



# Operation Manual

PRODUCT NAME

SI unit for CC-Link

MODEL / Series / Product Number

*EX140-SMJ1 Series*

**SMC Corporation**

## Table of Contents

Safety Instructions	2
Model Indication and How to Order	7
Summary of Product elements	7
Definition and terminology	7
Mounting and Installation	8
Communication wiring	8
Power supply wiring	10
Settings	10
Maintenance	13
Troubleshooting	14
Specifications	17
Specifications	17
Dimensions	18

## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC) <sup>\*1)</sup> and other safety regulations.

- \*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems  
ISO 4413: Hydraulic fluid power -- General rules relating to systems  
IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)  
ISO 10218-1992: Manipulating industrial robots -Safety.  
etc.



**Caution :** CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



**Warning :** WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



**Danger :** DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

### Warning

**1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

**2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

**3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

**4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

## **Caution**

### **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

### **Limited warranty and Disclaimer**

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### **Compliance Requirements**

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

## Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

### ■ Safety Instructions

#### **Warning**

- Do not disassemble, modify (including changing the printed circuit board) or repair.  
An injury or failure can result.
- Do not operate the product outside of the specifications.  
Do not use for flammable or harmful fluids.  
Fire, malfunction, or damage to the product can result.  
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.  
Fire or an explosion can result.  
This product is not designed to be explosion proof.
- If using the product in an interlocking circuit:
  - Provide a double interlocking system, for example a mechanical system.
  - Check the product regularly for proper operation.Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
  - Turn off the power supply.
  - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.Otherwise an injury can result.

#### **Caution**



- After maintenance is complete, perform appropriate functional inspections.  
Stop operation if the equipment does not function properly.  
Safety cannot be assured in the case of unexpected malfunction.
- Provide grounding to assure the safety and noise resistance of the Serial System.  
Individual grounding should be provided close to the product with a short cable.

## ■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

- The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

### \*Product specifications

- When conformity to UL is required, the SI unit should be used with a UL1310 Class 2 power supply.
- The SI unit is a  approved product only if they have a  mark on the body.
- Use the specified voltage.  
Otherwise failure or malfunction can result.
- Reserve a space for maintenance.  
Allow sufficient space for maintenance when designing the system.
- Do not remove any nameplates or labels.  
This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.  
It may also result in non-conformity to safety standards.

### ●Product handling

#### \*Installation

- Do not drop, hit or apply excessive shock to the fieldbus system.  
Otherwise damage to the product can result, causing malfunction.
- Tighten to the specified tightening torque.  
If the tightening torque is exceeded the mounting screws may be broken.
- Never mount a product in a location that will be used as a foothold.  
The product may be damaged if excessive force is applied by stepping or climbing onto it.

#### \*Wiring

- Avoid repeatedly bending or stretching the cables, or placing heavy load on them.  
Repetitive bending stress or tensile stress can cause breakage of the cable.
- Wire correctly.  
Incorrect wiring can break the product.
- Do not perform wiring while the power is on.  
Otherwise damage to the fieldbus system and/or I/O device can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.  
Otherwise the fieldbus system and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.  
Route the wires (piping) of the fieldbus system and/or I/O device separately from power or high voltage cables.
- Confirm proper insulation of wiring.  
Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment.  
Otherwise noise can cause malfunction.

#### \*Environment

- Select the proper type of protection according to the environment of operation.  
In case of IP20, avoid use in the place where water and oil scatter.
- Do not use the product in an environment where corrosive gases or fluids could be splashed.  
Otherwise damage to the product and malfunction can result.
- Do not use in an area where surges are generated.  
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use an fieldbus system with a built-in surge absorbing element.  
Direct drive of a load generating surge voltage can damage the fieldbus system.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the fieldbus system to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.  
Otherwise failure or malfunction can result.
- Do not use the product in an environment that is exposed to temperature cycle.  
Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.  
If using in a location directly exposed to sunlight, shade the product from the sunlight.  
Otherwise failure or malfunction can result.
- Keep within the specified ambient temperature range.  
Otherwise malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.  
Otherwise malfunction can result.

#### \*Adjustment and Operation

- Set the switches by using a sharp-pointed screwdriver etc.  
It may damage set switches.
- Perform settings suitable for the operating conditions.  
Incorrect setting can cause operation failure.  
For details of each setting, refer to page 10 of this manual.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.  
For the PLC protocol and programming refer to the relevant manufacturer's documentation.

#### \*Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.  
There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.  
There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.  
Stop operation if the equipment does not function properly.  
Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the each unit.  
They could damage the surface of the body and erase the markings on the body.  
Use a soft cloth to remove stains.  
For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

## Model Indication and How to Order

EX140-SMJ 1

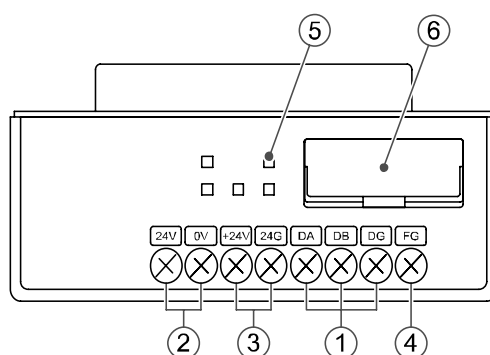
• Output type

1 16 outputs, NPN (positive common) / sink

• Fieldbus

MJ CC-Link

## Summary of Product elements



No.	Element	Description
1	Communication terminals (DA, DB, DG)	To connect the CC-Link line with a CC-Link-dedicated cable.
2	Power supply terminals (24 V, 0 V)	To supply power to solenoid valves.
3	Power supply terminals (+24 V, 24 G)	To supply power to the SI unit controller.
4	FG terminal	To connect to functional ground.
5	Display	LED display to indicate the status of the SI unit.
6	Switch setting area	Switches for setting the station number and transmission speed.

### ■ Definition and terminology

No.	Term	Definition
1	Number of stations	Total number of stations occupied by all slaves connected to the CC-Link network.
2	Station number	Numbers assigned to the slave stations, from 1 to 64, with No. 0 assigned to the CC-Link master. Slave stations must be assigned numbers according to the number of occupied stations so they are not duplicated.
3	Slave station	General term for any station other than the master station.
4	Number of occupied slaves	Number of networked stations in use by a slave. Depending on the data, one to four stations can be set. The remote I/O only occupies one station.
5	Remote I/O	A station which can only use digital data. Occupies only one station. (Example: digital units, solenoid valves, sensors, etc)



# Mounting and Installation

## ■ Communication wiring

The connection between a CC-Link-dedicated cable and an SI unit communication terminal for CC-Link is shown below.

The hole diameter for the screwdriver entry to access the terminal screw is  $\phi 6$  mm. (The terminal screw is an M3 cross head screw.)

- (1) Be sure to connect each signal line to its dedicated terminal. (Refer to Fig. 1)

The applicable size of the cross head screwdriver is No.2 ( $\phi 6$  mm or less).

Tighten the screws securely with a torque of 0.5 to 0.6 Nm.

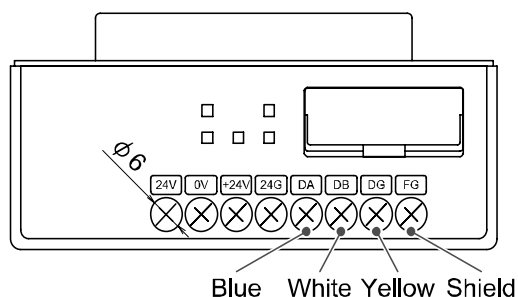


Fig. 1

- (2) Be sure to connect a terminating resistor between “DA” and “DB” at both ends of the CC-Link system. (Refer to Fig. 2) Use a CC-Link dedicated cable, or a cable with the same specifications. If a cable with any other specifications is used, normal data transmission cannot be guaranteed.

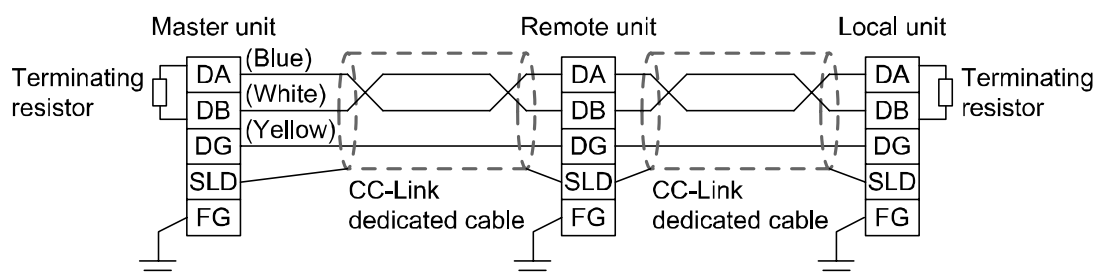


Fig. 2

- (3) The appropriate terminating resistor varies depending on the CC-Link cable used. (Refer to the table and Fig. 3 below)

Cable type	Terminating resistor
CC-Link dedicated cable	110 $\Omega$ 1/2 W (Brown, Brown, Brown)
CC-Link dedicated cable compatible to Ver.1.10	
CC-Link dedicated high performance cable	130 $\Omega$ 1/2 W (Brown, Orange, Brown)

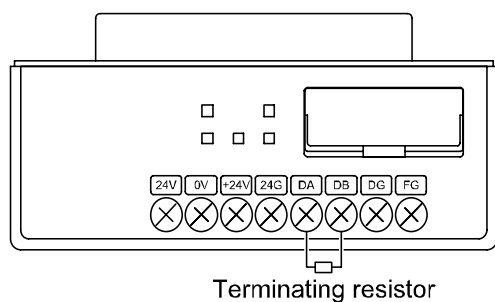


Fig. 3

- (4) The CC-Link-dedicated cable's shield wire (SLD) should be connected to the "FG" terminal of the SI unit. For the EX140-SMJ1, the "SLD terminal" and "FG terminal" are common. Therefore, connect 3 wires to the "FG Terminal" as shown in Fig. 4.

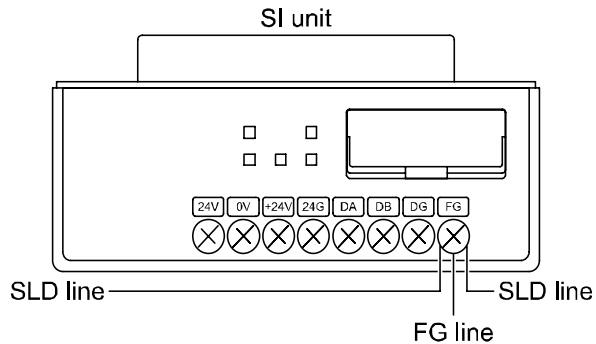


Fig. 4: Wiring to the FG terminal on the SI unit

When connecting 3 wires to the "FG terminal", crimp 2 wires together into one crimped terminal as shown in Fig. 5. Use another crimped terminal for other wires. After crimping, connect wires so that the back of the two crimped terminals face each other.

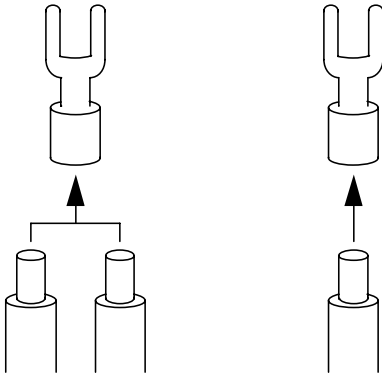


Fig. 5: How to crimp the terminal

## ■ Power supply wiring

Connect the power supply wiring to the solenoid valve power supply terminals and to the SI unit control power supply terminals.

Although the power supply consists of two separate systems, it is possible to use either a single power supply or separate power supplies.

Be sure to connect the power supply to the correct terminals. (Refer to Fig. 6)

The hole diameter for the screwdriver entry to access the terminal screw is  $\phi 6$  mm. (The terminal screw is an M3 cross head screw).

The applicable size of the cross head screwdriver is No.2 ( $\phi 6$  mm or less).

Tighten the screws securely with a torque of 0.5 to 0.6 Nm.

Note: Connect the ground terminal to ground. Resistance to ground should be 100 ohms or less.

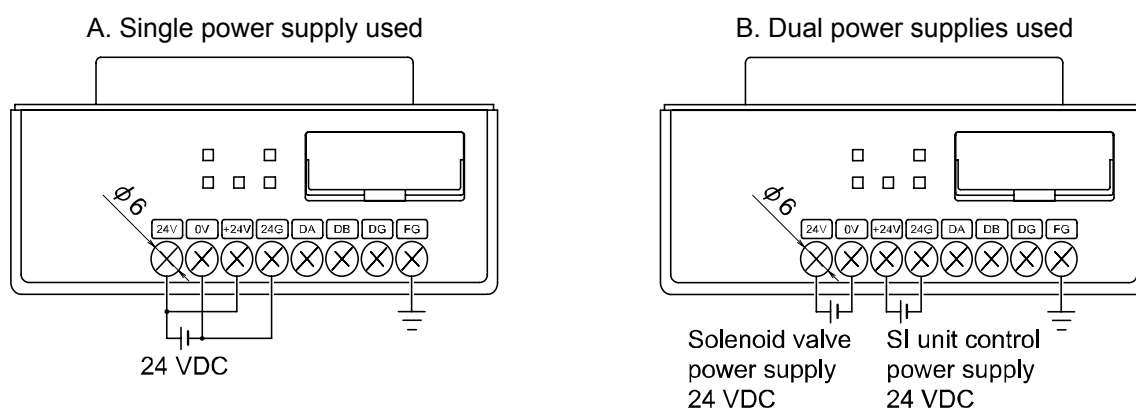
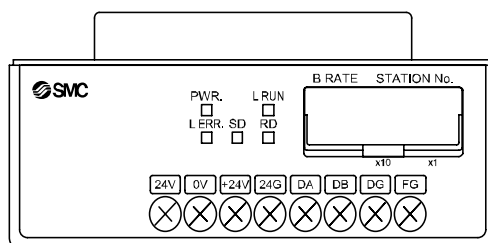


Fig.6

## Settings

### ○ Display setting



Display	Meaning
PWR.	LED is ON when the communication power is ON
L RUN	Indicates whether the SI unit is communicating with the master station correctly. LED is ON when the SI unit is receiving normal data from the master station. LED is OFF during time-out.
SD	LED is ON when data is being sent.
RD	LED is ON when data is being received.
L ERR.	LED is ON during communication errors (CRC errors). LED is OFF during time-out (L RUN LED is also OFF). LED is ON during station number setting and communication speed setting errors (the LED will turn off when the setting has been corrected and power has been restored). LED flashes when the station number or communication speed settings have changed during communication (the L RUN LED will turn on and the SI unit will operate according to the new settings once power is restored).

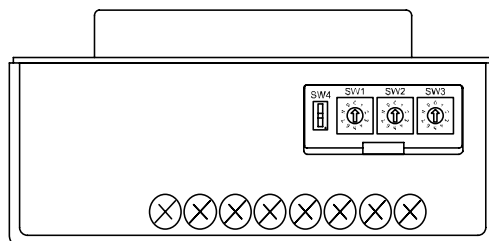
If the data link is normal, "PWR.", "L RUN", "SD", and "RD" LED's will be ON.

## ○Switch setting

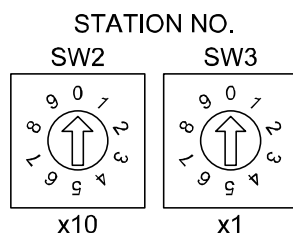
The setting for the station number and communication speed can be carried out using the rotary switches under the SI unit cover.

The setting for HOLD/CLEAR can be carried out using the DIP switch under the SI unit cover.

The settings must be carried out with the power supply for the SI unit turned off.



## •Station number setting



Setting	Setting range
x10	0 to 6
x1	0 to 9

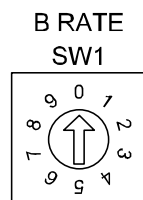
\*: The station number should be set within the range of 01 to 64.

If the number is set to 00, or to 65 or above, the "L ERR" LED will turn on.

\*: The station number must not be duplicated, this will cause an error.

\*: The default setting is 00.

## •Communication speed setting



Setting	Communication speed
0	156 kbps
1	625 kbps
2	2.5 Mbps
3	5 Mbps
4	10 Mbps

\*: The communication speed should be set within the range of 0 to 4.

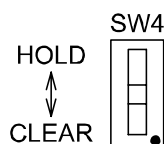
If the setting is out of range, the "L ERR" LED will turn on.

Turn the power off, and correct the setting.

\*: Set the same communication speed as the master station.

\*: The default setting is 0 (156 kbps).

## •HOLD/CLEAR setting



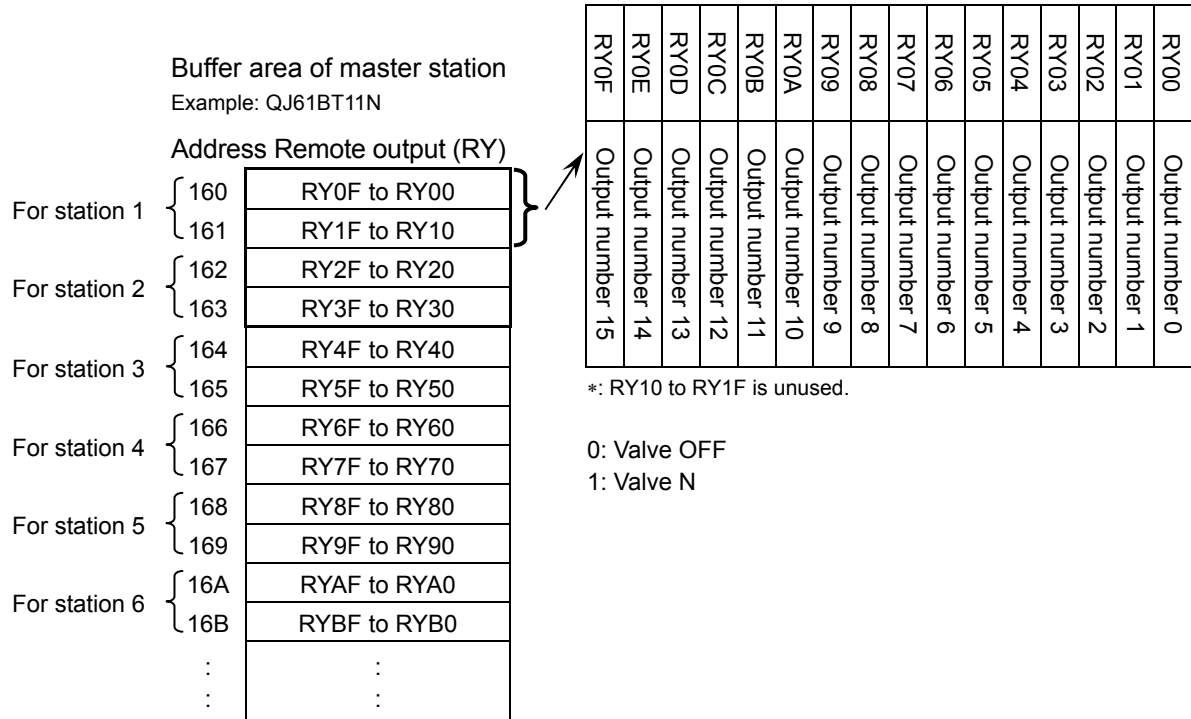
HOLD/CLEAR	Function
CLEAR	Clear the output when an error occurs
HOLD	Hold the output when an error occurs

\*: The default setting is CLEAR.

○Output and error information

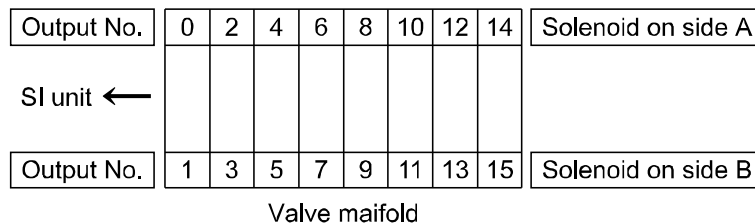
(1) I/O mapping table for master station Buffer Memory.

Example when SI unit station is assigned to "01".



(2) Output number assignment

The output number refers to the SI unit side solenoid position on the manifold and starts at zero.

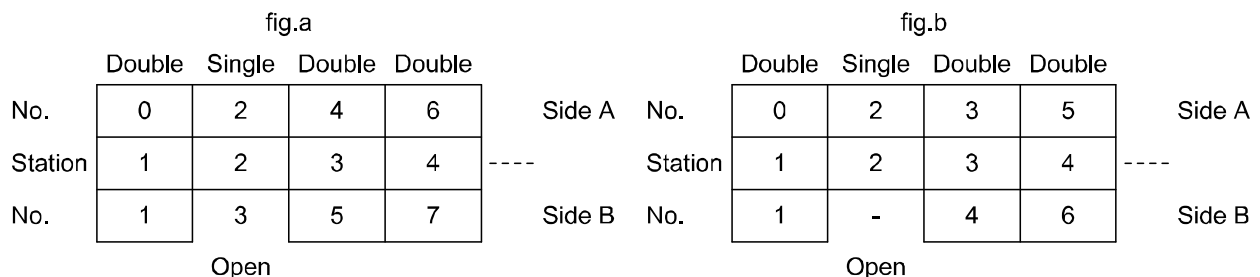


\*: Standard wiring of the manifold is for double-solenoid valves and the output number starts at the A side and then B side in that order as shown in the figure a.

If a single-solenoid valve is mounted on the standard wiring manifold, the output number for the B side valve is skipped.

\*: Custom wiring for mixed mounting single-solenoid valves and double-solenoid valves can be specified with a Wiring Specification Sheet. Example wiring is shown in the figure b.

\*: Bit status "0" and "1" in the data corresponds to solenoid valve status OFF and ON (0: OFF, 1: ON), and the output number starts at zero from LSB (least significant bit).



## Maintenance

### •Mounting and wiring

Item to inspect	Criteria	Countermeasure
Are SI unit terminals (for communication and power supply) securely connected?	No looseness.	Tighten the connector. (Refer to "Mounting/Installation")
Are the terminating resistors securely connected to both ends of the network (when the SI unit is at the end of the network)	Terminating resistors must be connected.	Connect suitable terminating resistors to cables. (Refer to "Mounting/Installation")
Is the connecting cable broken.	No apparent breaks	If any visible breaks are found, replace the cable.

### •Replacement parts

Item to inspect	Criteria	Countermeasure
CC-Link dedicated cable	No visible error and the correct cable must be used	If any visible breaks are found, replace the cable.
SI unit	No error in operation and display	If it does not operate as intended, or the display indicates errors, replace the unit.

### •Power supply

Item to inspect	Criteria	Countermeasure
Check that the SI unit control power supply voltage is within the specified range.	15 to 30 VDC	Investigate the cause of the voltage fluctuation, and take countermeasures against it.
Check that the solenoid valve power supply voltage is within the specified range.	24 VDC +10%/-5%	Investigate the cause of the voltage fluctuation, and take countermeasures against it.

# Troubleshooting

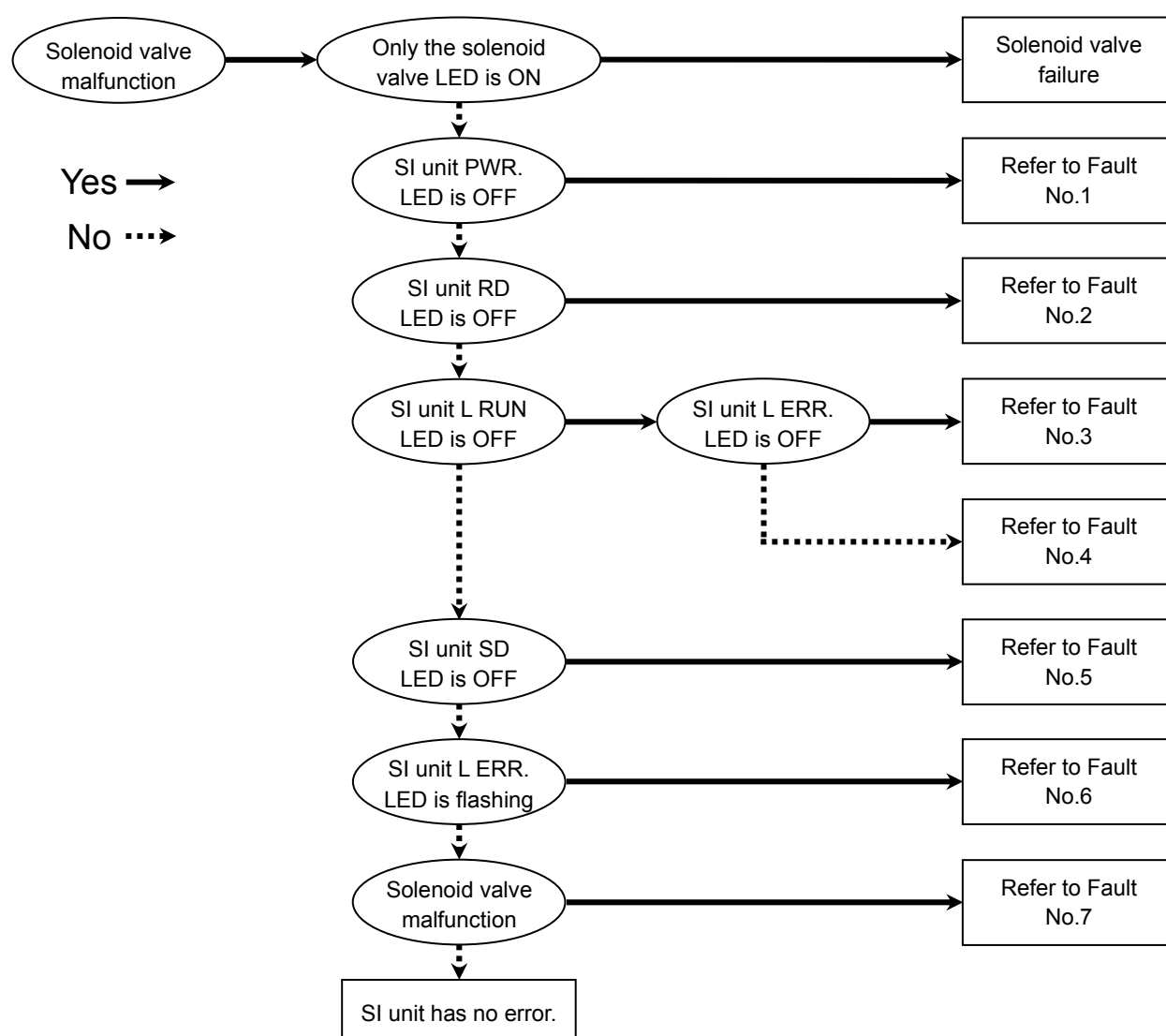
## ○Troubleshooting

Applicable model: EX140-SMJ1

If an operation failure of the product occurs, please confirm the cause of the failure from the following table.  
If a cause applicable to the failure cannot be identified and normal operation can be recovered by replacement with a new product, this indicates that the product itself was faulty.  
Problems with the product may be due to the operating environment (network construction etc). Please consult SMC.

If the cause of the problem cannot be found and the SI unit is not faulty, then inconsistencies with parameter settings or the network construction at the master station is possible.

In this case, please refer to the troubleshooting section of the CC-Link master user's manual (by Mitsubishi Electric Corporation).



○Faults and countermeasures

Trouble No.	Problem	Possible cause	Investigation method	Countermeasure
1	SI unit PWR LED is OFF	SI unit control power supply wiring failure	Check the SI unit control power supply cables for breaks, and check that the terminals are not loose. Avoid repetitive bending and stress on the cables, which may cause damage.	Connect the power supply cable correctly.
		SI unit control power supply failure	Check the SI unit control power supply wiring for any errors.	Correct the wiring.
			Check the SI unit control power supply voltage.	Supply 15 to 30 VDC to the SI unit control.
2	SI unit PWR LED is ON and RD LED is OFF	Communication wiring failure	Check the communication cables for breaks, and check that the terminals are not loose. Avoid repetitive bending and stress on the cables, which may cause damage.	Connect the communication cable correctly.
			Check the communication wiring for any errors.	Correct the wiring.
3	SI unit L RUN LED is OFF and L ERR.LED is OFF	Master station power supply failure	Check the power supply to the master station.	Connect the power supply to the master station correctly.
		Communication failure	Check that there are no high voltage cables or equipment that generates noise around the communication and power supply cables.	Separate the communication and power supply cables from the noise sources.
		Station number setting error	Check that the SI unit station number setting and the setting in the master station are the same.	Correct the setting.
		Communication speed setting error	Check that the SI unit communication speed setting and the setting in the master station are the same.	
4	SI unit L RUN LED is OFF and L ERR.LED is ON	Station number setting error or duplicate station number error	Check that the station number settings contain no errors and no duplications.	Correct the setting. To review the setting method, see "Settings".
		Communication speed setting error.	Check that the communication speed is set correctly.	



Trouble No.	Problem	Possible cause	Investigation method	Countermeasure
5	SI unit L RUN LED is ON and SD LED is OFF	Communication speed setting error	Check that the SI unit communication speed setting and the setting in the master station are the same.	Correct the setting.
		Station number setting error or duplicate station number error	Check that the station number settings contain no errors and no duplications.	
6	SI unit L RUN LED is ON and L ERR.LED is flashing	Communication speed change error	Check that the communication speed setting has not changed while the SI unit power is supplied.	Correct the settings with the power supply turned off, and then supply the power again.
		Station number setting change error	Check that the station number setting has not changed while the SI unit power is supplied.	
		Communication failure.	Check that there are no high voltage cables or equipment that generates noise around the communication and power supply cables.	Separate the communication and power supply cables from the noise sources.
7	Solenoid valve malfunction.	Solenoid valve failure.	Replace the solenoid valve with another and check the operation, or check the troubleshooting section in the solenoid valve manual.	Check the troubleshooting section of the solenoid valve manual, or contact SMC.
		Connection failure between SI unit and solenoid valve manifold	Check the connector between the SI unit and solenoid valve manifold for a connection failure, such as a bent pin.	Correct the connection between the SI unit and solenoid valve manifold.
		Too many solenoid valves (more than 16 outputs)	Check that the total number of outputs for the connected solenoid valves is 16 or less.	Correct the total number of outputs connected to the EX140-SMJ1 unit to 16 outputs or less.

# Specifications

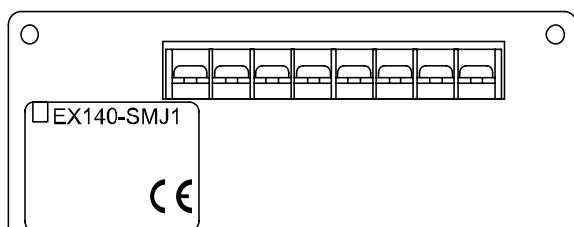
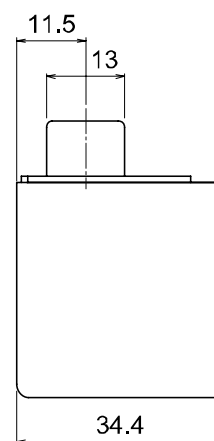
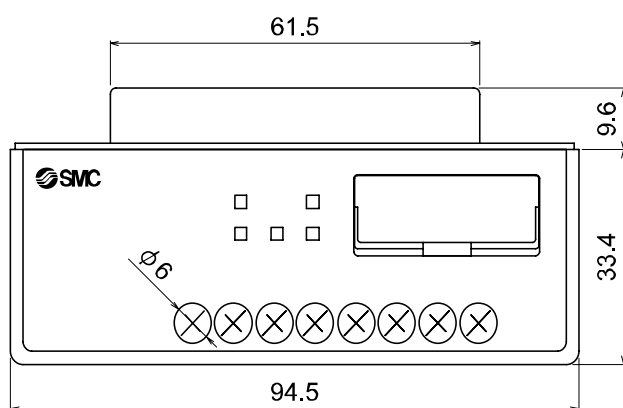
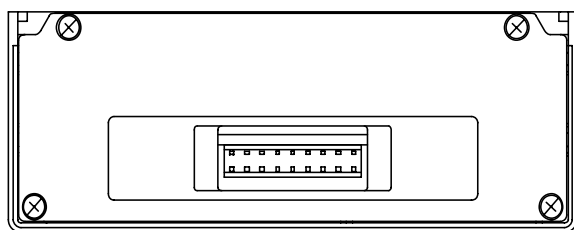
## ■ Specifications

Model No.		EX140-SMJ1
Communication specification	Applicable system	CC-Link Ver.1.10
	Occupied station	1 station
	Station number setting range	1 to 64 (Set with a rotary switch)
	Station type	Remote I/O
	Communication speed	156 k/625 k/2.5 M/5 M/10 Mbps
	Cable length between stations	20 cm or more
	Max. cable length	1200/900/400/160/100 m
Communication supply voltage		15 to 30 VDC
Solenoid supply voltage		24 VDC +10%/-5%
Output channel		16 outputs
Output type		Sink/NPN (positive common)
Internal current consumption (Unit)		0.1 A or less
Environment	Enclosure	IP20
	Withstand voltage	1500 VAC 1min. (Between FG and external terminal)
	Insulation resistance	2 MΩ or more (500 VDC between FG and external terminal)
	Ambient temperature	Operating temperature: 0 to +55 °C (when 8 outputs are used) 0 to +50 °C (when 16 outputs are used) Storage: -10 to 60 °C
	Ambient humidity	35 to 85%RH (no condensate)
	Operation atmosphere	No corrosive gas
Standard		CE marking
Weight		80 g or less

### •Applicable solenoid valve series

Representative series	Applicable series
SQ series	SQ1000, 2000 series
SZ series	SZ3000 series

## ■Dimensions



Revision history
B: New format
C: Error correction
D: Add the precautions and change into the latest format
E: Terminal screw change
F: Modified errors in text. (Page 10)

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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No.EX##-OME0011-F