Overview of Controllers

At Oriental Motor, a device that outputs the pulse signals required to operate a stepper motor or an AC servo motor is called a "controller". These products can perform various settings to control the motor and also permit connection with a programmable controller and sensors. Select a controller that best suits the system.

Features

- Possible to Set Positioning Operation Parameters
  The desired positioning operation parameters (number of operating pulses, starting pulse speed, operating pulse speed, acceleration/deceleration rate, etc.) can be set.

  ◇ Data Setting

  - Starting Pulse Speed (VS) [Hz]
    This is the frequency at which output of pulse signals is started. The controller starts outputting pulse signals at the frequency specified by the starting pulse speed, and increases the frequency along the slope specified by the acceleration/deceleration rate.

  - Operating Pulse Speed (VR) [Hz]
    This is the target pulse signal frequency. This frequency dictates the operating speed of the motor.

  - Acceleration/Deceleration Rate (TR) [ms/kHz]
    This is the slope along which the pulse signal frequency is increased (acceleration) or decreased (deceleration). At Oriental Motor, the time needed to increase (or decrease) the frequency by 1 kHz is expressed in units of ms/kHz.

  - The specific method of data setting varies from one product to another depending on, for example, whether a dedicated control module is used or a computer is used. For details, refer to the page explaining each product.

- Operation System

A system configuration for controlling a positioning motor is shown below. The controller receives signals from the programmable controller and outputs pulse signals to the driver.

- Jerk Limiting Control Function for Suppressing Vibration of the Motor

  The "jerk limiting control function" allows for the suppression of the vibration that occurs when the motor is being driven or stopped. For example, it is effective in situations such as suppressing vibration from belt pulley driving.

  ◇ Measurement Condition
    Application: Belt drive
    Operating Mode: Positioning operation
    Load: 10 kg (22 lb.)

  - Vibration that occurs when the operation mode is switched from acceleration and deceleration to constant speed manifests as vibration of the mechanism.

  - By suppressing vibration that otherwise occurs when the operation mode is switched from acceleration and deceleration to constant speed, vibration of the mechanism is suppressed.

  ◇ These graphs are provided only as a reference. The actual effect of this function will vary depending on the mechanism of the equipment.
Offering Functions to Facilitate Motor Control

Return-to-Mechanical Home Operation Function
To perform accurate positioning operation, the mechanical home that defines the reference point must be determined accurately. Oriental Motor’s controllers are equipped with the “automatic return-to-home operation function.” All that is needed is to wire a home sensor, and the home detection function can be used right away.

Test Mode Function
When building equipment, sometimes it is necessary to perform operation verification for just the driving part before the sequence program is completed. Oriental Motor’s controllers are equipped with a “test mode”, which can be used to verify operation based on data set in the controller.

I/O Check Function
The connection (I/Os) with the programmable controller can be checked.

Traveling Amount Setting in Multiple Units such as mm
The traveling amounts can be set by angle (degrees) or mm in addition to pulses.

- Setting in degrees

- Setting in mm

The specifics vary depending on the product. For details, refer to the page explaining each product.
Stored-Program Type Controller
SCX11 Universal Controller

For detailed information about regulations and standards, please see the Oriental Motor website.

The SCX11 universal controller is a highly functional and sophisticated controller, equipped with program editing and execution functions. The SCX11 is also able to control the motor via various serial ports such as USB, RS-232C and CANopen.

- **Features**
  - 100 Sequence Programs can be Stored
    The SCX11 can store up to 100 programs and execute various operations, from simple movements like "repeated positioning operation" to complicated controls like "operation by calculating the value based on external inputs".
  - Easy Operation
    The convenient and easy-to-use PC software, "Immediate Motion Creator for SCX Series", is provided with the SCX11. Easily start an operation with the click of a button or start key by setting the travel amount and speed. The GUI allows for easy program creation by selecting commands from the command list. Other functions available include, real time monitor for the teaching position, current position and I/O status, system parameter setting and I/O assignment.

- **Intelligent Setting**
  Program data for speed and travel amounts by setting the "User Unit" parameter. Data can be programmed in units such as "mm", "inch" and "revolution".

- **External Encoder Input**
  The SCX11 has a function for external encoder inputs which enables continuous monitoring of the feedback position and position error. Line driver, open collector and TTL inputs are compatible.

- **USB Port as Standard Equipment**
  The SCX11 has a mini USB port on the front panel which can directly connect to a PC through a commercially available mini USB cable. No special cable or converter is required.

- **Changeover from SCX10 is Possible**
  Functions like serial communication, I/O signals, commands etc. are the same as the SCX10, so changeover is easy.
Various Interfaces for Operation

- I/O
- USB
- RS-232C Connector

Stand-Alone Operation Using Sensors and Switches

The SCX11 can operate as a stand-alone controller, without a PC or programmable controller by utilizing 9 general inputs and 4 general outputs to select the desired sequences.

Direct Command Operation via CANopen

The SCX11 has a standard built-in interface for CANopen. Note: CANopen for the SCX11 is certified by CiA (CAN in Automation).

Operation Using a PC

The SCX11 can connect to a PC via RS-232C or USB*. The SCX11 can also be connected via an RS-232C daisy chain connection for multi-axis control with another SCX11 or other products such as the ASX Series all-in-one closed loop controller.

Operation Using a Programmable Controller

The SCX11 can communicate a wide variety of signals via I/O to a programmable controller. Serial communications is also available, if the programmable controller has a USB or RS-232C interface built-in.

Two Types of Operations

Executing Sequence Operation [Stored Program Function]

This function is available for conditional branching using general-purpose I/O, wait processes using internal timers and other operations based on sequence control including setting the positioning and speed data. The SCX11 can store up to 100 different programs that can be selected and executed via USB, RS-232C, CANopen and I/O port.

Example program:

```
Seq 1
[ 1 ] VS 1 : Starting Velocity
[ 5 ] DIS 2 : Incremental Motion Distance
[ 6 ] LOOP 3 : Begin Counted LOOP Block
[ 7 ] MI : Move Incremental Distance
[ 8 ] END : Wait for Motion End
[10 ] END : End of LOOP Block
[12 ] END : Wait for Motion End
[13 ] END : End Sequence
```

*Set the speed and travel amount as the unit of the actual motion such as "mm", "inch" and "revolution".

Multi-axis control via USB is configured with multiple USB ports.
Direct Command Operation
Operate a motor directly by sending commands via the serial port (USB, RS-232C, CANopen) from a PC or programmable controller. This function is suitable for applications where positioning data is updated frequently or managed all at once by the PC or programmable controller.

<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

[Example Commands]
DIS: Incremental Motion Distance
VR: Running Velocity
VS: Starting Velocity
TA: Acceleration Time
TD: Deceleration Time
MI: Move Incremental Distance
MA: Move to Absolute Position
MC: Move Continuously, Positive
MN: Move Continuously, Negative
MGHP: Seek Mechanical Home Position
ALMCCLR: Clear Alarm Condition

System Configuration
An example of a system configuration with the SCX11 controller.

 SYMBOL
1 Not supplied
2 Available for download. See website for details.
---

**Product Line**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCX11</td>
<td>$349.00</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>SCX11</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Operation Mode</strong></th>
<th>Immediate command/stored program</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Sequence Programs</strong></th>
<th>Number of Sequence Programs</th>
<th>Max. 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence Programs</td>
<td>Program Size</td>
<td>6 kByte maximum for total compiled sequences, 6 kByte maximum for 1 sequence (text data)</td>
</tr>
<tr>
<td>Programming Method</td>
<td>Immediate Motion Creator for CM/SCX Series (supplied software) or general terminal software</td>
<td></td>
</tr>
<tr>
<td>Function Example</td>
<td>Subroutines, mathematical operators, user variables</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Control</strong></th>
<th>Number of Control Axis</th>
<th>Single axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Modes</td>
<td>Positioning operation (INDEX operation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Return to mechanical home operation (HOME operation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous operation (SCAN operation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1-pulse operation (JOG operation)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Driver Interface</strong></th>
<th>Pulse Output</th>
<th>1 pulse mode/2 pulse mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Line driver output (line receiver input/photo-coupler input compatible)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Input</strong></th>
<th>5 signals photo-coupler input</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input voltage 4.25-26.4 VDC, input resistance 3 kΩ</td>
</tr>
<tr>
<td></td>
<td>Built-in 5/24 VDC power supply</td>
</tr>
<tr>
<td></td>
<td>sink logic/source logic compatible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Output</strong></th>
<th>8 signals photo-coupler open-collector outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 VDC 20 mA or less</td>
</tr>
<tr>
<td></td>
<td>Built-in 5/24 VDC power supply</td>
</tr>
<tr>
<td></td>
<td>sink logic/source logic compatible</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Encoder Input</strong></th>
<th>A-phase, B-phase, Index max. frequency 1 MHz</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>I/O</strong></th>
<th>9 signals (configurable) photo-coupler inputs, input voltage 4.25-26.4 VDC, input resistance 5.4 kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 signals (configurable) photo-coupler open-collector outputs</td>
</tr>
<tr>
<td></td>
<td>30 VDC 20 mA or less</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Serial Communications</strong></th>
<th>USB</th>
<th>USB2.0 compatible (virtual COM port) mini USB terminal 9600, 19200, 38400, 57600, 115200 bps (9600 is default.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232C</td>
<td>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 default.) daisy-chain compatible (up to 36 axis)</td>
<td></td>
</tr>
<tr>
<td>CANopen</td>
<td>CiA 301 ver4.02 compliant 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power Input</strong></th>
<th>Voltage</th>
<th>24 VDC ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>0.26 A</td>
</tr>
<tr>
<td></td>
<td>Mass</td>
<td>0.18 kg (0.40 lb.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Environmental Condition</strong></th>
<th>Ambient Temperature</th>
<th>0—50°C (+32—+122°F) (non-freezing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ambient Humidity</td>
<td>20—85% (non-condensing)</td>
</tr>
</tbody>
</table>

**Dimensions** Unit = mm (in.)

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