Technical Specifications

Product name : SI Unit

Model : EX250-SMJ2

SMC CORPORATION

Contents

1. Safety

The SMC SI Unit Save-wire System and this manual contain essential information for the protection of users and others from possible injury and damage to property and to ensure correct handling.
Please check that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.
Also read carefully the instruction manual of relevant equipment or apparatus before use.

■ Indications

IMPORTANT MESSAGES	
Read this manual and follow its instructions. Signal words such as WARNING,CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
⚠WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
⚠CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

■ Operator

■This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
■Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the SI Unit.

■ Usage Restrictions

- This product is designed for use in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives*1, or which malfunction or failure can cause a huge loss.

*1: Equipment or apparatus that directly matters human lives means the following:
- Medical equipment such as life support systems or equipment used in operating rooms
- Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
- Equipment or apparatus that conforms with those mentioned above.

- Contact our sales department when plans are made for the product to be used for the system*2 including equipment that concerns itself with the safety of persons or that seriously affects the public. This usage needs special consideration*3.

*2: The system including equipment that concerns itself with the safety of persons or that seriously affects the public means the following:
- Nuclear reactor control systems in nuclear power plants, safety protection systems or other systems important for safety in nuclear power facilities
- Driving control systems of mass transportation systems, and flight control systems
- Equipment or apparatus that comes into contact with foods or beverages

*3: Special consideration means discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant and etc.

- Special consideration of safety or maintainability should be taken to prevent hazard or loss caused by a failure or malfunction that is likely to occur in certain probability due to environmental stress (deterioration).

❖ The special consideration means to fully review the equipment or apparatus in design stage and to establish a backup system in advance such as a redundant system or fail-safe system.

⚠WARNING

■ Do not disassemble, modify (including change of printed circuit board) or repair.
An injury or failure can result.

■ Do not operate the product beyond specification range.
Operation at a range that exceeds the specifications can cause a fire, malfunction, or damage to SI Unit.
Verify the specifications before use.

■ Do not use the product in an atmosphere containing combustible, explosive or corrosive gas.
It can cause a fire, explosion or corrosion.
This SI Unit is not designed to be explosion-proof.

■ These instructions must be followed when using the product in an interlocking circuit:
- Provide double interlocking by another system such as mechanical protection
- Check the product regularly to ensure proper operation

Otherwise malfunction can cause an accident.

■ These instructions must be followed while in maintenance:
- Turn off the power supply
- Stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance
- Release all energy stored in equipment or devices (hydraulic pressure, mechanical springs, electric capacitors or gravity force), verify the energy is reset to zero, and then perform maintenance work.

Otherwise it can cause injury.

⚠CAUTION

■ Perform proper functional checks after maintenance.
Stop operation when an abnormality is observed such that the SI unit does not work properly.
Safety is not be assured due to unexpected malfunction.

NOTE

■Follow the instructions given below when selecting and handling your SI Unit:

●The instructions on selection (installation, wiring, environment of use, adjustment, operation and maintenance) described below must also be followed.

＊Product specifications

- Operate SI Unit with the specified voltage.
  Operation with a voltage beyond specifications can cause malfunction or damage of the unit.
- Reserve a space for maintenance
  Remember to leave space for maintenance when designing layout of the unit.
- Do not remove labels.
  Otherwise error while in maintenance or misreading of an operation manual can cause damage or malfunction.
  It may also result in nonconformity to safety standards.

● Instructions on handling

＊Installation

- Do not drop, hit or apply excessive shock (100 m/s^2) to the unit.
  Otherwise it can result in damage to the unit causing failure or malfunction.
- Follow the specified tightening torque.
  Excessive tightening torque can break screws.
  Refer to "3-3. Installation and Maintenance" for installation.

＊Wiring (including plugging in/out of connector)

- Do not bend or apply tensile force to cables, or apply force by placing heavy load on them.
  Wiring with bending stress or tensile stress can cause breakage of the cables.
- Connect wires and cables correctly.
  Miswiring can break the SI Unit depending on the miswired circuit .
- Do not connect wires while the power is on.
  Otherwise it can break the SI Unit or I/O devices causing damage or malfunction.
- Do not lay wires or cables with power cable or high-voltage cable in the same wiring route.
  Otherwise the wires to the SI Unit can be contaminated with noise or induced surge voltage from power lines or high-voltage lines causing malfunction.
  Lay the wires to the SI Unit and each I/O device to a wire duct or in a protective tube other than those for power lines or high- voltage lines.
- Verify the insulation of wiring.
  Poor insulation (interference with other circuit, poor insulation between terminals and etc.) can introduce excess voltage or current to the SI Unit or each I/O device causing damage.
- Separate power lines for solenoid valves from power line for Input and control unit.
  Otherwise wires can be contaminated with noise or induced surge voltage causing malfunction.
- Take proper measurements against noise such as noise filter when the SI Unit is incorporated in equipment or devices.
  Otherwise contamination with noise can cause malfunction.

＊ Environment

- Select the proper type of protection according to the environment of operation.
  IP67 protection is achieved when the following conditions are met.
  ① To connect units properly with communication line connector and power cable with M12 connector at the both end, and
  ② To install Input unit and input block, and SI Unit and manifold valves properly.
  Use cover or etc. when install in an environment where water always splashes on these units.

NOTE

- Take sufficient shielding measures when install at a following place.
  Insufficient measures can cause malfunction or failure.
  Verify the effect of the measures after installation of the unit in equipment or devices:
  ① A place where noise due to static electricity is generated
  ② A place where electric field strength is high
  ③ A place where there is radioactive irradiation
  ④ A place near power line
  ⑤ A place where water splashes on the product.
- Do not use the product near by a place where electric surges are generated.
  Internal circuit elements of the SI Unit can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the SI Unit. Provide surge preventives, and avoid interference.
- Use a SI Unit equipped with surge absorber when a surge-generating load such as a relay or solenoid valve is driven directly.
  Direct drive of a load generating surge voltage can damage SI Unit.
- Prevent foreign matter such as remnant of wires from entering this product.
  Take proper measures for the remnant not to enter the SI Unit in order to prevent failure or malfunction.
- Do not expose the SI Unit to vibration and impact.
  Otherwise it can cause failure or malfunction.
- Keep the specified ambient temperature range.
  Otherwise it can cause malfunction.
- Do not use SI Unit in a place where temperature suddenly changes even if it stays within the specified range.
- Do not expose the SI Unit to heat radiation from a heat source located nearby.
  It can cause malfunction.

*** Adjustment and Operation**

- Use precision screwdriver with small flat blade when setting rotary switches.

*** Maintenance**

- Before performing maintenance, make sure to turn of the power supply, stop supplied air, release the residual air in the piping into the atmosphere, and verify that the pneumatic system is open to the air.
  Otherwise an unexpected operation of a system component can occur.
- Perform maintenance and check regularly
  Otherwise an unexpected malfunction of the system can occur due to a malfunction of the unit.
  Refer to "3-3. Installation and Maintenance" the maintenance and checking methods.
- Perform a proper functional check.
  Stop operation when an abnormality is observed such that the device does not work properly.
  Otherwise an unexpected malfunction of the system component can occur.
- Do not use solvents such as benzene, thinner or other to clean the SI Unit.
  It can damage the surface of the body and erase the indication 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.

2. Specifications

2-1 . General specification

Item	Specification
Operating ambient temp.	+5 to +45℃
Operating ambient humidity	35 to 85% RH (No dew condensation)
Storage ambient temp.	-20 to +60℃
Vibration proof	10 to 57Hz 0.35mm (Constant amplitude) 57 to 150Hz 50m/s^2 (Constant acceleration)
Impact proof	150m/s^2 (peak), 11ms × three times in each direction ±X, Y and Z.
Noise immunity	Normal mode : ±1500V Pulse duration 1us Common mode : ±1500V Pulse duration 1us Radiation : ±1000V Pulse duration 1us
Withstand voltage	500V AC for 1min.
Insulation resistance	500V DC min10M ohm
Operating environment	No corrosive gas and no dust

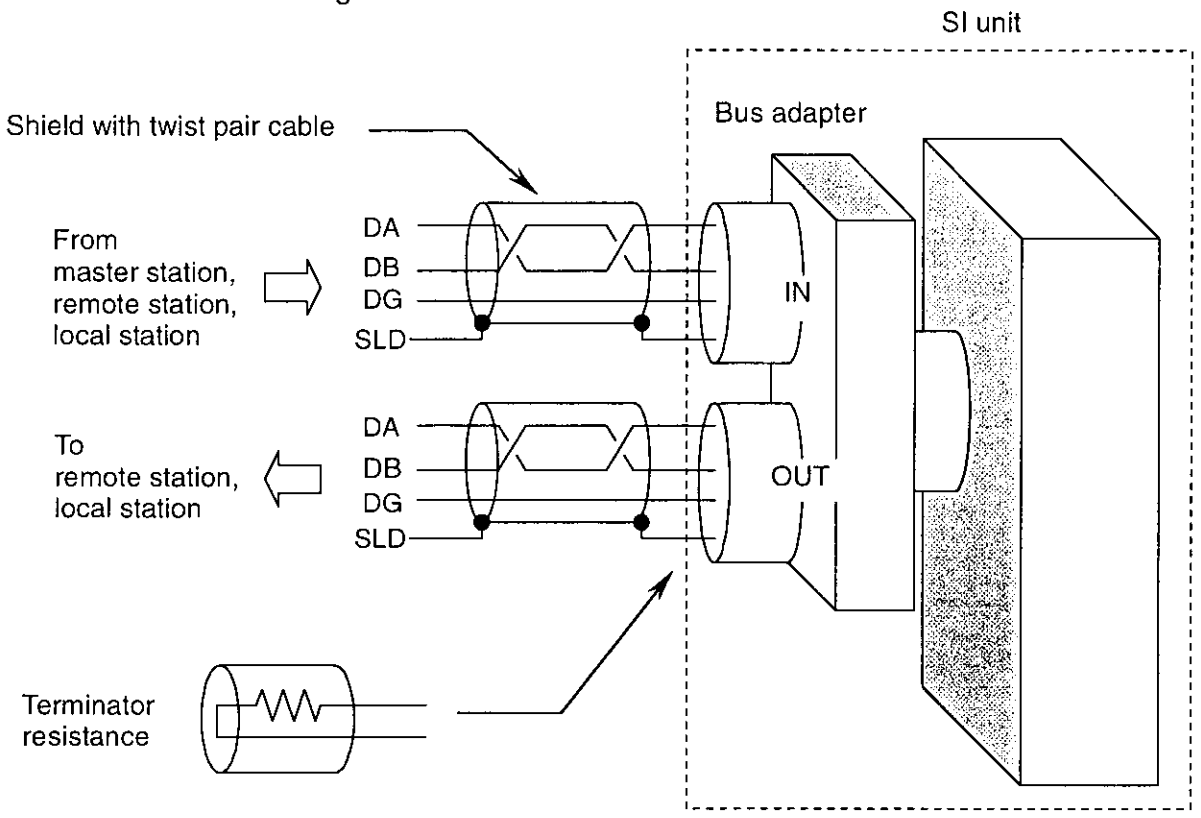
2-2 . Electrical and communication specification

Item		Specification
Power Voltage range, current consumption	Power for SI/Input Block Current consumption	19.2 to 28.8V DC Max. 1.1A or less Depending on the number of Input Block stations and sensor specifications.
	Power for solenoid valve Current consumption	22.8 to 26.4V DC Max. 2.0A or less Depending on number of solenoid valve station and specifications.
Solenoid valve connection specification	Output type	N-ch MOS-FET Open drain type
	Connection load	Solenoid valve with protection circuit for 24V DC and 1.5W or less surge voltage. (made by SMC)
	Residual Voltage	0.3V DC or less
	Insulation type	Opto coupler type
Communication specification	Station No. assignment range	1 to 63 (Assigned by the rotary switch)
	Baud rate setting range	156kbps, 625kbps, 2.5Mbps, 5Mbps, 10Mbps (Assigned by the rotary switch)
	Applicable system	CC-Link Ver.1.10
	Occupied station	2 stations
	Station type	Remote device station
	I/O points	Input/32 points Output/32 points

2-3 . Applicable solenoid valves

Representative series	Applicable series
VQC series	VQC1000, VQC2000, VQC4000
SV series	SV1000, SV2000, SV3000 (Tierod base manifold)

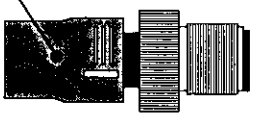
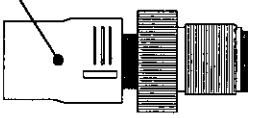
3-1.Communication wiring



Connect the terminal resistance to the end of connection.
Select correct type of terminal resistance which depends on the cable type.

Shield (SLD) is connected to the earth (E) inside of the unit.

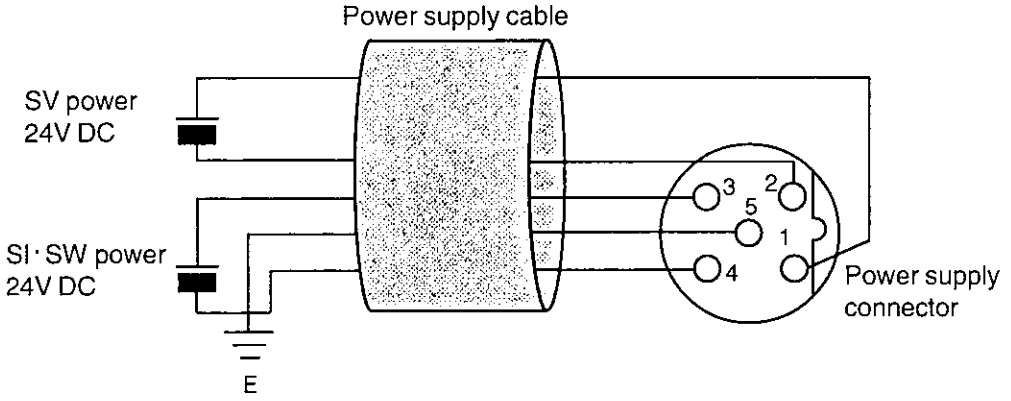
Terminator resistance and cable

Cable	FANC-SBH	FANC-SB
Terminator resistance	130 ohm,1/2W Black 	110 ohm,1/2W Gray 
Manufacture's model no. (CORRENS)	VA-4DCC-130	VA-4DCC-110

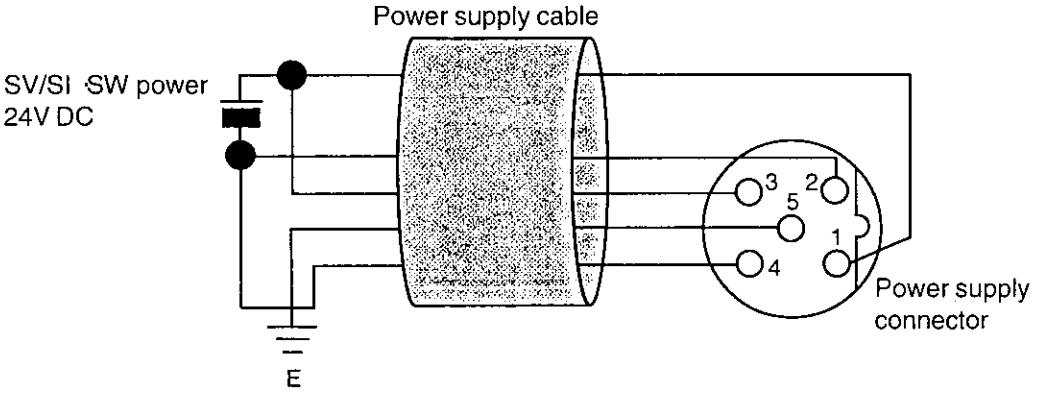
FANC-SB and FANC-SBH are model numbers of KURAMO Electric Co.Ltd.
Contact each manufacture or CC-Link partner association about communication cable.

3-2 . Power supply wiring

Power supply line inside the unit has individual power supplies for solenoid valve actuation (SV power supply) and for Control parts and Sensor (SI · SW power supply). Supply 24V DC for each of them.



A. Dual power supply

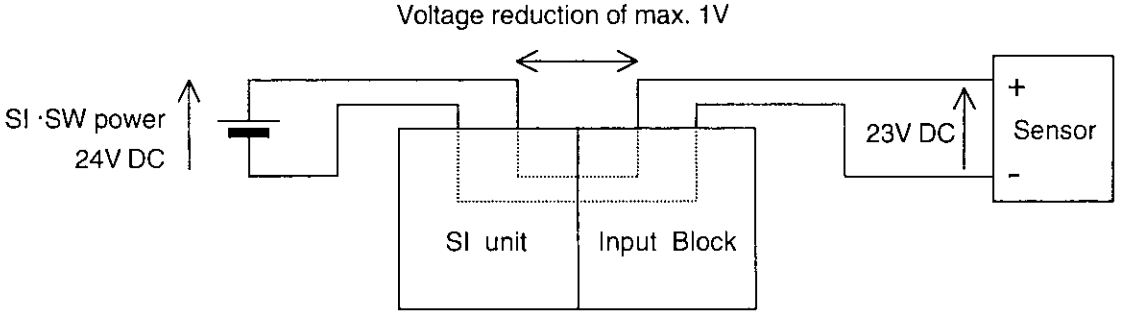


B. Single power supply

*In case of single power supply, pay attention to the range of each supply voltage.

Power for sensor is supplied to sensor connected with Input Block. Select sensor concerning voltage drop up to max. 1V inside the unit at this moment.

If sensor requires 24V, it is necessary to lower power supply voltage for sensor slightly or secure power supply for sensor separately without going through SI unit so that sensor input voltage can be 24V with actual loading (allowable voltage of power supply : 19.2V to 28.8V).

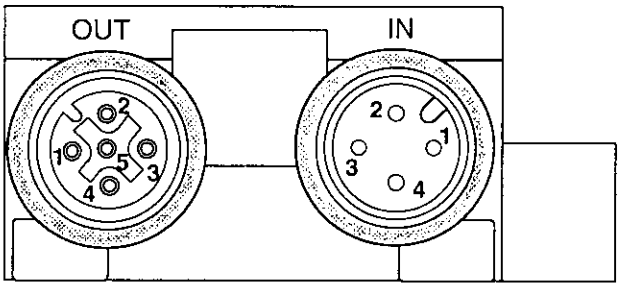


Communication connector (Bus adapter :P5032-75)

IN : M12 4pins (male)

OUT : M12 5pins (female)

Example of connected cable:CORRENS VA-4DBX[ ]CCG4 (OUT side)
VA-5DSX[ ]CCG4 (IN side) etc.



IN side

Pin No.	Description	Function
1	SLD	Shield
2	DB	Communication wire DB
3	DG	Communication wire DG
4	DA	Communication wire DA

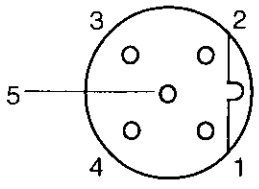
OUT side

Pin No.	Description	Function
1	SLD	Shield
2	DB	Communication wire DB
3	DG	Communication wire DG
4	DA	Communication wire DA
5	-	Unused

Power supply connector

M12 5pins reverse (male)

Example of connected cable:P5032-66-[ ] etc.



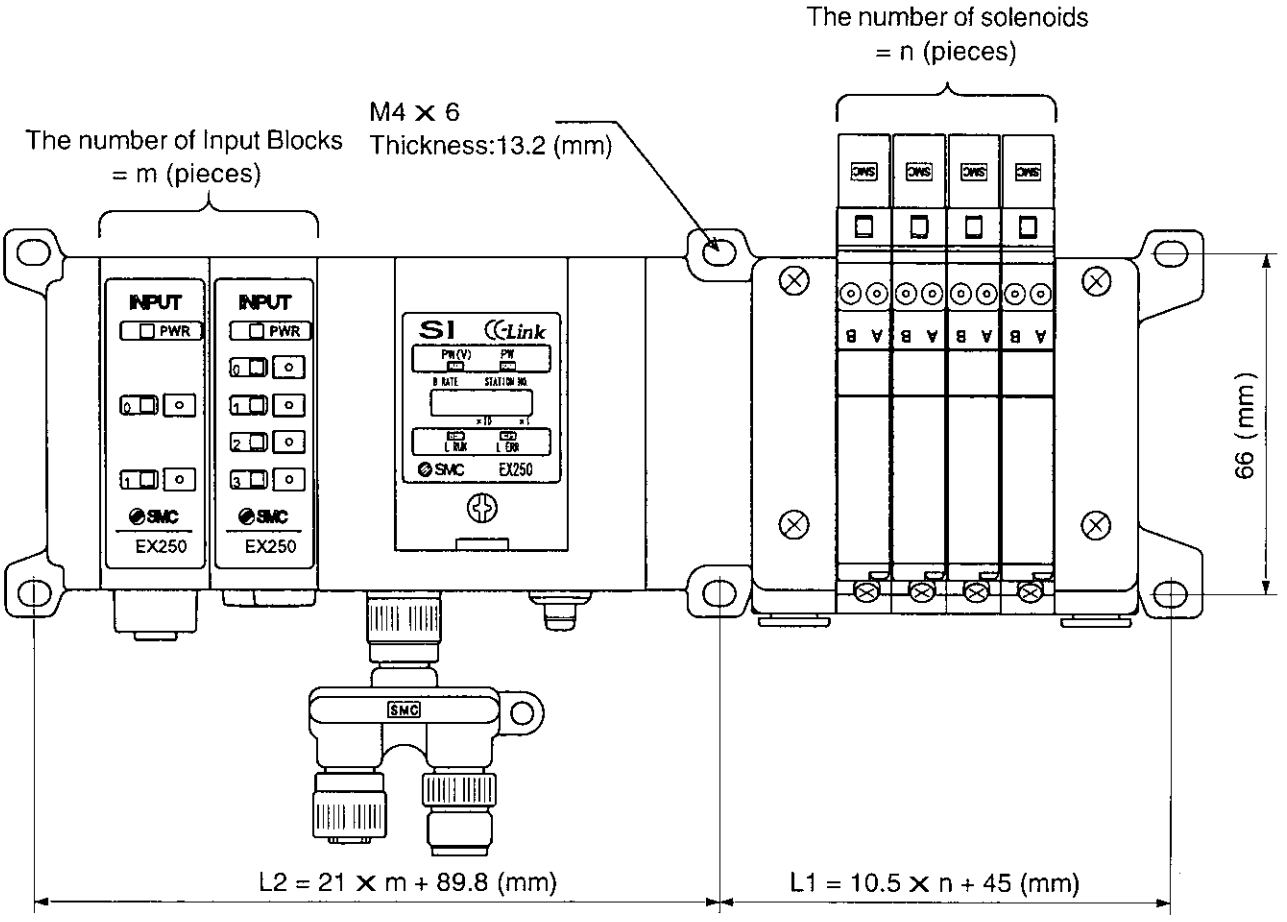
Pin No.	Description	Function
1	SV24V	+24V for solenoid valve
2	SV0V	0V for solenoid valve
3	SW24V	+24V for SI unit and Input Block
4	SW0V	0V for SI unit and Input Block
5	E	Earth

3-3 Installation and Maintenance

How to set

Not having mounting hole,it can't be set to BUS independently.Be sure to connect manifold to SI unit for setting.

And if Input Block is unnecessary,connect End Plate directly to SI unit.



For example, the table below shows the size when manifold of VQC1000 series connected.
Please refer to an individual catalog for the size when other manifolds are connected.

L \ n_m	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
L1	45	55.5	66	76.5	87	97.5	108	118.5	129	139.5	150	160.5	171	181.5	192	202.5	213
L2	89.8	110.8	131.8	152.8	173.8	194.8	215.8	236.8	257.8	278.8	299.8	320.8	341.8	362.8	383.8	404.8	425.8

(mm)

Wiring (for power supply,communication and input) and piping are done on only one side.
On the side,make a space for wiring and piping.

Maintenance

Addition of Input Block

1.Remove screws from End Plate.
2.Mount attached tie rod.
3.Connect additional Input Block.
4.Connect End Plate and tighten removed screws by specified tightening torque. (0.6N· m)

Exchange of SI unit

1.Remove screws from End Plate and release connection of each unit.
2.Replace old SI unit with new one. (Tie rod does not need to be removed.)
3.Connect End Plate and tighten removed screws by specified tightening torque. (0.6N· m)

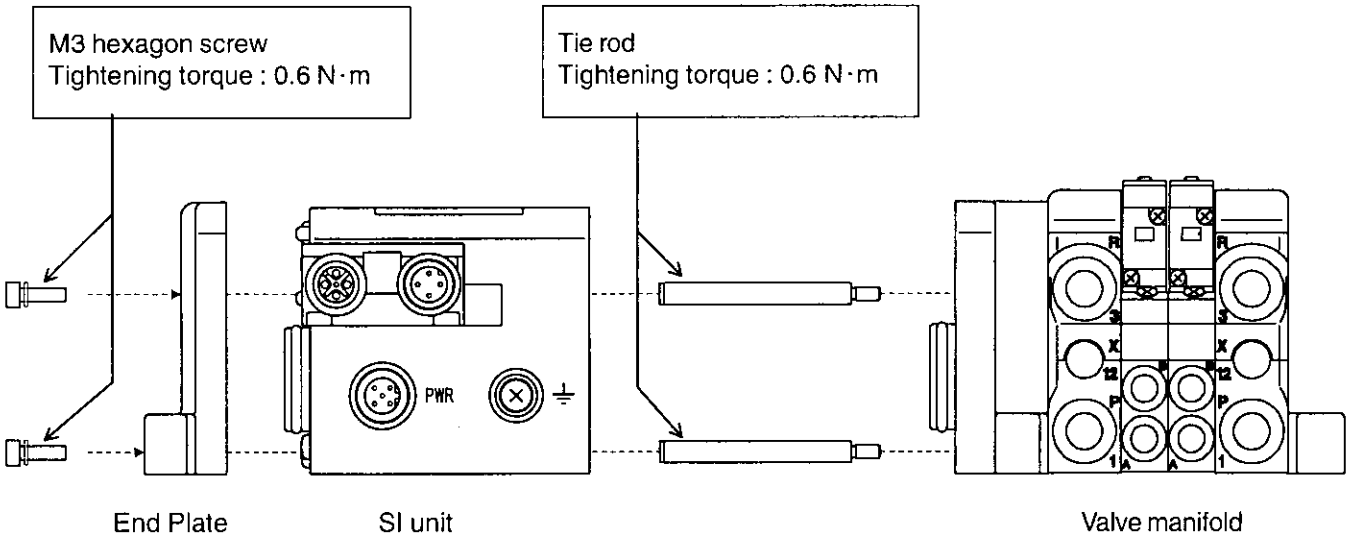
⚠CAUTION

For maintenance

(1) Be sure to turn-off all power supplies.
(2) Be sure that there is no foreign object in any of units.
(3) Be sure that gasket is lined properly.
(4) Be sure that tightening torque is according to specification.

If these items are not kept, it may lead to the breakage of substrate or intrusion of liquid or dust into the units.

Assembly and disconnection of unit

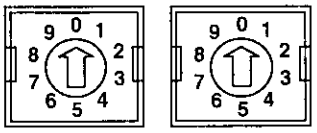


3-4 Rotary switch setting

Station No. and Baud rate are set by the rotary switch inside of the SI unit cover.
Set parameters while the power of SI unit is off.

3-4-1. Station no. setting

STATION NO.



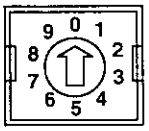
x10 x 1

Setting	Setting range
x10	0 to 6
x 1	0 to 9

Set stations within 01 to 63
"L ERR" display lights if 00 and station 64 or larger is selected.
Turn off the power and select correct station.
"L ERR" display blinks if the switch is operated which the power is on.

3-4-2 Baud rate setting

B RATE

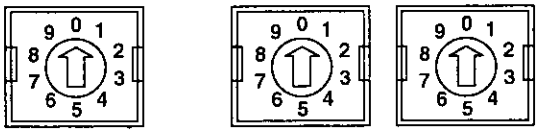


Setting	Baud rate
0	156 kbps
1	625 kbps
2	2.5 Mbps
3	5 Mbps
4	10 Mbps

Set baud rate within 0 to 4
"L ERR" display lights if the setting is out of 0 to 4.
Set correct value after cutting the power supply.
"L ERR" display blinks if the switch is operated which the power is on.
Select baud rate same as master station.

3-4-3 Adjusted when shipped

B RATE STATION NO.



x10 x 1

Please refer the table below for setting at the time of shipment from the factory.

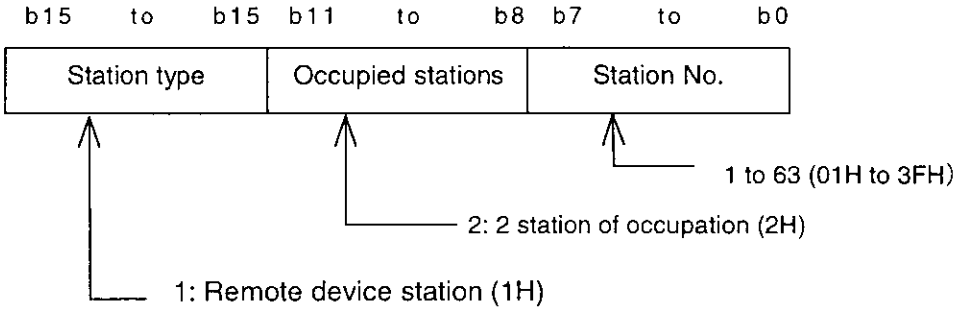
Set parameters		Setting of rotary switch	Contents
B RATE (Baud rate)		0	156kbps
STATION NO.	x10	0	-
	x 1	0	

3-5 Parameters setting

There are necessary parameters to be set for data link in CC-Link.Followings are parameters to set information.
To set parameters,data is written to the buffer memory "parameter information(address 00H to 5FH)" of master station.

3-5-1 Station information

Assign the type of connected remote /local station (or equivalent) and the remote/local station (equivalent) which are assigned to reserved station.
Match with parameters assigned by SI unit display switch.
Please refer below for the structure of assigned data.



That is "12[ ][ ]H". ([ ][ ]: 01 to 3F)

3-5-2 I/O information and error information.

(1)Buffer memory of master station correspondence table.

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

SI unit input correspondence.

RX00	Sensor 0 value	RX10	Sensor 16 value
RX01	Sensor 1 value	RX11	Sensor 17 value
RX02	Sensor 2 value	RX12	Sensor 18 value
RX03	Sensor 3 value	RX13	Sensor 19 value
RX04	Sensor 4 value	RX14	Sensor 20 value
RX05	Sensor 5 value	RX15	Sensor 21 value
RX06	Sensor 6 value	RX16	Sensor 22 value
RX07	Sensor 7 value	RX17	Sensor 23 value
RX08	Sensor 8 value	RX18	Sensor 24 value
RX09	Sensor 9 value	RX19	Sensor 25 value
RX0A	Sensor 10 value	RX1A	Sensor 26 value
RX0B	Sensor 11 value	RX1B	Sensor 27 value
RX0C	Sensor 12 value	RX1C	Sensor 28 value
RX0D	Sensor 13 value	RX1D	Sensor 29 value
RX0E	Sensor 14 value	RX1E	Sensor 30 value
RX0F	Sensor 15 value	RX1F	Sensor 31 value

0: Sensor OFF
1: Sensor ON

Buffer area of master station.
(AJ61BT11, A1SJ61BT11)

	Address	Remote Input (RX)
For station 1	E0	RX0F to RX00
	E1	RX1F to RX10
For station 2	E2	RX2F to RX20
	E3	RX3F to RX30
For station 3	E4	RX4F to RX40
	E5	RX5F to RX50
For station 4	E6	RX6F to RX60
	E7	RX7F to RX70
For station 5	E8	RX8F to RX80
	E9	RX9F to RX90
For station 6	EA	RXAF to RXA0
	EB	RXBF to RXB0
	:	:
	:	:

SI unit profile correspondence.

RX20	Input excess current detection	RX30	-
RX21	Output excess current detection (unused)	RX31	-
RX22	Valve supply voltage lowered	RX32	-
RX23	-	RX33	-
RX24	-	RX34	-
RX25	-	RX35	-
RX26	-	RX36	-
RX27	-	RX37	-
RX28	-	RX38	-
RX29	-	RX39	-
RX2A	-	RX3A	Error status flag
RX2B	-	RX3B	Remote READY
RX2C	-	RX3C	-
RX2D	-	RX3D	-
RX2E	-	RX3E	-
RX2F	-	RX3F	-

1.Input excess current detection
0 : Normal
1 : One of input block/fuse disconnected

2.Output excess current detection
0 : Normal
1 : Unused

3.Valve supply voltage lowered
0 : Normal
1 : Valve supply voltage is lowered

4.Error status flag
0 : Normal
1 : SI unit operation stopping
(Not turn on when detecting 1 to 3)

5.Remote READY
0 : SI unit operating
(Not turn off when detecting 1 to 3)

Buffer area of master station.
(AJ61BT11,A1SJ61BT11)

	Address	Remote Output(RY)
For station 1	160	RY0F to RY00
	161	RY1F to RY10
For station 2	162	RY2F to RY20
	163	RY3F to RY30
For station 3	164	RY4F to RY40
	165	RY5F to RY50
For station 4	166	RY6F to RY60
	167	RY7F to RY70
For station 5	168	RY8F to RY80
	169	RY9F to RY90
For station 6	16A	RYAF to RYA0
	16B	RYBF to RYB0
	:	:
	:	:

RY00	Valve 0 value	RY10	Valve 16 value
RY01	Valve 1 value	RY11	Valve 17 value
RY02	Valve 2 value	RY12	Valve 18 value
RY03	Valve 3 value	RY13	Valve 19 value
RY04	Valve 4 value	RY14	Valve 20 value
RY05	Valve 5 value	RY15	Valve 21 value
RY06	Valve 6 value	RY16	Valve 22 value
RY07	Valve 7 value	RY17	Valve 23 value
RY08	Valve 8 value	RY18	Valve 24 value
RY09	Valve 9 value	RY19	Valve 25 value
RY0A	Valve 10 value	RY1A	Valve 26 value
RY0B	Valve 11 value	RY1B	Valve 27 value
RY0C	Valve 12 value	RY1C	Valve 28 value
RY0D	Valve 13 value	RY1D	Valve 29 value
RY0E	Valve 14 value	RY1E	Valve 30 value
RY0F	Valve 15 value	RY1F	Valve 31 value

0: Valve OFF
1: Valve ON

(2) Fuse disconnection information

SI unit solenoid valve power fuse disconnection can be recognized by the link special register at master station.

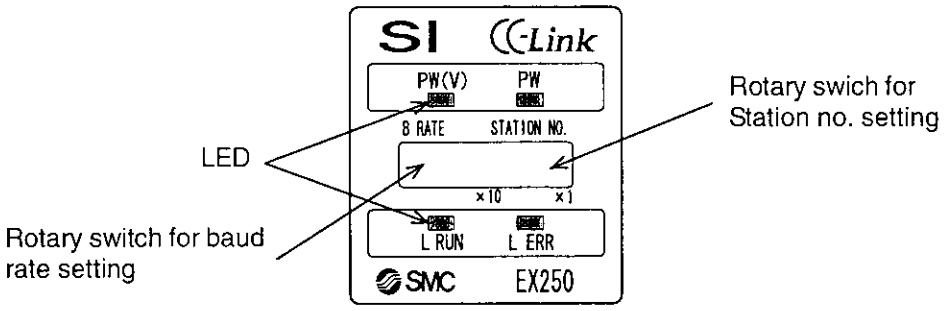
0: Normal
1: Fuse disconnected

	B1	b14	b13	b12	...	b3	b2	b1	b0
(688_H)SW0088	16	15	14	13	...	4	3	2	1
(689_H)SW0089	32	31	30	29	...	20	19	18	17
$(68A_H)$SW008A	48	47	46	45	...	36	35	34	33
$(68B_H)$SW008B	64	63	62	61	...	52	31	50	49

1 to 64 shows station number. Bits of occupied station turn on.

4.LED indicator and physical dimensions

4-1 LED indication

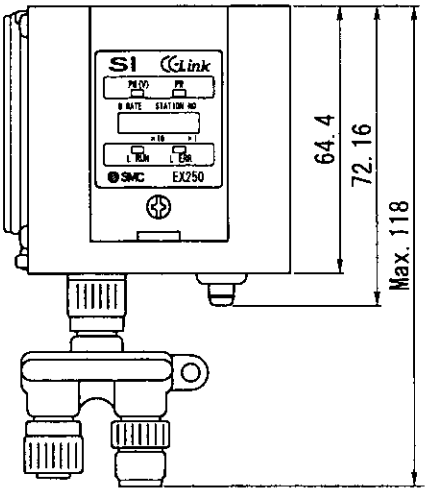


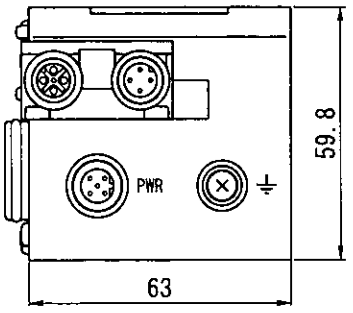
LED indication	Contents
PW	Lights up : Input and control power is ON. Lights off : Input and control power is OFF.
PW (V)	Lights up : When power supply for solenoid valves is turned on. Lights off : When supply voltage decreases below 19V.
L RUN	Lights up : Communication is normal. Lights off : Communication terminated.(Time over error)
L ERR	Lights up : Communication error. Flashing : Assignment of station no. and baud rate are made during communication. (Flicker every 0.4s) Lights off : Communication is normal.

"PW", "PW(V)","L RUN" light while data link is normal.

4-2 Physical dimensions

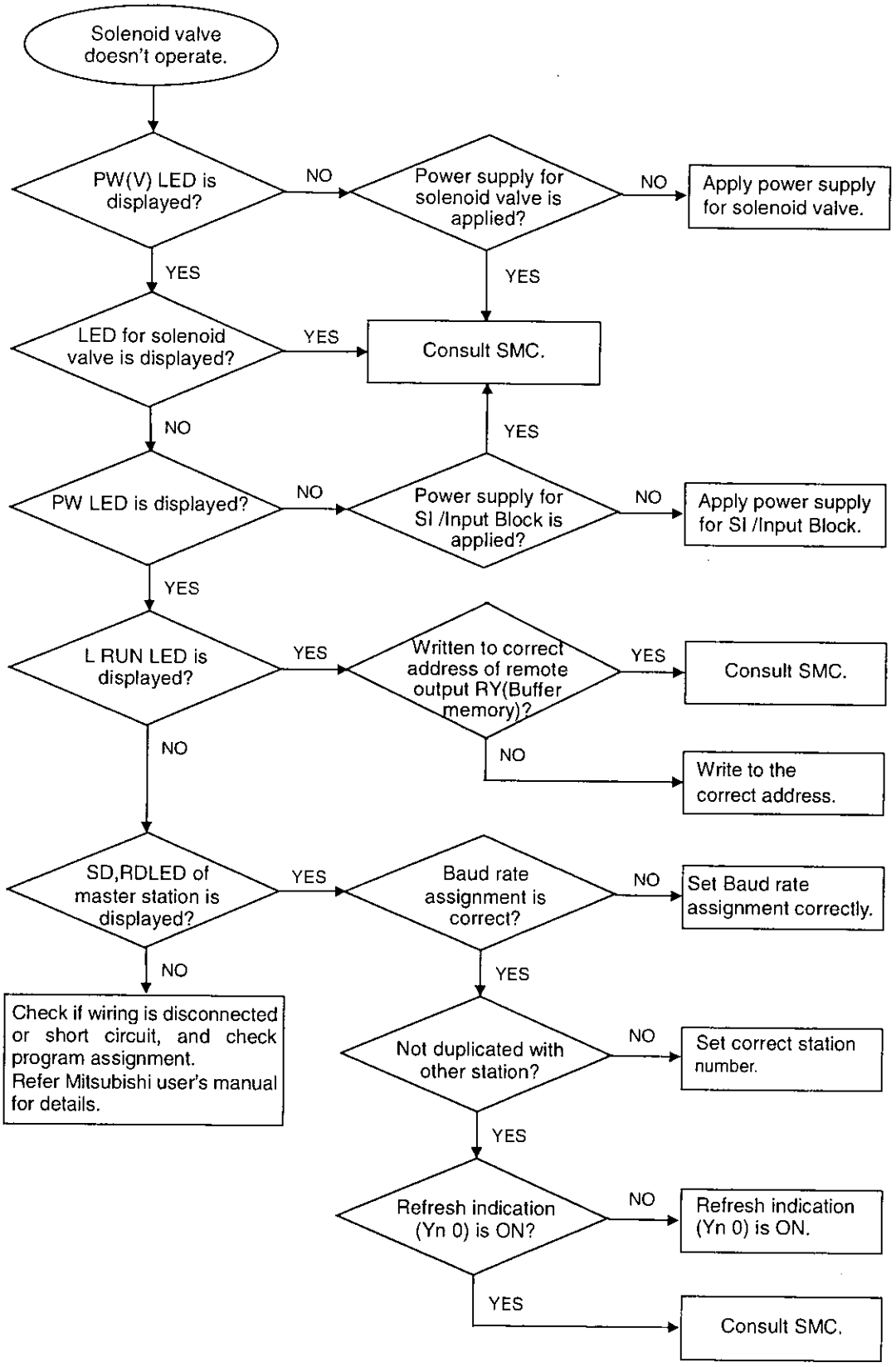
EX250-SMJ2

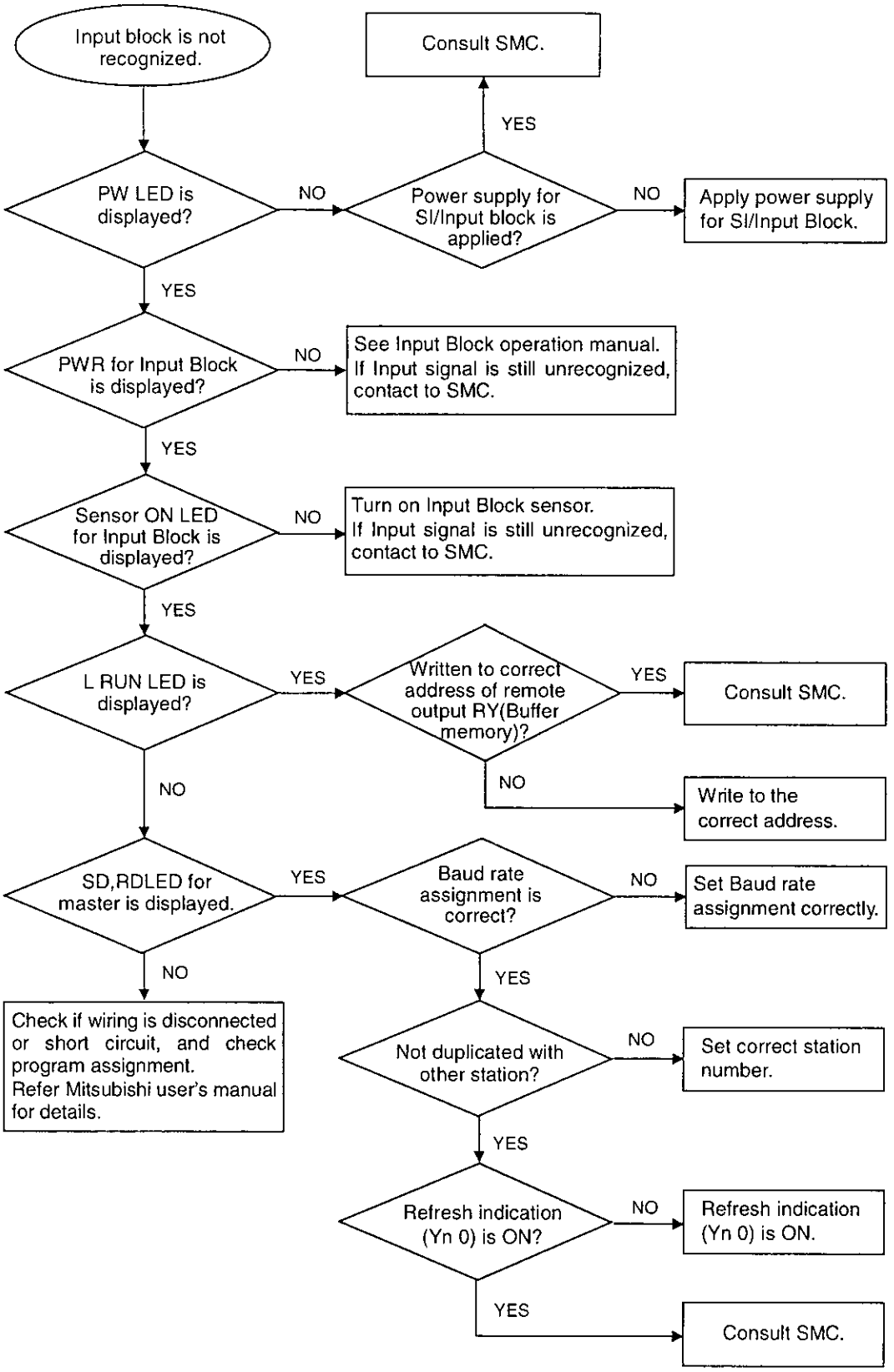




5.Trouble shooting

When SI unit doesn't operate properly, follow the flow chart below and resolve it.




Input block is not recognized.
PW LED is displayed?
NO
Power supply for SI/Input block is applied?
NO
Apply power supply for SI/Input Block.
YES
Consult SMC.
YES
PWR for Input Block is displayed?
NO
See Input Block operation manual. If Input signal is still unrecognized, contact to SMC.
YES
Sensor ON LED for Input Block is displayed?
NO
Turn on Input Block sensor. If Input signal is still unrecognized, contact to SMC.
YES
L RUN LED is displayed?
YES
Written to correct address of remote output RY(Buffer memory)?
YES
Consult SMC.
NO
Write to the correct address.
NO
SD,RDLED for master is displayed.
YES
Baud rate assignment is correct?
NO
Set Baud rate assignment correctly.
NO
Check if wiring is disconnected or short circuit, and check program assignment. Refer Mitsubishi user's manual for details.
YES
Not duplicated with other station?
NO
Set correct station number.
YES
Refresh indication (Yn 0) is ON?
NO
Refresh indication (Yn 0) is ON.
YES
Consult SMC.