



# Operation Manual

CompoBus/S SI unit

PRODUCT NAME

EX12 -SCS1/SCS2 *Series*

MODEL/ Series

**SMC Corporation**

## CONTENTS

Forward .....	3
1.Directions .....	3
2.Characteristics and System Structure.....	4
2-1.Characteristics .....	4
2-2.System structure .....	5
3.Applicable PLC .....	6
4.Specifications.....	7
4-1.SI unit specifications .....	7
4-2. CompoBus/S systemspecifications.....	8
4-3.External form of SI unit .....	9
4-4.How to order SI unit .....	11
5.Name and effect of each part of unit.....	12
5-1.LED Indication .....	12
5-2.Name of the terminal board .....	12
6.Switch setting.....	13
6-1.Address setting .....	13
6-2.Hold/Clear setting .....	15
7.Wiring.....	15
7-1.Wiring of communication line .....	15
7-2.Termination resistance .....	17
7-3.Communication cable .....	17
7-4.Wiring of power .....	18
8.SI unit output no. and solenoid valve coil.....	19
8-1.Standard wiring .....	19
8-2.Made-to order wiring(mixed wiring) .....	20
9.Troubleshooting .....	21

## Indication and meaning of directions



**Caution** : Operator error could result in injury or equipment damage.



**Warning** : Operator error could result in serious injury or loss of life.

(Note) : Explanations of related matters

### 1.Directions



#### **Warning**

- This product is intended to be used to the general FA equipment. The use of this product should be avoided for the equipment and device that human life may be directly injured and malfunction or failure may cause enormous loss.
- This product should no be disassembled and remodeled.



#### **Caution**

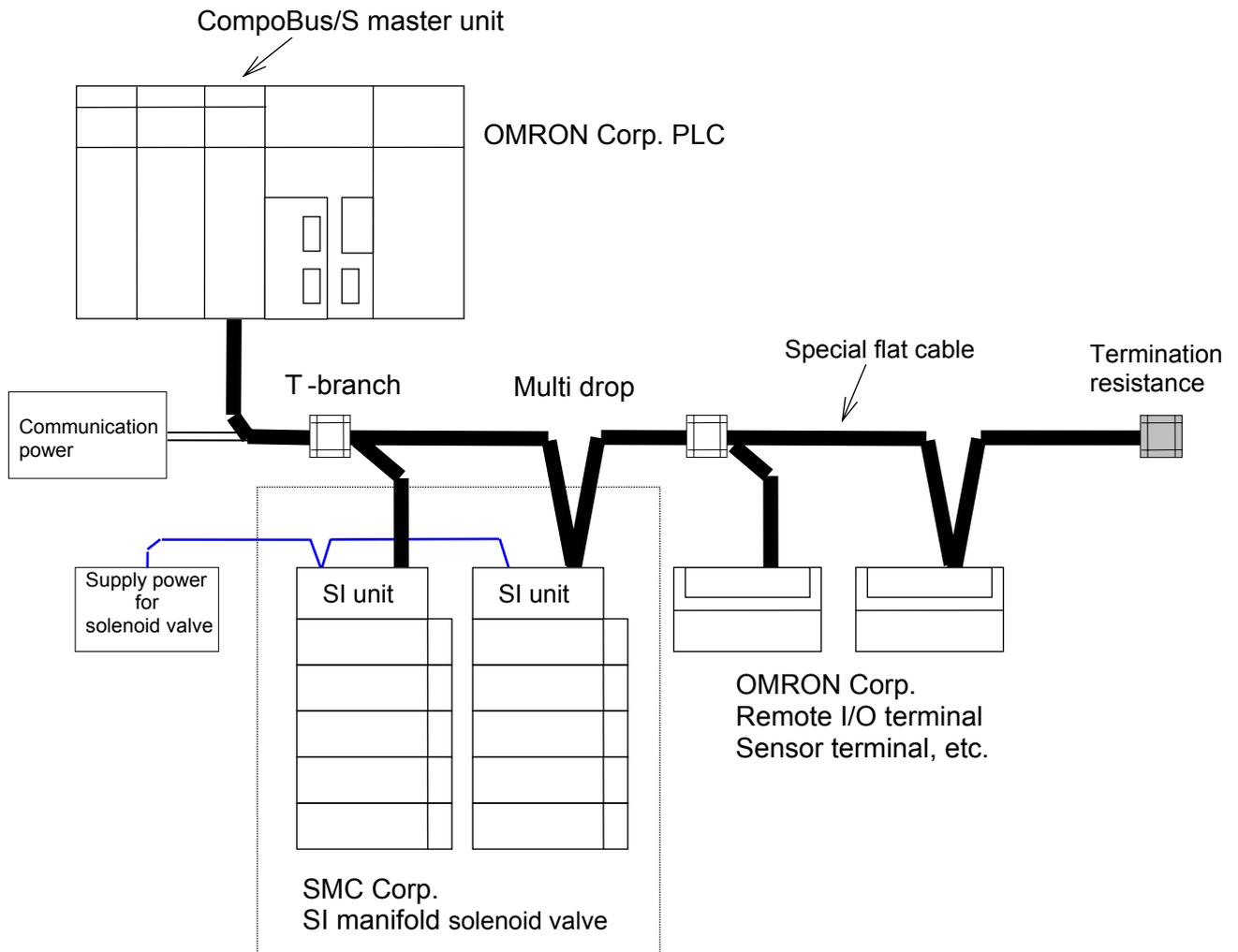
- Read this operation manual thoroughly and use the product within the range of specifications, observing the directions strictly.
- Make sure if this product and all the equipment connected with this product are turned off when wiring or inspecting.
- Don't touch the terminal and internal circuit boards while they are energized.
- Tighten wires securely with terminal screws.

## 2.Characteristics and System Structure

### 2-1.Characteristics

- CompoBus / S system  
Serial transmission system in which master and slave etc. are connected together by one cable thanks to OMRON Corp. PLC  
( programmable logic controller ) SYSMAC Series and CompoBus / S master unit.
- SI manifold solenoid valve for CompoBus /S  
Manifold solenoid valve with the remote Output unit (SI unit) connectable to CompoBus /S system. The occupying output point of SI unit is 16 or 8 points.
- Control many solenoid valves by one serial transmission cable  
Since SMC's SI unit transmits directly from master unit, wiring manpower can be reduced.
- High-speed communication cycle time  
The max. of 32 slaves , 256 ( IN 128/OUT 128 ) IN/OUT put are connected in the high-speed communication cycle time of 1 ms or less.
- Highly free system is built by T branch style and multi-drop style.  
Wiring can be composed freely by T branch style and multi-drop style.  
The length of the trunk line can be extended to 100m maximun.
- Greatly reduced maintenance  
The signal wiring will become one serial transmission cable, which will decrease much of the maintenance at the time of trouble like wrong, disconnection, etc. and increase credibility.

## 2-2. System structure



### 3.Applicable PLC

This SI unit is connected to the CompoBus/S system of OMRON Corp.

CompoBus/S has the following applicable PLC and master unit.

Applicable PLC	C200HX/HG/HE, C200HS	CQM1
Applicable master unit	C200HW - SRM21	CQM1 - SRM21
Max. IN/OUT put point per master	IN128/OUT128 point or IN64/OUT64 point	CQM1-CPU11/21: IN32/OUT32 point or IN16/OUT32 point CQM1-CPU41/42/43/44: IN64/OUT64 point or IN32/OUT32 point or IN16/OUT16 point
No. of the max. connection SI unit per master	when using EX12*-SCS1 (16 points output): 8 or 4 units when using EX12*-SCS2 (8 points output) : 16 or 8 units	EX12*-SCS1 (16 points output): 4, 2 or 1 unit EX12*-SCS2 (8 points output) : 8, 4 or 2 units

\*: 0, 1 or 2 or 4D or 4U

(Note)

Number of max. IN/OUT put points and max. connection SI unit are decided by setting the dip switch for setting the no. of max. connection slave of master unit.

Please refer to OMRON Corp. CompoBus/ S user's manual, etc. for details about PLC and master unit.

## 4. Specifications

### 4-1. SI unit specifications

Items	Specifications	
Types of SI unit	EX120/121/122/ EX124U/D - SCS1	EX120/121/122/ EX124U/D - SCS2
Operating ambient temperature	0 to 55 °C	
Operating ambient humidity	35 to 85% RH (without condensation )	
Storage ambient temperature	- 20 to + 65°C	
Vibration resistance	49 m/s <sup>2</sup>	
Impact resistance	98 m/s <sup>2</sup>	
Noise resistance	±1000 Vp - p pulse width 1μs , leading 1 ns pulse	
Dielectric strength	between the full external terminal and case: 1500 VAC for 1 minute	
Insulating resistance	between the full external terminal and case: 500 VDC 2MΩ or more	
Operating atmosphere	without corrosive gas nor dust	
Occupied output point	16 points	8 points
Output style	transistor style (NPN open collector style )	
Connection load	24 VDC, solenoid valve with lamp - surge voltage protection circuit of 2.1 W or less, SMC product	
Residual voltage	0.4 V or less	
Communication power voltage	14 to 26.4 VDC	
Supply power voltage for solenoid valve	24 VDC + 10%/-5%	
Current consumption	Communication power 0.1 A or less 24 VDC	
Weight	EX120: 110 g or less EX121: 140 g or less EX122: 130 g or less EX124U/D: 240 g or less	

#### 4-2.CompoBus / S system specifications

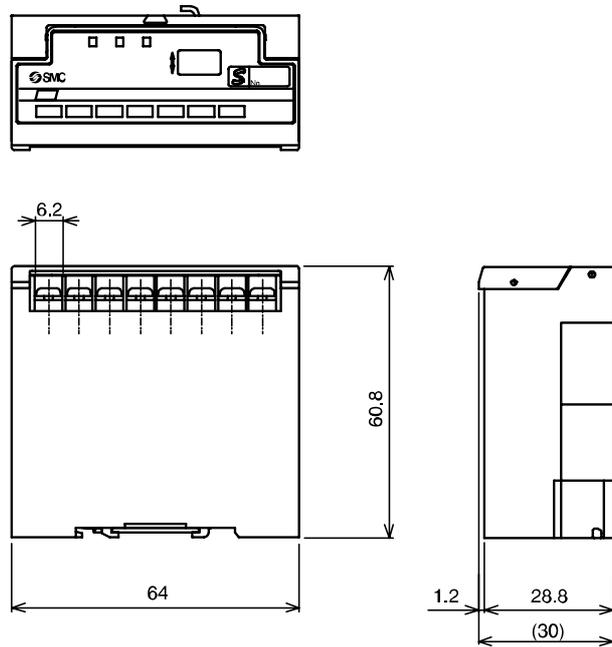
Items	Specifications															
Applicable PLC	OMRON Corp. C200HX/HG/HE, C200HS, CQM1															
Communication style	Protocol for CompoBus/S															
Communication speed	750 k bit/s															
Modulation style	base band style															
Symbol style	Manchester symbol style															
Error control	Manchester symbol check, frame length check, parity check															
Connection style	T branch style, multi drop style															
Distance	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Type of cable</th> <th style="width: 25%;">trunk line length</th> <th style="width: 25%;">branch line length</th> <th style="width: 25%;">full length of branch line</th> </tr> </thead> <tbody> <tr> <td>when using VCTF cable</td> <td>100 m or less</td> <td>3 m or less</td> <td>50 m or less</td> </tr> <tr> <td>when using the special flat cable</td> <td>30 m or less</td> <td>3 m or less</td> <td>30 m or less</td> </tr> </tbody> </table>				Type of cable	trunk line length	branch line length	full length of branch line	when using VCTF cable	100 m or less	3 m or less	50 m or less	when using the special flat cable	30 m or less	3 m or less	30 m or less
	Type of cable	trunk line length	branch line length	full length of branch line												
	when using VCTF cable	100 m or less	3 m or less	50 m or less												
	when using the special flat cable	30 m or less	3 m or less	30 m or less												
But if the no. of slave connection is 16 or less even when using the special flat cable, the length of trunk line can be 100 m or less and full length of branch line 50 m or less.																
Max. IN/OUT put point	Type of master		Max. IN/OUT put points													
	when using the C200HW - SRM21		IN128/OUT128 point or IN 64/OUT 64 point													
	when using the CQM1 - SRM21		IN 64/OUT 64 point or IN 32/OUT 32 point or IN 16/OUT 16 point													

(Note)

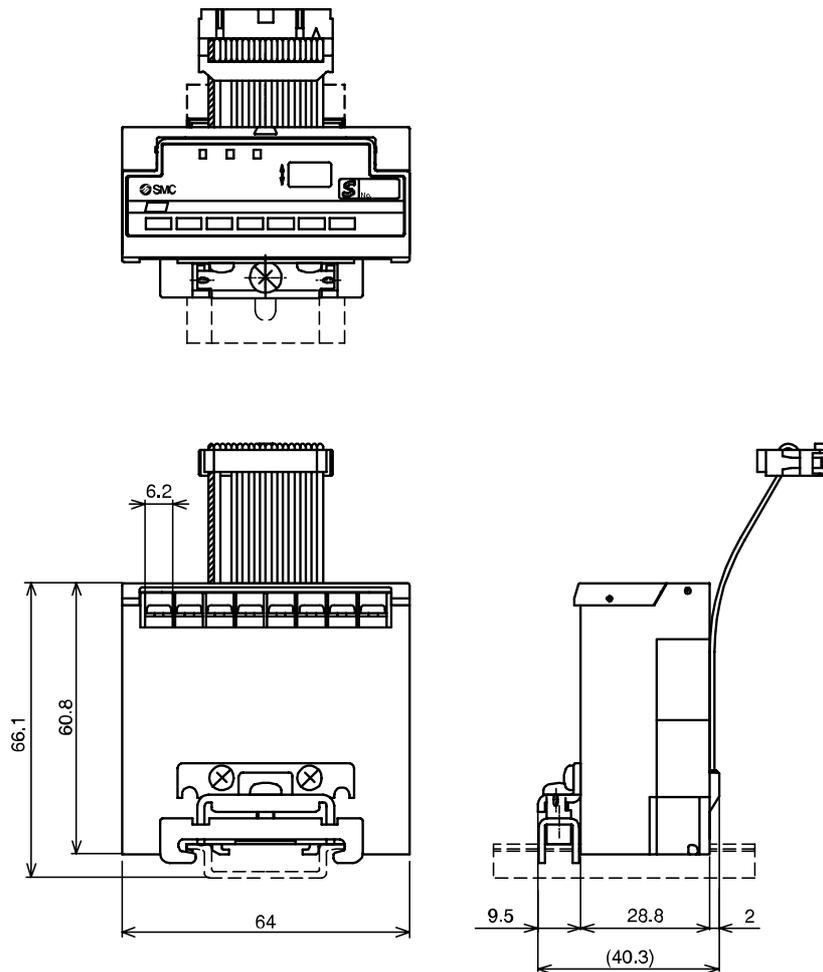
Please refer to OMRON Corp. CompoBus/ S user's manual, etc. for details.

4-3.External form of SI unit

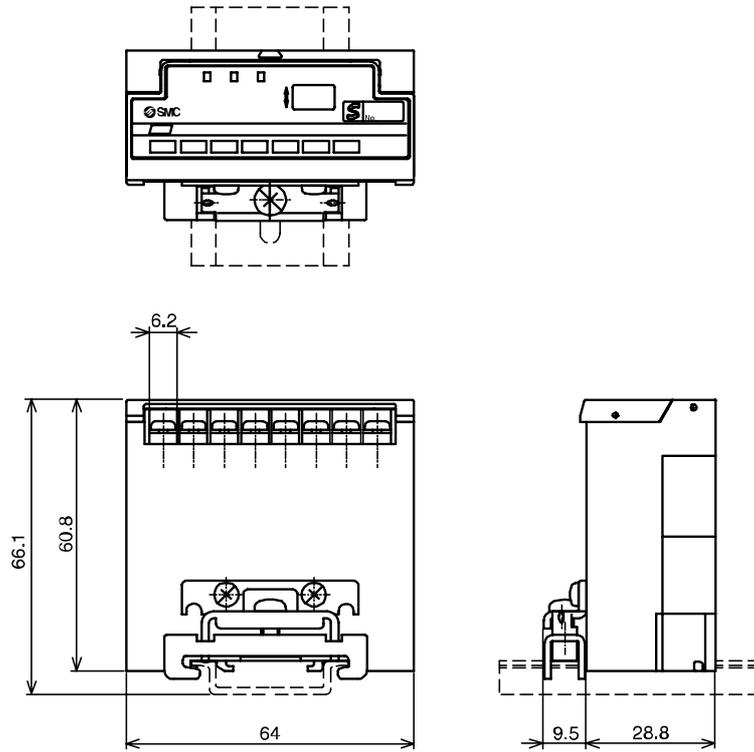
(1)External form of EX120 - SCS1 and 2



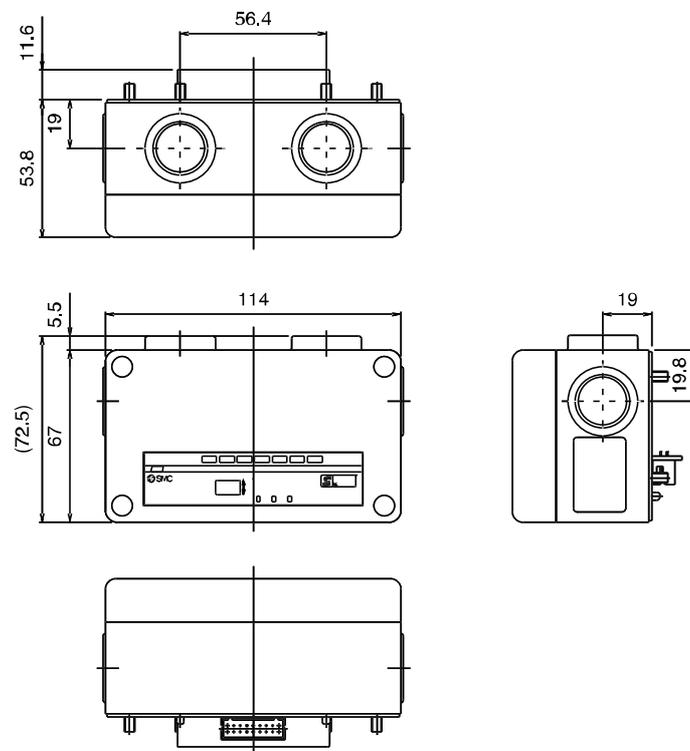
(2)External form of EX121 - SCS1 and 2



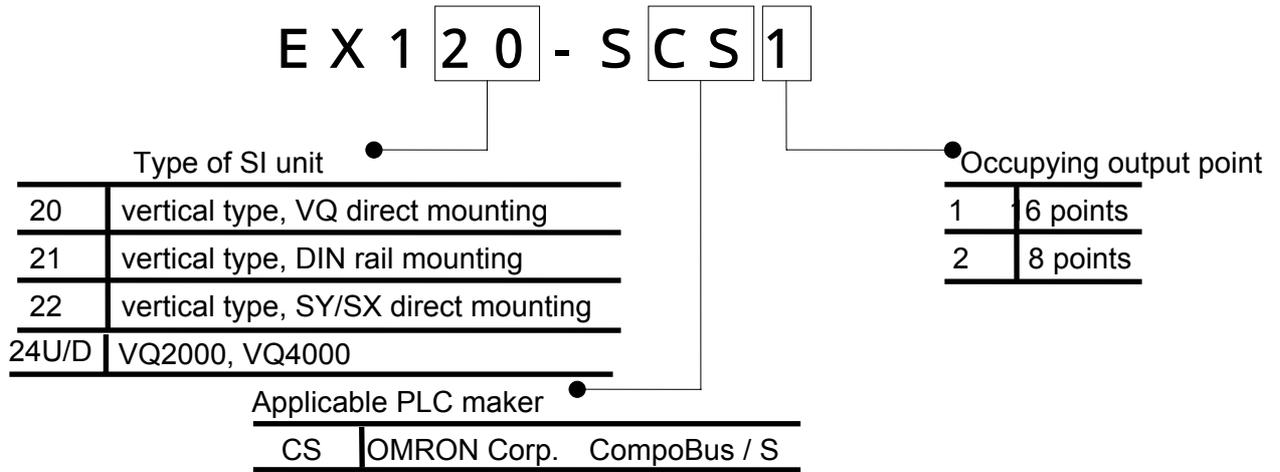
(3) External form of EX122 - SCS1 and 2



(4) External form of EX124D/U - SCS1 and 2

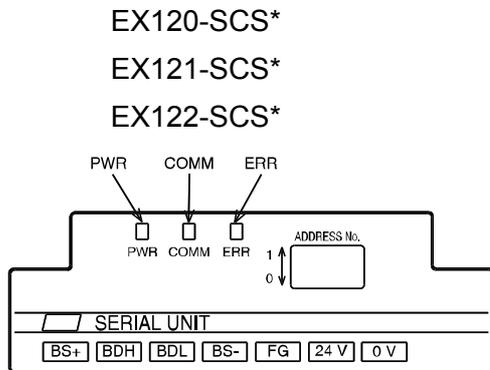


4-4.How to order SI unit

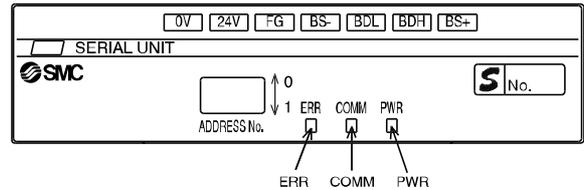


## 5.Name and effect of each part of unit

### 5-1.LED Indication

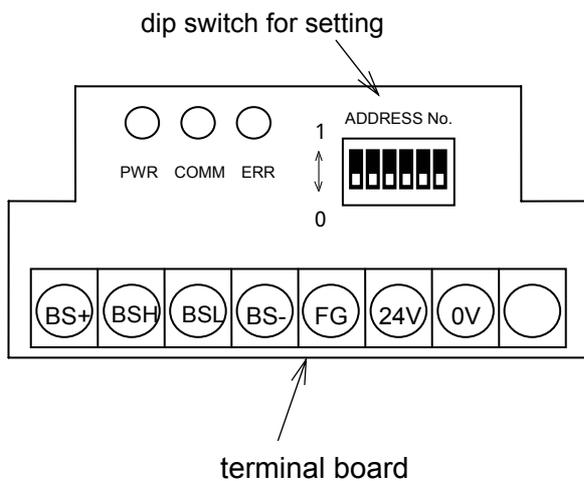


EX124U-SCS\*  
EX124D-SCS\*



LED	Contents
PWR	Light is on or off as the power supply for communication is on or off respectively.
COMM	Light is on during normal communication and off in error or stand-by mode.
ERR	Light is on when communication error occurs and off in normal condition stand-by mode.

### 5-2.Name of the terminal board



Terminal	Where to connect
BS+	BS+ communication power line
BDH	BDH communication line
BDL	BDL communication line
BS -	BS- communication power line
FG	Functional Ground
24V	24 V for solenoid valves power
0V	0 V for solenoid valves power

Terminal thread is M3 thread.

## 6.Switch Setting

The switch of SI unit should be set while the power is off.

### 6-1.Address setting

#### ( 1 ) ADDRESS NO. (node address)

The node address setting range depends on the type or setting of the master as follows:-

- For master unit C200HX/HG/HE, C200HS

If max. number of connected slaves is 16 (IN8/OUT8), the node address setting range is 0 to 7.

If max. number of connected slaves is 32 (IN16/OUT16), the node address setting range is 0 to 15

- For master unit CQM1:

The number of channels occupied by the PLC or master unit and the number of points occupied by one node address, are related as follows:

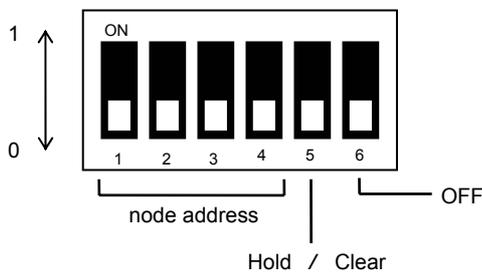
Number of CH occupied by PLC	Number of points occupied by one node address	Setting range	Max. number of connected slaves
IN1/OUT1	8	IN :0 to 1 OUT:0 to 1	IN2 OUT2
IN2/OUT2	8	IN :0 to 3 OUT:0 to 3	IN4 OUT4
IN4/OUT4	8	IN :0 to 7 OUT:0 to 7	IN8 OUT8
IN1/OUT1	4	IN :0 to 3 OUT:0 to 3	IN4 OUT4
IN2/OUT2	4	IN :0 to 7 OUT:0 to 7	IN8 OUT8
IN4/OUT4	4	IN :0 to 15 OUT:0 to 15	IN16 OUT16

(Note)

- The duplication of a node address in different slaves will cause communication error.
- For 16 point slaves which are assigned to one channel. although it occupies 2 slaves with 8 points, the node address which is not used must be as follow:-  
 If the node address used is odd: Node address with no. just before must also be used.  
 If the node address used is even: Node address with no. just after must also be used.  
 For example, if the node address 5 is set to a 16 points SI unit(a kind of slave), the node address 4 must also be used for the SI unit.
- For master unit CQM1, if 8 points slave is connected in 4 points mode.  
 The slave is considered to occupy points for 2 slaves, and the node address just after the set node address to the slave must also be used.  
 If the node address is duplicated with another slave,  
 communication error occurs and makes it impossible to start communication with CompoBus/S.
- During 4 points mode, 16 points slave is not available.

( 2 ) Switch setting

Open the terminal board cover on the upper section of SI unit and set the DIP switch.



•Setting of node address

Set the node address with SW 1 to 4 as follows: 0: OFF, 1: ON

node address	SW1	SW2	SW3	SW4	node address	SW1	SW2	SW3	SW4
0	0	0	0	0	8	0	0	0	1
1	1	0	0	0	9	1	0	0	1
2	0	1	0	0	10	0	1	0	1
3	1	1	0	0	11	1	1	0	1
4	0	0	1	0	12	0	0	1	1
5	1	0	1	0	13	1	0	1	1
6	0	1	1	0	14	0	1	1	1
7	1	1	1	0	15	1	1	1	1

## 6-2. Hold/Clear setting

This setting is intended to determine whether output of SI unit should be held or cleared totally when communication error occurs.

In SW5, setting is available as follows. 0: OFF 1: ON

Hold/Clear setting	SW5
Clear	0
Hold	1

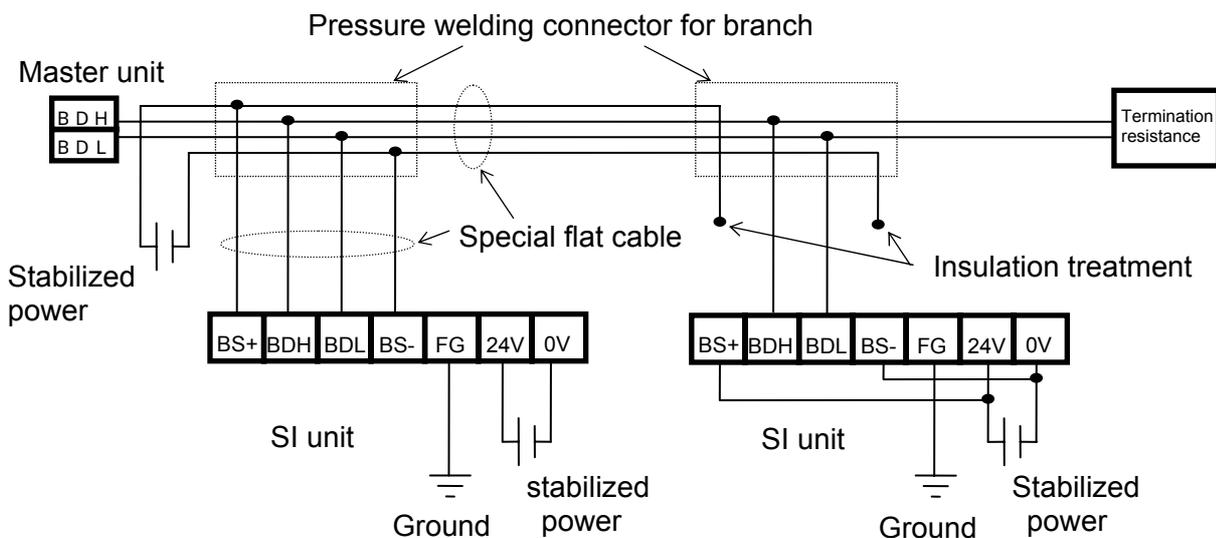
(Note)

Switch SW6 must remain off in use.

## 7. Wiring

### 7-1. Wiring of communication line

Connecting style of the CompoBus/S slave has 2 types: T branch style and multi-drop style. In the T branch style, slave is connected with branch line that branched off from the trunk line. In the multi-drop style, slave is connected directly with the trunk line. But branch line cannot be branched off from the branch line. When branch line is branched off from the trunk line, special pressure welding connector for branch or terminal board is used. When communication cable is connected with SI unit, BDH and BDL communication lines are connected with BDH and BDL terminals respectively. Communication power BS+ and BS- lines are also connected to BS+ and BS- terminals respectively.



This SI unit is multi power supply type slave. It has 2 supplying sections for communication and solenoid valve. It's possible to supply power to the supplying section for communication by the special flat cable. But another power is needed at the supplying section for solenoid valve. Also, the power can be supplied from the supply power for solenoid valve to communication power supplying section.

The communication line of special flat cable is as follows:



## Caution

The communication cable should be wired away from the power cable and high voltage cable in order not to be affected by noise, etc.

Cable should be connected without mistake. If it is wired wrongly, SI unit and other devices may be damaged.

## 7-2.Termination resistance

The termination resistance should be mounted at the end of trunk line on the opposite side of the master in order to stabilize the communication. The following OMRON Corp. 's products should be used for the termination resistance.

- SRS1-T terminal with the termination resistance usable for VCTF and special flat cable
- SCN1-TH4T pressure welding connector with the termination resistance  
usable only for the special cable

When the communication cable is connected to the terminal base with termination resistance, it is necessary to connect both BDH and BDL to an appropriate terminal.

If the network is connected in T branch style, it is necessary to connect a termination resistance to the end of the longest branch cable, so that the termination resistance is positioned at the furthest point from the master.

## 7-3.Communication cable

Type	Specifications
VCTF Cable	Vinyl cable VCTF JIS C 3306 2-cores, Nominal section 0.75 mm <sup>2</sup> (Signal line × 2) Conductor resistance (at 20 ): 25.1 /km
Compobus flat cable SCA1-4F10 (length 100m)	Nominal section 0.75 mm <sup>2</sup> × 4 (Signal line × 2, Power line × 2) Ambient temp.: 60 or less.

#### 7-4.Wiring of power

This SI unit is multi-power supply type slave. There are 2 supplying sections: for communication and for solenoid valve.

##### ( 1 ) Power supply for communication

- If VCTF cable is used for the communication, the power must be supplied for the SI unit by a separate cable.
- If Compobus flat cable is used for the communication, the power is supplied for the SI unit by the flat cable.

##### ( 2 ) Power supply for solenoid valve

- Power supply 24 VDC, +10% -5% is required.
- The power supply and cables used should be selected with consideration to the current consumption of the solenoid valves and of the SI unit.

##### ( Note)

The separate power supply should have margin in its capacity enough for in-rush current at start up.



## Caution

When using the Compobus flat cable for communication, any unused power supply cables must be isolated at both ends.

## 8.SI unit output no. and solenoid valve coil

### 8-1.Standard wiring

The output of SI unit is allotted in order from the D-side solenoid valve. In the case of VQ manifold solenoid valve, SI unit will be attached at the D-side, and so output will be 0, 1, 2 ... from the side of SI unit. In the case of SX, SY manifold solenoid valve, the mounting direction of SI unit is on the side of D and U. Therefore, if SI unit is mounted on the U-side, the output number will be allotted in order from the solenoid valve on the opposite side of SI unit.

When the number of station of VQ, SX manifold solenoid valve is 8 or less, the wiring inside the manifold will all be double wiring. SY manifold solenoid valve will be all single wiring.

[ e.g. of wiring 1: VQ manifold solenoid valve ] [ e.g. of wiring 2: SX manifold solenoid valve (U-side)]

9 . . .	B	double	5	U
. . .	A			
7 . . .	evacuated	single	4	U
. . .	A			
5 . . .	evacuated	single	3	U
. . .	A			
3 . . .	B	double	2	U
. . .	A			
1 . . .	B	double	1	U
. . .	A			
SI unit output no.	SI unit		stations	D

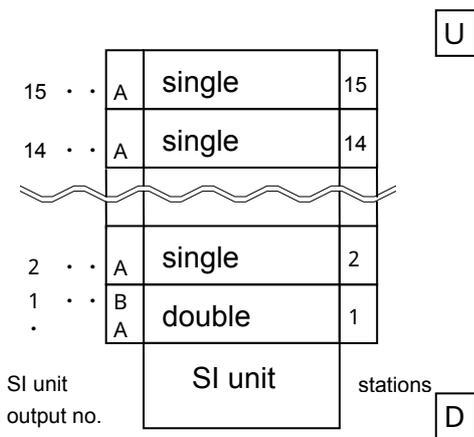
SI unit output no.	SI unit		stations	U
9 . . .	B	double	5	U
. . .	A			
7 . . .	evacuated	single	4	U
. . .	A			
5 . . .	evacuated	single	3	U
. . .	A			
3 . . .	B	double	2	U
. . .	A			
1 . . .	B	double	1	U
. . .	A			
				D

In the e.g. of wiring shown above, the 3<sup>rd</sup>, 4<sup>th</sup> single can be changed to double. In this case, the output no. of the 3<sup>rd</sup> solenoid valve on the B side will be 5, the output no. of 4<sup>th</sup> solenoid valve on the B side will be 7.

8-2.Made-to order wiring ( mixed wiring )

The mixed wiring can be done as the made-to-order wiring. Specify the wiring specifications by the manifold specifications, when the solenoid valve stations are 9~16 or when continuous output will be allotted to the single solenoid valve with VQ, SX manifold solenoid valve stations of 8 or less.

[ e.g. of wiring: VQ manifold solenoid valve ]



It is fixed depending on whether the solenoid valve carrying the manifold inside wiring is single or double.

In this case, please note that it's impossible to output since the inside wiring is not done to the B side of solenoid even if the solenoid valve is changed from single to double. The max. station of the single solenoid valve is 8 and 16 respectively when SI unit output point is 8 and 16.

(Reference)

For mixed wiring, the wiring specifications should be written clearly in the manifold specifications.

## 9. Troubleshooting

The following flow chart shows directions to solve the malfunction when SI unit doesn't operate normally. Refer to OMRON Corp. CompoBus/S user manual, etc. for the entire troubleshooting.

