status, values of important parameters, current position and alarm condition all at once
  - Type "REPORT", press space key for next page.
- Viewing varying parameter in real time
  - Attach " /" (space + forward slash) after command. (Example: "PC /")
- Displaying sequence statements as they are executed in real time
  - Set TRACE=1.

■ Communication

- Using multiple statements in a line
  - Set one command/parameter and use separator ';' and set other command/parameter and repeat. (Example: DIS=10;MI…) ＊ It can be used within a sequence.
- Facilitate key typing for parameter entry
  - Press space key instead of '='.
- Commanding to all devices at once
  - Attach "\" (back slash) before command. (Examples: \MI, \ABORT)
- Eliminating extra information (i.e., parameter name) on response to reduce time required to respond
  - Set VERBOSE=0. (recommended for automatic control)
- Showing only response from **SCX10** and eliminating echo (contents that were sent from host) on operating screen
  - Set ECHO=0.
- Decreasing communication delay on RS-232C daisy chain connection
  - Set BAUD parameter to grater value to increase the transmission rate.
- Using limit switches and home sensor via CANopen for a "sensor motion" or a mechanical home seeking
  - Assign sensor signals using RINSENSOR, RINLSP and RINLSN commands. (A delay may occur depending on a condition.)

■ Sequence Program

- Commenting inside a sequence
  - Use the‘#’ followed by a commenting text.
- Temporarily disable specific command lines in a sequence
  - Insert a ‘#’ before command line.
- Using user variable, either numeric value or text string in a sequence
  - Set desired variable with CREATEVAR command.
- Using math/logical operators in program
  - The following operations can be used.
    + : Addition, - : Subtraction, * : Multiplication, / : Division, % : Modulo (remainder), & : AND (Boolean), | : OR (Boolean), ^ : XOR (Boolean), << : Left arithmetic shift (Shift to left bit), >> : Right arithmetic shift (Shift to right bit)
- Using subroutines
  - Use CALL command to call a sequence program as a subroutine.- Write RET in the last of the sequence program to be used as the subroutine and call it using the CALL command from the main program
- Automatically asking operator or machine to provide and accepting numeric value to be entered
  - Use KB or KBQ.
    (Example: Set DIS=KB, DIS becomes numeric value that operator typed when it was asked)
- Suspending sequence processing until motion is complete
  - Insert the MEND command between the motion start command and next command
- Display the text on the screen, or control the display by sending the ASCII control code
  - Write the text following the SAS and/or SACS commands, the SACS command can describe the ASCII control code
- Protecting from modifying sequence
  - Use LOCK command followed by sequence name.
- Run a sequence automatically when the system is powered ON
  - Use the name CONFIG as a sequence name.

• Please contact your nearest Oriental Motor office for further information.

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