Orientalmotor

HP-13013-6

Universal Controller

SCX10

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.xx. If the firmware version of **SCX10** is 1.xx, please use the HP-13013-4 Operating Manual.

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Chapter 1 Before Use

1.1 Main Features

The **SCX10** universal controller is a compact and powerful programmable controller that can be connected with all Oriental Motor's standard pulse input drivers. The **SCX10** can also be connected to PLCs and computers by using variety of serial interfaces and I/Os.

■ Compact and Powerful

- 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 **SCX10**, 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 **SCX10** 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.
- Compact Size
  The **SCX10** is packed with powerful functions and many interfaces of a full-sized controller into a compact size. It can fit anywhere in your control panel.

■ Versatile Connections

- CANopen
  The **SCX10** comes equipped with CANopen as standard. Sequence selection and execution can be made through CANopen as well as commanding incremental motion. CANopen for the **SCX10** 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 **SCX10** 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 included.
- Configurable I/O
  While all standard connections to the drivers are included, the **SCX10** 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 **SCX10**, simple systems can be configured without a PLC or computer.
- Differential Pulse Output
  The **SCX10** has photo-coupler compatible differential pulse outputs that can be connected with all Oriental Motor's standard pulse input drivers for less noise concerns in a variety of environments.

■ Powerful Functions

- User Unit
  In the **SCX10**, 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 **SCX10** converts it to pulses for you. Any unit can be used.
- Friendly GUI
  While all commands for the **SCX10** 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

SCX10 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.

- USB
  The **SCX10** has a USB port on the front panel. When you perform the initial setup of the **SCX10**, directly connect it to your computer. Commercially available Mini USB cables 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.
- Three Mounting Options
  With it's standard configuration, the **SCX10** can be mounted on a DIN rail or a metal plate. If you take off the mounting plate, you may mount the **SCX10** onto a metal plate from the back side of it.

1.2 About Function Improvements

The firmware in this product has been updated to version 2 (Ver.2.xx), and it is now also compatible with the **NX** Series AC servo motor and driver package (position control mode). (The firmware in the product that this operating manual is attached and manufactured in starting with July to August 2011 has been updated to Ver.2.xx.)
In addition, the functions to support conventional stepping motor drivers have been expanded. The main features of the new function are as follows:

Feature	Content	Page
Reading the drivers' current position (absolute position) and home preset	8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)	91
Torque limiting/push-motion operation/current cutback release	8.4 Torque Limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)	96
	Chapter12 Command List ･TL	340
Limiting condition output (torque limiting /push-motion operation/current cutback	8.4 Torque Limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)	96
	6.4.3 Output Signals ･LC (limiting condition) Output	29
	6.5.4 Input Signals for Driver ･LC (limiting condition) Input	39
Push-motion type (sensor-less) home seeking operation	8.2.5 Mechanical Home Seeking ･Sensorless Mechanical Home Seeking Operation for "HOMETYP=12"	85
Driver operation ready (READY) /motor moving (MOVE)	6.4.3 Output Signals ･READY (operation ready) Output ･MOVE (motor moving) Output	29
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)	84

Additionally, the most suitable I/O signals for each driver/function can automatically be assigned by using the provided utility software **Immediate Motion Creator for CM/SCX Series**.
See the following notes before use.

■ Be sure to use version 2.00 or newer of the utility software **Immediate Motion Creator for CM/SCX Series (IMC)**

Since the functions of the **SCX10** (firmware Ver.2.xx) were expanded, the previous version of the **IMC** (Ver.1.xx) cannot be used. If the Ver.1.xx was installed in your PC, update it by using the CD-ROM provided. The new version of the **IMC** (Ver.2.xx) can be used with the previous versions of the **SCX10** firmware (Ver.1.xx).。

- Regarding the version of the **IMC** and the firmware version of the **SCX10**, check by using the "Help" - "Version Information" (or "About") function of the **IMC**. (When checking the firmware version, it is required to connect the **SCX10** to your PC.)
- Update to the latest version of **IMC** 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**.

■ Be sure to use version 2.1 of CANopen EDS files

The new version of the CANopen EDS files (Ver.2.1) can be used with both the new versions of the **SCX10** firmware (Ver.2.xx) and the previous versions of the **SCX10** firmware (Ver.1.xx).

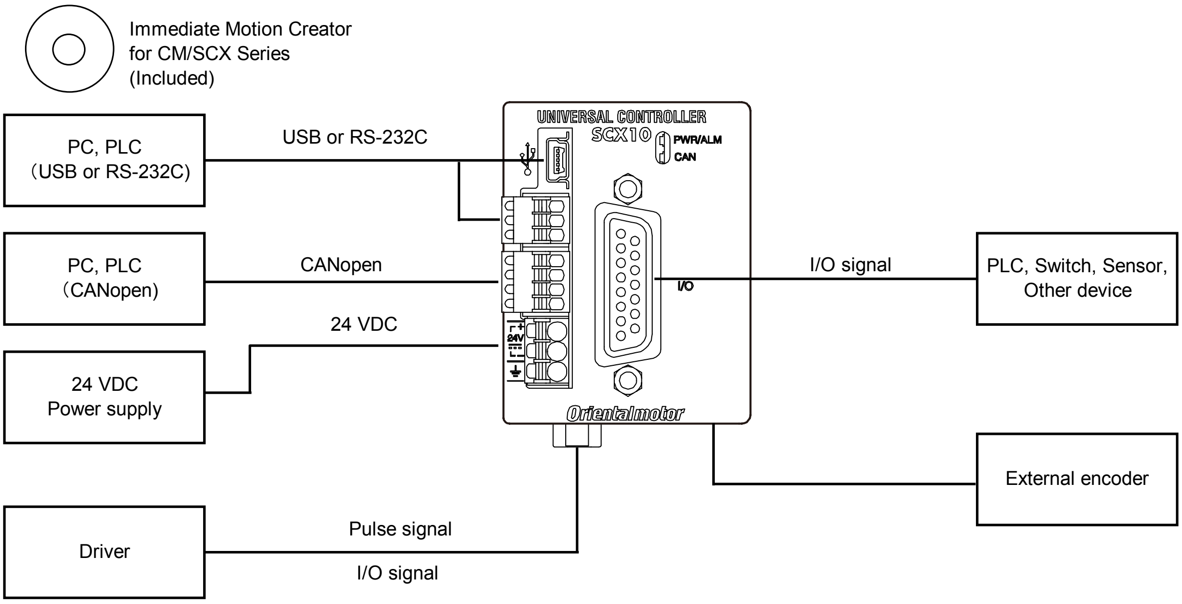
■ Commands and signals have been changed

- The new PSTOP (Panic Stop) command/signal stops the motion and the sequence.
  (The previous PSTOP command/signal stops only the motion.)
- Some of the command names listed below have been changed and the previous command names cannot be used in the new firmware. The functions of these commands remain the same.

Function	Previous Firmware (Ver.1.xx)	New Firmware (Ver.2.xx)
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

1.3 System Configuration

A sample system configuration using the **SCX10** is provided below.

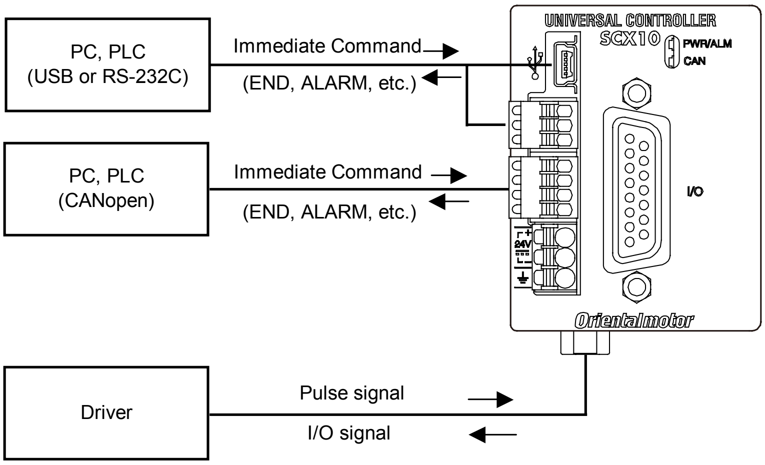


1.4 Operating Methods

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

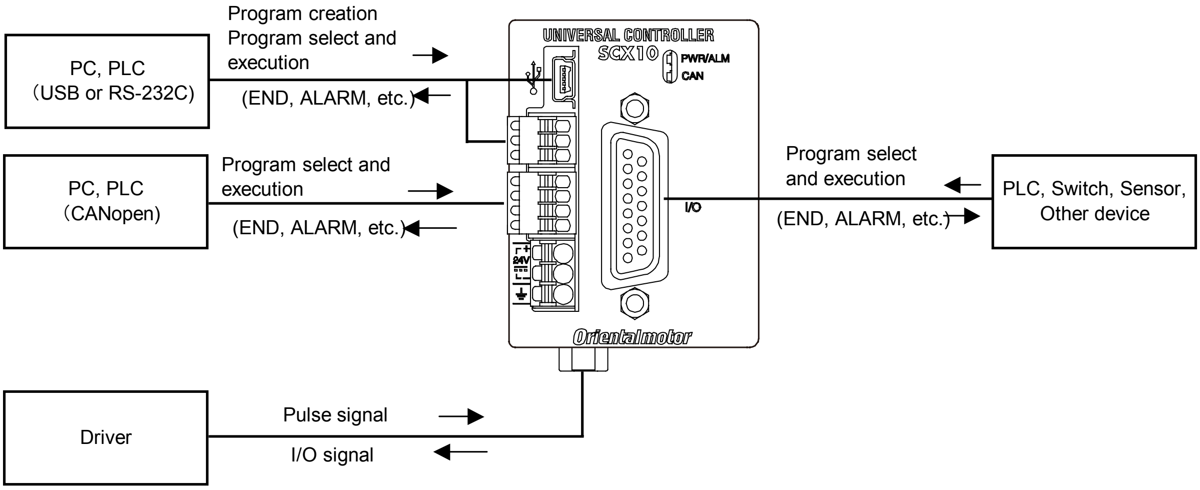
■ Immediate Command

Operate the motor by sending each commands immediately from the master controller such as a computer or PLC via RS-232C, USB or CANopen. See "Chapter 7 Start Up (Immediate Command)" on page 67 for more detail.



■ Program Execution

Create sequences using a computer, save the programs into the built-in memory of the **SCX10**, 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. See "Chapter 9 Program Creation and Execution" on page 112.



	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 **SCX10** 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 are also provided.
See "6.3 Connecting the USB and Installation of Utility Software" on page 19.

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: Class 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 15.
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 2002/95EC 27Jan.2003) compliant

Chapter 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.

Chapter 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 15 for measures with regard to noise.

■ EEPROM Write Cycle

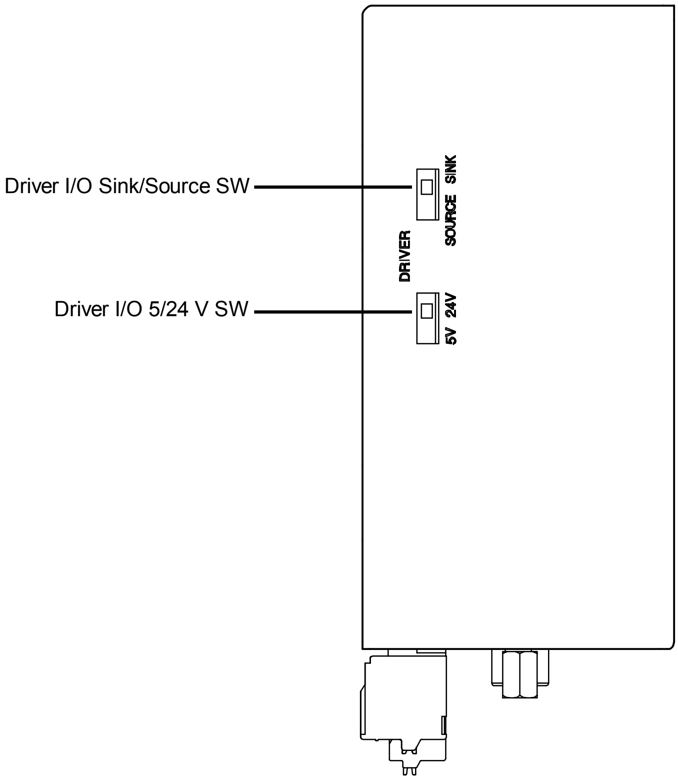
Do not turn off the 24 VDC power supply while data is being written to the EEPROM and 5 seconds after the completion of data write. Doing so may abort the data write and cause an EEPROM error alarm to generate. The EEPROM can be rewritten approx. 100,000 times.

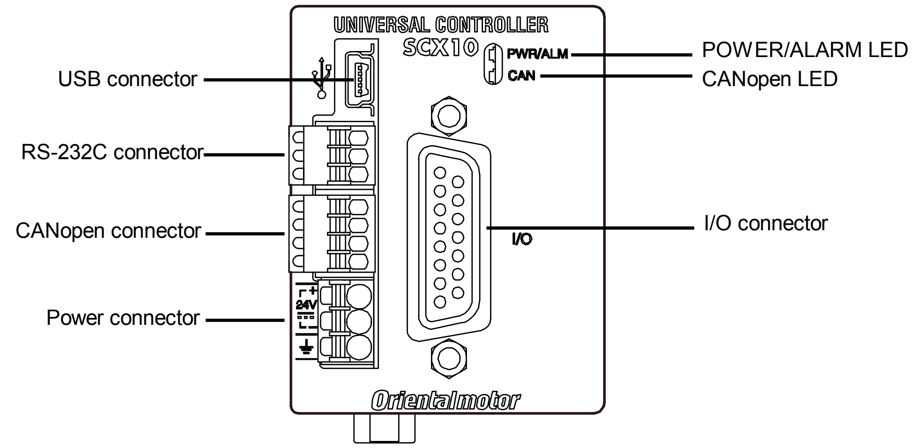
Chapter 4 Preparation

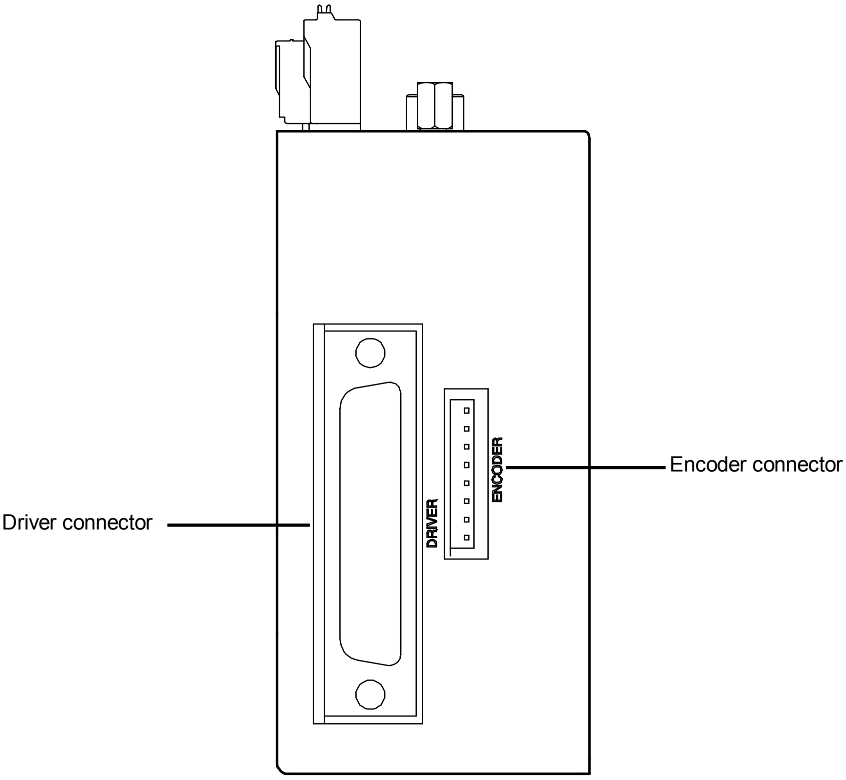
4.1 Checking the Product

• Universal Controller (**SCX10**)	1 unit
• CD-ROM (**Immediate Motion Creator for CM/SCX Series** (utility software), Startup manual, Operating manual, CANopen EDS file, USB driver, .NET Framework 2.0)	1 pc.
• Connector set RS-232C connector (3 pins): 1 CANopen connector (4 pins): 1 Power connector (3 pins): 1	1 set (packed in a bag)
• Encoder connector housing/contact (8 pins)	1 set (packed in a bag)
• Startup manual	1 copy

4.2 Names and Functions of Parts







Name	Description
POWER/ALARM Status 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 "Chapter 13 Troubleshooting" on page 358.
CANopen Status LED (green/red)	Green: Run Red: Error (See "10.3 LED Indication" on page 128 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 USB cable
CANopen connector	Connects to the CANopen cable
Encoder connector	Connects to the external encoder
Driver connector	Connects to the driver
Driver I/O Sink/Source SW	Set the logic of the driver connector
Driver I/O 5V/24V SW	Set the voltage of the driver connector

Chapter 5 Installation

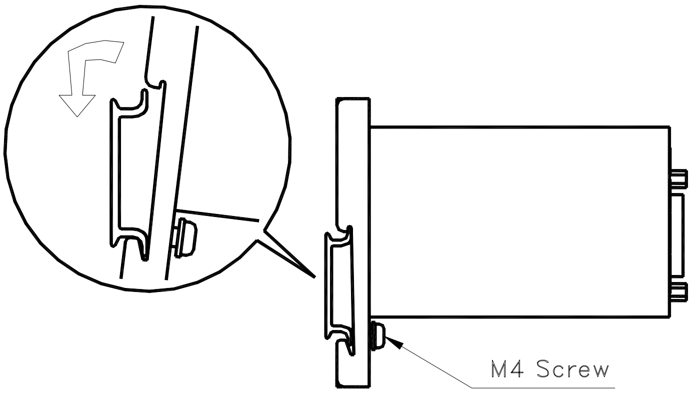
5.1 How to Install the SCX10

You can install the **SCX10** by one of the three following methods.

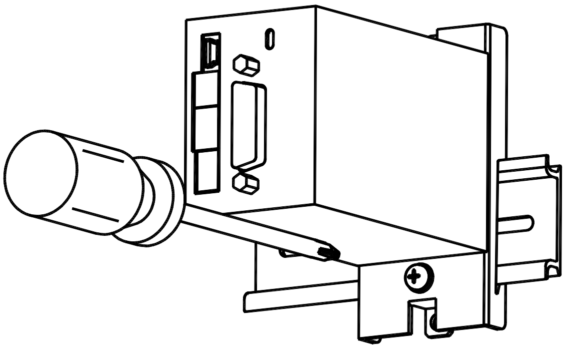
1. Mounting to a DIN rail

a. Loosen the M4 screw on the **SCX10**, using a screw driver.

b. Press the hook under the M4 screw onto the DIN rail, and push the upper hook of the **SCX10** onto the DIN rail.

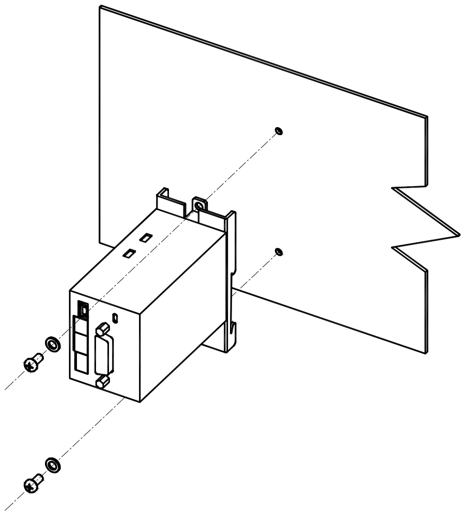


c. Tighten the M4 screw on the **SCX10**, using a screw driver.
*Tightening torque: 1.4 N・m (M4)



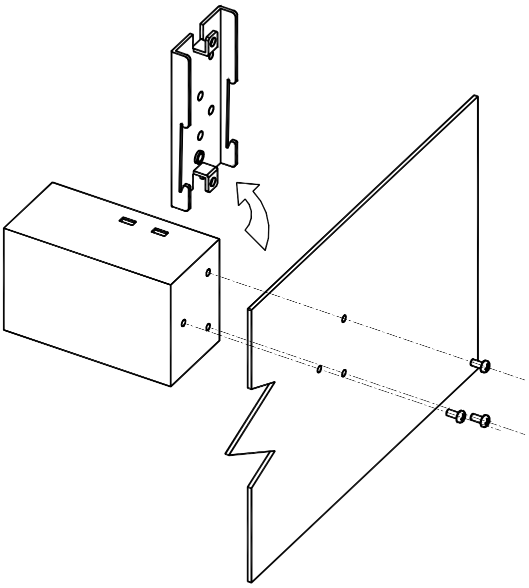
2. Mounting to a plate (Installation method A)

Secure the controller mounting bracket to a plate using two screws（M4, not included）.
*Tightening torque: 1.4 N・m (M4)



3. Mounting to a plate (Installation method B)

Remove the mounting bracket from the **SCX10**.
Secure the **SCX10** to a plate from the backside using three screws (M3, not included).
The thickness of the **SCX10** housing = effective depth of screw holes is 2 mm. Do not use screws with a length that will allow them to enter the **SCX10** more than 4 mm (including the 2 mm housing thickness) from the back. The use of longer screws can short-circuit in the **SCX10**.
*Tightening torque: 0.5N・m (M3)



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 7.

■ 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

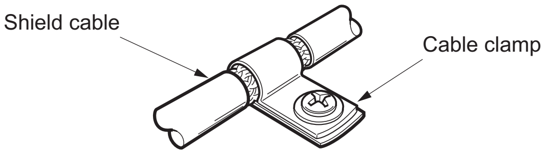
Use a 24 VDC power supply conforming to the EMC Directive.
Use a shielded cable for wiring and wire/ground the 24 VDC power supply over the shortest possible distance.
Refer to "Wiring the power supply cable and signal cable" below for how to ground the shielded cable.

■ 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. An optional driver cable is available (sold separately).
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.

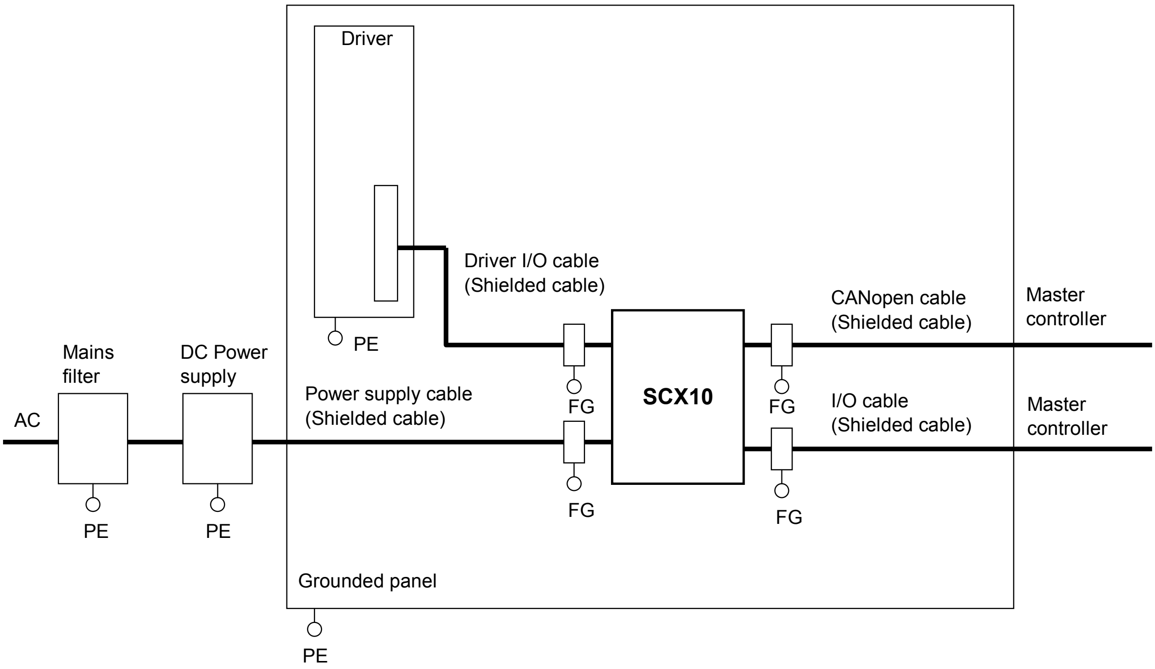


Notes about Installation and Wiring

- 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 SCX10 Module and Driver Installation and Wiring



Precautions about Static Electricity

Static electricity may cause the **SCX10** to malfunction or suffer damage. While the **SCX10** is receiving power, handle the **SCX10** with care and do not come near or touch the **SCX10**.

Note The **SCX10** uses parts that are sensitive to electrostatic charge. Before touching the **SCX10**, turn off the power to prevent electrostatic charge from generating.

If an electrostatic charge is impressed on the **SCX10**, the **SCX10** may be damaged.

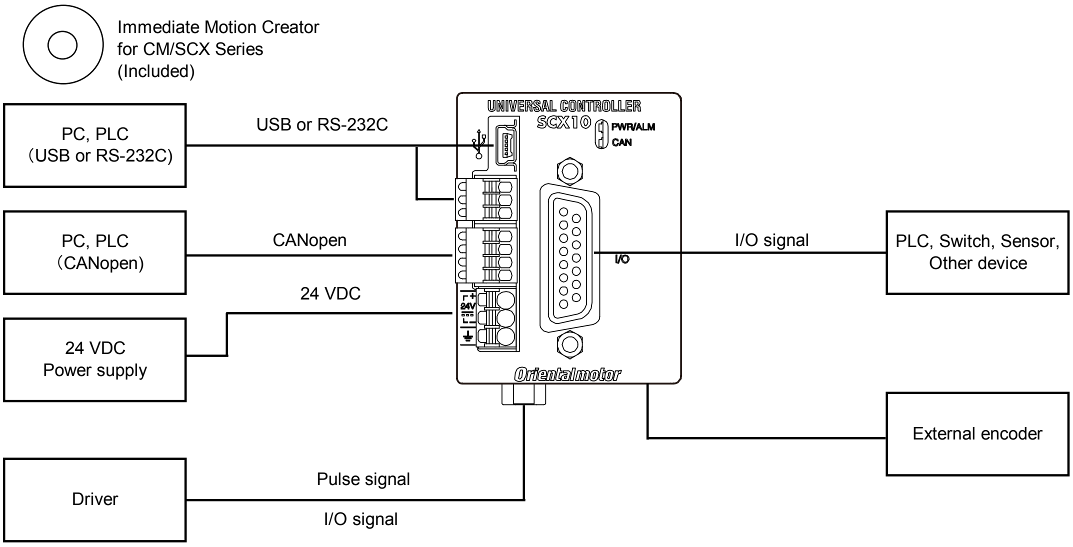
Chapter 6 Connection

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 **SCX10** 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 "Chapter 7 Start Up (Immediate Command)" on page 67.

■ Contents

6.2 Connecting the Power Supply
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	Immediate Command	Program Creation	Program Select and Execution
USB	✓	✓	✓
RS-232C	✓	✓	✓
CANopen	✓	–	✓
I/O	–	–	✓

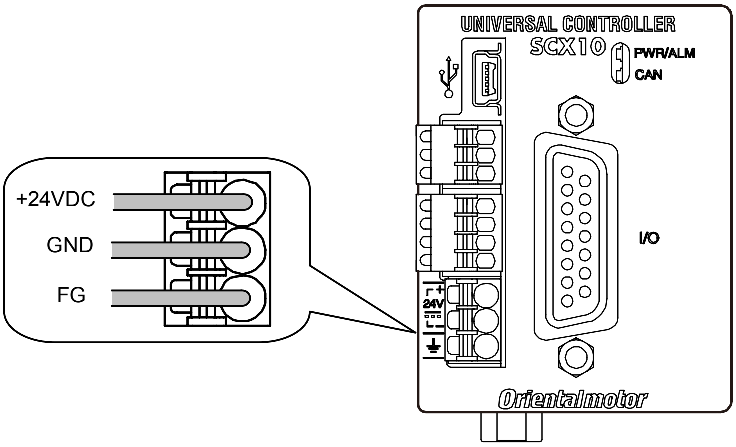
6.2 Connecting the Power Supply

■ 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 **SCX10**.

■ Grounding SCX10

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), and do not share the protective earth terminal with a welder or any other power equipment.



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 **SCX10** 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 **SCX10** 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 **SCX10** is connected via USB, setting data to more than 256 pieces of **SCX10** 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 **SCX10**.

■ USB Driver Installation

Insert the supplied CD-ROM into the CD-ROM drive of the computer, power on the **SCX10** and Connect to a USB port using a Mini-B cable. Prepare a commercially available USB mini-B cable. 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 **SCX10** 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 **SCX10** 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."

Windows 2000:

1. The "Found New Hardware Wizard" will be launched when the **SCX10** is connected. Click "Next."
2. For the FT232 USB UART installation, select "Search for a suitable driver for my device," and click "Next."
3. Check the box next to "Specify a location" and uncheck all others. Click "Next."
4. Click "Browse." Select the applicable CD-ROM drive and click "Open." Locate the "USB_Driver" folder and click "Open." Click "OK." Click "Next." After successful installation, click "Finish."
5. The installation of the USB Serial Port is then asked by Windows. Repeat same procedure as the above FT232 USB UART installation. After successful installation, click "Finish."

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

While all commands for the **SCX10** 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. All 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 2000 SP3 or later, Windows XP SP2 or later, Windows Vista, Windows 7
- .NET Framework 2.0 or greater
- 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 Installation (For Windows 2000 and Windows XP)

IMC runs on the Microsoft .NET Framework 2.0. While Windows Vista and Windows 7 normally install the .NET Framework, Windows 2000 and Windows XP require a separate installation. If the .NET Framework 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 2000 SP3 or later, Windows XP SP2 or later
- Disk Space: 280 MB (x86)

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

• Start

1. Connect the **SCX10** by USB Mini-B cable
2. Power on the **SCX10**
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 **SCX10**. The **IMC** will be launched.

The **IMC** is made to be intuitive to use. For instructions, refer to the HELP command in the **IMC**, as necessary.

- 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 the ECHO (Echo ON/OFF) and VERBOSE (respond with data and description/respond with data only) parameters of the **SCX10** 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 **SCX10**
   (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", 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 **SCX10** for the new settings to become effective

■ Setting the Baud Rate

Since the USB on the **SCX10** talks to the virtual COM port on the computer, the baud rate for the COM port and the baud rate for the **SCX10** need to be the same.
The default USB baud rate of the **SCX10** is 9600 bps, same as the default baud rate of a general Windows computer. If the baud rate on the computer or the **SCX10** 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 **SCX10** according to the following steps.

1. Turn on the power for the **SCX10** 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 **SCX10** is already communicating with your computer at 115200 bps.

Note When starting communication with the **SCX10**, be sure to set the baud rate of the **IMC** to the same baud rate that has been set to the **SCX10**. If you are unsure about the baud rate of the **SCX10**, 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 **SCX10**, wait for a few seconds and restart. Take the same action 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 **SCX10**, or check the COM port property of Windows if the application does not have the baud rate function.
- The **SCX10**:
  The USBBAUD is the command used to change the baud rate for the USB connection. Always set the **SCX10** 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 **SCX10**).

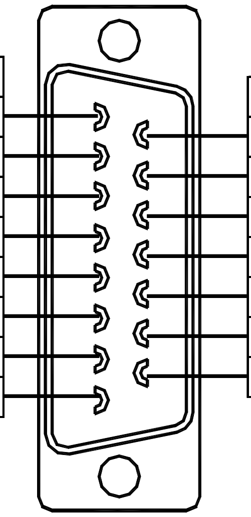
6.4.1 Pin Assignments

At the time of shipment, specific signals 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).

■ 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



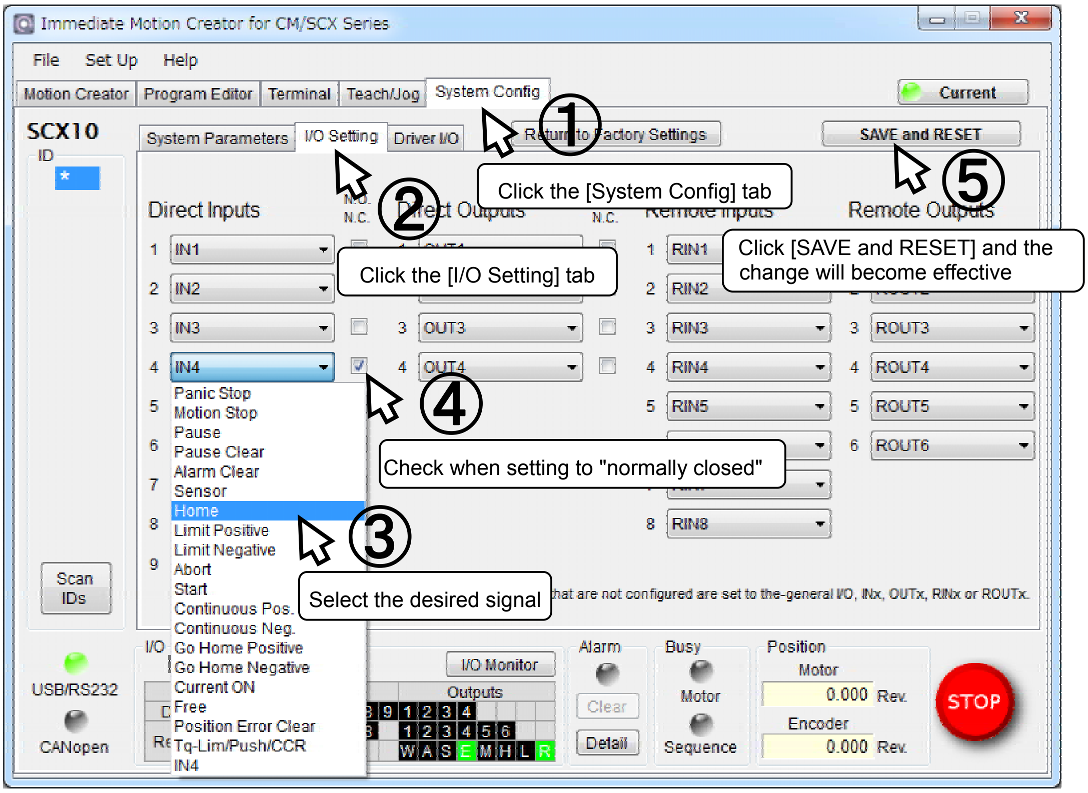
Pin No.	Signal	Description
9	IN1	General input
10	IN3	General input
11	IN5	General input
12	IN7	General input
13	IN9	General input
14	OUT2	General output
15	OUT4	General output

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 **SCX10** to a computer and activate the **IMC**. Connect the **SCX10** to a computer, launch the **IMC** and follow the steps below.



① Click the [System Config] tab

② Click the [I/O Setting] tab

③ Select the desired signal

④ Check when setting to "normally closed"

⑤ Click [SAVE and RESET] and the change will become effective

The setting can be performed by command input. 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
PAUSECLR (pause clear)	INPAUSECL	PAUSECLLV
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)	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 /current cutback release)	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	-

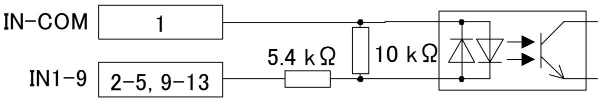
The following example is a command to assign the FREE input to the IN3 and set to "normally closed."

```
>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 setting. 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-CON 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 121.

- 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 servomotors and αSTEP products immediately. The action of the motor curernt and the alarm state after the PSTOP operation is determined by the ALMACT command.
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.
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 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 START input is turned ON while in a paused situation while the sequence continues running by waiting for the end of paused motion, or if the CONT command is executed, the remaining motion will be started.
If the PAUSECL input is turned ON or the PAUSECL 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.

• LSP (limit switch negative) Input/LSN (limit switch positive) 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 servomotors and αSTEP 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 LSN/LSP 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 servomotor), while freeing the motor shaft when OFF.
This signal also controls the power to the MBFREE (electromagnetic 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 has lower priority and is ignored.
- If the CON input is not assigned to any input, the motor current at power on is determined by the STRSW setting.
- If the CANopen is active and the CON input is assigned to the I/O connector, the motor current becomes ON only when all active CON inputs are ON.
- 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. For cases where the driver has READY output (ex. **AR**/**NX** Series driver), connect the READY input for driver on the SCX10 and set to enable (DREADY=1). The position error will not occur.

• 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 "Chapter 13 Troubleshooting" on page 358.

- START (start sequence) Input

This signal is used to start the sequence execution as determined by the selected IN1 to IN7.
Set the starting method using the STARTACT command.

STARTACT	Operation
0	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF does not stop sequence. ABORT input is needed for aborting sequence.
1	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF aborts the sequence.

- ABORT (abort) Input

This signal is used to terminate a sequence and/or 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

- When the driver has the FREE input: Connect the FREE input of the driver to the FREE output on the driver connector on the **SCX10**. 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).
- When the driver has the M.B.FREE input: Connect the M.B.FREE input to the M.B.FREE output on the driver connector on the **SCX10**. When turning this signal (the FREE input) ON, the electromagnetic brake will be released (The M.B.FREE input of the driver is turned ON).
  *The motor current is not controlled.

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 value is set to equal to PF value. As a result, the PE is reset to zero. 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 (commanded position) such as overload alarm condition.
The leading edge of the signal will cause the action.

- TL (torque limiting/push-motion operation/current cutback release) Input

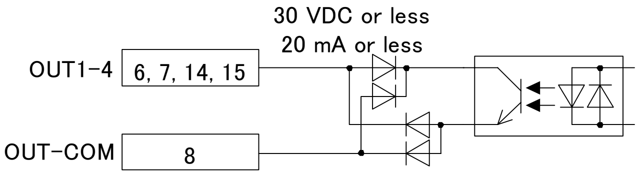
This signal is used to perform the following functions.
- **AR** Series driver: push-motion operation
- **NX** Series driver: torque limiting
- **CRK**, **CMK** Series driver: current cutback release

Memo The TL output of the driver connector on the **SCX10** will turn ON and OFF in synchronization with this TL input. To operate the function of this signal, it is required to connect the T-MODE input of the **AR** Series driver, the TL input of the **NX** Series driver, the C.D.INH input of the **CRK** Series driver or the ACDOFF input of the **CMK** Series driver to the TL output on the driver connector in advance.

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 setting. 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:
- Enter an 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 "Chapter 13 Troubleshooting" on page 358.

- END (motion end) Output

When in the following condition, END signal will be active.
When the DEND parameter is set to zero (0):
The END signal output is unrelated to the driver end signal.
・If the ENDACT is set to zero, the END output references only the end of pulse generation.
If the ENDACT is set to nonzero, the END output references both the end of pulse generation and the end area.
・The value of the ENDACT parameter determines the end area = acceptable position error (PE), where PE is the difference between commanded position (PC) and feedback position (PF).
This internal end status is then sent to DEND to select use of either internal end status or driver end signal.

When the DEND parameter is set to one (1) :
The state of the END output is the same as state of the driver END signal.

The relationship among the status of END signal output condition and ENDACT and DEND are as below

END Signal Output Condition	ENDACT	DEND
End of pulse	0	0
End of pulse AND Within end area	0 < (End Area)	0
Driver END signal	Unrelated	1

- RUN (sequence running) Output

This signal is output during sequence program execution.

Note

- 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 output while pulses are being outputs and is not related with the MOVE input on the driver connector of the **SCX10**. The MOVE input on the driver connector of the **SCX10** is referred only when the sensor-less home seeking is performing with the **ESMC** controller.

- READY (operation ready) Output

This signal is turned ON when the **SCX10** 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.
Ready status is equal to other than MOVE, RUN and ALARM status.

If "DREADY" is set to 1, 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 (It is required to connect the READY output of the driver to the READY input on the driver connector of the **SCX10** in advance). See the READY input on p.38 for the operation.

- LC (limiting condition) Output

This signal is turned ON under the following conditions.

- **AR** Series 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.
- **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)
- **RBK** Series driver: Under current cutback condition
- **ESMC** controller: While pressing the mechanical home when performing sensorless mechanical home seeking operation.

Memo The LC output on the driver connector of the **SCX10** will turn ON and OFF in synchronization with the LC input. To operate the function of this signal, it is required to connect the TLC output of the **AR** Series/**NX** Series driver, the CD output of the **RBK** Series driver or the T-UP output of the **ESMC** controller to the TL output on the driver connector of the **SCX10** in advance.

- 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 PAUSECL, START 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.

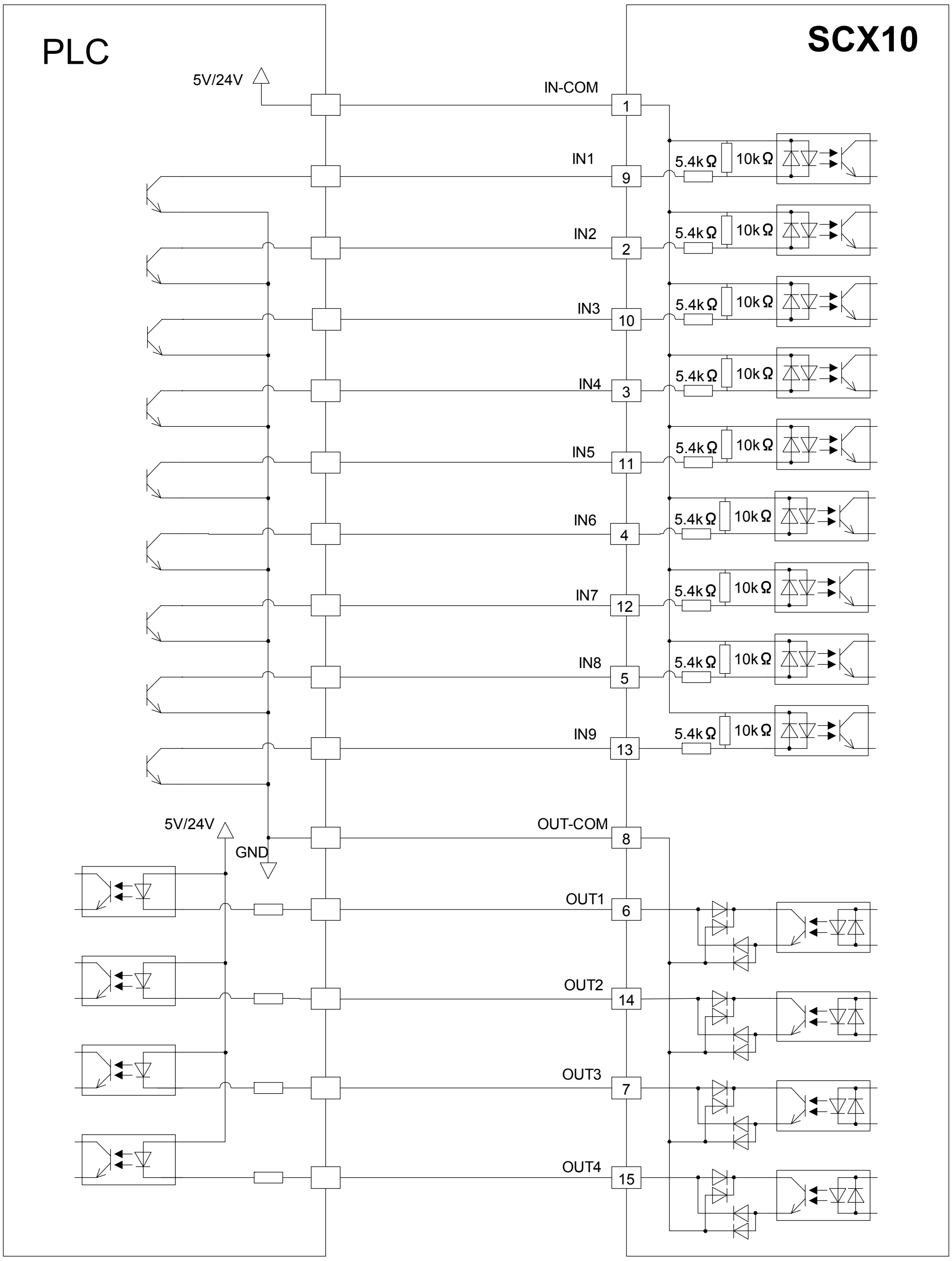
CURRENT	FREE	MBFREE
0	0	0 (Lock)
0	1	1 (Free)
1	0	1 (Free)
1	1	1 (Free)

*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 **SCX10**.

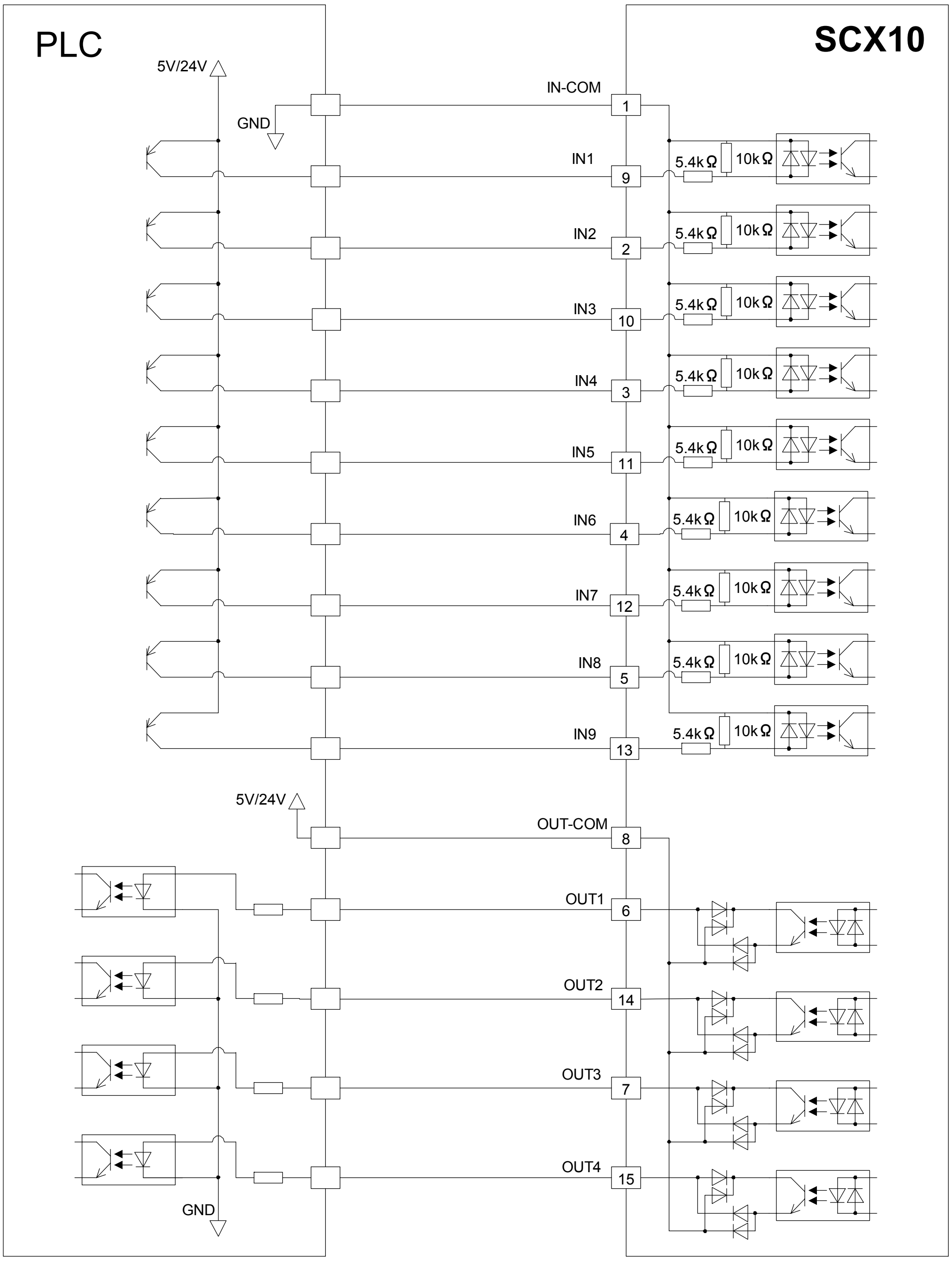
Note Once the motor has lost its holding torque, the equipment may move due to gravity or the presence of a load before the electromagnetic brake generates holding force.

6.4.4 Connection Example of I/O

■ Current Sink



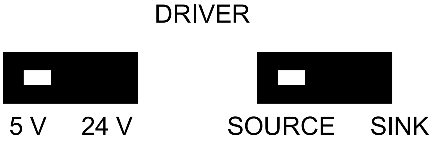
■ Current Source



6.5 Connecting the Driver

6.5.1 I/O Voltage and Logic

Set the voltage and logic switches according to the driver.
Example: Set to 5 V and current source logic



Memo Most of Oriental Motor's driver can be used with either source logic or sink logic. Selection can be made according to your needs. The switch should be set to match with the selected drivers' logic.

Note
- The **SCX10** supplies the power to the driver to turn the photo couplers on the driver ON or OFF. Selecting the wrong voltage and/or wrong logic may damage the driver and/or the **SCX10**.
- Set the voltage switch to 5 V for most of Oriental Motor's drivers while the **ESMC** controller requires setting to 24 V.

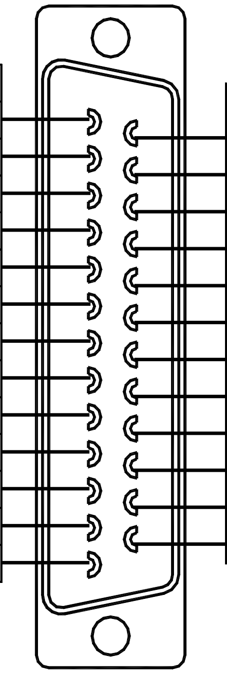
6.5.2 Signal Assignmens

■ Pin Assignments and Connector Function Table

Connect the I/O signal cable to the connector while checking the pin numbers in "Connector function table" provided below. (The connector is not supplied. Provide a 25 Pin D-Sub connector separately.)

See the following pin assignments for a solder type connector.

Driver general I/O when canceling assignment	Description	Signal name	Pin No.
–	Pulse/CW Pulse output	PLS/CW+	1
–	Direction/CCW output	DIR/CCW+	2
–	ASG Differential input	ASG+	3
–	BSG Differential input	BSG+	4
IN7	Timing/ZSG Differential input	TIMD+	5
–	Ground Connection	GND	6
OUT2	Motor Current On output	CON	7
OUT4	Resolution Selection	CS	8
OUT6	Magnetic Brake Free output	MBFREE	9
OUT8	General output	OUT8	10
IN2	Positioning Complete input	END	11
IN4	Limiting Condition input	LC	12
–	5V/24V output	5V/24V OUT	13

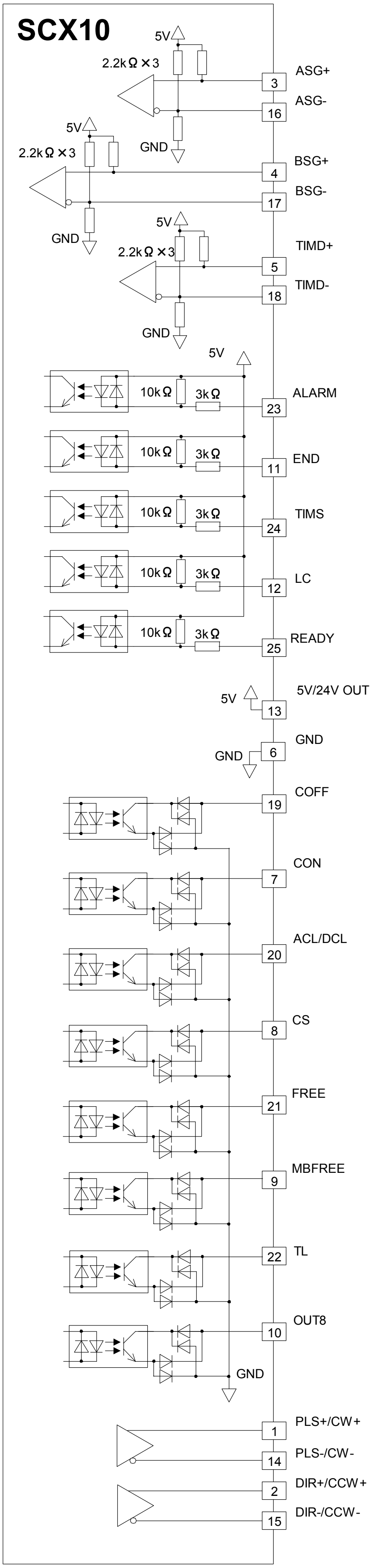


Pin No.	Signal name	Description	Driver general I/O when canceling assignment
14	PLS/CW-	Pulse/CW Pulse output	–
15	DIR/CCW-	Direction/CCW output	–
16	ASG-	ASG Differential input	–
17	BSG-	BSG Differential input	–
18	TIMD-	Timing/ZSG Differential input	IN7
19	COFF	Motor Current Off output	OUT1
20	ACL/DCL	Alarm Clear/Deviation Counter Clear output	OUT3
21	FREE	Motor Shaft Free output	OUT5
22	TL	Torque Limiting output	OUT7
23	ALARM	Alarm input	IN1
24	TIMS	Timing/ZSG Signal Ended input	IN3
25	READY	Operation Ready input	IN5

Memo The connector shell is connected to the FG terminal.

Note Be sure that the **SCX10** is not powered ON when the I/O connector is connected to, or disconnected from the driver. The connection or disconnection with power is ON damages the interface circuit in the **SCX10**.

■ Internal Circuit



6.5.3 Change of Signal Assignment

Signals are pre-assigned to the driver I/O so as to match with most of Oriental Motor products without any changes. However, it is required to change the assignment in the following cases.

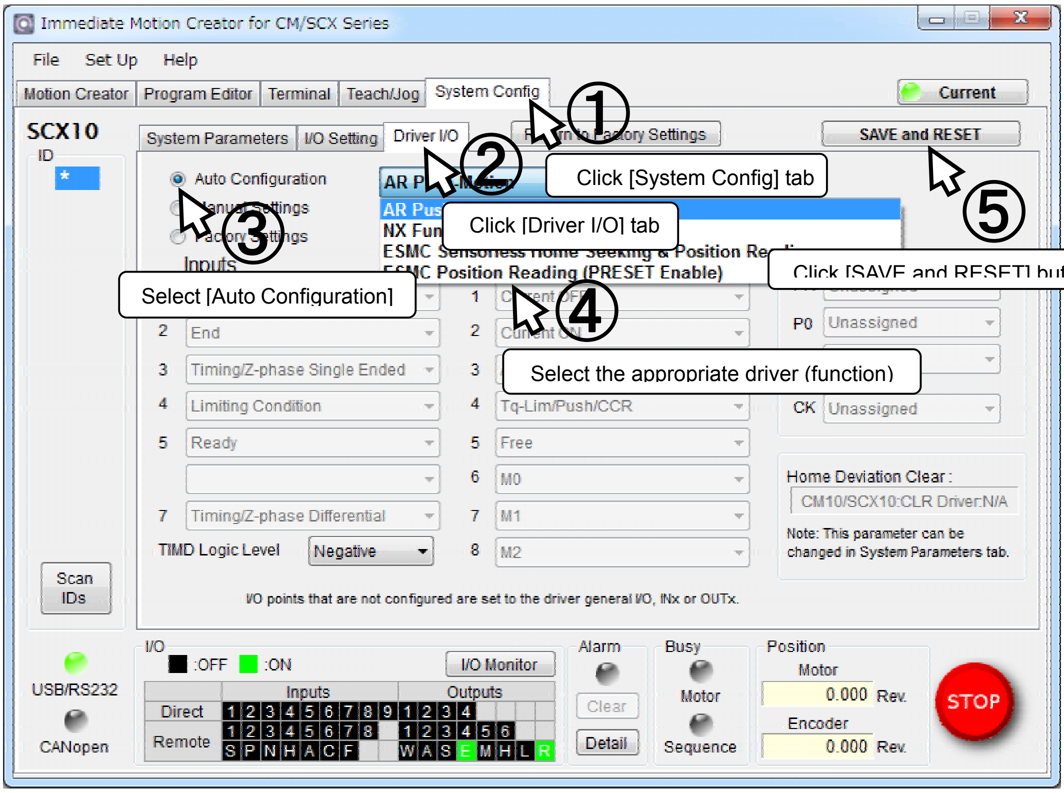
- With the **AR** Series driver (AC and DC power input type), when push-motion operation is used
- With the **NX** Series Driver, when torque limiting function is used, when current position reading function is used, or when accurate mechanical home seeking operation using the Z-phase signal (timing signal) etc. is required
- With the **ESMC** controller, when sensorless mechanical home seeking operation is used or, when current position reading function is used

Change the driver I/O using the "Automatic Setting" function of the provided utility software, **Immediate Motion Creator for 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 and current reading functions are implemented in the firmware Ver.2.00 or later of the **SCX10**. 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 **SCX10**. 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 **SCX10** to a computer and activate the **IMC**.



① Click [System Config] tab

② Click [Driver I/O] tab

③ Select [Auto Configuration]

④ Select the appropriate driver (function)

⑤ Click [SAVE and RESET] button

■ Automatic Setting Types

The following selections are available for setting. (In case of the **IMC** Ver. 2.02)

Selection	Description	Signals to be assigned	Signals to be deleted	Connection diagram
AR Push-Motion	With the **AR** Series driver, when using the push-motion operation function (disabling the resolution switching function)	M0, M1, M2	MBFREE	46 to 47
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)	M0, M1, PRESET, REQ, PR, CK, P0, P1	COFF, CS, MBFREE	58 to 59
ESMC Sensorless Home Seeking & Position Reading	With the **ESMC** controller, when sensorless mechanical home seeking operation is performed (The current position reading function will also be effective but the PRESET signal that sets the home position at an arbitrary position will not be effective)	REQ, PR, CK, P0, P1, HOME, HMSTOP, MOVE	CON, TL, READY	54 to 55
ESMC Position Reading	When using the current position reading function of the **ESMC** controller (The PRESET signal that sets the home position at an arbitrary position will be effective but sensorless mechanical home seeking operation cannot be used)	PRESET, REQ, PR, CK, P0, P1, MOVE	CON, READY	56 to 57

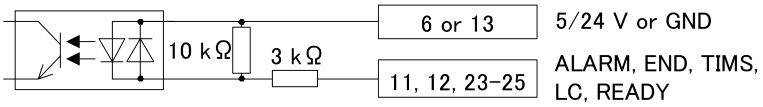
Memo

- 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 required to the driver. Refer to page 91 "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" or page 96 "8.4 Torque limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)" for details.
- For the driver I/O assignment by each setting, refer to the wiring diagram in this manual, or the driver I/O setting or I/O status monitor of the **IMC**.
- 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. "Refer to page 84 "8.2.5 Motion Types, HOMEDCL (deviation counter clear select at home seeking operation)" When setting manually, set under "System Parameters" tab.
- 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 "6.5.4 Input Signals for Driver" (page.37-) or "6.5.5 Output Signals for Driver" (page.40-).

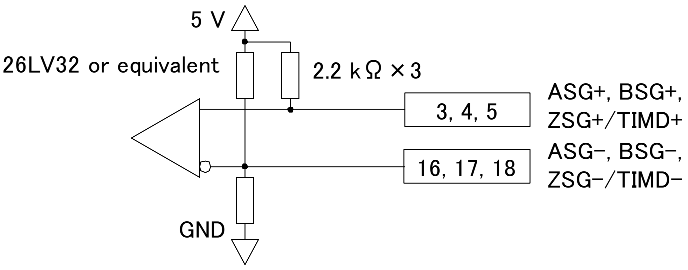
6.5.4 Input Signals for Driver

■ Internal Input Circuit

All input signals for the driver except for the encoder inputs 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.



The encoder inputs are line receiver inputs. These inputs can be connected to line driver, open collector and TTL output encoders, since the resistors are configured as shown in the figure.



Note When this input is used, connect the GND on the **SCX10** and the GND on the driver. Otherwise the **SCX10** may be damaged by a potential difference.

■ Signals

- ALARM (alarm) Input

This signal is used to input the alarm signal (ALM) or over heat signal (O.H.) from the driver.
If a driver alarm has occurred, the system ALARM signal/status becomes active (alarm code 6E: 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 **SCX10** detects the OFF status of driver output as the driver is in an alarm condition.) If there is a selectable switch for the alarm logic on the driver, set it to "Normally Closed."
- The DALARM parameter enables/disables the use this signal. (The factory setting is inactive.) Set DALARM=1 to enable this input if the driver alarm signal is used.

Note If the power on timing of the driver is delayed from the **SCX10**, 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 (positioning complete) Input

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. This terminal should be connected when using an αSTEP or a servomotor system.

- The DEND parameter selects the source of system END status, either driver end signal or the internal end signal. (The factory setting is DEND=0, the use of internal end signal.) Set DEND=1 to select this input if the driver end signal is used.

- TIMS (timing signal･Z-phase pulse single ended input) Input

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 servo motor 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 81.)

- 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=0, TIM=1, the use of TIMS.)

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)

- TIMD (timing signal･Z-phase pulse differential input) Input

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) Input

This signal is used to input the pulse output signal (ASG, BSG) from the driver that corresponds the motor operation.
The **SCX10** continuously monitors the feedback position (PF), calculated from encoder counter (EC). 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 "8.8 Encoder Function" on page 104.

- 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 (**ESMC** controller)

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). When connecting to the **ESMC** controller, this signal is used when performing sensorless mechanical home seeking operation.

- READY (operation ready) Input (**AR**/**NX** Series driver)

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 **SCX10** is "DREADY=0," and the READY signal from the driver is used). Set the parameter to "DREADY=1" when not using the READY signal from the driver.

- PR (position data output ready) Input (**NX** Series driver, **ESMC** controller)

This signal is used to read the drivers' current position. 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 assigning). 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 (**NX** Series driver, **ESMC** controller)

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 assigning). 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 (**NX** Series driver, **ESMC** controller)

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 assigning). And it automatically switches to the P1 input only when executing the current position reading command (ABSREQ and ABSREQPC).

- LC (limiting condition) Input

This signal is used to input the TLC signal of the **AR** Series/**NX** Series driver, the CD signal of the **RBK** Series driver or the T-UP signal of the **ESMC** controller. It will be turned ON under the following conditions.

- **AR** Series driver: When the motor is in a state of push-motion operating condition (the position deviation is 1.8 degrees or more) while in the normal operating mode, or when the motor torque reaches to the preset value in the current control operating mode.
- **NX** Series driver: When the motor torque reaches the preset value while the torque limiting function is used
- **RBK** Series driver: Under current cutback condition
- **ESMC** controller: While pressing the mechanical home when performing sensorless mechanical home seeking operation.

When the LC output is assigned to the I/O connector, the LC output will turn ON and OFF according to this signal. Using the DSIGLC command, you can check the signal status (It can also be used in a sequence).

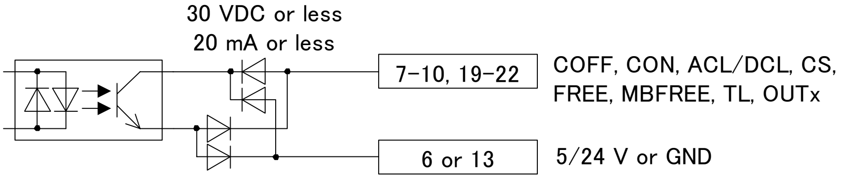
Memo

- The warning outputs from the **AR** Series, **NX** Series drivers and the electromagnetic brake control signal output from the **NX** Series driver are not supported. To use these signals, prepare the driver general input by canceling the assignment for one of the inputs (IN1 to IN5) on the driver connector of the **SCX10**, and then connect to it. By using the DIN1 to DIN5 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 and **NX** Series drivers 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 **SCX10** respectively. To read the ALARM code, cancel the assignment of READY, LC and TIMS to be the driver general input IN3, IN4 and IN5. Using the DIN3, DIN4 and DIN5 commands, 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 and **NX** Series driver is 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 **SCX10**, or combining the command PE that returns the position deviation and an "IF" statement. 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 ZSG2 output, is connected to TIMS of the **SCX10**. To read the NEAR output, cancel the assignment of the TIMS signal or an unnecessary signal to be the driver general input. Using the DINx 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.
- When assigning or canceling the driver signal, use the provided utility software **Immediate Motion Creator for CM/SCX Series (IMC)**. When selecting "Manual Settings" on [System Config] - [Driver I/O] screen, the driver I/O can be set individually.

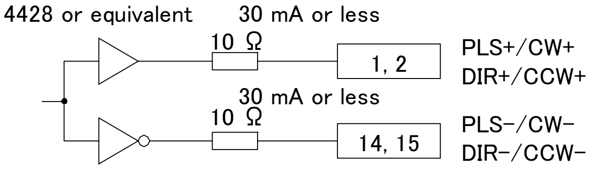
6.5.5 Output Signals for Driver

■ Internal Output Circuit

All output signals for the driver except for the pulse outputs 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.



The pulse outputs employ differential outputs. This output can be connected to photocoupler inputs and line receiver inputs.



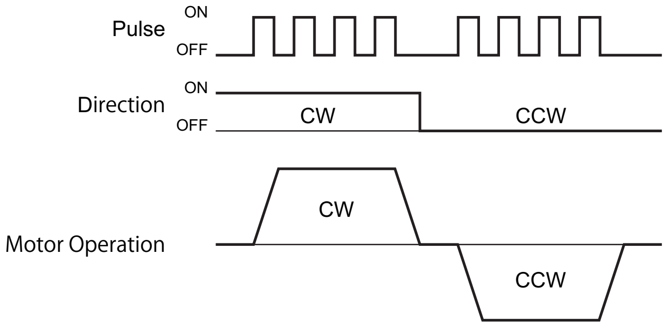
■ Signals

- PLS/CW and DIR/CCW Output

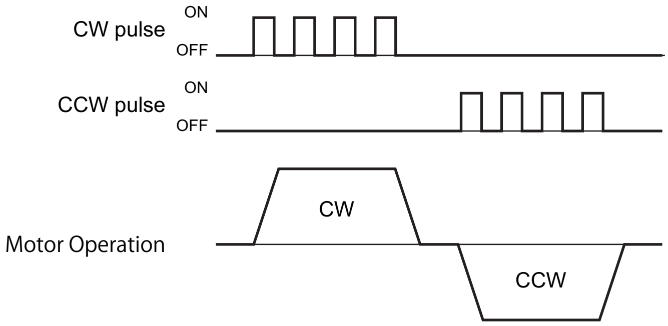
These terminals are used to output the pulse and direction signals to the driver.
Both the 1 pulse input mode and the 2 pulse input mode are supported. In the 1 pulse input mode, the motor will rotate in the CW direction with the DIR (direction) output turned ON and in the CCW direction with the DIR Output turned OFF. In the 2 pulse input mode, pulses for the CW and the CCW are provided separately to each terminal. The output mode may be switched between 1 pulse and 2 pulse modes via the PULSE parameter. (Set PULSE=0 for 2 pulse mode, PULSE=1 for 1 pulse mode. Factory setting of the parameter is PULSE=1.)
Additionally, the output logic can be changed using the PLSINV command.

Note If the driver for the 2-phase **CSK** Series or the **UMK** Series is connected to **SCX10**, only 2-pulse mode should be used. With the 1 pulse mode, some pulses may be missed when reversing due to a delay in response on the driver interface.

1 pulse mode



2 pulse mode



- COFF (motor current OFF) Output

This signal is used to toggle the motor current. The motor current is OFF when this signal is ON. Connect this signal to the C.OFF (current off) or AWO (all windings off) input on the driver, if the driver has either of these inputs.
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. The STRSW parameter determines the motor current ON or OFF when the device is powered on.
The "Current Off" command always has higher priority than "Current ON" among CON in system input, CON in remote (CANopen) input and CURRENT command.
The function of this signal is exactly the same as the CON input, except the logic is opposite.

- CON (motor current ON) Output (**AR**/**NX** Series driver)

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. 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 input, except the logic is opposite.

- ACL/DCL (driver alarm clear/deviation counter clear) Output (**AR**/**NX** Series driver)

This signal is used to clear the alarm status and the deviation counter of the driver. Connect this signal to the ACL (alarm clear) or CLR/ALM-RST (deviation counter clear / alarm reset) input terminal on 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.
This signal also functions as the deviation clear output for stopping servomotors and αSTEP products immediately. The deviation counter clear output momentarily becomes active when the limit sensors (LSN/LSP signal) are detected (when OTACT=0), the PSTOP is commanded, the PECLR is commanded (when driver alarm is inactive) and a mechanical home seeking is performed (when HOMEDCL=1).

- CS (resolution selection) Output

This signal is used to select the motor resolution. Connect this signal to the CS (change step) input terminal of 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 using the STRDCS command.

STRDCS=0: CS output is OFF at system start up
STRDCS=1: CS output is ON at system start up

- FREE (motor shaft free) Output (**AR**/**NX** Series driver, **ESMC** controller)

This signal is used to make the motor shaft free (motor current OFF and release the electromagnetic brake at the same time). Connect this signal to the FREE input terminal on the driver.
This signal can be controlled using 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 FREE output becomes ON. (The FREE input of the connected driver becomes ON.) That causes the motor current to be turned OFF and the electromagnetic brake will be released. The FREE command can always be used to control the FREE output regardless of the states of those inputs.

- HOME (sensor-less home seeking operation start) Output (**ESMC** controller)

This signal is used to start sensor-less home seeking operation.
It becomes effective when setting a mechanical home seeking operation mode (homing type) to "HOMETYP=12." See "8.2.5 Mechanical Home Seeking" in more detail.

- HMSTOP (sensor-less home seeking operation stop) Output (**ESMC** controller)

This signal is used to stop sensor-less home seeking operation.

- REQ (position data transmission request) Output (**NX** Series driver, **ESMC** controller)

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 (**NX** Series driver, **ESMC** controller)

This signal is used to set the driver's current position to the PRESET position (home position).

- CK (position data transmission clock) Output (**NX** Series driver, **ESMC** controller)

This signal becomes effective when executing the current position reading command (ABSREQ and ABSREQPC). It is the clock signal to request the data.

- TL (torque Limiting/push-motion operation/current cutback release) Output (**AR**/**NX** Series driver)

This signal is used to perform the following functions.

- **AR** Series driver: push-motion operation
- **NX** Series driver: torque limiting
- **CRK**, **CMK** Series driver: current cutback release
  (The current cut back release can be performed by turning the TL input signal ON or commanding TL =1.)

- M0/M1/M2 (data select bit 0/bit 1/bit 2) Output (**AR**/**NX** Series driver)

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.

- MBFREE (magnetic brake free) Output (**RK** Series driver)

This signal is used to control the electromagnetic brake. Connect this signal to the M.B.FREE input terminal on the driver. With standard Oriental Motor's stepping motor drivers, when the M.B.FREE input on the driver is ON, power to the electromagnetic is supplied and electromagnetic brake is disengaged (Free).
The MBFREE output is ON under normal operating conditions 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).
The MBFREE can also be manually controlled with the FREE function status. The state of the FREE function can be controlled using 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 these 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.

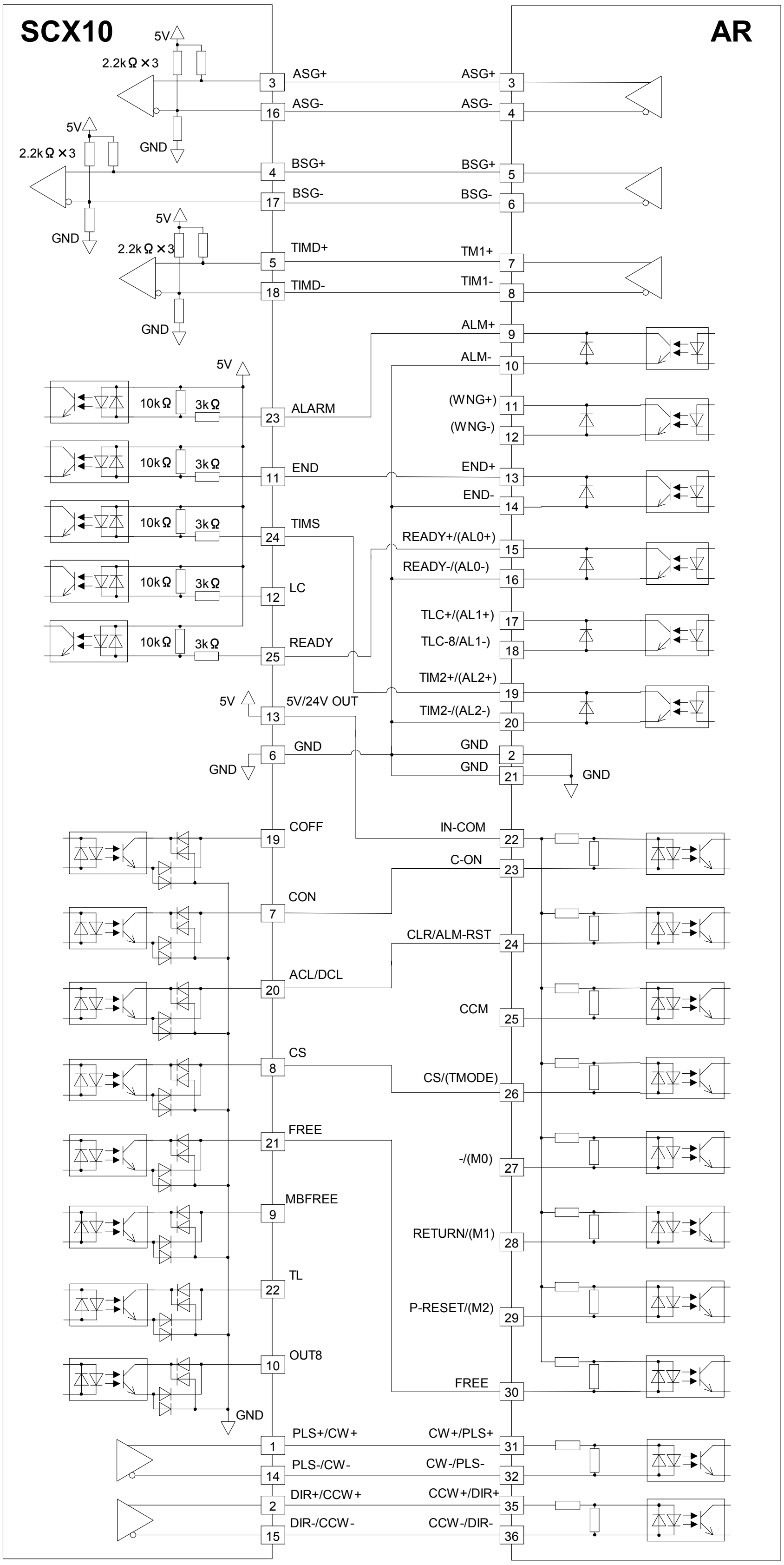
CURRENT	FREE	MBFREE
0	0	0 (Lock)
0	1	1 (Free)
1	0	1 (Free)
1	1	1 (Free)

*The state of MBFREE output on the driver connector of the **SCX10** is always the same as the state of the MBFREE on the I/O connector.

Memo The current control mode ON (CCM) function of the **AR** Series driver is not supported. However, if this signal is connected to the general output OUT8, it can be operated to turn "ON and OFF" by the OUT8 command (ON: OUT8=1, OFF: OUT8=0). It can also be used in a sequence.

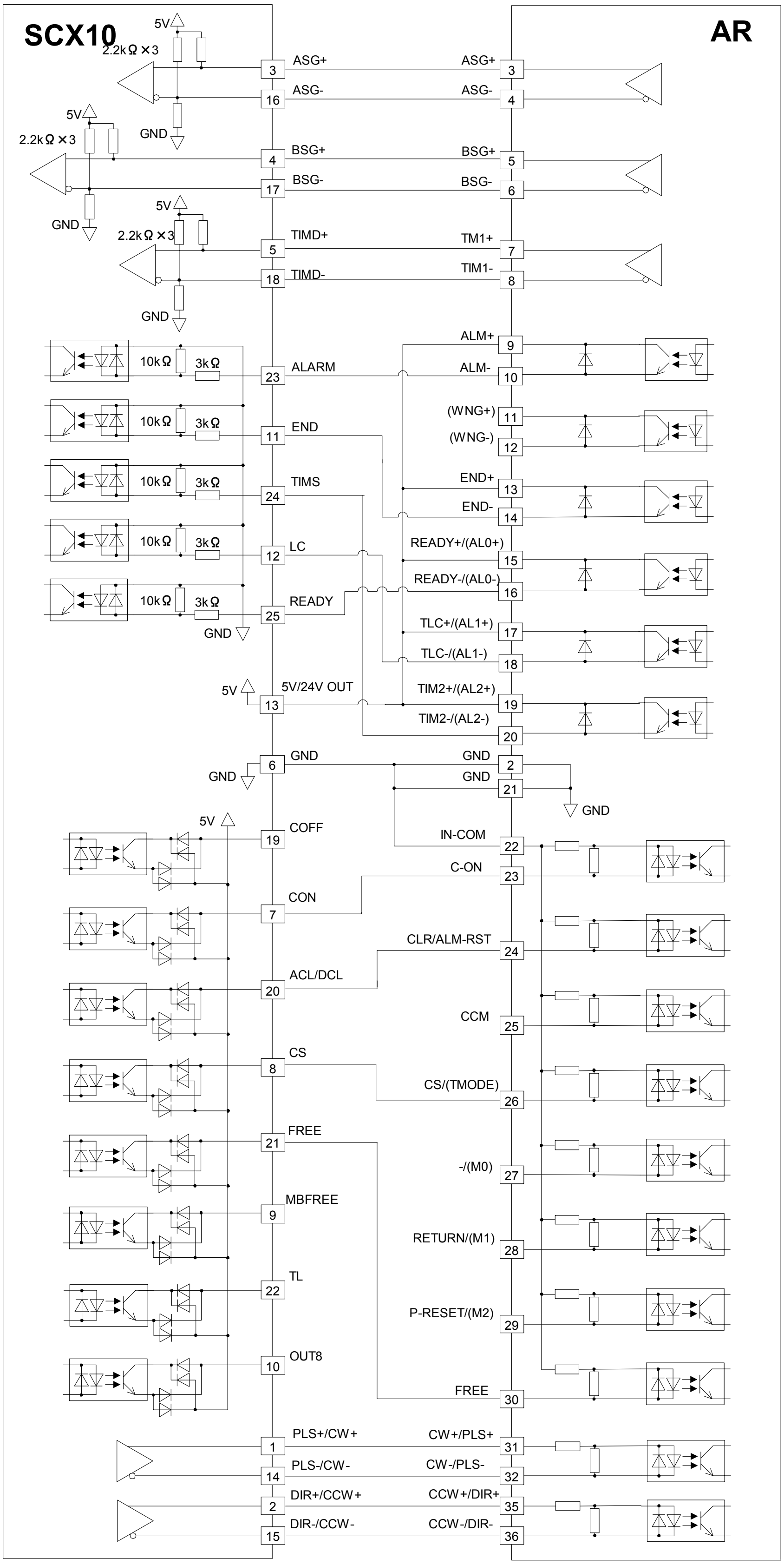
6.5.6 Connection Example of Driver

■ AR Series Driver (Current Sink)



SW Setting
SINK/SOURCE :SINK
5V/24V :5V

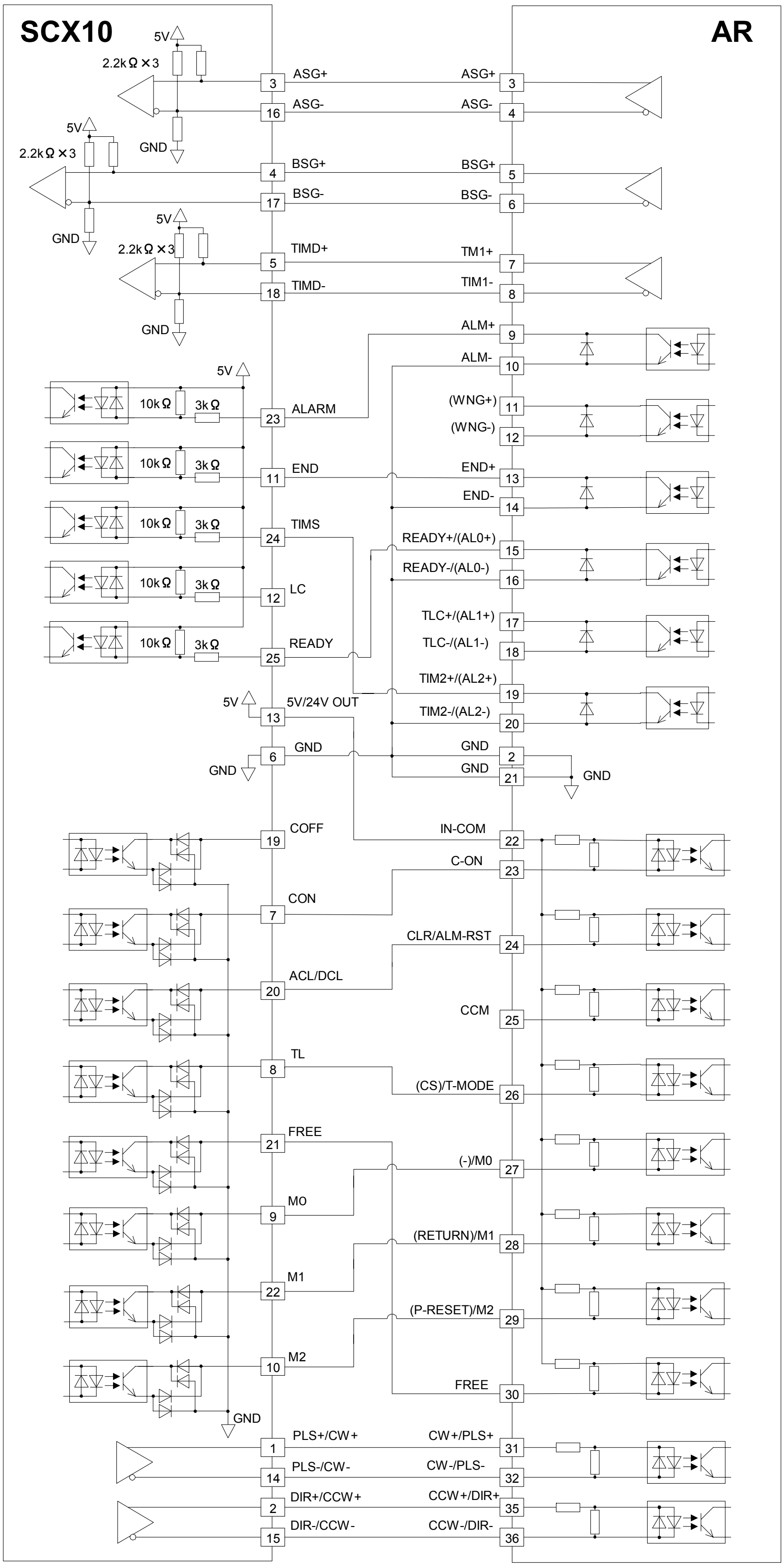
■ AR Series Driver (Current Source)



SW Setting
SINK/SOURCE :SOURCE
5V/24V :5V

■ AR Series Driver Push-Motion (Current Sink)

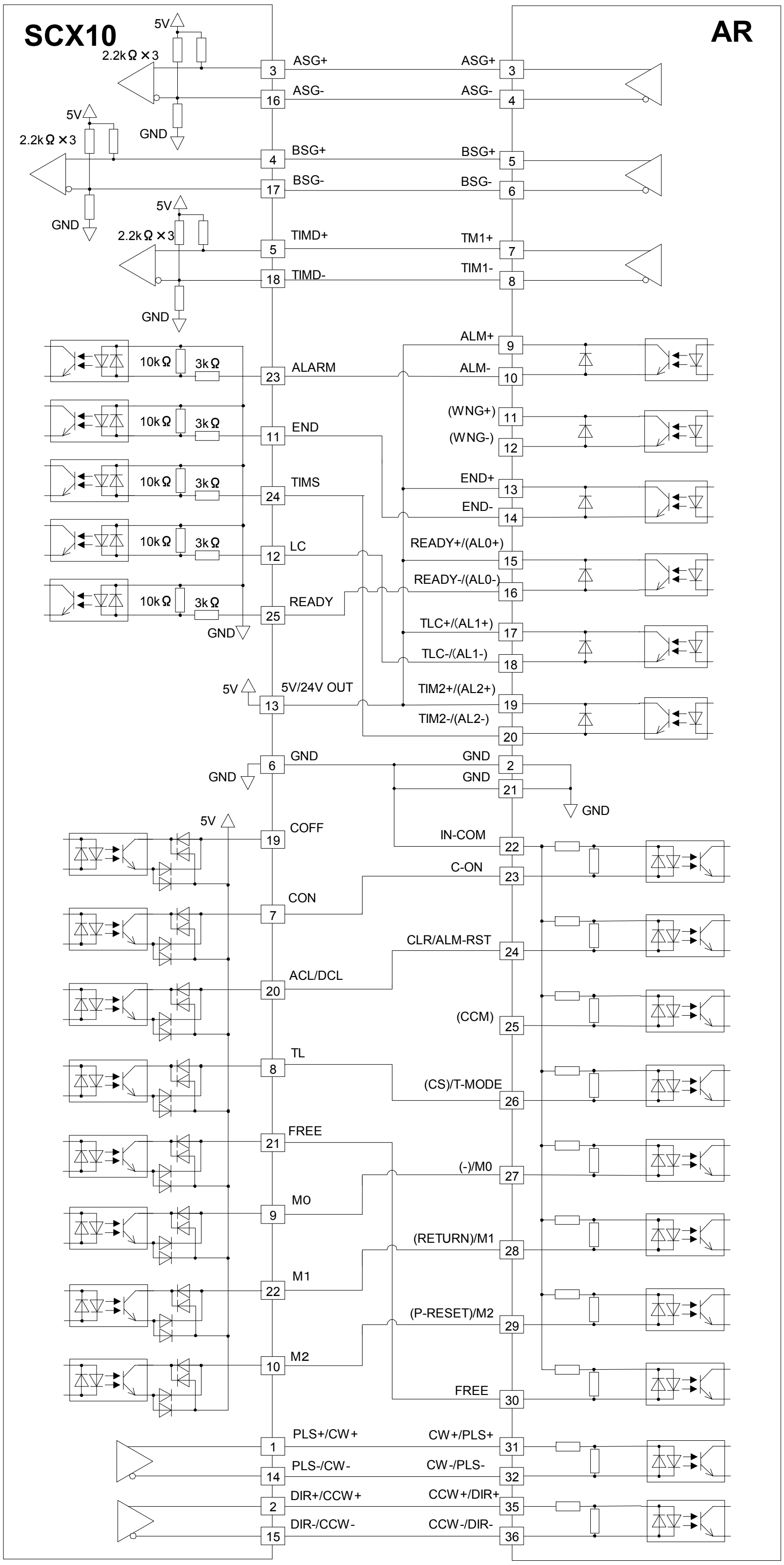
Note The I/Os for driver on the **SCX10** indicated below are set for "**AR** Push-Motion." The I/Os on the driver are also set for the push-motion operation. See "6.5.3 Change of Signal assignment" on page 35 and "8.4 Torque limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)" on page 96.



SW Setting
SINK/SOURCE :SINK
5V/24V :5V

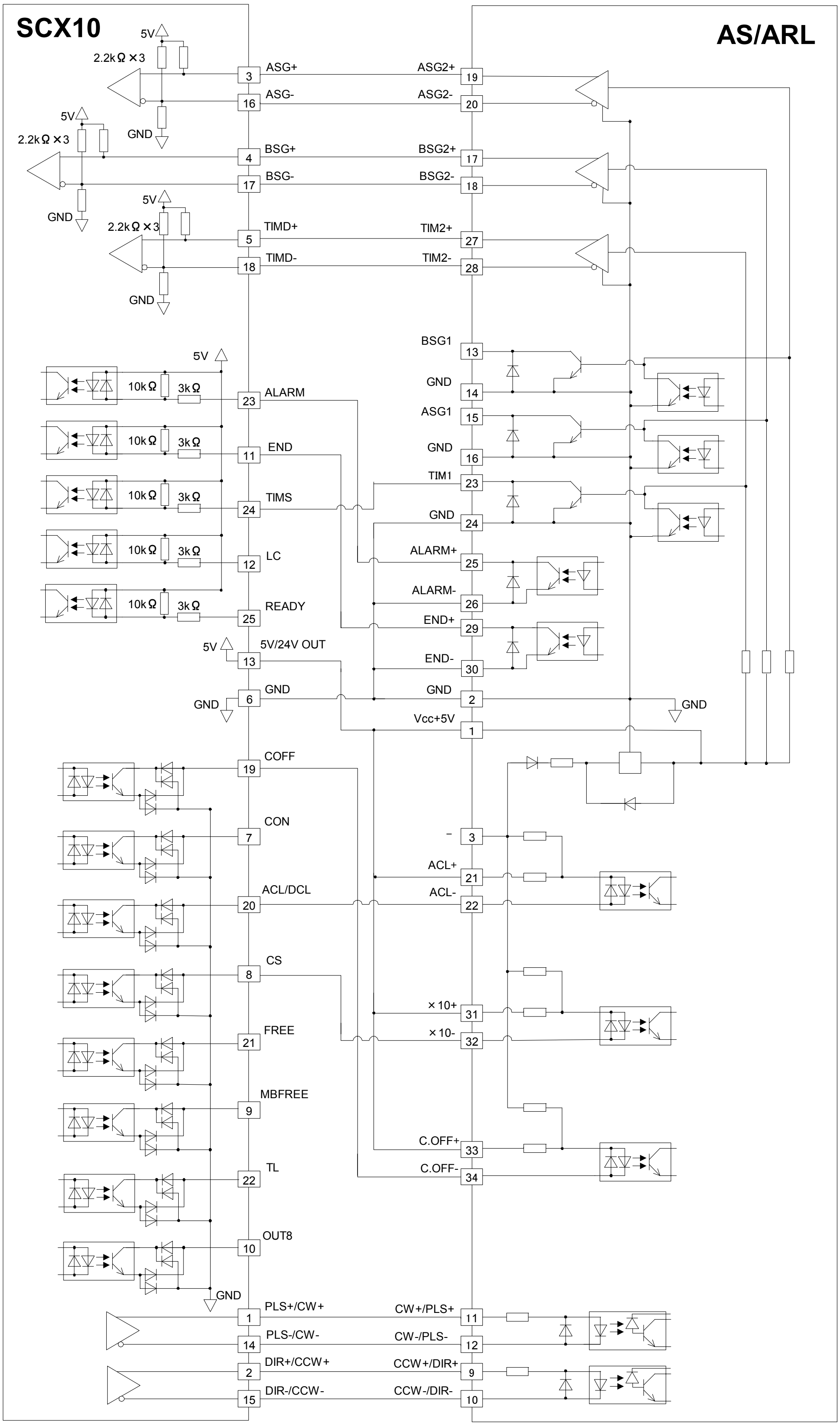
■ AR Series Driver Push-Motion (Current Source)

Note The I/Os for driver on the **SCX10** indicated below are set for "**AR** Push-Motion." The I/Os on the driver are also set for the push-motion operation. See "6.5.3 Change of Signal assignment" on page 35 and "8.4 Torque limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)" on page 96.



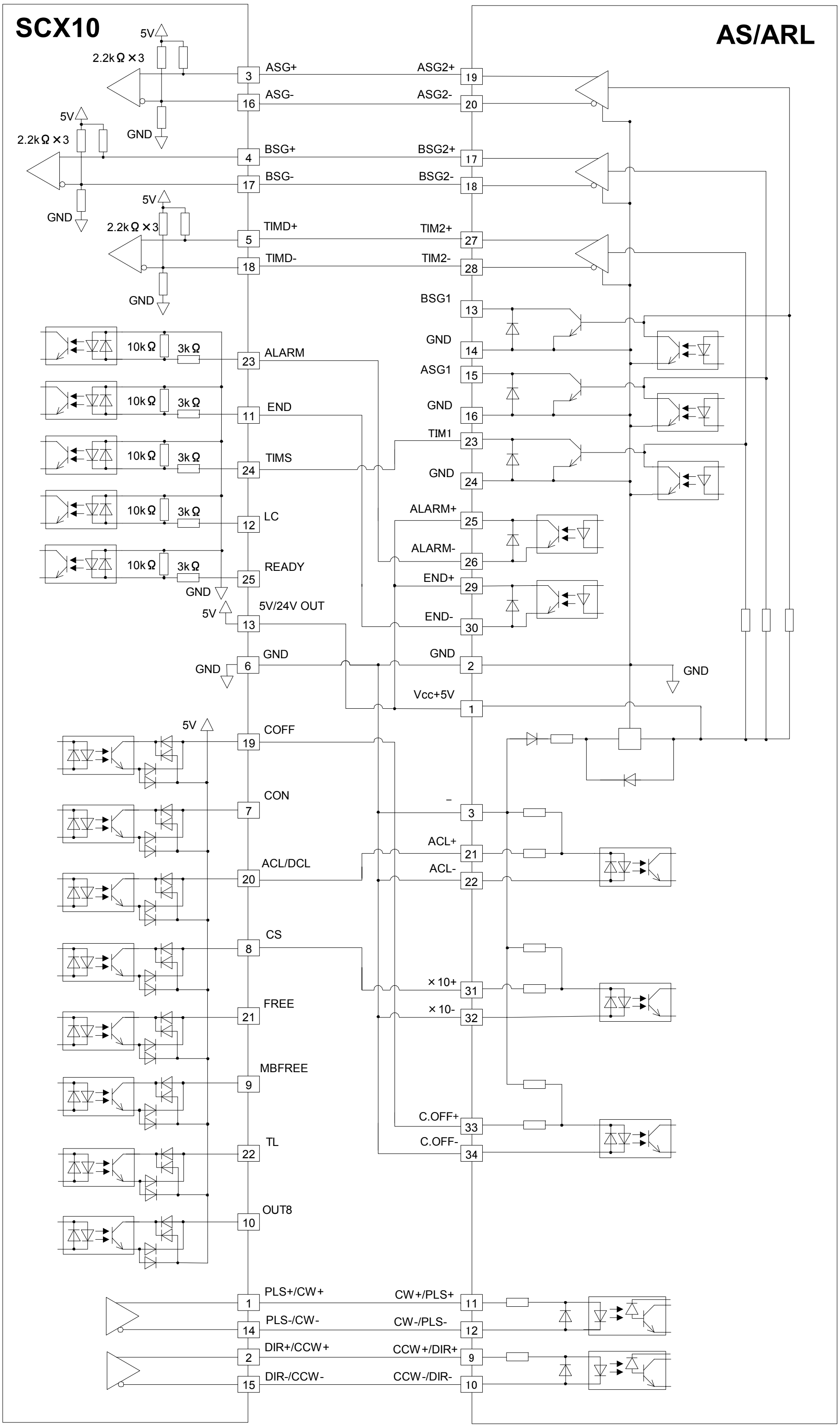
SW Setting
SINK/SOURCE :SOURCE
5V/24V :5V

■ AS/ARL Series Driver (Current Sink)



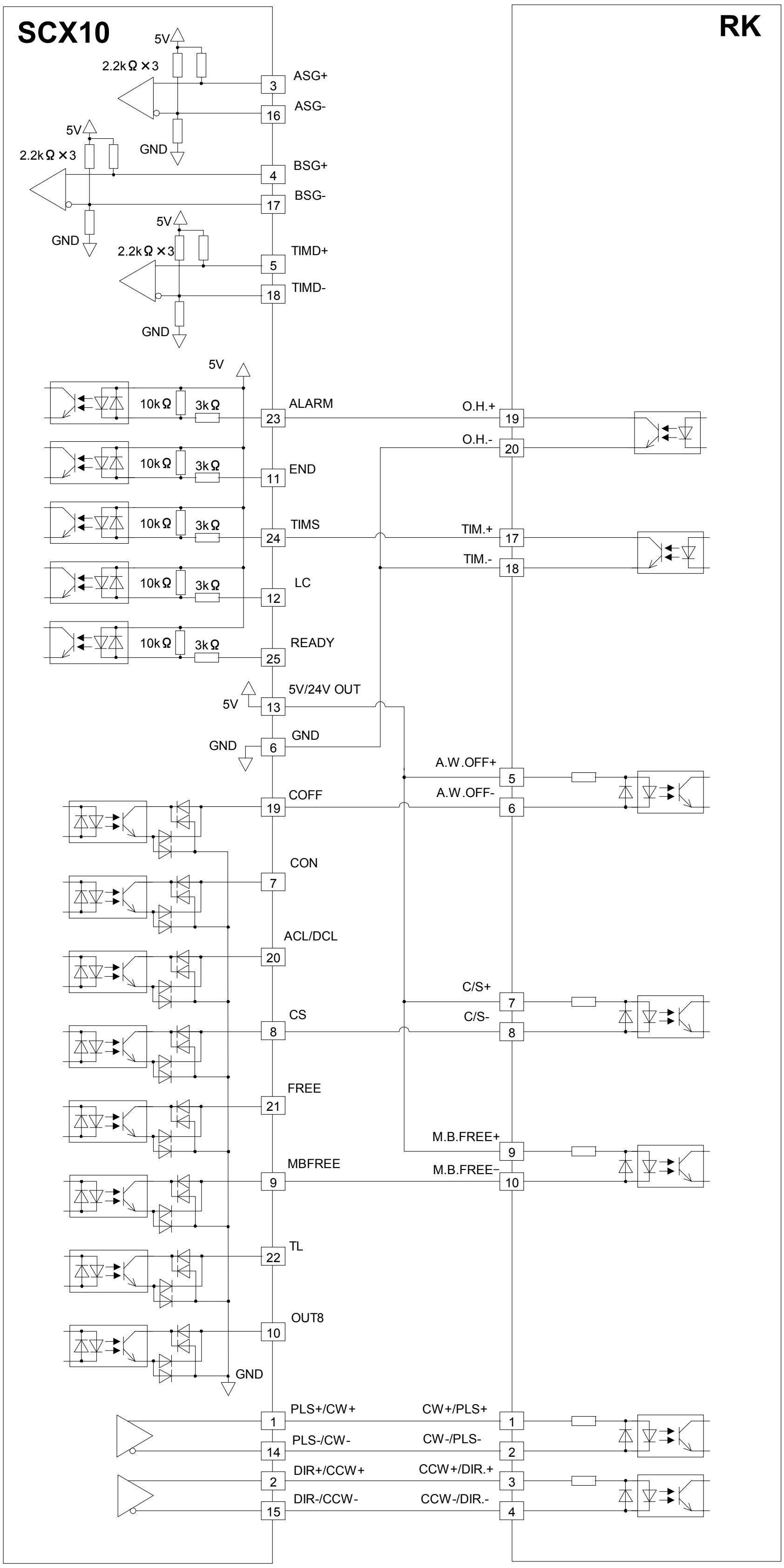
SW Setting
SINK/SOURCE :SINK
5V/24V :5V

■ AS/ARL Series Driver (Current Source)



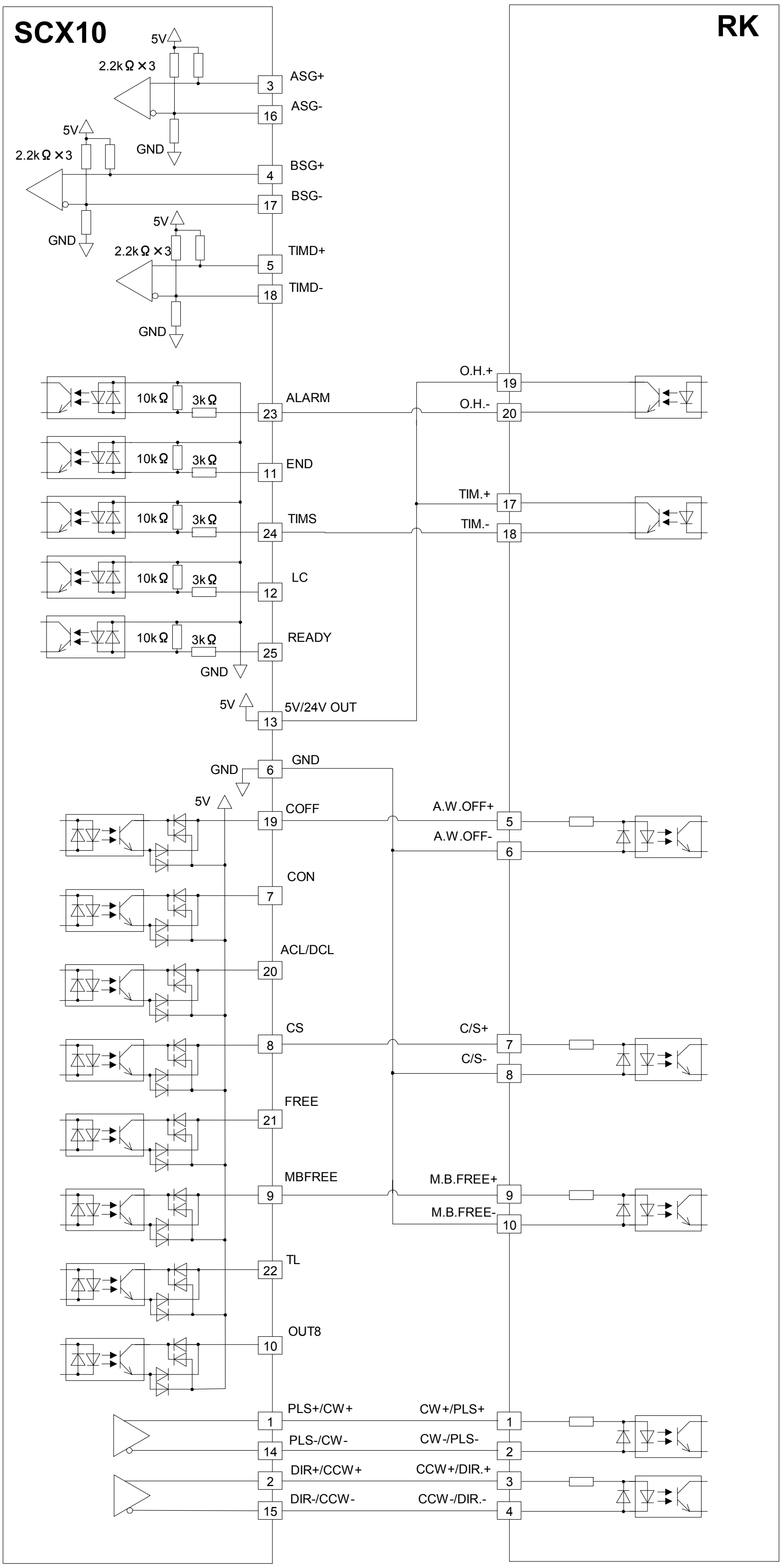
SW Setting
SINK/SOURCE :SOURCE
5V/24V :5V

■ RK Series Driver (Current Sink)



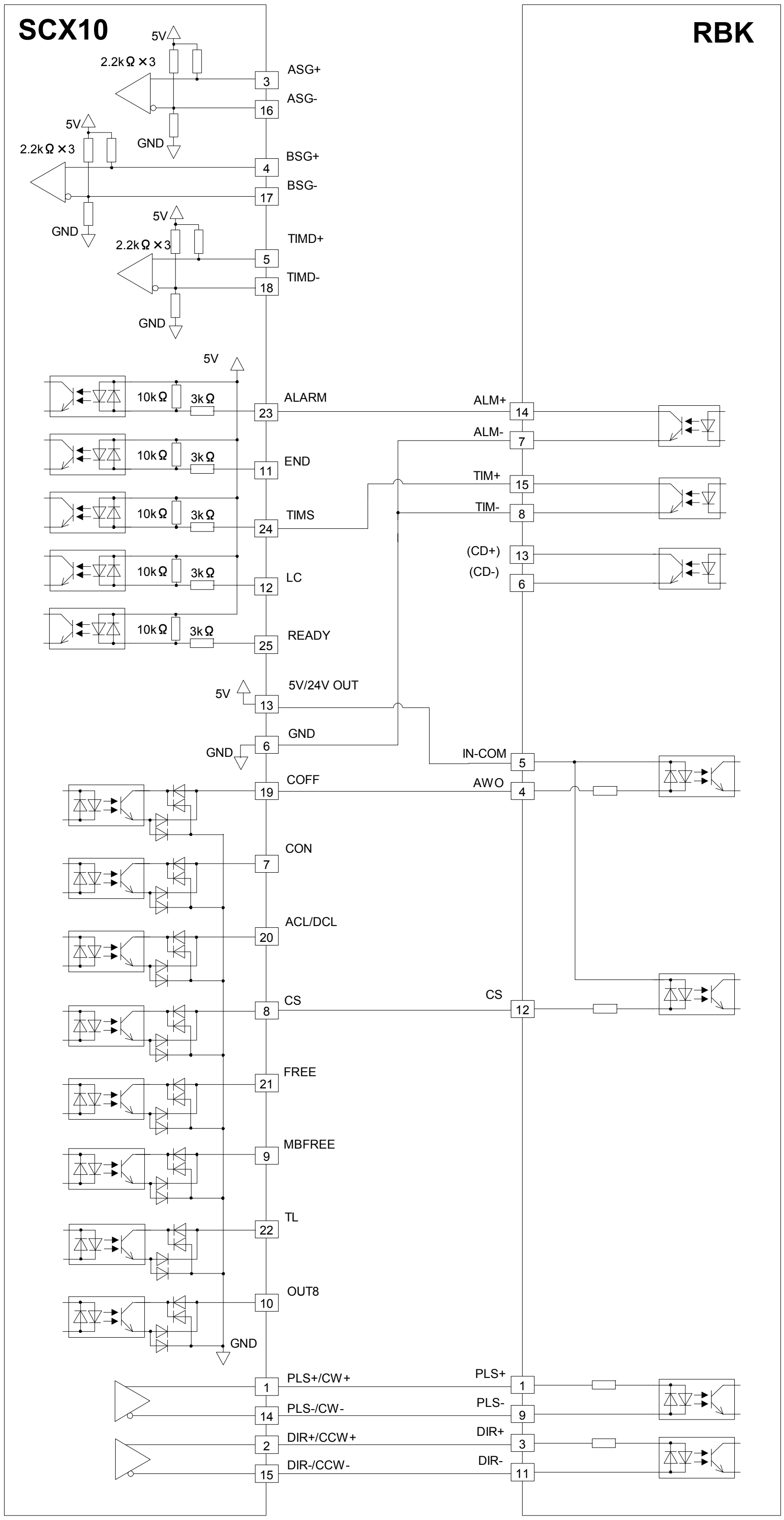
SW Setting
SINK/SOURCE : SINK
5V/24V : 5V

■ RK Series Driver (Current Source)



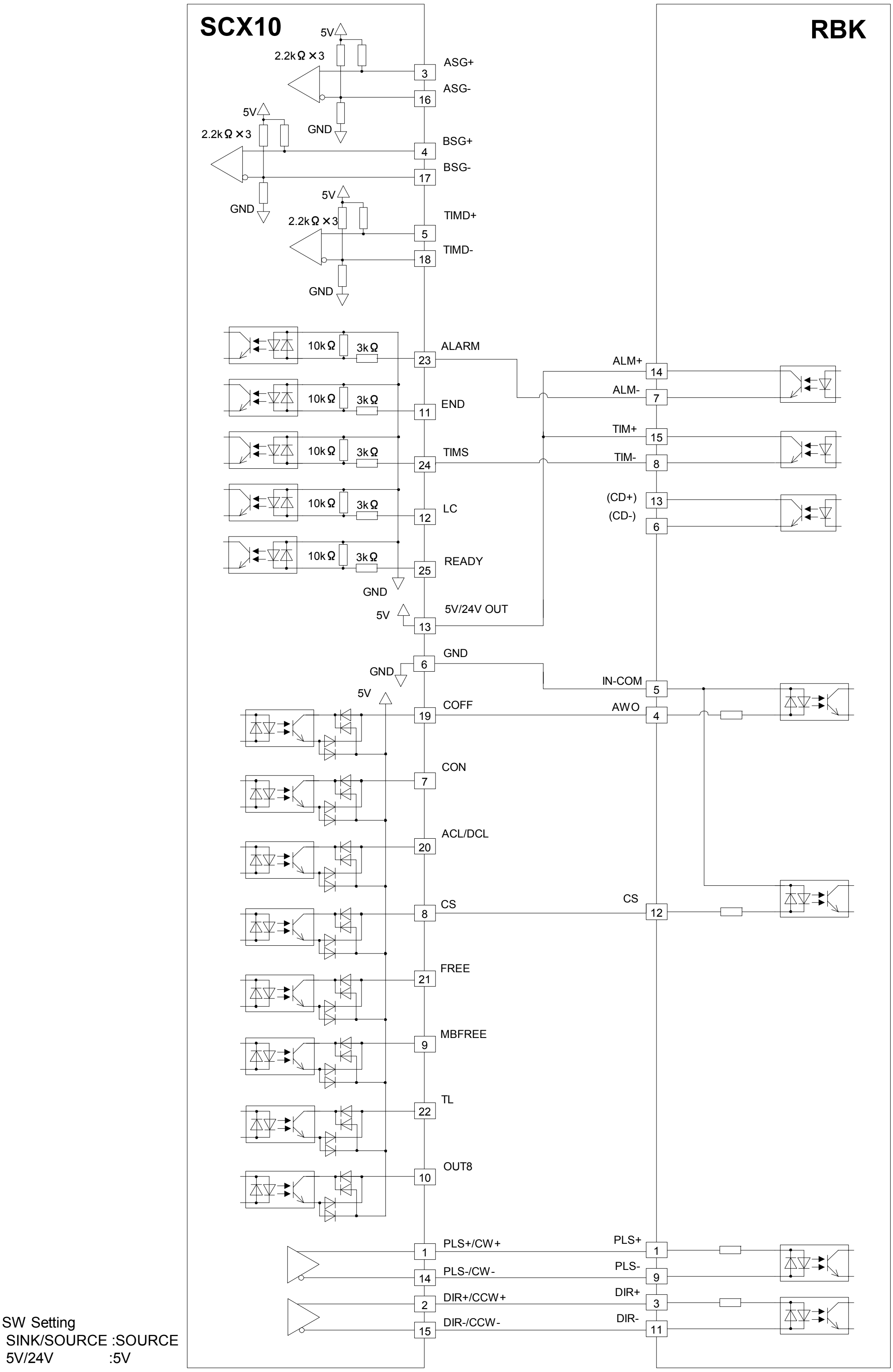
SW Setting
SINK/SOURCE : SOURCE
5V/24V : 5V

■ RBK Series Driver (Current Sink)



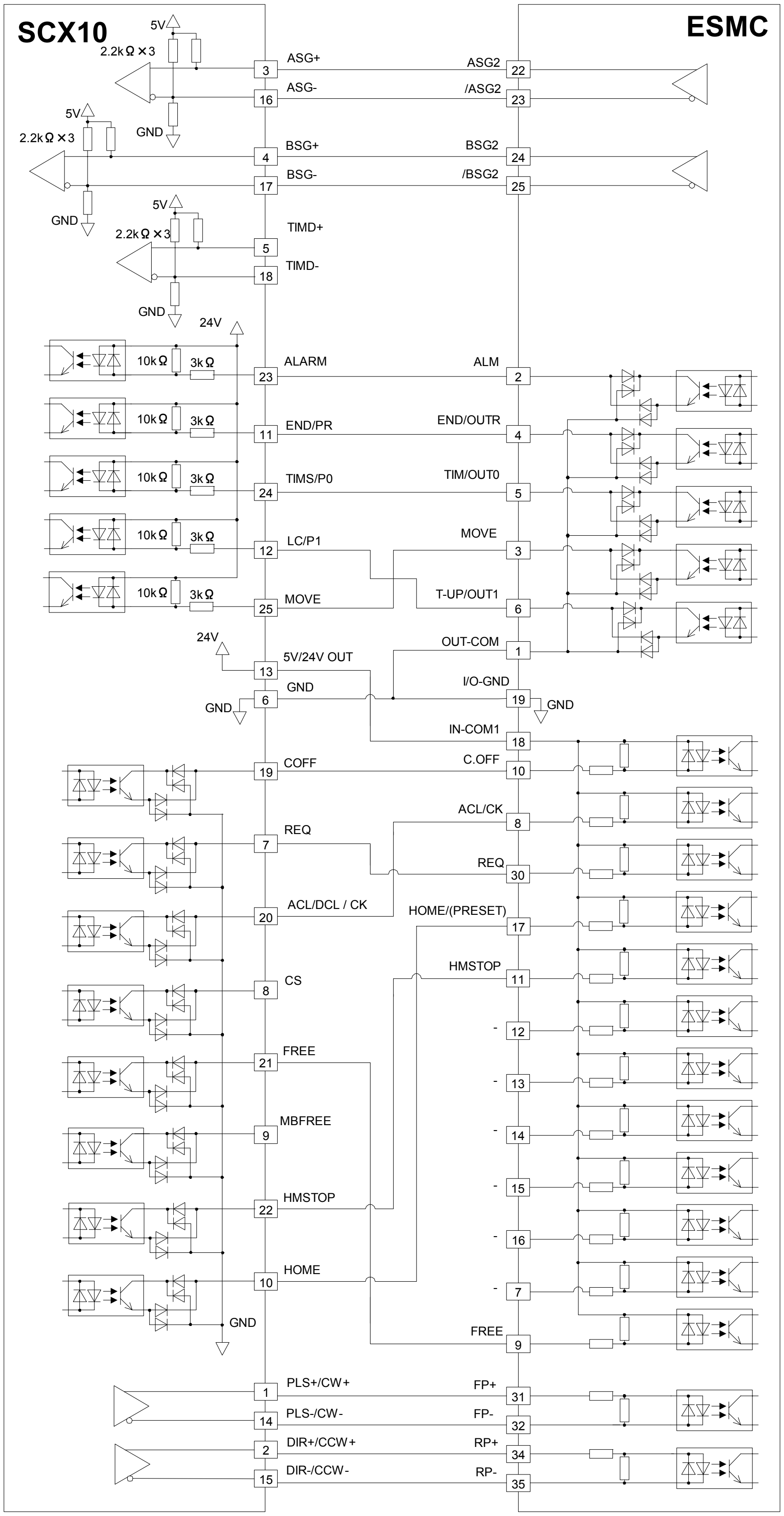
SW Setting
SINK/SOURCE :SINK
5V/24V :5V

■ RBK Series Driver (Current Source)



■ ESMC controller Sensorless Home Seeking & Position Reading (Current Sink)

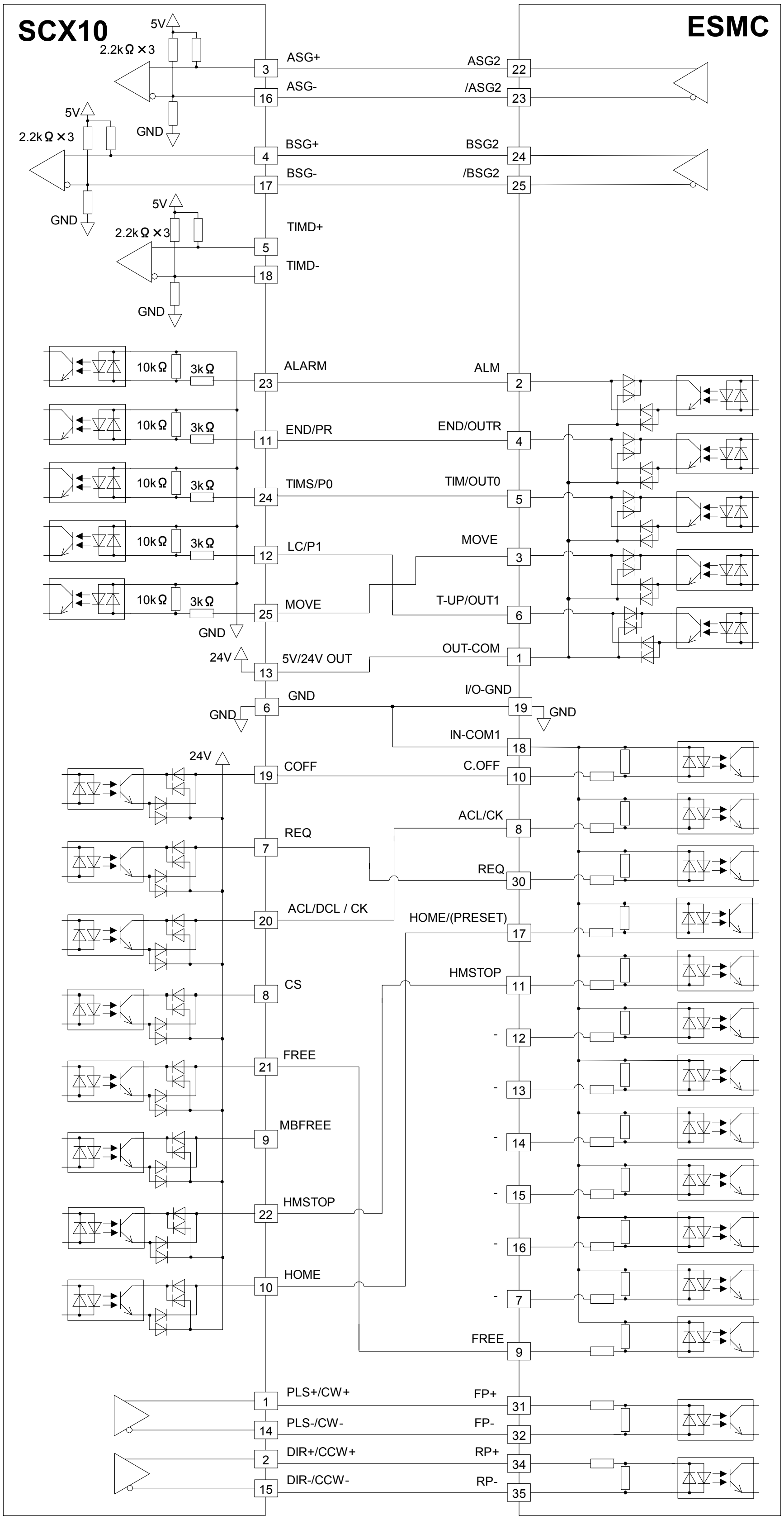
Note The I/Os for driver on the **SCX10** indicated below are set for "**ESMC** Sensorless Home Seeking & Position Reading." The I/Os on the driver are also set for the sensorless home seeking & position reading. See "6.5.3 Change of Signal assignment" on page 35 and "HOME Seeking Pattern: HOMETYP 12 (Sensor-less mode)" on page 90.



SW Setting
SINK/SOURCE :SINK
5V/24V :24V

■ ESMC controller Sensorless Home Seeking & Position Reading (Current Source)

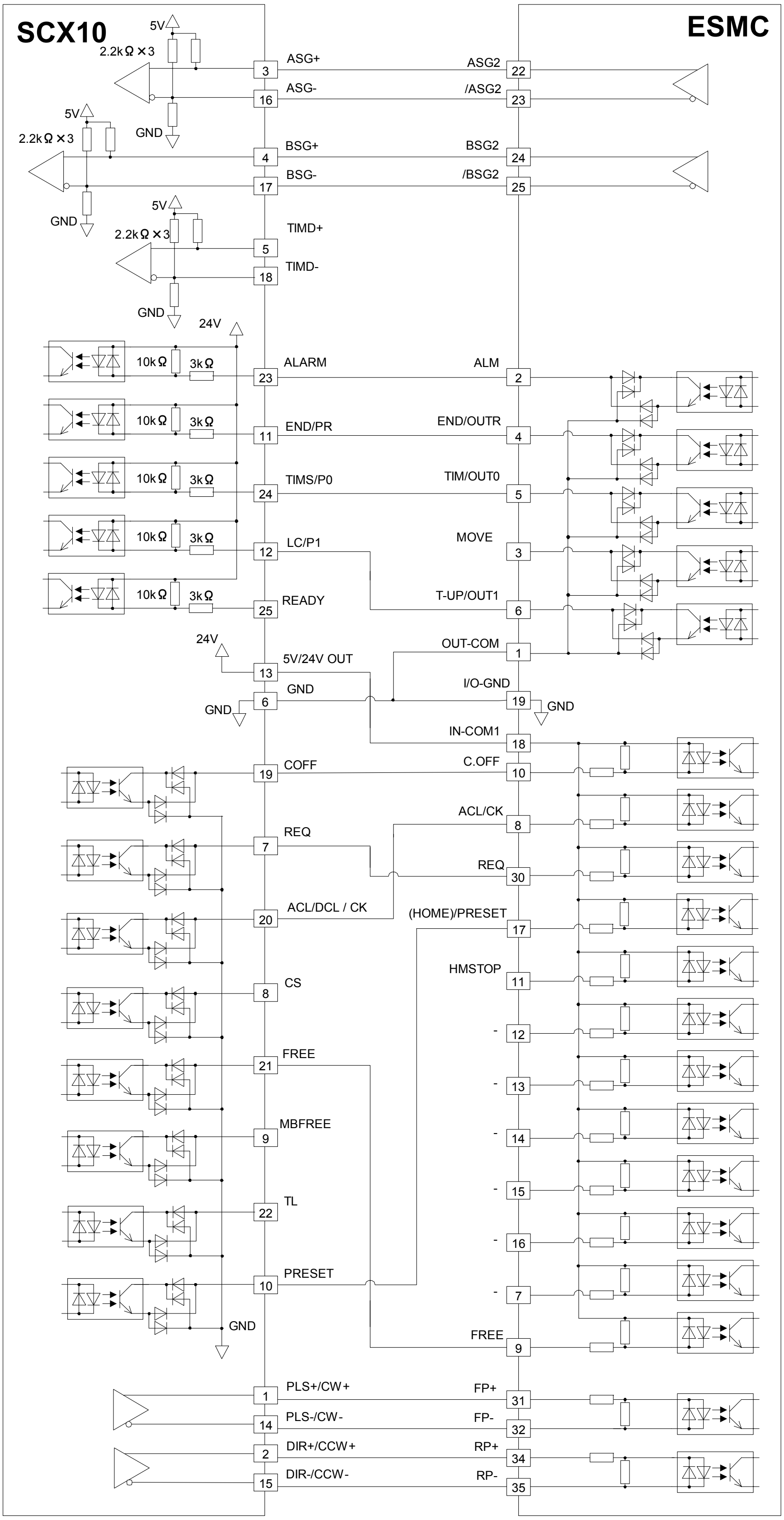
Note The I/Os for driver on the **SCX10** indicated below are set for "ESMC Sensorless Home Seeking & Position Reading." The I/Os on the driver are also set for the sensorless home seeking & position reading. See "6.5.3 Change of Signal assignment" on page 35 and "HOME Seeking Pattern: HOMETYP 12 (Sensor-less mode)" on page 90.



SW Setting
SINK/SOURCE :SOURCE
5V/24V :24V

■ ESMC controller Position Reading (Current Sink)

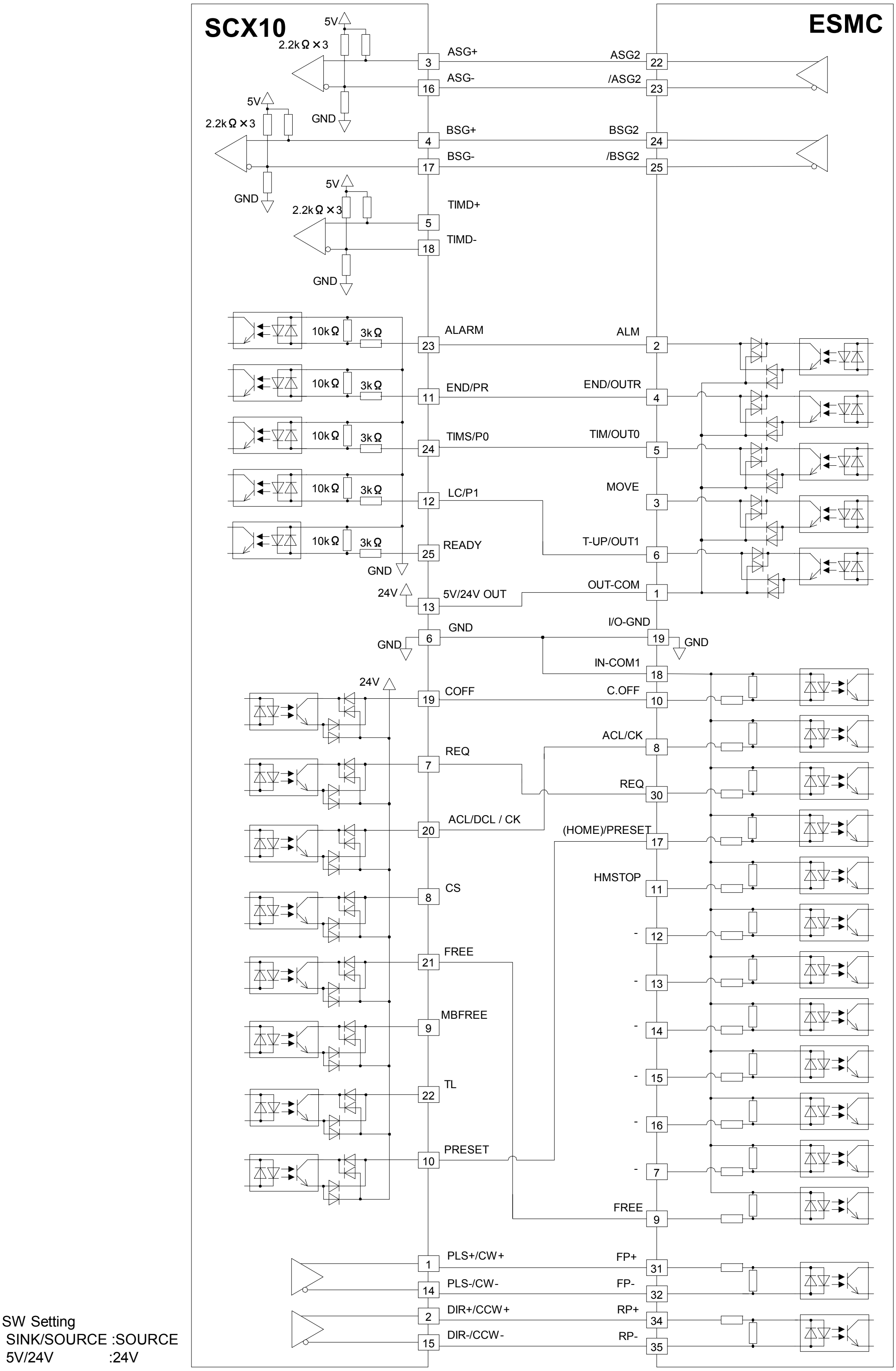
Note The I/Os for driver on the **SCX10** indicated below are set for "ESMC Position Reading." The I/Os on the driver are also set for the position reading. See "6.5.3 Change of Signal assignment" on page 35 and "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" on page 91.



SW Setting
SINK/SOURCE :SINK
5V/24V :24V

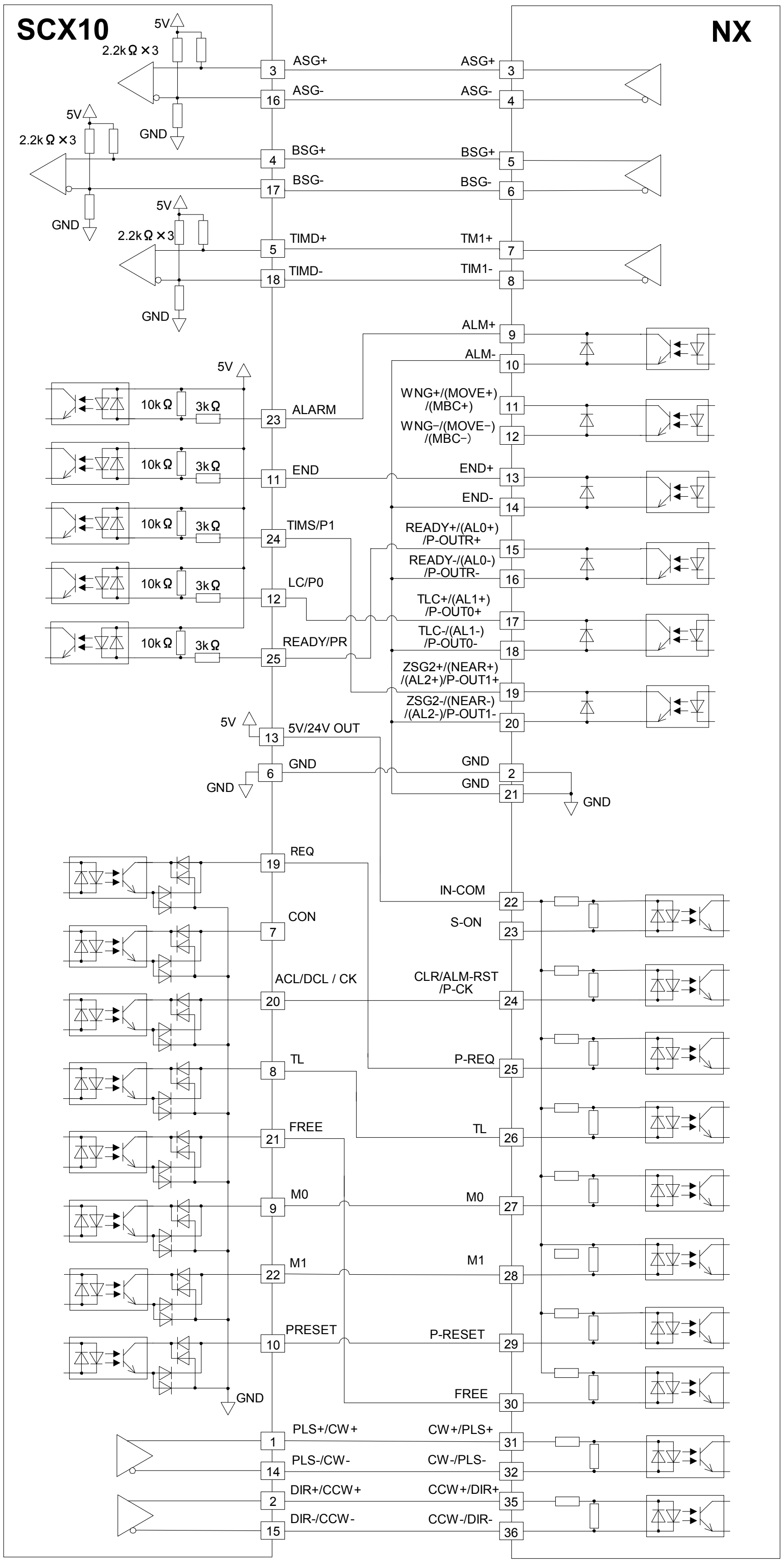
■ ESMC controller Position Reading (Current Source)

Note The I/Os for driver on the **SCX10** indicated below are set for "ESMC Position Reading." The I/Os on the driver are also set for the position reading. See "6.5.3 Change of Signal assignment" on page 35 and "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" on page 91.



■ NX Series Driver Function Expansion (Current Sink)

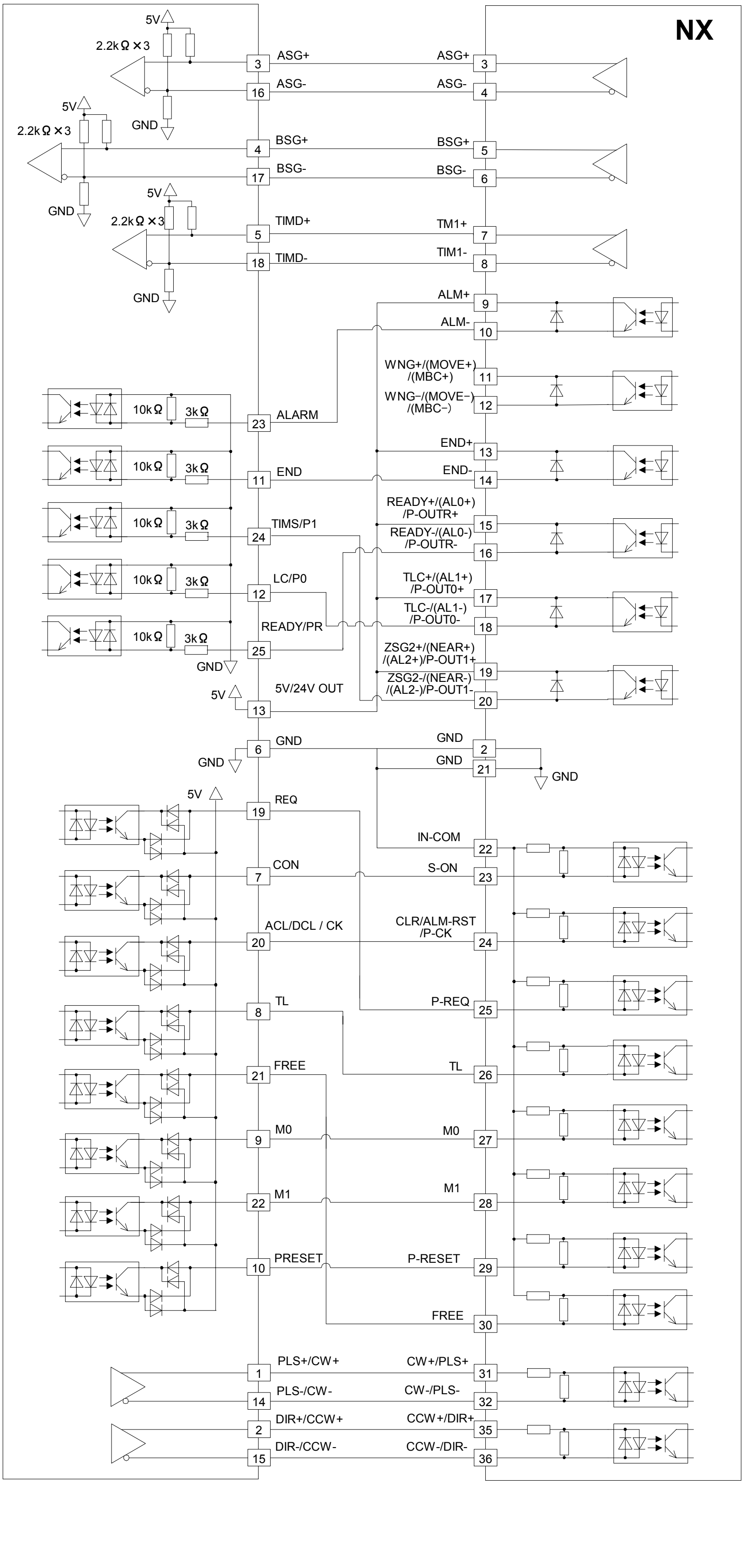
Note The I/Os for driver on the **SCX10** indicated below are set for "NX Function Expansion." The I/Os on the driver are also set for the function expansion. See "6.5.3 Change of Signal assignment" on page 35, "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" on page91 and "8.4 Torque limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)" on page 96.



SW Setting
SINK/SOURCE :SINK
5V/24V :5V

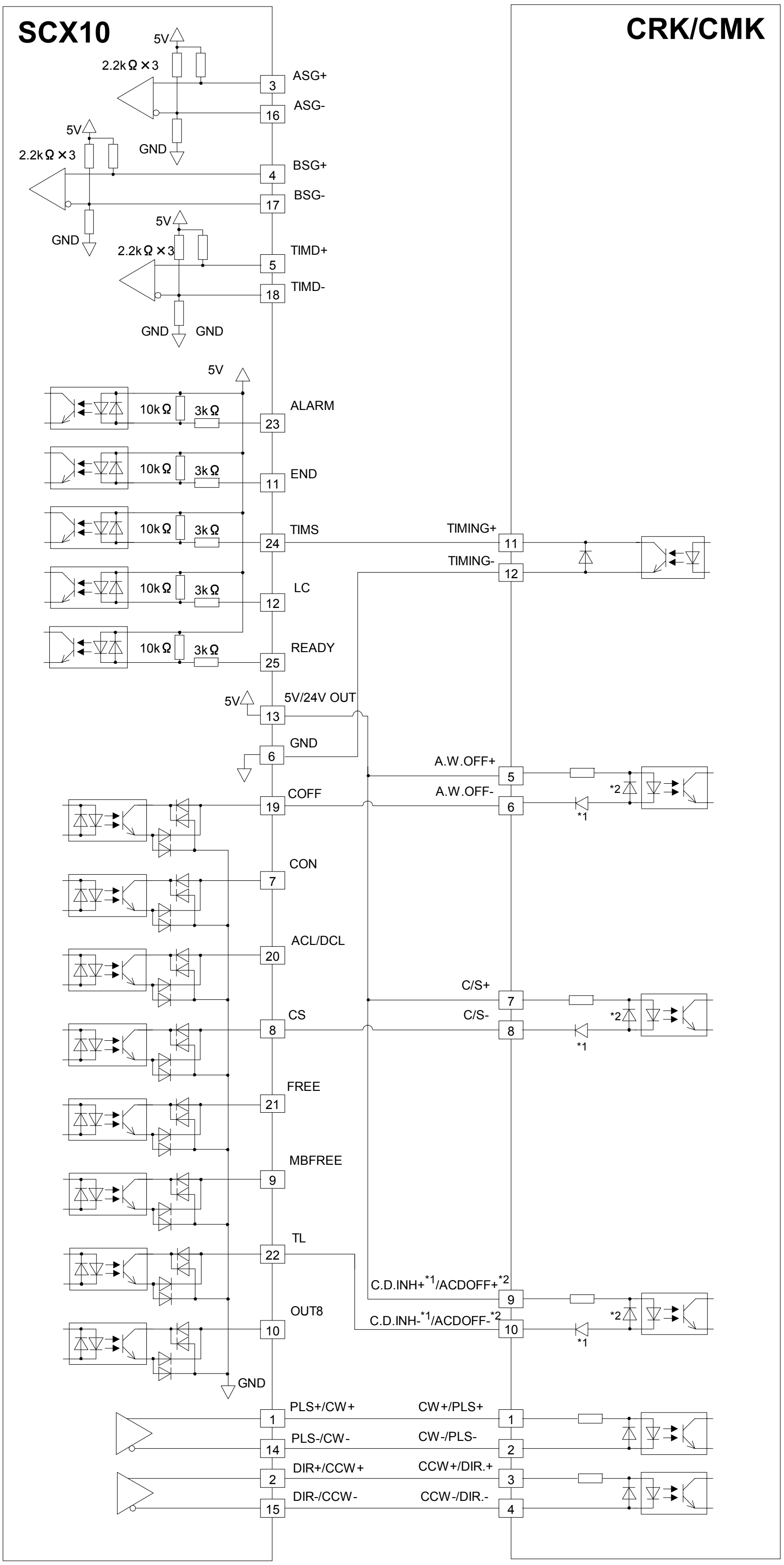
NX Series Driver Function Expansion (Current Source)

Note The I/Os for driver on the **SCX10** indicated below are set for "NX Function Expansion." The I/Os on the driver are also set for the function expansion. See "6.5.3 Change of Signal assignment" on page 35, "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" on page91 and "8.4 Torque limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)" on page 96.



SW Setting
SINK/SOURCE :SOURCE
5V/24V :5V

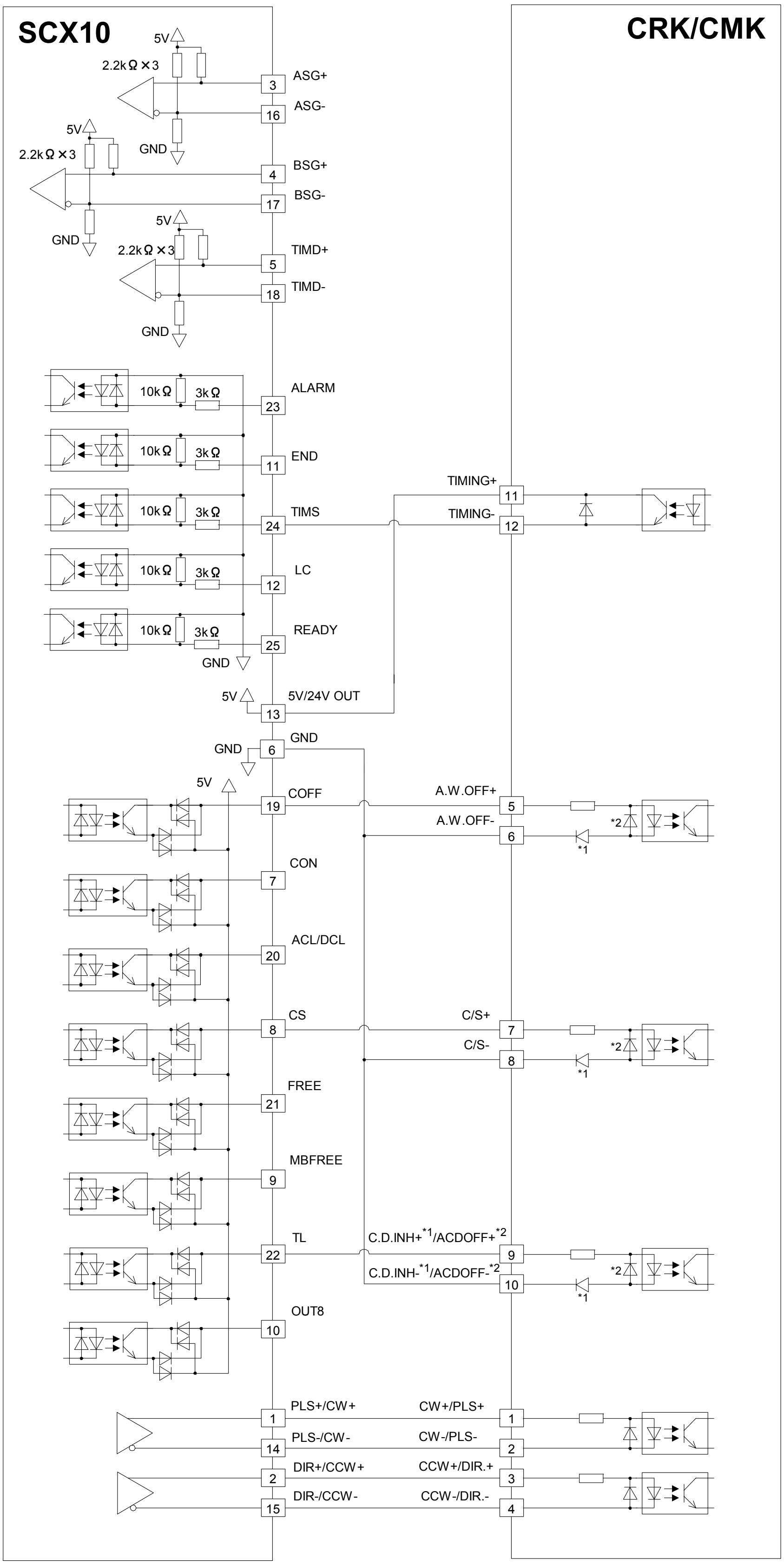
■ CRK/CMK Series Driver (Current Sink)



SW Setting
SINK/SOURCE : SINK
5V/24V : 5V

*1 CRK Series
*2 CMK Series

■ CRK/CMK Series Driver (Current Source)



SW Setting
SINK/SOURCE : SOURCE
5V/24V : 5V

*1 CRK Series
*2 CMK Series

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

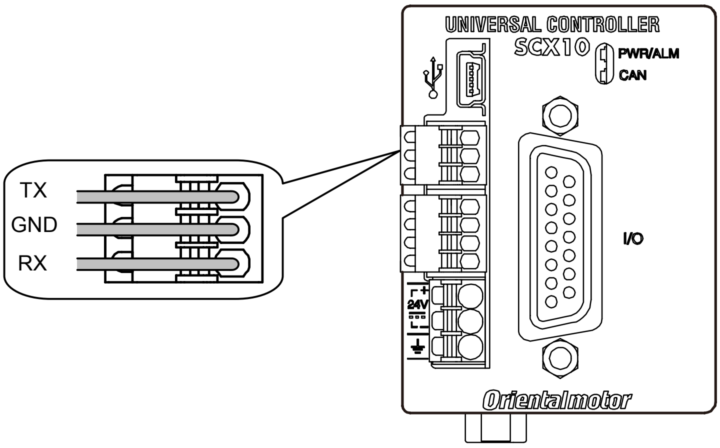
Item	Description
Electrical characteristics	In conformance with RS-232C
Transmission method	Start-stop synchronous method, NRZ (Non-Return Zero), full-duplex
Data length	8 bits, 1 stop bit, no parity
Transmission speed	9600, 19200, 38400, 57600, 115200 bps (9600 is factory setting.) Selected by the BAUD 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 **SCX10** 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 Utility Software" on page 19.

■ Connecting SCX10



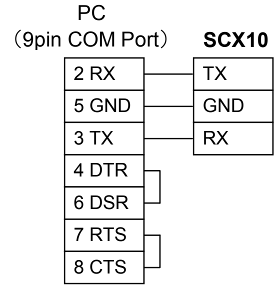
Applicable Lead Wire

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

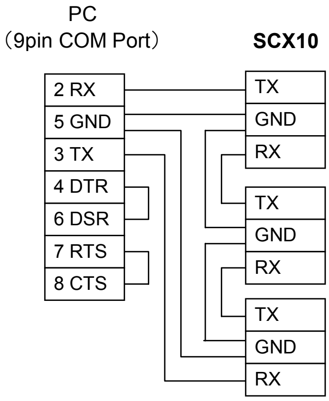


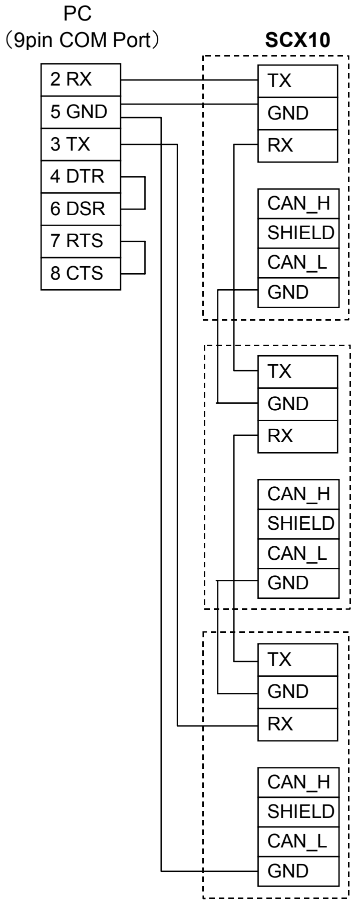
■ Daisy-Chain Connection

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

Using only the RS-232C connector

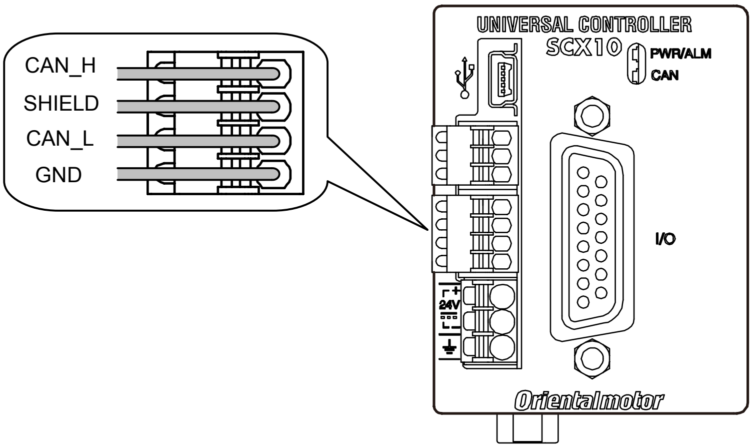
Using RS-232C and CANopen connector





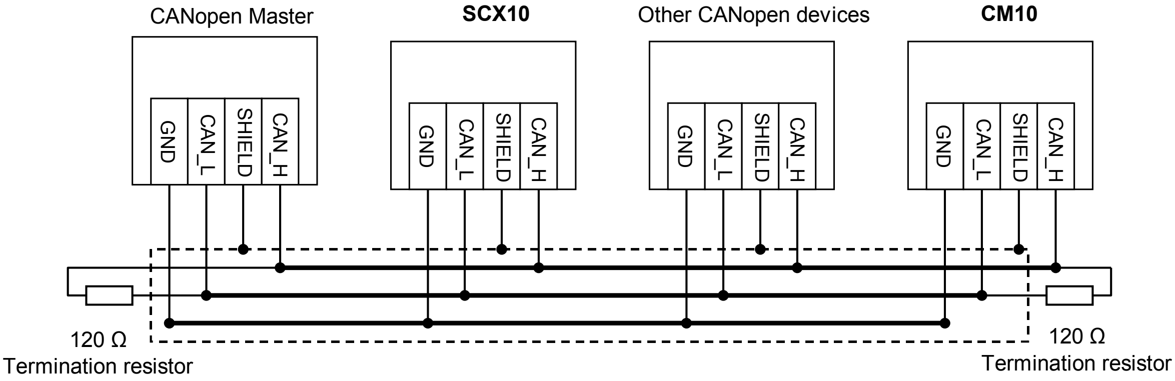
6.7 Connecting the CANopen

■ Connecting SCX10



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 **SCX10** 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.

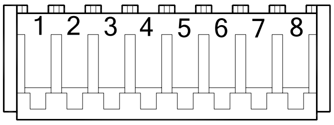
6.8 Connecting the External Encoder

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

■ Connector and Lead Wire

Connector housing	EHR-8 (manufactured by JST)
Contacts	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



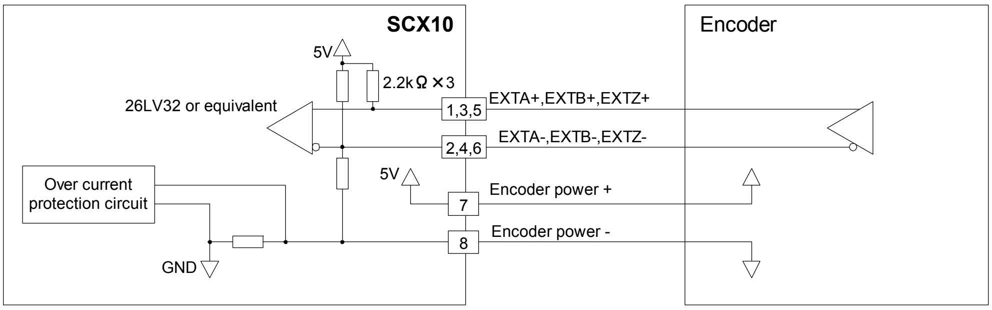
Pin No.	Signal Name	Description
1	EXTA+	External encoder ASG input
2	EXTA-	
3	EXTB+	External encoder BSG input
4	EXTB-	
5	EXTZ+	External encoder ZSG input
6	EXTZ-	
7	Encoder power +	External encoder power output (+5 V)
8	Encoder power -	External encoder power output (0 V)

Note

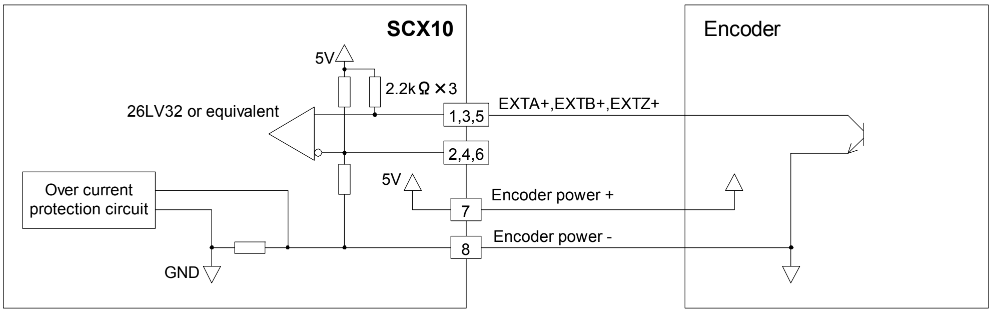
- This encoder power output should be used for the external encoder only.
- Connect the encoder input power "–" (ground) line to the "Encoder Power –" terminal as instructed below. Do not connect it to the "GND" terminal on the other connectors on the **SCX10**. The **SCX10** has a dedicated encoder power supply and the protection circuit on the "Encoder Power –" line detects the over current.

■ Connection Example

- Line Driver Output Encoder Connection

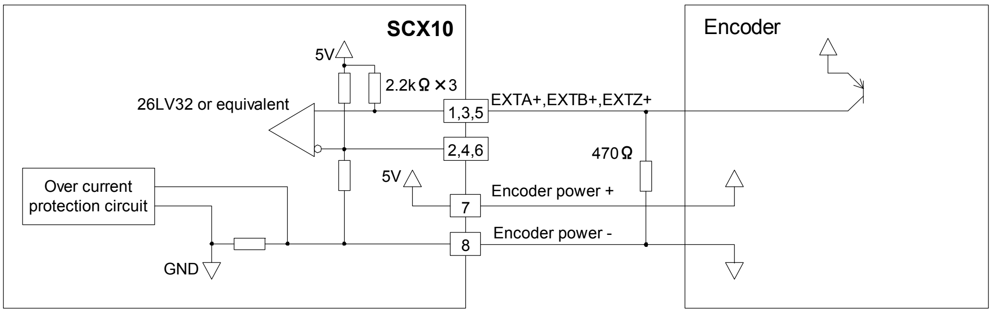


- Open Collector Output Encoder Connection (NPN Type)

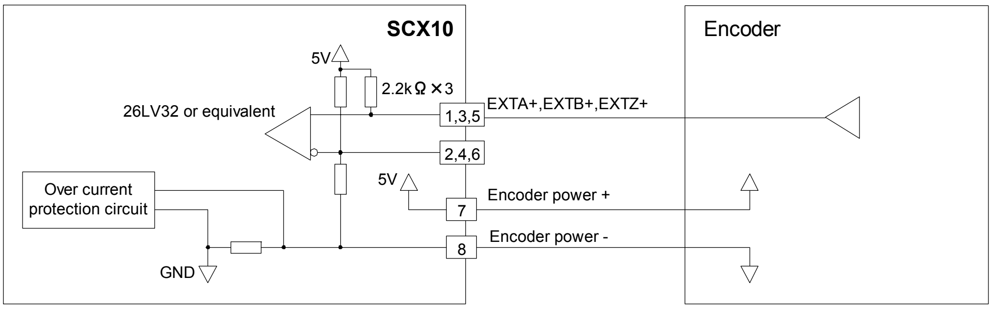


- Open Collector Output Encoder Connection (PNP Type)

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



- TTL Output Encoder Connection



Chapter 7 Start Up (Immediate Command)

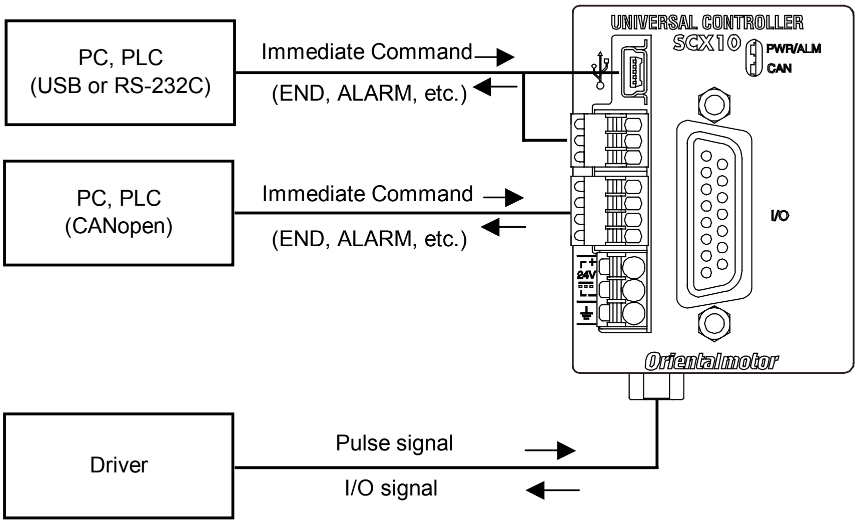
This chapter explains the initial set up, how to operate the device immediately from the terminal as well as command format. These are basic skills and are applied to many modes and functions that the **SCX10** has. All users should read this chapter for start up.

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
7.3 Setting the User Unit
7.4 Making the Motor Move (Immediate Command)
7.5 Optional Settings for Driver
7.6 Command Format

7.2 Preparation

1. Make sure the driver is properly connected. At a minimum, the pulse and direction lines (and the CON line if the driver has this input) need to be connected.
2. Connect a personal computer via USB or RS-232C
   See "6.3 Connecting the USB and Installation of Utility Software" on page 19 or "6.6 Connecting the RS-232C" on page 62 as necessary.
3. Power ON the **SCX10** and the driver
   See "6.2 Connecting the Power Supply" on page 17 as necessary.
4. Launch any general terminal software or the supplied utility software (**IMC**)
   See "6.3 Connecting the USB and Installation of Utility Software" on page 19 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 **SCX10** is 9600 bps.

Memo If the power on timing of the driver is delayed from the **SCX10**, the LED on the **SCX10** becomes red and blinks 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 179.

7.3 Setting the User Unit

The **SCX10** device defines all position and velocity related parameters in terms of "user units," instead of the pulse unit that is commonly used in pulse generators and motor controllers. The user unit is the actual motion distance in a user application, such as "mm," "inch" and "revolution." Pulse unit can also be used within this user unit system. (See following page.)

- DPR, UU: The number of user units per motor revolution is determined by the DPR parameter (Distance per Revolution), and the text used for unit information 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, 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 operating manual for the driver.).

- Example

(Using "Rev" unit, Motor resolution is 1000/rev.)

1. Set the user unit

   Enter "UU=Rev," and press the Enter key.

```
>UU=Rev
 UU=Rev
```

2. Set the distance per revolution

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

```
>DPR=1
 DPR=1(1) Rev
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 1240(1240)
 Minimum Movable Distance = +/- 0.001(0.001)
```

3. Set the motor resolution

   Enter "MR=1000," and press the Enter key.

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

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 Rev
```

   Distance is now indicated in the user unit, "Rev."

7. Enter VR and press the Enter Key

```
>VR
 VR=1 Rev/sec
```

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

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

- Parameters for User Unit

Parameter	Parameter Value	Function
DPR	0.5 - 51200 (1)	Distance Per Revolution [user unit] {mm, deg, etc.}
MR	10 - 51200 (1000)	Motor resolution [pulse/rev]
GA	1 - 100 (1)	Electric Gear {Numerator}
GB	1 - 100 (1)	Electric Gear {Denominator}
UU	String (Rev)	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

- 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 parameters. 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, 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.
- 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=Rev, 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 **SCX10** with actuator products -

- Products which resolution is 0.01 mm when combining with the **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 **SCX10** works as a "distance per millimeter" for the **ESMC** controller.)
- Products which resolution is 0.01 mm when combining with the **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 with the **ESMC** controller (**ESR** Series, **SPR4**, **PWA8**)
  UU=mm, DPR=1, MR=1000
- When combining with the **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 with the **DG** 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 with the **DG** Series Hollow Rotary Actuators (unit: deg)
  UU=deg、GA=18、GB=1、DPR=360、MR=1000

■ Parameter Range

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, 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, 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 STRSW=0)

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 STRSW is a command to select the current on (1) or off (0) at the system start. The factory setting is STRSW=1 (on).

■ Experience the Operation

1. Set the move distance

   Enter "DIS=10," and press the Enter key.

```
>DIS=10
 DIS=10 Rev
```

2. Set the running velocity

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

```
>VR=1
 VR=1 Rev/sec
```

3. Make the motor move

   Enter "MI," and press the Enter key.
   The motor starts to move in clockwise direction, and will rotate 10 revolutions at 1rev/sec.

```
>MI
>
```

4. Invert the direction

   Enter "DIS= -10" and "MI," both followed by pressing the Enter key.
   The motor will rotate 10 revolutions at 1 rev/sec in reverse direction.

```
>DIS=-10
 DIS=-10 Rev
>MI
>
```

5. Change the running velocity

   Enter "VR=2" and "MI," both followed by the Enter key.
   The motor will rotate at 2 rev/sec.

```
>VR=2
 VR=2 Rev/sec
>MI
>
```

You now know the basics of operating the **SCX10**. See "8.2 Motion Types" on page 75 for a variety of other motions.
The following section explains the command format that is used when commanding and making a program.

7.5 Optional Settings for Driver

Note For use of the **SCX10**, the **ESMC** controller should be set to the "driver mode." If the **ESMC** controller is used as the "controller mode (factory setting)," unexpected motion may occur due to unmatched I/O assignments.

■ Parameters

The following parameters should be set according to the driver and your needs.

IMC	Command	Range	Page
Motor Resolution	MR	10 to 51200	279
Pulse Mode	PULSE	0: 2 pulse output 1: 1 pulse output	303
Startup Current	STRSW	0: Current off at system start 1: Current on at system start	333
Encoder Resolution	ER	10 to 51200	237
Encoder Source	ENC	0: Not used 1: Driver encoder 2: External encoder	231
Driver Alarm Input Enable	DALARM	0: Not-use the ALARM signal input 1: Use the ALARM signal input	202
Driver End Input Enable	DEND	0: Internal end area 1: Driver END signal	207
TIMD Logic Level (Tab: Driver I/O)	TIMDLV	0: Positive 1: Negative	356
Driver Ready Input Enable	DREADY	0: Disable 1: Enable	224
Home Deviation Clear	HOMEDCL	0: Not clear driver deviation counter at homing 1: Clear driver deviation counter at homing 2: Not clear driver deviation counter at homing and the deviation is maintained precisely as the deviation in the **CM10**/**SCX10** will not be cleared at homing	243

■ Example Settings

Example of settings that matches to the each driver with factory settings are shown below. Setting should be changed according to the driver settings and your needs.

IMC	Factory Settings	**AR**	**AS/ARL**	**RK**	**RBK**	**ESMC**	**NX**	**CRK**	**CMK**
Motor Resolution	1000	1000	1000	500	200	100	1000	500	200
Pulse Mode	1	1	1	1	1	1	1	1	1
Startup Current	1	0	1	1	1	1	0	1	1
Encoder Resolution	1000	1000	1000	n/a	n/a	100	1000	n/a	n/a
Encoder Source	0	1	1	0	0	1	1	0	0
Driver Alarm Input Enable	0	1	1	1	1	1	1	0	0
Driver End Input Enable	0	1	1	0	0	1	1	0	0
TIMD Logic Level (Tab: Driver I/O)	1	AC input: 1 DC input: 0	0	n/a	n/a	n/a	1	n/a	n/a
Driver Ready Input Enable	0	1	0	0	0	0	1	0	0
Home Deviation Clear	0	0	0	0	0	0	1	0	0

Memo The **AR** Series driver and the **NX** Series driver are designed so that the motor current at driver start up is OFF. The motor current can be controlled by the **SCX10** using the CURRENT parameter. While the state of the CURRENT at system start up of the **SCX10** is set to "ON," it can be changed using the STRSW parameter.

7.6 Command Format

This section shows the command format. Spaces between each word are accepted. 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) can not be used.

Memo See "Appendix A "How to Send Commands Using ASCII Strings" on page 367 for information on ASCII string construction and for a 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	DIS=A (Available in sequence only)	"=" is required
Parameter value is equation	DIS=A*1.5 (Available in sequence only)	"=" 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 parameter	MI	-
Parameter is constant	MA 1.234	"=" is not accepted
Parameter is variable	MA POS [1]	"=" is not accepted
Parameter 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)   VERBOSE=0
>PC                           >PC
 PC=0.123 Rev                  0.123
>DIS=5.678                    >DIS=5.678
 DIS=5.678 Rev                 5.678
>HOMETYP                      >HOMETYP
 HOMETYP=0                     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 318 for SAS command).

Chapter 8 Features

This chapter introduces the main features of **SCX10**.

8.1 Overview

The **SCX10** 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, and support functions to accelerate successful system integration. The following subjects are discussed in the sections which follow:

■ Contents

8.2	Motion Types	8.2.1 PTP (Point-to-Point) Motions 8.2.2 Linked Motions 8.2.3 Continuous Motions 8.2.4 Electrical Home Position and Mechanical Home Position 8.2.5 Mechanical Home Seeking
8.3	Driver Current Position Reading (**NX** Series driver, **ESMC** controller)	Setting the Driver, Setting the **SCX10**, Reading the Driver Current Position, Releasing the Absolute Position Loss Alarm/Setting the Home Position
8.4	Torque Limiting/Push-motion Operation (**NX** Series driver, **AR** Series driver)	Setting the Driver, Setting the **SCX10**, Performing Torque Limiting/Push-motion Operation
8.5	Stopping Motion	hard stop, soft stop, and system status after stopping
8.6	Teaching Positions	teaching and storing positions
8.7	Multi Axis Operation	how to configure multi axis operation
8.8	Encoder Function	monitor position error and detect miss-steps
8.9	Mathematical/Logical/Conditional Operators	Mathematical/Logical Operators, Conditional Operators
8.10	User Variables	User Variables, User-Defined Variables
8.11	View and Test Functions	monitoring and testing I/O, monitoring parameters
8.12	Protective Functions	controlling the system response to alarm conditions

Note DPR and MR should be set before making any motions. See "7.3 Setting the User Unit" on page 68.

8.2 Motion Types

The **SCX10** 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
MI	None	Start incremental motion, distance DIS
MA	−MAXPOS - +MAXPOS	Start absolute motion to the specified destination [user unit]
DIS	−MAXPOS - +MAXPOS (0)	Distance for incremental motion [user unit]
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
TA	0.001 - 500 (0.5)	Acceleration time [sec]
TD	0.001 - 500(0.5)	Deceleration time [sec]

( ): factory setting

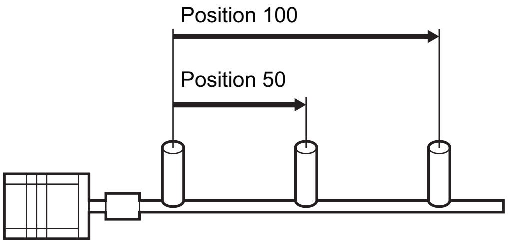
Note See "8.5 Stopping Motion" on page 99 for information on stopping motions before they finish.

Memo
- See the description of "Linked Motions" (below) for information on more complex motion profiles.
- The minimum output frequency on the **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.

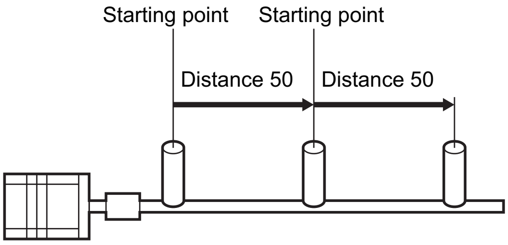
- Point-to-Point Motion Types

Two positioning modes are available for use in the positioning operation: absolute mode and incremental mode.
In absolute mode, the distance from electrical home is set.
In the absolute mode, the distance from electrical home is set regardless of the current position.
In incremental mode, each device destination becomes the starting point for the next movement. This mode is suitable when the same distance is repeatedly used.

• Absolute Mode



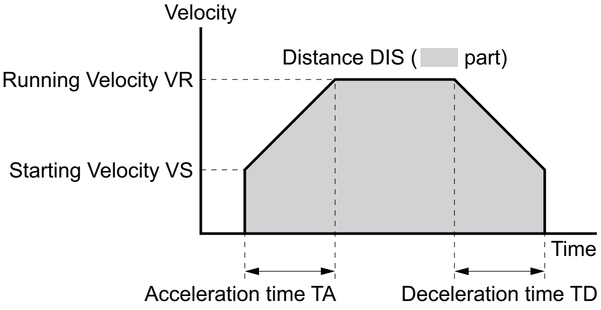
• Incremental Mode



- Example

Conditions:
Ball screw: lead 10 mm (See "7.3 Setting the User Unit" on page 68.)
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 (0.5)	Acceleration time [sec]
TD	0.001 - 500 (0.5)	Deceleration time [sec]

( ): factory setting

Note See "8.5 Stopping Motion" on page 99 for information on stopping motions before they finish.

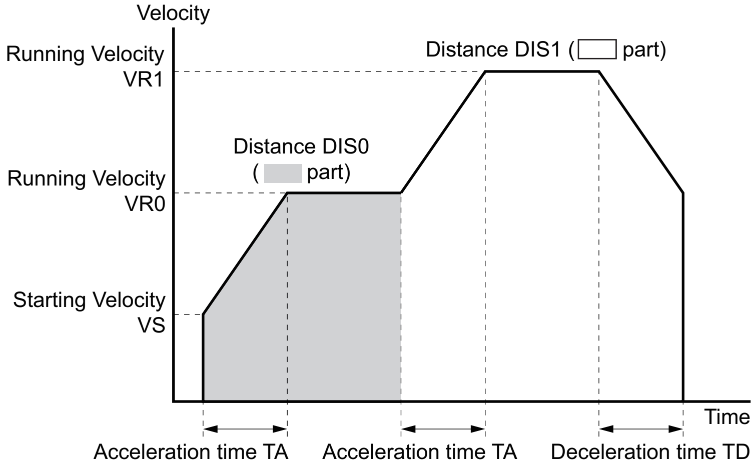
Memo

- 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 then continued: PAUSE causes a soft stop, and CONT is ignored.
- The minimum output frequency on the **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

Conditions: (User Units mm)
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: MCN is only permitted after a previous MCN, and MCP is only permitted after a previous MCP.

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	Start moving continuously in the positive direction at the specified VR.
MCN	None	Move continuous in the negative direction at the specified VR.
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
TA	0.001 - 500 (0.5)	Acceleration time [sec]
TD	0.001 - 500 (0.5)	Deceleration time [sec]
SENSORACT	0 - 2 (2)	SENSOR input action 0: Hard stop 1: Soft stop 2: Soft stop at fixed distance from SENSOR signal
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

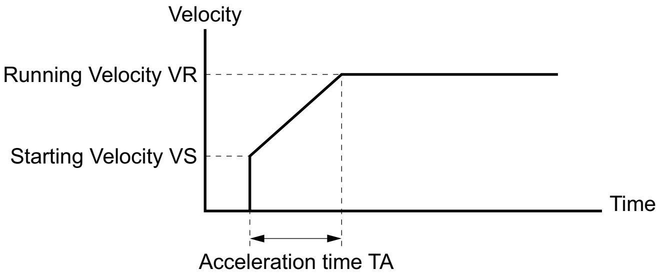
Note See "8.5 Stopping Motion" on page 99 for information on stopping motions before they finish.

Memo The minimum output frequency on the **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

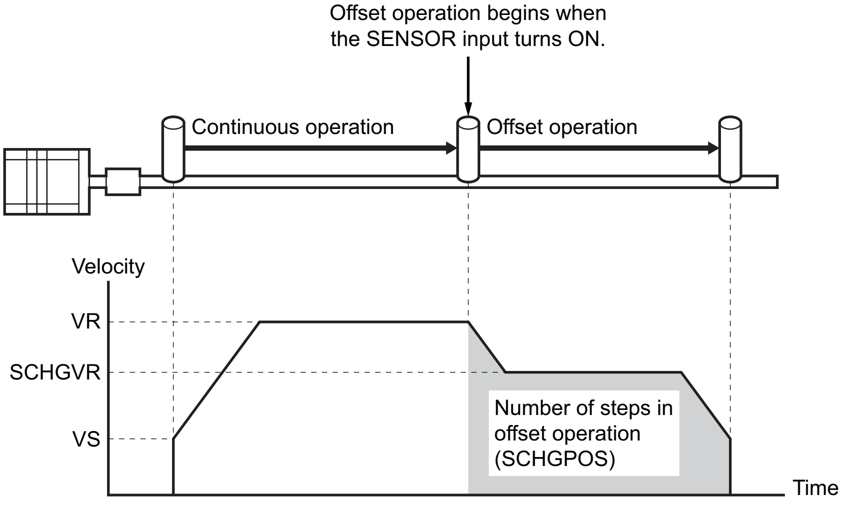
Conditions:
Ball screw: lead 10 mm (See "7.3 Setting the User Unit" on page 68.)
Running Velocity: 5 mm/sec
Starting Velocity: 1 mm/sec
Direction: Positive

```
>VS=1
 VS=1 mm/sec
>VR=5
 VR=5 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.
See "8.5 Stopping Motion" on page 99 for information on hard stops and soft stops. The picture below illustrates stopping action when SENSORACT=2.

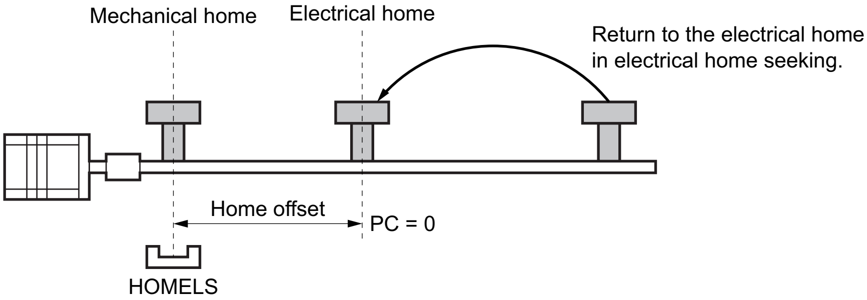

Offset operation begins when the SENSOR input turns ON.
Continuous operation
Offset operation
Velocity
VR
SCHGVR
VS
Number of steps in offset operation (SCHGPOS)
Time

8.2.4 Electrical Home Position and Mechanical Home Position

The **SCX10** is operated based on the position command (PC). The position command can be read and indicates the current position.
When the **SCX10** is powered on or reset, the position counter (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, and 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: position counter 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 (position reset) command, the current position will be set to the electrical home position and reset to "PC=0." Also, once executing the EHOME (return-to-electrical home operation) command, 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 (LIMN, LIMP) 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 VS (starting speed), VR (operating 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 (electrical 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	System home position output status (0: Not-active, 1: Active（at home）)
LIMN	−MAXPOS～+MAXPOS（0）	Setting of software position limit (Negative direction)
LIMP	−MAXPOS～+MAXPOS（0）	Setting of software position limit (Positive direction)
SLACT	0, 1(0)	Software position limit enable (0: Disabled, 1: Enabled)

( ): factory setting

Note

- See "8.5 Stopping Motion" on page 99 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, the position command (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 driver current position reading・Updating internal position（ABSREQPC）is performed, the electrical home position will be set without executing mechanical home seeking operation. See "8.3 Driver Current Position Reading (**NX** Series driver, **ESMC** controller)" on page 91.

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 (and possibly internal) 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 87 to 90.
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	Start seeking mechanical home in the + direction
MGHN	None	Start seeking mechanical home in the − direction
OFFSET	−MAXPOS - +MAXPOS (0)	Offset for mechanical home seeking [user unit]
HOMETYP	0～12（0）	Mechanical home seeking mode: see table below
VS	0 - MAXVEL (0.1)	Starting velocity [user unit/sec]
VR	0.001 - MAXVEL (1)	Running velocity [user unit/sec]
TA	0.001 - 500 (0.5)	Acceleration time [sec]
TD	0.001 - 500 (0.5)	Deceleration time [sec]
HOMEDCL	0～2（0）	Select the deviation counter clear during mechanical home seeking operation (refer to P.84 in details)

( ): factory setting

Note

- See "8.5 Stopping Motion" on page 99 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 200Hz pulse output speed, the final approach will be 200 Hz=200/MR "user unit/sec."
- The minimum output frequency on the **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.
- System END signal is referenced at the end of each motion. An error occurs if the END signal is not found.
- 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 **SCX10** 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.

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.87)
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.88)
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.89)
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.90)

- Example: Mechanical Home Seeking with HOMETYP=4

Conditions:
Ball screw, lead 10 mm (See "7.3 Setting the User Unit" on page 68.)
Running velocity: 5 mm/sec
Starting velocity: 1 mm/sec
Starting direction: positive
Acceleration time: 0.1 sec
Deceleration time: 0.1 sec

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

• Operation and Function at Mechanical Home Seeking Operation

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 (LIMN, LIMP) 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, **SCX10** resets the driver internal position to the home position. (The PRESET output of the driver connector on the **SCX10** 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 (home position preset) output to the driver connector on the **SCX10**, and set the PRESET input of the driver to be enabled. (Refer to "1.1 Driver current position reading" 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. EC (encoder count), PF (feedback position) and PC (position command) in the **SCX10** are set to 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 **SCX10** (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 **SCX10** 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 servomotor) 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 MGHN or MGHP 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)
```

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

Select whether the deviation counter of the **SCX10** and/or driver is cleared at the time of detecting the home position, and you can perform an accurate home seeking operation with a servomotor or you can acquire accurate feedback information when using an encoder.

Setting of HOMEDCL

Setting Value	Deviation Counter of the **SCX10**	Deviation Counter of the Driver
0	Clear	—
1	Clear	Clear
2	—	—

factory setting: 0 (zero)

Note

- When HOMEDCL is set to 1, ACL/DCL(Alarm Clear/Deviation Clear) output on the **SCX10** is required to be connected to the deviation clear input on the driver (CLR/ALM-RST input if the **NX** Series driver is used).
- 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 αSTEP product.

- Example 1: When using a stepping motor with an encoder (including the αSTEP, 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 αSTEP) 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 excitation sequence when the motor current was 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 simultaneously when a mechanical home seeking operation is performed, and PC and PF will become the same.

In case of the αSTEP, 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 simultaneously when executing mechanical home seeking operation, then PC and PF will become same.

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

Since the servomotor 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 **SCX10** is also cleared simultaneously, and the driver deviation is reflected to PE (position deviation) of the **SCX10** correctly.

- Example 3: When an accurate deviation is required to be seen with the stepping motor plus encoder (including the αSTEP, **ESMC** controller driver) 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 **SCX10** 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 αSTEP : 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 in the motor current ON state. 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 an encoder or feedback information, the setting of HOMEDCL is unrelated and is not required.
- A servomotor or the αSTEP will not misstep. Therefore, there is no need to see the deviation 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 of the αSTEP driver.

- Sensorless Mechanical Home Seeking Operation for "HOMETYP=12"

"HOMETYP=12" is sensor-less type mechanical home seeking operation (without external sensors), and can be used only when combining the **SCX10** 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.

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. The factory setting for the **EZSII** Series, **EZCⅡ** Series and **EZA** Series is "Push motion 1"

3. Assign the necessary signals in the driver connector on the **SCX10** are assigned

   Set to select "ESMC Sensor-less Home Seeking & Position Reading" using the "Auto Configuration" under the "System Config" tab - the "Driver I/O" tab in the provided utility software (**IMC**). Click the "SAVE and RESET" button and 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 to 5（2）	Assign the DINx input of the driver connector on the **SCX10** to the END (positioning complete) input (Connect to the END output of the driver)
DINMOVE	0 to 5（0）	Assign the DINx input of the driver connector on the **SCX10** to the MOVE (motor moving) input (Connect to the MOVE output of the driver)
DOUTHMSTOP	0 to 8（0）	Assign the DOUTx output of the driver connector on the **SCX10** to the HMSTOP (sensorless mechanical home seeking operation stop) output (Connect to the HMSTOP input of the driver)
DOUTHOME	0 to 8（0）	Assign the DOUTx output of the driver connector on the **SCX10** to the HOME (sensorless mechanical home seeking operation start) output (Connect to the HOME input of the driver)

*Parameter 0 indicates "unassigned."

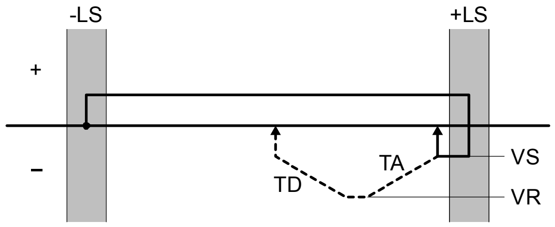
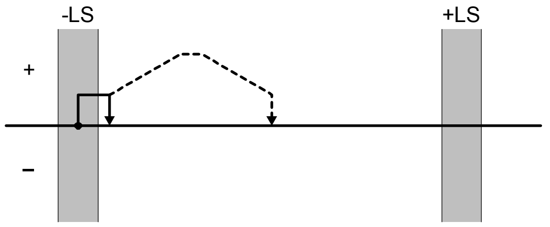
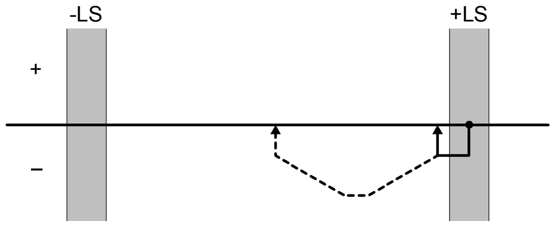
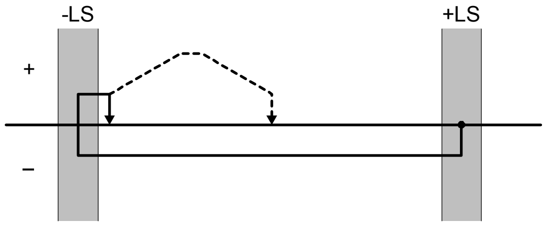
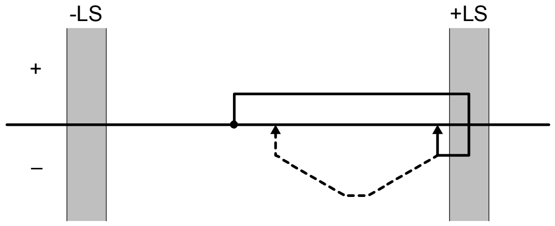
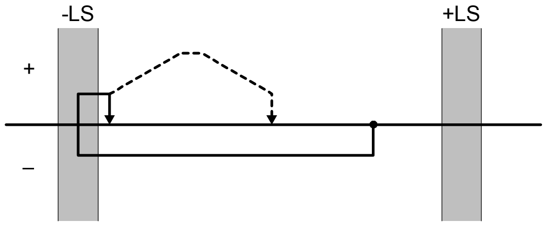
4. Connect the I/O points that have been configured in the step 3 and the points on the **ESMC** controller. (Refer to the connection diagram of "ESMC Sensor-less Home Seeking & Position Reading" on page 54 to page 55)

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

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

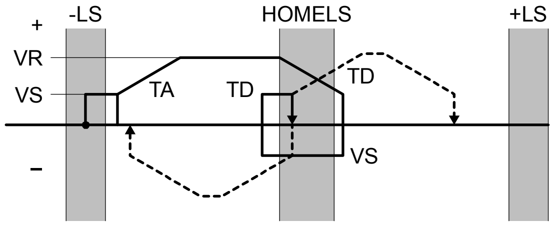
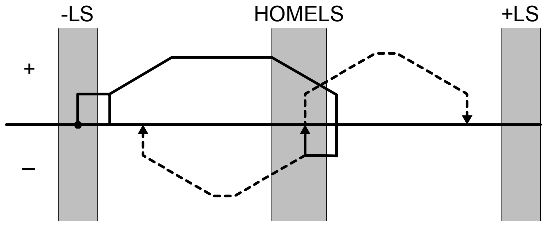
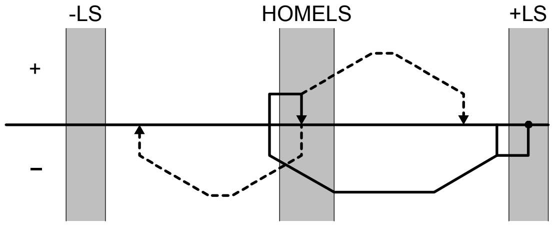
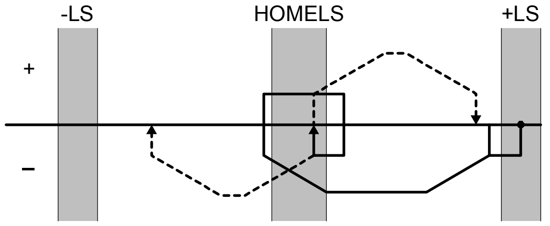
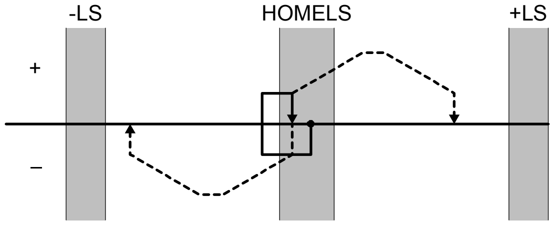
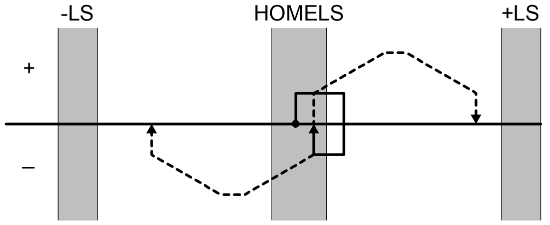
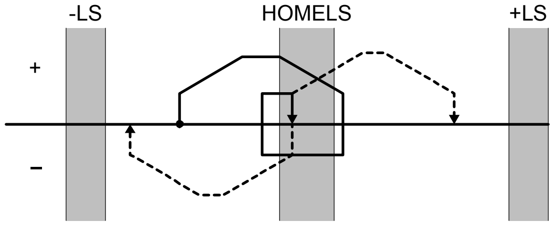
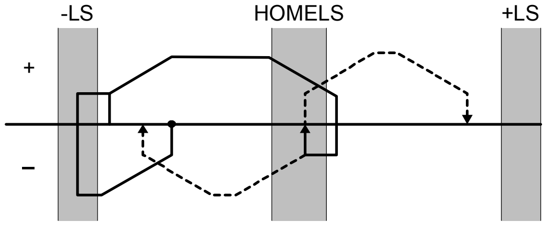
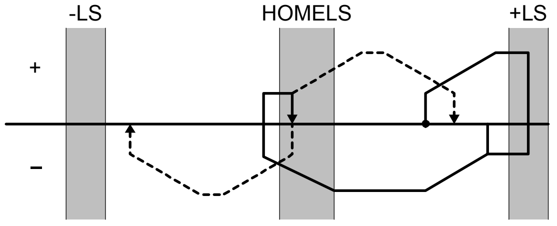
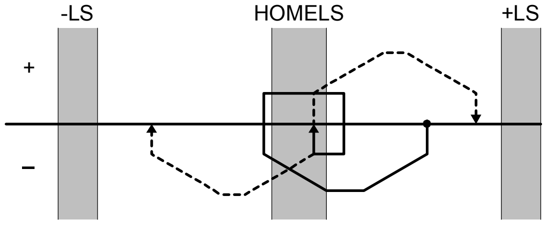
   (Starting direction and speed of the operation depend on the HOME parameters that was set to the driver in "2.")

- 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 ~ +LS		

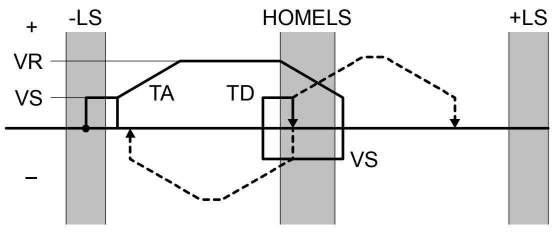
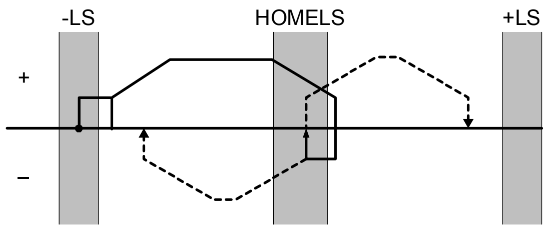
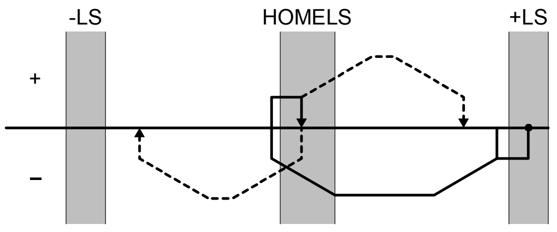
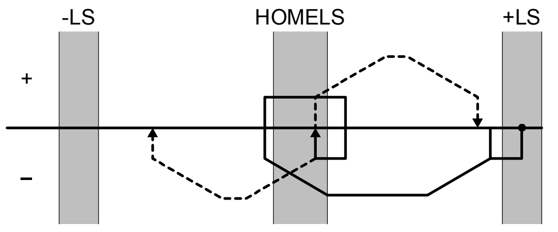
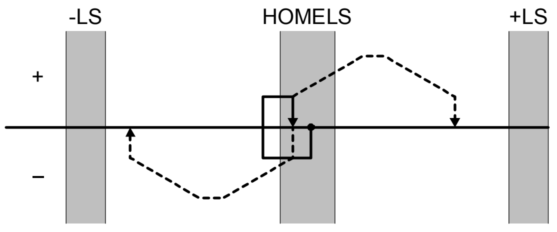
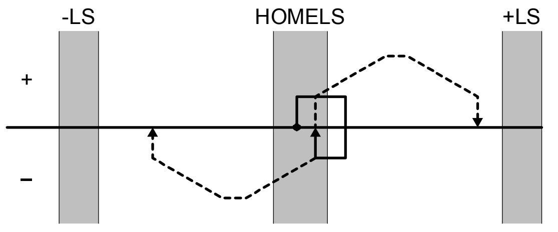
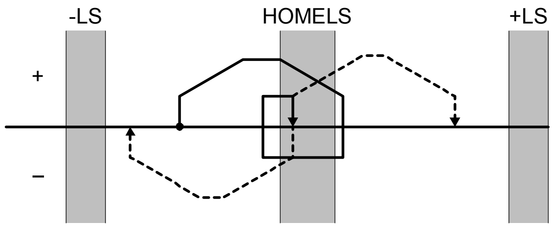
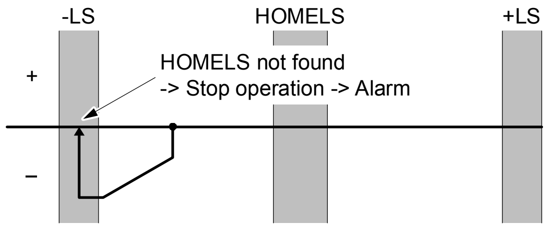
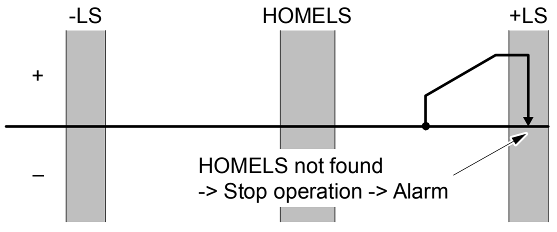
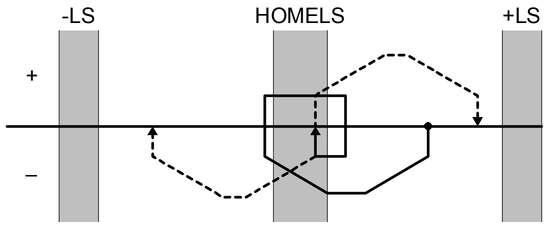
---- is operation with offset.

- 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 +LS + VR VS TA TD TD VS –	
+LS		
HOMELS		
HOMELS to -LS		
HOMELS to +LS		

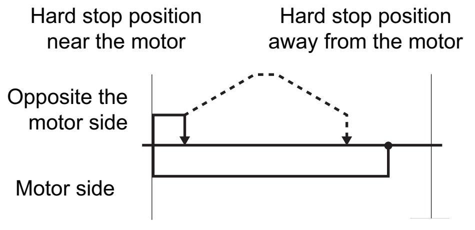
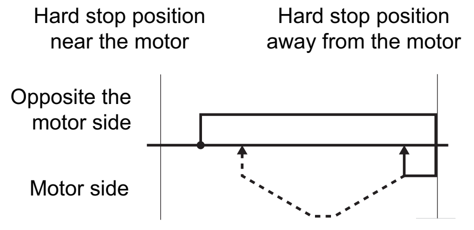
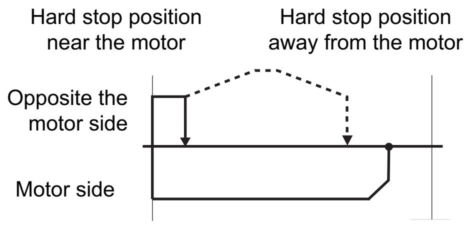
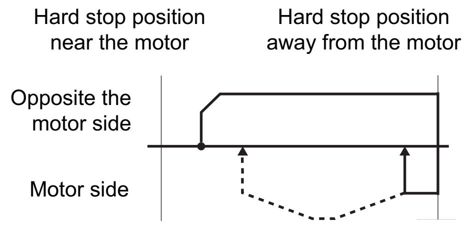
---- is operation with offset.

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

Starting position	HOME starting direction +(CW) (MGHP)	HOME starting direction −(CCW) (MGHN)
-LS	 -LS HOMELS +LS + VR VS TA TD VS −	
+LS		
HOMELS		
HOMELS ~ -LS		 -LS HOMELS +LS HOMELS not found -> Stop operation -> Alarm + −
HOMELS ~ +LS	 -LS HOMELS +LS + − HOMELS not found -> Stop operation -> Alarm	

---- is operation with offset.

- 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	 Hard stop position near the motor Hard stop position away from the motor Opposite the motor side Motor side	 Hard stop position near the motor Hard stop position away from the motor Opposite the motor side Motor side
Push-motion2 (high speed)	 Hard stop position near the motor Hard stop position away from the motor Opposite the motor side Motor side	 Hard stop position near the motor Hard stop position away from the motor Opposite the motor side Motor side

--- is operation with offset.

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

8.3 Driver Current Position Reading (NX Series driver, ESMC controller)

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 **SCX10** 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 sensorless mechanical home seeking operation cannot be performed.)

Note When selecting the "ESMC Position Reading" on the **SCX10** (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 sensorless mechanical home seeking operation when operating the PRESET on the **SCX10**.

Memo With the **ESMC** controller, if both the current position reading and the sensor-less mechanical home seeking operation are required, select HOME (enable sensorless mechanical home seeking operation start signal) by "HOME/PRESET switching." (The driver current position reading function can be performed even with this setting.) In sensorless 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 sensorless mechanical home seeking operation). (The PRESET signal is output from the **SCX10.**)

■ Setting the SCX10

To read the driver's current position, it is required to assign the necessary signals to the driver connector on the **SCX10**. Perform the following assignments using the automatic setting under "system setting" tab of the supplied utility software (**IMC**) as needed. (See "6.5.3 Change of Signal Assignment.")

- **NX** Series driver: Select "NX Function Expansion"
- **ESMC** controller: Select "ESMC Sensorless Home Seeking & Position Reading" or "ESMC Position Reading."

- When operating by a keyboard and not using the **IMC**, see the followings.
  It is required to assign each signal of the REQ (position data transmission request) output, CK (position data transmission clock) output, PR (position data transmission ready) input, P0 (position data bit 0) input and P1 (position data bit 1) input to the driver connector on the **SCX10** respectively. Also, it is required to assign the PRESET (reset home position) output signal when using the preset function.

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

Command	Parameter Value (Factory Setting)	Description
DINPR	0 to 5（0）	Assign the PR (position data output ready) input to the driver connector on the **SCX10** DINx (Connect to the OUTR output of the driver)
DINP0	0 to 5（0）	Assign the P0 (position data bit 0) input to the driver connector on the **SCX10** DINx (Connect to the OUT0 output of the driver)
DINP1	0 to 5（0）	Assign the P1 (position data bit 1) input to the driver connector on the **SCX10** DINx (Connect to the OUT1 output of the driver)
DOUTCK	0 to 8（0）	Assign the CK (position data transmission clock) output to the driver connector on the **SCX10** DOUTx (Connect to the CK input of the driver)
DOUTREQ	0 to 8（0）	Assign the REQ (position data transmission request) output to the driver connector on the **SCX10** DOUTx (Connect to the REQ input of the driver)
DOUTPRESET	0 to 8（0）	Assign the PRESET (reset home position) output to the driver connector on the **SCX10** DOUTx (Connect to the PRESET input of the driver)

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

■ Connection

Connect the I/O points that have been configured in the above and the points on the **NX** Series driver or **ESMC** controller. (Refer to the connection diagram for **NX** driver on page 58 to page 59 or for **ESMC** controller on page 56 to page 57.)

■ 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.

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, ・Update the value for PC (position command), PF (feedback position) and EC (encoder count) of the **SCX10** by the read driver current position ・Set the electrical home position and enable LIMN and LIMP when the software position limit control is set to 1 (SLACT=1)
PABS (Driver current position)	Driver current position (User unit)
ABSSTS (Driver status)	Driver status code (2 digits), driver alarm code (2 digits) example) 1C48 1C: driver alarm code（Hexadecimal） 48: driver status code（Hexadecimal）

<Steps>

1. Execute "CURRENT=0" (servo OFF/current OFF)
   Release any load on the shaft by setting the motor generating torque to zero. At the same time, set the deviation in the **SCX10** always to zero. (The current position PC will follow the feedback position PF)
   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. Hold the load in position using an electromagnetic brake etc. when any position displacement occurs by servo OFF/current OFF.
2. Execute ABSREQPC
   Read the driver current position and update the position information in the **SCX10**.
   If only reading the driver current position is required and updating the position information in the **SCX10** 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	Overwrite PC and PF (EC) after reading 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=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 referring to the current position only, use the ABSREQ (reading driver current position) command. The current position can be referred to using ABSREQPC, but PC, PF and EC of the **SCX10** will be overwritten. Also, an error will occur when ABSREQPC is used during pulse generation.
- When executing ABSREQPC, the PC (position command) of the **SCX10** is overwritten by the driver current position that was read. The value for PF (feedback position) and EC (encoder count) of the **SCX10** 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 at 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 will become "1." The ABSDATA output can be assigned to the remote output (in TPDO) of CANopen using the 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. PF (feedback position) and EC (encoder count) will follow maintaining PE (deviation). ･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 operation)	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 **SCX10** for about 1 msec.) The **NX** Series driver is required, 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 after absolute position loss alarm reset) *for the **NX** Series driver only
5. Execute mechanical home seeking home 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 **SCX10** (PC and PF) will not match the driver's current position. In this case, they will be matched by executing the ABSREQPC command. However, when setting the electrical home position other than the mechanical home position, it is recommended to set the offset value in the **SCX10** (use 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 will be output and the driver deviation counter will be cleared.

8.4 Torque Limiting/Push-motion Operation (NX Series driver, AR Series driver)

For safety operation, the maximum output torque of the servomotor 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) 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. Set the desired torque limiting value to the operation data No. 0 to 3.
- When using the **AR** Series 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 switching) 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 **SCX10** 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 under the factory setting, but it can be extended to four points if the analog I/O signal is set to disable.

■ Setting the SCX10

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 **SCX10** and/or I/O connector as follows.

- Setting the Driver Connector on the **SCX10**

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 **SCX10**.
* When using the **NX** Series driver, there is no need to assign the M2 input.

Execute the assignment using the "Auto Configuration" under the "System Config" tab – "Driver I/O" tab in the provided utility software (**IMC**).（See "6.5.3 Change of Signal Assignment."）

- When using the **NX** Series driver, select "**NX** Function Expansion"
- When using the **AR** Series driver, select "**AR** Push-Motion"

After selecting, click "SAVE and RESET." The necessary I/O signals will automatically be assigned.

Commands, which are executed by operating the keyboard, are as follows.

Command	Parameter Value (Factory Setting)	Description
DINLC	0～5（4）	Assign the driver connector on the **SCX10** DINx to the LC (limiting condition) input. (Connect to the TLC output of the driver)
DOUTTL	0～8（7）	Assign the driver connector on the **SCX10** DOUTx to the TL (torque limiting/push-motion operation) output. (Connect to the TL/T-Mode input of the driver)
DOUTM0	0～8（0）	Assign the driver connector on the **SCX10** DOUTx to the M0 (data select bit 0) output. (Connect to the M0 input of the driver)
DOUTM1	0～8（0）	Assign the driver connector on the **SCX10** DOUTx to the M1 (data select bit 1) output. (Connect to the M1 input of the driver)
DOUTM2	0～8（0）	Assign the driver connector on the **SCX10** 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 setting" 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 **SCX10** is enabled. And the CS (resolution switching) output is canceled and disabled.

Connection

Connect the I/O points that have been configured in the above and the points on the **NX** Series driver or **AR** Series Driver. (Refer to the connection diagram for **NX** Series driver on page 58 to page 59 or for **AR** Series driver on page 46 to page 47.)

Performing Torque Limiting/Push-motion Operation

See the following steps.

- When Performing Torque Limiting Operation:

1. Select the torque limiting value using the DD (driver operating data selection) parameter.
2. When setting the TL command (torque limiting) to "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 current value using the DD (driver operating data selection) parameter.
2. Set the TL command (push-motion operation) to "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	Setting the driver 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.
- Also 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 by command 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.
- 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 data "DD," the M0, M1 and M2 output of the driver connector on the **SCX10** 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

8.5 Stopping Motion

There are two ways to stop motion and sequence, command via serial communication ports and operate switch or PLC with I/O port. 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
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 1: Trigger alarm, motor current remains ON 2: Trigger alarm, motor current disabled	-

( ): factory setting

Note

- 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 can be continued (resumed) using the CONT command or input. The PAUSECLR command or PAUSECL input can be used to clear the remaining motion. 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 normally, since the PAUSE does not stop the sequence. See the descriptions for CONT (page 196), PAUSECLR (page 292) and PAUSE (page 291).
- Linked Motions, Return-to-electrical Home Operation and Mechanical Home Seeking cannot be paused and then continued: PAUSE causes a soft stop, and CONT is ignored.
- See "6.4.2 Input Signals" on page 25 for details on assigning signals to I/O ports.

8.6 Teaching Positions

The **SCX10** 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
- at any time, the system position can be stored to any location in the position data array
- while motor current is off, the system keeps monitoring position via the encoder inputs, ASG and BSG and commanded position (PC) is replaced by feedback position (PF) (accordingly, position becomes zero (0) if ASG and BSG inputs are not connected to the encoder or the encoder output of motor driver)

Note

- Motions use starting velocity VS, running velocity VR, and acceleration and deceleration times TA and TD.
- 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.
- 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 [millisecond]
D	Set jog distance in user unit（factory setting is 0.001）
F	When the driver has the FREE input : Toggle motor current and electromagnetic brake OFF and ON When the driver has the M.B.FREE input : Toggle electromagnetic brake OFF and ON
S	Save position array data to EEPROM (same as SAVEPOS)
<SPACE>	Hard stop
<ESC>	Soft stop, terminate teaching
<Enter>	Store current position to a location in the position data array (System will prompt for location, 1-100)

Note

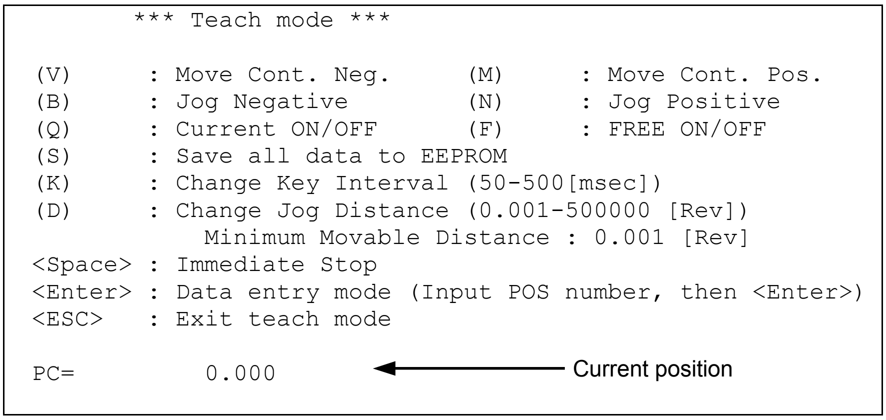
- For freeing the shaft, use the ‘F’ key when the driver has a FREE input , and use the ‘Q’ key when the driver has a M.B.FREE input. If the driver has a M.B.FREE input and is equipped with an electromagnetic brake, use both the 'Q' key and the 'F' key for freeing the shaft.
- Be careful when using the ‘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



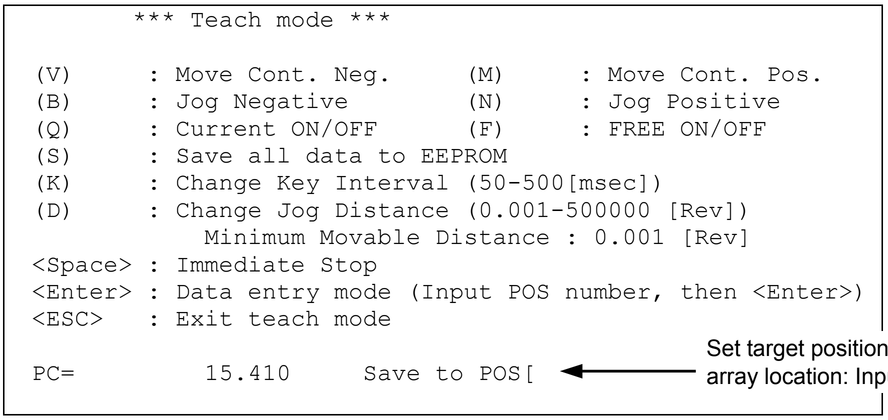
```
        *** Teach mode ***

 (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



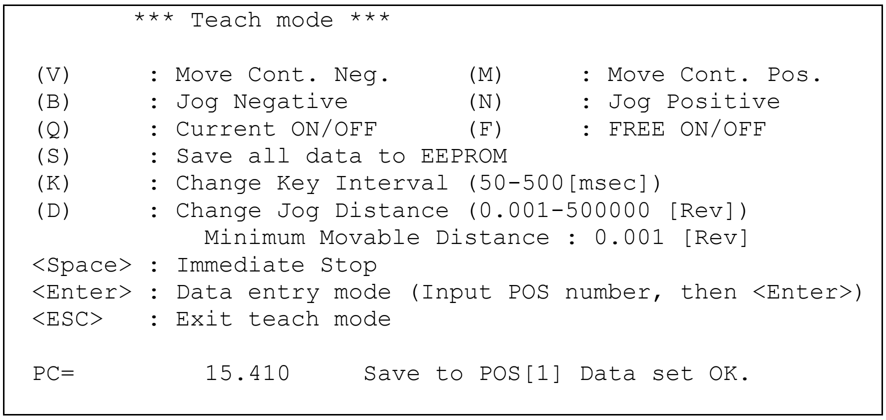
```
        *** Teach mode ***

 (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

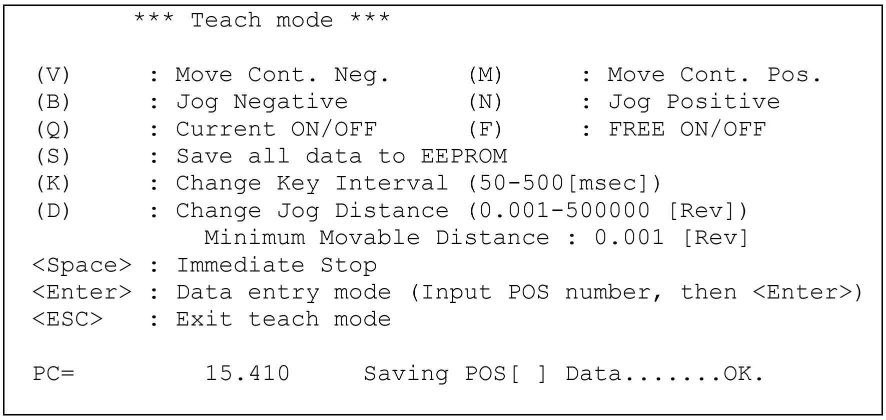


```
        *** Teach mode ***

 (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.
```

8.7 Multi Axis Operation

User or the master controller can operate more than one **SCX10** 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 62 for RS-232C Connection, ID (page 246), @ (page 170), TALK (page 335).

The **SCX10** can also be daisy chained with the **CM10** series 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** can not be used.

- Daisy Chain Communication Example

Call the specific device used for communication via 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: 8byte message format See "10.4 Controlling I/O Message (PDO)" on page 129.
- Reference section: "6.7 Connecting the CANopen" on page 64.

■ USB

- Maximum Nodes: Up to the number of COM ports on the master controller (PC)
- Addressing method: One **SCX10** pairs with one COM port on the master controller (PC). Command any target **SCX10** through the assigned port, each **SCX10** 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.

Note Be aware that Windows automatically changes the COM port number when a **SCX10** is replaced.

8.8 Encoder Function

The **SCX10** has encoder inputs that continuously monitor feedback position (PF) and position error (PE). 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.

■ Parameters

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

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

■ Example

```
Command                                           Description
>LIST CHECKLOAD                                   #List sequence CHECKLOAD

(  1) MCP                                         #Start continuous motion, positive
(  2) WHILE (IN1=0)                               #While Input 1 is off.
(  3)   D=PE-E                                    #Capture position error, and…
(  4)   D=0.01*D                                  #…Form a simple moving…
(  5)   E=E+D                                     #…average in variable E.
(  6) WEND                                        #End of WHILE block
(  7) SSTOP                                       #When IN1=1: Start soft stop
(  8) MEND                                        #Wait for motion to stop
(  9) IF (E>3)                                    #E = averaged position error
( 10)  SAS Load increasing, clean machine.        #if high, send reminder
( 11) ENDIF                                       #End of IF block
>
```

■ Selecting Encoder Input

There are two encoder inputs, on the driver connector of the **SCX10** and independent connector, and selected by ENC parameter.

ENC Parameter	Description
0	not used
1	on DRIVER connector on the **SCX10**
2	independent ENCODER connector

Memo 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 / timing signal･Z-phase pulse single ended input) in the **SCX10**, and can be used to seek the mechanical home position. See "8.2.5 Mechanical Home Seeking" on page 81.

8.9 Mathematical/Logical/Conditional Operators

For command list of mathematical/logical/conditional Operations, see "■ Math/Logical/Conditional Operators (In Sequence only)" on page 162.

■ Mathematical/Logical Operators

The following mathematical/logical operations can be used in a program:

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

8.10 User Variables

For command list of user variables, see "■ User Variables" on page 163.

■ 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 (X=KBQ)

• Example

```
Command                                        Description
(  1) MCP
(  2) WHILE (IN1=0)
(  3)    D=PE-E                                #PE: Position error command, E: user variable
(  4)    D=0.01*D                              #D: user variable
(  5)    E=E+D
(  6) WEND
(  7) SSTOP
(  8) MEND
(  9) IF (E>3)
( 10) SAS Load increasing, clean machine.
( 11) ENDIF
```

■ 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                #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
 New variable N_TOTAL is added.      N_TOTAL
 N_TOTAL=10
>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
>
```

8.11 View and Test Functions

■ I/O Test

The **SCX10** provides a utility to help confirm proper I/O operation. 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 sets all outputs to inactive (0).
An <ESC> key or character exits the OUTTEST process.

Note

- 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 reported by SIG__commands. It simply reflects the state of the input. For instance, SIGHOME is the system external Home Position (HOME) input signal state. If the state is high (photo coupler ON), SIGHOME=1 regardless of the input level (HOMELV) setting.

- 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, 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

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

Applicable Displayed Commands:
IN, INSG, INx, OUT, OUTSG, OUTx, IO, RIO, DIO, PC, PCI, PE, PF, PFI, RC, EC,
SIGPSTOP, SIGMSTOP, SIGABORT, SIGSTART, SIGMCP, SIGMCN, SIGMGHP, SIGMGHN, SIGPAUSE, 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 key 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.

- 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
>
```

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 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
   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 (-MAXPOS - +MAXPOS[UU])
 SCHGVR     : Velocity on SCHGPOS motion (0.001 - MAXVEL[UU/sec])

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

8.12 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

Condition	Description	Alarm Code
Hardware over travel	Positive or negative position limit signal detected	0x66
Software over travel	Position outside of programmed positive and negative position limits LIMP and LIMN	0x67
Panic stop	System executed a panic stop because of a PSTOP input or command	0x68

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)

Note See "9.7 Error Messages Displayed on the Terminal" on page 122 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

Note

- See "9.7 Error Messages Displayed on the Terminal" on page 122 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.

Chapter 9 Program Creation and Execution

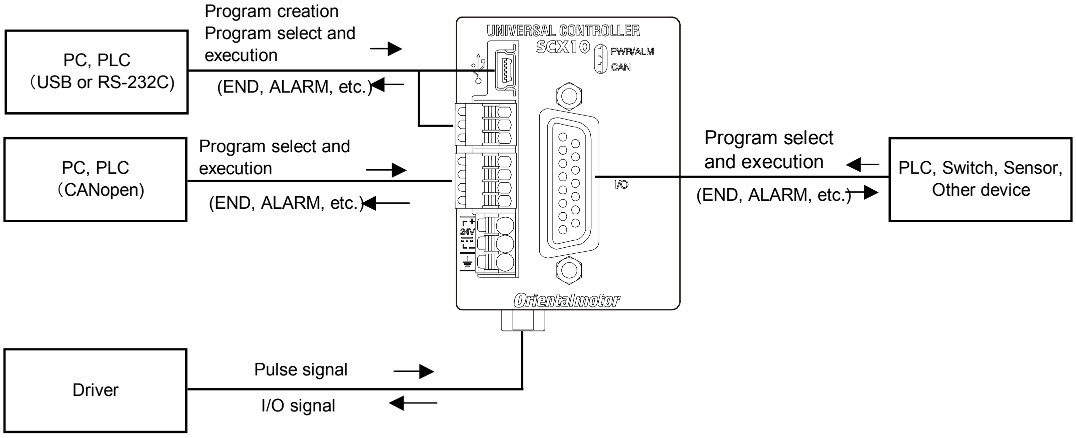
This chapter explains the methods used to create new programs, edit existing programs and execute programs.

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 **SCX10**, 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
9.3 Preparation
9.4 Creating a New Sequence
9.5 Sample Programs
9.6 Executing a Sequence
9.7 Error Messages Displayed on the Terminal

9.2 Operating Modes

Commands and programs are created by entering commands and parameters from a terminal program.
You can 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)

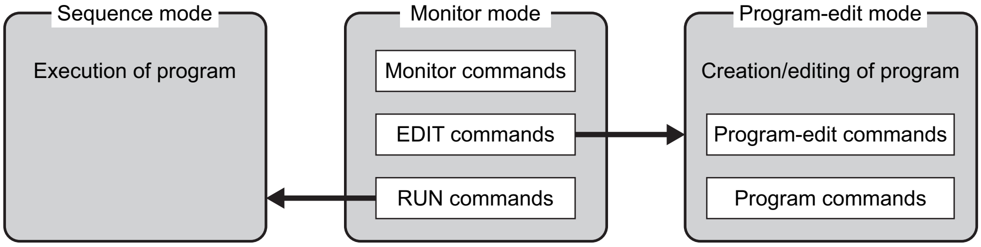
Sequences can be edited by either,
- Editing from the terminal.
- Editing from supplied utility software, the **Immediate Motion Creator for CM/SCX Series (IMC)**.

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 19 or "6.6 Connecting the RS-232C" on page 62 as necessary.

2. Power ON the **SCX10** and the driver
   See "6.2 Connecting the Power Supply" on page 18 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 19 as necessary.

   Communication Settings for general terminal software
   8 bits, 1 stop bit, no parity
   Baud rate: 9600 bps
   *The default USB and RS-232C baud rate of the **SCX10** is 9600 bps.

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	6 KB maximum for total compiled sequences 6 KB maximum for 1 sequence (text data)
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. **Name can not 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.

Note 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 **SCX10** can be used in a sequence. See "Chapter 12 Command List" on page 155.
For sequence specific commands, refer to "■ Sequence Commands" on page 162 and "■ Math/Logical/Conditional Operators (In Sequence only)" on page 162.

■ Example of Creating a New Sequence

1. Enter the terminal command "EDIT ∗" (* indicates the sequence name).

Insert a space between "EDIT" and the sequence name.
When the command is entered, a message indicating a blank sequence (New sequence) is displayed.
Enter "I" (Insert).
Subsequently, "(1)" is displayed and the system enters the sequence-edit mode.
You can now create a sequence.

```
>EDIT SAMPLE1

New Sequence

Sequence Name   : SAMPLE1
Sequence Number: 0
Lines:          : 0
Bytes:          : 0
Bytes Free      : 2048

>>Command: I

( 1)_
```

2. Enter commands and parameters by referring to Chapter12, "Command list," 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 a distance of 5 rev (DPR=1).
Insert a space or equal sign between the command and the parameter. See "■ Command Format" on page 368 as a reference.

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

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

The program is saved in the memory and a syntax check is performed. When an error in syntax is found, the line number on which the error was found is displayed together with the nature of the error.
Finally, enter "Q" to complete the program and exit edit mode.

```
( 4)

>>Command: S

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

>>Command: Q
>_
```

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.

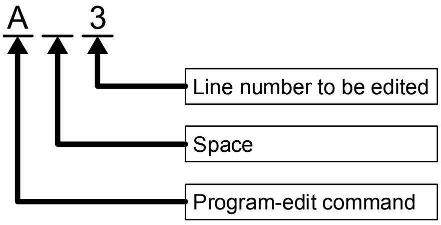
1. Enter the monitor command "EDIT ∗" (∗ indicates the sequence name or number).
   Insert a space between "EDIT" and the sequence name (or number).
   The system enters the sequence-edit mode.

```
>EDIT PROGRAM1

Sequence Name   : PROGRAM1
Sequence Number: 1
Lines:          : 5
Bytes:          : 23
Bytes Free      : 2025

>>Command:_
```

2. Enter a sequence-edit command and a line number according to the edit operation you wish to perform.
   Insert a space between the sequence-edit command and the line number.



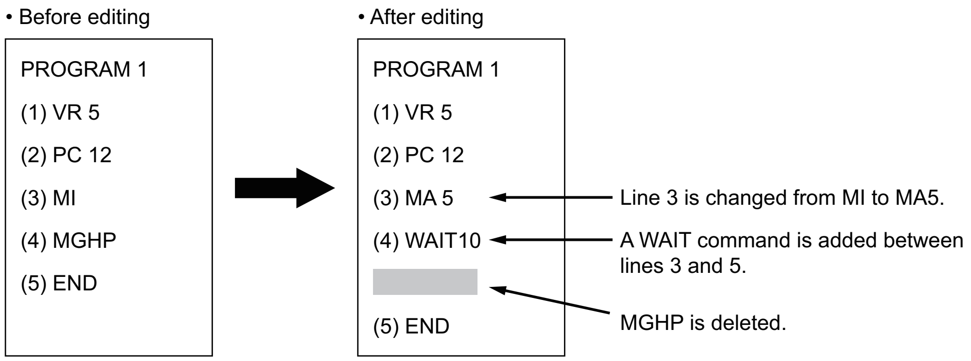
Command	Description
A	Alter(Change)
D	Delete
I	Insert
X	Cut
P	Paste
C	Copy
S	Save, Compile
Q	Quit
H	Display help
L	List
M	Display memory status

Note 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      : 2025

>>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 Back space 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 program-edit 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 program-edit 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 program-edit 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, and a syntax check is performed.

When an error in syntax is found, the line number on which the error was found is displayed together with the nature of the error.

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

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

>>Command:_
```

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

a ">" (command prompt) is displayed.

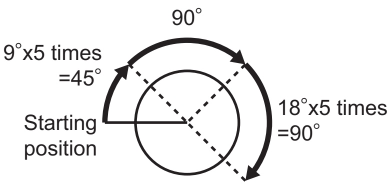
```
>>Command: Q
>_
```

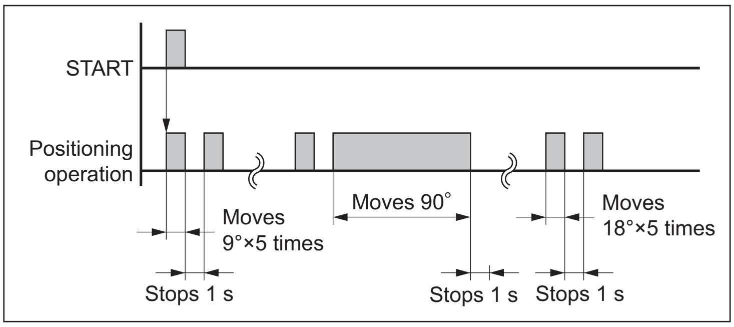
9.5 Sample Programs

This section provides sample programs.

■ Repeated Positioning Operation

- Motion Pattern





- Main Program

Applicable device:
Resolution: 360 deg/rev (DPR=360)
UU: Degrees

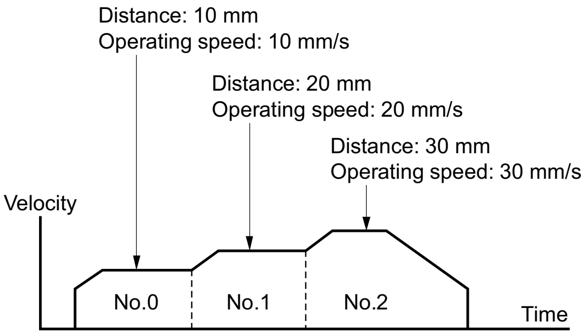
```
( 1) TA 0.1          The acceleration time is set to 0.1sec.
( 2) TD 0.1          The deceleration time is set to 0.1sec.
( 3) VS=10           The starting velocity is set to 10 deg/sec.
( 4) VR=360          The running velocity is set to 360 deg/sec.
( 5) LOOP 5          Lines 6 through 9 are repeated 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       The distance for operation number 0 is set to 10 mm.
(  2) DIS1=20       The distance for operation number 1 is set to 20 mm.
(  3) DIS2=30       The distance for operation number 2 is set to 30 mm.
(  4) VR0=10        The operating speed for operation number 0 is set to 10 mm/sec.
(  5) VR1=20        The operating speed for operation number 1 is set to 20 mm/sec.
(  6) VR2=30        The operating speed for operation number 2 is set to 30 mm/sec.
(  7) INCABS0=1     The positioning mode for operation number 0 is set to incremental.
(  8) INCABS1=1     The positioning mode for operation number 1 is set to incremental.
(  9) INCABS2=1     The positioning mode for operation number 2 is set to incremental.
( 10) LINK0=1       Operation number 0 is set to linked.
( 11) LINK1=1       Operation number 1 is set to linked.
( 12) LINK2=0       Operation number 2 is set to one shot linked.
( 13) MI            Start the operation to start at operation number 0. (Numbers 0 through 2 are linked.)
( 14) END           The 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 136.

■ Executing a Sequence from the Terminal

1. Connect the **SCX10** to the terminal by USB or RS-232C. Start the **Immediate Motion Creator for CM/SCX Series** (included) or terminal software.

2. Enter the terminal command "RUN ∗" (∗ indicates either a sequence name or number).
   Insert a space between "RUN" and the sequence name (or number).
   When the command is entered, the system executes the sequence.

■ Executing a Sequence from I/O

1. Use the INSTART command to assign the START function to IN1 to IN9. Connect the START input to the host controller.
   Connect the IN1 to IN9 and ABORT input, as needed.

2. 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

Note
- This selection can also be done with rotary digital 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.

3. Assert START input. System starts executing the desired sequence.
   There are two actions for START input. It is configured by STARTACT.

STARTACT	Operation
0	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF does not stop sequence. ABORT input is needed for aborting sequence.
1	Setting START input from OFF to ON starts sequence execution. Setting START input from ON to OFF aborts the sequence.

Note
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 341) in more detail.

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: Given sequence name exceeds 10 characters

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: Extra text is found after an editor command. (example: 34c)

End line must follow start line

Cause/action: Many Editor commands can take both start and end line numbers ([A]lter, [D]elete, [L]ist, [C]opy, [C]ut). 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: "Blocks" (WHILE−WEND, LOOP−ENDL, IF−ENDIF) can be "nested" inside each other. We permit up to 8 levels of nesting.

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 operations.

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 operation.

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: Mechanical home seeking could not be executed correctly.
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. Delete the program, and then enter it again.

Calculation result overflow
Cause/action: Calculation result over flow. Enter a program name that exists.

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 it's 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: Command is attempted that is not executable 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: Command that starts motion is attempted while a sequence is running.

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

Error: Action is not allowed. (Motion or I/O settings incompatible)
Cause/action: 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.

Chapter 10 Control by CANopen Communication

This chapter explains how to control the **SCX10** 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: SCX10_x_x.eds, under CANopen_EDS folder)

10.1 Overview

The **SCX10** uses CANopen DS301 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 page 25, "6.4.3 Output Signals" on page 28 and "Chapter 8 Features" on page 74 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 Chapter 12 Command List on page 164 for commands related to the CANopen and "Chapter 9 Program Creation and Execution".
- While both the PDO (Process Data Object) and SDO (Service Data Object) are supported with the **SCX10**, the PDO is mainly explained in this manual.

10.2 Transmission Speed and ID Setting
10.3 LED Indication
10.4 Controlling I/O Message (PDO)
10.5 I/O Message Format (PDO)
10.6 I/O Message Command Code List (PDO)
10.7 Object Dictionary (SDO)

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 190) and CANID command (page191).

Item	Description
Protocol	CiA Draft Standard 301 Ver4.02 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 **SCX10** 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

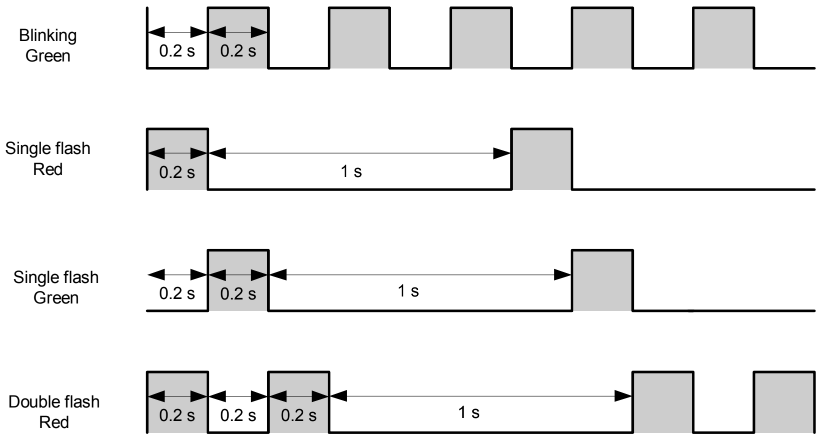
The CANopen run LED indicates the status of the CANopen network state machine.
If CAN has not been connected after turn the power on or the device is executing a reset, the CANopen run LED is off.

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. Apart from this situation, the bicolor status LED combines the behavior of the CAN error LED and those of the CAN run LED, as appropriate.

■ LED Indicator States and Flash Rates

The following indicator states are defined.



10.4 Controlling I/O Message (PDO)

■ I/O Message Format

The **SCX10** is controlled via CANopen by the following 8 byte I/O message formats; master to the **SCX10**, and the **SCX10** to a master, respectively.

- RPDO (Receive Process Data Object) : Master to **SCX10**

The RPDO acts as an input of the **SCX10**.

RPDO Mapping (Master → **SCX10**)

	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) : **SCX10** to Master

The TPDO acts as an output of the **SCX10**.

TPDO Mapping (**SCX10** → 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 **SCX10**)

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 **SCX10**. For example, to make the RIN1 turned ON, set the bit, byte [0]-Bit [0] in RPDO to "1" (ON). The **SCX10** receives this command and takes it as the "remote input 1 is turned ON."

RPDO (Master → **SCX10**)

	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 → **SCX10**)

	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 **SCX10**. See "6.4.2 Input Signals" on page 25 and "6.4.3 Output Signals" on page 28 - for details of each signal.

- TPDO (OUTPUT of **SCX10**)

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 **SCX10** to control a master controller. For example, if the ROUT1 is 1 (ON), that means the remote output ROUT1 on the **SCX10** is turned ON, and the remote input signal 1 of the master controller is turned ON.

TPDO (**SCX10** → 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 **SCX10** is in the ready status.

TPDO (**SCX10** → 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 (electromagnetic 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 **SCX10**.

Example: MSTOP is assigned to RIN1

RPDO (Master → **SCX10**)

	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 **SCX10**. See "6.4.2 Input Signals" on page 25 and "6.4.3 Output Signals" on page 28 - for details of each signal.

	Signal		Command for Assignment
INPUT (RPDO)	ALMCLR	(alarm clear)	RINALMCLR
	HOME	(home sensor)	RINHOME
	LSN	(limit switch negative)	RINLSN
	LSP	(limit switch positive)	RINLSP
	MSTOP	(motor stop)	RINMSTOP
	MGHP	(move go home positive)	RINMGHP
	PAUSE	(pause motion)	RINPAUSE
	PAUSECLR	(pause clear)	RINPAUSECL
	PECLR	(position error clear)	RINPECLR
	PSTOP	(panic stop)	RINPSTOP
	SENSOR	(sensor)	RINSENSOR
	TL	(torque limiting/push-motion operation /current cutback release)	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 "IO Message command code list." "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. 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 → **SCX10**)

	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.

Hereafter, examples are shown with hexadecimal numbers.
The data is set to the **SCX10** when the trigger (TRIG) bit is set to 1 (ON).

RPDO (Master → **SCX10**)

	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 **SCX10** 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. (Data of the DATA_R area in TPDO is fixed to 0 when a write command is issued in the RPDO.)

TPDO (**SCX10** → 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, that means that there is a process error.

TPDO (**SCX10** → 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 → **SCX10**)

	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 **SCX10** 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 **SCX10**, but you may also ask the **SCX10** 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 → **SCX10**)

	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 **SCX10** will send the value of the requested parameter to the master using TPDO as follows.

TPDO (**SCX10** → 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.

■ 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 in positive direction) 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 → **SCX10**)

	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 → **SCX10**)

	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 → **SCX10**)

	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]								

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 156. 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 → **SCX10**)

	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 → **SCX10**)

	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]								

Note

- When any of the RIN1-RIN8 are assigned to specific system inputs such as the ALMCLR (alarm clear) and MSTOP (motor stop), these bits (inputs) can not 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 **SCX10** reads RIN1 as ON in the program if the RIN is set to 1 at the program selection.)

- 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 → **SCX10**)

	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 → **SCX10**)

	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]								

10.5 I/O Message Format (PDO)

■ RPDO Mapping: Master → SCX10

	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 input General programmable remote inputs. All inputs can be assigned to system remote input signals. (PSTOP, MSTOP, MGHP, PAUSE, PAUSECLR, 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	Seek Mechanical Home Position, Negative direction (HOMETYP command determines the type of home seeking motion)	0: No action 1: Go Home
ABORT	Abort Sequence and Motions	<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	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: SCX10 → 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 outputs General programmable remote outputs. All outputs can be assigned to system output signals. (RUN, PSTS, MBFREE, ABSDATA).	0: Not active 1: Active
WNG	Warning status	0: No warning 1: Warning occurred
ALM	Alarm status	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	End of Motion	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: Drive END signal inactive ･1: Driver END signal active
MOVE	Motor Moving	0: Stopped 1: Moving (pulses are generating or sensor-less home seeking is in a operation)
HOME_P	Home Position	0: Not in HOME position 1: At HOME position
LC	Limiting Condition - **AR** Series 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. - **NX** Series driver: When the motor torque reaches the preset value while the torque limiting function is used - **RBK** Series driver: Under current cutback condition - **ESMC** controller: While pressing the mechanical home when performing sensorless 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	Trigger for handshake When the processing for parameter reading or writing, or other command is completed, this bit is set from 0 to 1.	0: Not yet process. 1: Processing completed.
STATUS	If sequence program can not 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=12.7mm (user unit): Set the value, 12700 in the command message.

Running velocity=10mm/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 List" and "8. Features" for the detail of commands.

Command Code		Description	Range	Factory Setting	Command Ref
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	Homing Type	0 to 11	0	HOMETYP
0164h	1164h	Home Offset Position	-MAXPOS to +MAXPOS [UU]	0	OFFSET
0380h	1380h	Driver Operation Data	0～7	0	DD
0400h	1400h	Incremental Motion Distance	-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 After Sensor Input	-MAXPOS to +MAXPOS [UU]	0	SCHGPOS
04A1h	14A1h	Velocity After Sensor Input	1 to MAXVEL [UU/sec]	1000	SCHGVR
0500h	1500h	Linked Motion Distance or Destination #0	-MAXPOS to +MAXPOS [UU]	0	DIS0
0501h	1501h	Linked Motion Distance or Destination #1	-MAXPOS to +MAXPOS [UU]	0	DIS1
0502h	1502h	Linked Motion Distance or Destination #2	-MAXPOS to +MAXPOS [UU]	0	DIS2
0503h	1503h	Linked Motion Distance or Destination #3	-MAXPOS to +MAXPOS [UU]	0	DIS3
0510h	1510h	Link Motion Running Velocity #0	1 to MAXVEL [UU/sec]	1	VR0
0511h	1511h	Link Motion Running Velocity #1	1 to MAXVEL [UU/sec]	1	VR1
0512h	1512h	Link Motion Running Velocity #2	1 to MAXVEL [UU/sec]	1	VR2
0513h	1513h	Link Motion Running Velocity #3	1 to MAXVEL [UU/sec]	1	VR3
0520h	1520h	Linked Move Type segment #0	0: Absolute 1: Incremental	1	INCABS0
0521h	1521h	Linked Move Type #1	0: Absolute 1: Incremental	1	INCABS1
0522h	1522h	Linked Move Type #2	0: Absolute 1: Incremental	1	INCABS2
0523h	1523h	Linked Move Type #3	0: Absolute 1: Incremental	1	INCABS3
0530h	1530h	Link Control 0 and 1	0: No link 1: Link	0	LINK0
0531h	1531h	Link Control 1 and 2	0: No link 1: Link	0	LINK1
0532h	1532h	Link Control 2 and 3	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 Ref
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 Sequences and Motions	n/a	ABORT
1C05h	Run Sequence (Sequence number is set in DATA.)	0 to 99	RUN
1C10h	Move Incremental Distance	n/a	MI
1C11h	Move Absolute Position	1 to 100	MA [POSx]
1C12h	Move Continuously, Positive	n/a	MCP
1C13h	Move Continuously, Negative	n/a	MCN
1C14h	Seek Mechanical Home Position, positive	n/a	MGHP
1C15h	Seek Mechanical Home Position, negative	n/a	MGHN
1C16h	Start Linked Index (Linked index number is set in DATA.)	0 to 3	MI [x]
1C17h	Return to Electrical Home	n/a	EHOME
1C18h	Pause Motion	n/a	PAUSE
1C19h	Continue Motion	n/a	CONT
1C1Ah	Clear Pause Motion	n/a	PAUSECL
1C1Bh	Change Velocity (Change velocity is set in DATA.)	1 to MAXVEL [UU/sec]	CV
1C1Ch	Position Error Clear	-	PECLR
1C1Dh	Driver Current Position Reading	-	ABSREQ
1C1Eh	Driver Current Position Reading/Updating Position Command	-	ABSREQPC
1C1Fh	Torque Limiting/Push-Motion Operation/Current Cutback Release	0, 1	TL

n/a: Not Applicable.

■ Monitor Commands

Command Code	Description	Range	Command Ref
2040h	Alarm (Now)	0 to 255	ALM
2063h	Position Command	-MAXPOS to +MAXPOS [UU]	PC
2064h	Velocity Command	0 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～+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	-2,147,483,648 to +2,147,483,647［UU］	EC
2091h	System Input Signal Status	0 to 523,263	INSG
2092h	General Output Status	0 to 15	OUT
2093h	System Output Signal Status	0 to 447	OUTSG
20A0h	Remote General Input Status	0 to 255	RIN
20A2h	Remote General Output Status	0 to 63	ROUT
20B0h	Driver General Input Status	0～127	DIN
20B1h	Driver System Signal Input Status	0～127	DINSG
20B2h	Driver System Output Status	0～255	DOUT
20B3h	System Driver Output Status	0～16382	DOUTSG

■ Maintenance Command

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

Note The minimum output frequency on the **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.

10.7 Object Dictionary (SDO)

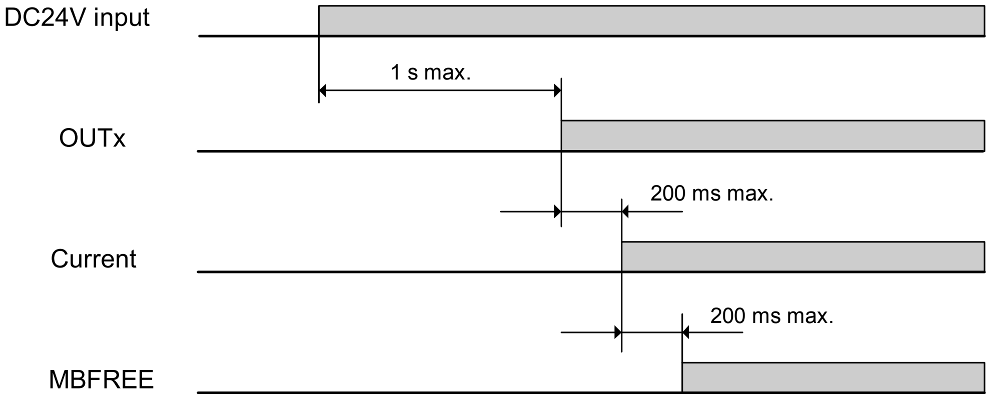
Index (hex)	Sub Index (Hex)	Name	Data Type	Category	Access	Factory Setting	Comment
1000	00	Device Type	UNSIGNED32	Mandatory	R	00000000h	This device does not follow a standardized device profile.
1001	00	Error Register	UNSIGNED8	Mandatory	R	0	generic error (bit 0) only
1008	00	Manufacturer Device Name	Visible String	Optional	R		**CM10** **SCX10**
1009	00	Manufacturer Hardware Version	Visible String	Optional	R	EB2537-2	EB2537-2
100A	00	Manufacturer Software Version	Visible String	Optional	R	1.00	1.00
100C	00	Guard Time	UNSIGNED16	Optional	R W	0	msec
100D	00	Life Time Factor	UNSIGNED8	Optional	R W	0	
1010		Store parameters		Optional			Signature "save"
	00	Largest subindex supported	UNSIGNED8	Optional	R	2	
	01	Save all parameters	UNSIGNED32	Optional	R W	-	all
	02	Save communication parameters	UNSIGNED32	Optional	R W	-	Index 1000h-5FFFh
1011		Restore default parameters	UNSIGNED32	Optional		-	Signature "load"
	00	Largest subindex supported	UNSIGNED8	Optional	R	2	
	01	Restore all default parameters	UNSIGNED32	Optional	R W	-	all
	02	Restore communication default parameters	UNSIGNED32	Optional	R W	-	Index 1000h-5FFFh
1014	00	COB-ID Emergency Object	UNSIGNED32	Optional	R	Node-ID +00000080h	Mandatory, if Emergency is supported
1017	00	Producer Heartbeat Time	UNSIGNED16	Optional	R W	0	Mandatory if guarding not supported.
1018		Identity Object		Mandatory			
	00	Number of entries	UNSIGNED8	Mandatory	R	2	
	01	Vendor ID	UNSIGNED32	Mandatory	R	000002BEh	Oriental Motor (Europa) GmbH
	02	Product code	UNSIGNED32	Optional	R		**CM10**: 5001 **SCX10**: 5002
1400		Receive PDO Communication Parameter		Mandatory			
	00	Largest sub-index supported	UNSIGNED8	Mandatory	R	2	
	01	COB-ID used by PDO	UNSIGNED32	Mandatory	R	Node-ID +200h	
	02	Transmission type	UNSIGNED8	Mandatory	R	254	Manufacturer specific (immediately)
1600		Receive PDO Mapping Parameter		Mandatory		-	
	00	Number of mapped application objects in PDO	UNSIGNED8	Mandatory	R	3	
	01	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E000110h	INP (Index=2E00h, Sub Index= 01h, 16bit)
	02	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E000210h	AID (Index=2E00h, Sub Index= 02h, 16bit)
	03	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E000320h	DATA (Index=2E00h, Sub Index =03h, 32bit)

Index (hex)	Sub Index (Hex)	Name	Data Type	Category	Access	Factory Setting	Comment
1800		Transmit PDO Communication Parameter		Mandatory			
	00	Largest sub-index supported	UNSIGNED8	Mandatory	R	5	
	01	COB-ID used by PDO	UNSIGNED32	Mandatory	R W	Node-ID +180h	Bit 31 is 1, if inhibit time and/or event timer is changed.
	02	Transmission type	UNSIGNED8	Mandatory	R	254	Manufacturer specific (Event: COS, Time over)
	03	Inhibit time	UNSIGNED16	Optional	R W	0	The value is defined as multiple of 100 usec.
	05	Event timer	UNSIGNED16	Optional	R W	0	The event timer elapses as multiple of 1 msec.
1A00		Transmit PDO Mapping Parameter		Mandatory		-	
	00	Number of mapped application objects in PDO	UNSIGNED8	Mandatory	R	3	
	01	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E100110h	OUTP (Index=E10h, Sub Index=01h, 16bit)
	02	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E100210h	ID_R (Index=2E10h, Sub Index=02h, 16bit)
	03	PDO mapping for the nth application to be mapped	UNSIGNED32	Optional	R	2E100320h	DATA_R (Index=2E10h, Sub Index=03h, 32bit)
2040	00	Alarm (Now)	UNSIGNED8	Optional	R	0	ALM
2063	00	Position Command	SIGNED32	Optional	RW	-	PC (-MAXPOS to +MAXPOS) UU
2064	00	Velocity Command	SIGNED32	Optional	R	-	VC (-MAXVEL to +MAXVEL) UU/sec
2066	00	Feedback Position	SIGNED32	Optional	R	-	PF (-MAXPOS to +MAXPOS) UU
206A	00	General Input Status	UNSIGNED32	Optional	R		IN
2080	00	Position Error	SIGNED32	Optional	R		PE (-MAXPOS to +MAXPOS) UU
2081	00	Encoder Count	SIGNED32	Optional	R		EC (-2,147,483,648 to +2,147,483,647)
2091	00	System Input Signal Status	UNSIGNED32	Optional	R		INSG
2092	00	General Output Status	UNSIGNED32	Optional	R		OUT
2093	00	System Output Signal Status	UNSIGNED32	Optional	R		OUTSG
20A0	00	Remote General Input Status	UNSIGNED8	Optional	R		RIN
20A2	00	Remote General Output Status	UNSIGNED8	Optional	R		ROUT
20C0	00	Clear Alarm	UNSIGNED8	Optional	W	-	ALMCLR
2140	00	Acceleration Time	UNSIGNED32	Optional	RW	500	TA (1 to 500,000) msec
2141	00	Deceleration Time	UNSIGNED32	Optional	RW	500	TD (1 to 500,000) msec
2142	00	Starting Velocity	UNSIGNED32	Optional	RW	100	VS (0 to MAXVEL) UU/sec
2160	00	Homing Type	UNSIGNED8	Optional	RW	0	HOMETYP (0 to 12)
2164	00	Home Offset Position	SIGNED32	Optional	RW	0	OFFSET (-MAXPOS to +MAXPOS) UU
2400	00	Incremental Motion Distance	SIGNED32	Optional	RW	0	DIS (-MAXPOS to +MAXPOS) UU
2401		Absolute Position					
	00	Number of entries	UNSIGNED8	Mandatory	R	100	
	01	Absolute Position 1	SIGNED32	Optional	RW	0	POS[1] (-MAXPOS to +MAXPOS) UU
	:		SIGNED32	Optional	RW	0	:
	64	Absolute Position 100	SIGNED32	Optional	RW	0	POS[100] (-MAXPOS to +MAXPOS) UU
2480	00	Running Velocity	UNSIGNED32	Optional	RW	1000	VR (1 to MAXVEL) UU/sec

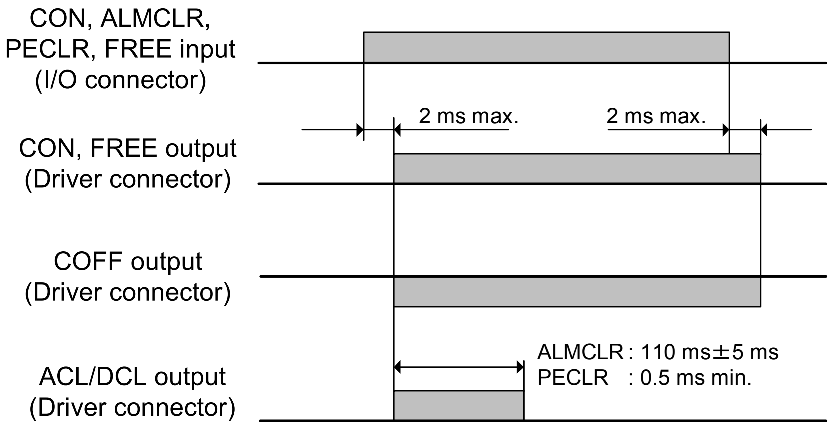
Index (hex)	Sub Index (Hex)	Name	Data Type	Category	Access	Factory Setting	Comment
24A0	00	Distance After SENSOR Input	UNSIGNED32	Optional	RW	0	SCHGPOS (0 to MAXPOS) UU
24A1	00	Velocity After SENSOR Input	UNSIGNED32	Optional	RW	1000	SCHGVR (1 to MAXVEL) UU/sec
2500		Linked Motion Distance or Destination	SIGNED32	Optional	RW		
	00	Number of Entries	UNSIGNED8	Mandatory	R	4	
	01	Linked Motion Distance or Destination 0	SIGNED32	Optional	RW	0	DIS0 (-MAXPOS to +MAXPOS) UU
	02	Linked Motion Distance or Destination 1	SIGNED32	Optional	RW	0	DIS1 (-MAXPOS to +MAXPOS) UU
	03	Linked Motion Distance or Destination 2	SIGNED32	Optional	RW	0	DIS2 (-MAXPOS to +MAXPOS) UU
	04	Linked Motion Distance or Destination 3	SIGNED32	Optional	RW	0	DIS3 (-MAXPOS to +MAXPOS) UU
2510		Linked Motion Running Velocity					
	00	Number of Entries	UNSIGNED8	Mandatory	R	4	
	01	Linked Motion Running Velocity 0	SIGNED32	Optional	RW	1000	VR0 (1 to MAXVEL) UU/sec
	02	Linked Motion Running Velocity 1	SIGNED32	Optional	RW	1000	VR1 (1 to MAXVEL) UU/sec
	03	Linked Motion Running Velocity 2	SIGNED32	Optional	RW	1000	VR2 (1 to MAXVEL) UU/sec
	04	Linked Motion Running Velocity 3	SIGNED32	Optional	RW	1000	VR3 (1 to MAXVEL) UU/sec
2520		Linked Move Type					
	00	Number of Entries	UNSIGNED8	Mandatory	R	4	
	01	Linked Move Type 0	BOOLEAN	Optional	RW	1	INCABS0 (0:Absolute, 1:Incremental)
	02	Linked Move Type 1	BOOLEAN	Optional	RW	1	INCABS1 (0:Absolute, 1:Incremental)
	03	Linked Move Type 2	BOOLEAN	Optional	RW	1	INCABS2 (0:Absolute, 1:Incremental)
	04	Linked Move Type 3	BOOLEAN	Optional	RW	1	INCABS3 (0:Absolute, 1:Incremental)
2530		Link Control					
	00	Number of Entries	UNSIGNED8	Mandatory	R	3	
	01	Link Control 0	BOOLEAN	Optional	RW	0	LINK0 (0:No Link, 1:Link-to-next)
	02	Link Control 1	BOOLEAN	Optional	RW	0	LINK1 (0:No Link, 1:Link-to-next)
	03	Link Control 2	BOOLEAN	Optional	RW	0	LINK2 (0:No Link, 1:Link-to-next)
2900	00	Running Timer	UNSIGNED32	Optional	RW	-	TIMER (0 to 500,000,000) msec
2E00		Command					
	00	Number of Entries	UNSIGNED8	Mandatory	R	3	
	01	INP	UNSIGNED16	Optional	RW	-	CANINP
	02	CANID	UNSIGNED16	Optional	RW	-	CANID
	03	DATA	UNSIGNED32	Optional	RW	-	CANDATA
2E10		Response					
	00	Number of Entries	UNSIGNED8	Mandatory	R	3	
	01	OUTP	UNSIGNED16	Optional	R	-	CANOUTP
	02	CANID_R	UNSIGNED16	Optional	R	-	CANID_R
	03	DATA_R	UNSIGNED32	Optional	R	-	CANDATA_R

Chapter 11 Timing Charts

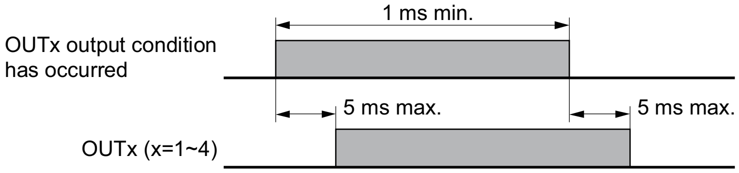
■ Power Input



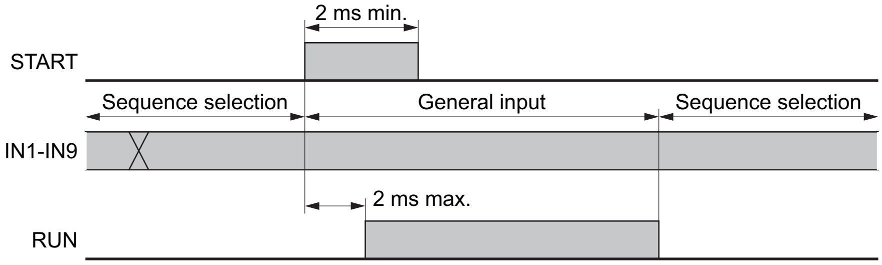
■ Controller Input and Output


CON, ALMCLR, PECLR, FREE input (I/O connector)
2 ms max.
2 ms max.
CON, FREE output (Driver connector)
COFF output (Driver connector)
ACL/DCL output (Driver connector)
ALMCLR : 110 ms±5 ms
PECLR : 0.5 ms min.

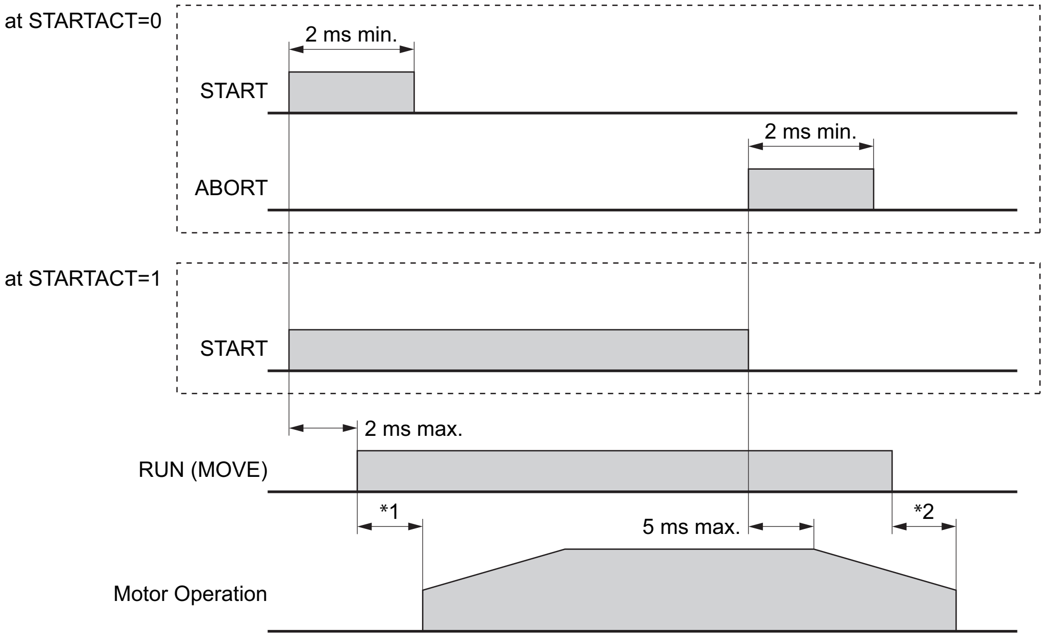
■ Output



Selection and Execution of a Sequence



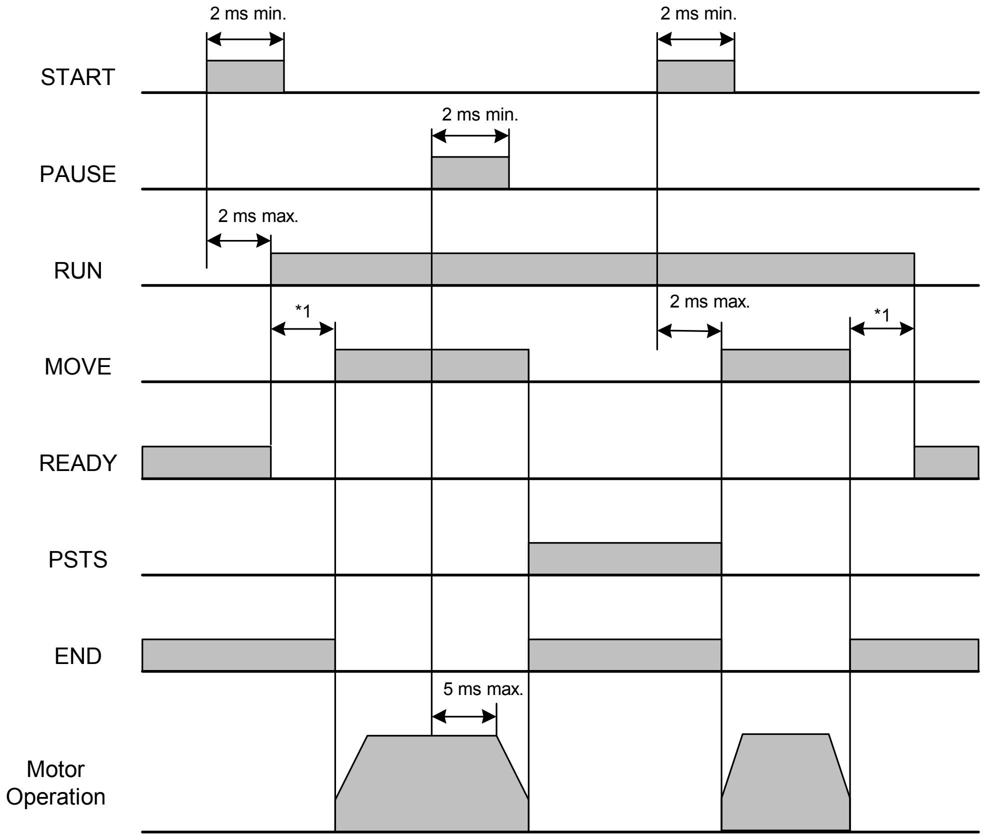
Execution and Stopping a Sequence (START, ABORT, RUN, MOVE)



*1 Depend on the program.

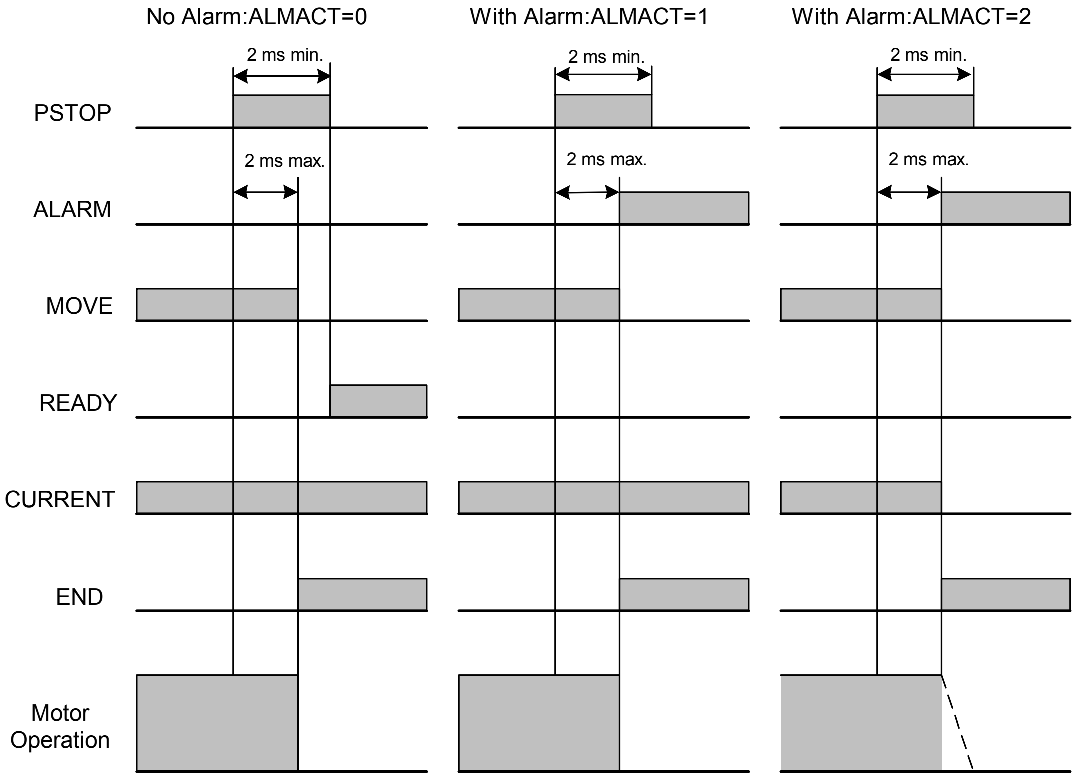
*2 Depend on the load condition and settling time at stop.

■ Pausing Index Operation (PAUSE, PSTS)

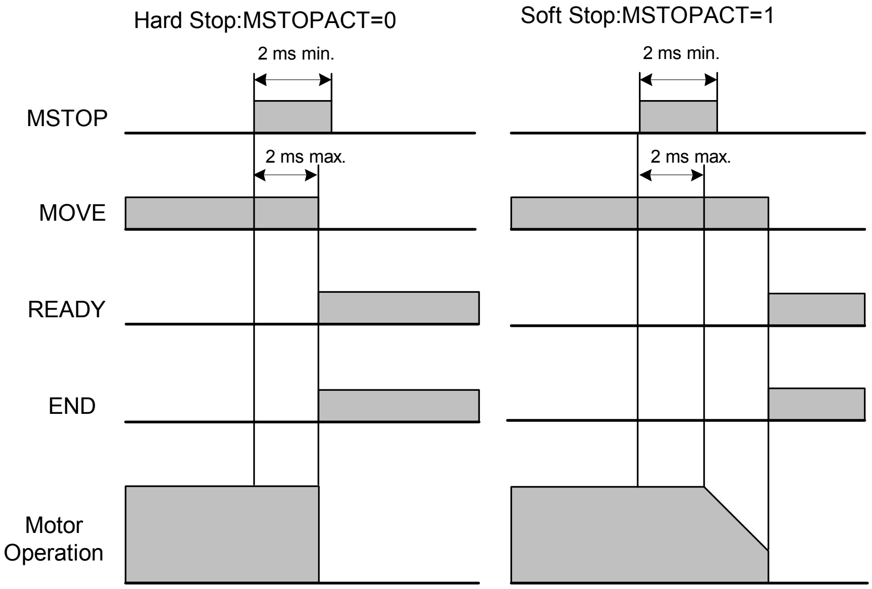


*1 Depend on the program.

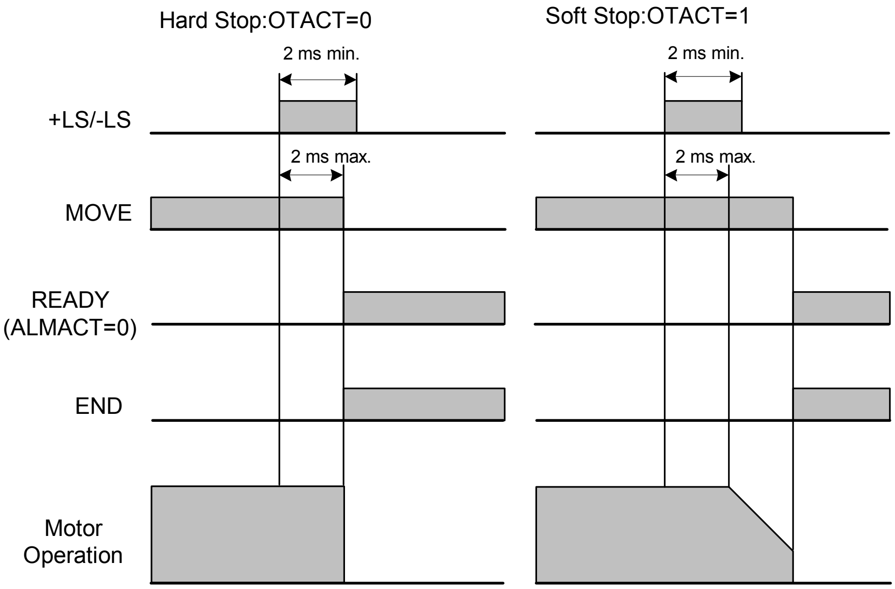
■ When the PSTOP Input is Turned ON



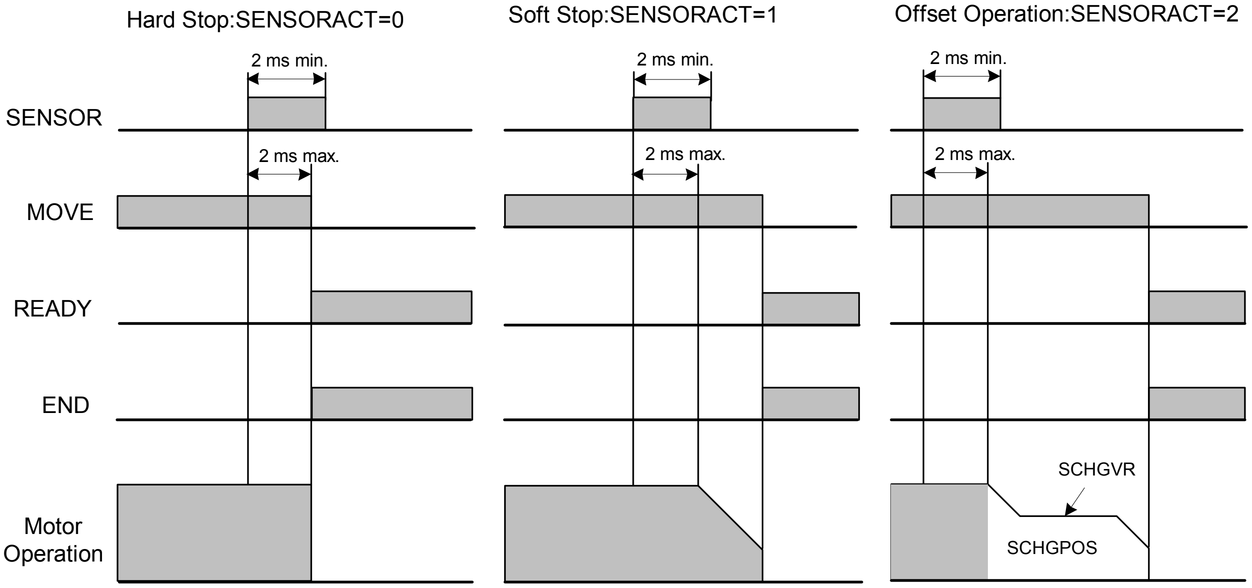
■ When the MSTOP Input is Turned ON



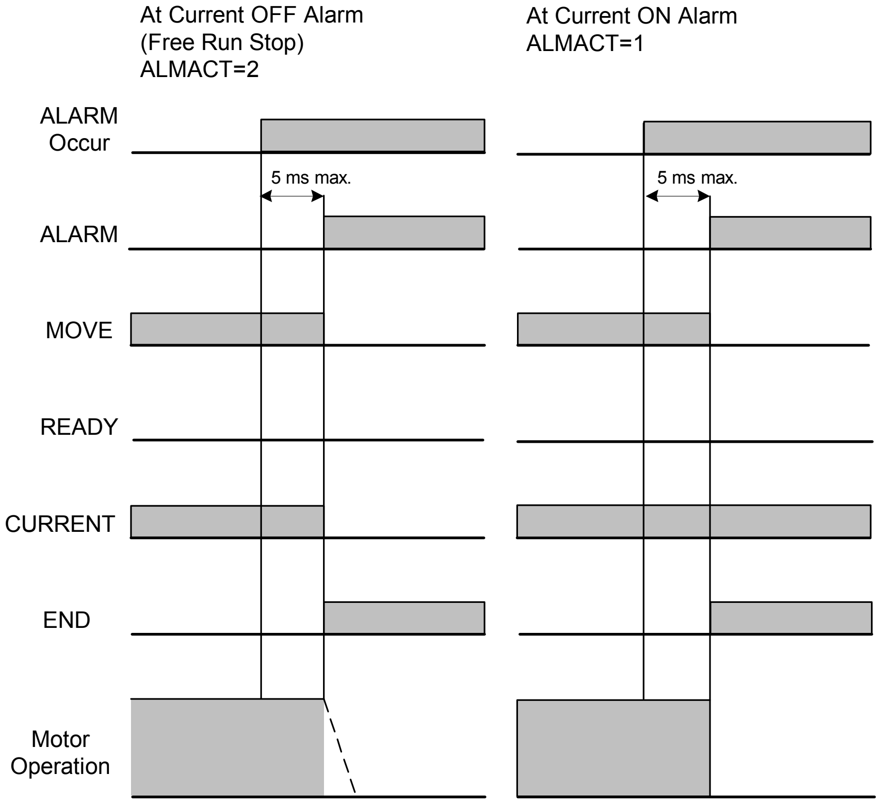
■ When the (+LS, −LS) Input is Used



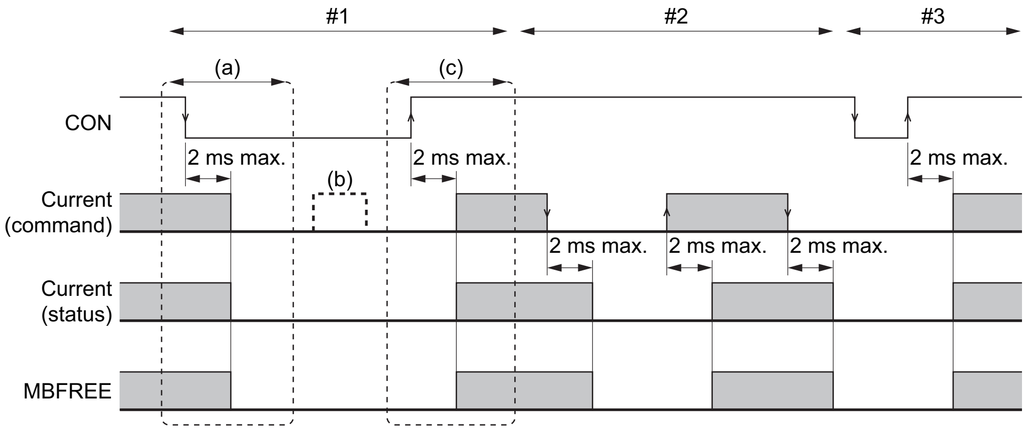
■ When the SENSOR Input is Used



■ When the ALARM is Occurred



■ CON Input and MBFREE Output



1. The order for priority: Current OFF＞Current ON

(a) When the device is in an excited state and the non-active edge of CON is detected.
→ CURRENT=1→0、remove the excitation state、MBFREE output goes non-active
(b) When the CON input is non-active.
Writing to the CURRENT command is invalid. (read only)
(c) When the active edge of the CON input is detected.
→ CURRENT=0→1、return to an excitation state、MBFREE output goes active

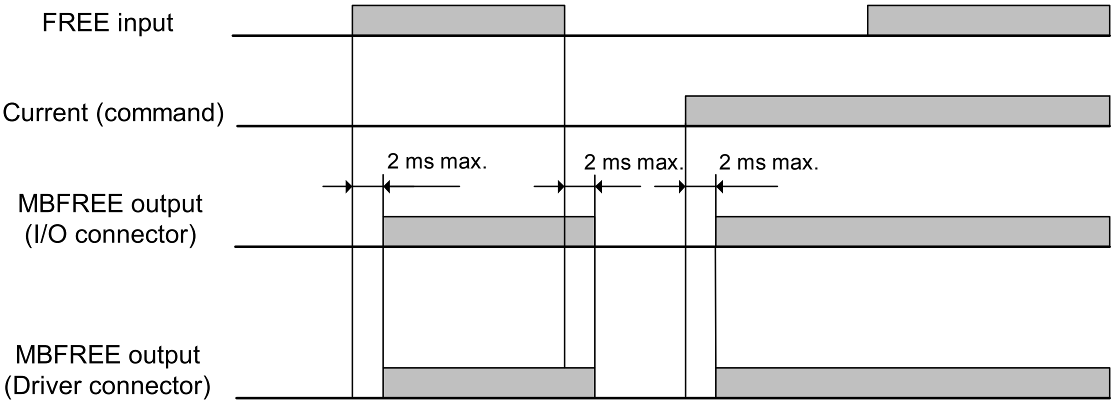
2. Excitation state ON/OFF by CURRENT command

When the CON input is active.
CURRENT=1→0, remove the excitation state, MBFREE output is non-active
CURRENT=0→1, return to an excitation state, MBFREE output is active

3. CON input with a non-excitation state. (CURRENT=0)

Nothing occurs if the non-active edge or non-active level of the CON input is detected while CURRENT=0.
When the active edge of CON input is detected.
→ CURRENT=0→1、return to excitation state、MBFREE output goes active

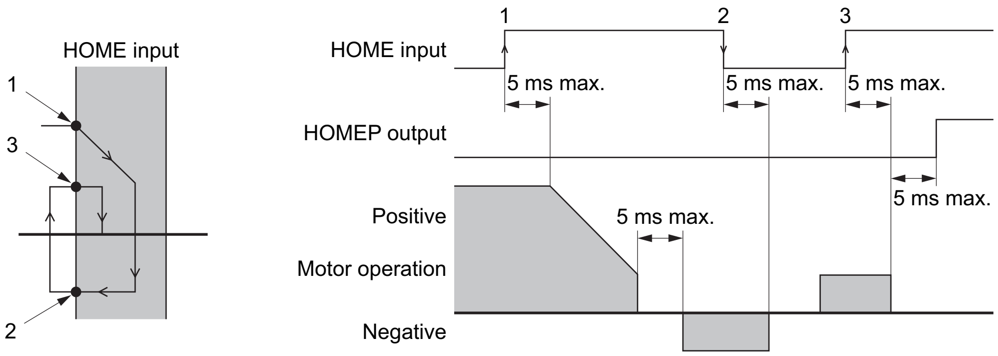
■ FREE Input and MBFREE Output


FREE input
Current (command)
2 ms max.
2 ms max.
2 ms max.
MBFREE output (I/O connector)
MBFREE output (Driver connector)

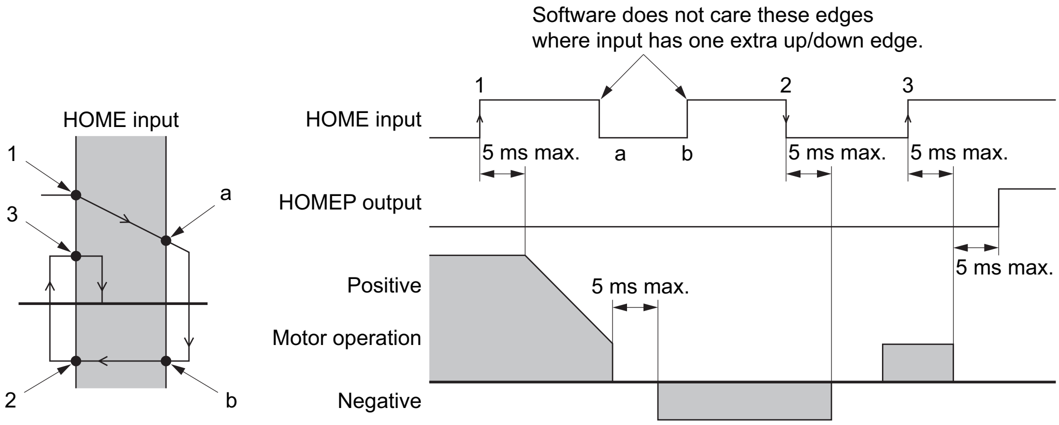
Mechanical Home Seeking

(Except "HOMETYP=12")

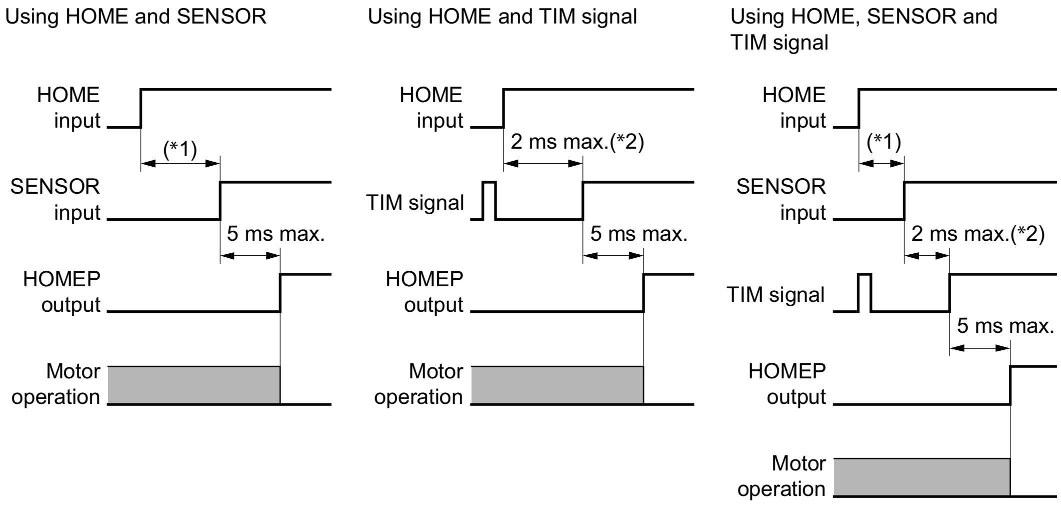
- When the Mechanical Home Seeking Operation is Completed without Passing the HOME Input.



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



- Stopping Operation

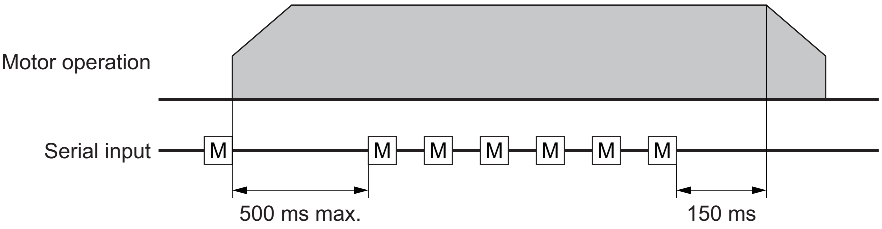


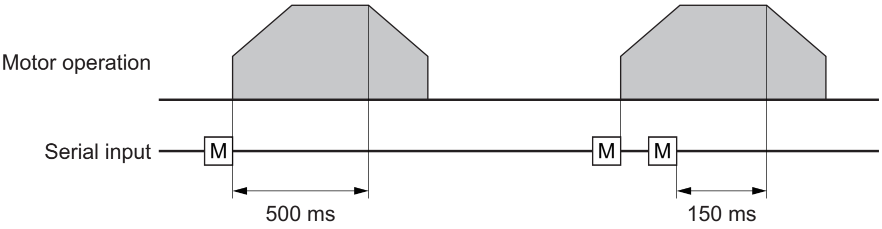
*1 Depends on the HOMES and SENSOR position.

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

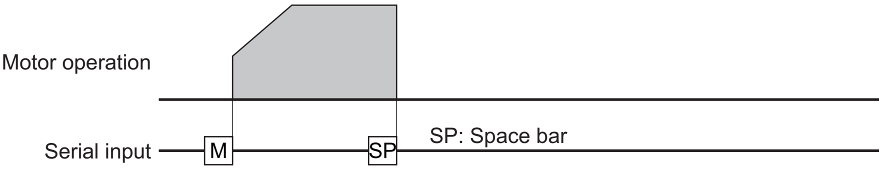
■ Teaching Operation

- When Holding the Key Down





- To Stop Motion Immediately



Chapter 12 Command List

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 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 utilizing these rules. / parameter cannot be used
SAVE & RESET REQUIRED	n/a : S : R : SR :	Not applicable, or not required. 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 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 immediately be used. Command or parameter can immediately be used. (Read only) Command or parameter cannot immediately be used.
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 68 for more details.	
source target newname	Sequence names or sequence numbers, as appropriate. Names can be Up to 10 letters or numbers, and must start with a letter.	

Memo See "7.6 Command Format" on page 73 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	-	196
CV	Change Velocity	n/a	0.001 to MAXVEL	-	n/a	yes	yes	yes	-	201
EHOME	Return to Electrical Home	n/a	n/a	-	n/a	yes	yes	yes	MOVE	229
HSTOP	Hard Stop	n/a	n/a	-	n/a	yes	yes	yes	-	245
MA	Move to Absolute Position	n/a	-MAXPOS to +MAXPOS	-	n/a	yes	yes	yes	MOVE	268
MCN, MCP	Move Continuously, Negative or Positive	n/a	n/a	-	n/a	yes	yes	yes	-	273
MGHN, MGHP	Seek Mechanical Home Position	n/a	n/a	-	n/a	yes	yes	yes	MOVE	275
MI	Move Incremental Distance	n/a	n/a	-	n/a	yes	yes	yes	MOVE	276
MIx (x=0 to 3)	Start Linked Index	n/a	n/a	-	n/a	yes	yes	yes	MOVE	277
MSTOP	Motor Stop	n/a	n/a	-	n/a	yes	yes	yes	-	280
PAUSE	Pause Motion	n/a	n/a	-	n/a	yes	yes	yes	-	291
PAUSECLR	Clear Paused Motion	n/a	n/a	-	n/a	yes	yes	yes	-	292
PSTOP	Panic Stop	n/a	n/a	-	n/a	yes	yes	yes	-	302
SSTOP	Soft Stop	n/a	n/a	-	n/a	yes	yes	yes	-	330

■ Motion Variables

COMMAND	DESCRIPTION	FACTORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
DIS	Incremental Motion Distance	0.0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	216
DISx (x=0 to 3)	Linked Motion Distance or Destination	0.0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	217
INCABSx (x=0 to 2)	Linked Move Type	1	0: Absolute 1: Incremental	-	S	yes	yes	yes	-	249
LINKx (x=0 to 2)	Link Control	0	0: No Link 1: Link-to-Next	-	S	yes	yes	yes	-	263
OFFSET	Home Offset Position	0.0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	283
POS[x] (x=1 to 100)	Position Array Data	0.0	-MAXPOS to +MAXPOS	-	S	yes	yes	yes	-	300
SCHGPOS	Distance After SENSOR Input	0.0	0.0 to MAXPOS	-	S	yes	yes	yes	-	323
SCHGVR	Velocity After SENSOR Input	1.0	0.001 to MAXVEL	-	S	yes	yes	yes	-	324
TA	Acceleration Time	0.5	0.001 to 500.0 [s]	-	S	yes	yes	yes	-	334
TD	Deceleration Time	0.5	0.001 to 500.0 [s]	-	S	yes	yes	yes	-	336
VR	Running Velocity	1.0	0.001 to MAXVEL	-	S	yes	yes	yes	-	350
VRx (x = 0 to 3)	Linked Motion Running Velocity	1.0	0.001 to MAXVEL	-	S	yes	yes	yes	-	351
VS	Starting Velocity	0.1	0.0 to MAXVEL	-	S	yes	yes	yes	-	352

■ 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	-	-	169
<ESC>	(Escape): Abort Operation(s)	n/a	n/a	-	n/a	yes	-	-	-	171
ABORT	ABORT Sequence and Motions	n/a	n/a	-	n/a	yes	yes	yes	-	173
ABSPLSEN	Enable Operation at Driver Absolute Position Loss Alarm Release	n/a	n/a	-	n/a	yes	yes	yes	-	174
ABSREQ	Driver Current Position Reading	n/a	n/a	-	n/a	yes	yes	yes	-	175
ABSREQPC	Driver Current Position Reading/Updating Position Command	n/a	n/a	-	n/a	yes	yes	yes	MOVE	176
ALMACT	ALARM Action	2	0: Current On, Alarm Off 1: Current On, Alarm On 2: Current Off, Alarm On	-	SR	yes	-	-	-	180
ALMCLR	Clear ALARM	n/a	n/a	-	n/a	yes	-	yes	-	181
ALMMSG	ALARM Message Action	0	0: No Messages 1: Messages, Alarms Only 2: Messages, Alarms and Warnings	-	S	yes	-	-	-	182
ALMSET	Set User ALARM	n/a	n/a	-	n/a	yes	yes	-	-	183
CLEARALL	Rreturn to Factory Condition	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	192
CLEARPOS	Clear POS[x] Position Array Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	193
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	-	200
DD	Driver Operation Data	0	0 to 3: Torque Limiting 0 to 7: Push-motion Operation	-	S	yes	yes	yes	-	203
DIRINV	Direction Invert	0	0: Positive motion is clockwise 1: Positive motion is counter-clockwise	-	SR	yes	read	yes	-	215
DPR	Distance Per Revolution	1	0.5 to 51200.0	-	SR	yes	read	-	-	223
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	yes	-	231
ENDACT	System End Action	0	0: End of pulse generation 0.001 to (+MAXPOS/2): END area	-	SR	yes	read	-	-	234
ER	Encoder Resolution	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**,**4**,**5**,**SCX10**	10 to 51200	-	SR	yes	read	-	-	237
FREE	Motor Shaft Free	0	0: Normal Condition 1: Motor Shaft Free	-	n/a	yes	yes	-	-	239
GA, GB	Electrical Gear Ratio	1	1 to 100	-	SR	yes	read	-	-	240

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
HOMEDCL	Clear Driver Deviation Counter at Homing	0	0: Not Clear Driver Deviation Counter at Homing 1: Clear Driver Deviation Counter at Homing 2: Not Clear Driver Deviation Counter at Homing and the deviation is maintained precisely as the deviation in the **CM10**/**SCX10** will not be cleared at Homing	-	SR	yes	read	-	-	243
HOMETYP	Homing Type	0	0 to 12	-	S	yes	yes	yes	MVRO	244
INITPRM	Initialize Parameters	n/a	n/a	-	R	yes	-	-	MOVE RUN	252
LIMN, LIMP	Software Position Limits	0.0	-MAXPOS to +MAXPOS	-	SR	yes	read	yes	-	261
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	-	-	-	272
MR	Motor Resolution	100: **CM10-3** 200: **CM10-2** 1000: **CM10-1**,**4**,**5**,**SCX10**	10 to 51200	-	SR	yes	read	yes	-	279
MSTOPACT	Motor Stop Action	0	0: Hard Stop 1: Soft Stop	-	SR	yes	-	-	-	281
OTACT	Overtravel Action	0	0: Hard Stop 1: Soft Stop	-	SR	yes	-	-	-	284
PECLR	Position Error Clear	n/a	n/a	-	n/a	yes	yes	yes	MOVE	296
PRESET	Reset Home Position	n/a	n/a	-	n/a	yes	yes	yes	MOVE	301
PULSE	Pulse Output Mode	1	0: 2PULSE Output 1: 1PULSE Output	-	SR	yes	-	-	-	303
RESET	Reset Device	n/a	n/a	-	n/a	yes	-	-	-	306
SAVEALL	Save All Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	319
SAVEPOS	Save Position Array Data	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	320
SAVEPRM	Save Parameters	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	321
SENSORACT	SENSOR Input Active	2	0: Hard Stop 1: Soft Stop 2: Soft Stop at fixed distance from SENSOR signal	-	SR	yes	-	-	-	325
SLACT	Software Position Limit Control	0	0: Disabled 1: Enabled after homing	-	SR	yes	read	-	-	328
STARTACT	START Input Action	0	0: Start Sequence when set active 1: Start Sequence when set active, Abort when set inactive	-	SR	yes	-	-	-	331
STRDCS	Driver Step Angle at System Start	0	0:DCS output OFF at system start 1:DCS output ON at system start	-	SR	yes	read	-	-	332

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
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	-	-	-	333
TL	Torque Limiting /Push-Motion Operation /Current Cutback Release	0	0: OFF 1: ON	-	n/a	yes	yes	yes	-	340
UU	User Units	Rev: **CM10-1**,**2**,**4**,**5**,**SCX10** mm: **CM10-3**	Text string, 20 characters maximum	-	S	yes	-	-	-	345

■ 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	-	178
DALARM	Driver Alarm Input 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	-	-	202
DEND	Driver End Input Enable	0: **CM10-2**,**SCX10** 1: **CM10-1**,**3**,**4**,**5**	0: Internal end area 1: Driver END signal	-	SR	yes	read	-	-	207
DREADY	Driver READY (operation ready) Signal Enable	0: **CM10-2**,**3**,**4**,**SCX10** 1: **CM10-1**,**5**	0: Disable 1: Enable	-	SR	yes	read	-	-	224
DSIGxxx	Status For Driver "xxx" Input Signal/Driver "xxx" Output Signal	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	225
EC	Encoder count	0	-2,147,148,648 to +2,147,483,647	yes	n/a	read	read	read	-	226
MAXPOS	Maximum Position Value	500000	n/a	-	n/a	read	-	-	-	270
MAXVEL	Maximum Velocity Value	1240: **CM10-1**,**4**,**5**,**SCX10** 6200: **CM10-2** 12400: **CM10-3**	n/a	-	n/a	read	-	-	-	271
PABS	Driver Current Position	n/a	n/a	-	n/a	read	read	read	-	290
PC	Position Command	n/a	-MAXPOS to +MAXPOS	yes	n/a	yes	yes	yes	MV RO	293
PCI	Incremental Position Command	n/a	-MAXPOS to +MAXPOS	yes	n/a	read	read	-	-	294
PE	Position Error	n/a	-MAXPOS to +MAXPOS	yes	n/a	read	read	read	-	295
PF	Feedback Position	n/a	-MAXPOS to +MAXPOS	yes	n/a	yes	yes	yes	-	297
PFI	Incremental Feedback Position	n/a	-MAXPOS to +MAXPOS	yes	n/a	read	read	-	-	298
SIGxxx	Status For System "xxx" Input Signal/System "xxx" Output Signal	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	326
TIM	Select Timing Input Signal	1	0: Use the TIMD/EXTZ input 1: Use the TIMS input	-	SR	yes	read	-	-	338
TIMER	Running Timer	0	0.0 to 500000.0	yes	n/a	yes	yes	yes	-	339
VC	Velocity Command	n/a	0 to +MAXVEL	yes	n/a	read	read	read	-	346

■ I/O

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
DIN	Driver General Inputs Status	n/a	0 to 127	yes	n/a	read	read	read	-	208
DINSG	Driver System Signal Input Status	n/a	0 to 127	yes	n/a	read	read	read	-	209
DINx (X=1 to 7)	Driver Individual General Input Status	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	210
DINxxx	Driver "xxx" Signal Input Assignment	See page 211 for DINxxx command	See page 211 for DINxxx command	-	SR	yes	-	-	-	211
DIO	Driver I/O Status	n/a	0: Not Active 1: Active	-	n/a	read	-	-	-	213
DOUT	Driver System Output Status	n/a	0 to 255	yes	n/a	yes	yes	yes	-	218
DOUTSG	Driver System Output Status	-	0 to 16382	yes	n/a	read	read	read	-	219
DOUTx (x=1 to 8)	Driver Individual General Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	220
DOUTxxx	Driver "xxx" Signal Output Assignment	See page 221 for DOUTxxx command	See page 221 for DOUTxxx command	-	SR	yes	-	-	-	221
EVx (x=1,2)	Configure Event Output	n/a	(x=1 to 2) (See EVx entry for a full explanation)	-	n/a	yes	yes	-	-	238
IN	General Input Status	n/a	0 to 511	yes	n/a	read	read	read	-	248
INITDIO	Initialize Driver I/O	n/a	n/a	-	SR	yes	-	-	-	250
INITIO	Initialize I/O	n/a	n/a	-	SR	yes	-	-	-	251
INITRIO	Initialize Remote I/O	n/a	n/a	-	SR	yes	-	-	-	253
INSG	System Input Signal Status	0	0 to 1047551	yes	n/a	read	read	read	-	254
INx (x=1 to 9)	Individual General Input Status	0	0: Not Active 1: Active	yes	n/a	read	read	-	-	255
INxxx	"xxx" Signal Input Assignment	0	0: Unassigned 1 to 9: Assigned	-	SR	yes	-	-	-	256
IO	Input/Output Status	n/a	n/a	yes	n/a	yes	-	-	-	258
OUT	General Output Status	n/a	0 to 15	yes	n/a	yes	yes	read	-	285
OUTSG	System Output Signal Status	0	0 to 1983	yes	n/a	read	read	read	-	286
OUTTEST	I/O Test Utility	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	287
OUTx (x=1 to 4)	Individual General Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	288
OUTxxx	"xxx" Signal Output Assignment	0	0: Unassigned 1 to 4: Assigned	-	SR	yes	-	-	-	289
PLSINV	Pulse Output Invert	0	0: Positive logic 1: Negative logic	-	SR	yes	-	-	-	299
xxxLV	"xxx" Input Level/"xxx" Output Level	See page 356 for xxxLV command	See page 356 for xxxLV command	-	SR	yes	-	-	-	356

■ Monitor Commands

COMMAND	DESCRIPTION	FACORY 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	-	179
HELP	Display Help Information	n/a	n/a	-	n/a	yes	-	-	-	242
REPORT	Display System Status	n/a	n/a	-	n/a	yes	-	-	-	305
TEACH	Teach Positions	n/a	n/a	-	n/a	yes	-	-	MOVE RUN	337
TRACE	Sequence Trace Control	0	0: Trace is disabled 1: Trace is enabled	-	n/a	yes	-	-	-	341
VER	Display Firmware Version	n/a	n/a	-	n/a	yes	-	-	-	347

■ Communications

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
\	Global Command	n/a	[command]	-	n/a	yes	-	-	-	168
@	Select Device	n/a	*,0 to 9, A to Z	-	n/a	yes	-	-	-	170
BAUD	RS-232C BAUD Rate	0	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 115200 bps	-	SR	yes	read	-	-	186
ECHO	Communications Echo Control	1	0: Echo Off 1: Echo On	-	S	yes	-	-	-	227
ID	Device ID	*	*, 0 to 9, A to Z	-	S	yes	-	-	-	246
TALK	Select Device	n/a	*, 0 to 9, A to Z	-	n/a	yes	-	-	-	335
USBBAUD	USB BAUD Rate	0	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 115200 bps	-	SR	yes	read	-	-	343
VERBOSE	Command Response Control	1	0: Respond with data only 1: Respond with data and descriptive text	-	S	yes	-	-	-	348

■ Sequence Commands

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
#	Sequence Comment	n/a	n/a	-	n/a	-	yes	-	-	166
BREAKL	Break LOOP Block	n/a	n/a	-	n/a	-	yes	-	-	187
BREAKW	Break WHILE Block	n/a	n/a	-	n/a	-	yes	-	-	188
CALL	Call Sequence As Subroutine	n/a	Valid sequence name or number, or variable	-	n/a	-	yes	-	-	189
ELSE	Begin ELSE Block: execute if IF is false	n/a	n/a	-	n/a	-	yes	-	-	230
END	End Sequence	n/a	n/a	-	n/a	-	yes	-	-	233
ENDIF	End of IF Block	n/a	n/a	-	n/a	-	yes	-	-	235
ENDL	End of LOOP Block	n/a	n/a	-	n/a	-	yes	-	-	236
IF	Begin IF Block: execute if IF is true	n/a	Conditional expression	-	n/a	-	yes	-	-	247
KB	Keyboard Input	n/a	-Max.Number to +Max.Number	-	n/a	-	yes	-	-	259
KBQ	Keyboard Input (Quiet)	n/a	-Max.Number to +Max.Number	-	n/a	-	yes	-	-	260
LOOP	Begin Counted LOOP Block	n/a	1 to Max.Number	-	n/a	-	yes	-	-	267
MEND	Wait for Motion End	n/a	n/a	-	n/a	-	yes	-	-	274
RET	Sequence Return	n/a	n/a	-	n/a	-	yes	-	-	307
SACS	Send ASCII Control String	n/a	string: a series of ASCII characters or control codes, maximum 70 characters.	-	n/a	-	yes	-	-	317
SAS	Send ASCII String	n/a	string: a series of ASCII characters, maximum 70 characters.	-	n/a	-	yes	-	-	318
VIEW	View Parameter	n/a	Valid parameter or variable name	-	n/a	-	yes	-	-	349
WAIT	Wait for Specified Time	n/a	0.0 to 500000.0	-	n/a	-	yes	-	-	353
WEND	End of WHILE Block	n/a	n/a	-	n/a	-	yes	-	-	354
WHILE	Begin WHILE Block	n/a	Conditional expression	-	n/a	-	yes	-	-	355

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

COMMAND	DESCRIPTION	FACORY SETTING	RANGE	/ parameter	SAVE & RESET REQUIRED	Immediate?	IN sequences?	CANopen?	Commands not Allowed	PAGE
&, |, ^, <<, >>	AND, OR, XOR, Left logic shift, Right logic shift	n/a	n/a	-	n/a	-	yes	-	-	167
+, -, *, /, %	Addition, Subtraction, Multiplication, Division, Modulo	n/a	n/a	-	n/a	-	yes	-	-	167
a < b	a is smaller than b	n/a	n/a	-	n/a	-	yes	-	-	172
a <= b	a is equal to or smaller than b	n/a	n/a	-	n/a	-	yes	-	-	172
a = b, a == b	a is equal to b	n/a	n/a	-	n/a	-	yes	-	-	172
a > b	a is larger than b	n/a	n/a	-	n/a	-	yes	-	-	172
a >= b	a is equal to or larger than b	n/a	n/a	-	n/a	-	yes	-	-	172
a! = b	a is not equal to b	n/a	n/a	-	n/a	-	yes	-	-	172

■ 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	-	-	184
CLEARVAR	Clear User-defined Variables	n/a	n/a	-	S	yes	-	-	RUN	195
CREATEVAR	Create User-defined Variable	n/a	N_xxx [Numeric Type] or S_xxx [String Type]	-	S	yes	-	-	RUN	198
DELETEVAR	Delete User-defined Variable	n/a	N_xxx [Numeric Type] or S_xxx [String Type]	-	S	yes	-	-	RUN	205
LISTVAR	Lists All User-defined Variables	n/a	n/a	-	n/a	yes	-	-	-	265
N_xxx	User-defined Numeric Variables	0 when created	-Max.Number to +Max.Number	-	S	yes	yes	-	-	282
S_xxx	User-defined String Variables	empty when created	Text string, 20 characters maximum	-	S	yes	yes	-	-	316

■ 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	194
COPY	Copy Sequence	n/a	COPY source target	-	n/a	yes	-	-	RUN	197
DEL	Delete Sequence	n/a	DEL target	-	n/a	yes	-	-	RUN	204
DIR	Sequence Directory	n/a	n/a	-	n/a	yes	-	-	-	214
EDIT	Edit Sequence	n/a	EDIT target	-	n/a	yes	-	-	RUN	228
LIST	List Sequence Contents	n/a	LIST target [startline] [endline]	-	n/a	yes	-	-	-	264
LOCK	Lock Sequence	n/a	LOCK target	-	n/a	yes	-	-	RUN	266
REN	Rename Sequence	n/a	REN target newname	-	n/a	yes	-	-	RUN	304
RUN	Run Sequence	n/a	[PGM]	-	n/a	yes	-	yes	RUN	315
UNLOCK	Unlock Sequence	n/a	UNLOCK target	-	n/a	yes	-	-	RUN	342

■ 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	-	-	-	190
CANID	CANopen Node Adress	1	1 to 127	-	SR	yes	-	-	-	191
RIN	Remote General Input Status	n/a	0 to 255	yes	n/a	read	read	read	-	308
RINx (x=1 to 8)	Individual Remote General Input Status	n/a	0: Not Active 1: Active	yes	n/a	read	read	-	-	309
RINxxx	"xxx" Signal Remote Input Assignment	0	0: Unassigned 1 to 8: Assigned	-	SR	yes	-	-	-	310
RIO	Remote geneal I/O Status	n/a	n/a	yes	n/a	yes	-	-	-	311
ROUT	Remote General Output Status	n/a	0 to 63	yes	n/a	yes	yes	read	-	312
ROUTx (x=1 to 6)	Individual Remote general Output Control	0	0: Not Active 1: Active	yes	n/a	yes	yes	-	-	313
ROUTxxx	"xxx" Signal Remote Output Assignment	0	0: Unassigned 1 to 6: Assigned	-	SR	yes	-	-	-	314

■ I/O Signal and Command Structure

The table below groups the commands by functions for I/O terminals, CANopen remote I/O assignment, motion assignment, I/O logic assignment, and I/O status display.

Immediate Command	I/O Assignment	CANopen Remote I/O Assignment	Action	Logic Level	Signal Status	Description
ABORT	INABORT	(Default Assignment)	-	ABORTLV	SIGABORT	Abort Sequence and Motions
ALMCLR	INALMCLR	RINALMCLR	-	ALMCLRLV	SIGALMCLR	Clear Alarm
CURRENT	INCON	(Default Assignment)	-	CONLV	SIGCON	Motor Current ON
FREE	INFREE	(Default Assignment)	-	FREELV	SIGFREE	Motor Shaft Free
MCN	INMCN	(Default Assignment)	-	MCNLV	SIGMCN	Move Continuously Negative
MCP	INMCP	(Default Assignment)	-	MCPLV	SIGMCP	Move Continuously Positive
MGHN	INMGHN	(Default Assignment)	-	MGHNLV	SIGMGHN	Move Go Home Negative
MGHP	INMGHP	RINMGHP	-	MGHPLV	SIGMGHP	Move Go Home Positive
MSTOP	INMSTOP	RINMSTOP	MSTOPACT	MSTOPLV	SIGMSTOP	Motor Stop
PAUSE	INPAUSE	RINPAUSE	-	PAUSELV	SIGPAUSE	Pause Motion
PAUSECLR	INPAUSECL	RINPAUSECL	-	PAUSECLLV	SIGPAUSECL	Clear Paused Motion
PECLR	INPECLR	RINPECLR	-	PECLRLV	SIGPECLR	Clear Position Error
PSTOP	INPSTOP	RINPSTOP	ALMACT	PSTOPLV	SIGPSTOP	Panic Stop
RUN	INSTART	(Default Assignment)	STARTACT	STARTLV	SIGSTART	START input
TL	INTL	RINTL	-	TLLV	SIGTL	Torque imiting/Push-motion Operation/Current Cutback Release
-	INHOME	RINHOME	-	HOMELV	SIGHOME	Home Sensor
-	INLSN	RINLSN	OTACT	OTLV	SIGLSN	Limit Switch Negative
-	INLSP	RINLSP	OTACT	OTLV	SIGLSP	Limit Switch Positive
-	INSENSOR	RINSENSOR	SENSORACT	SENSORLV	SIGSENSOR	SENSOR input
-	OUTALARM	(Default Assignment)	-	ALARMLV	SIGALARM	Alarm
-	OUTEND	(Default Assignment)	ENDACT	ENDLV	SIGEND	Positioning Complete
-	OUTHOMEP	(Default Assignment)	-	HOMEPLV	SIGHOMEP	Home Position Signal
	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	Run Sequence

# : Sequence Comment

Execution Mode	Sequence
Syntax	#commenting text
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 = mathematical operation
Y = Numeric Value or Variable
Z = Variable

See Also A to Z

Description

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

For simple constant assignments, the equals sign ("=") is not required. For assignment to a variable or to a mathematical expression, the equals sign is required.

Note on shift operations: A = B >> C, A = B << C:

If B has a fractional part, the shift operation is treated as a multiply (or divide) by the appropriate power of 2.

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

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

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 active on the daisy chain communication network.

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

Example

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

; : 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 mm/second, distance to 2 mm and them 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, A to Z
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)

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.

<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
>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
>
```

ABORT : ABORT Sequence and Motions

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.

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) END`	#End the sequence
`>RUN 9`	#Execute sequence #9
`>ABORT`	#Abort sequence execution and decelerate the motor to a stop
`>`	

ABSPLSEN : Enable Operation at Driver Absolute Position Loss Alarm Release

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSPLSEN
See Also	PRESET, ALMCLR, MGHP, MGHN, DSIGREQ

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`
` HOMETYP=4`
	Set the pattern of mechanical home seeking operation. Use HOME, LSN and LSP

`>MGHP`	Start in the positive direction of mechanical home seeking operation

ABSREQ : Driver Current Position Reading

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSREQ
See Also	PABS, ABSSTS, PRESET, ABSREQPC, DINPR, DINP0, DINP1, DOUTREQ, DOUTCK, ROUTABSDATA, 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.

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 and ABSSTS can be referred to if the ABSDATA output is assigned and the ABSDATA output is 1 (ON).

PABS, 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.

Caution

・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 : Driver Current Position Reading/Updating Position Command

Execution Mode	Immediate, Sequence and CANopen
Syntax	ABSREQPC
Commands not Allowed	MOVE
See Also	PABS, ABSSTS, PRESET, ABSREQ, DINPR, DINP0, DINP1, DOUTREQ, DOUTCK, ROUTABSDATA, 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/alarm code) parameter. When the electrical home is set and the software position limit control is set to 1 (SLACT=1), LIMN and LIMP (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.

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 and ABSSTS can be referred to if the ABSDATA output is assigned and the ABSDATA output is 1 (ON).

PABS, 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.

Caution

・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).

・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 "8.3 Driver Current Position Reading (NX Series driver, ESMC controller)" on page 91.

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`	Overwrite PC and PF (EC) after reading current position, driver status and driver alarm
` PABS=124.35 Rev`	Current position
` Driver Status Code = 48`	Driver status code
` Driver ALARM Code = 1C`	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, 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 PABS 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).

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 and ABSSTS can be referred to if the ABSDATA output is assigned and the ABSDATA output is 1 (ON).

PABS, 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 = 48`	Driver status code
` Driver ALARM Code = 1C`	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	ALARMLV, ALMACT, ALMCLR, ALMMSG, ALMSET, CURRENT, OUTALARM, DALARM

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 "Chapter 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.

Important Interactions

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	ALARMLV, DALARM, ALM, ALMCLR, OUTALARM, PSTOP
Description	Establishes the Action of the motor current and alarm state after a PSTOP operation, or after Over Position Error, or hardware or software overtravel errors.
Important Interactions	The ALMACT is effective only in limited types of alarms as above. See "13.1 Protective Functions and Troubleshooting" on page 358.

Example

```
Command                                          Description
>ALMACT=1                                        #Set the ALMACT to 1
 ALMACT=2(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
 Resetting system.                               values
-------------------------------------------
         CM10-*
         Controller Module
         Software Version: *.**
         Copyright 2010
         ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>ALMACT
>ALMACT=1(1)                                     #Query new value
>
```

ALMCLR : Clear ALARM

Execution Mode	Immediate and CANopen
Syntax	ALMCLR
See Also	INALMCLR, RINALMCLR, DALARM, ALM, ALARMLV, ALMACT, ALMMSG, ALMSET, 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.

Important Interactions

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.

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 "Chapter 13 Troubleshooting" to see which conditions can and cannot be cleared.

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
>ALM                                                               condition, if possible.
 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: 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
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	ALARMLV, ALM, ALMACT, ALMCLR, ALMSET, OUTALARM

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                                       #Set the ALMMSG to messaging alarm
 ALMMSG=1 [Alarm]                               only
>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.
```

ALMSET : Set User ALARM

Execution Mode	Immediate and Sequence
Syntax	ALMSET
See Also	ALARMLV, ALM, ALMACT, ALMCLR, ALMMSG, OUTALARM
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
>RUN CHKINPUT                               #Run sequence CHKINPUT
>Motion succeeded                           #Successful
>RUN CHKINPUT                               #Run again
>Illegal sensor input entry!                #Sequence aborted
>ALMSET command detected.
>ALM                                        #Check alarm
  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│B. . . Y│Z}=n In sequence only: {A│B. . . Y│Z} = expression 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 (CRRUN=CRSTOP+I)
· Targets for interactive data entry commands (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 – 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 (bits per second) 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 1

When using a terminal emulator, such as Microsoft® HyperTerminal, a new session is needed for communicating at the higher speed. Within Microsoft® HyperTerminal, follow these procedures to connect at the higher speed.

1) Disconnect the current session
  a. Select the CALL menu then click DISCONNECT
2) Establish the new Baud rate in the properties menu
  a. Select the FILE menu then Properties
  b. Click CONFIGURE
  c. Change the BITS PER SECOND field to the value established with the BAUD command.
  d. Click OK and OK again
  e. Select the CALL menu then click CALL

If the CLEARALL command is issued, the baud rate will be reset to 9600 bps.

Note 2

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
 BAUD=0(1) [9600bps(19200bps)]                second (bps)
>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
 Resetting system.                            baud value
-------------------------------------------   #NOTE: change baud rate of host
          CM10-*                              system before proceeding!
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>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

```
Command              Description
>LIST 7              #List sequence 7
(  1) LOOP           #Loop indefinitely
(  2)   IF (IN2=1)   #If INPUT2 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 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
```

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. 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.
`(  4) RET`	
`>`	

CANBAUD : CANopen BAUD Rate

Execution Mode	Immediate
Syntax	CANBAUD=n
Range	n = 0: 10 (kilo bits per second) 1: 20 (kilo bits per second) 2: 50 (kilo bits per second) 3: 125 (kilo bits per second) 4: 250 (kilo bits per second) 5: 500 (kilo bits per second) 6: 800 (kilo bits per second) 7: 1 (mega bits per second)
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 CAN open Communication BAUD Rate for the device.

Example

```
Command                                            Description
>CANBAUD=1                                         #Set the Baud Rate to 20 kBits per
 CANBAUD=0(1) [10kbps(20kbps)]                     second (kbps)
>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
 Resetting system.                                 baud value
-------------------------------------------        #NOTE: change baud rate of host
          CM10-*                                   system before proceeding!
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>CANBAUD                                           #Query the Baud Rate
 CANBAUD=1(1) [20kbps(20kbps)]                     #Baud is set as 20kbps
```

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)                                   #Save the parameter assignments
>SAVEPRM                                       #Device response
 (EEPROM has been written 10 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.                  #Establish the saved parameter
>RESET                                         values
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>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

Use caution when clearing all parameter values, position array data, and sequences. Once the information is cleared it cannot be restored.
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.

Example

Command

```
>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.
>
```

Description

#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, INITPRM, TEACH
Description	Clears all POS[x] position array data. Position data will set to 0.
Caution	**Use caution when clearing position array data. Once the data points are cleared, they cannot be restored.** **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.**

Example

Command

```
>CLEARPOS
(EEPROM has been written 13 times)
 Enter Y to proceed, other key to cancel. y
 Clear POS[ ] Data.....OK.
>
```

Description

#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	**Use caution when clearing all sequences. Once the sequences are deleted, they cannot be restored.** **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.**

Example

```
Command                                           Description
>DIR                                              #List all sequences


   ##  Name        TextSize  Locked
   ==  ==========  ========  ======
    0  <nameless>        10
    1  <nameless>        37

  Total:   2
  Executable memory:    43 bytes used of  2048 bytes total,    2 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	**Use caution when clearing all user-defined variables. Once the variables are cleared, they cannot be restored.**

Example

```
Command                                          Description
>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, INPAUSE, INPAUSECL, 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.

Acceleration and deceleration times TA and TD, and start and running velocities VS and VR determine the motion profile while changing speed.

If the paused motion was a point-to-point index (MI, MA, EHOME), 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.

If the paused motion was a mechanical home seeking operation (MGHP, MGHN), a CONT command restarts the process from the beginning: CONT has the same effect as re-issuing the original MGHx command.

In all cases, the system uses the values of VS, VR, TA and TD in effect at the time the CONT command is executed.

The CONT command has no effect if motion has not been previously PAUSE'd.

If sequences are running, the START input can cause the same action as a CONT command.

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 then continued: 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 commanded position 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 or numbers, 10 character maximum, must start with a 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
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, INCON, CONLV, SIGCON

Description

Enables or disables the motor current.

Important Interactions

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.

The "Current OFF" always has higher priority than "Current ON" among CON in system input, CON in remote (CANopen) input and CURRENT command.

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.

Example

```
Command              Description
>CURRENT 0           #Turn motor current off. Motor has no holding torque
 CURRENT=0
>CURRENT 1           #Turn motor current on. Motor now has holding torque
 CURRENT=1
>
```

CV : Change Velocity

Execution Mode	Immediate, Sequence and CANopen
Syntax	CV=n
Range	n = 0.001 to MAXVEL (User Units/second)
See Also	DPR, MA, MCN, MCP, 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 warning 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

Important Interactions

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                  #Set User Units (UU) to mm (millimeters)
 UU=mm
>VR 3                   #Set the running velocity to 3 mm/second.
 VR=3 mm/sec
>DIS 10                 #Set the distance to 10 mm
 DIS=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 Input Enable

Execution Mode	Immediate and Sequence
Syntax	DALARM=0
Range	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	DINALARM, 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 6E:Driver alarm). The alarm status automatically becomes inactive when the driver alarm becomes inactive.

Example

Command   Description

```
>DALARM=0                                          #Set DALARM=0
 DALARM=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 values
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>DALARM                                            #Confirm the new assignment
 DALARM=0(0) [Disable(Disable)]
>
```

DD : Driver Operation Data

Execution Mode	Immediate, Sequence and CANopen
Syntax	DD=n
Range	n=0～3 (Torque limiting) 0～7 (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, DOUTM0, DOUTM1, DOUTM2, 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`
` DD=1`
	Assign the data #1 (M0 is set to ON, and M1 and M2 are set to OFF)

`>TL=1`
`  TL=1`
	Torque limiting operation or push-motion operation is enabled

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  2048 bytes total,    1 percent.
  Storage memory:        87 bytes used of 21775 bytes total,    0 percent.
>DEL TEST1                                         #Delete the program TEST1 from
 Enter Y to proceed, other key to cancel. y        memory
>                                                  #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                #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 Input Enable

Execution Mode	Immediate and Sequence
Syntax	DEND=0
Range	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	DINEND, 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.

END Source Selection

END Signal Output Condition	ENDACT	DEND
End of pulse	0	0
End of pulse AND Within end area	0 < (End Area)	0
Driver END signal	Unrelated	1

Signal Flow Path

CM10/SCX10 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      (used for MEND, END output,
                                                                          Mechanical home seeking)
```

Important Interactions

The internal end signal is generated by end area and/or end of pulse generation. (See ENDACT.)

Example

Command

```
>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
 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, DINALARM, DINEND, DINSG, DINTIMDEXTZ, DINTIMS, RIO

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 DIN=14 then DIN2 is ON,DIN3 is ON and DIN4is ON (8). (2+4+8=14)
To check the status of a single general input, use the DINx command.

Important Interactions

If an input is assigned to a specific 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=32                     #Device response indicating Input #6 is ON
>
>LIST 8                     #List sequence 8

(   1) SAS PRESS START      #Notify user to press start
(   2) IF  (DIN=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  (DIN=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
>
```

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, IO, RIO

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:

DIN	Contribution to DIN if active
READY	64
LC	32
MOVE	16
TIMD/EXTZ	8
TIMS	4
END	2
ALARM	1

DINSG is the sum of the contribution of all active signals:
If DINSG=2, the END signal is active, and all the other signals are inactive.
If DINSG=5, the ALARM (1) and TIMS (4) signals are active (1+4=5), and all other signals are inactive.

Be careful not to confuse DINSG with DIN (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**. DINSG reports the status of assigned input signals on the driver connector of the **CM10/SCX10**.

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
 1 1 0 0 1 1 0 - - 0 0 0 0 0 0 0 0

>DINSG                                                          #Check DINSG status
 DINSG=37                                                       #Device response: the ALM signal, the TIMS signal and LC signal are active
```

DINx : Driver Individual General Input Status

Execution Mode	Immediate and Sequence
Syntax	DINx=n
Range	x = 1 to 7 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 specific 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 DINSG command to check the status of the specific system input signals on the driver connector of the **CM10**/**SCX10**.

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 (DIN1=1)                           #If input 1 is active
(  4)       MCP                                 #Move continuous, positive
(  5)       WHILE (DIN1=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 (DIN2=1)                           #If input 2 is active
( 10)       MCN                                 #Move continuous, negative
( 11)       WHILE (DIN2=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
>
```

DINxxx : Driver "xxx" ALARM Signal Input Assignment

Execution Mode	Immediate
Syntax	DINxxx=n ("xxx" signal input assignment)
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	DIO, INITDIO, DIN, DINSGxxx and "See Also" column in the chart below.

Description

Assign the driver "xxx" input signal to the driver connector INy input (y: parameter n).

Setting to zero causes the system "xxx" input signal on the driver connector of the **CM10**/**SCX10** to be unassigned and the INy is set to a general input. If the INITDIO command is entered, the parameter is set to the factory setting.

Command	Signal	Description	Factory Setting	Range	See Also
DINALARM	ALARM	Alarm	1	0, 1: **CM10-1**,**2**,**3**,**4**,**5** 0 to 5: **SCX10**	DALARM
DINEND	END	Positioning Complete	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**	-
DINTIMDEXTZ	TIMD/EXTZ	Timing Signal･Z-phase Pulse Differential Input /External Encoder ZSG	7	0, 7	TIM, ENC
DINTIMS	TIMS	Timing Signal･Z-phase 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.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>DINALARM                                      #Confirm new value
 DINALARM=0(0)
>
```

DIO : Driver I/O Status

Execution Mode	Immediate
Syntax	DIO
Range	0: Not Active 1: Active
Access	READ
See Also	IO, DINSG

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**.

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 (0-99) or name (up to 10 alpha-numeric characters, starting with a letter).
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  2048 bytes total,   34 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  2048 bytes total,   34 percent.
  Storage memory:      2259 bytes used of 21775 bytes total,   10 percent.
>
```

DIRINV : Direction Invert

Execution Mode	Immediate, Sequence and CANopen
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, MCN, MCP, MGHN, MGHP, 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
 Resetting system.                           the saved parameters
-------------------------------------------
          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 : Incremental Motion Distance

Execution Mode	Immediate, Sequence and CANopen
Syntax	DIS=n
Range	n = -MAXPOS to +MAXPOS (User Units) MAXPOS is determined by the current DPR value and varies when the DPR value is changed. Query DPR or MAXPOS to determine the range of n.
Factory Setting	0.0
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	CV, DIRINV, DPR, MA, MAXPOS, MI, TA, TD, VS, VR

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 : Linked Motion Distance or Destination

Execution Mode	Immediate, Sequence and CANopen
Syntax	DISx=n

Range	x = 0 to 3 (Linked Motion Profiles defined by DISx, VRx, INCABSx, and LINKx)
	n = -MAXPOS to +MAXPOS (User Units)
	MAXPOS is determined by the current DPR value and varies when the DPR value is changed.
	Query the DPR or MAXPOS commands to determine the range of n.

Factory Setting	0.0
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" link2 from link3
` LINK2=0`	#Device response
`>MI1`	#Start the linked operation motion
`>`	

DOUT : Driver System Output Status

Execution Mode Immediate, Sequence and CANopen

Syntax DOUT

Range 0 to 255 (integer values)
/: real time monitor (immediate mode only)

Access READ and WRITE

See Also DIO, INITDIO, DOUTx, DIN, DINx, DOUTSG

Description

The DOUT command displays 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
OUT8	128
OUT7	64
OUT6	32
OUT5	16
OUT4	8
OUT3	4
OUT2	2
OUT1	1

For example, if DOUT=14 then output #2 (2) is ON, output #3 (4) is ON and output #4 is ON (8). (2+4+8=14) To check the status of a single general output, use the DOUTx command.

Important Interactions

If an output is assigned to a specific system driver output signal (CON, FREE etc.) the DOUT command will always show that output OFF or 0. Use the DOUTSG command to read the status of the assigned system output signals on the driver connector of the **CM10**/**SCX10**.

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 0 0 0 0 0 - - 0 0 1 0 0 1 0 0

>DOUT                                                         #Check DOUT Status
 DOUT=32
```

DOUTSG : System Driver Output Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	DOUTSG
Range	0 to 16382 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	DOUT, DINSG, DIO, IO, RIO

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:

Signal name of the driver connector on the **CM10/SCX10**	Contribution to DOUTSG if active
M2	8192
M1	4096
M0	2048
TL	1024
REQ	512
HMSTOP	256
PRESET	128
HOME	64
MBFREE	32
FREE	16
CS	8
ACL/DCL	4
CON	2
COFF	1

DOUTSG is the sum of the contribution of all active signals:
If DOUTSG=4, the ACL/DCL signal is active, and all other signals are inactive.
If DOUTSG=9, the COFF (1) and CS (8) signals are active (1+8=9), and all other signals are inactive.

Be careful not to confuse DOUTSG with DOUT (Output Status). 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**. DOUTSG reports the status of assigned output signals on the driver connector of the **CM10/SCX10**.

Example

```
Command                                                       Description
>DIO                                                          #Display the DIO
 Inputs  (1-7) = ALM IN2 END READY LC TIMS TIMD/EXTZ          status
 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
 1 0 0 0 0 0 0 - - 1 0 1 0 0 0 0 1

>DOUTSG                                                       #Check DOUTSG
 DOUTSG=529                                                   Status
```

DOUTx : Driver Individual General Output Control

Execution Mode	Immediate and Sequence
Syntax	DOUTx=n

Range	x = 1 to 8
	n = 0: Not Active
	1: Active
	/: real time monitor (immediate mode only)

Factory Setting	0
Access	READ and WRITE
See Also	INIDTIO, DOUT, DOUTSG

Description

DOUTx 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 DOUTSG command to check the status of the assigned system output signals on the driver connector of the **CM10/SCX10**.

Example

Command | Description

```
>DOUT5=1                                                         #Driver General
 DOUT5=1                                                         Purpose Output 5
>DIO                                                             active
 Inputs   (1-7)  = ALM IN2 END READY LC TIMS TIMD/EXTZ           #Display the DIO
 Outputs  (1-8)  = CON ACL/DCL REQ CS OUT5 OUT6 PRESET FREE      status
                                                                 #Device response
 --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
>DOUT5=0                                                         Purpose Output 5
 DOUT5=0                                                         inactive
>DIO                                                             #Display the DIO
 Inputs   (1-7)  = ALM IN2 END READY LC TIMS TIMD/EXTZ           status
 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 1 1 0 0 1 - - 1 0 0 0 0 0 0 0
```

DOUTxxx : Driver "xxx" ALARM Signal Output Assignment

Execution Mode	Immediate
Syntax	DOUTxxx=n ("xxx" signal output assignment)
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	DIO, INITDIO, DIN, DSIGxxx (Except: ACLDCL, HMSTOP, HOME), and "See Also" column in the chart below.

Description

Assign the driver "xxx" output signal to the driver connector OUTy input (y: parameter n).

Setting to zero causes the system "xxx" output signal on the driver connector of the **CM10**/**SCX10** to be unassigned and the OUTy is set to a general output. If the INITDIO command is entered, the parameter is set to the factory setting.

Command	Signal	Description	Factory Setting	Range	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	Motor 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
DOUTCON	CON	Motor 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
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	Motor Shaft 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	Push-motion 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
DOUTHOME	HOME	Push-motion 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**	-
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	Range	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                               #Unassign the ACL/DCL output
 DOUTACLDCL=2(0)
>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.
-------------------------------------------
>DOUTACLDCL                                 #Confirm the new assignment
 DOUTACLDCL=0(0)
>
```

DPR : Distance Per Revolution

Execution Mode	Immediate and Sequence
Syntax	DPR=n
Range	n = 0.5 to 51200.0 (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, MAXPOS, MAXVEL, MAXOVERFLOW

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. The User Unit (UU) value could be set to mm (millimeters). Therefore, a distance of 10 mm would equate to a DIS value of 10. The operator is now working in terms of real world units as opposed to motor revolutions or steps.
DPR also effects the minimum and maximum numeric range of many variables. In particular, it effects position range limit MAXPOS, velocity range limit MAXVEL.

Important Interactions

The value of DPR effects all positions, distances, and velocities. For most applications, an appropriate value for DPR should be set before any motions are programmed. Changing DPR later may invalidate some motions because of range limits, and will change all physical shaft motions.
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.

Note

MAXVEL and MAXPOS may change, programmed values for some parameters (e.g. VR, VS) may be out of range with the new scaling. See "7.3 Setting the User Unit" for more detail.

Example

```
Command                                            Description
>UU mm                                             #Set the User Units to mm (millimeters)
 UU=mm
>DPR 10                                            #Set the Distance Per Revolution to 10
 DPR=1(10) mm                                      User Units, device responds with
 Position range = +/- 500000(500000)               rescaled limits and new ranges
 Velocity range = 0.001 - 2480(24800)
 Minimum Movable Distance = +/- 0.001(0.001)       #Save the parameter assignments
>SAVEPRM
 (EEPROM has been written 21 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.                      #Establish the saved parameter values
>RESET
 Resetting system.
------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
------------------------------------------         #Query the Maximum Position Value
>MAXPOS
 MAXPOS=500000(500000) mm                          #Query the Maximum Velocity Value
>MAXVEL
 MAXVEL=24800(24800) mm/sec
>
```

DREADY : Driver READY (operation ready) Signal Enable

Execution Mode	Immediate and Sequence
Syntax	DALARM=0
Range	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	DINREADY, DSIGREADY, 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 (0x6F=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.
-------------------------------------------
         CM10-*
         Controller Module
         Software Version: *.**
         Copyright 2010
         ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>DREADY                                                 #Confirm new value
 DREADY=0(0)  [Disable(Disable)]
>
```

DSIGxxx : Status For Driver "xxx" Input Signal / Driver "xxx" 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 status of system "xxx" 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	Positioning Complete	**CM10-1**, **3**, **4**, **5**,**SCX10**	END, DEND, 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/EXTZ	Timing Signal･Z-phase Pulse Differential Input/External Encoder ZSG	**CM10-1**, **2**, **3**, **4**, **5**,**SCX10**	TIM, ENC
DSIGTIMS	TIMS	Timing Signal･Z-phase 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	Motor Current OFF	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	CURRENT
DSIGCON	CON	Motor Current ON	**CM10-1**, **2**, **3**, **4**, **5**, **SCX10**	CURRENT
DSIGCS	CS	Resolution selection	**CM10-1**, **2**, **4**, **SCX10**	STRDCS
DSIGFREE	FREE	Motor Shaft 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	/: real time monitor (immediate mode only)
Factory Setting	0
Access	READ
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.

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.

Example

Command	Description
`>EC`	#Query the Encoder Counter
`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
>VS                  #Query the Starting Velocity
 VS=0.1 rev/sec      #Device response
>ECHO 0              #Turn off the ECHO
 ECHO=0              #Device response
>ECHO=0              #Query ECHO setting: note actual query text not echoed back (just 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 and numbers, up to 10 characters, starting with a letter)
Commands not Allowed	RUN

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 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

Important Interactions

- 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      : 2048           #Device response

>>Command:                       #<ESC> is sent to exit the Editor
>                                #Back at the main system prompt
```

EHOME : Return to Electrical Home

Execution Mode	Immediate, Sequence and CANopen
Syntax	EHOME
Commands not Allowed	MOVE
See Also	HOMETYP, LIMN, LIMP, MGHN, MGHP, 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 negative and positive position limits (LIMN, LIMP), 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.

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 and CANopen
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 Counter) 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 Counter) 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 MGHN or MGHP 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
 Resetting system.                                     values
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>ENC                                                   #Query the ENC setting
 ENC=1(1) [Driver(Driver)]                             #Device response
```

END : End Sequence

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 n = greater than 0 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, OUTEND, 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.

The value "n" determines the end area = acceptable position error (PE), where PE is the difference between commanded position (PC) and feedback position (PF).

This internal end status is then sent to DEND to select use of either internal end status or driver end signal.

END Source Selection

END Signal Output Condition	ENDACT	DEND
End of pulse	0	0
End of pulse AND Within end area	0 < (End Area)	0
Driver END signal	Unrelated	1

Signal Flow Path

CM10/**SCX10** 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 (used for MEND, END output,

Mechanical home seeking)

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
  Resetting system.                              #Establish the saved parameter values
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
```

ENDIF : End of IF Block

Execution Mode Sequence

Syntax ENDIF

See Also IF, ELSE, WHILE, WEND

Description

Indicates the completion of a 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
>
```

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, MR, PC, PE

Description

Set the encoder resolution.

Example

```
Command                                                  Description
>ER=1000                                                 #Set the encoder resolution
 ER=100(1000)                                            #Device response
>SAVEPRM                                                 #Save the parameter
 (EEPROM has been written 21 times)                      assignments
 Enter Y to proceed, other key to cancel. y              #Device response
 Saving Parameters........OK.                            #Device response
>RESET
  Resetting system.
---------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
---------------------------------------
>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
z: Output logic level after trigger; 0 or 1
m: Event trigger source
T: Trigger n seconds after motion start; 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

Description

Configures events which control outputs on-the-fly. Up to 2 events can be configured and active at the same time, using both event channels 1 and 2
EVx 0 clears (deactivates) the event. Once an event has been configured, it remains active until cleared.
Clearing the event does not clear or reset the output itself.
Event checking restarts at the beginning of a motion. The designated output will be set to the designated state when the designated condition has been met. To detect the transition, assure that the designated output is in the opposite state prior to the event occurring.
The output used should not have an assigned system output signal (e.g. if OUTEND=3, do not use output 3 for events). If the output has been assigned to a system output signal, no event-driven transitions will occur on the output.

Example

```
Command                    Description
>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
>EV1 0; EV2 0              #Clear events number 1 and 2
>
```

FREE : Motor Shaft Free

Execution Mode	Immediate and Sequence
Syntax	FREE=n
Range	n = 0: Normal Condition 1: Motor Shaft Free
Factory Setting	0
See Also	INFREE, SIGFREE, FREELV

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).

This command is the same as the FREE inputs on the I/O connector and the remote I/O (CANopen). If either of those inputs is ON, the state of the FREE function becomes 1. 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.

Note that the value of PC is set equal to the PF value when the status of the FREE function becomes 1.

- 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`
`  FREE=1`
	#Turn motor current off and power of electro magnetic brake release. Motor has no holding torque

`>FREE=0`
`  FREE=0`
	#Turn motor current on and power of electro magnetic brake lock. Motor has holding torque

GA, GB : Electrical Gear Ratio

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.

Important Interactions

GA and GB, along with DPR, determine the value of MAXVEL. When any of these parameters are changed:

Programmed velocities VS, VR, VR0-3, and SCHGVR are checked for an out of range condition.
A warning message will be transmitted for any velocities that are out of range, with the new values of DPR, GA, and GB.

See "7.3 Setting the User Unit" for more detail.

Example

```
Command                                           Description
>UU mm                                            #Set User Units to mm (millimeters)
 UU=mm
>DPR 10                                           #Set the distance per revolution to 10
 DPR=1(10) mm                                     mm
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 2480(24800)
>GA 3                                             #Set the Gear Ratio Numerator to 3:
 GA=1(3)                                          system rescales again
>GB 1                                             #Set the Gear Ratio Denominator to 1,
 GB=1(1)                                          system rescales again
>MAXVEL                                           #Query the MAXVEL value
 MAXVEL=2480(8266.666) mm/sec
>SAVEPRM                                          #Save the parameter assignments
 (EEPROM has been written 28 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.
-------------------------------------------
>DPR                                              #Check new effective values.
 DPR=10(10) mm
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 8266.666(8266.666)
 Minimum Movable Distance = +/- 0.001(0.001)
>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 : Clear Driver Deviation Counter at Homing

Execution Mode	Immediate
Syntax	HOMEDCL=n
Range	n = 0: Not Clear Driver Deviation Counter at Homing 1: Clear Driver Deviation Counter at Homing 2: Not Clear Driver Deviation Counter at Homing and the deviation is maintained precisely as the deviation in the **CM10**/**SCX10** will not be cleared at 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 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 servomotor 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."

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 : Homing Type

Execution Mode	Immediate, Sequence and CANopen
Syntax	HOMETYP=n
Range	n = 0 to 12 (integer values)
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, INHOME, RINHOME, INLSN, INLSP, RINLSN, RINLSP, MGHN, MGHP, OFFSET, OUTHOMEP, INSENSOR, RINSENSOR

Description

HOMETYP configures system operation when seeking a mechanical home position with the MGHN or MGHP commands. Mechanical home seeking reacts to various inputs differently, depending on HOMETYP, and according to the following table:

HOMETYP	Home Position Indicator Signals			
	HOME	+LS, -LS	SENSOR	TIMING
0	not used	Required for valid home	-	-
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	-	-
5			-	Required for valid home
6			Required for valid home	-
7			Required for valid home	Required for valid home
8		Stop: Alarm	-	-
9			-	Required for valid home
10			Required for valid home	-
11			Required for valid home	Required for valid home
12	not used	not used	not used	not used

In HOMETYP 0-3, a limit sensor (-LS or +LS) is used as the primary home indicator.

In HOMETYP 4-11, the HOME input is used as the primary home indicator.

HOMETYP=12 is sensor-less type mechanical home seeking operation (without external sensors), and can be used only when combining the **CM10**/**SCX10** with the **ESMC** controller.

If SENSOR is used, the SENSOR input and the home indicator must both be active to establish the HOME position.

If TIMING is used, the motor must reach a current phase angle of zero (0) degrees while the home input is active to establish the HOME position. (Current phase angle reaches zero degrees fifty (50) or one hundred (100) times per motor revolution.)

If SENSOR and TIMING are both used, a TIMING angle must be reached while both the SENSOR input and home indicator are active, to establish a HOME position.

See "8.2.5 Mechanical Home Seeking" on page 81 for details.

Note

SENSORACT does not affect the use of the SENSOR input while seeking mechanical home with MGHN or MGHP.

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

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

HSTOP should be used with care. 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.
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)
See Also	ELSE, ENDIF, WHILE, BREAKW, WEND, LOOP, BREAKL, ENDL

Description

Executes the conditional branching of an IF statement.
Parenthesis 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

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).
Block 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 INITIO, INSG, INx, INxLV, IO, OUT, OUTSG, OUTTEST, OUTx, REPORT

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 IN=14 then Input #2 (2) is ON, Input #3 (4) is ON and Input #4 is ON (8). (2+4+8=14)
To check the status of a single general input, use the INx command.

Important Interactions If an input is assigned to a system input signal (HOME, LSN, LSP, etc) the IN command will always show that input OFF or 0. Inputs which have been assigned to system input signals do not affect IN. Use the INSG command to read the status of the assigned system input signals.

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 : Linked Move Type

Execution Mode	Immediate, Sequence and CANopen
Syntax	INCABSx=n
Range	x = 0 to 3 (Linked Motion Profiles defined by DISx, INCABSx, VRx) 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.

Important Interactions

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/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" link2 from link3
 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	DIO, SAVEPRM, RESET, (DIN___commands, DOUT___commands)
Description	All Driver Connector's on the **CM10**/**SCX10** inputs and outputs are set to initial value.

Example

Command | Description

```
>INITDIO                                                     #Reset the current
 Enter Y to proceed, other key to cancel. Y                  DIO assignment to
                                                             factory settings
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.        #Save the parameter
>SAVEPRM                                                     assignments
 (EEPROM has been written 21 times)                          #Device response
 Enter Y to proceed, other key to cancel. y                  #Establish the saved
 Saving Parameters........OK.                                parameter values
>RESET
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>
```

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	IN, INSG, INx, IO, OUT, OUTSG, OUTTEST, OUTx,
Description	Cancels all Input or Output assignments. All system input signal assignment values (INCROFF, INHOME, etc) and all system output signal assignment values (OUTEND, OUTHOMEP, etc) are set to zero (0), unassigned. All Inputs and Outputs are reset for general purpose use. The command must be confirmed before it executes. SAVEPRM and RESET are then required for this command to take effect. 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.).

Example

```
Command                                                Description
>INITIO                                                #Reset the current IO
 Enter Y to proceed, other key to cancel. Y            assignment to factory
5(0)                                                   settings
0(0)                                                   #Device response
0(0)
0(0)
4(0)
1(0)
3(0)
2(0)
6(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
 All I/O configurations are set to factory default.    #Device response
 Execute SAVEPRM then RESET to activate new settings.
>SAVEPRM                                               #Save the parameter
 (EEPROM has been written 21 times)                    assignments
 Enter Y to proceed, other key to cancel. y            #Device response
 Saving Parameters........OK.
>RESET                                                 #Establish the saved
 Resetting system.                                     parameter values
-------------------------------------------
          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, INITIO, INITDIO, INITRIO

Description

Reprograms all parameters to the original factory default setting.
Execute a RESET command after INITPRM to activate the default settings.
INITPRM cannot be executed while the motor is moving or a sequence is executing.

Example

Command

```
>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: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>
```

Description

#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	RIN, RINx, RINSG, ROUT, ROUTx, ROUTSG, RIO, INITIO

Description

Cancels all Remote Input or Remote Output assignments.

All remote input signal assignment values (RINSENSOR, RINHOME, etc) and all remote output signal assignment values (ROUTEND, ROUTHOMEP, etc) are set to zero (0), unassigned.

All remote inputs and outputs are reset for general purpose use.

The command must be confirmed before it executes. SAVEPRM and RESET are then required for this command to take effect. If the command is executed accidentally, RESET without SAVEPRM.

The old I/O assignments remain effective until SAVEPRM and RESET execute.

Example

Command | Description

```
>INITRIO                                             #Reset the current RIO assignment to
 Enter Y to proceed, other key to cancel. Y          factory settings
5(0)                                                 #Device response
0(0)
0(0)
0(0)
4(0)
1(0)
3(0)
2(0)
6(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
0(0)
 All I/O configurations are set to factory default.     #Device response
 Execute SAVEPRM then RESET to activate new settings.
>
```

INSG : System Input Signal Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	INSG
Range	0 to 1047551 (integer values) /: real time monitor (immediate mode only)
Access	READ
See Also	IN, INxLV, IO, OUTSG

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 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:
If INSG=2, the ABORT signal is active, and all other signals are inactive.
If INSG=192, the HOME (64) and SENSOR (128) signals are active (64+128=192), and all other signals are inactive.

Be careful not to confuse INSG with IN (Input Status). IN reports the status of General Purpose Inputs (those inputs which are not assigned to a signal). INSG reports the status of system input signals.

Example

Command	Description
`>INSG`	#Query the current Input Signal Value
`INSG=4096`	#Device response: the CON signal is active

INx : Individual General Input Status

Execution Mode	Immediate and Sequence
Syntax	INx

Range	x = 1 to 9
	n = 0: Not Active
	1: Active
	/: real time monitor (immediate mode only)

Factory Setting	0
Access	READ
See Also	INITIO, INSG, INxLV, IO, OUT, OUTSG, OUTTEST, OUTx

Description

INx returns the state of General Purpose Input "x."
The active level of each General Purpose Input is determined by INxLV.
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 INSG command to check the status of the system input signals.

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 : "xxx" Signal Input Assignment

Execution Mode	Immediate
Syntax	INxxx=n ("xxx" signal input assignment)
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: LSN/LSP), SIGxxx (Except: PAUSECL), INITIO, IO, IN, INSG, INx, INxLV, OUTTEST, and "See Also" column in the chart below.

Description

Assign the "xxx" input signal to the I/O connector.

This signal can be assigned to any of the 9 inputs. If INxxx is zero (0), the "xxx" signal is not assigned to any input.

Command	Signal	Description	See Also
INABORT	ABORT	Abort Sequence and Motions	ABORT, <ESC>
INALMCLR	ALMCLR	Clear Alarm	ALMCLR, RIN, RINALMCLR, RIO, RINx
INCON	CON	Motor Current ON	CON, CURRENT, STRSW
INFREE	FREE	Motor Shaft Free	FREE, CURRENT
INHOME	HOME	Home Sensor	HOMETYP, MGHN, MGHP, RIN, RINHOME, RIO, RINx
INLSN/INLSP	LSN/LSP	Limit Switch Negative /Limit Switch Positive	ALM, ALMACT, ALMCLR, OTLV, RIN, RINLSN/RINLSP, RIO, RINx
INMCN/INMCP	MCN/MCP	Move Continuously Negative /Move Continuously Positive	-
INMGHN/INMGHP	MGHN/MGHP	Move Go Home Negative /Move Go Home Positive	RIN, RINMGHN, RIO, RINx
INMSTOP	MSTOP	Motor Stop	MSTOP, MSTOPACT, RIN, RINMSTOP, RIO, RINX
INPAUSE	PAUSE	Pause Motion	PAUSE, CONT, PAUSECLR, INPAUSECL, OUTPSTS, RIN, RINPAUSE, RINx
INPAUSECL	PAUSECLR	Clear Paused Motion	PAUSECLR, CONT, PAUSE, RIN, RINPAUSECL, RINPAUSE, OUTPSTS, RIO, RINx
INPECLR	PECLR	Clear Position Error	PECLR, PC, PE, PF, RIN, RINPECLR, RIO, RINx
INPSTOP	PSTOP	Panic Stop	ABORT, <ESC>, ALMACT, HSTOP, INMSTOP, MSTOPACT, MSTOPLV, SSTOP, RIN, RINPSTOP, RIO, RINx
INSENSOR	SENSOR	SENSOR input	RIN, RINSENSOR, RIO, RINx, SENSORACT, MGHN, MGHP, SCHGPOS, SGHGVR
INSTART	START	START input	STARTACT
INTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL, RIN, RINTL, RIO, RINx, 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.                        #Establish the saved parameter value
>RESET
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.                   #Confirm new value
-------------------------------------------
>INABORT
 INABORT=2(2)
>
```

IO : Input/Output Status

Execution Mode	Immediate
Syntax	IO
Range	/: real time monitor (immediate mode only)
See Also	ABORTLV, ALARMLV, ENDLV, HOMELV, HOMEPLV, INHOME, INITIO, INLSN, INLSP, INMSTOP, INPAUSE, INPAUSECL, INPSTOP, INSENSOR, IN, INxLV, MOVELV, MSTOPLV, OTLV, OUTALARM, OUTEND, OUTHOMEP, OUTMBFREE, OUTMOVE, OUTPSTS, OUTRUN, PAUSECLLV, PAUSELV, PSTOPLV, PSTSLV, RUNLV, SENSORLV, STARTLV,

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 the IO status
 Inputs (1-9) = IN1 SENSOR HOME PSTOP -LS +LS IN7 IN8 IN9  #Device response
 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
>
```

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.

Note

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.

Note

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
```

LIMN, LIMP : Software Position Limits

Execution Mode	Immediate, Sequence and CANopen
Syntax	LIMN n: Minimum permitted position LIMP n: Maximum permitted position
Range	n = -MAXPOS to +MAXPOS (User Units)
Factory Setting	0.0
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 LIMN and LIMP 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 LIMN and LIMP.) 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 the action defined by ALMACT will trigger. For continuous motions (MCN, MCP), 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. MCN or MCP can be executed, if the motor would move in the direction of the operational range.
Note	If LIMN=LIMP=0, software position limit checking is disabled, even if SLACT=1. LIMN and LIMP 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
 HOMETYP=8                                         instead of LSN, LSP.
>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.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>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 limit
detected.
>PC                                                #Checked PC
 PC=10.001 Rev                                     #Just over LIMP
>
```

LINKx : Link Control

Execution Mode	Immediate, Sequence and CANopen
Syntax	LINKx=n

Range	x = 0 to 2 (Linked Motion Profiles defined by DISx, INCABSx, VRx)
	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/s
`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].

Example

```
Command                    Description
>LIST PROGRAM10 2 5        #List sequence PROGRAM10, from line 2 through 5

(   2) LOOP 5              #Partial contents of sequence PROGRAM10
(   3)   MI
(   4)   MEND
(   5)   WAIT 1.0

>
```

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                 #List for numeric user-defined variables
   ==  ==========   ============
    1  PRICE        0                            #Variables created but not assigned a value
    2  QUANTITY     0                            show 0
    3  LOT          32
    4  SERIAL       4583274
    5  SIZE         0
    6  LENGTH       106
    7  WIDTH        60
    8  WEIGHT       0.95
    9               0                            #Empty (available) slots have no name.
   10               0                            #List for string user-defined variables
   ##  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
>
```

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 still be loaded into the editor (with the EDIT command), but any changes must be saved to a new location.
A locked sequence can be unlocked with the UNLOCK command.
The sequence directory listing (DIR command) shows the lock status for all sequences.

Note

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  2048 bytes total,    2 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 (LOOP-ENDL, IF-ENDIF, 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 : Move to Absolute Position

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, MCN, MCP, 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 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 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.
>
```

MAXPOS : Maximum Position Value

Execution Mode	Immediate
Syntax	MAXPOS
Range	n/a (User Units)
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, PC, OFFSET, etc.) 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, and is automatically updated when these parameters are changed. Both active and future values of MAXPOS are shown when MAXPOS is queried, and the new value becomes effective after SAVEPRM and RESET are performed.

Example

```
Command                                       Description
>UU in.                                       #Set the User Units to in. (inches)
 UU=in.
>DPR 10                                       #Set the Distance Per Revolution to 10
 DPR=1(10) in.                                User Units: device responds with
 Position range = +/- 500000(500000)          ranges, active and (future).
 Velocity range = 0.001 - 2480(24800)
 Minimum Movable Distance = +/- 0.001(0.001)  #Save the parameter assignments
>SAVEPRM
 (EEPROM has been written 68 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.                 #Establish the saved parameter values
>RESET
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------   #Confirm the new DPR setting
>DPR
 DPR=10(10) in.
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 24800(24800)
 Minimum Movable Distance = +/- 0.001(0.001)
>MAXPOS                                       #Query the Maximum Position Value
 MAXPOS=500000(500000) in.
>MAXVEL                                       #Query the Maximum Velocity Value
 MAXVEL=24800(24800) in./sec
>
```

MAXVEL : Maximum Velocity Value

Execution Mode	Immediate
Syntax	MAXVEL
Range	n/a (User Units/Second)
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 when MAXVEL is queried.

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.                                             #Set the User Units to in. (inches)
 UU=in.
>DPR 10                                             #Set the Distance Per Revolution to 10
 DPR=1(10) in.                                      User Units: device responds with
 Position range = +/- 500000(500000)                ranges, active and (future).
 Velocity range = 0.001 - 2480(24800)
 Minimum Movable Distance = +/- 0.001(0.001)        #Save the parameter assignments
>SAVEPRM
 (EEPROM has been written 68 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.                       #Establish the saved parameter values
>RESET
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------         #Confirm the new DPR setting
>DPR
 DPR=10(10) in.
 Position range = +/- 500000(500000)
 Velocity range = 0.001 - 24800(24800)              #Query the Maximum Position Value
 Minimum Movable Distance = +/- 0.001(0.001)
>MAXPOS                                             #Query the Maximum Velocity Value
 MAXPOS=500000(500000) in.
>MAXVEL
 MAXVEL=24800(24800) in./sec
>
```

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	OUTMBFREE, SIGMBFREE, ROUTMBFREE, DOUTMBFREE, 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 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 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 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)
>
```

MCN, MCP : Move Continuously, Negative or Positive

Execution Mode

Immediate, Sequence and CANopen

Syntax

MCN
MCP

See Also

<ESC>, ABORT, DIRINV, DPR, PSTOP, INLSN, INLSP, INMSTOP, INPAUSE, INxLV, LIMN, LIMP, MSTOPACT, MSTOPLV, PAUSE, TA, TD, UU, VR, VS

Description

MCN and MCP start continuous motions, with no defined final position. MCN starts moving in the negative direction, and MCP starts moving in the positive 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 MCN or MCP command. The direction cannot be changed: MCN cannot be issued while an MCP 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.
MCN and MCP 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.

Note

MCN and MCP 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 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 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	SIGMOVE, SIGEND, WHILE, WEND, IF, ENDIF

Description

MEND suspends sequence processing until motion is complete.

Most 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

Most 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 error 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.
>
```

MGHN, MGHP : Seek Mechanical Home Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	MGHN (move go home negative) MGHP (move go home positive)
Commands not Allowed	MOVE
See Also	DIRINV, INHOME, RINHOME, INLSN, INLSP, RINLSN, RINLSP, HOMETYP, HOMELV, PC, OFFSET, OUTHOMEP, OUTSG, SIGHOMEP

Description

MGHN and MGHP start motion patterns, attempting to find a mechanical home position which links position zero (PC=0) to an application reference signal. MGHN starts moving in the negative direction, and MGHP starts moving in the positive direction.

The process may involve moving in both directions before concluding. MGHN and MGHP 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 LSN, LSP, and HOME must be assigned to an input, before executing MGHN or MGHP. 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 81 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.

Software position limits LIMN and LIMP 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 (LIMN and LIMP not both 0), the limits are enabled after successful completion of a homing process.

MGHN and MGHP 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.

Note

MGHN and MGHP 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, LSN, LSP
 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 : Move Incremental Distance

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 Index

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 0x70h 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.

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" link2 from link3
`LINK2=0`	#Device response
`>MI1`	#Start the linked operation motion
`>`	

MR : Motor Resolution

Execution Mode	Immediate, Sequence and CANopen
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 Sequence
See Also	EC, ER, PC, PE
Description	Sets the motor resolution (pulse/rev)

Example

```
Command                                                Description
>MR=51200                                              #Set the motor resolution
 MR=500(51200)                                         #Device response
  Position range = +/- 500000(41943)
  Velocity range = 0.001 - 2480(24.218)
  Minimum Movable Distance = +/- 0.001(0.001)
>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: *.**
          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, INMSTOP, MSTOPACT, 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, if is assigned. See the INMSTOP command for more information.

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/sec
 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	INMSTOP, MSTOPLV, 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

Range	N_xxx can be the name of any existing numeric user-defined variable
	n = -Maximum Number to +Maximum Number
	xxx = Variable name: 1 to 10 alphanumeric characters

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                #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) 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 : Home Offset Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	OFFSET=n
Range	n = -MAXPOS to +MAXPOS (User Units)
Factory Setting	0.0
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, MGHN, MGHP

Description

OFFSET is the distance to be moved as the last step of a mechanical home seeking operation (MGHN, MGHP).
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, SIGLSP, SIGLSN, INLSN, INLSP, OTLV, LIMN, LIMP, SLACT

Description

OTACT establishes the stop action taken, when the system detects an over travel input signal (LSN or LSP) or when position exceeds position limits set with LIMN and LIMP.

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 servomotors and αSTEP 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 0`
` OTACT=0(0)`
	#Set the over travel action to Hard Stop.

`>ALMACT 2`
` ALMACT=2(2)`
	#Set Alarm Action to 2 (stop, alarm, current off)

`>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, LIMN and LIMP position limits become active)

OUT : General Output Status

Execution Mode

Immediate, Sequence and CANopen

Syntax

OUT=n

Range

n = 0 to 15 (integer values)
/: real time monitor (immediate mode only)

Access

READ and WRITE
READ Only in CANopen mode

See Also

INITIO, IO, IN, OUTTEST, OUTSG, OUTx, REPORT

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 OUT=10 then OUT2 (2) is ON, and OUT4 is ON (8). (2+8=10)
To check or change the status of a single general output, use the OUTx command.
All general purpose outputs are in the inactive (OFF) state immediately following system startup.

Caution

All outputs are OFF when device power is off.

Important Interactions

If an output is assigned to a system output signal (OUTHOMEP, OUTALARM, OUTEND, etc) the OUT command will not effect or reflect the electrical I/O port state. The port is always controlled by its assigned signal. Use the OUTSG command to read the status of the assigned system output signals.

Example

```
Command                                                  Description
>IO                                                      #Check IO Status
 Inputs(1-9) = -LS IN2 IN3 IN4 IN5 +LS IN7 IN8 IN9       #Response: Note that ALARM has
 Outputs(1-4)  = ALARM OUT2 OUT3 OUT4                    been assigned to Output #1.
                                                         Outputs 2-4 are general purpose.

 --Inputs---                     Outputs
 1 2 3 4 5 6 7 8 9 -(SEQ#)-  - 1 2 3 4                   #All outputs reported off.
 0 0 0 0 0 0 0 0 0 -(  0 )-   - 0 0 0 0
>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                  #All outputs are on… expect
 0 0 0 0 0 0 0 0 0  -(  0 )-  - 0 1 1 1                  Output #1. Output 1 active state
>                                                        cannot be effected by OUT
```

OUTSG : System Output Signal Status

Execution Mode	Immediate, Sequence and CANopen
Syntax	OUTSG
Range	n = 0 to 1983 /: real time monitor (immediate mode only)
Factory Setting	0
Access	READ
See Also	SIGMOVE, SIGRUN, SIGEND, SIGHOMEP, SIGALARM, SIGPSTS, SIGMBFREE, SIGREADY, OUT

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:

- If OUTSG=2, the RUN signal is active, and all other signals are inactive.
- If OUTSG=132, the END (4) and MBFREE (128) signals are active (4+128=132), and all other signals are inactive.

Be careful not to confuse OUTSG with OUT (Output Status). OUT reports the status of General Purpose Outputs (those outputs which are not assigned to a signal). OUTSG reports the status of system output signals.
System output signals are always maintained in their appropriate state, even in the signals are not assigned to outputs.

Example

```
Command          Description
>OUTSG           #Query the status of the system output signals
 OUTSG=1         #OUTSG equals 1, indicating motion is occurring
>
```

OUTTEST : I/O Test Utility

Execution Mode	Immediate
Syntax	OUTTEST
Commands not Allowed	MOVE, RUN
See Also	IN, INSG, OUT, OUTSG, IO

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

Range	x = 1 to 4
	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 controls the state of General Purpose Output 'x'.
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 OUTSG to check the status of assigned system output signals.

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 : "xxx" Signal Output Assignment

Execution Mode	Immediate
Syntax	OUTxxx=n ("xxx" signal output assignment)
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, IO, OUT, OUTSG, OUTx, OUTTEST, and "See Also" column in the chart below.

Description

Assign the "xxx" output signal to the I/O connector.

This signal can be assigned to any of the 9 outputs. If OUTxxx is zero (0), the "xxx" signal is not assigned to any output.

Command	Signal	Description	See Also
OUTALARM	ALARM	Alarm	ALARM, ALM, ALMCLR
OUTEND	END	Positioning Complete	END, DEND, ENDACT
OUTHOMEP	HOMEP	Home Position Signal	-
OUTLC	LC	Limiting Condition	DINLC
OUTMBFREE	MBFREE	Magnetic Brake Free	FREE, CURRENT, ROUTMBFREE, RIO, ROUTx
OUTMOVE	MOVE	Motor Moving	MEND
OUTPSTS	PSTS	Pause Status	PAUSE, PAUSECLR, CONT, ROUTPSTS, RIO, ROUTx
OUTREADY	READY	Operation Ready	DREADY
OUTRUN	RUN	Run Sequence	ROUTRUN, RIO, ROUTx

Example

```
Command                                            Description
>OUTALARM                                          #Check ALARM assignment
 OUTALARM=1(1)                                     #Assigned to Output #1
>OUTALARM 3                                        #Change the ALARM signal
 OUTALARM=1(3)                                     assignment to Output #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
 Resetting system.                                 values
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------        #Confirm the new assignment
>OUTALARM
 OUTALARM=3(3)
>
```

PABS : Driver Current Position

Execution Mode	Immediate, Sequence and CANopen
Syntax	PABS
Access	READ
See Also	ABSREQ, ABSREQPC, ABSSTS, 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 position command) 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 and ABSSTS can be referred to if the ABSDATA output is assigned and the ABSDATA output is 1 (ON).

PABS, 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.

Caution

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, INPAUSE, INPAUSECL, OUTPSTS, OUTSG, PAUSECLLV, PAUSELV, PSTSLV, SIGPAUSE, SIGPAUSECL, SIGPSTS, PAUSECLR

Description

PAUSE interrupts a motion, stopping the motor by controlled deceleration (soft stop). This command does not stop a sequence program. See SSTOP for details on the velocity profile during deceleration.

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.

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.
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.

If no motion is in process when a PAUSE command is issued, the PAUSE command has no effect.

Motions may also be paused by assigning system input signal PAUSE to an input. Operation after PAUSE becomes active is identical to issuing a PAUSE command.

Note that the PAUSE does not pause or suspend sequences.

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 then continued: PAUSE causes a soft stop, and CONT is ignored.

Example

Command	Description
`>MCP`	#Move continuously (positive)
`>PAUSE`	#Pause motion
`>CONT`	#Resume motion
`>`	

PAUSECLR : Clear Paused Motion

Execution Mode

Immediate, Sequence and CANopen

Syntax

PAUSECLR

See Also

PAUSE, CONT, INPAUSECL, RINPAUSECL, SIGPAUSECL, 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.

This signal can be assigned to system inputs by the INPAUSECL parameter or remote inputs by the RINPAUSECL.

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," "8.5 Stopping Motion."

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)
Access	READ and WRITE READ only while motion is in progress
See Also	DPR, GA, GB, EHOME, MA, MGHN, MGHP, 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). 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, MGHN, MGHP).

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	/: real time monitor (immediate mode only)
Access	READ
See Also	DPR, GA, GB, PC, PE, PF, PFI
Description	PCI is the change in position command PC (commanded position) since the last motion started. PCI is continuously updated by the system. PCI is set to zero (0) at system startup. PCI is undefined immediately after a mechanical home seeking operation completes (MGHN, MGHP).

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	/: real time monitor (immediate mode only)
Access	READ
See Also	ENDACT, PC, PCI, PF, PFI

Description

PE is the position error, the difference between commanded position (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.
Refer to the ENDACT command and the example below.

Example

```
Command                                        Description
>LIST CHECKLOAD                                #List sequence CHECKLOAD

(  1) MCP                                      #Start continuous motion, positive
(  2) WHILE (IN1=0)                            #While Input 1 is off.
(  3)   D=PE-E                                 #Capture position error, and…
(  4)   D=0.01*D                               #…Form a simple moving…
(  5)   E=E+D                                  #…average in variable E.
(  6) WEND                                     #End of WHILE block
(  7) SSTOP                                    #When IN1=1: Start soft stop
(  8) MEND                                     #Wait for motion to stop
(  9) IF (E>3)                                 #E = averaged position error
( 10)  SAS Load increasing, clean machine.     #if high, send reminder
( 11) ENDIF                                    #End of IF block
>
```

PECLR : Position Error Clear

Execution Mode	Immediate, Sequence and CANopen
Syntax	PECLR
Commands not Allowed	MOVE
See Also	INPECLR, PECLRLV, SIGPECLR, RINPECLR, EC, PC, PE, PF

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. Also the ACL/DCL signal on the driver connector of the **CM10**/**SCX10** is momentarily output, when the driver alarm is inactive.

The PECLR function may also be executed via the PECLR input. See the INPECLR command to assign the PECLR input.

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
Range	−MAXPOS to +MAXPOS (User Units) /: real time monitor (immediate mode only)
Access	READ, WRITE Read only while motion is in progress.
See Also	EC, ER, DPR, GA, GB, 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 counter) 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 commanded position PC, 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 cannot be set directly, but does 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).

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	−MAXPOS to +MAXPOS (User Units) /: real time monitor (immediate mode only)
Access	READ
See Also	DPR, GA, GB, 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. PFI is undefined immediately after a mechanical home seeking operation completes (MGHN, MGHP).

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: *.**
         Copyright 2010
         ORIENTAL MOTOR CO., LTD.
---------------------------------------
>PLSINV                                           #Confirm the new value
 PLSINV=1(1)
```

POS [x] : Position Array Data

Execution Mode	Immediate, Sequence and CANopen
Syntax	POS[x]=n

Range	x = 1 to 100
	n = -MAXPOS to +MAXPOS

Factory Setting	0.0
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

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" for more information on the TEACH function.

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
DOUTPRESET, PC, PF, OUTHOMEP, SLACT, LIMN, LIMP, ABSPLSEN

Description

When the PRESET command is executed, PC (position command) is set to zero. This position will be the electrical home. 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), LIMN and LIMP (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.

・If the PRESET command is executed when the parameter for PRESET（offset from 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/internal position updating) 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, MCN, MCP, MGHN, MGHP, MI, EHOME, SSTOP, HSTOP, MSTOP, 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 servomotors and αSTEP products immediately.

The PSTOP command operates independently of the motor stop action setting (MSTOPACT) .
The PSTOP function may also be executed via the PSTOP input. See the INPSTOP command to assign the PSTOP input.

There are several different ways to stop the motor. See "8.5 Stopping Motion" on page 99 for more information.

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
>
```

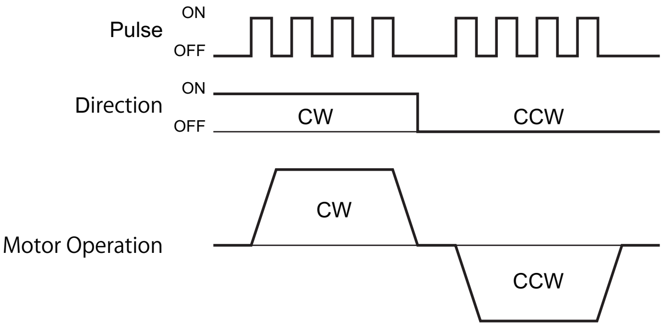
PULSE : Pulse Output Mode

Execution Mode	Immediate
Syntax	PULSE=n
Range	n = 0: 2 pulse output 1: 1 pulse output
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

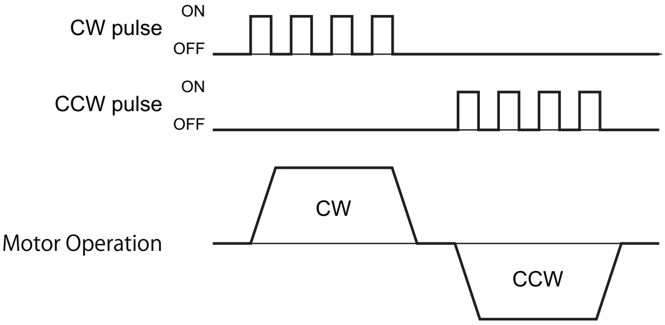
Description

Set the pulse output mode.

1 pulse mode



2 pulse mode



Example

Command / Description

```
>PULSE=0                                               #Set pulse output invert
 PULSE=1(0)                                            #Device response
>SAVEPRM                                               #Save the parameter
 (EEPROM has been written 21 times)                    assignments
 Enter Y to proceed, other key to cancel. y            #Device response
 Saving Parameters........OK.                          #Device response
>RESET
 Resetting system.
---------------------------------------
         CM10-*
         Controller Module
         Software Version: *.**
         Copyright 2010
         ORIENTAL MOTOR CO., LTD.
---------------------------------------
>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 or numbers, 10 character maximum, must start with a 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.

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  2048 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  2048 bytes total,    0 percent.
  Storage memory:       18 bytes used of 21775 bytes total,    0 percent.
>REN PROG2 MOVE1
Error: Sequence already exists.       #Can't rename if new name exists already.
>
```

REPORT : Display System Status

Execution Mode	Immediate
Syntax	REPORT
See Also	ALM, DIR, IO

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), 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, 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.
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.

Example

Command / Description

```
>ALMACT 1
 ALMACT=2(1)
```

#New value of Alarm Action: alarm, keep current on. Active (Future) values

```
>ALMMSG 2
 ALMMSG=2 [Alarm+Warning]
```

#New value for Alarm Messaging: Transmit message for alarm and warning.

```
>SAVEPRM
 (EEPROM has been written 95 times)
 Enter Y to proceed, other key to cancel. Y
 Saving Parameters........OK.
```

#Save all parameters

```
>RESET
 Resetting system.
-----------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-----------------------------------------
```

#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 current sequence. If the sequence was CALL'ed from another sequence, the original sequence will resume at the statement following the CALL statement. If the sequence 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 RINSG, RINx, ROUT, ROUTSG, ROUTx, 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 RIN=14 then Remote General Input #2 (2) is ON, Remote General Input #3 (4) is ON and Remote General Input#4 is ON (8). (2+4+8=14)

To check the status of a single remote general input, use the RINx command.

Important Interactions If remote input is assigned to a system input signal (HOME, LSN, LSP, 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=n

Range x = 1 to 8
n = 0: Not Active
1: Active
/: real time monitor (immediate mode only)

Access READ

See Also RIN, INITRIO, RIO

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`
	#Remote General Purpose Input 1 inactive

RINxxx : "xxx" Signal Remote Input Assignment

Execution Mode	Immediate
Syntax	RINxxx=n
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	INxxx, RINxx, SIGxxx (Except: PAUSECL), RIO, INITRIO, RIN, RINx, and "See Also" column in the chart below.

Description

Assign the "xxx" input signal to the remote input.

This signal can be assigned to any of the 8 remote inputs. If RINxxx is zero (0), the "xxx" signal is not assigned to any remote input.

Command	Signal	Description	See Also
RINALMCLR	ALMCLR	Clear Alarm	ALMCLR
RINHOME	HOME	Home Sensor	HOMETYP, MGHN, MGHP
RINLSN/RINLSP	LSN/LSP	Limit Switch Negative /Limit Switch Positive	ALM, ALMACT, ALMCLR
RINMGHP	MGHP	Move Go Home Positive	MGHP
RINMSTOP	MSTOP	Motor Stop	MSTOP, MSTOPACT
RINPAUSE	PAUSE	Pause Motion	PAUSE, CONT, PAUSECLR, RINPAUSECL, OUTPSTS
RINPAUSECL	PAUSECLR	Clear Paused Motion	PAUSECLR, CONT, PAUSE, RINPAUSE, SIGPSTS, OUTPSTS
RINPECLR	PECLR	Clear Position Error	PECLR, EC, PC, PE, PF
RINPSTOP	PSTOP	Panic Stop	PSTOP, ABORT, <ESC>, ALMACT, HSTOP, MSTOPACT, MSTOPLV, SSTOP
RINSENSOR	SENSOR	SENSOR input	INSENSOR, SENSORACT, MGHN, MGHP, SCHGPOS, SCHGVR
RINTL	TL	Torque Limiting /Push-motion Operation /Current Cutback Release	TL

Important Interactions

The xxxLV does not invert the logic level of RINxxx.

Example

```
Command                                         Description
>RINALMCLR 3                                    #Assign remote input number 3 as
 RINALMCLR=0(3)                                 the ALMCLR signal
>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
 Resetting system.                              values
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>RINALMCLR                                      #Confirm new value
 RINALMCLR=3(3)
>
```

RIO : Remote General I/O Status

Execution Mode	Immediate
Syntax	RIO
Range	/: real time monitor (immediate mode only)
See Also	RIN, ROUT, RINx, ROUTx

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  #Device response
  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
>
```

ROUT : Remote General Output Status

Execution Mode	Immediate and Sequence CANopen
Syntax	ROUT=n
Range	n = 0 to 63 (integer values) /: real time monitor (immediate mode only)
Access	READ and WRITE READ only in CANopen
See Also	RINSG, ROUTSG

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 ROUT=10 then ROUT2 (2) is ON, and ROUT4 is ON (8). (2+8=10)
To check or change the status of a single general output, use the 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          #Device response
 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
>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          #Device response
 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
```

ROUTx : Individual Remote general Output Control

Execution Mode	Immediate and Sequence
Syntax	ROUTx=n
Range	x = 1 to 6 n = 0: Not Active 1: Active /: real time monitor (immediate mode only)
Factory Setting	0
See Also	INITRIO, ROUT, ROUTSG, RIO, RIN
Description	ROUTx 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.

Example

```
Command            Description
>ROUT1             #Check ROUT1 status
 ROUT1=0
>ROUT1=1           #Set ROUT1to active
>ROUT1             #Check ROUT1 status again
 ROUT1=1
```

ROUTxxx : "xxx" Signal Remote Output Assignment

Execution Mode	Immediate
Syntax	DOUTxxx=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), ROUTxxx, SIGxxx, RIO, INITRIO, ROUT, ROUTx, and "See Also" column in the chart below.

Description

Assign the "xxx" output signal to the remote output.

This signal can be assigned to any of the 6 remote outputs. If ROUTxxx is zero (0), the "xxx" signal is not assigned to any remote output.

Command	Signal	Description	See Also
ROUTABSDATA	ABSDATA	Driver Current Position Data Ready	ABSREQ, ABSREQPC
ROUTMBFREE	MBFREE	Magnetic Brake Free	CURRENT, FREE
ROUTPSTS	PSTS	Pause Status	PAUSE, PAUSECLR, CONT
ROUTRUN	RUN	Sequence Running	-

Example

Command — Description

```
>RINALMCLR 3                                     #Assign remote input number 3 as
 RINALMCLR=0(3)                                  the ALMCLR signal
>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
 Resetting system.                               values
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>RINALMCLR                                       #Confirm new value
 RINALMCLR=3(3)
>
```

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>

Description

RUN starts execution of a sequence.
Sequences can also be started with the dedicated START input.
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.

Important Interactions

Sequences cannot be edited while a sequence is executing. The system prevents the editor from starting.

Example

```
Command                     Description
>LIST MAIN                  #List sequence MAIN

(   1) VR 10                #Sequence listing.
(   2) LOOP 10
(   3)     MI
(   4)     CALL WATCHER
(   5) ENDL
(   6) MA 0
(   7) CALL WATCHER
>RUN MAIN                   #Run sequence MAIN
>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

Range	S_xxx can be the name of any existing user-defined string variable
	text = 20 characters maximum
	xxx = Variable name: 1 to 10 alphanumeric characters

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
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
>Fourth Quadrant                motion.
>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.

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:

- ^@ (ASCII value NULL, binary 0) is not supported.
- ^, followed by a space, transmits one space character (this permits leading or trailing space characters in the output)
- ^^ transmits a single caret (^). ^^^ transmits an ASCII CTRL-^, 1Eh.

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 B.

Note

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.

"@" can not be used in an ASCII string.

Example

Command

```
>LIST REFRESH

(   1) # VT-100 EMULATION
(   2) # 1) CLEAR DISPLAY
(   3) # 2) HOME CURSOR
(   4) # 3) TRANSMIT PREFERRED PROMPT
(   5) SACS ^[[2J^[[H-->
>RUN REFRESH
-->
```

Description

#List Sequence "REFRESH"

#Comments, in sequence
#Transmitted control codes below cause VT-100 displays to clear screen and "home" the cursor.
Then: transmit a custom prompt

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.

Other commands and comments cannot follow an SAS command on the same line: they will be considered part of the ASCII string.

Note

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.

"@" can not be used in an ASCII string.

Example

Command   Description

```
>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.

The EEPROM has a nominal expected lifetime of 100,000 write cycles, which should be sufficient for almost all applications. The SAVEALL and SAVEPRM commands should not be used automatically (i.e. by a host controller) if they could possibly execute at high frequency. Saving once per day, for instance, yields a nominal expected lifetime of almost 275 years. Saving once per minute reduces the expected lifetime to about 70 days, and is certainly not recommended.

The system keeps a counter of how many times EEPROM has been written (by SAVExxx commands, CLEARxxx commands, or INITxxx commands). This counter is displayed each time any of these commands is executed, for reference.

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

```
>SAVEALL
 (EEPROM has been written 100 times)
 Enter Y to proceed, other key to cancel. y
 Saving Parameters........OK.
 Saving POS[ ] Data.......OK.
>
```

Description

#Save all parameters, variables, and position array data.

#System requires confirmation

#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, 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.
The EEPROM has a nominal expected lifetime of 100,000 write cycles, which should be sufficient for almost all applications. The SAVEPOS command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. Saving once per day, for instance, yields a nominal expected lifetime of almost 275 years. Saving once per minute reduces the expected lifetime to about 70 days, and is certainly not recommended.
The system keeps a counter of how many times EEPROM has been written (by SAVExxx commands, CLEARxxx commands, or INITxxx commands). This counter is displayed each time any of these commands is executed, for reference.

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 ***

 (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 TEACH mode to "learn" target positions.

```
 PC=         0.000     Save to POS[23]     Data set OK.
 End teach mode
```

#<Enter>, this PC saved to POS[23]
#<ESC>: exit TEACH

```
>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. The EEPROM has a nominal expected lifetime of 100,000 write cycles, which should be sufficient for almost all applications. The SAVEPRM command should not be used automatically (i.e. by a host controller) if it could possibly execute at high frequency. Saving once per day, for instance, yields a nominal expected lifetime of almost 275 years. Saving once per minute reduces the expected lifetime to about 70 days, and is certainly not recommended. The system keeps a counter of how many times EEPROM has been written (by SAVExxx commands, CLEARxxx commands, or INITxxx commands). This counter is displayed each time any of these commands is executed, for reference.
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.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>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
 (EEPROM has been written 14 times)           startup value
 Enter Y to proceed, other key to cancel. Y   #Confirm SAVEPRM
 Saving Parameters........OK.
>RESET                                        #Reset the system again
 Resetting system.
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>VR                                           #Check value again
 VR=10 Rev/sec                                #OK. We have new startup value
>
```

SCHGPOS : Distance After SENSOR Input

Execution Mode	Immediate, Sequence and CANopen
Syntax	SCHGPOS=n
Range	n = 0.0 to MAXPOS (User Units)
Factory Setting	0.0
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	INSENSOR, RINSENSOR, MCN, MCP, SCHGVR, SENSORACT, SENSORLV, MAXPOS

Description

SCHGPOS is the distance used for SENSOR offset operation.

SENSOR offset operation allows the system to stop a continuous motion (MCN, MCP) 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	INSENSOR, RINSENSOR, MCN, MCP, SCHGPOS, SENSORACT, SENSORLV, MAXVEL

Description

SCHGVR is the velocity used for SENSOR offset operation.

SENSOR offset operation allows the system to stop a continuous motion (MCN, MCP) 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
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	INSENSOR, RINSENSOR, MCN, MCP, SCHGPOS, SCHGVR, SENSORLV
Description	SENSORACT establishes the stop action taken when the system detects a SENSOR input signal while executing a continuous motion (MCN, MCP). 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. SENSOR input behavior is different during home seeking operations (MGHN, MGHP). 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: *.**`
`Copyright 2010`
`ORIENTAL MOTOR CO., LTD.`
`-------------------------------------------`
	#Reset to activate new settings

`>SENSORACT`
`SENSORACT=1(1)`
	#Confirm the new value

SIGxxx : Status For System "xxx" Input Signal/System "xxx" 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: LSN/LSP, MBFREE), INSG/OUTSG, and "See Also" column in the chart below.

Description

SIGxxx is the status of system "xxx" input/output (included remote input/output) signal on the I/O connector.

SIGxxx becomes "0 (zero)" when not active, while SIGxxx becomes "1" when active.

If the output signals are not assigned to the output connector, you can check the status, using the SIGxxx commands of the output signals.

＜Input＞

Command	Signal	Description	See Also
SIGABORT	ABORT	Abort Sequence and Motions	ABORT
SIGALMCLR	ALMCLR	Clear Alarm	ALMCLR, RINALMCLR
SIGCON	CON	Motor Current ON	CURRENT
SIGFREE	FREE	Motor Shaft Free	FREE
SIGHOME	HOME	Home Sensor	HOMETYP, MGHP, MGHN, EHOME, RINHOME
SIGLSN/SIGLSP	LSN/LSP	Limit Switch Negative /Limit Switch Positive	OTLV, OTACT, HOMETYP, MGHP, MGHN, RINLSN/RINLSP
SIGMCN/SIGMCP	MCN/MCP	Move Continuously Negative /Move Continuously Positive	MCN/MCP
SIGMGHN/SIGMGHP	MGHN/MGHP	Move Go Home Negative /Move Go Home Positive	MGHN/MGHP
SIGMSTOP	MSTOP	Motor Stop	MSTOPACT, RINMSTOP
SIGPAUSE	PAUSE	Pause Motion	PAUSE, RINPAUSE, PAUSECLR, CONT
SIGPAUSECL	PAUSECLR	Clear Paused Motion	PAUSECLR, RINPAUSECL, PAUSE, CONT
SIGPECLR	PECLR	Clear Position Error	PECLR, RINPECLR, EC, PC, PE, PF
SIGPSTOP	PSTOP	Panic Stop	PSTOP, RINPSTOP, ALMACT
SIGSENSOR	SENSOR	SENSOR input	RINSENSOR, SENSORACT
SIGSTART	START	START input	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	Positioning Complete	DEND, ENDACT
SIGHOMEP	HOMEP	Home Position Signal	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	Run Sequence	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`
` VR=20 Rev/sec`
` TD=0.005`
	#Set Run velocity and Deceleration time… maybe aggressive?

`>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

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 LIMN and LIMP 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 LIMN and LIMP.) 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 the action defined by ALMACT will trigger. For continuous motions (MCN, MCP), 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. MCN or MCP can be executed, if the motor would move in the direction of the operational range.
Note	If LIMN=LIMP=0, software position limit checking is disabled, even if SLACT=1. LIMN and LIMP 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
 ALMMSG=2 [Alarm+Warning]                        alarm and warning messages
>SAVEPRM                                         #Save new configuration
 (EEPROM has been written 62 times)              information
 Enter Y to proceed, other key to cancel. Y
 Saving Parameters........OK.
>RESET                                           #Reset the system to make new
 Resetting system.                               settings active
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>MGHP                                            #Find home, start in positive dir.
>SIGHOMEP                                        #Check HOME input after
 SIGHOMEP=1                                      operation completes: active.
>MCP                                             #Start continuous motion
>Over travel: software position limit            #Alarm at position limit
detected.
>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.

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. 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, STARTLV
Description	STARTACT determines the action associated with the dedicated START input. START can be configured to start sequences only (STARTACT=0), or to act as a toggle (STARTACT=1): 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
 STARTACT=0(1)                                     level detect
>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: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>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	DOUTCS, 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
 STRDCS=0(1)                                     System Start to level detect
>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.
-------------------------------------------      #Confirm new value.
>STRDCS
 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, 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.

Important Interactions

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. 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.

Example

```
Command                                                Description
>STRSW 0                                               #Configure for CURRENT=0 at
 STRSW=1 (0) [Current ON at start up(Current OFF       start up
at start up)]
>SAVEPRM                                               #Save new settings
 (EEPROM has been written 10 times)
 Enter Y to proceed, other key to cancel. Y
 Saving Parameters........OK.
>RESET                                                 #Reset to activate new
 Resetting system.                                     settings
-------------------------------------------
          CM10-*
          Controller Module
          Software Version: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------
>CURRENT                                               #CURRENT=0 after restart
 CURRENT=0
>
```

TA : Acceleration Time

Execution Mode	Immediate, Sequence and CANopen
Syntax	TA=n
Range	n = 0.001 to 500.0 (seconds)
Factory Setting	0.5(seconds)
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, MCN, MCP, MGHN, MGHP, MI, MIx, TD

Description

TA affects the initial ramp time for:

- MA (Move Absolute)
- MI (Move Incremental)
- MCN and MCP (Move Continuously, negative and positive)
- MGHN and MGHP (Move Go Home, negative and positive)
- 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)
- MCN and MCP (Move Continuously, negative and 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, 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 500.0 (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, MCN, MCP, MGHN, MGHP, 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)
- MGHN and MGHP (Seek home, start negative and positive)
- EHOME (Return to PC=0)
- SSTOP (Soft Stop)
- MSTOP (Motor Stop, if MSTOPACT=1)
- ABORT (Abort sequences and motions)
- <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)
- MCN and MCP (Move Continuously, negative and positive)
- 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 "8.6. Teaching positions" on page 100.

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	DINTIMDEXTZ, DINTIMS, 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 MGHN or MGHP 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: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-----------------------------------------            #Query the TIM setting
>TIM                                                 #Device response
 TIM=1(1)
>
```

TIMER : Running Timer

Execution Mode	Immediate, Sequence and CANopen
Syntax	TIMER=n
Range	n = 0.0 to 500000.0 (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, DOUTTL, DOUTM0, DOUTM1, DOUTM2, DOUTCS, INTL, DINLC, OUTLC, SIGTL, SIGLC, 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)

When the TL input is assigned to the I/O connector, the same operation as TL=1 will be executed when the photocoupler is ON. (Normally open and normally closed can be reversed by the TLLV command)

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 the data #1 (M0 is set to ON, and M1 and M2 are set 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
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 }.
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 (bits per second) 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 USB Communication BAUD Rate for the device
Important Interactions	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. 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**.) Always set the **CM10/SCX10** baud rate first, then set the baud rate of the computer.
Note	When using a terminal emulator, such as Microsoft® HyperTerminal, a new session is needed for communicating at the higher speed. Within Microsoft® HyperTerminal, follow these procedures to connect at the higher speed. 1) Disconnect the current session a. Select the CALL menu then click DISCONNECT 2) Establish the new Baud rate in the properties menu a. Select the FILE menu then Properties b. Click CONFIGURE c. Change the BITS PER SECOND field to the value established with the BAUD command. d. Click OK and OK again e. Select the CALL menu then click CALL If the CLEARALL command is issued, the baud rate will be reset to 9600 bps.

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=UserUnitName
Range	UserUnitName = ASCII Characters, 20 characters maximum 0 (Clear string)
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
Description	UU defines the units displayed with position- and velocity- related parameters, when the system is responding verbosely (VERBOSE=1). 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	/: real time monitor (immediate mode only)
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

```
Command                Description
>VR                    #Check target running velocity VR
 VR=17.5 mm/sec        #17.5 mm/second
>TA                    #Check acceleration time TA
 TA=20                 #20 seconds
>MCP                   #Start moving continuously, positive direction
>VC                    #Check commanded velocity, while accelerating
 VC=0.892 mm/sec       #Slowly increasing toward VR
>VC
 VC=1.614 mm/sec
>VC
 VC=2.293 mm/sec
>VC
 VC=3.007 mm/sec
>VC
 VC=3.721 mm/sec
>
```

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-* /*.** / Mar 5 2010`	#Typical response
`>`	

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.

The examples below show the differences in several responses.

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.
Note	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," 500000000.)
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	CV, EHOME, MA, MCN, MCP, MGHN, MGHP, MI, MAXVEL
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 direction for the motion is determined by start vs. end positions (for point to point motions), or by choice of positive or negative motion command (MCN vs. MCP, MGHN vs. MGHP).
Important Interactions	The Change Velocity (CV) command overwrites VR with the value designated in the CV command.
Note	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 : Linked Motion Running Velocity

Execution Mode	Immediate, Sequence and CANopen
Syntax	VRx=n

Range	x = 0 to 3: Linked motion segment
	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	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 the start and end positions for the entire linked index.

Note

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`
` VR1=5 in./sec`
	#Set the velocity for linked motion segment #1 to 5 user units/second

`>DIS1 10`
` DIS1=10 in.`
	#Set the distance for linked motion segment #1 to 10 user units

`>INCABS1 1`
` INCABS1=1 [INC]`
	#Set the move type for linked motion segment #1 to incremental

`>LINK1 1`
` LINK1=1`
	#Enable the linked between segments #1 and #2

`>VR2 10`
` VR2=10 in./sec`
	#Linked motion segment #2 velocity equals 10 user units/second

`>DIS2 20`
` DIS2=20 in.`
	#Linked motion segment #2 distance equals 20 user units

`>INCABS2 0`
` INCABS2=0 [ABS]`
	#Set the move type for linked motion segment #2 to absolute

`>LINK2 0`
` LINK2=0`
	#Unlink segment #2 from segment #3

`>MI1`	#Start the linked motion, with segment 1

VS : Starting Velocity

Execution Mode

Immediate, Sequence and CANopen

Syntax

VS=n

Range

n = 0.0 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," 500000000.)

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, MCN, MCP, MGHN, MGHP, MI, MIx, MAXVEL

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.
Speed changes between zero (0) speed and VS is instantaneous. (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 MGHN and MGHP with HOMETYP=0-3, and used as the velocity for final HOME input detection with any of HOMETYP value. See "8.2.5. Mechanical Home Seeking" on page 81 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               #Wait for motion to finish
(   9)   MEND             #Turn output 4 on
(  10)   OUT4 1           #Wait before proceeding, wait time in variable Q
(  11)   WAIT Q           #Turn output 4 off
(  12)   OUT4 0           #End of LOOP block
(  13) ENDL
>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

Command	Description
`>CREATEVAR N_COUNTS=0`	#Create user-defined numeric variable named N_COUNTS
`>CREATEVAR 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
`>`	

WHILE : Begin WHILE Block

Execution Mode Sequence

Syntax WHILE (element1 {Conditional Operator} element2)

See Also IF, LOOP, WEND, BREAKW

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.
Parenthesis 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, forming a WHILE "block." BREAKW statements may appear within the WHILE block, terminating iteration and breaking out of the block.
When executed, the conditional expression is evaluated. If it evaluates to TRUE, sequence processing proceeds to the statement following the WHILE. 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. If the expression evaluates to TRUE when the WHILE statement executes, the contents of the WHILE block will be executed. The expression will be reevaluated at the next iteration: it is not tested during execution of the enclosed block statements.
Block structures (IF-ENDIF, WHILE-WEND, LOOP-ENDL) may be nested, to eight (8) levels deep.

Example

Command	Description
`>CREATEVAR N_COUNTS=0`	#Create user-defined numeric variable named N_COUNTS
`>CREATEVAR 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
`>`	

xxxLV : "xxx" Input Level/"xxx" 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 DC power input type.
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 "xxx" input/output signal, if used.

＜INxLV＞

INxLV establishes the active level of General Purpose Input x.
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 Sequence and Motions	ABORT, <ESC>, ALMACT, HSTOP, MSTOP, MSTOPACT, PSTOP, STARTACT, SSTOP
ALMCLRLV	ALMCLR	Clear Alarm	ALMCLR, ALM, ALARMLV, ALMACT, ALMMSG, ALMSET, OUTALARM
CONLV	CON	Motor Current ON	CURRENT
EXTZLV	EXTZ	External Encoder ZSG	DINTIMDEXTZ, DINTIMS, DSIGTIMDEXTZ, ENC, HOMETYP, TIM
FREELV	FREE	Motor Shaft Free	FREE
HOMELV	HOME	Home Sensor	HOMETYP, MGHN, MGHP
INxLV （x = 1 to 9）	INx	Individual General Input	-
MCNLV/MCPLV	MCN/MCP	Move Continuously Negative /Move Continuously Positive	MCN/MCP
MGHNLV/MGHPLV	MGHN/MGHP	Move Go Home Negative /Move Go Home Positive	MGHN/MGHP
MSTOPLV	MSTOP	Motor Stop	MSTOP, MSTOPACT
OTLV	LSN/LSP	Limit Switch Negative /Limit Switch Positive	-
PAUSECLLV	PAUSECLR	Clear Paused Motion	PAUSECLR
PAUSELV	PAUSE	Pause Motion	PAUSE
PECLRLV	PECLR	Clear Position Error	PECLR, EC, PC, PE, PF, RINPECLR
PSTOPLV	PSTOP	Panic Stop	PSTOP
SENSORLV	SENSOR	SENSOR input	SENSORACT, RINSENSOR
STARTLV	START	START input	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

＜Output＞

Command	Signal	Description	See Also
ALARMLV	ALARM	Alarm	ALARM, ALM, ALMCLR
ENDLV	END	Positioning Complete	END
HOMEPLV	HOMEP	Home Position Signal	HOMETYP, MGHN, MGHP
LCLV	LC	Limiting Condition	LC
MOVELV	MOVE	Motor Moving	-
PSTSLV	PSTS	Pause Status	-
READYLV	READY	Operation Ready	-
RUNLV	RUN	Run Sequence	-

Example

```
Command                                              Description
>ABORTLV 1                                           #Set the ABORT input logic to the
 ABORTLV=0(1)                                        Normally Closed logic level
>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: *.**
          Copyright 2010
          ORIENTAL MOTOR CO., LTD.
-------------------------------------------          #Confirm ABORT input logic level
>ABORTLV
 ABORTLV=1(1)
>
```

Chapter 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.

Types of Protective Functions

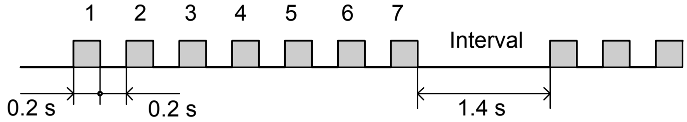
Protective Function	Description	Alarm Code	ALARM LED Blinks	System Action	ALMCLR Effect
No alarm	No alarm	0x00	OFF	Normal Operation	−
Out of position range	The PABS value exceeded the coordinate control range (-2,147,483,648～+2,147,483,647).	0x32	1	Motion and sequence processing stop.	Clears alarm
Stack overflow	Sequence memory "stack" exhausted	0x90			
Sequence reference error	Attempt to call a non-existing sequence as a subroutine	0x94			
Calculation over flow	Sequence calculation result exceeded numerical limits	0x98			
Parameter range error	Attempt to set a parameter to a value outside its range	0x99			
Zero division	Attempt to divide by zero	0x9A			
PC command execution error	Attempt to modify position counter PC while a motion was in process	0x9D			
User variable reference error	Attempt to access a non-existing user-defined variable	0x9E			
Parameter write error	Attempt to change a parameter under invalid conditions (e.g. if prohibited while moving)	0x9F			
Motion while in motion	Attempt to execute a motion while an incompatible motion is in progress	0xA0			
User alarm	ALMSET command intentionally executed	0xE0			
Panic stop	System executed a panic stop because of a PSTOP input or command	0x68	6	Defined by ALMACT setting	
LS logic error	Positive and negative position limit signals on simultaneously	0x60	7	Motion and sequence processing stop	
LS connected in reverse	Positive or negative position limit signal detected opposite home seeking direction	0x61			
HOME operation failed	Unstable or unexpected position limit signal detected while seeking home position	0x62			
HOMELS not found	No HOME input detected between position limit signals while seeking home position	0x63			
TIM, SENSOR signal error	TIM position or SENSOR input expected with HOME input: not found	0x64			
Hardware over travel	Positive or negative position limit signal detected	0x66		Defined by ALMACT setting	
Software over travel	Position outside of programmed positive and negative position limits	0x67			
LS detected during home offset motion	Positive or negative position limit signal detected while moving to OFFSET position after homing	0x6A		Motion and sequence processing stop	
Driver alarm	Driver alarm signal is active	0x6E			
Driver connection error	The command was canceled due to no response from the driver during executing the command or before executing the command	0x6F			
Motion parameter error	Attempt to execute motion with incompatible motion parameters	0x70			
EEPROM error	User data in non-volatile EEPROM memory is corrupt	0x41	9	Motor current disabled (no holding torque)	No effect
System error	System detected unexpected internal logic state	0xF0	ON	Motor current disabled (no holding torque)	No effect
Memory error	Internal memory access error	0xF1			
Sequence internal error	Sequence code invalid or corrupt	0xF2			

- 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 in Chapter 9 for details of a system reset).
- Turn off the power, wait for the green POWER LED to turn off, then turn 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 Troubleshooting and Corrective Actions

If device operation is not normal, check this section and take appropriate action. If operation is still not normal, contact your nearest Oriental Motor office.

Memo Perform failure diagnosis using the following methods:

- Check the alarm code using the ALM command.
- Count how many times the ALARM LED blinks.

13.3 Types of Protective Functions (Alarms)

Phenomenon	Alarm Code	ALARM LED Blinks	Protective Function	Description	Action
Motion and sequence execution stop	0x90	1	Stack overflow	Sequence memory "stack" exhausted	Restructure sequences to reduce the number of nested blocks or subroutine calls
	0x94		Sequence reference error	Attempt to call a non-existing sequence as a subroutine	Revise the CALL statement or rename the intended target sequence
	0x98		Calculation overflow	Sequence calculation result exceeded numerical limits	Check math operations, make sure they cannot overflow
	0x99		Parameter range error	Attempt to set a parameter to a value outside its range	Make sure all assignments stay within defined limits
	0x9A		Zero division	Attempt to divide by zero	Check division operations, test divisor for zero before division
	0x9D		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
	0x9E		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
	0x9F		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.
	0xA0		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.
	0xE0		User alarm	ALMSET command intentionally executed	If a user alarm was not expected, check sequence programming for inappropriate ALMSET command(s)

Phenomenon	Alarm Code	ALARM LED Blinks	Protective Function	Description	Action
Motion and sequence execution stop	0x60	7	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.).
	0x61		LS connected in reverse	Positive or negative position limit signal detected opposite home seeking direction	
	0x62		HOME operation failed	Unstable or unexpected position limit signal detected while seeking home position	
	0x63		HOMELS not found	No HOME input detected between position limit signals while seeking home position	Check HOME sensor wiring and connections
	0x64		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.
	0x6A		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
	0x6E		Driver alarm	Driver alarm signal is active	Check the driver and see the operating manual of the driver.
	0x6F		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.
	0x70		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	Protective Function	Description	Action
Motion and sequence execution stop. Motor may or may not have holding torque, depending on ALMACT.	0x68	6	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).
	0x66	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.).
	0x67		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.	0x41	9	EEPROM error	User data in non-volatile EEPROM memory is corrupt	Contact Oriental Motor to arrange for inspection or repair.
	0xF0	ON	System error	System detected unexpected internal logic state	
	0xF1		Memory error	Internal memory access error	
	0xF2		Sequence internal error	Sequence code invalid or corrupt	

Chapter 14 Inspection

It is recommended that periodic inspections be conducted after each operation of the controller module. 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 controller module uses semiconductor elements, so be extremely careful when handling them.

Static electricity may damage the controller module.

Chapter 15 Specifications

Operation Mode		Immediate command / Stored program
Sequence Programs	Number of Sequence Programs	Max.100
	Program Size	6 kB Maximum for total compiled sequences 6 kB Maximum for 1 sequence (text data)
	Programming Method	**Immediate Motion Creator for CM/SCX Series** (supplied software) or General terminal software
	Function Example	Subroutines, Math/Logical operators, User variables
Control	Number of Control Axis	Single axis
	Control Modes	Positioning operation (INDEX operation) Mechanical home seeking operation (HOME operation) Continuous operation (SCAN operation) 1-pulse Operation (JOG operation)
	Operating Mode	Incremental/Absolute
	Starting Velocity	0～1.24 MHz (1 Hz increments)
	Speed Range	1 Hz～1.24 MHz (1 Hz increments)
	Acceleration Time	0.001～500 sec (0.001 sec increments)
	Position Range	-2,147,483,648 to +2,147,483,647 pulses maximum
	Mode for Mechanical Home Seeking	3 sensor mode, 2 sensor mode, 1 sensor mode (+LS, -LS, Home, Sensor, Timing)
	Features	User Unit, Teaching Positions, Linked Motion, Multi Axis Operation, External encoder input, Protective Functions
Driver Interface	Pulse Output	1Pulse Mode/2 Pulse Mode Line Driver Output (Line receiver input /Photo-coupler input compatible)
	Input	5 signals Photo-coupler input Input voltage 4.25 V-26.4 V Input resistance 3 kΩ Built-in 5V/24 VDC power supply Sink logic/Source logic compatible
	Output	8 signals Photo-coupler open-collector outputs 30 VDC 20 mA or less Built-in 5 VDC/24 VDC power supply Sink logic/Source logic compatible
	Encoder Input	A-phase, B-phase, Index Max. Frequency 1 MHz Differential (AM26LV32 or equivalent)
External Encoder Input		A-phase, B-phase, Index Max. Frequency 1 MHz Differential (AM26LV32 or equivalent) Line-driver, Open 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) Mini USB terminal 9600, 19200, 38400, 57600, 115200 bps (9600 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 is factory setting.) Daisy-Chain compatible (up to 36 axis)
	CANopen	CiA Draft Standard 301 Ver4.02 compliant 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps Certified by CiA (CiA201001-301V402/22-0114)
Power Input	Voltage	24 VDC ± 10%
	Current	0.26 A
Mass		0.33 kg (0.73lb)

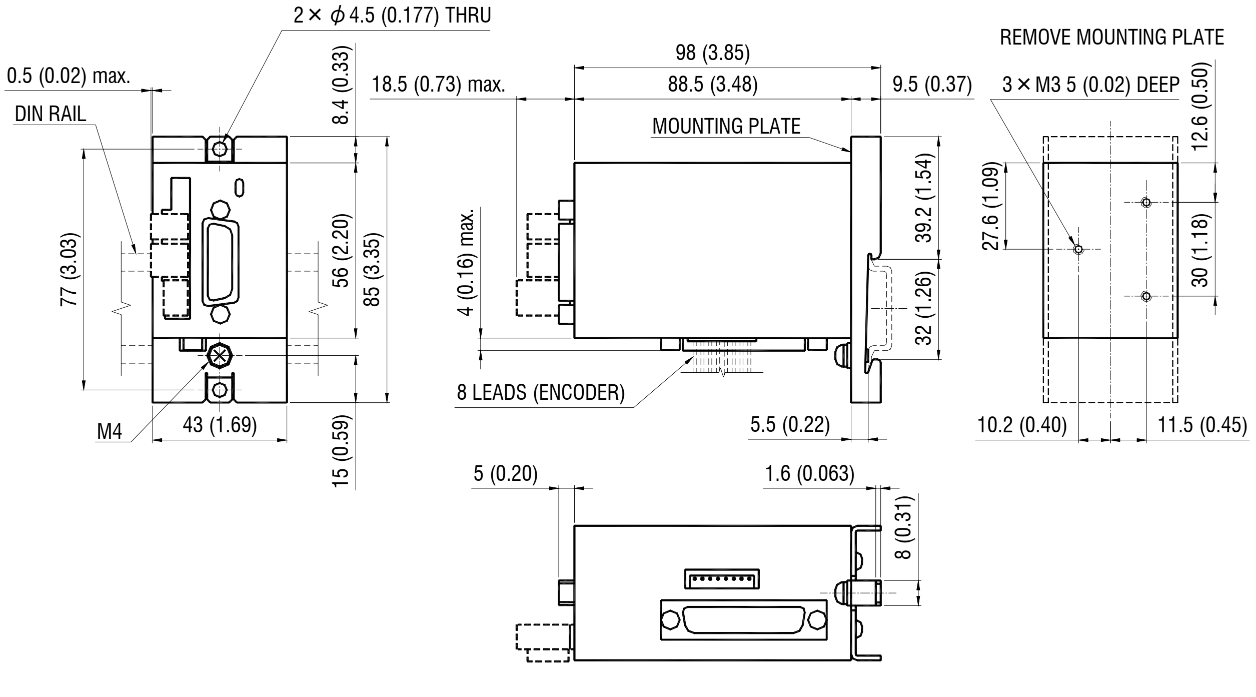
General Specification

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)

- **SCX10**



Appendix A 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. Spaces between each [ ] are accepted as part of the 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) [Command] [=(2Dh)] [Parameter (depends on command)] [EOL]
[Command] [SP] [Constant] [EOL]

■ Examples

Condition	Example	Notes

Parameter is constant	`DIS=1.234[EOL]`
	`DIS 1.234[EOL]`
		'=' can be replaced with [SP].

Parameter is variable	`DIS=A[EOL]`	'=' is required.
Parameter 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] [Parameter (depends on command)] [EOL]

■ Examples

Condition	Example	Notes
No parameter	`MI[EOL]`	
With parameter (constant)	`MA 1.234[EOL]`	'=' is not accepted.
With parameter (variable)	`MA POS[1][EOL]`	'=' is not accepted
With parameter (String)	`RUN Test[EOL]`	'=' is not accepted.

Appendix B TIPS

The **SCX10** 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
  - If all motion parameters are known, use linked index motions. Refer to the Mix command. Use the SENSOR input with SCHGVR and SCHGPOS

- 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, SCHGPOS and SCHGVR with desired offset position and velocity

- Stopping motion or sequence while running
  - Press ESC key

- Verifying that the motor has not missed any steps
  - 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, speed reaches to desired value (in immediate command)
  - Set EVx with desired output port and desired parameter

■ 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 acceleration
  - 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 **SCX10** 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 **SCX10** 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 "/" (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 parameter and use separator ‘;’ and set other parameter and repeat…

- Avoid pressing ‘=’ key for easier key typing while data entry
  - Press space key instead of ‘=’

- Commanding to all devices at once
  - Attach "\" (back slash) before command (Examples: \MI, \ABORT)

- Eliminating extra information on response to reduce time required to respond
  - Set VERBOSE=0 (recommended for automatic control)

- Showing only data and eliminating echo (command) on operating screen
  - Set ECHO=0

- Decreasing communication delay on RS-232C daisy chain connection
  - Set BAUD parameter to grater value

- Using limit switches and home sensor via CANopen for a sensor motion or a mechanical home seeking
  - Assign sensor signals using RINSENSOR, RINLSN, RINLSP 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 mathematical/logical operations in program
  - The following operations can be used
    + : Addition, - : Subtraction, * : Multiplication, / : Division, % : Modulo (remainder), & : AND (Boolean), | : OR (Boolean), ^ : XOR (Boolean), << : Left logic shift (Shift to left bit),
    >> : Right logic shift (Shift to right bit)

- Using subroutines
  - Use CALL command to call a sequence program as a subroutine

- 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
  - Use the MEND command right after a motion start command

- Showing text strings on the screen
  - Use SAS or SACS command followed by desired text string

- 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

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