

---

---

# TECHNICAL INSTRUCTION MANUAL

**Rockwell Automation Remote I/O (RIO) System**

---

**SI Unit : EX120-SAB1-X1**

---

**EX121-SAB1-X1**

---

**EX122-SAB1-X1**

---

**EX124※-SAB1**

---

**SMC CORPORATION**

## ● Safety Instructions ●

( Read carefully before handling. )

Thoroughly read this technical instruction manual and related manuals mentioned here to ensure the safety and proper operation of the product.

These safety instructions are intended to prevent hazardous situations and / or equipment damage. These instructions indicate the level of potential hazard by labeling "**CAUTION**" or "**WARNING**".

### Level of potential hazard

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

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

### Safety instructions for pneumatic equipment

#### **WARNING**

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

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and / or tests to meet specific requirements.

**2. Only trained personnel should operate pneumatically operated machinery and equipment.**

Compressed air can be dangerous if an operator is unfamiliar with it.

Trained and experienced operators should perform assembly, handling or repair of pneumatic systems.

**3. Don't service machinery / equipment or attempt to remove components until safety is confirmed.**

1. Inspection and maintenance of machinery / equipment should only be performed after confirmation of safe locked-out control positions.

2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.

3. Before machinery / equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc. (Bleed air into the system gradually to create back-pressure.)

**4. Contact SMC if the product is to be used in any of the following conditions:**

1. Conditions and environments beyond the given specifications, or if product is used outdoors.

2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuit, press applications, or safety equipment.

3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

## **Safety instructions for electric equipment**

### **WARNING**

1. The product specified here is designed to use in ordinary factory automation equipment. Prevent the use in machinery and / or equipment where human life may be directly injured and malfunction or failure may cause enormous loss.
2. Don't use in the explosive atmosphere, the atmosphere of catch fire-able gas, the corrode-able atmosphere. It becomes cause such as the injury, the fire.
3. The person who has professional knowledge implement work of the carriage, the establishment, the piping, the wiring, the operation, the maintenance, the check. It will cause in being shocked, the injury, the fire and so on.
4. Install a direct stop circuit outside that to stop operation immediately and then the power supply can be blocked off.
5. Don't disassemble the product for modifications. It will cause in the injury, the damaging and so on.

### **CAUTION**

1. Thoroughly read this manual and operate the product within the specified range. Follow the instructions.
2. Don't drop or any impact to the product.
3. Use within specified voltage range. Use outside of specified voltage will cause malfunction, damage to unit, electric shock, and fire.
4. Don't touch the terminal or internal circuit board while they are energized. it may cause malfunction, damage to unit, and electric shock.  
Go in the power supply OFF condition when increasing / decreasing of the manifold valve and pulling out of the connector.
5. Use within operating ambient temperature. Don't use where temperatures can rapidly change even though it is within the specifications.
6. Foreign objects should be prevented from entering the product. Contamination by foreign objects, such as wire chips will cause fire, breakage, and malfunction.
7. Carry out regular checks to confirm correct operation.  
Unintentional malfunction or incorrect operation may not maintain safety.

## INDEX

<b>1. Outline</b> .....	<b>4</b>
1.1. Rockwell Automation Remote I/O (RIO) System .....	4
<b>2. Applicable PLC</b> .....	<b>4</b>
<b>3. System structure</b> .....	<b>5</b>
3.1. System structure drawing .....	5
<b>4. SI Unit Appearance and Product number</b> .....	<b>6</b>
4.1. Each type of SI unit appearance .....	6
4.2. Product number.....	7
4.3. LED Display .....	8
<b>5. Specification</b> .....	<b>9</b>
5.1. General specification.....	9
5.2. Rockwell Automation Remote I/O Communication specification .....	9
5.3. SI Unit Specification .....	10
<b>6. Setting for operation</b> .....	<b>11</b>
6.1. Switch setting .....	11
6.2. Setting for operation SW1.....	11
6.3. Setting for operation SW2.....	12
<b>7. Wiring</b> .....	<b>13</b>
7.1. Wiring for power supply .....	13
7.2. Earth (FG : Frame Ground) terminal .....	13
7.3. Wiring for Communication .....	14
<b>8. Output No. of the SI unit for manifold solenoid valve</b> .....	<b>15</b>
8.1. Each type of manifold solenoid valve vs. output No. of SI unit.....	15

## 1. Outline

### 1.1. Rockwell Automation Remote I/O (RIO) System

- Remote I/O (RIO) System is suitable to the master unit as PLC and SLC series of Rockwell Automation.
- Output is 16 points per unit.
- Communication speed is selectable, 57.6kbit/sec, 115.2kbit/sec or 230.4kbit/sec.
- 2 system of power supply (communication and solenoid valve).
- Maximum 32 slaves can be connected to 1CH of PLC master unit.



Maximum number that can be connected is depending on master unit.

Please inquire Rockwell Automation in detail.

This product is approved by the patent and the industrial property of Rockwell Automation, and realized the communication link.

Rockwell Automation does not guarantee and support this product.

This product is supported in the responsibility of SMC.

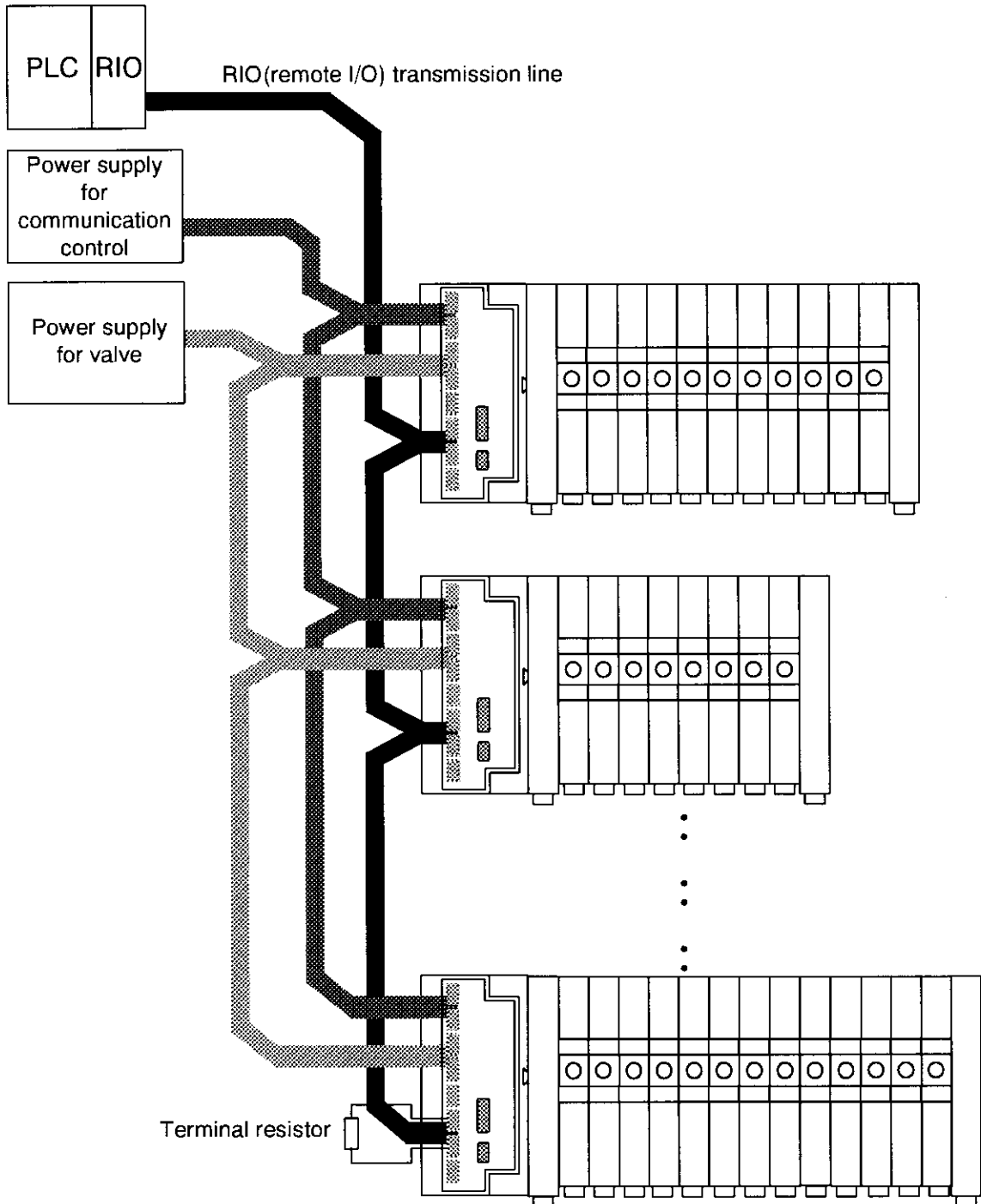
## 2. Applicable PLC

Applicable for PLC in which Rockwell Automation Remote I/O (RIO) System installed.

Please inquire Rockwell Automation in detail.

### 3. System structure

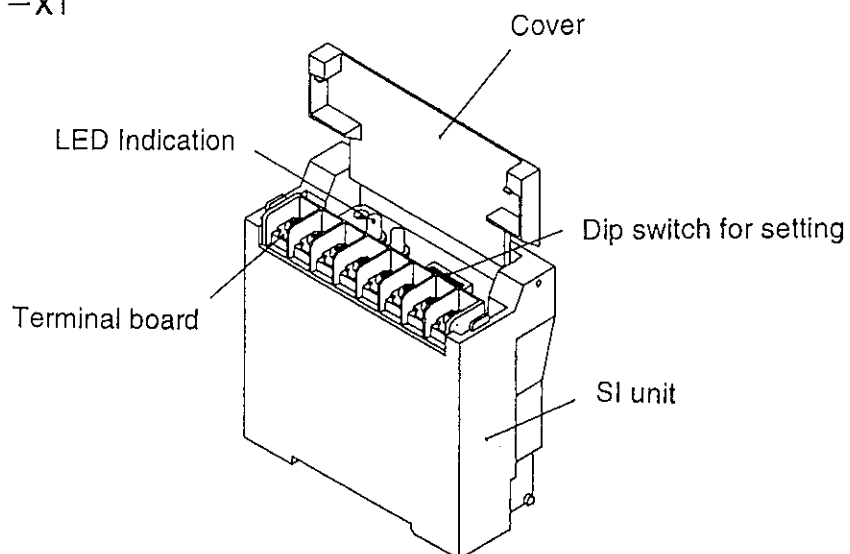
#### 3.1. System structure drawing



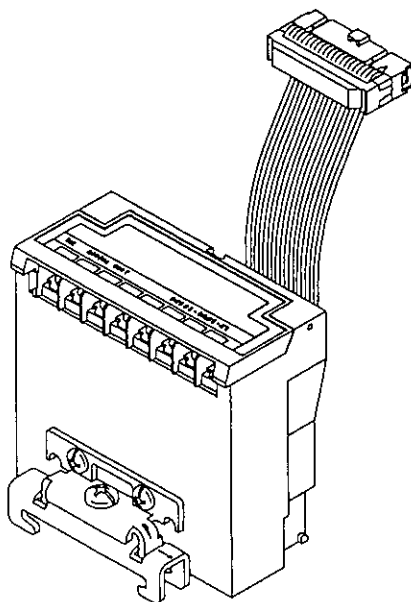
## 4. SI Unit Appearance and Product number

### 4.1. Each type of SI unit appearance

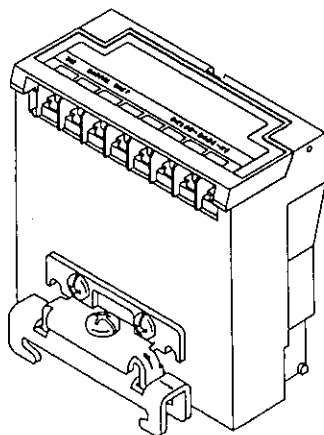
EX120-SAB1-X1



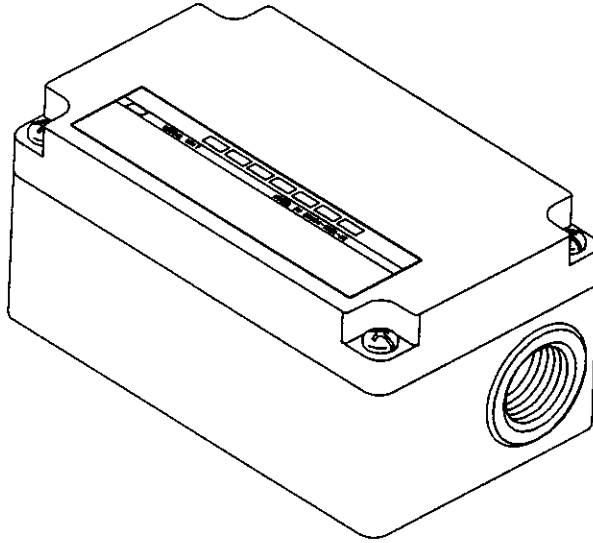
EX121-SAB1-X1



EX122-SAB1-X1



## EX124※-SAB1



### 4.2. Product number

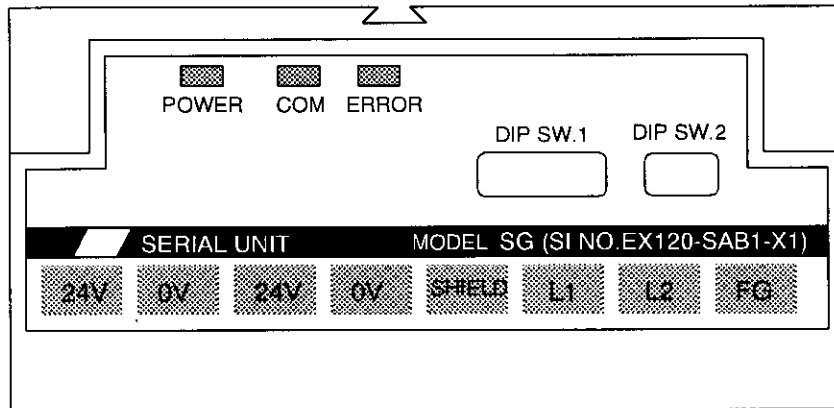
EX12※-SAB1-X1

● Description for Special

Description	Mounting type
EX120	VQ1000, 2000 Direct Mounting Type
EX121	DIN rail mounting type
EX122	SX/SY Direct mounting type
EX124U EX124D	VQ4000 type

Description	Applicable PLC
AB	The System made by Rockwell Automation. (formerly, Allen-Bradley Co.)

### 4.3. LED Display



Display	Contents
PWR	Power supply for communication control ON : Steady OFF : Blink
COM	Normal RIO communication : Steady Abnormal : Blink
ERROR	Abnormal communication : Steady Normal communication : Blink

## 5. Specification

### 5.1. General specification

No.	Item	Specification
1	Operating temperature	0~+55°C (valve 8 points turned ON) 0~+50°C (valve 16 points turned ON)
2	Storage temperature	-10~+55°C
3	Ambient humidity	35~85%RH (without condensation)
4	Vibration resistance	5G (conform to JIS C0911 10~55Hz double amplitude 0.5mm)
5	Shock resistance	10G (conform to JIS C0912)
6	Noise resistance	1000Vp-p pulse width 1μs build up 1ns pulse
7	Withstand Voltage	1000VAC 1min (between PE-external terminal package)
8	Insulation resistance	10MΩ or more (500VDC meg. between PE-external terminal package)
9	Momentary power Failure	1msec or less
10	Environment	No corrosion gas
11	Applicable Altitude	1000m or less above the sea.

### 5.2. Rockwell Automation Remote I/O Communication specification

No.	Item	Specification		
1	Applicable PLC	PLC series of Rockwell Automation		
2	Master of Remote I/O	RIO/DIO built-in PLC, RIO/DIO Scanner (external connection type)		
3	Communication speed	57.6kbps, 115.2kbps, 230.4kbps		
4	Transmission line	Twist pair cable with shields		
5	Transmission distance	Communication speed		Communication distance
		57.6kbps		10,000feet approx. 3,048m
		115.2kbps		5,000feet approx. 1,524m
		230.4kbps		2,500feet approx. 762m

Note 1) The maximum connection number of terminals and CH are depending on the model of PLC and SLC. Please inquire Rockwell Automation in detail.

### 5.3. SI Unit Specification

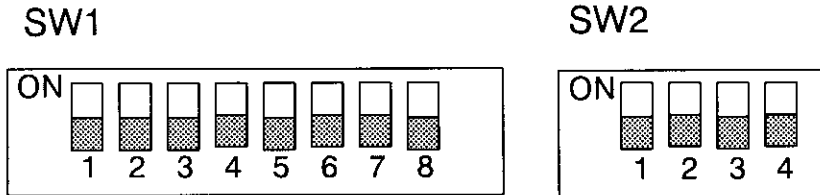
No.	Item	Specification
1	Supply voltage for communication	DC24V±10%
2	Supply voltage for solenoid valve	DC24V+10%/-5%
3	Consumption current	Power supply for communication and internals : DC24V 100mA or less Power supply for solenoid valve : DC24V 1.6A or less
4	Output point	16 points
5	Output style	Transistor (NPN : Open corrector type)
6	Connected load	Solenoid valve with lamp and surge voltage protection circuit DC24V, 2.1W or less (Product of SMC Co.)
7	Residual voltage	0.4V or less
8	Weight	180g or less
9	Dimension	EX120 type : 64 × 30 × 60.8mm EX121, EX122 type : 64 × 40 × 60.8mm EX124type : 133 × 66 × 53.8mm

## 6. Setting for operation

### 6.1. Switch setting

**Turn the power off in case of Dip-Switch setting.**

In case of Dip-Switch setting, open the protection cover of station switch, and set the Dip Switch with blade driver or etc.

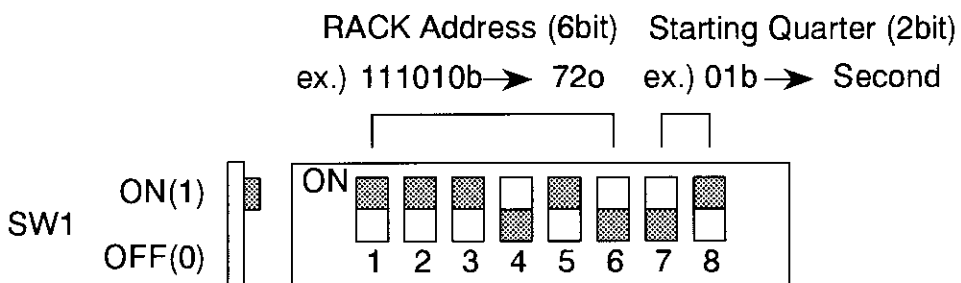


### 6.2. Setting for operation SW1

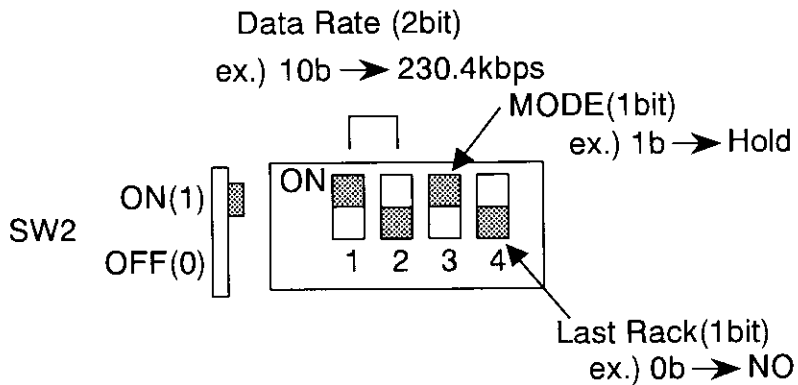
This switch set Rack Address / Starting Quarter.

- 1) RACK Address (6 bit setting)  
61 type of settings (0 to 74oct : octal number) are available.
- 2) Starting Quarter (2 bit setting)  
4 type of settings (First, Second, Third, Fourth) are available.

SW1 No.		1	2	3	4	5	6	7	8
		32	16	8	4	2	1		
Rack Address	0	0	0	0	0	0	0		
	1	0	0	0	0	0	1		
	2	0	0	0	0	1	0		
	73	0	1	1	1	1	1		
74	1	1	1	1	0	0			
Starting Quarter	First							0	0
	Second							0	1
	Third							1	0
	Forth							1	1



### 6.3. Setting for operation SW2



SW2 No.		1	2	3	4
Data Rate	57.6kbit/sec	0	0		
	115.2kbit/sec	0	1		
	230.4kbit/sec	1	×		
MODE	Clear			0	
	Hold			1	
Last Rack	NO				0
	YES				1

#### (1) Setting of Data Rate (2 bit setting)

Set Data communication speed.

57.6kbit/sec : 0 0

115.2kbit/sec : 0 1

230.4kbit/sec : 1 ×

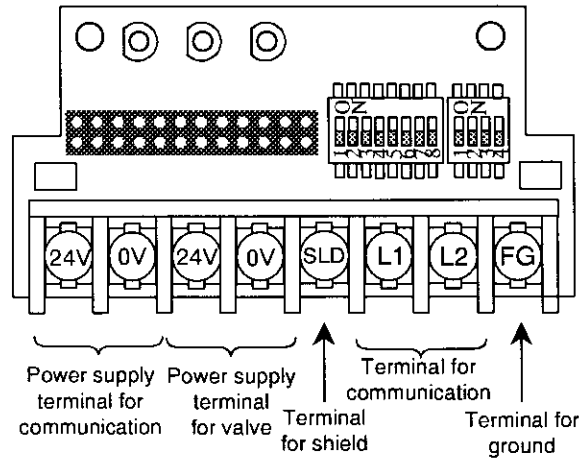
#### (2) Mode Setting (Setting of 1bit)

Setting	Operation
0 CLEAR	If "0" (OFF) is set, output status of the solenoid valve is cleared and held temporarily in case of Remote I/O (RIO) communication error. Returned to normal status, automatically recovered.
1 HOLD	If "1" (ON) is set, output status of the solenoid valve is held temporarily the last normal output status in case of Remote I/O (RIO) communication error. Returned to normal status, automatically recovered.

#### (3) Last Rack (1 bit setting)

In case of Last Rack, this switch set to "1" (ON).

## 7. Wiring



※terminal screw : M3

### 7.1. Wiring for power supply

- 1) The SI unit has two independent power supply terminals for solenoid valve and communication. Supply power (24V DC) to both power terminals respectively.
- 2) Set each wire to specified terminal respectively.

### **CAUTION**

The power supply can be used as either single or separate power supply, two systems of wiring are necessary.

### 7.2. Earth (FG : Frame Ground) terminal

- 1) The terminal FG of SI unit is an earth terminal. Please ground the third (earth resistance  $100\Omega$  or less) with special earth line (wire of  $2\text{mm}^2$  or more)
- 2) If the earth is shared with other equipment, contrary effect may occur. Do not share the terminal FG with other equipment as much as possible.

### 7.3. Wiring for Communication

- 1) Use a recommended communication cable of the Rockwell Automation.
- 2) In the communication cable wiring among master to SI unit, connect LINE1 to terminal L1, LINE2 to terminal L2 respectively.
- 3) In the communication cable wiring, connect the unit to the unit sequentially.
- 4) Connect a recommended shield cable with the terminal SHIELD of SI unit.

Type of Cable	Recommended Cable
Shielded, twisted pair (2-core)	Rockwell Automation No.1770-CD
	Belden Co., type 9463

- 5) If the SI unit is a final station of RIO/DIO in physical situation, ensure to connect the terminal resistor with terminal L1 and L2 of the SI unit. (Use a terminal resistor of 1/2W rating)

Communication speed (kbps)	Terminal Resistance value
57.6	150 $\Omega$
115.2	150 $\Omega$
230.4	82 $\Omega$

#### CAUTION

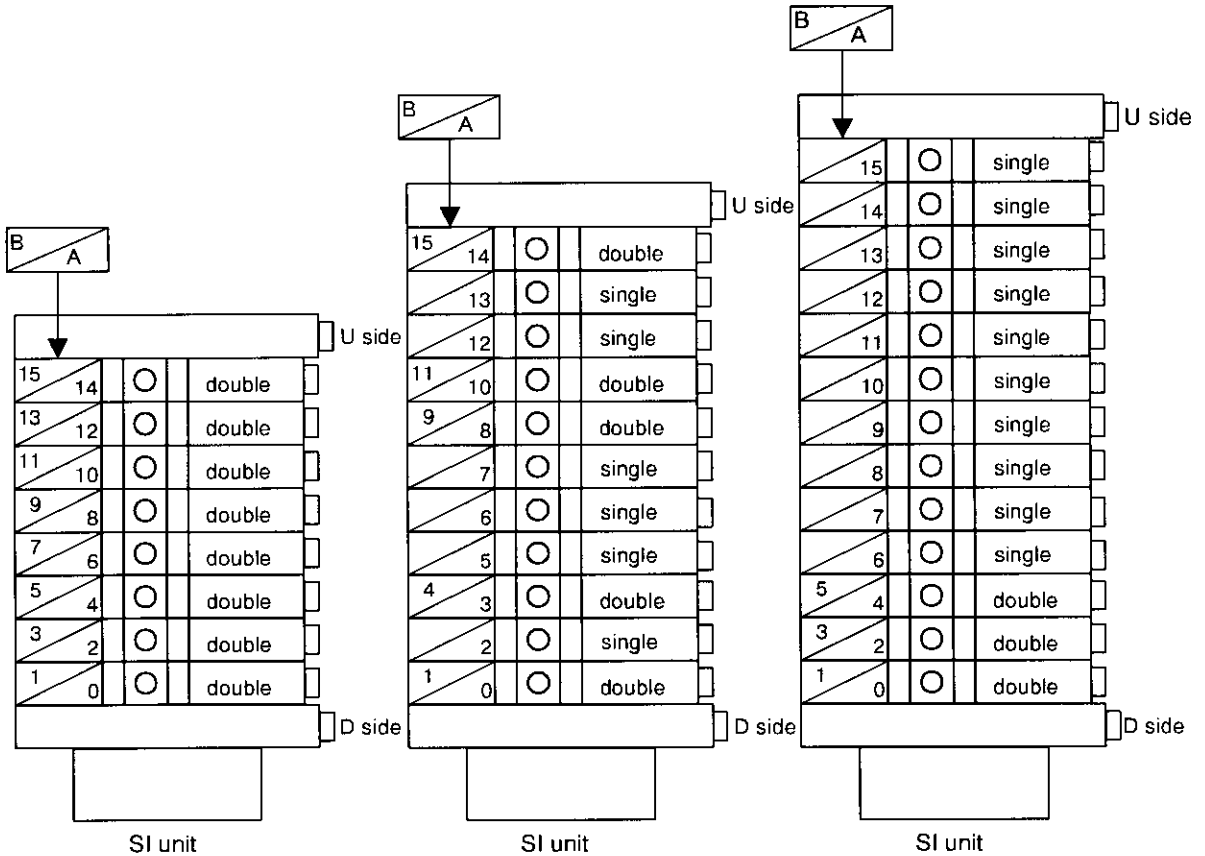
- Turn the power OFF in case of wiring operation.
- Set each wire to specified terminal respectively.

## 8. Output No. of the SI unit for manifold solenoid valve

### 8.1. Each type of manifold solenoid valve vs. output No. of SI unit

Output numbers of the SI unit toward manifold solenoid valve are shown like a following figure.

The SI unit has 16 points output (0 to 15).



ex1 : 8 stations double solenoid valve

ex2 : Single solenoid valve and Double solenoid valve are mixed