Panasonic®

PROGRAMMABLE CONTROLLER

FP Σ S-LINK Unit Technical Manual

FP Σ S-LINK Unit Manual
ARCT1F403E-1 '06.02

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Panasonic...the new name for NAiS

Matsushita Electric Works, Ltd.

Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safe.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assure in these specifications.
-Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock..
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection might cause abnormal exothermic heat or smoke generation
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on.

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Table of Contents

Special Precautions

This manual is the instruction manual for the FPΣ S-LINK unit.
For detailed formation on the S-LINK, refer to the “S-LINK Design manual and Construction manual” of SUNX Limited.

Differences between FP0 S-LINK control unit and FP2 S-LINK unit
The specifications of FP0 S-LINK unit is basically the same as FP2 S-LINK unit, however, the following specifications are different.
For detailed information, refer to various specifications and manuals.

	FPΣ S-LINK unit	FP0 S-LINK control unit (S-LINK communication part)	FP2 S-LINK unit
Wiring for S-LINK	Standard wiring	Standard wiring	Standard wiring Loop wiring
Fuse for S-LINK power supply	Can be replaced. (Tubular fuse: 5 m x 20 mm)	Cannot be replaced.	Cannot be replaced.
No. of I/O points setting (mode switch)	Following mode switches cannot be used. No. 1: 0 input point/ 64 output points No. 7: 64 input points/ 32 output points No. D: 96 input points/ 32 output points	Fixed at 64 input points/ 64 output points	All settings can be used.
RUN/CHK. selector switch MONITOR switch	Available	Not available	Available

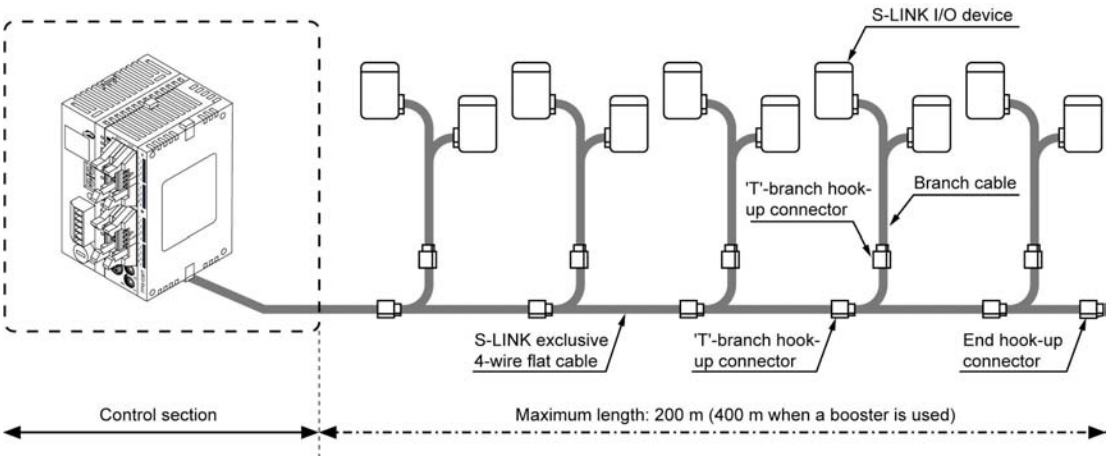
Chapter 1

Selecting the Right Equipment

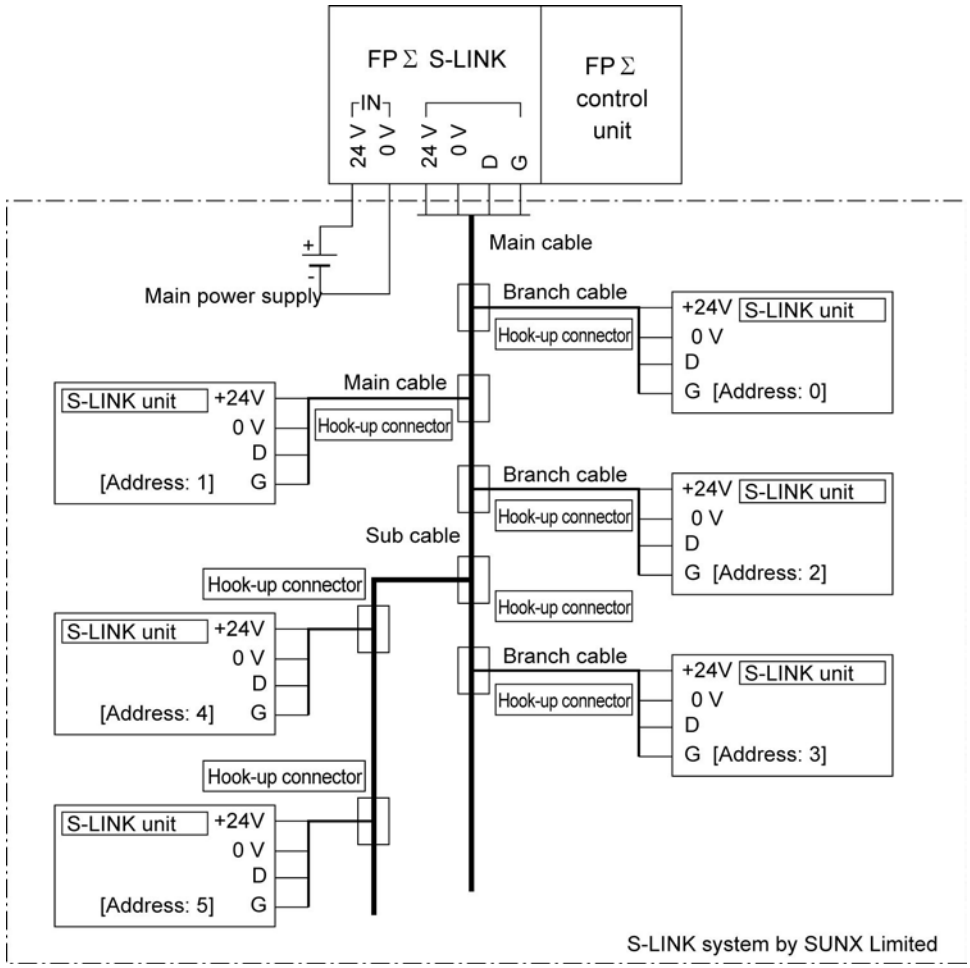
1.1 Features and Types

1.1.1 Features

Wiring is donw from the S-LINK unit using an S-LINK exclusive 4-wire flat cable and an end hook-up connector is connected at the end of the main cable. The maximum cable length is 200 meters (400 meters if a booster is used).



- The user may select combinations offering up to a total of 128 inputs and outputs.
- The inputs and outputs are handled by the program just like ordinary ones.
- The S-LINK system can be easily monitored by reading shared memory data.
- A board range of peripheral devices for the S-LINK enable easy ssytem configuration.



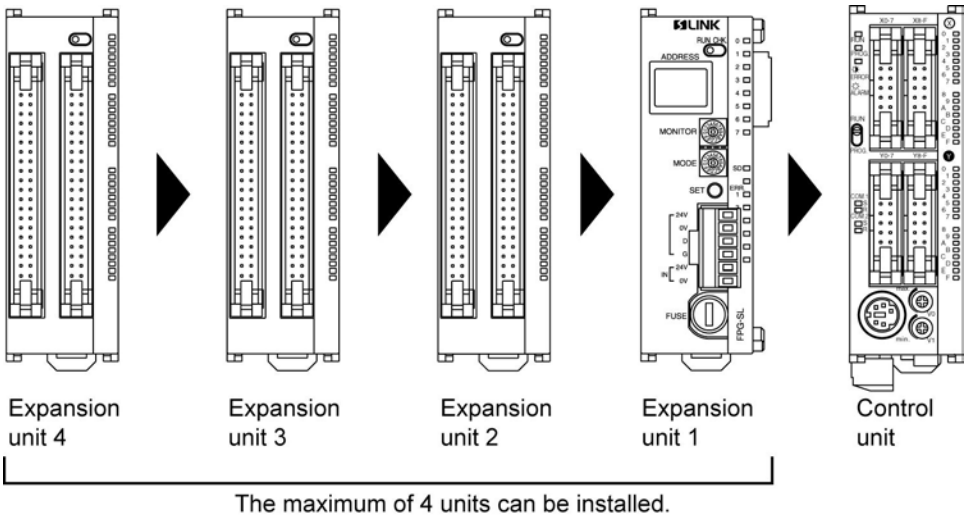
1.1.2 Types

Name	Internal function	Part No.	Product No.
FPΣ S-LINK unit	128 input/output points using S-LINK	FPG-SL	AFPG780

1.2 Restrictions

1.2.1 Installation Position of S-LINK Units

The maximum of 4 S-LINK units can be installed as expansion units in the position to the left of and adjacent to the FPΣ control unit.



No. of control I/O points

Types of control unit	No. of I/O points for control unit	No. of I/O points when FPΣ S-LINK unit is installed.
FPG-C32T2/FPG-C32T2TM Note1)	32 points	Max. 640 points Note2)
FPG-C28P2/FPG-C28P2TM	28 points	Max. 636 points Note2)
FPG-C24R2/FPG-C24R2TM	24 points	Max. 632 points

Note1) The FPΣ expansion unit cannot be fitted to the FPG-C32T or FPG-C32TTM.
Note2) It is the No. of points when 4 FPΣ S-LINK units have been installed.

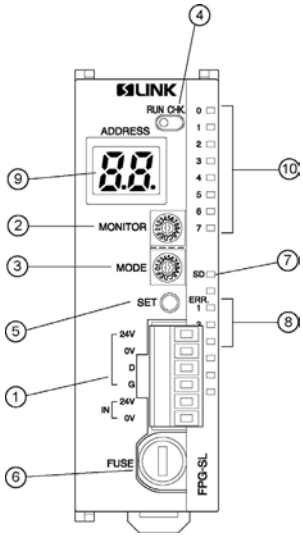
Key Point:
If the FP0 expansion unit and the FPΣ expansion unit are used together, the I/O points can be extended up to 640 points for the FPG-C32T2/FPG-C32T2TM.

Chapter 2

Specifications

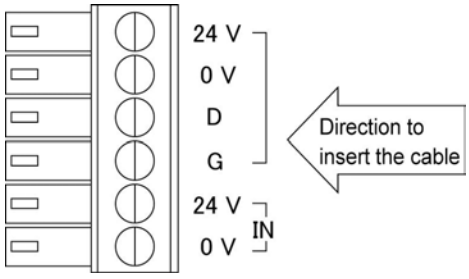
2.1 Parts Names and Functions

2.1.1 S-LINK Control Unit



① S-LINK terminal block

The power supply and signal wires of the S-LINK are connected to the terminal block.
The S-LINK terminal block is a connector type, and can be detached from the S-LINK unit for wiring operations.



Terminal block: MC1.5/6 ST-3.5
(made by Phoenix Contact Co.

No.	Terminal name		Color of connecting cable
1	Main cable	24 V	Brown
2		0 V	Blue
3		D	White
4		G	Black
5	External power supply input	24 V	
6		0 V	

Note: A [–] screwdriver is necessary for wiring.

② MONITOR switch

The display addresses of the I/O information for the "⑩ I/O indicators" (corresponding to the S-LINK device addresses) are specified in units of 8 points.

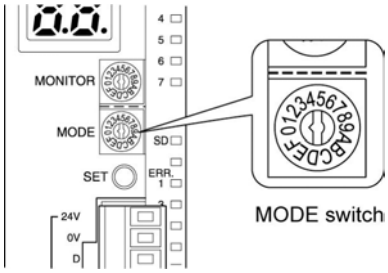
No.	Display address
0	0 to 7
1	8 to 15
2	16 to 23
3	24 to 31
4	32 to 39
5	40 to 47
6	48 to 55
7	56 to 63

No.	Display address
8	64 to 71
9	72 to 79
A	80 to 87
B	88 to 95
C	96 to 103
D	104 to 111
E	112 to 119
F	120 to 127

③ **MODE switch**

These are used to specify the number of input/output points for the S-LINK system (32, 64, 96 or 128 points). Set value is read only once, when the power supply to the FPΣ is turned on.

If the setting is changed after the power supply was turned on, E42 (I/O verify error) will occur in the control unit.



④ **RUN/CHK. selector switch**

Set to RUN: This is the normal operation mode.

Set to CHK.: This is the check mode (for detailed information, see ⑤ SET switch).

The following items can be confirmed using the SET switch.

When normal: The number of S-LINK devices that the FPΣ S-LINK unit recognizes as connected to it are displayed as a blinking display by the ⑨ ADDRESS display, and all of the addresses light in sequential order.

If an error occurs: All of the addresses for the S-LINK devices where errors have occurred are displayed in sequential blinking displays (when ERR4 occurs) by the ⑨ ADDRESS display.

Note:

After confirming the above items, always return the system to the operation mode (RUN) side.

⑤ **SET switch**

When the RUN/CHK. selector switch is set to RUN:

Pressing the SET switch reads the connection status for the S-LINK system and stores it in the memory. At this point, the number of the S-LINK devices is lighted for a given period of time by the ⑨ ADDRESS display (if the same address has been specified for more than one S-LINK device, it is counted as one S-LINK device). In subsequent operation, the FPΣ S-LINK unit checks for errors using the connection status registered at this time.

(The output unit data effective at the time that the SET switch was pressed is retained.)

When the RUN/CHK. selector switch is set to CHK.:

When normal: Each time the SET switch is pressed, the number of S-LINK devices which the S-LINK unit recognizes as connected to it is displayed as a blinking display by the ⑨ ADDRESS display, and all of the addresses light in sequential order, starting with the smallest (the display is repeated).

If an error occurs: Each time the SET switch is pressed, all of the addresses for the S-LINK devices where errors have occurred are displayed by the ⑨ ADDRESS display in a sequential blinking display, starting with the smallest (when ERR4 occurs).

Note:

If the RUN/CHK. selector switch is set to the RUN position and the SET switch is pressed while an error is in effect, only the number of S-LINK devices that can be confirmed at that point are stored in the memory. There is a possibility that S-LINK devices where the error has not been corrected will not be recognized (if this happens, they will not be a target for the check).

⑥ **Fuse**

A 8A-tubular fuse of 5 mm x 20 mm is used (provided as an accessory).
For the replacement, use a UL/CSA-approved time-lag type fuse.

⑦ **Transmission indicator (SEND)**

It blinks during communicating I/O data between each S-LINK device on the S-LINK system.
It is synchronized with the communication frames, so that the blinking cycle gets slow as the number of total I/O points is large.

⑧ **ERROR indicators**

These light if an error occurs in the S-LINK system.
ERR1 (Error 1): Short circuit between D-G line.
ERR3 (Error 3): Abnormal voltage level between D-G line.
ERR4 (Error 4): Broken wire or I/O S-LINK device error

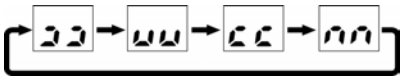
Note:

- If ERR1 (Error 1) lights (there is little possibility that ERR1 (Error 1) occurs by itself), the protective function which guards against a short-circuit between D and G has been activated.
  To cancel the protective function, turn off the power supply to the S-LINK, and then repair the cause of the short-circuit. (The short-circuit protective function is maintained as long as the power supply to the S-LINK is on.)
- If the power supply to the S-LINK is turned off, ERR1 (Error 1) and ERR3 (Error 3) light.
- ERR4 (Error 4) is maintained after repairing. To cancel this error, either turn the power supply to the FPΣ off and then on again, or press the SET switch to reset it when the RUN/CHK. selector switch is set to the RUN position, or turn the power supply to the S-LINK off and then on again.
- If the signal line is broken or the power supply to the booster is cut off, errors occur on more than one I/O S-LINK devices.

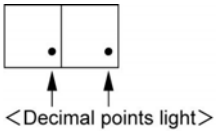
⑨ **ADDRESS display (2-digit hexadecimal display)**

This displays the transmission status, the number of connected S-LINK devices, and the addresses of the various S-LINK devices. (Refer to "④ RUN/CHK. selector switch" and "⑤ SET switch".

During normal transmission:
The "3 3" shaped character rotates in the clockwise direction.



If an error occurs:
This displays an abnormal address number. In case faults occur on several I/O S-LINK devices, the decimal pints light up, and the smallest error address of the S-LINK device which the error occurs is displayed.



⑩ I/O indicators

The on/off status of the various S-LINK system addresses are displayed in units of eight points. The address to be displayed is selected using the ② MONITOR switch.

[Displayed addresses]

I/O	MONITOR switch number															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
1	1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121
2	2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122
3	3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123
4	4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124
5	5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125
6	6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126
7	7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127

Note:

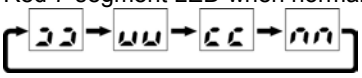
If you display a non-existent unit address (one that is greater than the total number of I/O), an arbitrary number appears.

2.2 Specifications

2.2.1 General Specifications

Item	Specifications
	S-LINK unit
Ambient operating temperature	0 to +55 °C
Ambient storage temperature	-20 to +70 °C
Ambient operating humidity	30 to 85%RH (at 25 °C non-condensing)
Ambient storage humidity	30 to 85%RH (at 25 °C non-condensing)
Breakdown voltage	500 V AC between S-LINK terminal block and power supply terminal/function earth, for 1 minute (Cutoff current: 10 mA, excluding protective varistor)
Insulation resistance	100M Ω or more between S-LINK terminal block and power supply terminal/function earth (measured with a 500 V DC megger testing)
Vibration resistance	10 to 55 Hz, 1 cycle/min, double amplitude of 0.75 mm, 10 min on X, Y and Z directions
Shock resistance	98 m/s^2 , 4 times on X, Y and Z directions
Noise immunity	1000 Vp-p with pulse widths 50 ns and 1 μs (with noise simulator)
Operating conditions	Free from corrosive gases and excessive dust
Current consumption	100 mA max. (Inside: 5 V DC)
Weight	Approx. 85 g

2.2.2 S-LINK Controller Specifications

Item		Specifications
		S-LINK unit
No. of channels		1
No. of input/output points		128 points max.
		The number of input and output points can be selected for each channel, using the switch on the main unit. Input: 0/32/64/96/128 points Output: 0/32/64/96/128 points (16-point input and 16-point output also possible)
Rated power supply voltage		+24 V DC ± 10%/Allowable ripple P-P ± 10% max. (Supplied from IN-24V, IN-0V of the S-LINK terminal block)
Current consumption Note1)		[S-LINK controller current consumption (including D-G line current consumption)] + 24 V DC 1.6 A max.
		[Maximum current which can be supplied (supplied to S-LINK devices and I/O devices form 24 V-0 V line)] +24 V DC 7A (fuse: 8A)
Transmission method		Bi-directional time-divided multiple signal transmission
Synchronization method		Bit synchronization, frame synchronization
Transmission protocol		S-LINK protocol
Baud rate		28.5 kbps
Transmission distance Note2)		128 I/O signals can be transmitted over a pair of wires up to a distance to 200 m max. (400 m when a booster is used)
FAN-out Note2)		320
Connection method		'T'-branch multi-drop wiring or multi-drop wiring (+24 V/0 V/D-G line [function provided to protect again short-circuiting between D-G line])
Interface with FP2 CPU Note3)		Common memory system Reading possible through F150 instruction: writing possible through F151 instruction FPΣ expansion 1: Slot No. 0 FPΣ expansion 2: Slot No. 1 FPΣ expansion 3: Slot No. 2 FPΣ expansion 4: Slot No. 3
Display indicators	**Transmission indicator**	Green LED blinks in response to synchronization signals
	Error indicators	Red LED light up depending on the error
	Address display	Red 7-segment LED when normal:  If error occurs: Error address display (hexadecimal) lights. In RUN mode: No of S-LINK devices connected flashes when SET switch is turned on. In CHK. mode: Recognized address or address where error occurred flashes when system SET button is turned on.
	I/O (on/off) indicators	Green LED On/off conditions of S-LINK devices are displayed in units of 8 points. The address to be displayed are selected by the monitor switch.

Note1) For detailed information on current consumption, refer to "Determining the Power Supply Capacitance" in the S-LINK Instruction Manual of SUNX Limited.

Note2) For information on the booster and FAN-out, refer to the S-LINK Instruction Manual of SUNX Limited.

Note3) The number of input and output points is automatically reflected in input X and output Y.

Chapter 3

I/O Assignments

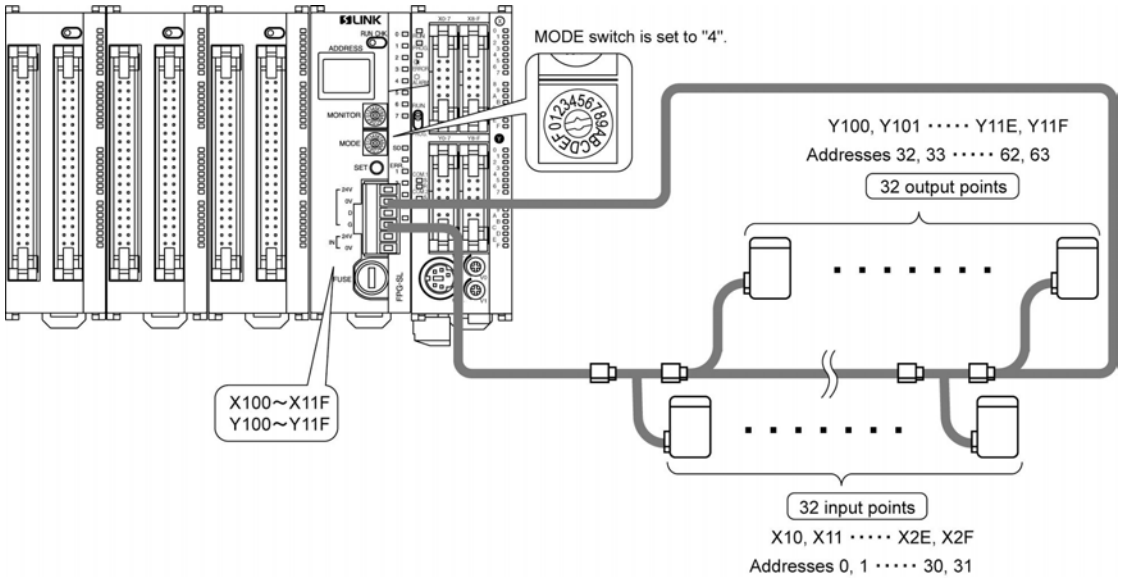
3.1 An Overview of I/O Allocation

3.1.1 Overview

The S-LINK unit, like other I/O units, uses inputs (X) and outputs (Y).
The inputs/outputs on the FPΣ side are treated as corresponding to the I/O addresses (S-LINK devices) in the S-LINK.

3.1.2 Example of I/O Number and S-LINK Addresses

The illustration below shows an example of the relationship between the addresses in the S-LINK I/O device and the addresses allocated to the S-LINK unit.



Contents of the illustration:
Control unit, S-LINK unit installed beside it.
I/O numbers allocated to the S-LINK unit are X100 to X11F (32 points) and Y100 to Y11F (32 points) according to the I/O allocation of the FPΣ expansion unit.
Addresses on the S-LINK are input (0 to 31) and output (32 to 63).

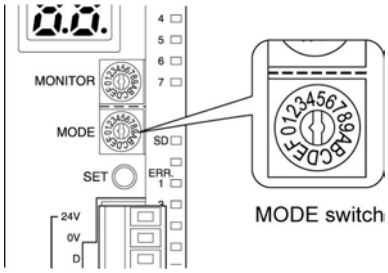
Note:

- Setting contents selected with the I/O setting switch are read only the one time, when the power supply to the FPΣ is turned on.
- For detailed information pertaining to the S-LINK, refer to the “S-LINK Instruction Manual” of SUNX Limited.

3.2 Specifying the Number of Input/Output Points

3.2.1 How to Specify the Number of Input/Output Points

The number of input points and number of output points for the S-LINK are specified using the MODE switch.
The number can be selected as shown in the table below.



No.	FPΣ		S-LINK		No. of input points	No. of output points	Total No. of points
	Input [No. of points]	Output [No. of points]	Input address	Output address			
0	– [0]	Y(n)0 to Y(n+1)F [32]	–	0 to 31	0	32	32
1	– [0]	Y(n)0 to Y(n+3)F [64]	–	0 to 63	0	64	64
2	– [0]	Y(n)0 to Y(n+7)F [128]	–	0 to 127	0	128	128
3	X(n)0 to X(n+1)F [32]	– [0]	0 to 31	–	32	0	32
4	X(n)0 to X(n+1)F [32]	Y(n)0 to Y(n+1)F [32]	0 to 31	32 to 63	32	32	64
5	X(n)0 to X(n+1)F [32]	Y(n)0 to Y(n+3)F [64]	0 to 31	32 to 95	32	64	96
6	X(n)0 to X(n+3)F [64]	– [0]	0 to 63	–	64	0	64
7	X(n)0 to X(n+3)F [64]	Y(n)0 to Y(n+1)F [32]	0 to 63	64 to 95	64	32	96
8	X(n)0 to X(n+3)F [64]	Y(n)0 to Y(n+3)F [64]	0 to 63	64 to 127	64	64	128
9	X(n)0 to X(n+7)F [128]	– [0]	0 to 127	–	128	0	128
A	– [0]	Y(n)0 to Y(n+5)F [96]	–	0 to 95	0	96	96
B	X(n)0 to X(n+1)F [32]	Y(n)0 to Y(n+5)F [96]	0 to 31	32 to 127	32	96	128
C	X(n)0 to X(n+5)F [96]	– [0]	0 to 95	–	96	0	96
D	X(n)0 to X(n+5)F [96]	Y(n)0 to Y(n+1)F [32]	0 to 95	96 to 127	96	32	128
E	X(n)0 to X(n)F [16]	Y(n)0 to Y(n)F [16]	0 to 15	16 to 31	16	16	32
F	X(n)0 to X(n+7)F [128]	– [0]	0 to 127	–	128	0	128

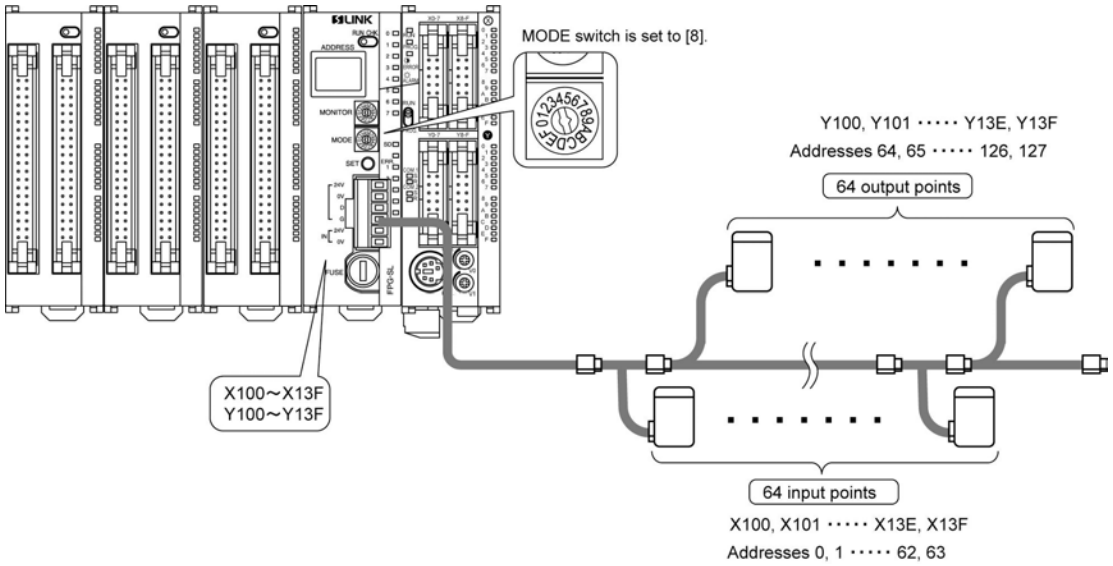
Note:

- No. 1, No. 7 and No. D cannot be used. If they are set, an error (E34: I/O status error) occurs in the control unit.
- I/O numbers are determined based on the position of the slot used for installation.
- If the MODE switch is changed during the operation, an error occurs in the FPΣ control unit.
- The contents of the settings for No. 9 and No. F are the same (either one may be selected).

3.2.2 Examples of Settings

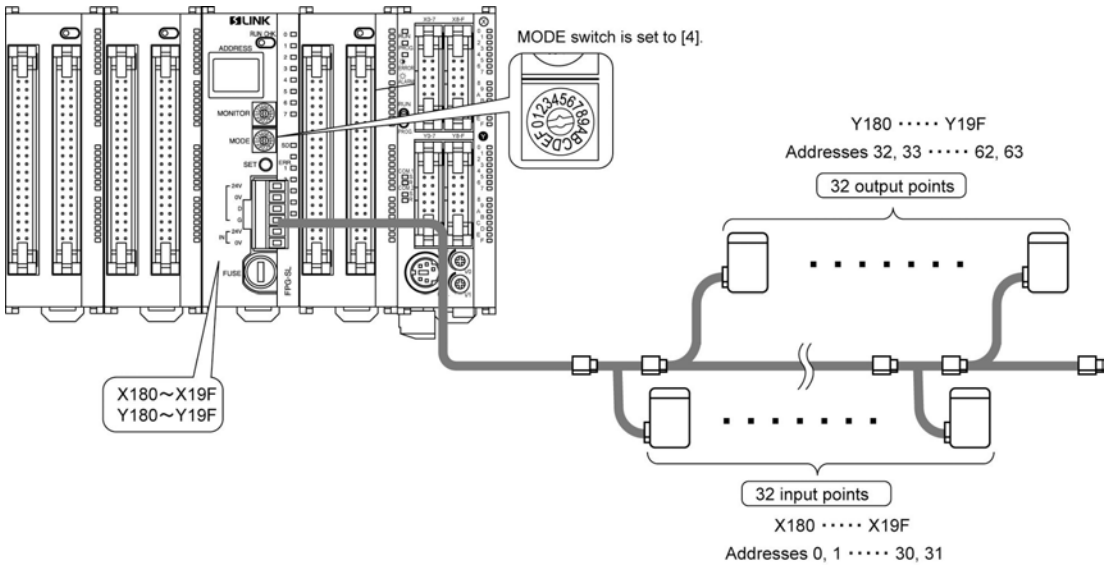
Example 1

S-LINK unit has been installed next to the control unit, and the MODE switch has been set to [8].



Example 2

Another unit has been installed between the S-LINK unit and the control unit, and the MODE switch has been set to [4].



3.3 Allocating I/O Numbers

3.3.1 I/O Allocation

Unit type	No. of allocation	Expansion unit 1 Slot 0	Expansion unit 2 Slot 1	Expansion unit 3 Slot 2	Expansion unit 4 Slot 3
FPΣ S-LINK unit	Input	X100 to X17F	X180 to X25F	X260 to X33F	X340 to X41F
	Output	Y100 to Y17F	Y180 to Y25F	Y260 to Y33F	Y340 to Y41F

- The number of I/O points that can be actually used is depending on the setting of the MODE switch.


Reference: <3.2.1 How to Specify the Number of Input/Output Points>

Chapter 4

Construction and Wiring

4.1 Wiring Methods

4.1.1 Type of Wiring for S-LINK

The FPΣ S-LINK unit does not support a loop wiring.
For detailed information, refer to the “S-LINK Instruction Manual” of SUNX Limited.

4.1.2 S-LINK Main Unit

The wires noted below should be used. We recommend using the appropriate screwdriver to tighten the wiring. Tightening torque should be 0.22 to 0.25N-m (2.3 to 2.5 kgf-cm).

- Suitable wires (strand wires)

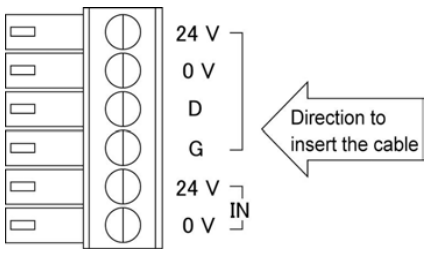
Size	Nominal cross-section area
AWG #20 to 16	0.5 to 1.25 mm^2

- S-LINK exclusive flat cable (SL-RCM100, SL-RCM200 made by SUNX Limited.)
  Conductor’s area: 0.5 mm^2, 4 wires, External diameter: ϕ2.5 mm x 4
- S-LINK exclusive cab-tire cable (SL-CBM100, SL-CBM200 made by SUNX Limited.)
  Conductor’s area: 0.5 mm^2, 4 wires, External diameter: ϕ2.5 mm x 4
- Exclusive tool (blade width 0.4 x 2.5) (Product No. AFP0806)

Manufacturer	Model No. (Product No.)
Phoenix Contact Co.	SZS0.4 x 2.5 (1205037)

Reference:
For the details on the suitable wires and exclusive tool, <S-LINK Instruction Manual> of SUNX Limited.

Standard wiring
The power supply and the signal line for the S-LINK are connected.
As the S-LINK terminal block is a connector type, it can be removed from the S-LINK unit for wiring.



Terminal block: MC1.5/6-ST-3.5 (Phoenix Contact Co.)

No.	Terminal name		Color of connecting cable
1	Main cable	24 V	Brown
2		0 V	Blue
3		D	White
4		G	Black
5	External power supply input	24 V	
6		0 V	

Note:
- A “–“ flathead screwdriver is necessary for wiring.

4.2 S-LINK Main Power Supply

4.2.1 Role and Connection of S-LINK Main Power Supply

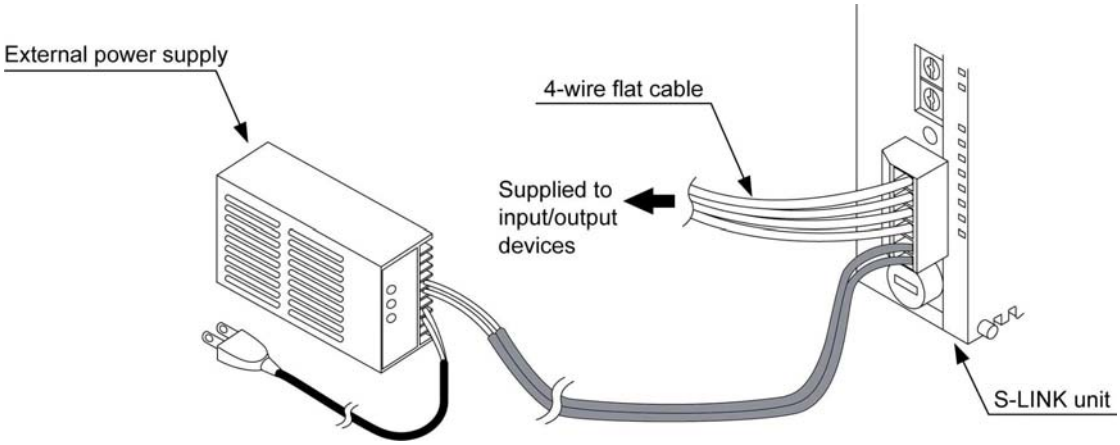
Role

In order to supply power to the various S-LINK devices, an external power supply must be connected to the S-LINK unit and power supplied through that source.

- This is the power supply for the S-LINK controller in the S-LINK unit and S-LINK I/O devices to which power is supplied through the 24 V - 0 V line of the S-LINK main cable.
- The current consumption for the overall S-LINK system is calculated by referring to the section entitled “Determining the Power Supply” in the “S-LINK Instruction Manual” of SUNX Limited. (For standard purposes, a power supply exceeding 24 V DC, 1.6 A should be selected.)

Connection

The power supply is connected to “IN 24 V - 0 V” on the S-LINK terminal block.



Note:

- The S-LINK is protected by a fuse, but if too many input/output devices are connected, or if the current consumption is heavy enough to cause the fuse to blow, we recommend providing a local power supply.

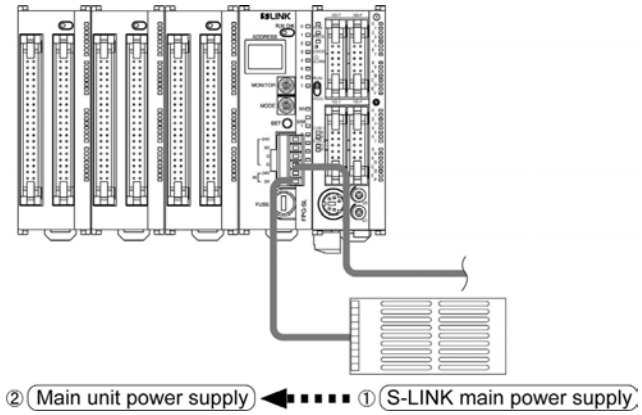
Chapter 5

Starting and Ending Operations

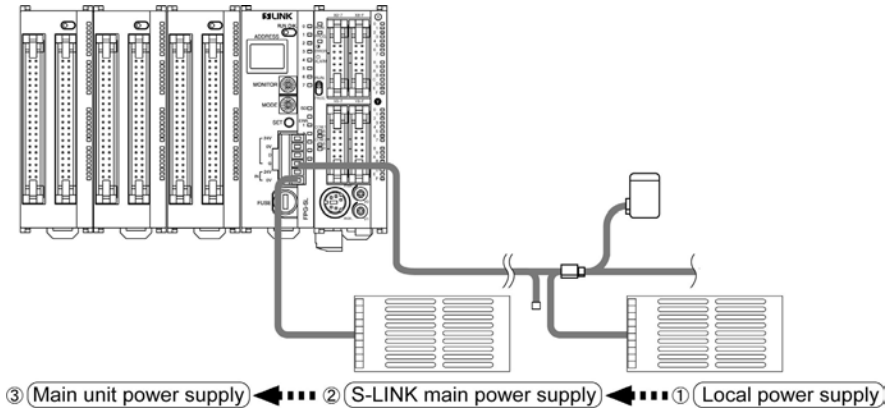
5.1 Sequence and Timing for Turning Power Supply On

5.1.1 Sequence

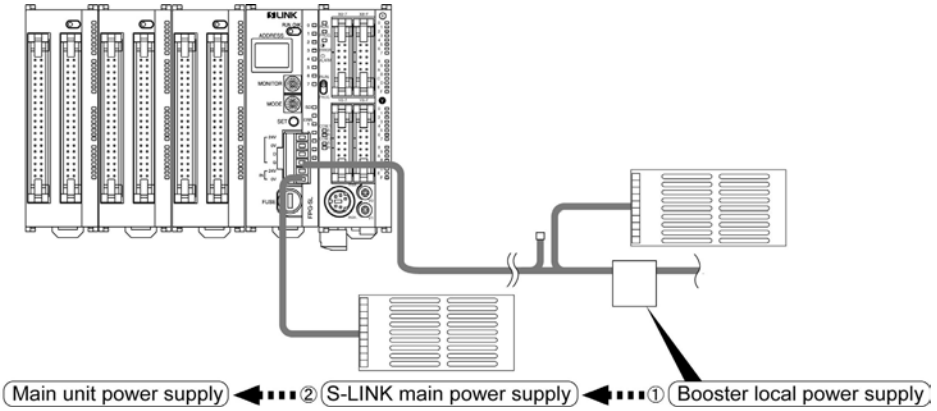
- When starting up the power supply for the FPΣ, always turn on the power supply for the S-LINK first or turn both power supplies on at the same time.



- When a local power supply is being used for connected devices and for S-LINK devices, always turn on the local power supply first or turn it and the power supply for S-LINK on at the same time.



- When the booster SL-BS1A is used with the local power supply, always turn on the power supply for the booster SL-BS1A first or turn it and the power supply for S-LINK on at the same time.



5.2 Sequence of Turning Off Power Supplies

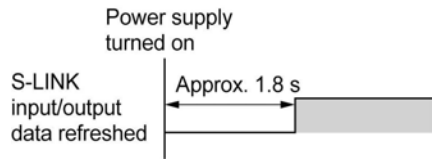
- When ftuning off the power supply to the main unit (FPΣ), always turn off the main unit power supply before turning off the S-LINK main power supply.
- If using a local power supply, always turn off the power supplies in the following sequence: main unit → S-LINK main power supply → local power supply (or turn off the main unit → S-LINK main and local power supplies at the same time).
- If using the booster local power supply, turn off the power supplies in the following sequence: main unit → S-LINK main power supply → booster local power supply (or turn off the main unit → S-LINK main and booster local power supplies at the same time).

Note:

- When turning off the power supplies, any S-LINK devices being run from a local power supply will stop operating when the local power supply is turned off, and this causes a disconnection error.

5.3 Timing

After the power supply for the FPΣ system is turned on, with the external power supply for the S-LINK already on, it takes approximately 1.8 seconds for the S-LINK input/output data to be refreshed.
A timer or similar device should be used to boot the program, so that the program boots after the data has been refreshed. Make sure an adequate time period is taken into consideration, allowing time after booting the system for S-LINK input to pass through the b contact, and other operations to be completed.



Note:

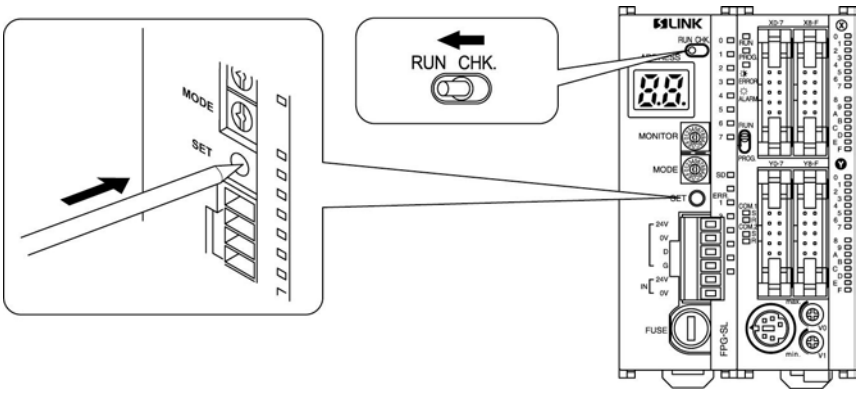
- Make sure an adequate time period is taken into consideration, allowing time after booting the system for S-LINK input to pass through the b contact, and other operations to be completed.

5.4 S-LINK Device Address Recognition

5.4.1 Recognizing the Address

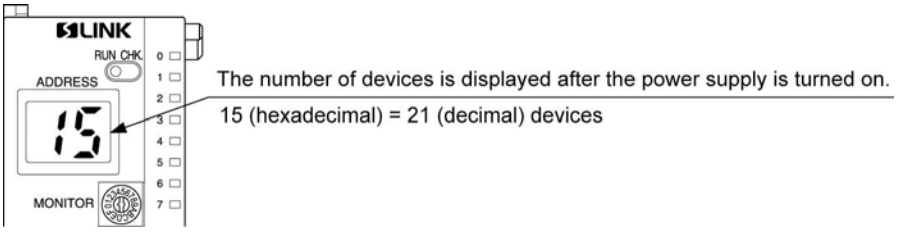
When an S-LINK unit is being used for the first time, the connection status for the S-LINK system must be recognized.
Once the connection status has been recognized, it does not have to be done again each time the system is started up, but the operator must make sure that recognition has been carried out the first time that the S-LINK unit is used. Following the procedure noted below, check to make sure that recognition has been carried out.

How to recognize the address
Set the RUN/CHK. selector switch on the S-LINK unit to the “RUN” position.
If the S-LINK system is being operated for the first time, turn on the power supply and then press the system SET button.



Explanation
When the system SET button is pressed, the number of connected devices recognized by S-LINK unit blinks on the address display in hexadecimal (HEX.) number, and then, a “ ” shaped character rotates in the clockwise direction.
If the actual number of connected devices differs from the number displayed above, since an unrecognized S-LINK I/O device exists, check for address overlapping, incorrect connection, etc..

Note:
When the booster is connected, even if the address of the booster is recognized, it is not included in the number of connected devices.



Note:

- Do not used pointed objects such as needles, or breakable objects such as mechanical pencil lead, to press the system SET button.
- If address recognition is performed first, the information is stored in EEPROM. There is thus no need to press the system SET button each time the power is turned on.
- Turning on the flag in the shared memory enables to perform the equivalent operation of the system SET button.

Reference: <6.1.2 Shared Memory Addresses>

System SET button

- When the power supply is switched on for the fist time after completing the wiring of S-LINK system, an arbitrary error display may appear. This does not indicate any abnormal operation. (If the system SET button is pressed, this display is erased.)
- If an error address is displayed during normal use of the device, do not press the system SET button. Pressing the system SET button causes the check of that address to be skipped during subsequent checking operations.

What to do if an error occurs

Check the address that is displayed, and then turn off the power supply. Take whatever steps are necessary to correct the error for that address (correct settings and connections) and then turn on the power supply again.

5.4.2 Results and Processing of Address Recognition

If there are no problems

The displayed numeric value matches the actual number of S-LINK I/O devices that are connected to the S-LINK system. Operation of the FPΣ can now be begun.

Explanation

The connection status that is recognized is stored in the EEPROM in the S-LINK unit. After this, it will not be necessary to press the system SET button when the power supply is turned on.
Checking for errors in the S-LINK during operation will be carried out based on the connection status stored in the memory at this time.

If there is a problems

The displayed numeric value does not match the actual number of S-LINK I/O devices that are connected to the S-LINK system.

Explanation

There is a S-LINK I/O device that has not been correctly recognized.
Turn off the power supply and check carefully for erroneous connections, and to make sure none of the addresses specified for S-LINK I/O devices have been duplicated.
For information on connections and on specifying addresses, refer to the “S-LINK Instruction Manual” of SUNX Limited.

After the error is corrected

Carry out the steps described in “Recognizing the Address”.

Reference: <5.4.1 Recognizing the Address>

5.5 Cofirming Connected Units

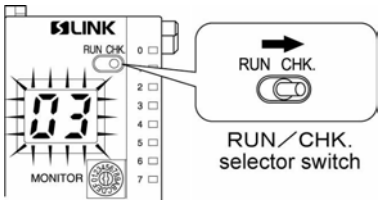
5.5.1 Confirming All Recognized Addresses

When the procedures of address recognition for S-LINK devices are completed, the user can confirm the addresses of the S-LINK I/O devices that have been recognized.
This is useful in preventing problems such as erroneous settings where the same address may have been allocated to two or more S-LINK I/O devices.

Note:
If the same address is assigned to multiple devices, the S-LINK I/O devices will be recognized as a single device.

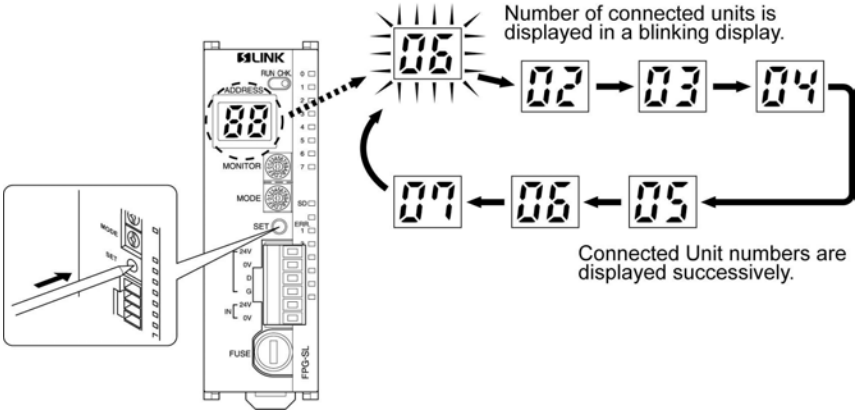
Procedure

1. Set the RUN/CHK. selector switch to the “CHK.” position.
   The S-LINK unit switches to check (CHK.) mode.
   The number of recognized connected devices blinks.
   (At this time, even if booster is connected, it is not included in the number of connected devices.)



2. Press the system SET button.
   The smallest of the recognized addresses is displayed. After this, each time the system SET button is pressed, the recognized addresses are displayed successively in the ascending order. (only the first set address in case of multi-channel S-LINK I/O devices)
   After the last recognized address is displayed, the number of recognized connected devices is displayed once again, and then, the display of the addresses is repeated. Further, by pressing the system SET button continuously for some time, the recognized addresses can be displayed successively.

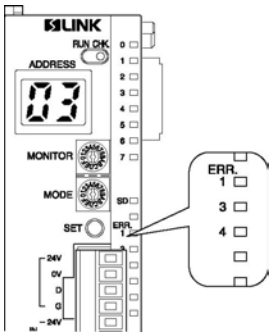
[Example]



Note:
After confirmation has been made, always set the RUN/CHK. selector switch back to the “RUN” position. The display reverts to the normal “ ” display.

5.5.2 Confirming All Addresses Where Errors Have Occurred

When the ERROR 4 indicator illuminates (a wire is broken or a problem has occurred in an S-LINK I/O device), you can check the address of the S-LINK I/O device where the error has occurred.

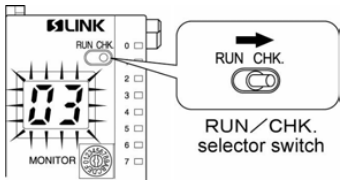


Reference:

For an explanation of the contents of the address display, <7.2.2 Judging Error Displays (When Numbers are Displayed)>

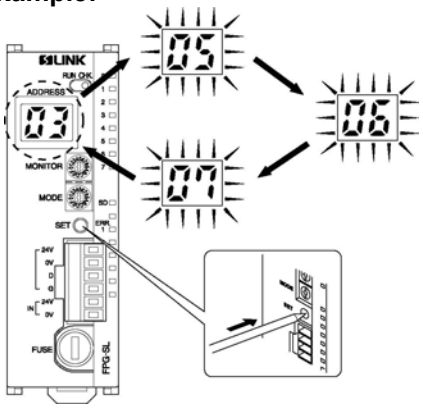
Procedure

1. Set the RUN/CHK. selector switch to the “CHK.” position.
   The S-LINK unit switches to check (CHK.) mode.



2. Press the system SET button.
   Each time the system SET button is pressed, the addresses of the S-LINK I/O devices where a fault has occurred blink sueccessively.

Example:



Note:

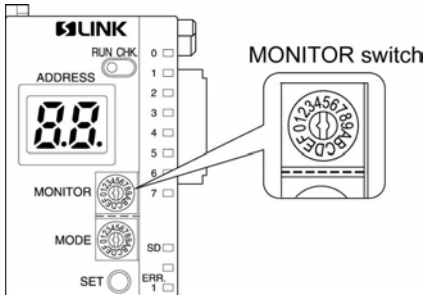
After confirmation has been made, always set the RUN/CHK. selector switch back to the “RUN” position.

5.5.3 Confirming the On/Off Status of Addresses

It is possible to confirm the on/off status of the various addresses in the S-LINK.

Procedure

1. Using the MONITOR switch, select the numeric value where the address to be confirmed is stored.



As shown in the table below, eight addresses are assigned to each numeric value on the MONITOR switch, in sequential order. Select the numeric value that includes the address to be confirmed.

[Displayed addresses]

I/O indicator	MONITOR switch number															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
1	1	9	17	25	33	41	49	57	65	73	81	89	97	105	113	121
2	2	10	18	26	34	42	50	58	66	74	82	90	98	106	114	122
3	3	11	19	27	35	43	51	59	67	75	83	91	99	107	115	123
4	4	12	20	28	36	44	52	60	68	76	84	92	100	108	116	124
5	5	13	21	29	37	45	53	61	69	77	85	93	101	109	117	125
6	6	14	22	30	38	46	54	62	70	78	86	94	102	110	118	126
7	7	15	23	31	39	47	55	63	71	79	87	95	103	111	119	127

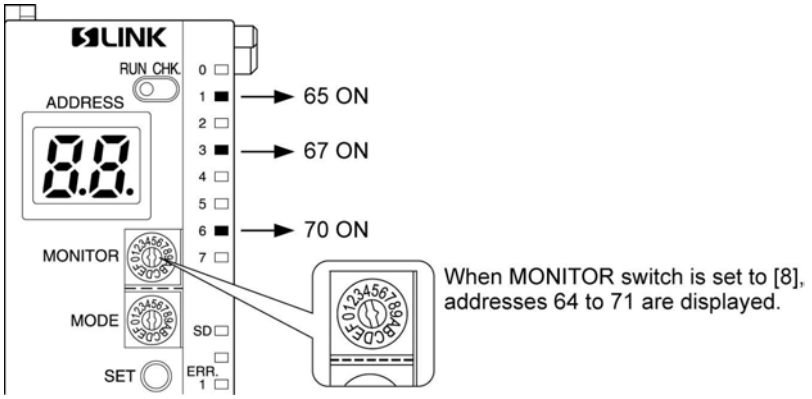
Note:

If you display a non-existent unit address (one that is greater than the total number of I/O points selected with the MODE switch), an arbitrary number appears.

2. Check to see which segments of the I/O display on the front of the unit are lighted.

Based on the above table, the on/off status of addresses can be confirmed in units of eight points.

Example:



Chapter 6

Shared Memory

6.1 Configuration of the Shared Memory

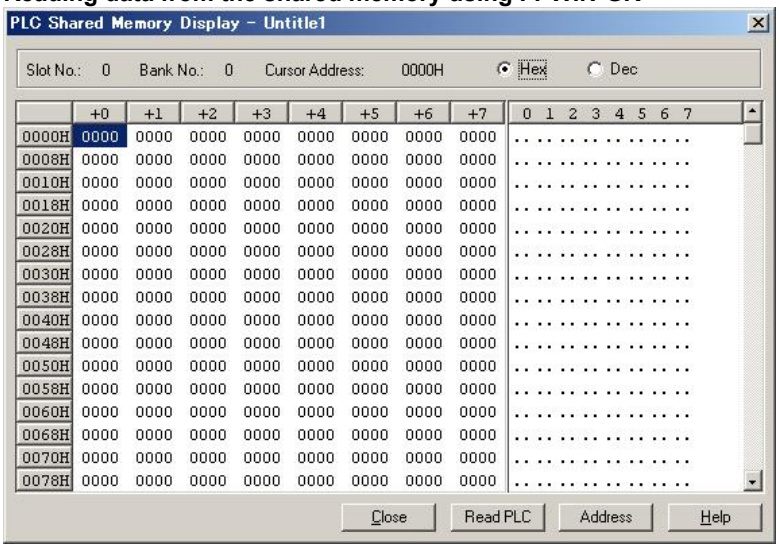
6.1.1 Shared Memory

The S-LINK is equipped with an internal shared memory that enables data to be read from and written to the control unit.

Function of the shared memory

Information such as the detection of unit (S-LINK device) addresses where errors occur, when they occur, and the number of S-LINK devices connected to the S-LINK system is stored in the memory. Data can be read from and written to the control unit using high-level instructions.

Reading data from the shared memory using FPWIN-GR



Reading data from the shared memory using the program

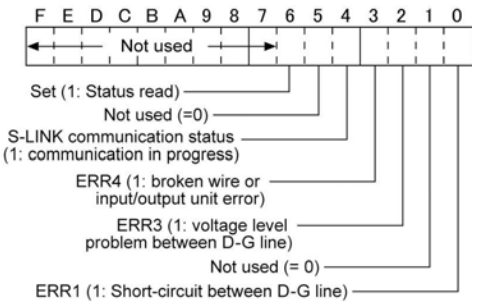
Reading from and writing to the FPΣ control unit can be carried out using [F150: Data read from intelligent unit (READ)] and [F151: Data write into intelligent unit (WRT)]

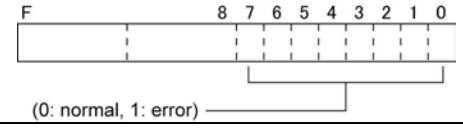
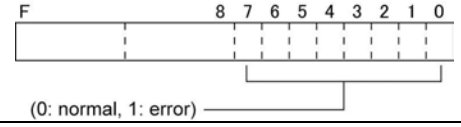
Configuration of shared memory in S-LINK A: Available N/A: Not available

Address	Allocation	Read	Write
H0	Control flag/error flag	A	A
H1	No. of units where error occurred	A	N/A
H2	No. of units connected	A	N/A
H3	Total No. of inputs/outputs	A	N/A
H4	No. of input points	A	N/A
H5	No. of output points	A	N/A
H6	System setting	A	A
H7	Confirmation of communication frame	A	A
H8 to HF	Units where error occurred (for 128 units)	A	N/A
H10 to H17	Connected units (for 128 units)	A	N/A
H18	Error address for booster SL-BS1A	A	N/A
H19	Connection address for booster SL-BS1A	A	N/A
H1A to H7F	Not used	–	–

6.1.2 Shared Memory Addresses

Configuration of shared memory in S-LINK

Address	Allocation	No. of words	Set value	Read	Write
H0	**Control flag/ Error flag**	**1**	Indicates S-LINK unit control and error contents.  • If bit 0 (ERR1) = 1, the protective function that guards against a short-circuit between D – G line has been triggered. To cancel the short-circuit protective function, turn off the power supply to the S-LINK, correct the cause of the short-circuit, and re-boot the unit (the short-circuit protective function continues to be active as long as the S-LINK power supply is on.) • If the S-LINK power supply is off, bit 0 (ERR1) and bit 2 (ERR3) = 1. • Bit 3 (ERR4) = 1 is retained. To cancel it, the FPΣ power supply must be turned off and then on again (or the system SET button pressed and reset). Or turn on the S-LINK power supply again. • If communication is in progress, bit 4 (S-LINK communication status) is “1”. • Bit 6 (Set) has the same function as the system SET button on the main unit and the system set of the shared memory address H6. If “1” is written for this bit, the S-LINK connection status at that points is read. This bit automatically returns to “0” after the connection status has been read.	A	A
H1	**No. of units where error occurred**	**1**	This indicates the target number of connected devices if ERR4 (Error 4) occurs.	A	N/A
H2	**No. of units connected**	**1**	This indicates the number of S-LINK I/O devices connected to the S-LINK unit.	A	N/A
H3	**Total No. of inputs/outputs**	**3**	The total number of input and output points, the number of input points, and the number of output points specified using the MODE switch are input. A numeric value of 0, 16, 32, 64, 96 or 128 points is input.	A	N/A
H4	**No. of input points**				
H5	**No. of output points**				

Address	Allocation	No. of words	Set value	Read	Write
H6	**System setting**	**1**	This has the same function as the SET switch of address H0, bit 6 (Set). If “1” is written for this bit, the S-LINK connection status at that point is read. This bit automatically returns to “0” after the status has been read.	A	A
H7	**Confirmation of communication frame**	**1**	If there is consecutive and different output to the same address, if the following data is written to the address before the output data previously written to that address is transferred to the S-LINK output unit, the earlier data is ignored. The confirmation made after the communication frame has been completed is used to check whether the output data has been transferred to the S-LINK output unit. If any numeric value other than “0” is written after the output data has been written, the value automatically becomes “0” after the output data has been transferred to the S-LINK output unit. Checking to make sure that the value has been changed to “0” in the program and then writing the next output data prevents errors in the transmission of output data.	A	A
H8 to HF	**Units where error occurred (for 128 units)**	**8**	If ERR4 occurs, this indicates the address of the S-LINK I/O device that is the target of the error. If one of the bits is “1”, ERR4 (broken wire or input/output unit error) has occurred at that address. (Refer to Connection Unit Address Quick Reference Table.)	A	N/A
H10 to H17	**Connected units (for 128 units)**	**8**	This indicates the address of S-LINK I/O device connected to the S-LINK system. If one of the bits is “1”, an S-LINK I/O device is connected at that address. (Refer to Connection Unit Address Quick Reference Table.)	A	N/A
H18	**Error address for booster SL-BS1A**	**1**	Indicates the booster address where the error occurred. 	A	N/A
H19	**Connection address for booster SL-BS1A**	**1**	Indicates the booster address connected to the S-LINK system. 	A	N/A
H1A to H7F	**Not used**	**-**	-	-	-

Error address quick reference table

If “1” is written for a bit, ERR4 has occurred at that address.

Bit / Address	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H8	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
H9	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
HA	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
HB	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
HC	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
HD	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
HE	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
HF	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112

(Bit 1: error, 0: normal)

Connection unit address quick reference table

If “1” is written for a bit, an S-LINK I/O device is connected at that address.

Bit / Address	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
H10	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
H11	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
H12	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
H13	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
H14	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
H15	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
H16	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
H17	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112

(Bit 1: connected, 0: not connected)

Note:

If the same address is set for two S-LINK devices, they will be counted as one S-LINK device.

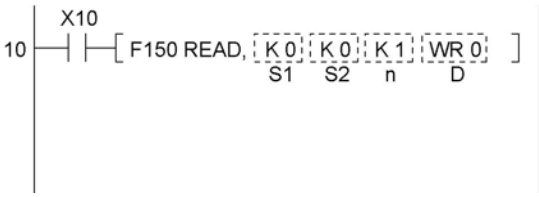
6.2 Shared Memory Reading Program

6.2.1 High-level Instruction to be Used

The high-level instruction “F150” is used to read data from the shared memory in the S-LINK unit. For specific information on using the instruction, refer to the “FP series Programming Manual”.

F150 (READ)

These instructions are used to read data from the memory of the intelligent unit.



Types of memory areas that can be specified (specified in word units)
(A: Available N/A: Not available)

		WX	WY	WR	WL	SV	EV	DT	LD	FL	I0 to ID	Constant		Index modifier
												K	H	
S1	**Slot No. specification**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
S2	**First address to be read from intelligent unit memory**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
n	**No. of words to be read**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	**First No. of area where data to be read is stored**	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	A

Explanation

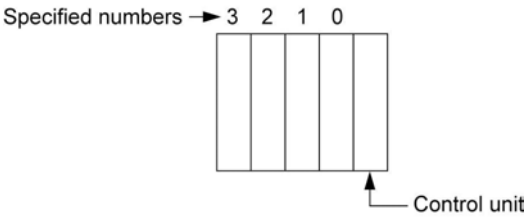
The data stored in the shared memory specified by S1 is read from the address specified by S2 in the number of words specified by n, and is stored starting from the area specified by D.

Specifying the slot number

The slot numbers of the target S-LINK unit are allocated automatically, in response to the installation position.

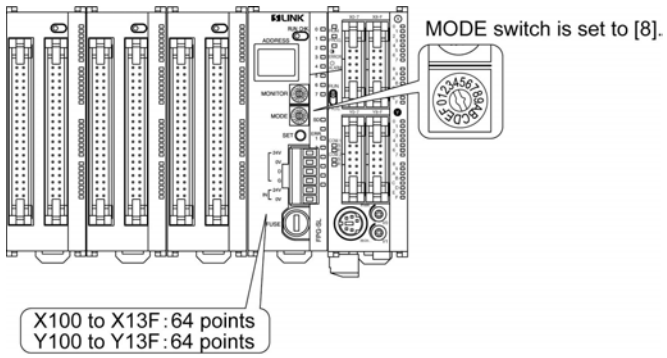
With FPΣ (Installed on the left side only)

Count from the unit nearest to the control unit to the left.



6.2.2 Example of Reading Program

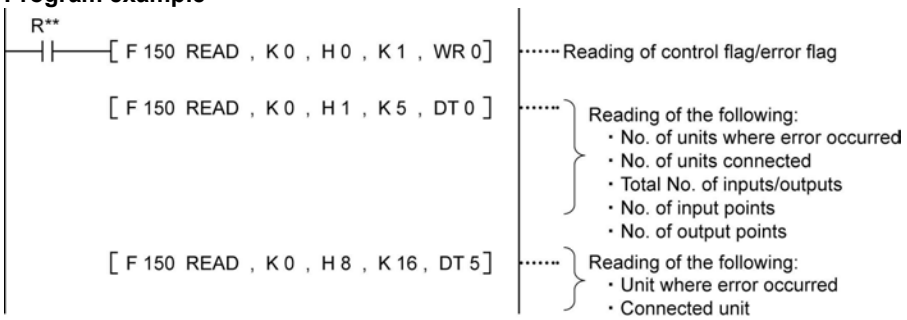
The following program example shows a case where the S-LINK unit is installed on the backplane in the position indicated in the illustration.



Note:
If the FPΣ is configured differently, the slot number and the first device containing the data to be read should be changed.

Program

Program example



FPΣ configuration example

S-LINK unit	Control unit

Results of execution

[Control flag/error flag] (R8 to R15 = OFF)

R 0	ERR1	R 4	S-LINK communication status
R 1	ERR2 (not used)	R 5	OFF
R 2	ERR3	R 6	Set
R 3	ERR4	R 7	OFF

[Other information]

DT0	No. of units where error	DT5 to DT12	Unit where error occurred
DT1	No. of units connected	DT13 to DT20	Connected unit
DT2	Total No. of inputs/outputs		
DT3	No. of input points		
DT4	No. of output points		

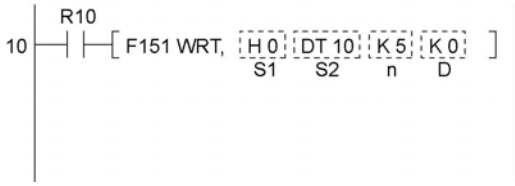
If the FPΣ is configured differently, the slot number and the first device containing the data to be read should be chagned.

6.3 Shared Memory Writing Program

The high-level instruction “F151” is used to write data to the shared memory in the S-LINK unit. For specific information on using the instruction, refer to the “FP series Programming Manual”.

F151 (WRT)

These instructions are used to write data to the memory of the intelligent unit.



Types of memory areas that can be specified (specified in word units)
(A: Available N/A: Not available)

		WX	WY	WR	WL	SV	EV	DT	LD	I0 to ID	Constant		Index modifier
											K	H	
S1	**Slot No. specification**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
S2	**First No. of area to store data to be written**	A	A	A	A	A	A	A	A	N/A	N/A	N/A	A
n	**No. of words to be written**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A
D	**First address to be written to intelligent unit memory**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A

Explanation

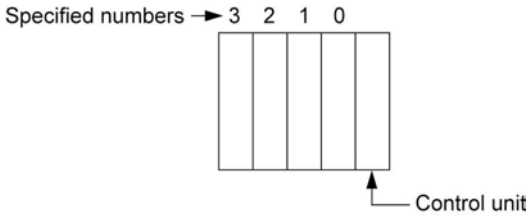
Writes n words of the initial data from the area specified by S2 of the CPU or control unit to the address specified by D of the shared memory of the intelligent unit specified by S1.

Specifying the slot number

The slot numbers of the target S-LINK unit are allocated automatically, in response to the installation position.

With FPΣ (Installed on the left side only)

Count from the unit nearest to the control unit to the left.

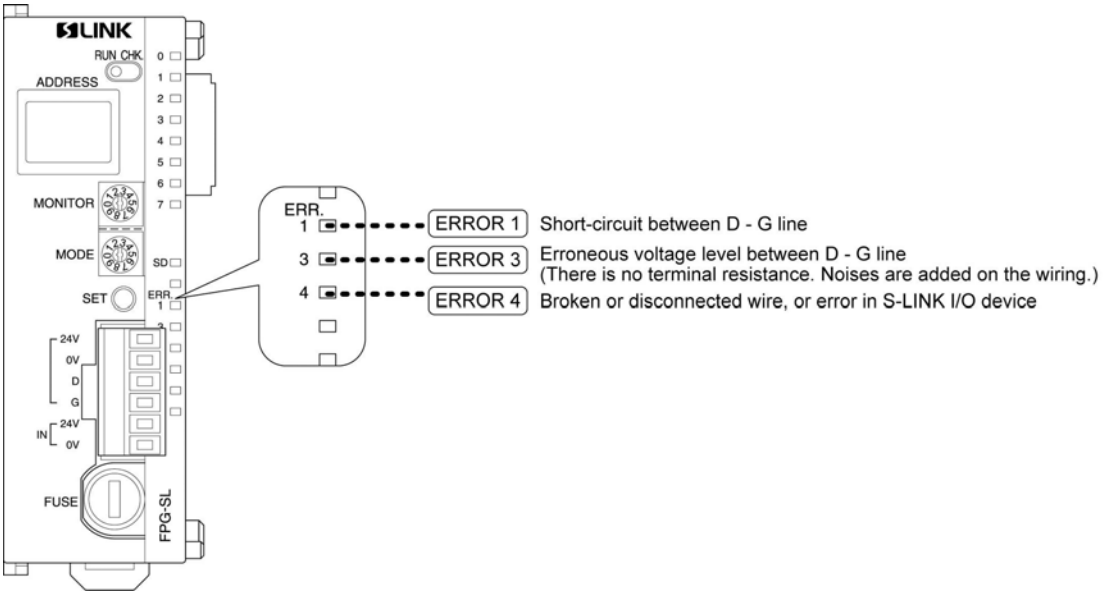


Chapter 7

What To Do If An Error Occurs

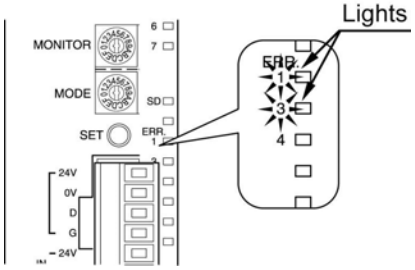
7.1 Judging Errors From the Error Indicators

7.1.1 When the Error Indicators (ERROR LED) Light



7.1.2 How to Eliminate Errors

When ERROR1 and ERROR3 light simultaneously



(1) The line between D and G is short-circuited. Eliminate the cause of the error.

Note:

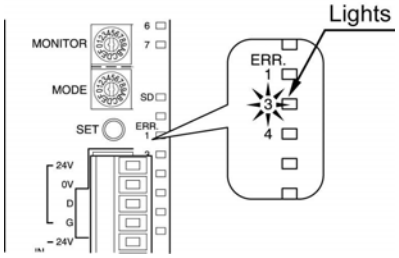
The short-circuit protective function is not canceled simply by eliminating the cause of the error. Always turn off the S-LINK main and local power supplies and turn it back on again.

(2) The S-LINK main and local power supplies are off, or the power supplies were turned on in the wrong sequence.

Turn off the S-LINK main and local power supplies and the power supply of FPΣ, eliminate the cause of the problem, and turn the power supplies on again.

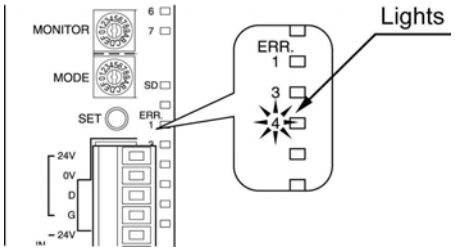
Reference: <5.1 Sequence and Timing for Turning Power Supply On>

When only ERROR3 lights



There is no terminal resistance, or noise is added on the wiring.
Connect the wiring correctly, and eliminate the noise.

When only ERROR4 lights



There is a broken or disconnected wire in the S-LINK, or there is an error in an S-LINK device. If this happens, set the RUN/CHK. selector switch to the “CHK.” position, and press the system SET button. This displays the address of the S-LINK I/O device where the error occurred in the address display window (if errors have occurred at multiple addresses, the display changes seq uentially each time the system SET button is pressed).
This error is retained. Turn off the S-LINK main and local power supplies, and repair the broken or disconnected wire, or eliminate the problem with the input/output unit. Then turn on the S-LINK main and local power supplies.

7.2 Judging by Error Codes

7.2.1 E34 (I/O Status Error) Occurred

When E34 (I/O status error) occurred in the control unit, the MODE switch of the S-LINK unit has been set to either No. 1, No. 7 or No. D.
Use the numbers other than the above numbers.

Reference: <3.2.1 How to Specify the Number of Input/Output Points>

7.2.2 E42 (I/O Verify Error) Occurred

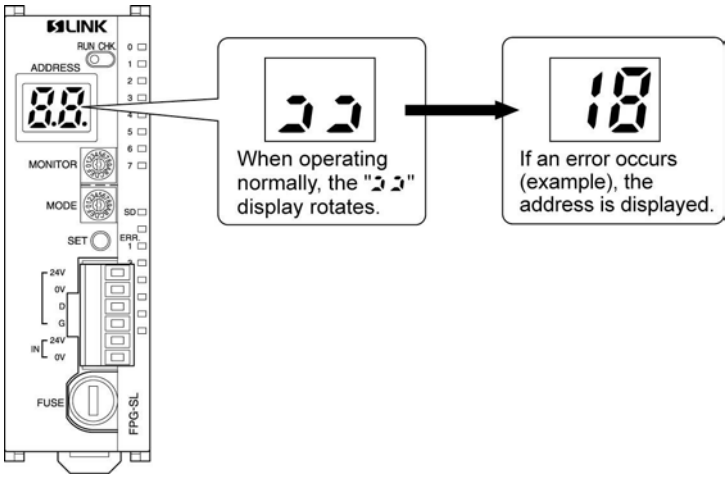
When E42 (I/O verify error) occurred in the control unit, the MODE switch of the S-LINK unit has been changed after the power supply was turned on.
The MODE switch should be changed when the power supply of the FPΣ is off.

7.3 Judging by Address Display

7.3.1 Function of Address Display

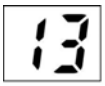
When the system is functioning normally, the "▯ ▯" display rotates.
If an error occurs at an address in the S-LINK (an S-LINK device), that address is displayed as a numeric value.

Example



7.3.2 Judging Error Displays (When Numeric Value is Displayed)

Only a numeric value is displayed.
Example:



* This is a hexadecimal number display.

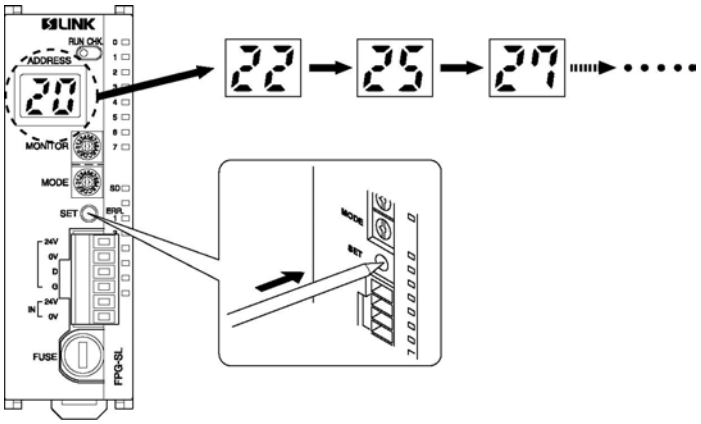
An error has occurred at the address that is displayed.
There is only one address where an error has occurred.
Turn off the power supply to the S-LINK, and correct the error. Then turn on the power supply to the S-LINK.

A numeric value and decimal points are displayed.
Example:

* This is a hexadecimal number display.

Decimal points

More than one error has occurred.
The numeric value that is displayed indicates the smallest address of the addresses where errors have occurred.



To check error addresses other than the one that is displayed, set the “RUN/CHK.” selector switch to the “CHK.” position, and press the system SET button.
Turn off the power supply to the S-LINK, and correct the error. Then turn on the power supply to the S-LINK.

Note:

- Set the “RUN/CHK.” selector switch to the “CHK.” position before pressing the system SET button.
- If the RUN/CHK. selector switch is set to the RUN position and the SET switch is pressed while an error is in effect, only the number of S-LINK devices that can be confirmed at that point are stored in the memory. There is a possibility that S-LINK devices where the error has not been corrected will not be recognized (if this happens, they will not be a target for the check).

Chapter 8

Appendix

8.1 S-LINK Address Quick Reference Table

S-LINK address substitution table (For slot 0)

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X100	Y100	0	0
X101	Y101	1	1
X102	Y102	2	2
X103	Y103	3	3
X104	Y104	4	4
X105	Y105	5	5
X106	Y106	6	6
X107	Y107	7	7
X108	Y108	8	8
X109	Y109	9	9
X10A	Y10A	10	A
X10B	Y10B	11	B
X10C	Y10C	12	C
X10D	Y10D	13	D
X10E	Y10E	14	E
X10F	Y10F	15	F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X110	Y110	16	10
X111	Y111	17	11
X112	Y112	18	12
X113	Y113	19	13
X114	Y114	20	14
X115	Y115	21	15
X116	Y116	22	16
X117	Y117	23	17
X118	Y118	24	18
X119	Y119	25	19
X11A	Y11A	26	1A
X11B	Y11B	27	1B
X11C	Y11C	28	1C
X11D	Y11D	29	1D
X11E	Y11E	30	1E
X11F	Y11F	31	1F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X120	Y120	32	20
X121	Y121	33	21
X122	Y122	34	22
X123	Y123	35	23
X124	Y124	36	24
X125	Y125	37	25
X126	Y126	38	26
X127	Y127	39	27
X128	Y128	40	28
X129	Y129	41	29
X12A	Y12A	42	2A
X12B	Y12B	43	2B
X12C	Y12C	44	2C
X12D	Y12D	45	2D
X12E	Y12E	46	2E
X12F	Y12F	47	2F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X130	Y130	48	30
X131	Y131	49	31
X132	Y132	50	32
X133	Y133	51	33
X134	Y134	52	34
X135	Y135	53	35
X136	Y136	54	36
X137	Y137	55	37
X138	Y138	56	38
X139	Y139	57	39
X13A	Y13A	58	3A
X13B	Y13B	59	3B
X13C	Y13C	60	3C
X13D	Y13D	61	3D
X13E	Y13E	62	3E
X13F	Y13F	63	3F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X140	Y140	64	40
X141	Y141	65	41
X142	Y142	66	42
X143	Y143	67	43
X144	Y144	68	44
X145	Y145	69	45
X146	Y146	70	46
X147	Y147	71	47
X148	Y148	72	48
X149	Y149	73	49
X14A	Y14A	74	4A
X14B	Y14B	75	4B
X14C	Y14C	76	4C
X14D	Y14D	77	4D
X14E	Y14E	78	4E
X14F	Y14F	79	4F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X150	Y150	80	50
X151	Y151	81	51
X152	Y152	82	52
X153	Y153	83	53
X154	Y154	84	54
X155	Y155	85	55
X156	Y156	86	56
X157	Y157	87	57
X158	Y158	88	58
X159	Y159	89	59
X15A	Y15A	90	5A
X15B	Y15B	91	5B
X15C	Y15C	92	5C
X15D	Y15D	93	5D
X15E	Y15E	94	5E
X15F	Y15F	95	5F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X160	Y160	96	60
X161	Y161	97	61
X162	Y162	98	62
X163	Y163	99	63
X164	Y164	100	64
X165	Y165	101	65
X166	Y166	102	66
X167	Y167	103	67
X168	Y168	104	68
X169	Y169	105	69
X16A	Y16A	106	6A
X16B	Y16B	107	6B
X16C	Y16C	108	6C
X16D	Y16D	109	6D
X16E	Y16E	110	6E
X16F	Y16F	111	6F

I/O address		S−LINK address	
		Decimal	Hexa-decimal
X170	Y170	112	70
X171	Y171	113	71
X172	Y172	114	72
X173	Y173	115	73
X174	Y174	116	74
X175	Y175	117	75
X176	Y176	118	76
X177	Y177	119	77
X178	Y178	120	78
X179	Y179	121	79
X17A	Y17A	122	7A
X17B	Y17B	123	7B
X17C	Y17C	124	7C
X17D	Y17D	125	7D
X17E	Y17E	126	7E
X17F	Y17F	127	7F

Note) If the input and output are mixed, the S-LINK addresses of the output Y start after the S-LINK addresses of the input X.

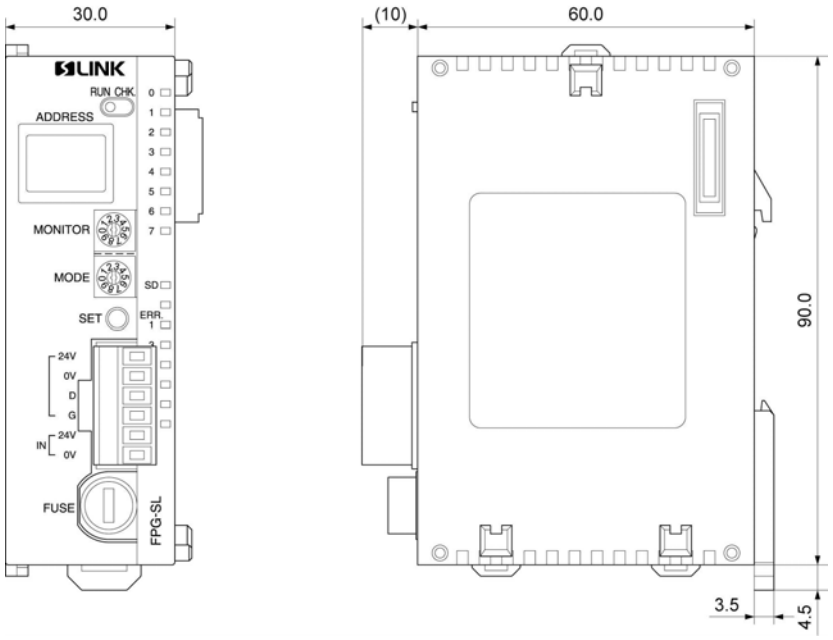
Note: <3.2.2 Examples of Settings>

Chapter 9

Dimensions

9.1 Dimensions

FPG-SL (AFPG780)



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