
TECHNICAL INSTRUCTION MANUAL

CC-Link SI Unit

EX120-SMJ1

EX121-SMJ1

EX122-SMJ1

EX124※-SMJ1

Following safety requirements aim at the prevention of hazardous condition and the damage of instruments. Here, the hazard is classified in “Dangerous”, “Warning” and “Caution” on the level of hazard.

Please refer to regulation of safety on ISO and JIS to ensure safety.



Warning : Operator error may cause the death or serious injury.



Caution : Operator error may cause the injury or equipment damage.



Warning

- 1.The product is designed to use in ordinary full automation equipment. Don't use this product in equipment or instrument where human life may be directly injured or malfunction of failure may cause devastating loss.
- 2.Don't disassemble the product to repair and modification.



Caution

Read this operation manual carefully to ensure the safety and proper operation.

CONTENTS

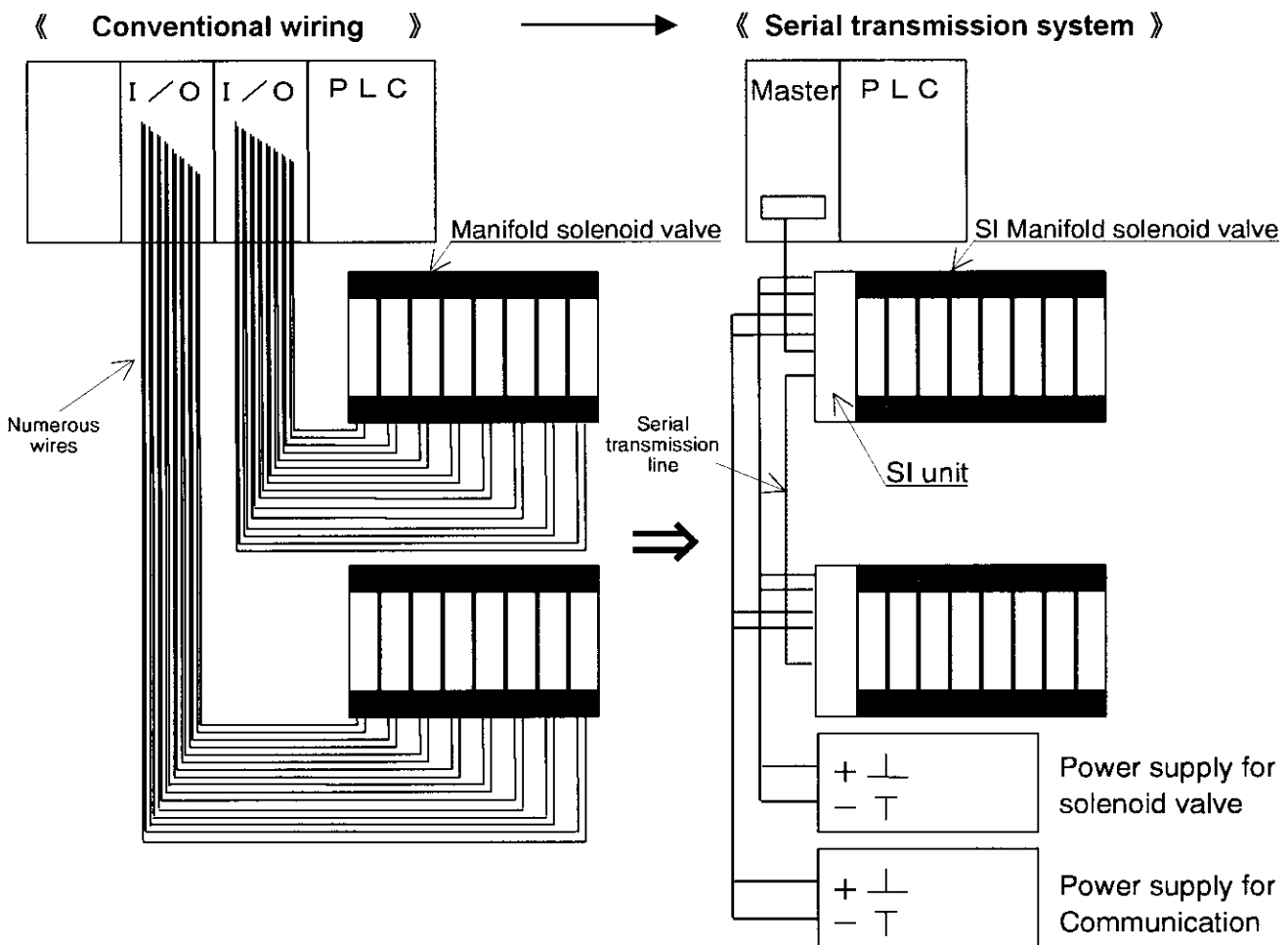
1. Outline.....	4
1 - 1 Features	4
1-1-1 Wire-saving serial transmission system.....	4
1-1-2 CC-Link System.....	5
1-1-3 SI manifold solenoid valve for CC-Link	5
1 - 2 Cautions for SI unit selection	6
2. Specifications.....	7
2 - 1 General specifications.....	7
2 - 2 CC-Link	8
2 - 3 SI Unit solenoid valve output.....	9
2 - 4 Twist pair cable.....	9
3. System structure	10
3 - 1 Whole structure	10
3 - 2 Applicable suitable solenoid valve	10
3 - 3 Appearance & How to order.....	11
4. Descriptions & Functions.....	13
4 - 1 LED operation indicator.....	13
4 - 2 Transmission speed setting switch : “B RATE”	13
4 - 3 Station number setting switch : “STATION NO.”	14
4 - 4 Terminal block for external wiring.....	14
5. Initial setting	15
5 - 1 Switch setting	15
5-1-1 Station number	15
5-1-2 Transmission speed	15
5 - 2 Parameter setting.....	16
5-2-1 Station information.....	16
5 - 3 Correspondence of SI unit output numbers & solenoid valve coils.....	16
5-3-1 Standard wiring.....	16
5-3-2 Semi-standard wiring (Mixed wiring)	17
6. Wiring.....	18
6 - 1 Communication line.....	18
6 - 2 Power supply line	19
6-2-1 Power supply for communication	19
6-2-2 Power supply for solenoid valve.....	19
6 - 3 Wire length.....	19
7. Troubleshooting	20

1. Outline

This manual explains specifications, parts descriptions and setting of serial interface unit (equivalent to remote I/O station) which drives a manifold solenoid valve (hereinafter referred to as SI unit) connected with Mitsubishi Electric Corp. CC-Link System (hereinafter referred to as CC-Link).

1 - 1 Features

1-1-1 Wire-saving serial transmission system



◆ Controls numerous solenoid valves with only one serial transmission line.

Serial transmission system controls large number of solenoid valves by means of one serial transmission line coming from the remote I/O master station of PLC (programmable logic controller), which allows epoch-making reduction of wires required.

◆ Greatly improves space efficiency.

Hundreds of wires in conventional parallel wiring method. Compact size SI manifold solenoid valve and coaxial tube incredibly improve space efficiency.

◆Decentralized control available by 16 outputs.

Decentralized control is available for a maximum of 16 points per SI manifold solenoid valve.

◆Largely reduces maintenance work.

Because of the only one serial transmission line in a system, wiring error or other wire troubles does not occur as often as before. The reduction of maintenance work will result in higher reliability.

1-1-2 CC-Link System

◆High speed communication

10 Mbps of high speed communication is possible. When 10 Mbps is set as the transmission speed, link scan time will be 4 ms even if 64 units are connected.

◆A maximum of 64 SI units connectable.

In CC-Link, 64 remote I/O stations can be connected per master station at the maximum. Since one remote station contains 32 points, a maximum of 2048 points can be set as link points.

This SI unit occupies one station (16 output points) per unit. Thus, it is possible to set link points a maximum of 1024 points of valves.

◆Variable communication speed / distance.

The option in speed and distance provides wide range of systems.

Communication speed	Total extended distance
10 Mbps	100 m
5 Mbps	150 m
2.5 Mbps	200 m
625 Kbps	600 m
156 Kbps	1200 m

1-1-3 SI manifold solenoid valve for CC-Link

◆Applicable to series VQ, SX and SY.

Four types of SI units : EX120 (direct mounting VQ1000/2000), EX121 (DIN rail mounting), EX122 (direct mounting SX/SY) and EX124※ (VQ4000) are available.

◆ Two power supplies

There are two power supplies: one for communication and the other for solenoid valve.

◆ Setting of communication speed and station number by rotary switch

Communication speed is set 156 Kbps and station number 0 before shipment.

* Note that SI unit outputs only clear mode when a communication error occurs.

◆ Supports remote I/O stations or equivalents.

Equivalents of remote stations applicable only with I/O data is supported.

1 - 2 Cautions for SI unit selection

This unit is serial interface unit especially designed for CC-Link.

Do not connect with other data link systems such as MELSECNET/MINI-S3 Data Link System.

2. Specifications

2 - 1 General specifications

Supply voltage for communication	DC 15V to 30V
Supply voltage for solenoid valve	DC +10% - 5%
Power consumption	Communication, Internal power supply : DC 24V, 0.1A or less Solenoid valve power supply : DC 24V, 1.5 A or less
Output number	16 points
Output type	Open collector type (NPN)
Connected load	DC 24V, SMC solenoid valve with 2.1 W or less of light/ surge voltage suppressor
Withstand voltage	Between external terminal package and ground, AC 1500V for 1 min.
Insulation resistance	Between all the live terminals and ground, 2M Ω (with insulation resistance tester of DC 500V)
Noise resistance	\pm 1500 Vp-p power supply noise, 1 μ s of pulse width for 3 min., 1ns pulse on first transition \pm 1000 Vp-p radiation, 1 μ s of pulse width for 3 min., 1ns pulse on first transition
Vibration resistance	5 G (Compliance with JIS C0911, 10 to 55 Hz, 0.5 mm of one -side amplitude)
Shock resistance	10 G (Compliance with JIS C0912)
Ambient temperature	0 to + 55°C (when 8 points of valves are ON) 0 to + 50°C (when 16 points of valves are ON)
Ambient humidity	35 to 85 % RH (without dew condensation)
Environment	No corrosive gas
Storage temperature	- 10 to + 60 °C
Weight	EX120 : 110 g or less EX121, EX122 : 140 g or less EX124※: 240 g or less
Dimensions	EX120 : 64 × 30 × 60.8 mm EX121, EX122 : 64 × 40 × 60.8 mm EX124※: 113 × 66 × 53.8 mm

2 - 2 CC-Link

Max. link points	Remote I/O : 2048 points								
Link points per station	Remote I/O : 32 points								
Link scan time (at 10 Mbps)	3.9 ms / 64 stations (when all of them are equivalents of remote I/O stations)								
Occupied station no.	1 station								
Communication speed	10 M / 5M / 2.5M / 625K / 156 Kbps (changed by switch)								
Communication type	Broad cast polling								
Synchronization	Frame synchronization								
Coding	NRZI								
Transmission path	RS485 bus								
Transmission format	Comply with HDLC								
Error control	CRC ($X^{16} + X^{12} + X^5 + 1$)								
Max. connectable unit number (for mater station)	64 units								
Max. transmission distance	Communication speed (bps)	156k	625k	2.5M	5M		10M		
	Total extended distance(m)	1200	600	200	150	110	100	80	50
	Station Interval	①	2 m or more						
	Interval	②	30 cm or more		60 cm or more	30 to 59 cm	1m or more	60 to 99 cm	30 to 59 cm
Connection cable	Twist pair cable with shield								
RAS function	Automatic line reset Confirmation of data link condition Offline test (hardware, line test, parameter confirmatory test)								
Terminating resistor	110 Ω (connected between "DA" and "DB" of end units)								

Notes

- 1) ①: Between master local station and the adjoining stations.
- 2) ②: Between remote I/O station and remote device station

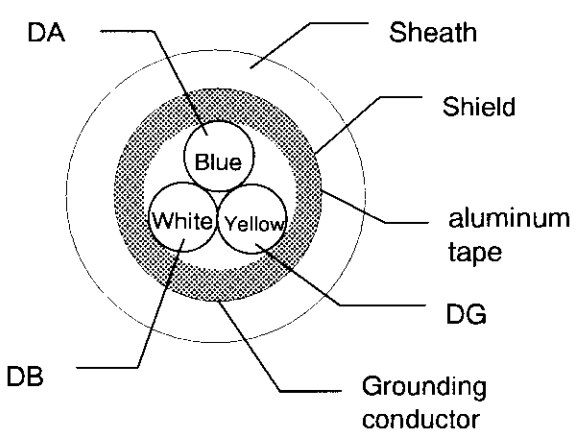
This SI unit is designed to meet the specifications of remote I/O station. Refer to the Mitsubishi Electric Corp. CC-Link Users' Manual for details.

2 - 3 SI Unit solenoid valve output

Rated output current	100 mA / point or less
Residual voltage	0.4 V or less
Insulation	Photo coupler insulation
Output indication	Displayed with LEDs on manifold solenoid valve connected

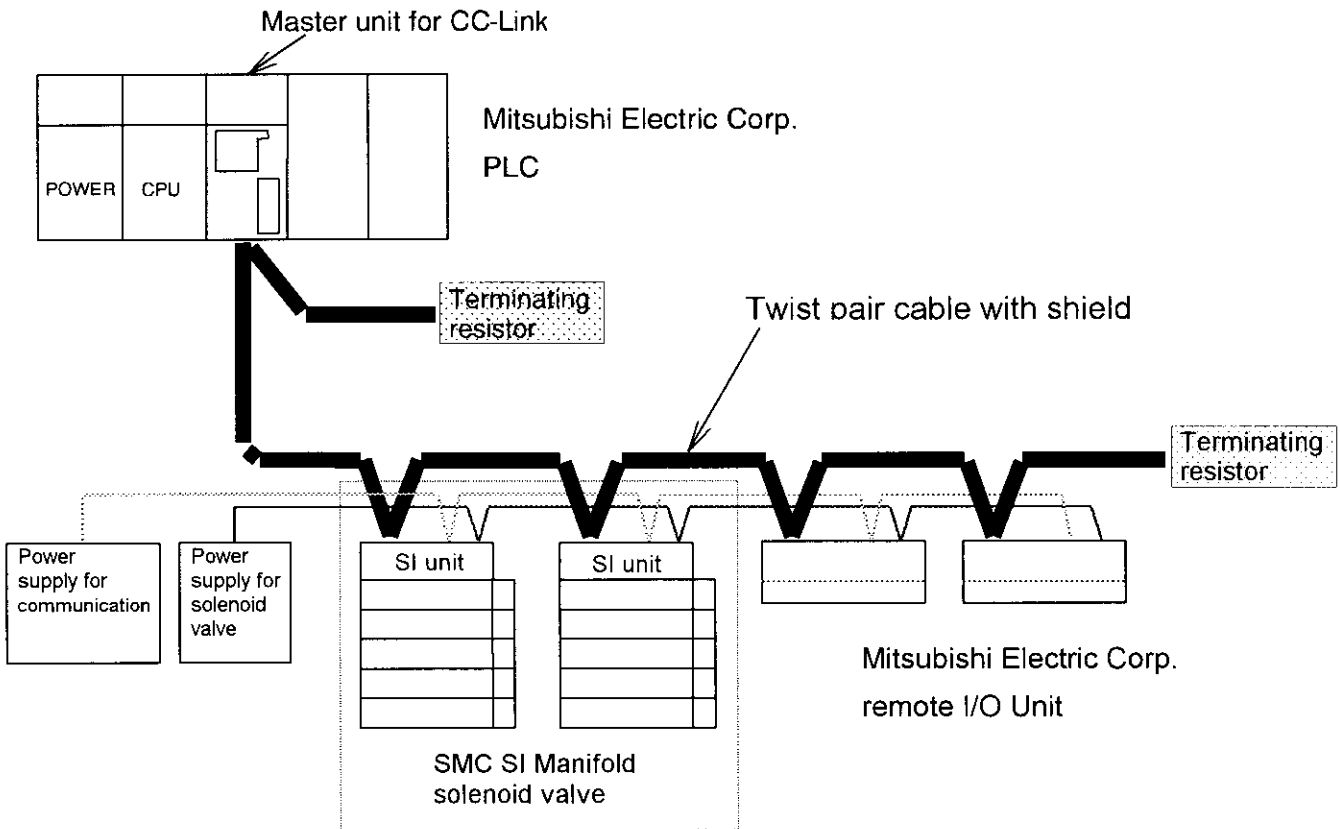
2 - 4 Twist pair cable

Details of a twist pair cable recommended for CC-Link are as follows. Performance of CC-Link cannot be guaranteed if other than the cable below is used.

Model	FANC - SB 0.5mm ²
Whom to contact	Mitsubishi Electric Corp. Service Center Kuramo Denko
Cable	Twist pair cable with shield
Conductor cross sectional area	0.5 mm ²
Conductor resistance (20°C)	37.8 Ω / km or less
Insulation resistance	10,000 MΩ / km or more
Withstand voltage	DC 500V, One minute
Electrical capacitance (1kHz)	60 nF / km or less
Characteristic impedance (1 MHz)	100 ± 15Ω
Cross section	
Outer diameter	7 mm
Estimated mass	65 kg / km

3. System structure

3 - 1 Whole structure



3 - 2 Applicable suitable solenoid valve

Solenoid valve	VQ Base mounted				VQ Flip		VQ Cassette	SX Base ported	SY Base ported
	Plug-in		Plug lead		Plug-in	Plug lead	Plug lead	Plug-in	Plug-in
	VQ1000 VQ2000	VQ4000	VQ0000	VQ1000	VQ1000	VQ0000 VQ1000 VQ2000	VQ1000	SX3000 SX5000	SY3000 SY5000
EX120-SMJ1	○								
EX121-SMJ1			●	○	●	●	○	○	○
EX122-SMJ1								○	○
EX124-SMJ1 EX124D-SMJ1 EX124U-SMJ1		○							

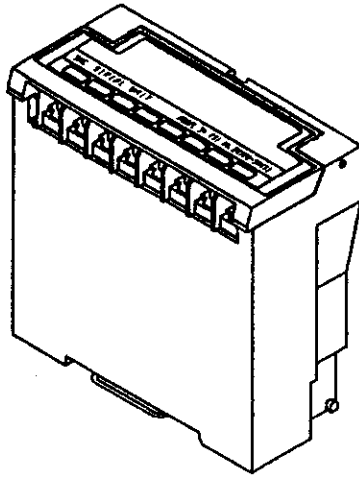
○ : Standard product:

● : Contact SMC.

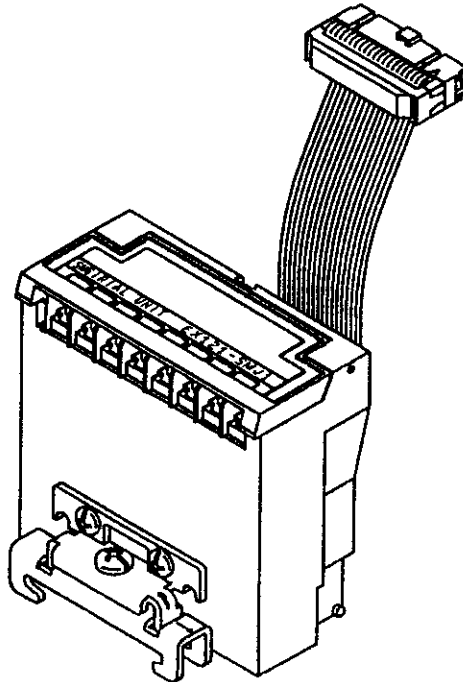
Refer to the catalogues of VQ, SX and SY solenoid valves for details.

3 - 3 Appearance & How to order

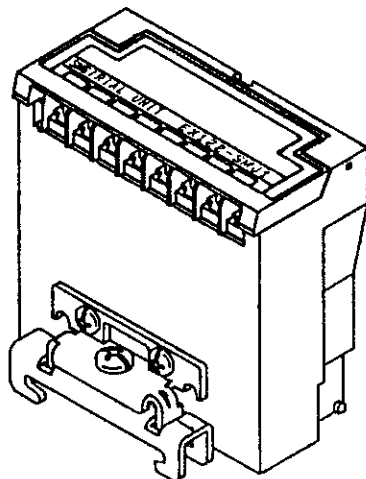
< EX120-SMJ1 >



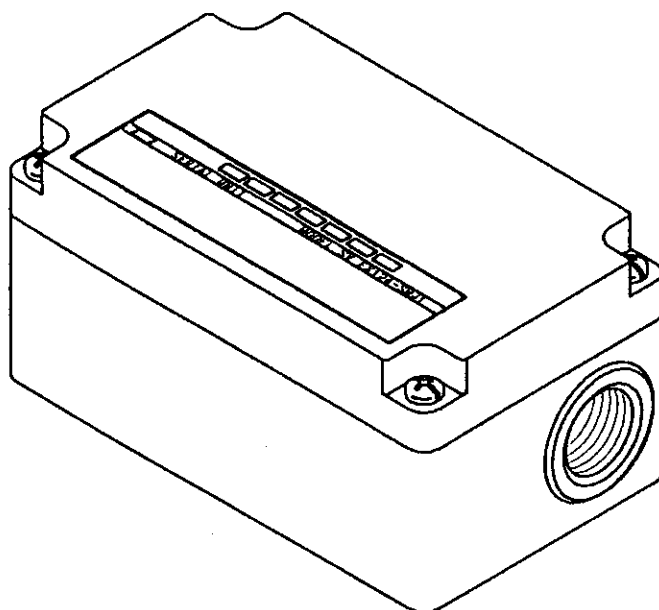
< EX121-SMJ1 >



< EX122-SMJ1 >

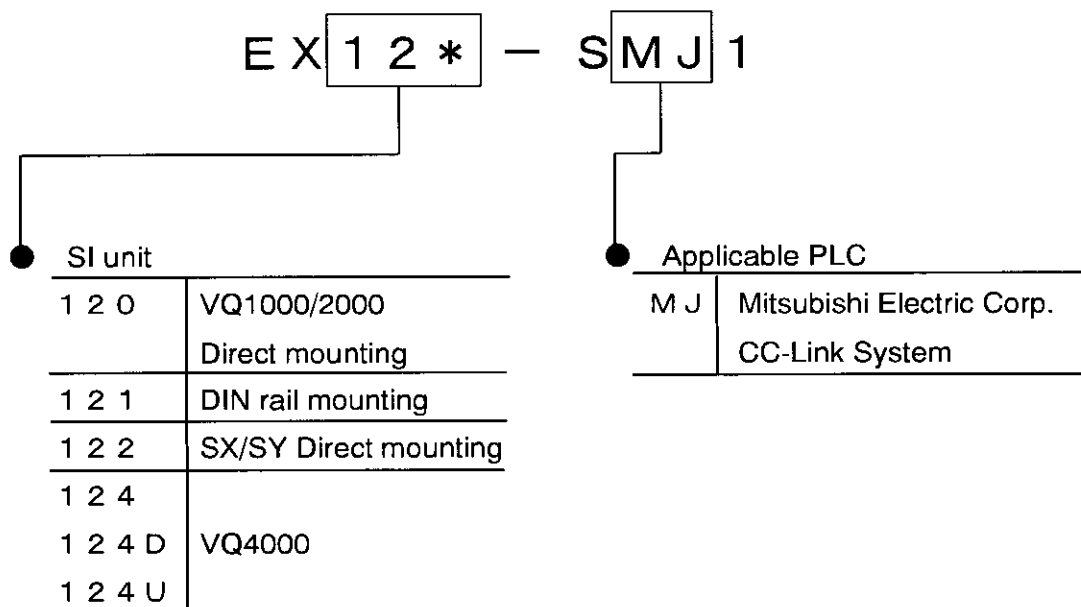


< EX124※-SMJ1 >

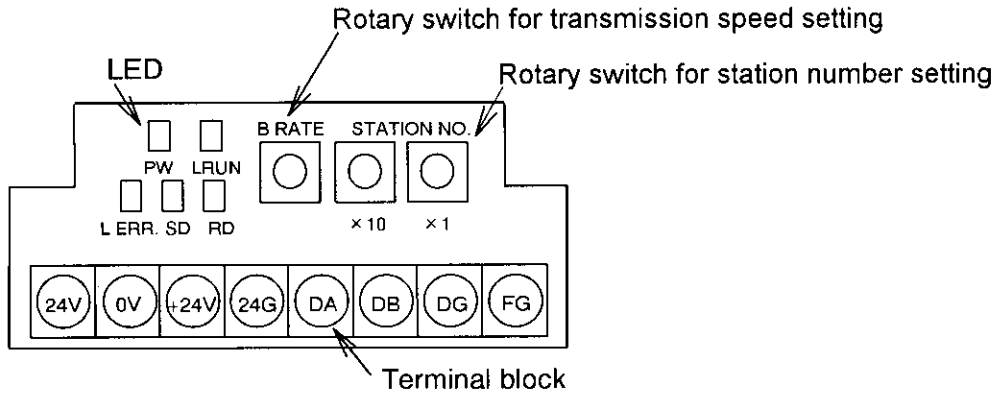


How to order

EX 1 2 * — SM J 1



4. Descriptions & Functions



4 - 1 LED operation indicator

PW	Lights up as power supply for communication is turned on.
L RUN	To see whether if SI unit communicates data with master station normally. Goes off due to overtime lighting when receiving normal data from master station. (Lights up as receiving normal data.)
SD	Lights up as sending data.
RD	Lights up as receiving data.
L ERR.	Lights up when a transmission error (CRC error) occurs. Goes off due to overtime. (as well as RUN) Lights up if there is any error in station number setting or transmission speed setting. (Goes off when corrections are made and power is supplied again.) ERR blinks when setting of station number or transmission speed is changed. (RUN is lighting and the unit operates with a station number and transmission speed set at the first power supply.)

“PW”, “L RUN”, “SD” and “RD” light up when data linked normally.

4 - 2 Transmission speed setting switch : “B RATE”

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

Set transmission speed within the range of 0 to 4.
Refer to “Initial Setting”, Chapter 5 for details.

4 - 3 Station number setting switch : “STATION NO.”

Set station number within the range of 01 to 64. (Overlapped station number setting is not allowed.)

“×10” is to set the tens digit of a station number.

“× 1” is to set the units digit of a station number.

Refer to “Initial Setting”, Chapter 5 for details.

4 - 4 Terminal block for external wiring

Terminal	Connect to
24 V	24 V of power supply line for solenoid valve
0 V	0 V of power supply line for solenoid valve
+ 24V	24 V of power supply line for communication
24 G	0 V of power supply line for communication
DA	Communication line DA
DB	Communication line DB
DG	Communication line DG
FG	Grounding conductor

* M3 terminal threads in use.

5. Initial setting

5 - 1 Switch setting

Set station numbers of SI unit while power is off.

Use rotary switches located in SI unit indication cover to set station numbers and communication speed.

- 1) Station number setting (01 to 64)
- 2) Communication speed setting (156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps or 10 Mbps)

5-1-1 Station number

Set station numbers of SI unit to determine a buffer memory address where to store output information of SI unit.

Conform them to the settings of "station information (address 20H to 5FH)" in parameter information area of buffer memory.

Set station numbers considering the following points.

- (1) Station number setting ranges from 01 to 64.
- (2) Only one station is occupied.
- (3) Any station number should not be skipped.

A skipped station number will be considered as an "abnormal data link station (link special register SW0080 to 0083 : buffer memory address 680H to 683H.)".

This can be avoided by setting a station to be skipped as a reserved station.

- (4) The same station number cannot be set repeatedly.

Otherwise, mounting error will occur. (Error code will be stored in SW0069.)

5-1-2 Transmission speed

Possible transmission distance varies depending on the total extended distance.

Setting	Transmission distance	①	②	Max. transmission distance
0	156 kbps	2 m or more	30 cm or more	1,200 m
1	625 kbps		30 cm or more	600 m
2	2.5 Mbps		30 cm or more	200 m
3	5 Mbps		60 cm or more	150 m
			30 to 59 cm	110 m
4	10 Mbps		1 m or more	100 m
			60 to 99 cm	80 m
			30 to 59 cm	50 m

- ① 2 m or more of cable is required between master/ local station and the adjoining stations.
- ② When transmission speed is 5 Mbps or 10 Mbps, note that the maximum transmission distance varies according to the cable length between remote I/O station (or its equivalent) and remote device station (or its equivalent).

Note: Clear mode is output when a communication error occurs.

5 - 2 Parameter setting

Among the necessary parameter setting for data link in CC-Link, station information setting is explained here.

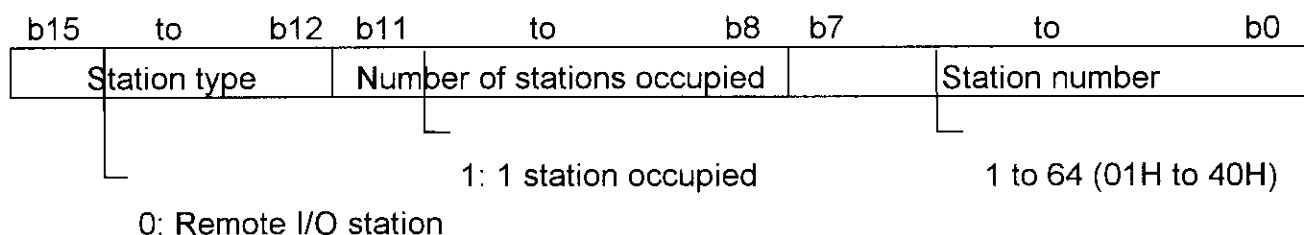
For parameter setting, data is written in "parameter information area (address 0H to 5FH)" of master station buffer memory.

5-2-1 Station information

Set the types of remote stations / local stations (or its equivalent) connected and set as a reserved station.

Conform them to the settings made by switches of SI unit indicator.

The structure of data to be set is shown below.



It comes to "0 1 * *". (* *: 1 to 64)

5 - 3 Correspondence of SI unit output numbers & solenoid valve coils

5-3-1 Standard wiring

Outputs of SI unit are assigned to solenoid valves in order, which starts from the one at Side D. In case of VQ 0000 / 1000 / 2000 series manifold solenoid valves, output numbering starts from Side D whereby SI unit is attached.

SI unit can be attached to either side: D or U for SX and SY manifold solenoid valves but Side U only for VQ 4000 series manifold valves. When SI unit is attached to Side U, output assignment starts from a solenoid valve opposite to SI unit. If there are 8 stations or less of VQ and SX manifold solenoid valves, manifolds are internally connected in double wiring. All the SY manifold solenoid valves are connected in single wiring.

<Examples>

VQ1000 manifold solenoid valve

SX manifold solenoid valve (U side)

9 . . .	B	Double	5	U
8 . . .	A			
7 . . .	Blank	Single	4	D
6 . . .	A			
5 . . .	Blank	Single	3	D
4 . . .	A			
3 . . .	B	Double	2	D
2 . . .	A			
1 . . .	B	Double	1	D
0 . . .	A			
SI unit output no.	SI unit		NO. of stations	

SI unit output no.	SI unit		NO. of stations	U
9 . . .	B	Double	5	U
8 . . .	A			
7 . . .	Blank	Single	4	D
6 . . .	A			
5 . . .	Blank	Single	3	D
4 . . .	A			
3 . . .	B	Double	2	D
2 . . .	A			
1 . . .	B	Double	1	D
0 . . .	A			

With the examples above, wiring of 3rd and 4th stations can be changed to double from single. In that case, output number is 5 for B of 3rd station and 7 for B of 4th station.

5-3-2 Semi-standard wiring (Mixed wiring)

Mixed wiring is available as semi-standard specification. Specify "mixed wiring" on a manifold specification sheet if 9 to 16 stations of solenoid valves are mounted or continuous output assignment for single solenoid valves is required for 8 stations or less of VQ / SX manifold solenoid valves.

<Example>

VQ1000 manifold solenoid valve

15 . . .	A	Single	15	U
14 . . .	A			
~~~~~				
2 . . .	A	Single	2	D
1 . . .	B			
0 . . .	A	Double	1	D
SI unit output no.	SI unit		NO. of stations	

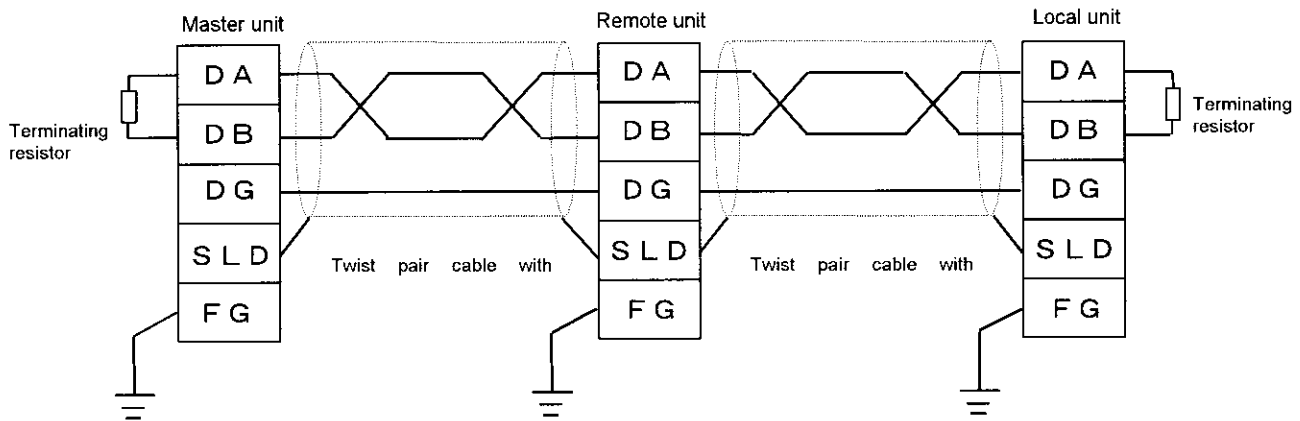
Fix the internal manifold wiring according to the type of solenoid valves to be mounted: single or double. Note that a single solenoid valve, in this case, cannot be output for a lack of internal wiring to solenoid B even if changed to double. The maximum number of the stations is 8 for 8 points of SI unit outputs, and 16 for 16 outputs provided that all the solenoid valves are single.

Note: For mixed wiring, specify it as wiring specification on a manifold specification sheet.

## 6. Wiring

### 6 - 1 Communication line

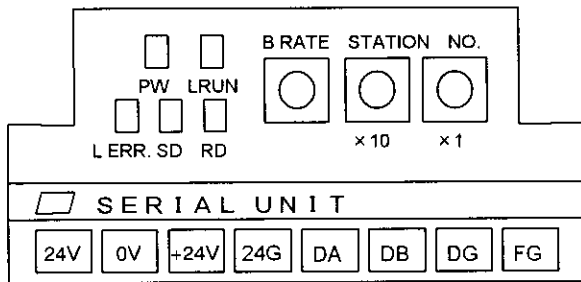
Connect master unit, local unit and remote unit (SI unit) using twist pair cables as follows.



- (1) Connectable with any stations regardless of the station numbers.
- (2) Never fail to connect terminating resistor (110  $\Omega$ ) with "DA" and "DB" of each end unit.
- (3) Master unit can be connected with other than the ends of the cable.
- (4) T type multipoint connection and star connection are impossible.
- (5) Ground the both ends of a shielding wire of twist pair cable (Class 3 Grounding) via "FG" in a unit.
- (6) "SLD" and "FG" are common in this SI unit.

## 6 - 2 Power supply line

This SI unit has two power supply lines: for communication and solenoid valves.



### 6-2-1 Power supply for communication

Connect with “+ 24V ” and “24G”.

+ 24V : 24V of power supply line for communication

24G : 0V of power supply line for communication

### 6-2-2 Power supply for solenoid valve

Connect with “24V ” and “0V”.

24V : 24V of power supply line for solenoid valves

0V : 0V of power supply line for solenoid valves

Decide power supply and connection cable from the current consumption of solenoid valve and SI unit.

Power for solenoid valves can be transferred to SI unit power supply for communication.

## 6 - 3 Wire length

Transmission distance	between master/local station and the adjoining stations	between remote I/O station and remote device station	Max. transmission distance
156 kpbs	2 m or more	30 cm or more	1,200 m
625 kpbs		30 cm or more	600 m
2.5 Mbps		30 cm or more	200 m
5 Mbps		60 cm or more	150 m
		30 to 59 cm	110 m
10 Mbps		1 m or more	100 m
		60 to 99 cm	80 m
		30 to 59 cm	50 m

## 7. Troubleshooting

Follow the chart below to take some measures against SI unit malfunctions.

Refer to the Users' Manual prepared by Mitsubishi Electric Corp. when the whole system needs troubleshooting.

