Panasonic®

PROGRAMMABLE CONTROLLER

FP3/FP5

P TYPE (OPTICAL) LINK SYSTEM

Technical Manual

FP3/5 P TYPE (OPTICAL) LINK SYSTEM Technical Manual
ACG-M0015-2

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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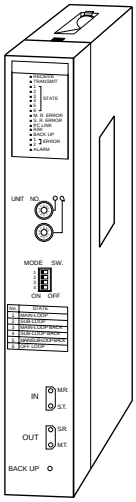
CHAPTER 1

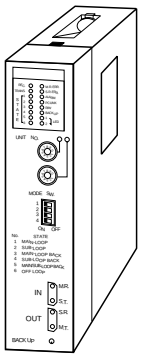
FEATURES AND SYSTEM CONFIGURATIONS

“PC” is an abbreviation of Programmable Controller.

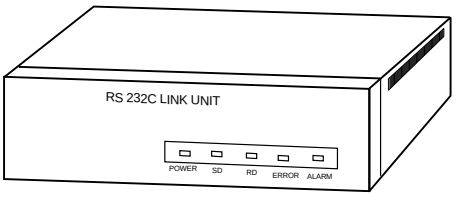
1-1. Features



FP5 P Type (Optical) Link Unit



FP3 P Type (Optical) Link Unit



RS232C Link Unit

- High speed, long distance transmission
  Data can be transmitted at the speed of 375 kbps between stations which can be at a maximum of 800 m/2,624.672 ft. (total length of optical fiber cable : 10,000m/32,808.398 ft.) apart.

- A maximum of 3 P Type (Optical) Link Units can be installed on a single Master Backplane.
  Each CPU can control a maximum of 3 P/W link units*. If you install other types of P/W link units, such as a W Type (Wire) link Unit, a C.C.U. (Computer Communication Unit) or a C-NET Link Unit, the total number of P/W link units must be 3 or less.
  *Units that are classified as P/W link units are :
  P Type (Optical) Link Unit, W Type (Wire) Link Unit, C.C.U.(Computer Communication Unit) and C-NET Link Unit

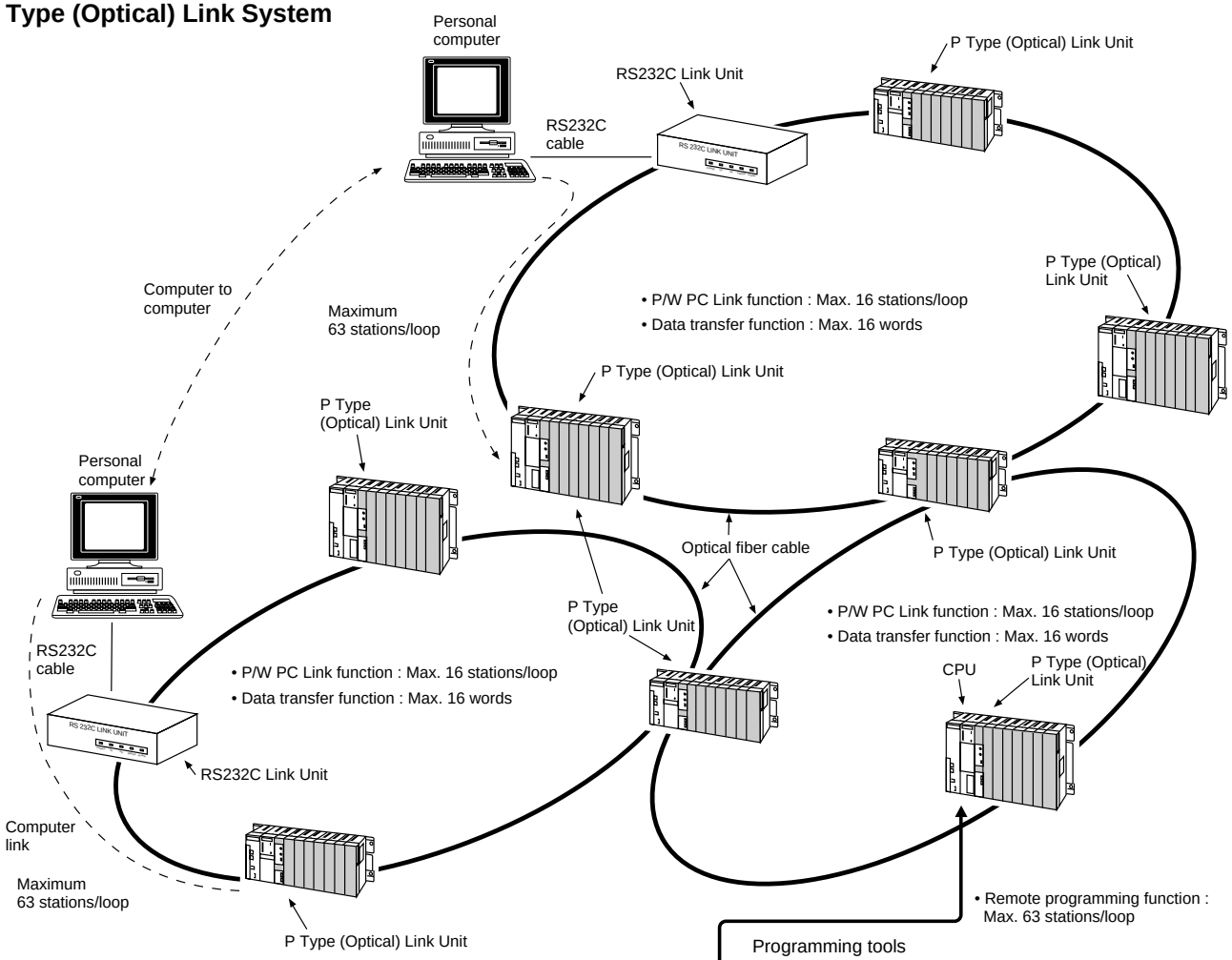
- In the P Type (Optical) Link System, the following communication functions are available :
  <P/W PC Link function>
  P/W PC Link is formally called “P Type (Optical)/W Type (Wire) Programmable Controller Link”. Data are easily exchanged between Programmable Controllers using 1,024 points of link relays (L) and 128 words (one word = 16 bits) of link data registers (LD). A maximum of 16 stations in a loop can be set in PC Link Mode in the P/W Link. A maximum of 2 P Type (Optical) Link Units can be used as stations with PC Link Mode in one CPU.
  <Data Transfer function>
  Data can be transferred between Programmable Controllers using send and receive instructions. This function is available to all of the stations (Max. 63 stations) in a loop.
  <Remote Programming function>
  Programming, system register setting and data readout of a remotely located Programmable Controller can be controlled from any Programmable Controller located close to you. This function is available to all of the stations (Max. 63 stations) in a loop.
  <Computer Link function>
  The Computer Link is particularly useful in applications ranging from process monitoring to production management, because types of information, such as operation mode monitoring, production data settings, and logging functions can be transmitted.
  <Computer to Computer Communication function>
  Communications between Computers, in information exchanges of 118 bytes at a time, is possible.

- System Self-diagnostic functions (R.A.S. function)
  The P Type (Optical) Link System is provided System Self-diagnostic functions such as automatic loopback, transmission self-diagnostic tests and hardware diagnostic functions.

* R.A.S. : Reliability, Availability and Serviceability

1-2. System Configurations

P Type (Optical) Link System



- In the FP Series Programmable Controller System, the P Type (Optical) Link System is one of the P/W Link available.
- The FP3/FP5 P Type (Optical) Link Units can be installed on the Master Backplane used in the FP3/FP5 Programmable Controllers.
- The FP3/FP5 P Type (Optical) Link Units are connected with a optical fiber cable running between Programmable Controllers.
- Connect the computer and RS232C Link Unit to P Type (Optical) Link System through the RS232C cable.
- P Type (Optical) Link System provides communication functions between FP3s and FP5s as follows.

Between Programmable controllers	:	P/W PC Link communication, Data Transfer communication and Remote Programming function
Between Programmable Controller to computer	:	Computer Link communication and Data Transfer communication
Between computers	:	Computer to Computer communication

1-3. Specifications of the P Type (Optical) Link System

Item	Description
Communication method	Token passing method
Transmission method	Baseband transmission method
Baud rate	375 kbps
Transmission cable	Optical Fiber Cable
Connectable stations	Max. 63 stations/loop (Max. 16 stations can be set in PC Link Mode)
Transmission distance	Total 10,000 m/32,808.398 ft. (Between stations : 800 m/2,624.672 ft.)

Notes :

Be sure to check that the P Type (Optical) Link System is configured according to the following CPU restrictions :

- Max. number of P/W link units per CPU : 3 P/W link units [any combination of W Type (Wire) Link Units, P Type (Optical) Link Units, C.C.U.s (Computer Communication Units) and C-NET Link Units]
- P/W PC Link per CPU : Max. 2 P/W PC Link

CHAPTER 2

P TYPE (OPTICAL) LINK UNIT

“PC” is an abbreviation of Programmable Controller.

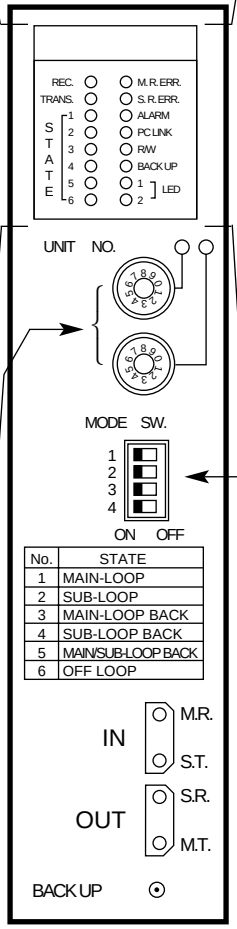
2-1. Parts Terminology and Functions

1. FP3 P Type (Optical) Link Unit

Operation Monitor LEDs :

REC. LED	ON	:	when receiving
	OFF	:	when not receiving
TRANS. LED	ON	:	when sending
	OFF	:	when not sending
STATE 1 LED	ON	:	when communicating in main loop mode
	* OFF	:	when not communicating in main loop mode
STATE 2 LED	ON	:	when communicating in sub loop mode
	* OFF	:	when not communicating in sub loop mode
STATE 3 LED	ON	:	when communicating in main loop back mode
	* OFF	:	when not communicating in main loop back mode
STATE 4 LED	ON	:	when communicating in sub loop back mode
	* OFF	:	when not communicating in sub loop back mode
STATE 5 LED	ON	:	when communicating in main and sub loop back mode
	* OFF	:	when not communicating in main and sub loop back mode
STATE 6 LED	ON	:	when no link function is available
	* OFF	:	when at least one of the link functions is available

* When all of the STATE LEDs (from 1 to 6) are in the OFF state, the unit functions only as a path for the system using the backup power supply.

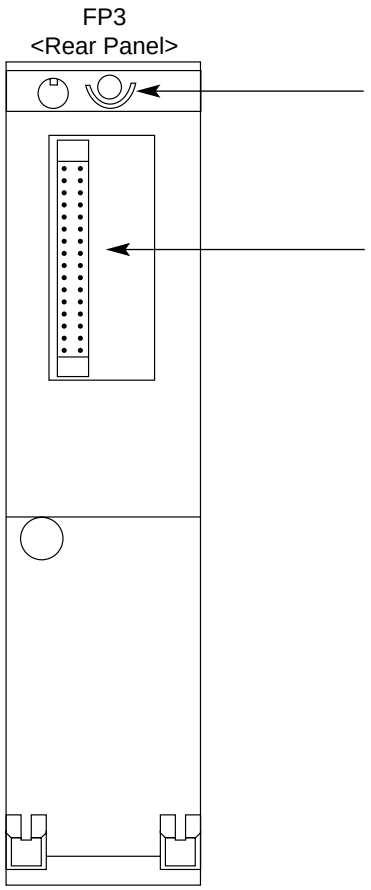


Operation Monitor LEDs :

M.R.ERR. LED	ON	:	not receiving in main loop mode
	OFF	:	normal communication in main loop mode
S.R.ERR. LED	ON	:	not receiving in sub loop mode
	OFF	:	normal communication in sub loop mode
ALARM LED	ON	:	unit error
	OFF	:	normal unit operation
PC LINK LED	ON	:	when PC Link Mode is set.
	OFF	:	when PC Link Mode is not set.
R/W LED	ON	:	when the unit is communicating with the CPU
	OFF	:	when the unit is not communicating with the CPU
BACK UP LED	ON	:	when backup power is present
	OFF	:	when backup power is not present
ERR. 1 LED	ON	:	transmission self-diagnostic testing mode
	Flashes:		hardware self-diagnostic error (when the ERR. 2 LED flashes)
	OFF	:	normal unit operation
ERR. 2 LED	ON	:	communication error, identical use of station number (UNIT NO.), link area setting error
	Flashes:		station number (UNIT NO.) setting error
	OFF	:	normal unit operation

Mode Selector Switches (MODE SW.) : See following page.

Station Number (UNIT NO.) Selector : See following page.



Mounting Screw :
A screw for attaching the unit to a Master Backplane.

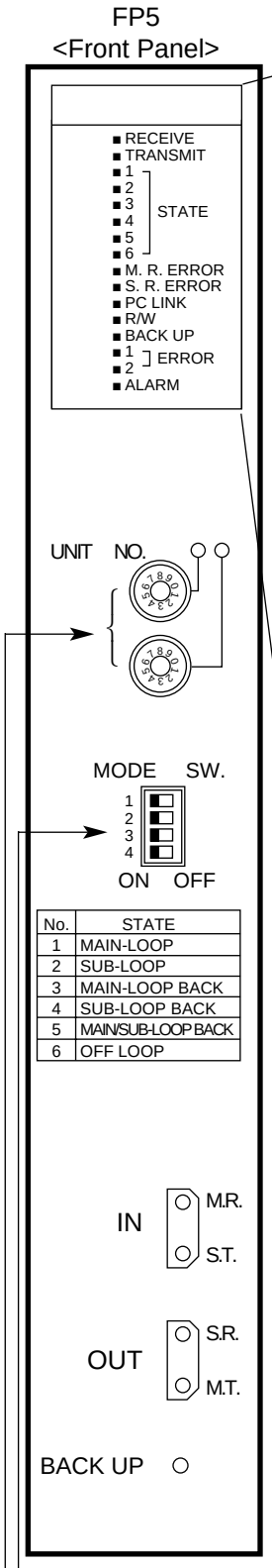
Connector :
Connects to the slot on the Master Backplane.

Mode Selector Switches (MODE SW.) :

Mode switch number	Specification		Switch position			
			1	2	3	4
1	P/W PC Link function	Not PC Link Mode	ON	—	—	—
		PC Link Mode	OFF	—	—	—
2	Operation mode setting	Transmission self-diagnostic testing mode	—	ON	—	—
		Normal operation	—	OFF	—	—
3	Transmission self-diagnostic test mode selecting	Test 1	—	—	OFF	OFF
		Test 2	—	—	ON	OFF
4		Test 3	—	—	OFF	ON
		Test 4	—	—	ON	ON

Station Number (UNIT NO.) Selector :
A maximum of 63 P Type (Optical) Link Units can be connected in a loop. In the P Type (Optical) Link System, each P Type (Optical) Link Unit must be assigned its station number without duplication in the same loop.

2. FP5 P Type (Optical) Link Unit



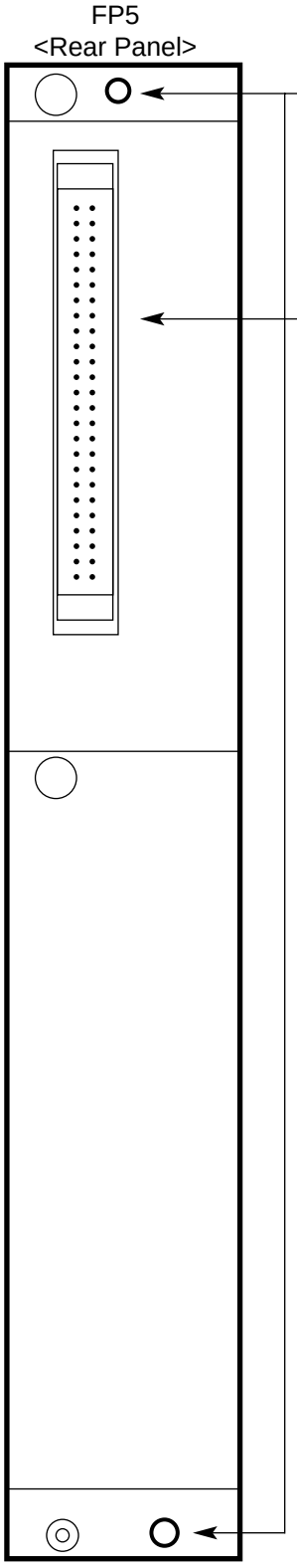
Operation Monitor LEDs :

RECEIVE LED	ON	: when receiving
	OFF	: when not receiving
TRANSMIT LED	ON	: when sending
	OFF	: when not sending
STATE 1 LED	ON	: when communicating in main loop mode
	* OFF	: when not communicating in main loop mode
STATE 2 LED	ON	: when communicating in sub loop mode
	* OFF	: when not communicating in sub loop mode
STATE 3 LED	ON	: when communicating in main loop back mode
	* OFF	: when not communicating in main loop back mode
STATE 4 LED	ON	: when communicating in sub loop back mode
	* OFF	: when not communicating in sub loop back mode
STATE 5 LED	ON	: when communicating in main and sub loop back mode
	* OFF	: when not communicating in main and sub loop back mode
STATE 6 LED	ON	: when no link function is available
	* OFF	: when at least one of the link functions is available
M.R.ERROR LED	ON	: not receiving in main loop mode
	OFF	: normal communication in main loop mode
S.R.ERROR LED	ON	: not receiving in sub loop mode
	OFF	: normal communication in sub loop mode
PC LINK LED	ON	: when PC Link Mode is set.
	OFF	: when PC Link Mode is not set.
R/W LED	ON	: when the unit is communicating with the CPU
	OFF	: when the unit is not communicating with the CPU
BACK UP LED	ON	: when backup power is present
	OFF	: when backup power is not present
ERROR 1 LED	ON	: transmission self-diagnostic testing mode
	Flashes	: hardware self-diagnostic error (when the ERROR 2 LED flashes)
	OFF	: normal unit operation
ERROR 2 LED	ON	: communication error, identical use of station number (UNIT NO.), link area setting error
	Flashes	: station number (UNIT NO.) setting error
	OFF	: normal unit operation
ALARM LED	ON	: unit error
	OFF	: normal unit operation

* When all of the STATE LEDs (from 1 to 6) are in the OFF state, the unit functions only as a path for the system using the backup power supply.

Mode Selector Switches (MODE SW.) : See following page.

Station Number (UNIT NO.) Selector : See following page.



Mounting Screws :
The screw for attaching the unit to a Master Backplane.

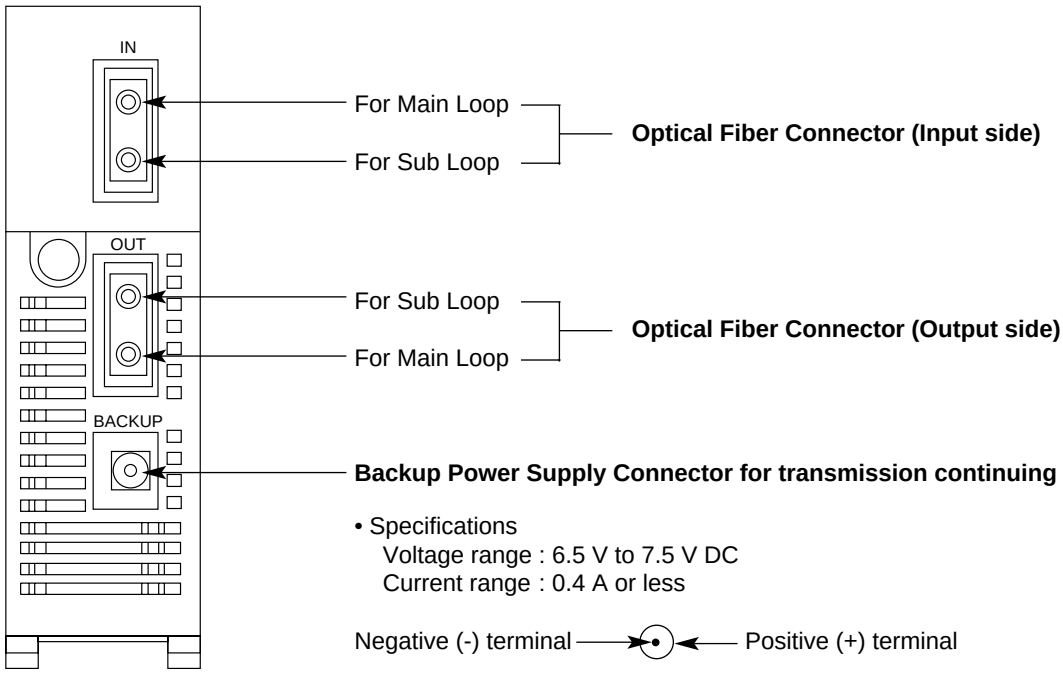
Connector :
Connects to the slot on the Master Backplane.

Mode Selector Switches (MODE SW.) :

Mode switch number	Specification		Switch position			
			1	2	3	4
1	P/W PC Link function	Not PC Link Mode	ON	—	—	—
		PC Link Mode	OFF	—	—	—
2	Operation mode setting	Transmission self-diagnostic testing mode	—	ON	—	—
		Normal operation	—	OFF	—	—
3	Transmission self-diagnostic test mode selecting	Test 1	—	—	OFF	OFF
		Test 2	—	—	ON	OFF
4		Test 3	—	—	OFF	ON
		Test 4	—	—	ON	ON

Station Number (UNIT NO.) Selector :
A maximum of 63 P Type (Optical) Link Units can be connected in a loop. In the P Type (Optical) Link System, each P Type (Optical) Link Unit must be assigned its station number without duplication in the same loop.

FP3 and FP5
<Bottom Panel>



2-2. Specifications

1. General Specifications

Item	Description
Ambient temperature	0° C to 55° C/32° F to 131° F
Ambient humidity	30 % to 85 % RH (non-condensing)
Storage temperature	-20° C to +70° C/-4° F to +158° F
Storage humidity	30 % to 85 % RH (non-condensing)
Vibration resistance	10 Hz to 55 Hz, 1 cycle/min : double amplitude of 0.75 mm/0.030 in., 10 min on 3 axes
Shock resistance	Shock of 98 m/s^2 or more, 4 times on 3 axes
Noise immunity	1,000 Vp-p with pulse width, 50 ns or 1 μs (based on in-house measurements)
Operating environment	Free from corrosive gases and excessive dust

2. Performance Specifications

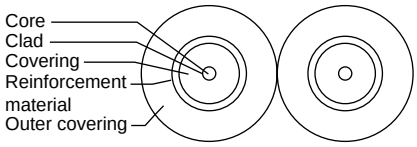
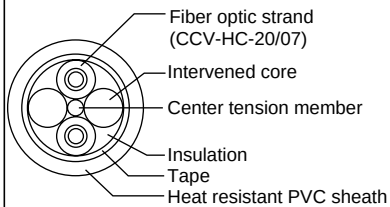
Item	Description
Communication method	Token passing method
Transmission method	Baseband transmission method
Baud rate	375 kbps
Transmission cable	Optical Fiber Cable
Connectable stations	Max. 63 stations/loop [Max. 16 stations can be set as stations with P/W PC Link function.]
Transmission distance	Total 10,000 m/32,808.398 ft. (Transmission distance of between stations: 800 m/2,624.672 ft.)
Number of I/O per P Type (Optical) Link Unit	16 points [16SE (can be allocated as 0 using NPST-GR)]
Current consumption	FP3 P Type (Optical) Link Unit : 320 mA or less (at 5 V DC) FP5 P Type (Optical) Link Unit : 400 mA or less (at 5 V DC)
System Self-diagnostic functions (R.A.S. function)	• Automatic communication restoration function • Transmission self-diagnostic testing function, etc.
Weight	FP3 P Type (Optical) Link Unit : Approx. 250 g/8.819 oz. FP5 P Type (Optical) Link Unit : Approx. 450 g/15.874 oz.

Notes :

- Installation conditions
  A maximum of 3 P Type (Optical) Link Units can be installed on a single Master Backplane.
  Each CPU can control a maximum of 3 P/W link units. If other types of P/W link units are installed together, the total number of P/W link units must not exceed 3 units.
  P/W link units : P Type (Optical) Link Unit, W Type (Wire) Link Unit, C.C.U. (Computer Communication Unit) and C-NET Link Unit.
- A maximum of 16 stations in a single loop can be set for PC Link Mode.
- A maximum of 2 P Type (Optical) Link Units can be set for PC Link Mode in a single CPU.
  If any other units with P/W PC Link function such as a W Type (Wire) Link Unit are present, the total number of units set for P/W PC Link Mode must not exceed 2 units in a single CPU.

3. Cable Specifications

1) General Specifications

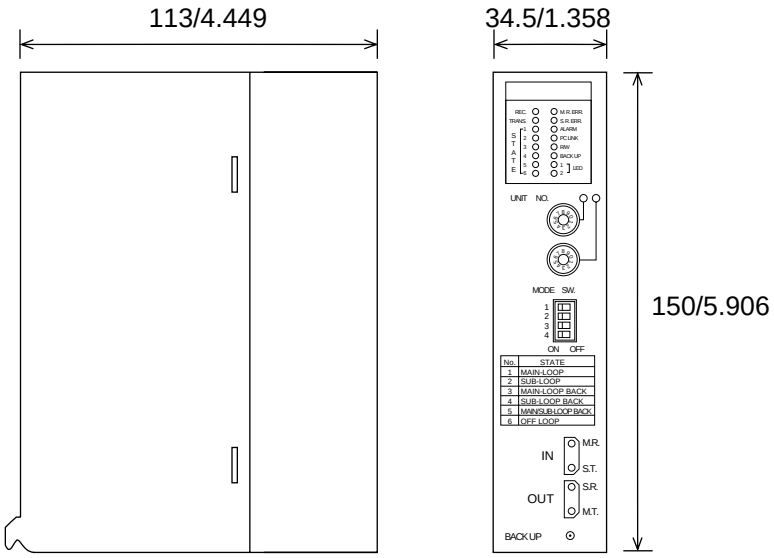
Item		Description	
Types		Optical fiber cord	Optical fiber cable
Construction			
Cable diameter		2.2 × 4.4 mm/0.087 × 0.173 in.	8.4 mm/0.331 in.
Allowable bending radius	Temporary bend	15 mm/0.591 in. or more	25 mm/0.984 in. or more
	Long term bend	50 mm/1.969 in. or more	85 mm/3.346 in. or more
Allowable tension	Temporary tension	25 kg/55.188 lb.	75 kg/165.563 lb.
Storage and Ambient temperature		-20° C to 70° C/-4° F to 158° F	
Transmission loss		Max. 7 dB/km	
Transmission band		Max. 14 MHz·km	
Core diameter		200 μm	
Clad diameter		230 μm	
Conductor		Two-conductor	
Weight		8 kg/17.660 lb. per 1 km	70 kg/154.525 lb. per 1 km

2) Performance Specifications

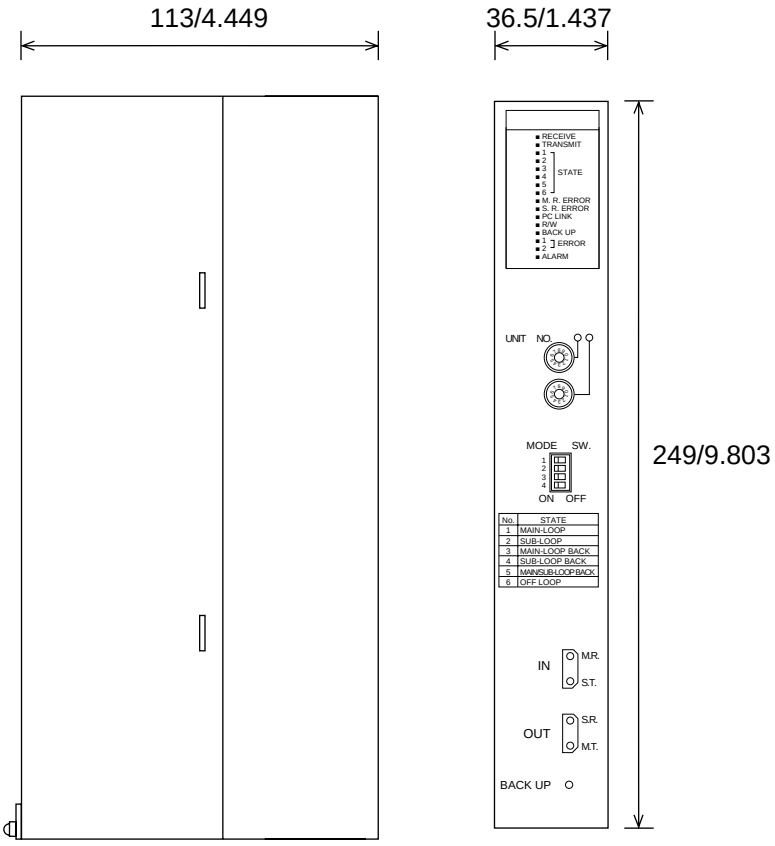
Item		Operation temperature for Optical fiber cable		
		0° C to 55° C/ 32° F to 131° F	-10° C to 70° C/ 14° F to 158° F	-20° C to 70° C/ -4° F to 158° F
Transmission distance between stations	When using bonded connector	800 m/2,624.672 ft.	600 m/1,968.504 ft.	500 m/1,640.420 ft.
	When using compressed connector	500 m/1,640.420 ft.	400 m/1,312.336 ft.	300 m/984.252 ft.

2-3. Dimensions

FP3



FP5



(unit : mm/in.)

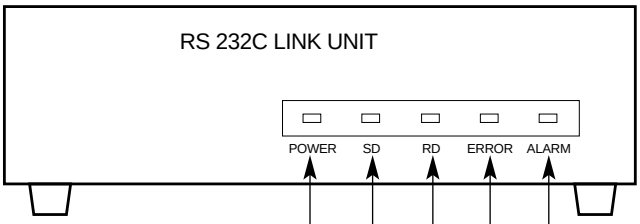
CHAPTER 3

RS232C LINK UNIT

“PC” is an abbreviation of Programmable Controller.

3-1. Parts Terminology and Functions

1. Front Panel



Operation Monitor LEDs :

POWER LED
ON : when power is present
OFF : when power is not present

SD LED
ON : when sending
OFF : when not sending

RD LED
ON : when receiving
OFF : when not receiving

ERROR LED
ON : when the unit issues an error response for the device connected through the RS232C
Flashes : when the command data from the device connected through the RS232C is damaged
: when the power is turned ON, unit is not reset
OFF : normal communication

ALARM LED
ON : unit error
OFF : normal unit operation

2. Rear Panel

Reset button :

When the Reset button is pressed, communications with the computer originating from the RS232C Link Unit and communications with the Programmable Controller originating from the RS232C Link Unit are temporarily interrupted.

Switch number	Specification		1
1	Character bit	7-bit	OFF
		8-bit	ON
2 & 3	Parity check	Invalid	C
		Valid	C
	Parity bit	Odd parity	(
		Even parity	
4	Stop bit	1-bit	
		2-bit	
5		CR	

Communication Mode Selector Switches (MODE SW.) :

Switch number	Specification		1	2	3	4	5	6	7	8
1	Character bit	7-bit	OFF							
		8-bit	ON							
2	Parity check	Invalid		OFF						
		Valid		ON						
3	Parity bit *	Odd parity			OFF					
		Even parity			ON					
4	Stop bit	1-bit				OFF				
		2-bit				ON				
5 & 6	Delimiter code	CR					OFF	OFF		
		CR, LF					OFF	ON		
		LF					ON	OFF		
		LF, CR					ON	ON		
7	XON/XOFF control	Invalid							OFF	
		Valid							ON	
8	Transmission mode	Steady-state communication mode								OFF
		Transparent communication mode								ON

* Parity bit (switch number 3) setting is effective only when the parity check (switch number 2) is set for ON.

Backup Power Supply Connector for transmission continuing :

<Specification>

Power supply range

Voltage range : 6.5 V to 7.5 V DC

Current range : 0.4 A or less

negative (-) terminal ⊙ positive (+) terminal

Station Number(UNIT NO.) Selector :

A maximum of 63 P Type (Optical) Link Units can be connected in a loop. In the P Type (Optical) Link System, each P Type (Optical) Link Unit must be assigned its station number (UNIT NO.) without duplication in the same loop.

Mode Selector Switches (MODE SW.) :

Switch number	Specification		Switch position 1 2 3 4
1	Not used		———
2	Operation mode setting	Transmission self-diagnostic testing mode	ON
		Normal operation	OFF
3	Transmission self-diagnostic test mode selection	Test 1	OFF OFF
		Test 2	ON OFF
4		Test 3	OFF ON
		Test 4	ON ON

Optical Fiber Connector (Input/Output side) :

Refer to page 25, "4-3. Connecting the P Type (Optical) Link System", for details about optical fiber connecting.

Operation Monitor LEDs :

Upper side

RECEIVE LED
- ON: when receiving
- OFF: when not receiving

TRANSMIT LED
- ON: when sending
- OFF: when not sending

STATE 1 (MAIN-LOOP) LED
- ON: when communicating in main loop mode
- * OFF: when not communicating in main loop mode

STATE 2 (SUB-LOOP) LED
- ON: when communicating in sub loop mode
- * OFF: when not communicating in sub loop mode

STATE 3 (MAIN-LOOP BACK) LED
- ON: when communicating in main loop back mode
- * OFF: when not communicating in main loop back mode

STATE 4 (SUB-LOOP BACK) LED
- ON: when communicating in sub loop back mode
- * OFF: when not communicating in sub loop back mode

STATE 5 (MAIN/SUB-LOOP BACK) LED
- ON: when communicating in main and sub loop back mode
- * OFF: when not communicating in main and sub loop back mode

STATE 6 (OFF LOOP) LED
- ON: when no link function is available
- * OFF: when at least one of the link functions is available

Lower side

M RE LED
- ON: not receiving in main loop mode
- OFF: normal communication in main loop mode

S RE LED
- ON: not receiving in sub loop mode
- OFF: normal communication in sub loop mode

R/W LED
- ON: when the unit is communicating with the CPU
- OFF: when the unit is not communicating with the CPU

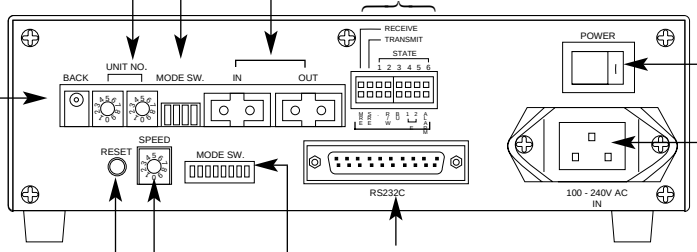
B U LED
- ON: when backup power is present
- OFF: when backup power is not present

E 1 LED
- ON: transmission self-diagnostic testing mode
- Flashes: hardware self-diagnostic (when the E 2 LED flashes)
- OFF: normal unit operation

E 2 LED
- ON: communication error, identical use of station number (UNIT NO.), link area setting error
- Flashes: (when the E 2 LED flashes) station number (UNIT NO.) setting error
- OFF: normal unit operation

ALARM LED
- ON: unit error
- OFF: normal unit operation

* When all of the STATE LEDs (from 1 to 6) are in the OFF state, the unit functions only as a path for the system using the backup power supply.



Power Switch

AC Power Supply Connector :

Rated operation voltage : 100 V AC to 240 V AC

RS232C Interface :

Refer to page 27, "3. Connecting a Computer and a RS232C Link Unit" for details.

See preceding page.

Reset button :

Baud rate selector :

Communication Mode Selector Switches (MODE SW.) :

3-2. Specifications

1. General Specifications

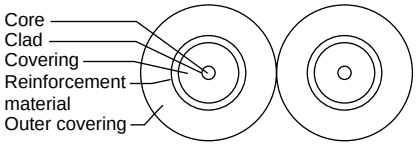
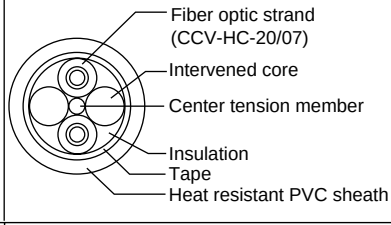
Item	Description
Ambient temperature	0° C to 55° C/32° F to 131° F
Ambient humidity	30 % to 85 % RH (non-condensing)
Storage temperature	-20° C to +70° C/-4° F to +158° F
Storage humidity	30 % to 85 % RH (non-condensing)
Vibration resistance	10 Hz to 55 Hz, 1 cycle/min : double amplitude of 0.75 mm/0.030 in., 10 min on 3 axes
Shock resistance	Shock of 98 m/s^2 or more, 4 times on 3 axes
Noise immunity	1,000 Vp-p with pulse width, 50 ns or 1 μs (based on in-house measurements)
Operating environment	Free from corrosive gases and excessive dust

2. Performance Specifications

Item	Description
Operating voltage range	85 V AC to 264 V AC
Power consumption	20 VA or less
Interface	RS232C, one port
Baud rate	300/600/1,200/2,400/4,800/9,600/19,200 bps (selected by baud rate selector)
Weight	Approx. 2,000 g/4.415 lb.

3. Cable Specifications

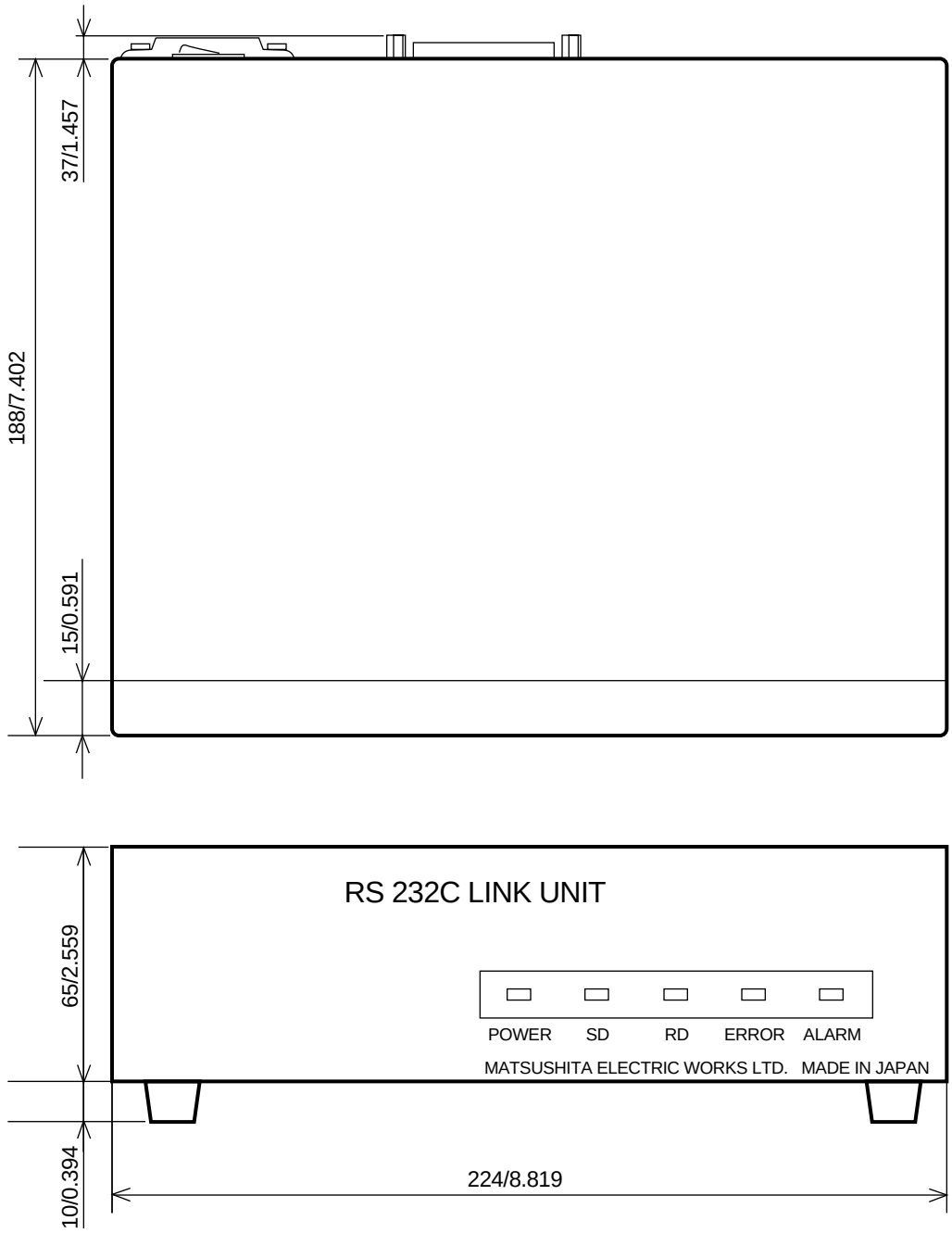
1) General Specifications

Item		Description	
Types		Optical fiber cord	Optical fiber cable
Construction			
Cable diameter		2.2 × 4.4 mm/0.087 × 0.173 in.	8.4 mm/0.331 in.
Allowable bending radius	Temporary bend	15 mm/0.591 in. or more	25 mm/0.984 in. or more
	Long term bend	50 mm/1.969 in. or more	85 mm/3.346 in. or more
Allowable tension	Temporary tension	25 kg/55.188 lb.	75 kg/165.563 lb.
Storage and Ambient temperature		-20° C to 70° C/-4° F to 158° F	
Transmission loss		Max. 7 dB/km	
Transmission band		Min. 14 MHz·km	
Core diameter		200 μm	
Clad diameter		230 μm	
Conductor		Two-conductor	
Weight		8 kg/17.660 lb. per 1 km	70 kg/154.525 lb. per 1 km

2) Performance Specifications

Item		Operation Temperature for Optical Fiber Cable		
		0° C to 55° C /32° F to 131° F	-10° C to 70° C /14° F to 158° F	-20° C to 70° C /-4° F to 158° F
Transmission distance between stations	When using bonded connector	800 m/2,624.672 ft.	600 m/1,968.504 ft.	500 m/1,640.420 ft.
	When using compressed connector	500 m/1,640.420 ft.	400 m/1,312.336 ft.	300 m/984.252 ft.

3-3. Dimensions



(unit : mm/in.)

CHAPTER 4

INSTALLATION AND SETTINGS

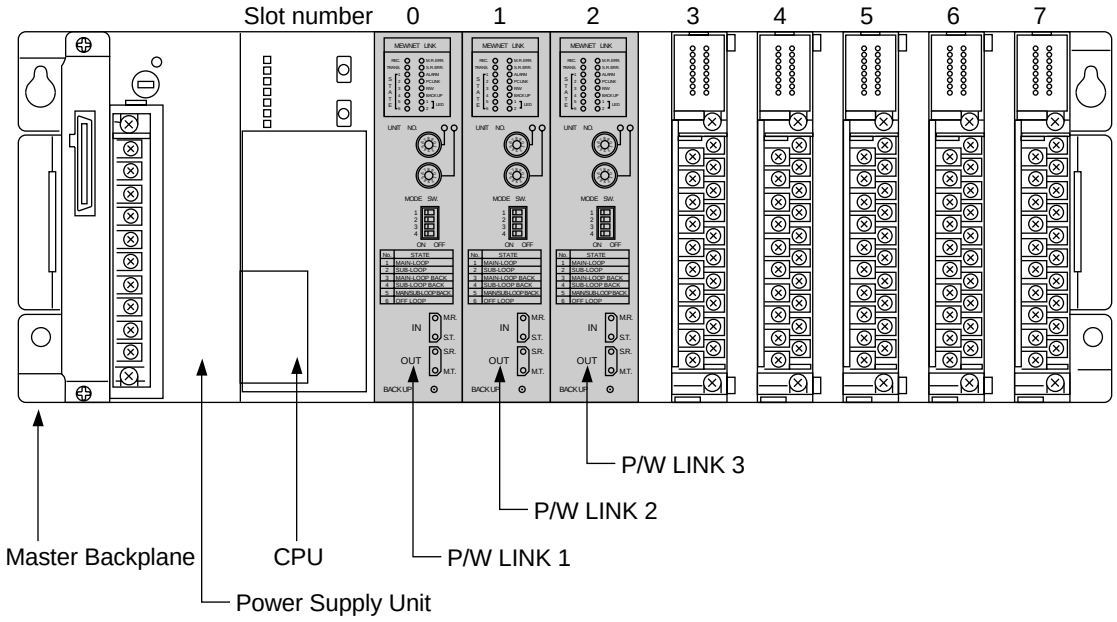
"PC" is an abbreviation of Programmable Controller.

4-1. Installing P Type (Optical) Link Units

1. Location

- The FP3/FP5 P Type (Optical) Link Units should be installed closest to the CPU on the each corresponding Master Backplane.
- The P Type (Optical) Link Unit is handled as P/W link unit. Up to 3 P/W link units can be installed on each CPU.
  Units classified as P/W link units are :
  P Type (Optical) Link Unit, W Type (Wire) Link Unit, C.C.U. (Computer Communication Unit), C-NET Link Unit.
- Each unit is specified as "P/W LINK 1", "P/W LINK 2" or "P/W LINK 3" starting with the unit installed closest to the CPU.

Example :



Notes :

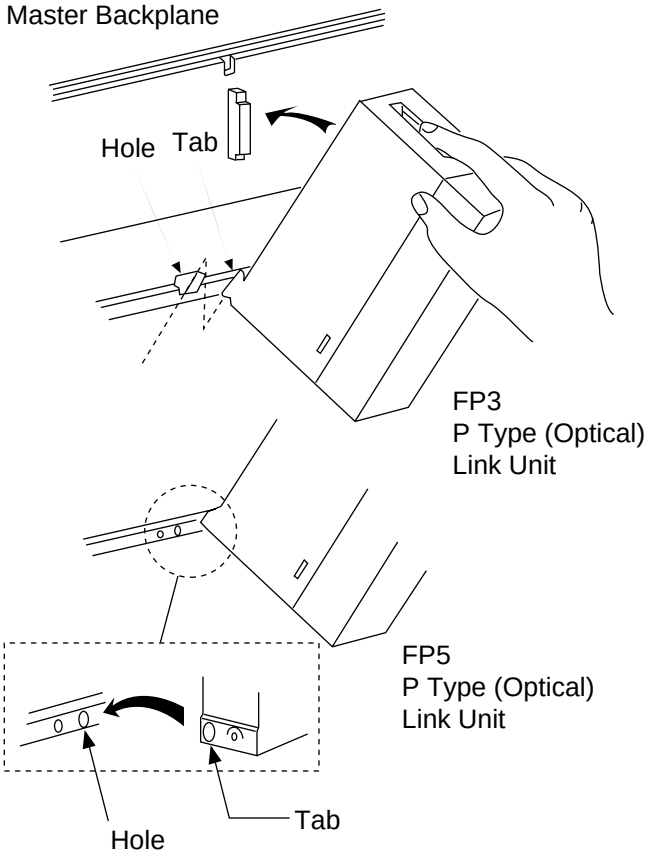
- The P Type (Optical) Link Units cannot be installed nor used on the Expansion Backplane.
- A maximum of 2 P/W PC Link functions are available for one CPU.
  The units set in PC Link Mode are designated as "P/W PC LINK 0" and "P/W PC LINK 1" starting with the unit closer to the CPU respectively.
- A maximum of 16 stations can be set as PC Link Mode in one loop.
- The I/O points "16 points (16SE)" are automatically allocated for the P Type (Optical) Link Unit.
  Using the NPST-GR ("SET I/O MAP" function), the occupied points can be set to 0 point (0SE).
  This function will help you when more actual I/O points are needed.

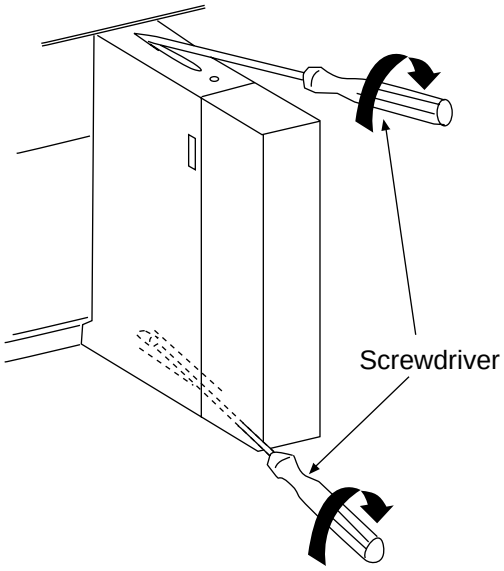
2. How to Install P Type (Optical) Link Units

Before installing the unit, remove the connector cover on the Master Backplane.

1. Fit the unit tabs on the bottom of the Link Unit into the unit holes on the Master Backplane. Push the unit in the direction shown by the arrow to plug it into the Master Backplane.

2. After plugging the unit into the Master Backplane, tighten the installation screw at the top and/or bottom.
   FP3 : at the top
   FP5 : at the top and bottom



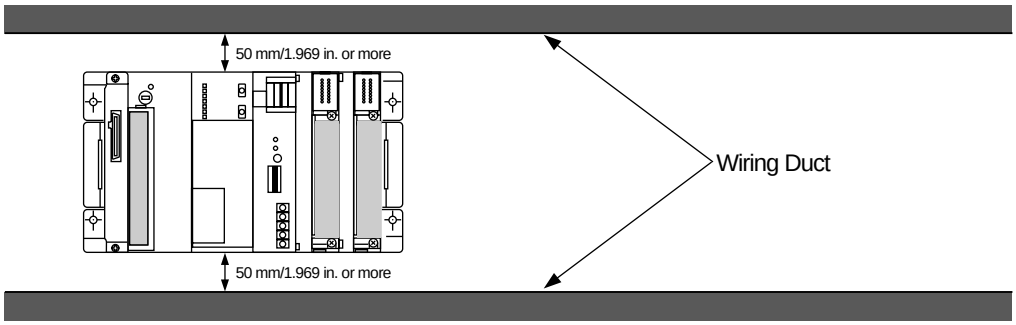


Notes :

- Be sure to remove or install P Type (Optical) Link Units only when all power is OFF.
- Be careful not to use unreasonable force when plugging the connector on the P Type (Optical) Link Unit into the connector on the Master Backplane.

4-2. Notes on Use

- Install and remove the P Type (Optical) Link Unit only when all of the power is turned OFF.
- Be sure to install the P Type (Optical) Link Unit securely in the Master Backplane.
- Do not touch its connectors on rear side of the unit or Backplane with your hand. Static electricity build-up on your body can damage the P Type (Optical) Link Unit.
- Do not drop the P Type (Optical) Link Unit or apply excessive force to it.
- Do not allow pieces of wire or other objects to fall into the unit when making the wiring connections.
- The system should only be used within the conditions for which it is rated. See the specifications.
  - Operate the system at ambient temperatures of 0° C to 55° C/32° F to 131° F.
  - Operate the system at an ambient humidity of 35 % to 85 % RH.
- The system should be used in a place where it will not be exposed to :
  - Sudden temperature change causing dew condensation.
  - Inflammable or corrosive gas.
  - Excessive airborne dust or metal particles.
  - Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions of ammonia or caustic soda.
  - Excessive vibration or shock.
  - Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges.
  - Water in any form including spray or mist.
  - Direct sunlight.
- When installing a wiring duct, maintain a clearance between the unit and duct as shown in the figure.



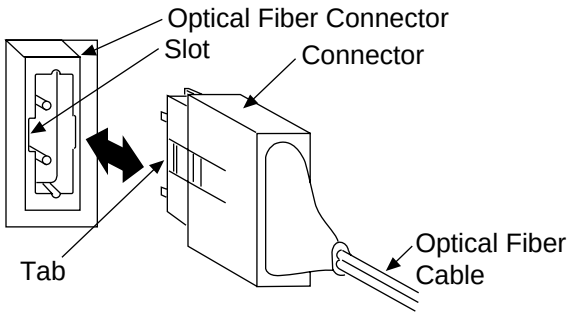
4-3. Connecting the P Type (Optical) Link System

1. Connecting Optical Fiber Cable

1) Connection and Disconnection

■ **Connection Method**

Fit the tab into the slot of optical fiber connector. Push the connector in the direction of arrow to plug it into the optical fiber connector.



■ **Disconnection Method**

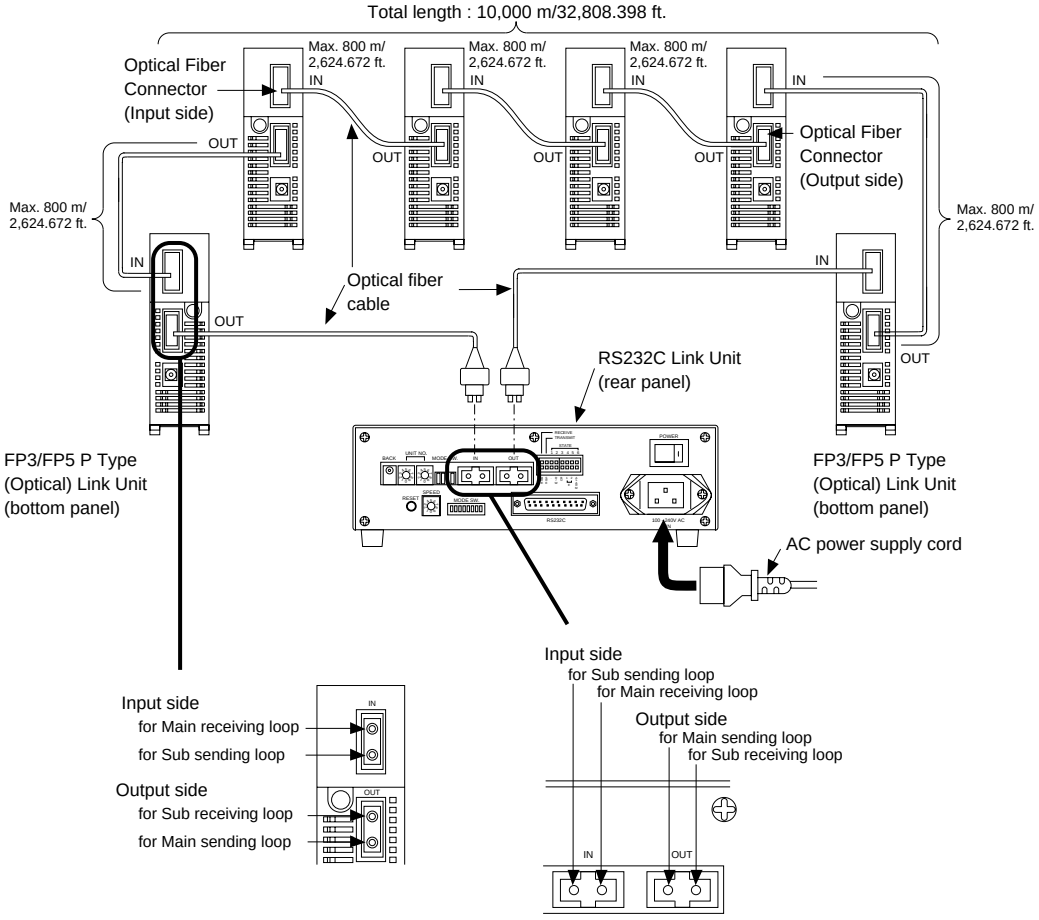
Depress the tab while gently pulling.

2) Notes on Use

- Do not touch or dirty optical fiber cable ends.
- Such actions may cause an optical loss, possibly resulting in transmission errors.
- Do not exceed allowable bending radius.
- Excessive bending may cause optical loss, cable breakage, or transmission errors.
- Avoid actions which place weight on connector. Such actions may loosen connector or break cable. Do not pull on the cable or exceed specified maximum cable tension, which differs for different types of cabling.
- To avoid possible transmission errors, always cover P Type (Optical) Link Unit with supplied protective cap when optical fiber cable is not attached.

2. Connecting the P Type (Optical) Link Unit and the RS232C Link Unit

- Connect the P Type (Optical) Link Unit to P Type (Optical) Link Unit and the P Type (Optical) Link Unit to RS232C Link Unit using the optical fiber cable.
- Connect the optical fiber connector (Input side) and optical fiber connector (Output side) of each P Type (Optical) Link Units using the optical fiber cable.



Notes :

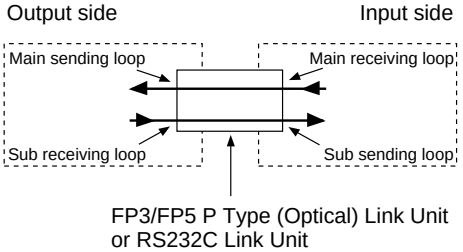
- Refer to page 12, "3. Cable Specifications", for details about the optical fiber cable.
- Connect the P Type (Optical) Link Units with all power OFF.
- Total length of the optical fiber cable should be 10,000 m/32,808.398 ft. or less. (Maximum transmission distance of between P Type (Optical) Link Units : 800 m/2,624.672 ft.)
- A maximum of 63 P Type (Optical) Link Units can be connected in one loop.

■ Structure of Loop System

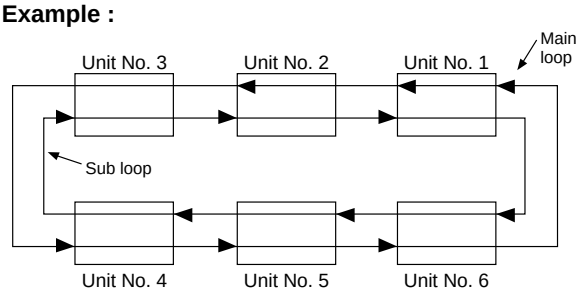
The loop system is composed of 2 types of loops ("Main loop" and "Sub loop") as follows :

- The "Main loop" is used when communication is normal.
- The "Sub loop" is used when communication error occurred at main loop.

Diagram :

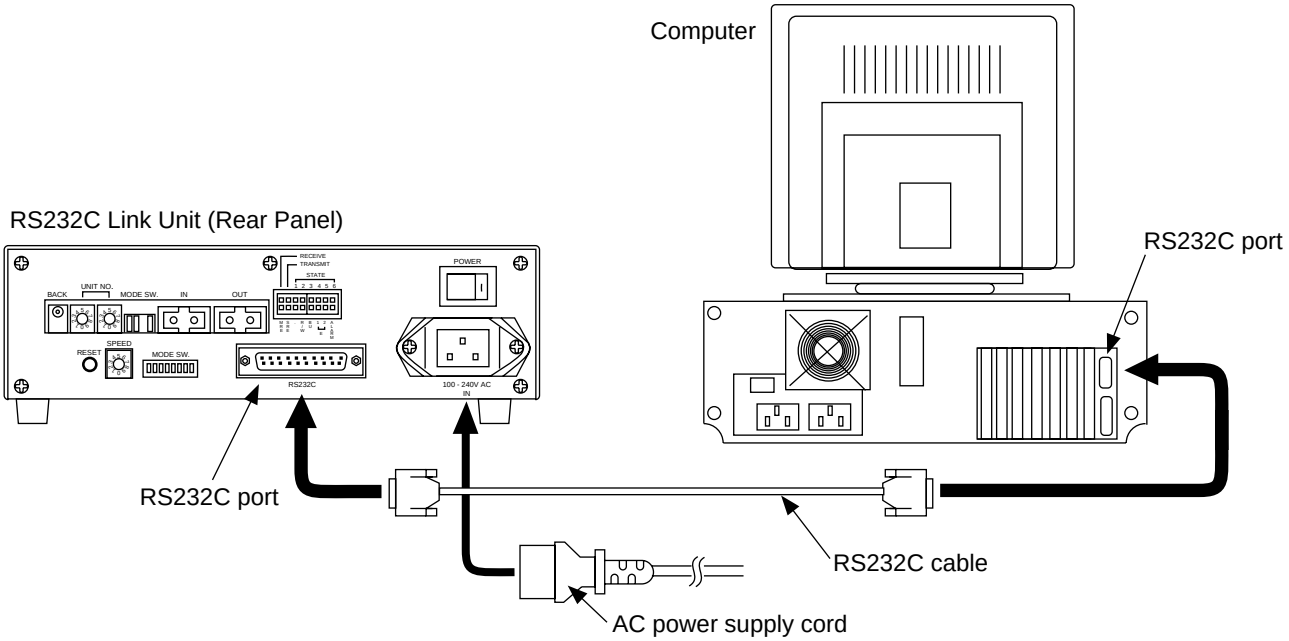


Example :



3. Connecting a Computer and a RS232C Link Unit

The computer is looped with the P Type (Optical) Link Unit through a RS232C Link Unit. Connect the RS232C port of your computer to that of the RS232C Link Unit using the RS232C cable.



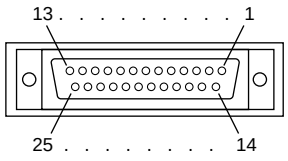
■ Requirements :

Computer : IBM PC-AT or 100 % compatible

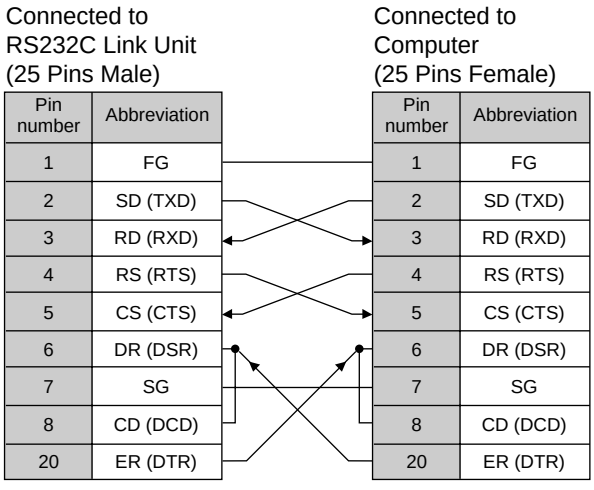
RS232C Link Unit : AFP8760

RS232C cable : Max. length 15 m/49.213 ft.

■ RS232C Cable Example



Pin number	Specification	Direction RS232C Link Unit / Computer
1	FG	—
2	SD (TXD)	→
3	RD (RXD)	←
4	RS (RTS)	→
5	CS (CTS)	←
6	DR (DSR)	←
7	SG	—
8	CD (DCD)	←
20	ER (DTR)	→



Connected to RS232C Link Unit (25 Pins Male) Pin number	Abbreviation	Connected to Computer (25 Pins Female) Pin number	Abbreviation
1	FG	1	FG
2	SD (TXD)	2	SD (TXD)
3	RD (RXD)	3	RD (RXD)
4	RS (RTS)	4	RS (RTS)
5	CS (CTS)	5	CS (CTS)
6	DR (DSR)	6	DR (DSR)
7	SG	7	SG
8	CD (DCD)	8	CD (DCD)
20	ER (DTR)	20	ER (DTR)

Notes :

- Be sure to turn OFF the power to your computer and the RS232C Link Unit when connecting them.
- Check the RS232C specifications of your computer before connecting it to the RS232C Link Unit.
- Use an RS232C cable of 15 m/49.213 ft. or less.

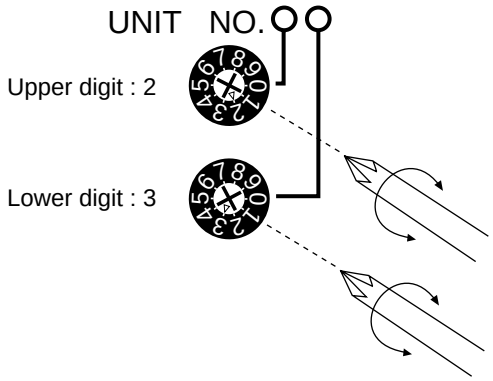
4-4. Settings

1. Setting the P Type (Optical) Link Unit

1) Setting the Station Number (UNIT NO.)

A station number (UNIT NO.) can be selected using the two Station Number (UNIT NO.) Selectors.
The number must be within the range of 01 to 63 and cannot be duplicated on that loop.

Example : station number (UNIT NO.) 23



How to set station number (UNIT NO.)

Turn the dials to the desired station number (UNIT NO.) with a phillips screwdriver.
The upper dial is used to set the tens-digit and the lower dial is used to set the ones-digit.
Be sure to enter both digits of the station number (UNIT NO.).

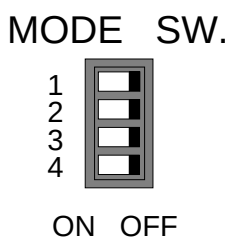
Notes :

- If an invalid station number (UNIT NO.) is assigned in a loop, an error occur and the ERROR 2 LED will flash. When an error has occurred, data communication will be disabled.
- If a station number (UNIT NO.) is assigned to more than one unit in one loop, an error will occur and the ERROR 2 LED will turn ON. You may leave station numbers (UNIT NO.) unassigned, if you wish. That is, you can assign station numbers arbitrarily e.g. 1, 2, 4, 9.
- The station which uses P/W PC Link functions should be within the range of 01 to 16 without duplication in one loop.

2) Setting the Operation Mode

The operation modes (PC Link Mode, Computer Link Mode and Transmission Self-diagnostic Test Mode) can be set with the Mode Selector Switches (MODE SW.).

Mode Selector Switches (MODE SW.)



Notes :

- Set the Mode Selector Switches (MODE SW.) with all power OFF.
- Do not set the Mode Selector Switches (MODE SW.) during data transmission.

Operation mode	Description	Switch position			
		1	2	3	4
PC Link Mode	PC Link function, Computer Link function, Data Transfer function, Remote Programming function	OFF	OFF	——	——
Computer Link Mode	Computer Link function, Data Transfer function, Remote Programming function	ON	OFF	——	——
Transmission Self-diagnostic Test Mode	Test 1 : Main Loop and Sub Loop modes checking	——	ON	OFF	OFF
	Test 2 : Main Loop Back, Sub Loop Back and Main/Sub Loop Back modes checking	——	ON	ON	OFF
	Test 3 : Loop backup function setting (When all of the STATE LEDs are in the OFF state, the unit functions only as a path for the system using the backup power supply.)	——	ON	OFF	ON
	Test 4 : Link function availability setting	——	ON	ON	ON

Refer to page 62, "4. Transmission Self-diagnostic Testing Function", for details about Transmission Self-diagnostic Test Modes (Test 1 to Test 4).

2. Setting the RS232C Link Unit

1) Setting the Station Number (UNIT NO.)

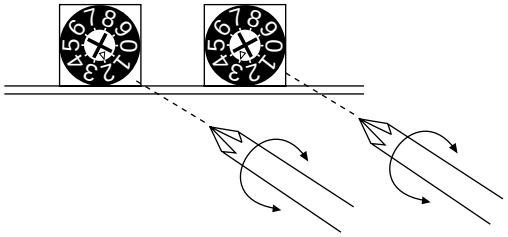
A station number (UNIT NO.) can be selected using the two Station Number (UNIT NO.) Selectors. The number must be within the range of 01 to 63 and cannot be duplicated on the loop.

How to set station number (UNIT NO.)

Turn the dials to the desired station number (UNIT NO.) with a phillips screwdriver.
The upper dial is used to set the tens-digit and the lower dial is used to set the ones-digit.
Be sure to enter both digits of the station number (UNIT NO.).

Example : station number (UNIT NO.) 23

Upper digit : 2 Lower digit : 3



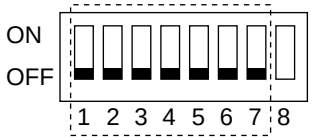
Notes :

- If an invalid station number (UNIT NO.) is assigned in a loop, an error occurs and the ERROR 2 LED will flash. When an error has occurred, data communication will be disabled.
- If a station number (UNIT NO.) is assigned to more than one unit in one loop, an error will occur and the ERROR 2 LED will turn ON. You may leave station numbers (UNIT NO.) unassigned, if you wish. That is, you can assign station numbers arbitrarily e.g. 1, 2, 4, 9.

2) Setting the RS232C Communication Modes

The RS232C communication modes setting for the RS232C Link Unit are changed with the Communication Mode Selector Switches (MODE SW.).

Communication Mode Selector Switches (MODE SW.)



Notes :

- Set the Communication Mode Selector Switches (MODE SW.) with all power OFF.
- Do not set the Communication Mode Selector Switches (MODE SW.) during data transmission.

Switch number	Specification		Switch position 1 2 3 4 5 6 7 8
1	Character bit	7-bit	OFF
		8-bit	ON
2 & 3	Parity check	Invalid	OFF OFF
		Valid	OFF ON
	Parity bit	Odd parity	ON OFF
		Even parity	ON
4	Stop bit	1-bit	OFF
		2-bit	ON
5 & 6	Delimiter code	CR	OFF OFF
		CR, LF	OFF ON
		LF	ON OFF
		LF, CR	ON ON
7	X ON/X OFF control	Invalid	OFF
		Valid	ON

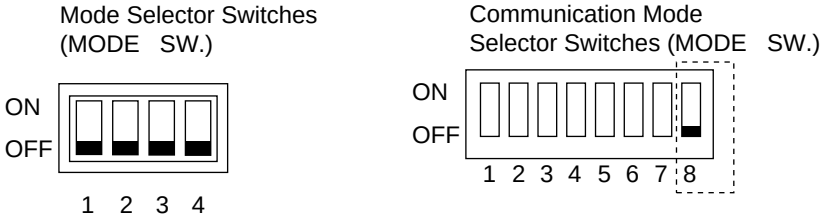
* CR : Carriage Return, LF : Line Feed

3) Setting the Operation Mode

The operation modes (Steady-state Communication Mode, Transparent Communication Mode and Transmission Self-diagnostic Test Mode) can be set with the Mode Selector Switches (MODE SW.) and Communication Mode Selector Switch 8 (MODE SW. 8).

Notes :

- Set the Mode Selector Switches (MODE SW.) and Communication Mode Selector Switches (MODE SW.) with all power OFF.
- Do not set the Mode Selector Switches (MODE SW.) and Communication Mode Selector Switches (MODE SW.) during data transmission.



Operation mode	Description	Switch position				
		Mode Selector Switches (MODE SW.)				
		1	2	3	4	8
Steady-state Communication Mode	Mode setting and confirming function, Computer Link function, Remote Programming function, Data Transfer function, Computer to Computer Communication function, PC Link function (readout only)	—	OFF	—	—	OFF
Transparent Communication Mode	Transfer function for a large quantity of data	—	OFF	—	—	ON
Transmission Self-diagnostic Test Mode	Test 1 : Main Loop and Sub Loop modes checking	—	ON	OFF	OFF	—
	Test 2 : Main Loop Back, Sub Loop Back and Main/Sub Loop Back modes checking	—	ON	ON	OFF	—
	Test 3 : Loop backup function setting (When all of the STATE LEDs are in the OFF state, the unit functions only as a path for the system using the backup power supply.)	—	ON	OFF	ON	—
	Test 4 : Link function availability setting	—	ON	ON	ON	—

Refer to page 62, "4. Transmission Self-diagnostic Testing Function", for details about Transmission Self-diagnostic Test Modes (Test 1 to Test 4).

CHAPTER 5

SYSTEM FUNCTIONS

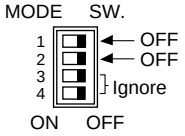
"PC" is an abbreviation of Programmable Controller.

5-1. Unit Set Up Procedure

Follow the procedure below to set up the P Type (Optical) Link System.

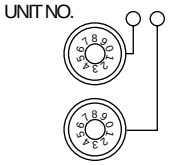
STEP 1 Check the settings for station number (UNIT NO.) and operation modes.

- Is all power turned OFF during setting?
- Is the station number (UNIT NO.) outside the allowed range (01 to 63)?
- Do the station numbers (UNIT NO.) overlap?



- Is the station number (UNIT NO.) of any unit in the PC Link Mode outside the allowed range (01 to 16)?

P Type (Optical) Link Unit



STEP 2 Turn ON the unit's power.

STEP 3 Check all the Operation Monitor LEDs on the front of the unit.

- Is ERROR 1 LED OFF?
- Is ERROR 2 LED OFF?
- Does the PC LINK LED show the actual PC Link Mode setting?
  (ON for PC Link Mode enabled, OFF for disabled)

Notes :

- If any error occurs, check the cause and correct the error.
  Refer to page 56, "5-5. Error Checking during Transmission", for details about error correction.
- You can check the unit's operation status by reading the special relays and special data registers in the CPU.

STEP 4 P Type (Optical) Link Units are ready for operation.

When in PC Link Mode, the PC Link Area in the CPU must be allocated in the system registers of the CPU.

Note :

- The system registers for use as the PC Link Area are not set when shipped.
  Refer to page 39, "4) System register for PC Link Area", for details about setting up the PC Link Area.

5-2. Outline of P Type (Optical) Link System Communication Functions

The P Type (Optical) Link System can handle 5 kinds of communication functions between FP3 and FP5 Programmable Controllers :

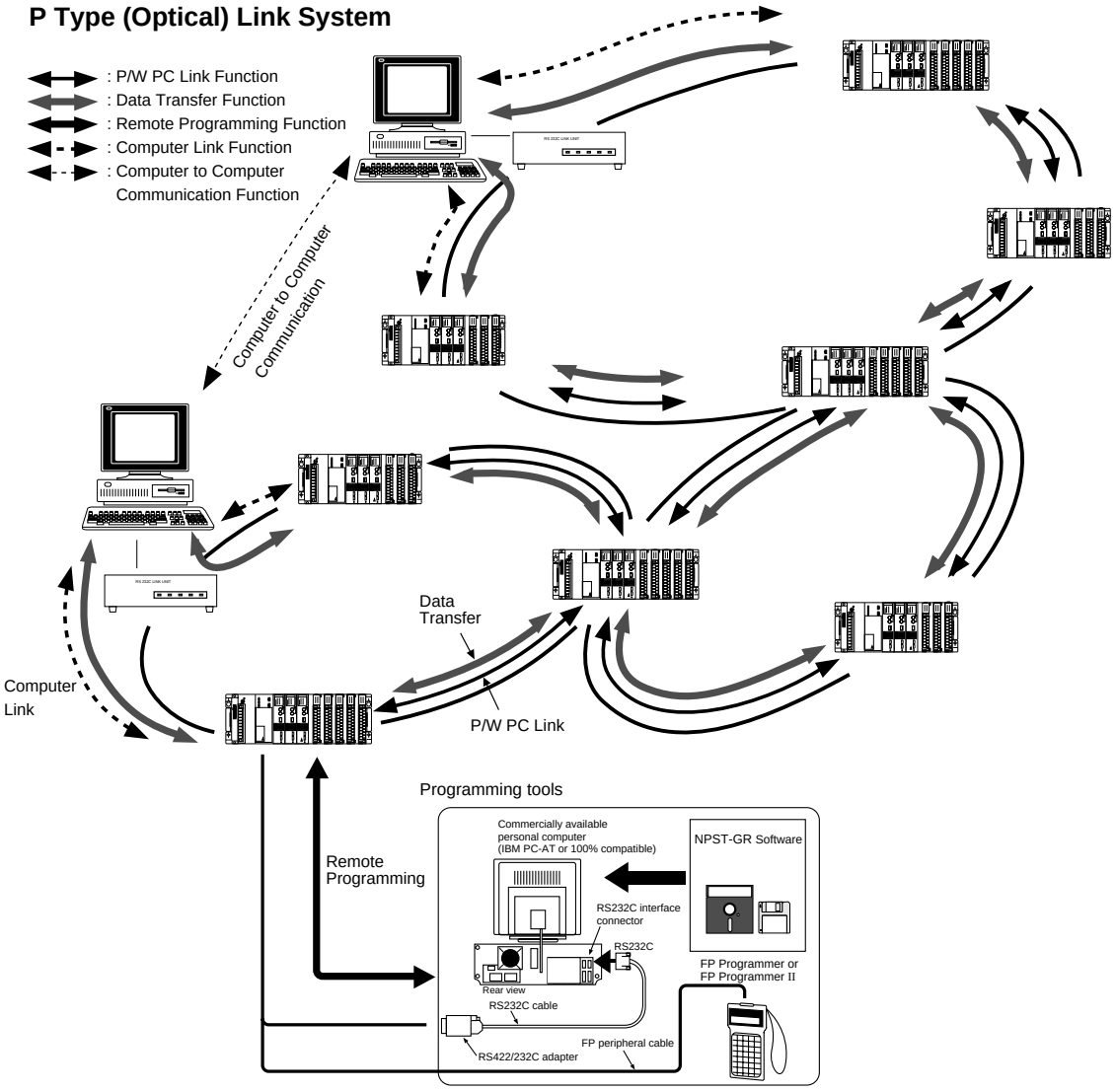
P/W PC Link Function, Data Transfer Function, Remote Programming Function, Computer Link Function and Computer to Computer Communication Function

Between Programmable Controllers	: P/W PC Link Function Data Transfer Function Remote Programming Function
Programmable Controller to Computer	: Computer Link Function Data Transfer Function
Between Computers	: Computer to Computer Communication Function

Notes :

- Computer Link Function can only be performed when the P Type (Optical) Link Unit links the computer with RS232C Link Unit.
- P/W PC Link Function can only be performed when the P Type (Optical) Link Unit is set to the "PC Link Mode". If the unit is set to the "Not PC Link Mode", the unit can perform Computer Link, Data Transfer and Remote Programming Functions.

P Type (Optical) Link System



5-3. Communication Functions of P Type (Optical) Link Unit

1. P/W PC Link Function

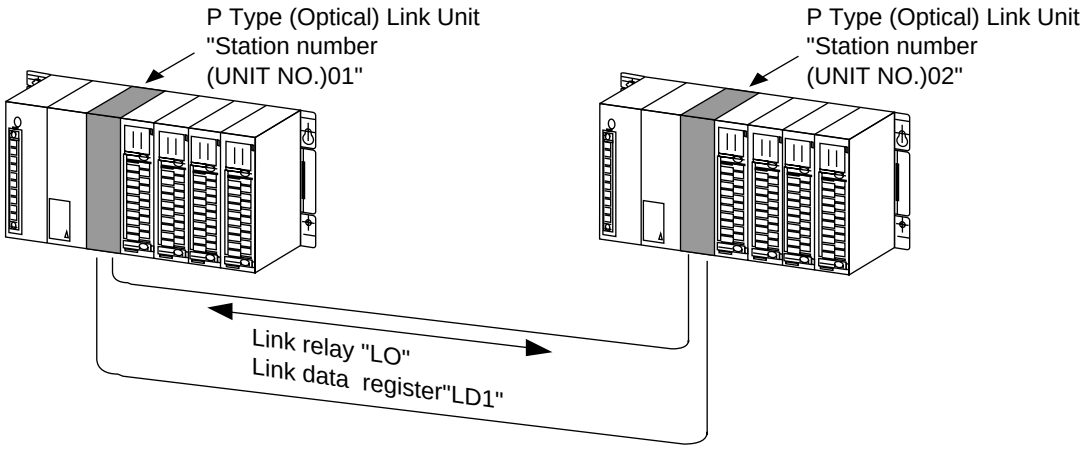
1) Outline

- The P/W PC Link Function is one of the functions available with a P Type (Optical) Link System.
- P/W PC Link Function is formally called "P Type (Optical)/W Type (Wire) Programmable Controller Link Function".
- In a P/W PC Link Function, data is shared between Programmable Controllers by writing or reading data in memory areas called "link relays (L)" and "link data registers (LD)" which exist in each Programmable Controller.
- P/W PC Link Function can only be performed between P Type (Optical) Link Unit set in the "PC Link Mode" with the Mode Selector Switch 1 (MODE SW. 1) on the front panel of the unit.
  (In the same loop, both of FP3s and FP5s can be installed.)

  Since no special instructions for data communication are required when using the P/W PC Link Function, you can create programs without needing complicated procedures.

Notes :

- A maximum of 16 stations in a single loop can be in the PC Link Mode.
- A maximum of 2 P Type (Optical) Link Units on a single CPU can be set in PC Link Mode.
  If other units with a P/W PC Link Function, such as W Type (Wire) Link Unit, are installed together on the CPU, the total number of units with a P/W PC Link Function must not be more than 2 units.



The figure above shows an example of P/W PC Link under the following conditions :

- The operating status in the "Station number (UNIT NO.) 01" is changed according to the ON/OFF state of the link relay "L0" of the CPU in the "Station number (UNIT NO.) 02".
- When data stored in WX1 is written to link data register LD1 on the "Station number (UNIT NO.) 02", "Station number (UNIT NO.) 01" reads the data stored in LD1 and writes it in WY1.

  Thus, data transfer from WX1 on the "Station number (UNIT NO.) 02", to WY1 on the "Station number (UNIT NO.) 01" can be easily performed by using a link data register LD1.

2) Configuring PC Link Area

- Each CPU has 2 PC Link Areas available for :

  P/W PC LINK 0

  P/W PC LINK 1

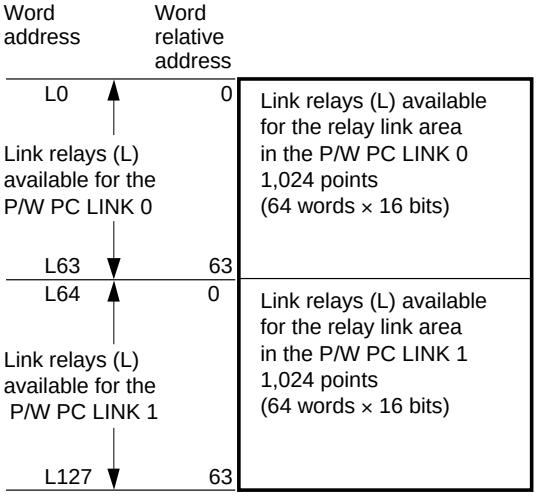
- Each PC Link Area is composed of 2 types of areas (a relay link area and a data link area) and the following areas are available as PC Link Areas :

  P/W PC LINK 0 : relay link area ..... Max. 1,024 points for link relays (L0 to L63F)
  data link area ..... Max. 128 words for link data registers (LD0 to LD127)

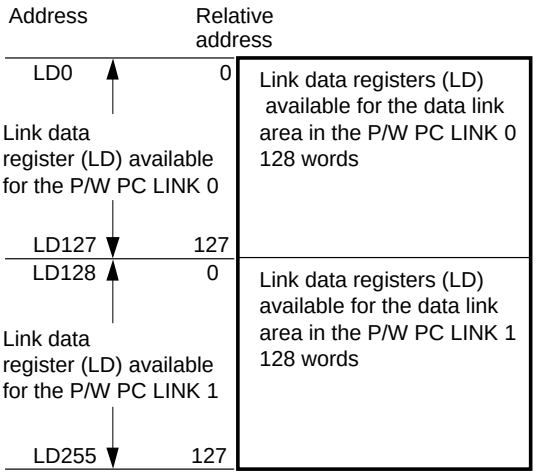
  P/W PC LINK 1 : relay link area ..... Max. 1,024 points for link relays (L640 to L127F)
  data link area ..... Max. 128 words for link data registers (LD128 to LD255)

The area available as the PC Link Area is configured as follows :

■ Link relays (L)



■ Link data registers (LD)



Notes :

- One CPU can control a maximum of 2 P/W PC Links.
- The units in PC Link Mode are designated as P/W PC LINK 0 and P/W PC LINK 1 starting with the unit which is closest to the CPU.
- Any area which is not used as a part of the PC Link Area set aside for the P/W PC Link can be used as normal internal relays and data registers.

3) Allocating the area for P/W PC Link

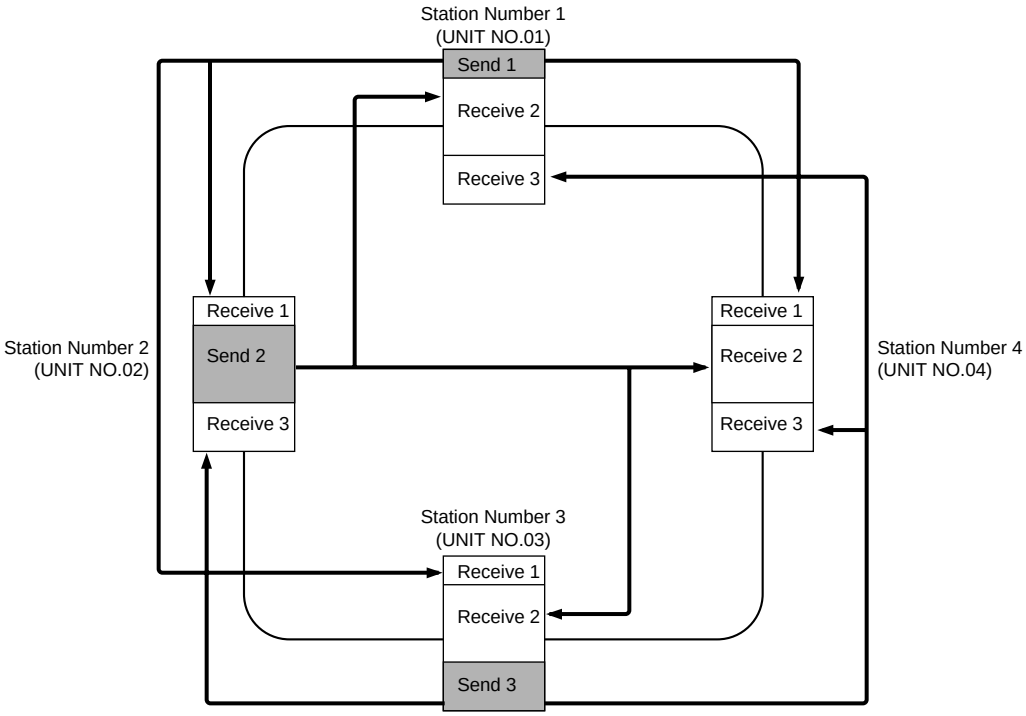
The data is sent from the send area of the PC Link Area in one CPU to the receive area of the PC Link Area in the other CPUs.

Each PC Link Area is composed of the relay link area and data link area.

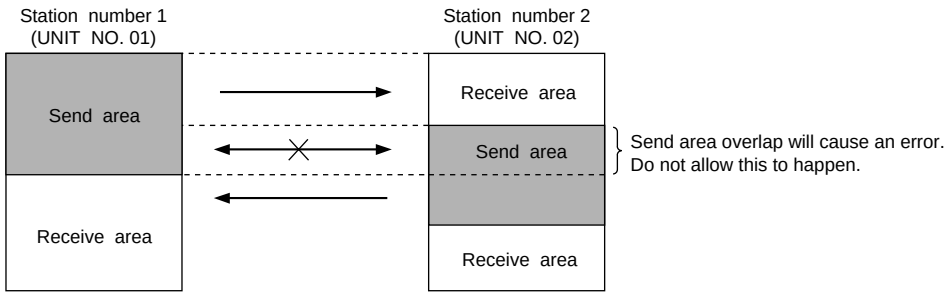
In both of the links, the address must be assigned for the send and receive areas.

The send area addresses in the PC Link Area should not be overlapped in the same loop. If the send area addresses overlap each other in the same loop, an error will occur.

■ PC Link Area allocation example in one loop :



- The data in the "Send 1" area is transferred to the "Receive 1" area in stations 2, 3 and 4.
- The data in the "Send 2" area is transferred to the "Receive 2" area in stations 1, 3 and 4.
- The data in the "Send 3" area is transferred to the "Receive 3" area in stations 1, 2 and 4.
- There is no send area in the station number 04 (UNIT NO. 04) in this loop.
- The send and receive area settings must be assigned for both the link relays (L) and the link data registers (LD).
- The send area addresses in each PC Link Area (P/W PC LINK 0 and P/W PC LINK 1) should not be overlapped in the same loop. If the send area relative addresses are overlapped, an error will occur.
  Be sure to allocate non-overlapping send areas.

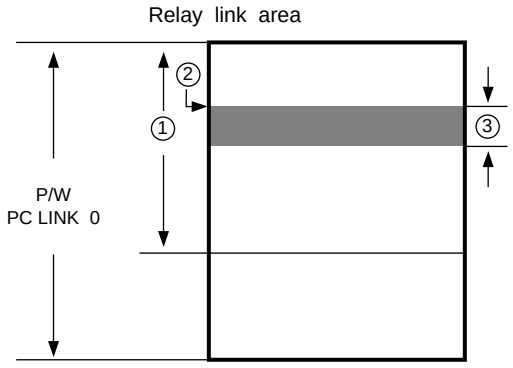


4) System register for PC Link Area

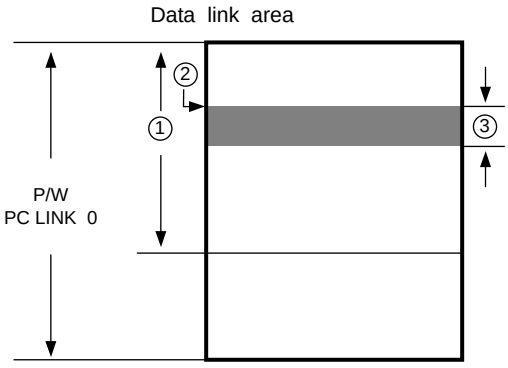
The allocation of the areas available for the P/W PC LINK 0 and P/W PC LINK 1 in the CPU are specified using the system registers as follows :

System register number	Content			Default value	Setting range
40	For P/W PC LINK 0	Link relays (L) size of the relay link area in P/W PC LINK 0		0	0 to 64 words from address L0 (0 to 1,024 points)
41		Link data register (LD) size of the data link area in P/W PC LINK 0		0	0 to 128 words from address LD0
42		Send relay link area setting	Starting address for the send relay link area	0	0th to 63rd word
43			Size of the send relay link area	0	0 to 64 words from the starting address
44		Send data link area setting	Starting address for the send the data link area	0	0th to 127th word
45			Size of the send data link area	0	0 to 127 words from the starting address
50	For P/W PC LINK 1	Link relay (L) size of the relay link area in P/W PC LINK 1		0	0 to 64 words from address L64 (0 to 1,024 points)
51		Link data register (LD) size of the data link area in P/W PC LINK 1		0	0 to 128 words from address LD128
52		Send relay link area setting	Starting address for the send relay link area	64	64th to 127th word
53			Size of the send relay link area	0	0 to 64 words from the starting address
54		Send data link area setting	Starting address for the send data link area	128	128th to 255th word
55			Size of the send data link area	0	0 to 127 words from the starting address

Example : for P/W PC LINK 0



① Link relays(L) size of the relay link area
② Starting address for the send relay link area
③ Size of the send relay link area



① Link data register(LD) size of the data link area
② Starting address for the send data link area
③ Size of the send data link area

■ **Notes :**

- Link relay (L) assignments are performed in units of words (1 word = 16 bits).
  If the system register address 40 is set to 64, all of the relays (1,024 points : L0 to L63F) can be used as the relay link area for the P/W PC LINK 0.
- The send area is used for sending data to the other Programmable Controllers which are in the PC Link Mode in the same loop. The rest area of the PC Link Area is automatically allocated as the receive area.
  If the send area size is set to 0, all of the area is used as the receive area.
  If the send area size is set to the maximum value,
  send link relay area : all of the relays are used as send link relays
  send link data register area : all 127 link data registers are used as send link data registers.
- Even if 128 link data registers are available for use as the PC Link Area, a maximum of 127 link data registers can be used for the send area.
- Make sure that the send area allocated is within the range of the specified PC Link Area.
- Within the same loop, the send area addresses must not be overlapped.

■ When Connecting a P/W PC LINK 0 station to a P/W PC LINK 1 station

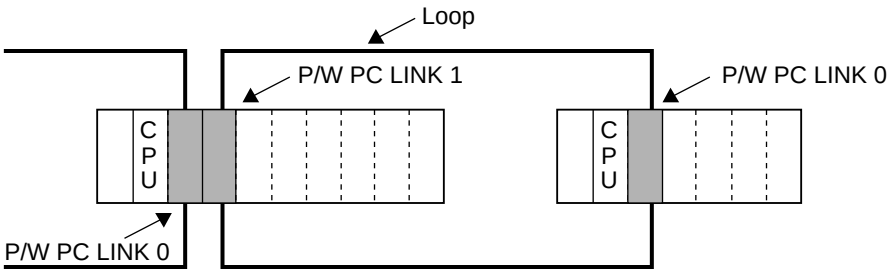
When the P/W PC Link Function is used, it is possible to connect a P Type (Optical) Link Unit which is assigned as P/W PC LINK 0 to a P Type (Optical) Link Unit which is assigned as P/W PC LINK 1.
In this case, special attention is required when allocating the PC Link Area since the addresses for P/W PC LINK 0 and P/W PC LINK 1 are not in same absolute address range. When allocating the PC Link Area, the relative addresses should be carefully considered.

Notes :

- The formulas for getting the relative address in P/W PC LINK 1 are :
  Link relays (L) : Actual address minus 64 words
  Link data register (LD) : Actual address minus 128 words
- The relative address numbers are equal to the addresses in the PC Link Area of P/W PC LINK 0.

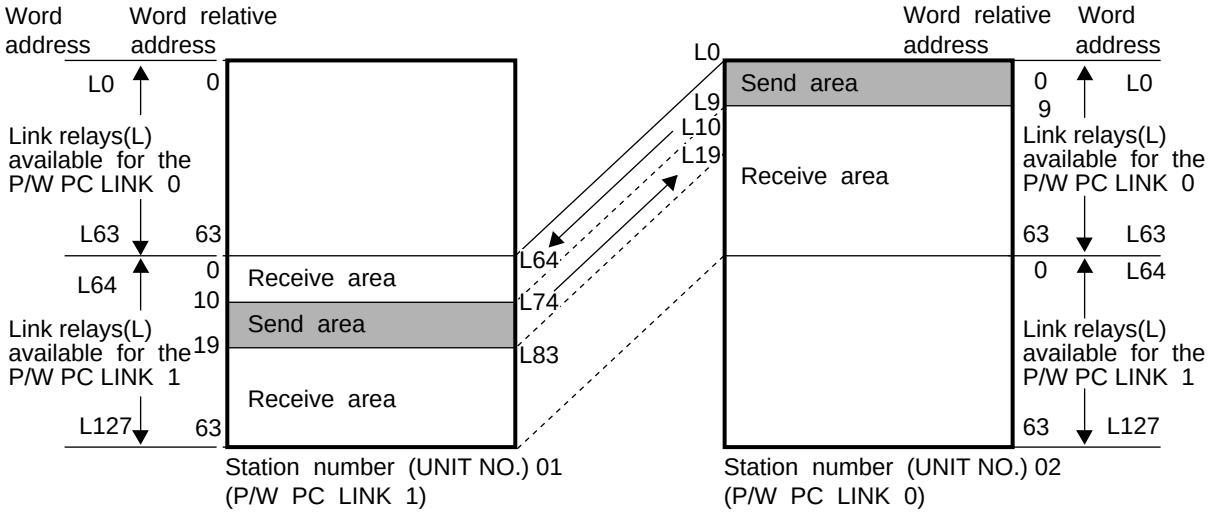
Example :

Connection :

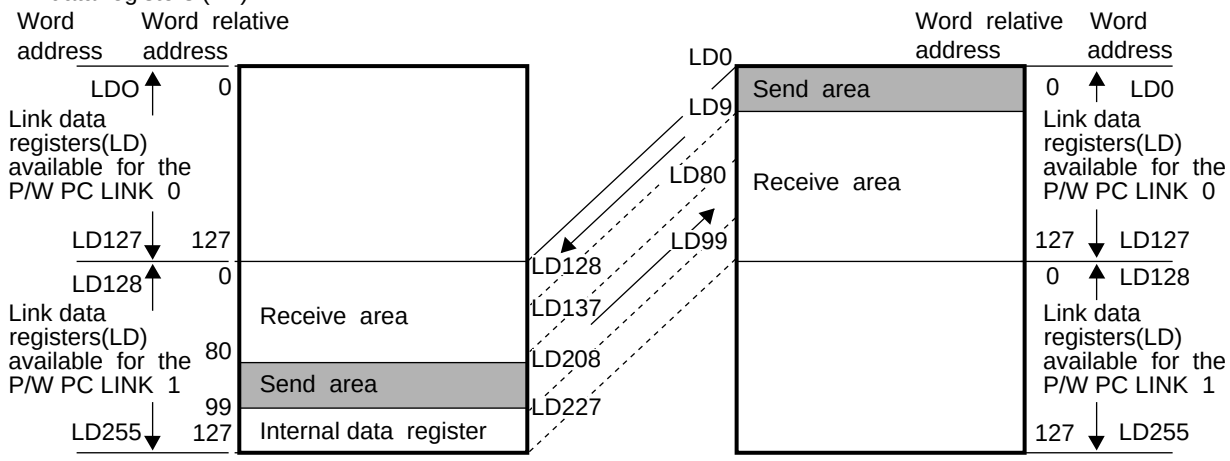


PC Link Area :

• Link relays (L)



• Link data registers (LD)



5) Allocating the PC Link Area Using Programming Support Tools

The PC Link Area can be allocated by setting system registers. System register setting is performed with the FP Programmer or the NPST-GR programming support tool.

■ Using the FP Programmer Ⅱ

Procedure

1. Connect the FP Programmer to the RS422 port on the CPU using the FP Peripheral Cable.
2. Place the Mode Selector Switch of CPU in the PROG. mode.
3. Set the system registers in the CPU using the OP50 function and the following procedure :

ACLR → (–) OP → 5 → 0 → ENT →

4. Enter the system register number with alphanumeric keys.

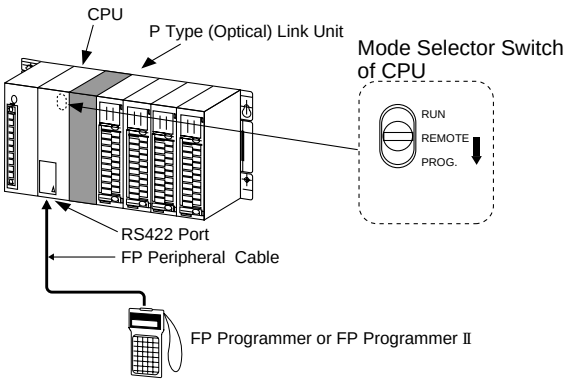
→ READ ▼ → The set value of the specified register address is displayed.

→ (HELP) CLR →

→ (BIN) K/N → Enter the new value (decimal) for the specified system register address.

→ WRT

Connecting Method



FP Programmer or FP Programmer Ⅱ : AFP1114, AFP1112A or AFP1112
FP Peripheral Cable : AFP5520 (0.5 m/1,640 ft.) or AFP5523 (3 m/9,843 ft.)

Note :

• If the AFP1112 type FP Programmer is used, the baud rate must be set in the CPU. Be sure to set the baud rate in the CPU to 19,200.

• Link relay (L)

System register number	P/W PC LINK 0	P/W PC LINK 1	Description
	40	50	Link relay (L) area size
	42	52	Starting address for the send relay link area
	43	53	Send relay link area size

• Link data register (LD)

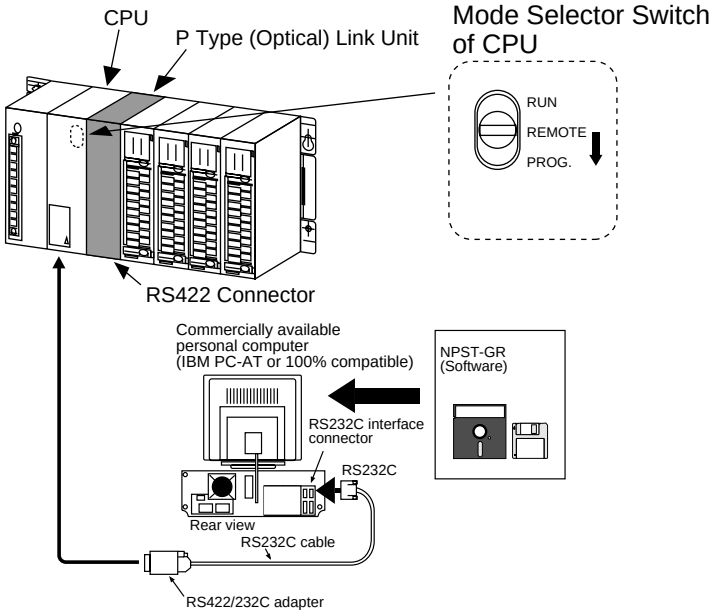
System register number	P/W PC LINK 0	P/W PC LINK 1	Description
	41	51	Link data register (LD) area size
	44	54	Starting address for the send data link area
	45	55	Send data link area size

• Refer to "FP PROGRAMMER Operation Manual", for details about the operation.

■ Using the NPST-GR Software

Procedure

1. Connect the RS422 port on the CPU to the RS422 port on the RS422/232C Adapter with the FP Peripheral Cable.
   Then, connect the RS232C port on the RS422/232C Adapter to RS232C port on your computer using an RS232C Cable.
2. Start the NPST-GR software on the computer.
   Set the NPST configurations.
   (PLC Type, Port selection, Transmission rate, etc.)
3. Put the NPST-GR program in the ONLINE mode and then place the CPU in the PROG. mode.
4. Select "SET SYSTEM REG" from the NPST MENU and select the PC LINK CTRL function using function keys. ("LINK 0" or "LINK 1")
   Press {f9 LINK 0}, when you set PC LINK 0.
   Press {f10 LINK 1}, when you set PC LINK 1.



NPST-GR Softwere	: AFP266538
FP Peripheral Cable	: AFP5520 (0.5 m/1.640 ft.) or AFP5523 (3 m/9.843 ft.)
RS232C Cable	: AFB85833 or AFB85853 (3 m/9.843 ft.)
RS422/232C Adapter	: AFP8550
Computer	: IBM PC-AT or 100% compatible with MS-DOS (PC-DOS) Ver. 3.0 or later

• Link relay (L)

System register number	P/W PC LINK 0	P/W PC LINK 1	Description
	40	50	Link relay (L) area size
	42	52	Starting address for the send relay link area
	43	53	Send relay link area size

• Link data register (LD)

System register number	P/W PC LINK 0	P/W PC LINK 1	Description
	41	51	Link data register (LD) area size
	44	54	Starting address for the send data link area
	45	55	Send data link area size

- Refer to "NPST-GR Manual", for details about the operation of NPST-GR.

6) Special Internal Relays and Special Data Registers for the P/W PC Link

The P/W PC Link status of a loop, the CPU status etc. can be checked using special internal relays (R) and special data registers (LD).

■ Checking the PC Link Modes (P/W PC LINK 0 : R9060 to R906F, P/W PC LINK 1 : R9080 to R908F)

The following special internal relays can be used for checking whether each P Type (Optical) Link Unit in a loop is in PC Link Mode or not.

Special internal relay address		Station number (UNIT NO.)
P/W PC LINK 0	P/W PC LINK 1	
R9060	R9080	01
R9061	R9081	02
R9062	R9082	03
R9063	R9083	04
R9064	R9084	05
R9065	R9085	06
R9066	R9086	07
R9067	R9087	08
R9068	R9088	09
R9069	R9089	10
R906A	R908A	11
R906B	R908B	12
R906C	R908C	13
R906D	R908D	14
R906E	R908E	15
R906F	R908F	16

ON : when the P Type (Optical) Link Unit is in PC Link Mode

OFF : when the P Type (Optical) Link Unit is not in PC Link Mode

Note :

- Since the P/W PC Link Function is available only for P Type (Optical) Link Units assigned as 01 to 16, no P Type (Optical) Link Units outside the range of 01 to 16 can be checked. If P Type (Optical) Link Units outside the range have PC Link Mode enabled, an error will occur.

■ Checking the CPU Mode (RUN or PROG. mode) (P/W PC LINK 0 : R9070 to R907F, P/W PC LINK 1 : R9090 to R909F)

The CPU mode (RUN or PROG.) for each station in the P/W PC Link is checked using the special internal relays.

Special internal relay address		Station number (UNIT NO.)
P/W PC LINK 0	P/W PC LINK 1	
R9070	R9090	01
R9071	R9091	02
R9072	R9092	03
R9073	R9093	04
R9074	R9094	05
R9075	R9095	06
R9076	R9096	07
R9077	R9097	08
R9078	R9098	09
R9079	R9099	10
R907A	R909A	11
R907B	R909B	12
R907C	R909C	13
R907D	R909D	14
R907E	R909E	15
R907F	R909F	16

ON : when the P Type (Optical) Link Unit is in RUN Mode

OFF : when the P Type (Optical) Link Unit is in PROG. Mode

■ Checking a Send Area Overlap Error (P/W LINK 1 : DT9170, P/W LINK 2 : DT9200, P/W LINK 3 : DT9230)

When a send area overlap error occurs, the overlapped station numbers (UNIT NO.) can be found. These special data registers are useful to search a send area overlapped station when the error occurs.

Special data register address	Description
DT9170	Indicates the station number (UNIT NO.) where the send area is overlapped in the P/W LINK 1 loop.
DT9200	Indicates the station number (UNIT NO.) where the send area is overlapped in the P/W LINK 2 loop.
DT9230	Indicates the station number (UNIT NO.) where the send area is overlapped in the P/W LINK 3 loop.

The contents of the special data registers are configured as follows :

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
Overlapped station (UNIT NO.)	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

1 (ON) : Overlapped
0 (OFF) : Not overlapped

Example :

Send area overlap stations : Station numbers (UNIT NO.) 01 and 03.
Checked from : Station number 1 (UNIT NO. 01)/LINK 2 (P/W PC LINK 0)
Special data register : DT9200
Contents of DT9200 : "0000000000000101"[0005 (H)]

DT9200	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1
Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
Overlapped station (UNIT NO.)	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1

2. Data Transfer Function

1) Outline

Data Transfer is one of the functions available in a P Type (Optical) Link System.
In the P Type (Optical) Link System, data can be transferred between Programmable Controllers, a Programmable Controller and a computer with instructions F145 (SEND)/P145 (PSEND) and F146 (RECV)/P146 (PRECV).
This function is available to any station (max. 63 stations) in a loop.

Notes :

- A maximum of 3 P Type (Optical) Link Units can be installed on a Master Backplane.
  Each CPU can control a maximum of 3 P/W link units.
  The P/W link units area : P Type (Optical) Link Unit, W Type (Wire) Link Unit, C.C.U. (Computer Communication Unit), C-NET Link Unit
  The P/W link units on a single CPU are assigned as P/W LINK 1, P/W LINK 2 and P/W LINK 3 starting with the unit closest to the CPU.
- A maximum of 16 words can be transferred at one time.

2) Memory Configuration of the FP3/FP5

The memory areas of FP3/FP5 Programmable Controllers which are related to the F145 (SEND)/P145 (PSEND) and F146 (RECV)/P146 (PRECV) instructions are as follows :

Name of memory area			Available number of points/words (Address range)	Numbering system
Relays	External input relay (X)		2,048 points (X0 to X127F) [=128 words (WX0 to WX127)]	Relay bit numbering system [Word numbering system]
	External output relay (Y)		2,048 points (Y0 to Y127F) [=128 words (WY0 to WY127)]	Relay bit numbering system [Word numbering system]
	Internal relay (R)		1,568 points (R0 to R97F) [=98 words (WR0 to WR97)]	Relay bit numbering system [Word numbering system]
	Link relay (L)		2,048 points (L0 to L127F) [=128 words (WL0 to WL127)]	Relay bit numbering system [Word numbering system]
Registers	Data register (DT)		2,048 words (DT0 to DT2047)	Word numbering system
	File register (FL)	FP3 : 10 k Type	8,189 words (FL0 to FL8188)	Word numbering system
		FP3/FP5 : 16k Type	22,525 words (FL0 to FL22524)	
	Link data register (LD)		256 words (LD0 to LD255)	Word numbering system
	Index register (IX/IY)		2 words (IX & IY)	IX or IY (No numbering system)
Timers /Counters	Timer/Counter contact (T/C)		256 points (0 to 255)	Decimal numbering
	Timer/Counter Set (Preset) value (SV)		256 words (SV0 to SV255)	Word numbering system
	Timer/Counter Elapsed (Count) value (EV)		256 words (EV0 to EV255)	Word numbering system

Notes :

Explanation of basic terminology

- Bit : One binary digit. The smallest unit of binary information. A bit can express a value of "1" or "0".
- Word : A word is composed of 16 bits which are all operated on at the same time when a word operation is performed. Addresses for words are expressed as decimal numbers.
- Relay bit address : Addresses for relay bits (X,Y,R and L) are expressed as a combination of a word address (decimal) and a hexadecimal number for the specific bit. The least significant digit is hexadecimal and the rest of the digits are decimal.
  Example : X 3 8 F ← Hexadecimal (Bit number)
  ↑ Decimal (Word number)

3) Link Data Sending Instruction (F145 SEND/P145 PSEND)

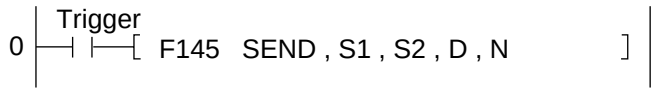
■ [F145 (SEND, steps : 9), P145 (PSEND, steps : 9)]

Outlines

The F145 (SEND) instruction sends data to another Programmable Controller in the same loop whenever the trigger is turned ON.

The P145 (PSEND) instruction sends data to another Programmable Controller in the same loop only when the leading edge of the trigger is detected.

Basic instruction format



S1	Memory area address for setting the conditions for this instruction. (address S1+1 & S1 are used)
S2	Starting memory area address for data to be sent (data source).
D	Destination memory area in another station. (always specified as "0")
N	Starting memory area address in the destination memory area specified in "D" above.

Memory Area

Item	Relay				Timer/ Counter		Register					Constant		Index modifier	
	WX	WY	WR	WL	SV	FV	DT	LD	FL	IX	IY	K	H	IX	IY
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	A	A	N/A	N/A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A

A : Available, N/A : Not available

Note:

• When the address of "S1" is specified, the next memory location "S1 + 1", is automatically specified.

Flag Condition

Flag	Description
R9030	0 : When data can not be transferred. (Including the time while data is being transferred.) 1 : When data can be transferred.
R9031	0 : When the transfer operation has completed without error. 1 : When a transfer error occurs. (error code is stored in DT9039.) See "Note" next page.
R9007	Turns ON and stays ON, • when data specified in "S1 + 1" and/or "S1" is out of the range. • when the unit can not be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9017.)
R9008	Turns ON for an instant, • when data specified in "S1 + 1" and/or "S1" is out of range. • when the unit can not be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9018.)

Note :

- When the flag R9031 (special internal relay) turns ON (1), one of the following error codes are stored in DT9039 (special data register).
  - 71 (Hexadecimal) : Response signal indicating that the transfer operation can not be received.
  - 72 (Hexadecimal) : Buffer for the link is full.
  - 73 (Hexadecimal) : A response message was not received.

When one of the above mentioned errors occurs, check the value of the time-out in system register number 32. The time out value can be set in the range of 10 ms to 81.9 s (default = 2 s).

Description ■ "S1 + 1" & "S1" Setting

High word

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
S1 + 1	0 0 0 0			

Link　Station No. (UNIT NO.)

Low word

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
S1	0 0 0			

F　n2　n1

① When data is sent in units of words

- "S1" Setting
  - F = 0 : Units of words selected.
  - n2 = 0000 (H0) : Enter H0 when word units are selected.
  - n1 = 00000001 (H01) to 00011111 (H10) : Enter the number of words to be sent. (01 to 16)
- "S1 + 1" Setting
  - LINK = 0001 (H1) to 0011 (H3) : Enter the LINK number (1 to 3) for the destination station.
  - Station number (UNIT NO.) = 00000001 (H01) to 00111111 (H3F) : Enter the station number (UNIT NO.).

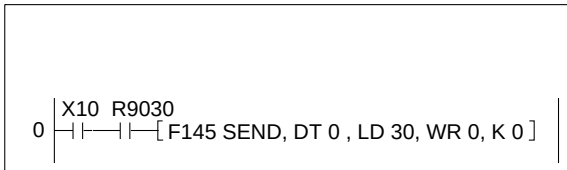
② When data is sent in units of bits

- "S1" Setting
  - F = 1 : Units of bits selected.
  - n2 = 0000 (H0) to 1111 (HF) : Enter the destination bit position (00 to 15).
  - n1 = 00000000 (H00) to 00001111 (H0F) : Enter the source bit position (00 to 15).
- "S1 + 1" Setting
  - LINK = 0001 (H1) to 0011 (H3) : Enter the LINK number (1 to 3) for the destination station.
  - Station number (UNIT NO.) = 00000001 (H01) to 00111111 (H3F) : Enter the station number (UNIT NO.).

Note :

- The available areas for the W Type (Wire) Link System are :
  LINK = 0001 (H1) to 0011 (H3)
  Station number (UNIT NO.) = 00000001 (H01) to 00100000 (H20)

Program example



Address	Command	
0	ST	X 10
	AN	R 9030
	F 145	(SEND)
	DT	0
	LD	30
	WR	0
	K	0

4) Link Data Receiving Instruction (F146 RECV/P146 PRECV)

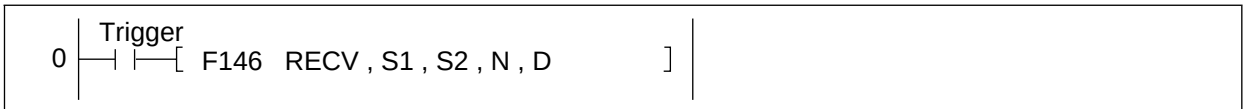
■ [F146 (RECV, steps : 9), P146 (PRECV, steps : 9)]

Outlines

The F146 (RECV) instruction receives data from another Programmable Controller in the loop whenever the trigger is turned ON.

The P146 (PRECV) instruction receives data from another Programmable Controller in the loop only when the leading edge of the trigger is detected.

Basic instruction format



S1	Memory area address for setting the conditions for this instruction. (address S1 + 1 & S1 are used)
S2	Source memory area type in another station. (always specified as "0")
N	Starting memory area address in the source memory area in another station specified in "S2" above.
D	Starting memory area address in the destination memory area.

Memory Area

Item	Relay				Timer/ Counter		Register					Constant		Index modifier	
	WX	WY	WR	WL	SV	FV	DT	LD	FL	IX	IY	K	H	IX	IY
S1	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A	A
S2	A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A
D	N/A	A	A	A	A	A	A	A	A	N/A	N/A	N/A	N/A	A	A

A : Available, N/A : Not available

Note:

• When the address of "S1" is specified, the next memory location "S1 + 1", is automatically specified.

Flag Condition

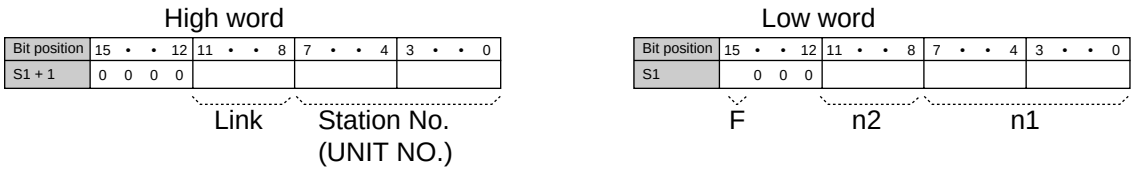
Flag	Description
R9030	0 : When data can not be transferred. (Including the time while data is being transferred.) 1 : When data can be transferred.
R9031	0 : When the transfer operation has completed without error. 1 : When a transfer error occurs. (The error code is stored in DT9039.) See "Note" next page.
R9007	Turns ON and stays ON, • when the data specified in "S1 + 1" and/or "S1" is out of range. • when the unit can not be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9017.)
R9008	Turns ON for an instant, • when data specified in "S1 + 1" and/or "S1" is out of range. • when the unit can not be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9018.)

Note :

- When the flag R9031 (special internal relay) turns ON (1), one of the following error codes are stored in DT9039 (special data register).
  - 71 (Hexadecimal) : Response signal indicating that the transfer operation can not be received.
  - 72 (Hexadecimal) : Buffer for the link is full.
  - 73 (Hexadecimal) : A response message was not received.

When one of the above mentioned errors occurs, check the value of the time-out in system register number 32. The time out value can be set in the range of 10 ms to 81.9 s (default = 2 s).

Description ■ "S1 + 1" & "S1" Setting



① When data is sent in units of words

- "S1" Setting
  F = 0 : Units of words selected.
  n2 = 0000 (H0) : Enter H0 when word units are selected.
  n1 = 00000001 (H01) to 00011111 (H10) : Enter the number of words to be sent. (01 to 16)
- "S1 + 1" Setting
  LINK = 0001 (H1) to 0011 (H3) : Enter the LINK number (1 to 3) for the source station.
  Station number (UNIT NO.)
  = 00000001 (H01) to 00111111 (H3F) : Enter the station number (UNIT NO.).

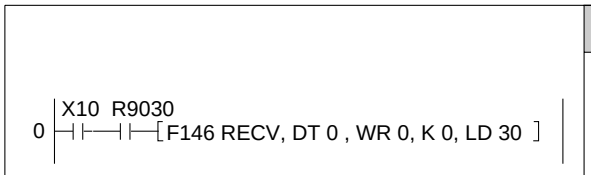
② When data is sent in units of bits

- "S1" Setting
  F = 1 : Units of bits selected.
  n2 = 0000 (H0) to 1111 (HF) : Enter the destination bit position (00 to 15).
  n1 = 00000000 (H00) to 00001111 (H0F) : Enter the source bit position (00 to 15).
- "S1 + 1" Setting
  LINK = 0001 (H1) to 0011 (H3) : Enter the LINK number (1 to 3) for the source station.
  Station number (UNIT NO.)
  = 00000001 (H01) to 00111111 (H3F) : Enter the station number (UNIT NO.).

Note :

- The available areas for the W Type (Wire) Link System are :
  LINK = 0001 (H1) to 0011 (H3)
  Station number (UNIT NO.) = 00000001 (H01) to 00100000 (H20)

Program example



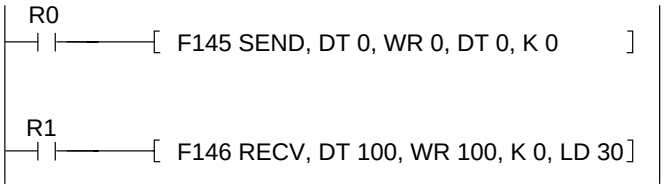
Address	Command	
0	ST	X 10
	AN	R 9030
	F 146	(RECV)
	DT	0
	WR	0
	K	0
	LD	30

5) Cautions

■ Limitations on the Simultaneous Execution of Data Transfer Instructions

- A maximum of two F145 (SEND)/P145 (PSEND) and F146 (RECV)/P146 (PRECV) instructions can be executed by one CPU at the same time from 2 other stations.
- A maximum of one F145 (SEND)/P145 (PSEND) or F146 (RECV)/P146 (PRECV) instructions can be executed at the same time for one CPU. If triggers for two or more instructions are turned ON in one scan, the instruction programmed with the smallest address is executed after the end instruction (ED). When two or more instructions are programmed, program triggers for the instructions not to be turned ON at the same time.

Example :



R0 : Trigger for F145
Turns ON only when R1 is OFF.

R1 : Trigger for F146
Turns ON only when R0 is OFF.

Flag	Description
R9030	0 : When data can not be transferred. (Including the time while data is being transferred.) 1 : When data can be transferred.
R9031	0 : When the transfer operation has completed without error. 1 : When a transfer error occurs. (The error code is stored in DT9039.)
R9007	Turns ON and stays ON , • when the data specified in "S1 + 1" and/or "S1" is out of range. • when the unit cannot be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9017.)
R9008	Turns ON for an instant, • when the data specified in "S1 + 1" and/or "S1" is out of range. • when the unit can not be found. • when the ending memory area address (Source/Destination) specified using "S1 + 1", "S1", "D" and "N" is beyond the limits of the specified memory area. (The error program address is stored in DT9018.)

• Time out error

When the transfer operation is not performed within specified period, a time out error occurs. The maximum time required for the transfer operation can be specified in system register number 32.

$$\text{Value used (Decimal)} = \frac{\text{Time (ms)}}{2.5}$$

Value used (Decimal)	Time (ms)
4	10 (ms)
⋮	⋮
800	2000
⋮	⋮
32,760	81,900

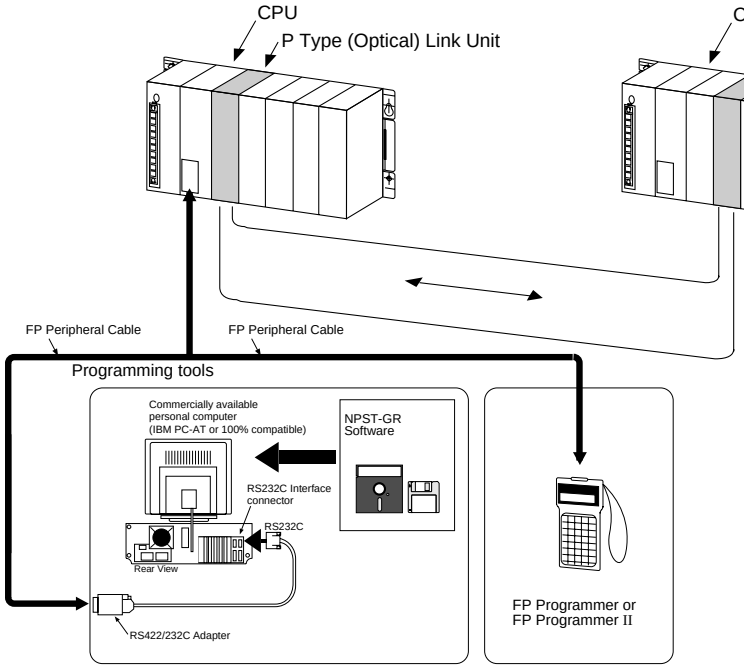
When the transfer operation is not completed within the specified time, the flag R9031 (special internal relay) turns ON (1) and an error code is stored in DT9039.

[71 (Hexadecimal): Response signal indicating that the transfer operation can not be received.
72 (Hexadecimal): Buffer for the link is full.
73 (Hexadecimal): A response message was not be received.]

3. Remote Programming Function

1) Outline

The Remote Programming function is one of the functions available for the P Type (Optical) Link System. In the P Type (Optical) Link System, programming, system register setting and readouts of data from remotely located Programmable Controller can be performed from the Programmable Controller closest to you, using the programming tools. This function is available between all of the stations (Max. 63 stations) in a loop.



The tools to be prepared :

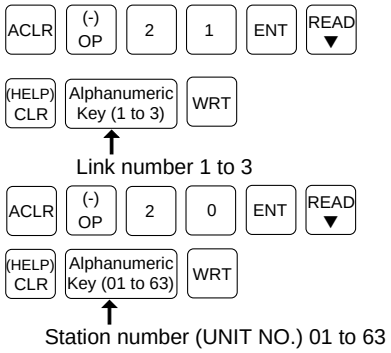
FP Programmer	: AFP1112A or AFP1112
FP Programmer II	: AFP1114
FP Peripheral Cable	: AFP5520 (0.5 m/1.640 ft.) AFP5523 (3 m/9.843 ft.)
Computer	: IBM PC-AT or 100% compatible with MS-DOS (PC-DOS) Ver. 3.0 or later
NPST-GR Software	: AFP266538
RS422/232C Adapter	: AFP8550
RS232C cable	: AFB85833 or AFB85853 (3 m/9.843 ft.)

2) Operating Remote Programming Using Programming Support Tools

■ Using the FP Programmer

Procedure

1. Connect the FP Programmer or FP Programmer II to the RS422 port on the CPU using the FP Peripheral Cable.
2. Place the CPU in the PROG. mode.
3. Set the link number by the "OP21" function as procedure.
4. Set the station number (UNIT NO.) by the "OP20" function as procedure.
5. You can create programs and assign system registers of the remotely located FP3/FP5 CPU from another FP3/FP5 CPU with "PROG. mode" in the same loop.



Note :

Changes the operating mode ("PROG." ⇄ "RUN") when the Mode Selector Switch of CPU is set to "REMOTE" position.

• Refer to "FP PROGRAMMER Operation Manual," for details about operation of FP Programmer.

■ Using the NPST-GR Software

Procedure

1. Connect the RS422 port on the CPU to the RS422 port on the RS422/232C Adapter with the FP Peripheral Cable. Then, connect the RS232C port on the RS422/232C Adapter to RS232C port on your computer using and RS232C Cable. Run the NPST-GR software on the computer.
   Set the "ONLINE" mode when the {CTRL}-{ESC} keys on keyboard.

2. Select "LINK UNIT SPECIFY" from the "ONLINE FUNCTION MENU."

3. Input the number of unit. (range : 00 to 63)

   Select 1, 2 or 3 for the loop number by { → }{ ← } keys on keyboard.

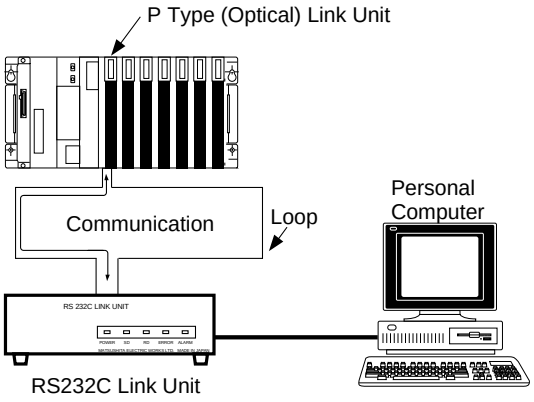
4. You can create programs and assign system registers of the remotely located FP3/FP5 CPU from another FP3/FP5 CPU with "PROG. mode" in the same loop.

* Refer to "NPST-GR Manual", for details about the operation of NPST-GR.

4. Computer Link Function

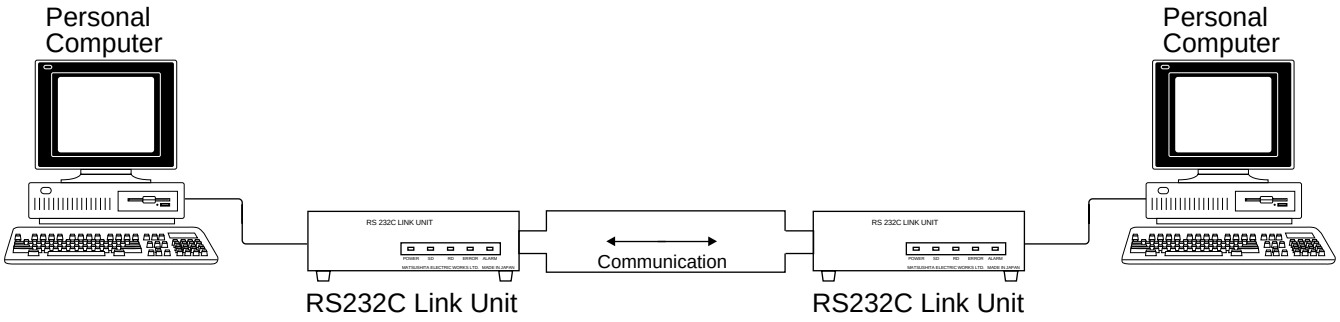
Communication of between computer and P Type (Optical) Link Unit
[Maximum 63 stations in one loop (including computer station), up to 3 loops per CPU]
The computer is capable of reading and writing relays and registers for the Programmable Controller using MEWTOCOL-COM.
The Computer Link Function is particularly useful in applications ranging from process monitoring to production management, because types of information, such as operation mode monitoring, production data settings, and logging functions can be transmitted.

• Refer to page 118, "7-4. MEWTOCOL-COM (Communication Protocol)", for details about Computer Link Function.



5. Computer to Computer Communication Function

Communication between computer and computer (Maximum 63 stations in one loop)
Communications between computers, in information exchanges of 118 bytes at a time, is possible.



5-4. Communication Functions of RS232C Link Unit

1. Steady-state Communication Mode

Command message communications with the RS232C port in the steady-state mode provide the functions as follows :

Function	Description
Mode Status Setting and Reading Function	Reads and sets the state of the RS232C Link Unit such as reading the communication state, setting and reading the RS232C communication code, opening and closing of a channel.
Computer Link Function Remote Programming Function	Information such as Programmable Controller contacts, registers and programs can be read from and write to the computer based on the half-duplex communication protocol (MEWTOCOL-COM). The Computer Link Function and Remote Programming Function can not be used simultaneously, select and use either one using the Mode Selector Switches.
Data Transfer Function	Contact and data information can be read at the computer by a Programmable Controller based on the half-duplex data protocol (MEWTOCOL-DAT).
Computer to Computer Communication Function	Information can be transferred between computers. In the steady-state mode, one transfer consists of a maximum 118 bytes.
P/W PC Link Function (read only)	Reads the P/W PC Link relay and link data register.

2. Transparent Communication Mode

Using the RS232C port as Computer to Computer Communication Function in the steady-state mode, large amounts of data can be transferred from the computer to the RS232C Link Unit as well as from the RS232C Link Unit to the computer.

5-5. Error Checking during Transmission

The errors during transmission are as follows :

Item	ERROR 2 LED	Description	Step to take
Communication error	ON	Normal communication can not be executed. Optical fiber cable break or P Type (Optical) Link Unit is non-active on loop.	• Check the connection of optical fiber cable. • Check non-active P Type (Optical) Link Unit.
Station number (UNIT NO.) overlapped error	ON	When station number (UNIT NO.) for remote station is the same as the close station, an error is enacted.	Change the station number (UNIT NO.) of the close or remote station.
P/W PC Link Area setting error	ON	When P/W PC Link Area for remote station overlaps a close station, an error is enacted.	Change the P/W PC Link Area of the close or remote station.
Station number (UNIT NO.) setting error	Flashing	When an invalid station number (UNIT NO.) is assigned in one loop, an error will occur.	• The station number (UNIT NO.) must be within the range of 01 to 63 in one loop. • The station number (UNIT NO.) which uses P/W PC Link Functions should be within range of 01 to 16 on one loop.

Notes :

- The error status can be checked with using special internal relays (R9050 : Link 1, R9051 : Link 2, R9052 : Link 3) and special data registers (DT9161 : Link 1, DT9163 : Link 2 and DT9165 : Link 3)
- ERROR 1 LED is OFF during the steady-state mode.
  When ERROR 1 LED is ON or Flashing, errors in transmission self-diagnostic test mode or self-diagnostic error are possibilities.
- If ERROR 1 LED is flashing in addition to ERROR 2 LED is flashing, a hardware self-diagnostic error of P Type (Optical) Link Unit may have occurred.

• Refer to page 96, "7-1. How to Read the Special Internal Relays (R) and Special Data Registers (DT)", for details about special internal relays and special data registers.

• Refer to page 62, "4. Transmission Self-diagnostic Testing Function", for details about transmission self-diagnostic test.

• Refer to page 57, "1. Unit Hardware Self-diagnostic Function", for details about unit self-diagnostic function.

5-6. R.A.S. (Reliability, Availability and Serviceability) Functions

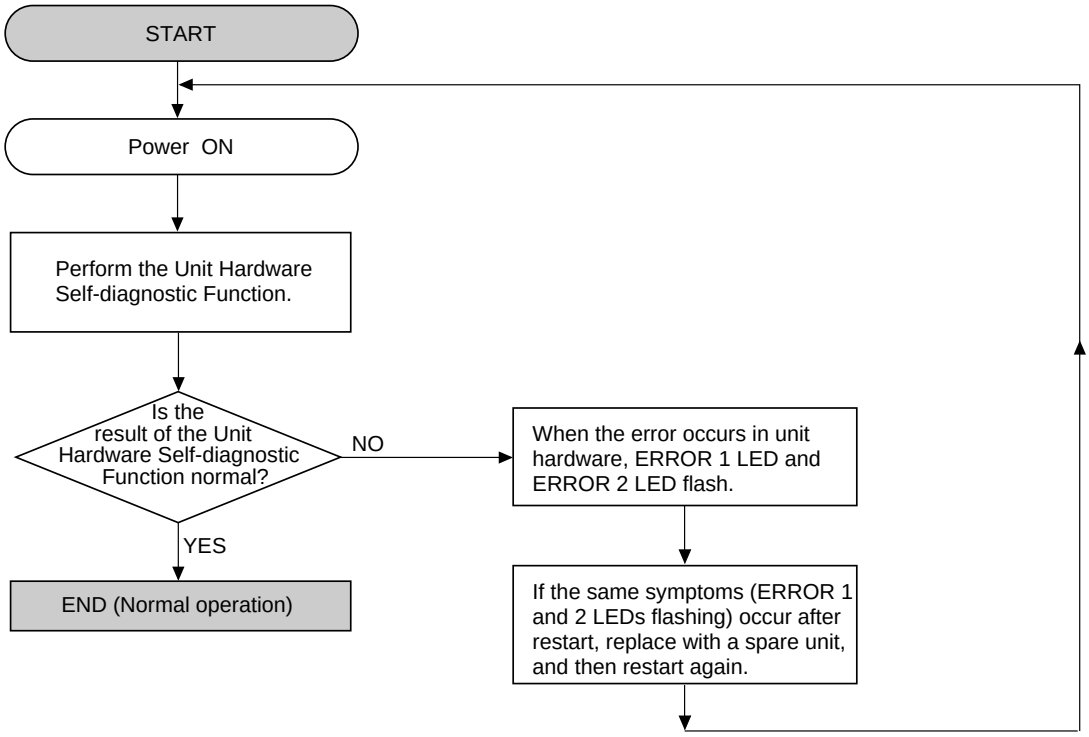
The P Type (Optical) Link System provides 4 kinds of R.A.S. (Reliability, Availability and Serviceability) functions as follows :

- Unit Hardware Self-diagnostic Function
- Automatic Loop Reset Transmitting Function
- Loop Backup Function
- Transmission Self-diagnostic Testing Function

1. Unit Hardware Self-diagnostic Function

- The unit hardware self-diagnostic function troubleshoots the hardware of P Type (Optical) Link Unit and RS232CLink Unit when power is present.
- If an error occurs, ERROR 1 LED and ERROR 2 LED on the P Type (Optical) Link Unit and RS232C Link Unit are flashes.

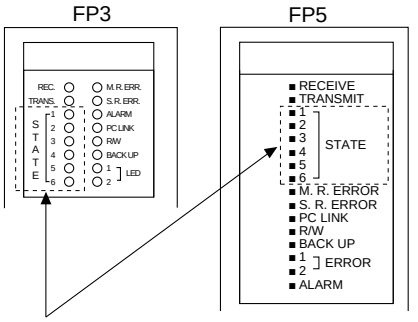
Procedure



2. Automatic Loop Reset Transmitting Function

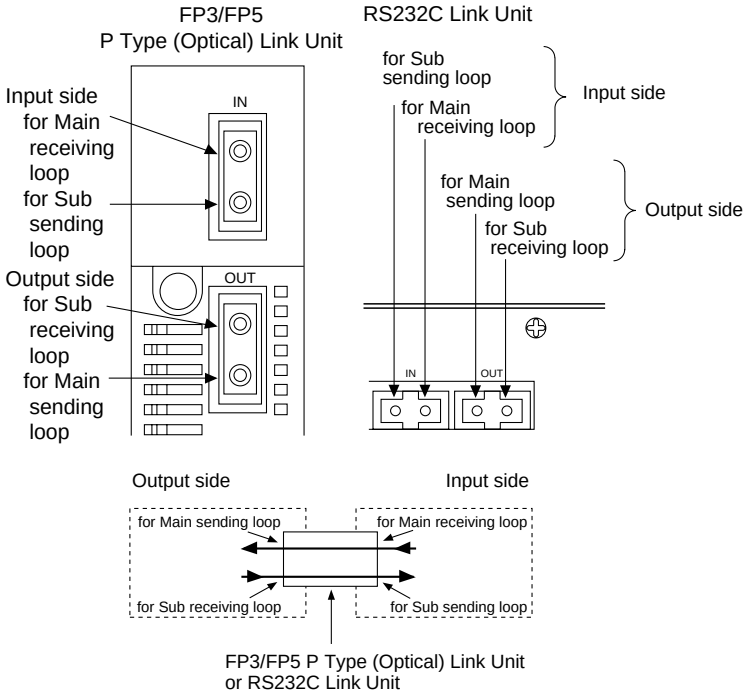
- After power ON, if a error occurs in the transmission loop, FP3/FP5 P Type (Optical) Link Unit or RS232C Link Unit, the loop reset transmitting function is automatically performed.
- The occurring error location is automatically by-passed and the loop mode is switched to usable transmission loop.
- The STATE LEDs (STATE 1 to 6) of operation monitor LED indicates the usable transmission loop mode.

■ Operation Monitor LEDs



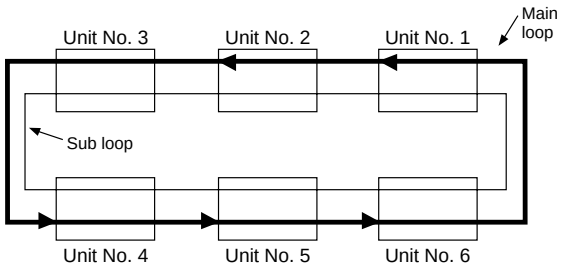
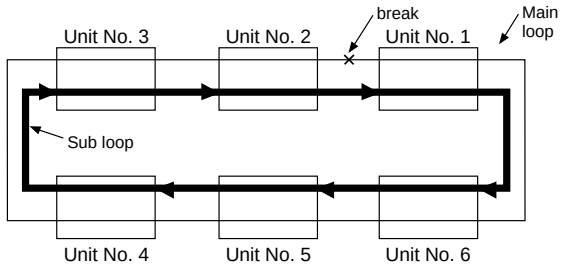
STATE LEDs
STATE 1 : Main loop communicating mode
STATE 2 : Sub loop communicating mode
STATE 3 : Main loop back communicating mode
STATE 4 : Sub loop back communicating mode
STATE 5 : Main and sub loop back communicating mode
STATE 6 : Link function availability

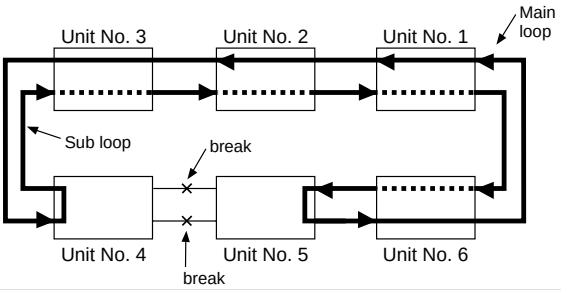
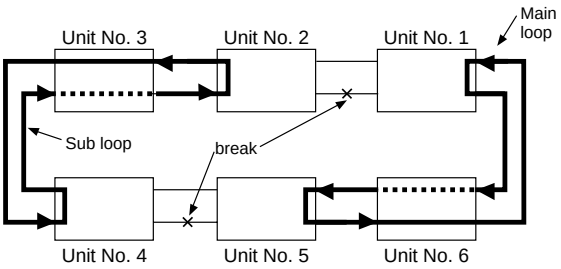
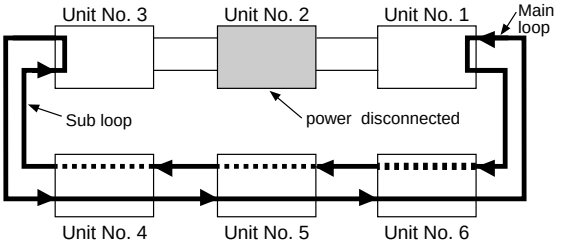
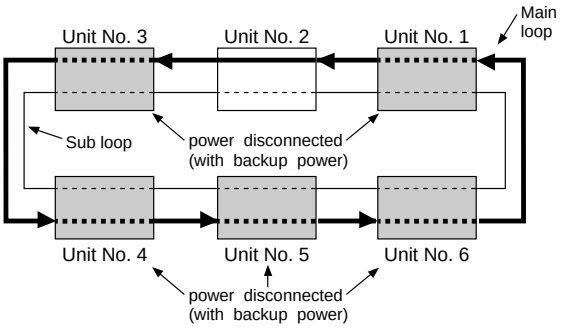
■ Optical Fiber Connector

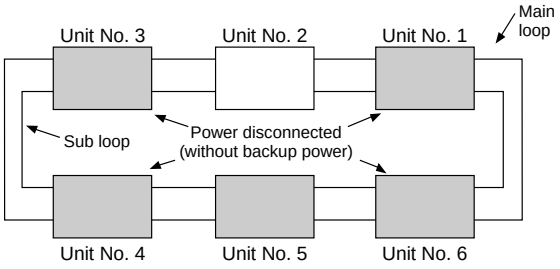
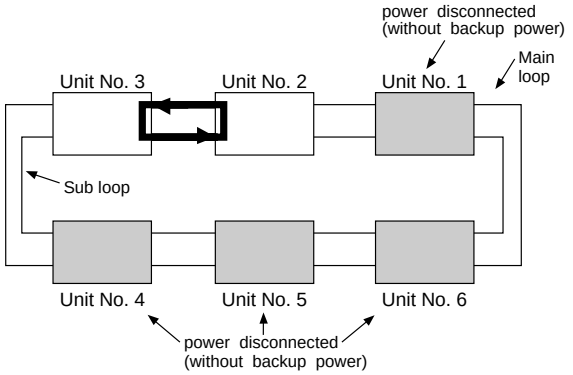


Note :

- ERROR LED 2 is ON during the loop reset transmitting function and turns OFF when the transmission loop is established.

Transmission State		STATE LED	Usable Transmission Loop
Normal communication	All stations (unit No. 1 to No. 6) communicate in main loop communicating mode.	• STATE 1 LED of Unit No. 1 to No. 6 : ON	
Communication error	When the main loop breaks between unit No. 1 and No. 2 : All stations (unit No. 1 to No. 6) communicate in sub loop communicating mode.	• STATE 2 LED of Unit No. 1 to No. 6 : ON	

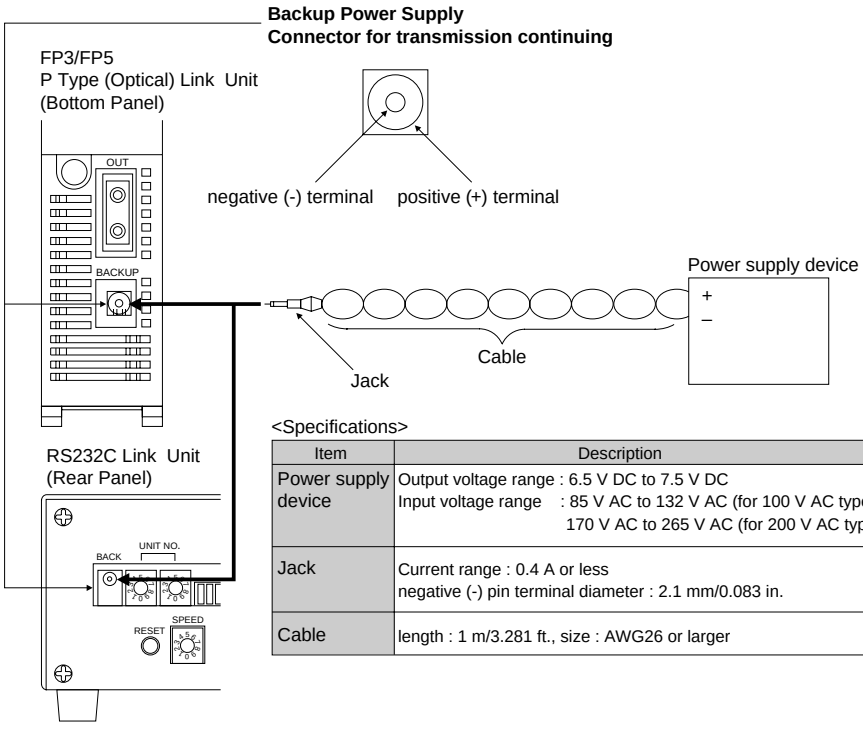
Transmission State		STATE LED	Usable Transmission Loop
Communication error	When the main and sub loops breaks between unit No. 4 and No. 5 : All stations (unit No. 1 to No. 6) communicate in main, sub, main and sub loop with backup power communicating modes.	• STATE 5 LED of Unit No. 1, 2, 3 and 6 : ON • STATE 3 LED of Unit No. 4 : ON • STATE 4 LED of Unit No. 5 : ON	
	When a different location breaks: main loop breaks between unit No. 4 and No. 5 sub loop breaks between unit No. 1 and No. 2 All stations (unit No. 1 to No. 6) communicate in main, sub, main and sub loop with backup power communicating modes. • Loop 1 : No. 1-NO. 6-No. 5 • Loop 2 : No. 2-NO. 3-No. 4	• STATE 3 LED of Unit No. 1, 4 : ON • STATE 4 LED of Unit No. 2, 5 : ON • STATE 5 LED of Unit No. 3, 6 : ON	
	When only one unit (unit No.2) is disconnected from power : The stations (unit No. 1, No. 3 to No. 6) communicate in main, sub, main and sub loop with backup power communicating modes.	• STATE 3 LED of Unit No. 1 : ON • STATE 4 LED of Unit No. 3 : ON • STATE 5 LED of Unit No. 4 to 6 : ON	
	When only one unit (unit No. 2) is connected from power. (The unit No. 1 and No. 3 to No. 6 are with backup power supply.) : The unit No. 2 is communicates in main loop communicating mode. The unit No. 1 and No. 3 to No. 6 communicate in link communication.	• STATE 1 LED of Unit No. 2 : ON • STATE 1 to 6 LEDs of Unit No. 1 and No. 3 to No. 6 : OFF	

Transmission State		STATE LED	Usable Transmission Loop
Communication error	When only one unit (unit No. 2) is connected from power. (The unit No. 1 and No. 3 to No. 6 are with backup power supply.) : No communication (Unit No. 2 is not in communicating mode.)	• STATE 6 LED of Unit No. 2 : ON	
	When two units (unit No. 2 and No. 3) are connected from power. (The unit No. 1 and No. 4 to No. 6 are without backup power supply.) : • Unit No. 2 communicates in sub loop with backup power communicating mode. • Unit No. 3 communicates in main loop with backup power communicating mode.	• STATE 3 LED of Unit No. 3 : ON • STATE 4 LED of Unit No. 2 : ON	

3. Loop Backup Function

When the power of FP3/FP5 P Type (Optical) Link Unit and RS232C Link Unit with backup power supply is cut off, the transmission loop can be maintained in its normal state.

1) Connecting Method



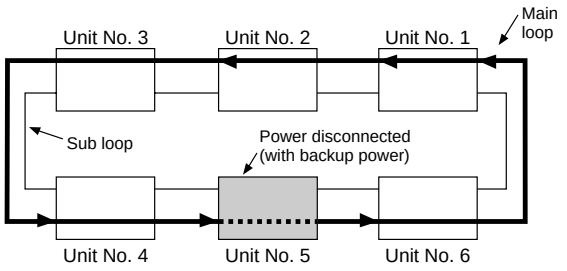
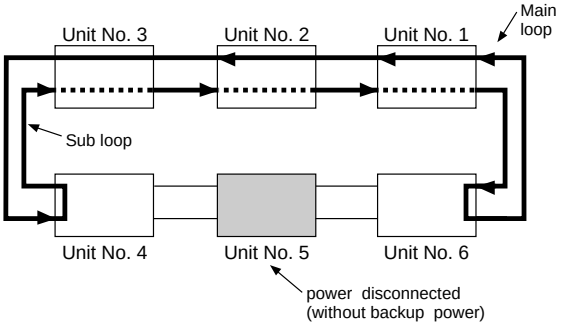
<Specifications>

Item	Description
Power supply device	Output voltage range : 6.5 V DC to 7.5 V DC Input voltage range : 85 V AC to 132 V AC (for 100 V AC type) 170 V AC to 265 V AC (for 200 V AC type)
Jack	Current range : 0.4 A or less negative (-) pin terminal diameter : 2.1 mm/0.083 in.
Cable	length : 1 m/3.281 ft., size : AWG26 or larger

2) Function Explanation

Example :

When the power supply of P Type (Optical) Link Unit (No. 5) is cut off :

Item	Transmission State	STATE LED	Usable Transmission Loop
Backup power is present	Normal transmission (Main loop communicating mode)	BACKUP LED : ON	
Backup power is not present	Automatic loop reset transmitting function switches the station except No. 5 to the loop with backup power communicating mode. Normal transmission continues except station unit No. 5.	BACKUP LED : OFF	

4. Transmission Self-diagnostic Testing Function

1) Outline

- The transmission self-diagnostic testing function checks the communication state on transmission loop of P Type (Optical) Link System using the optical fiber cable for trial operation.
- The transmission self-diagnostic testing function provides the 4 kinds of test mode using Mode Selector Switches 3 & 4 (MODE SW. 3 & 4).
- The test modes of transmission self-diagnostic testing function as follows :

  Test 1 mode : Checks the communication state of main loop and sub loop communicating modes.

  Test 2 mode : Checks the communication state of main loop with backup power, sub loop with backup power and main and sub loop with backup power communicating modes.

  Test 3 mode : Checks the loop backup function.

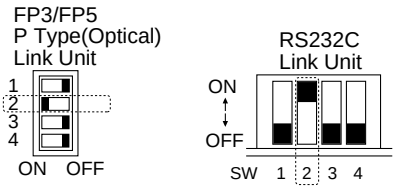
  Test 4 mode : Checks the link function availability.

2) Procedure

Follow the procedure below to operation the transmission self-diagnostic testing function.

STEP 1. Turn OFF the power of the unit.

STEP 2. Remove the optical fiber cable from optical fiber connector.



STEP 3. Set the ON position of Mode Selector Switches 2 (MODE SW. 2).

STEP 4. Turn ON the power of the unit.
Check that the ERROR 1 LED is ON.
If the ERROR 1 LED is OFF, turns OFF the power of the unit.
And then power up again.

STEP 5. Try the all test modes (Test 1 to Test 4 modes) of the transmission self-diagnostic testing function using Mode Selector Switches 3 & 4 (MODE SW. 3 & 4) and optical fiber cable for trial operation.
Refer to page 63, "3) Optical Fiber Cable for Trial Operation" and page 64, "4) Test Explanation",
for details about the test modes (Test 1 to Test 4 modes) of the transmission self-diagnostic testing function.

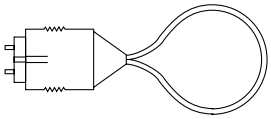
STEP 6. Operation completion
Turn OFF the power of the unit.
Set the OFF position of Mode Selector Switches 2 (MODE SW. 2) and reconnect the optical fiber cable into the optical fiber connector.

3) Optical Fiber Cable for Trial Operation

The transmission self-diagnostic test is performed using the optical fiber cables for trial operation.
The optical fiber cables for trial operation are as follows :

■ Testing cable 1 : for test 1 and test 4 modes

■ Testing cable 2 : for test 2 and test 3 modes



■ Notes on use

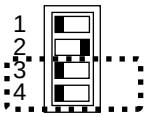
- Do not twist the testing cable since doing so will increase the optical loss or destroy the cable.
- Avoid any application which exerts excessive tension on the connector portion of the testing cable after installation.
  Such an application may cause the connector to loosen or the testing cable to break.
- Do not pull or apply shock to the optical fiber connector.
- Avoid pulling the optical fiber cable with a tension which exceeds the allowable tension.
- Handle the cable carefully.
  Placing objects or stepping on the optical fiber cable may cause breaks or an increase in optical loss.

4) Test Explanation

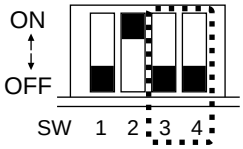
- Select the test modes (Test 1 to Test 4 modes) of transmission self-diagnostic test using Mode Selector Switches 3 & 4 (MODE SW.3 & 4) and optical fiber cable for trial operation.
- The test results indicates by ERROR LEDs (ERROR 1, ERROR 2, M.R.ERROR and S.R.ERROR LEDs).
- The test results are also stored using special data registers (DT9171, DT9201 and DT9231).

■ Mode Selector Switches (MODE SW.)

FP3/FP5
P Type (Optical)
Link Unit



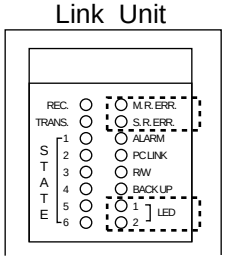
RS232C Link Unit



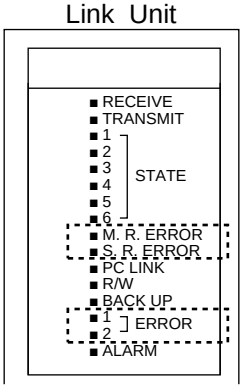
Test Mode	Description	Switch Position	
		SW3	SW4
Test 1 mode	Checks the communication state of main loop and sub loop communicating modes.	OFF	OFF
Test 2 mode	Checks the communication state of main loop with backup power, sub loop with backup power and main and sub loop with backup power communicating modes.	ON	OFF
Test 3 mode	Checks the loop backup function.	OFF	ON
Test 4 mode	Checks the link function availability.	ON	ON

■ ERROR LEDs

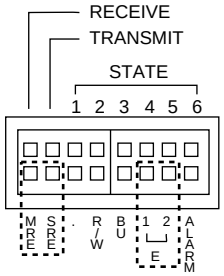
FP3 P Type (Optical) Link Unit



FP5 P Type (Optical) Link Unit

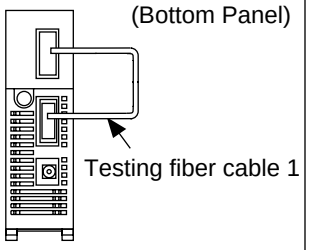
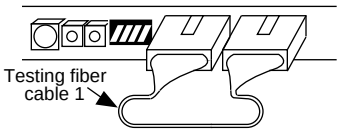
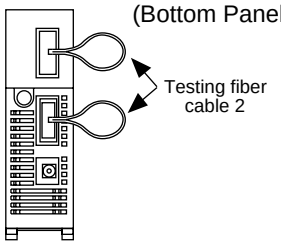
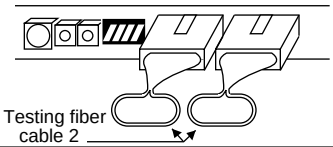
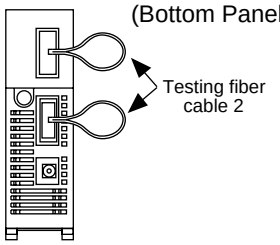
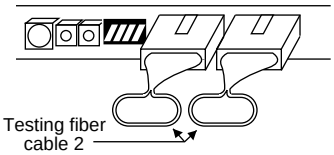


RS232C Link Unit



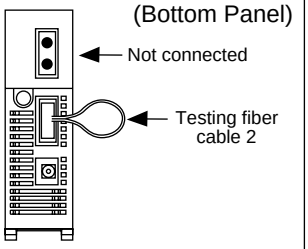
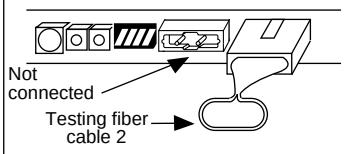
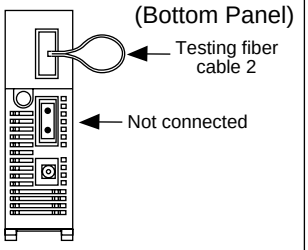
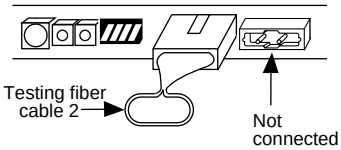
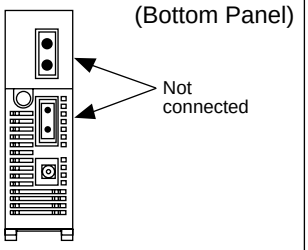
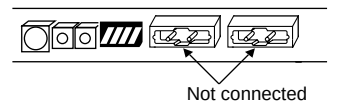
- M.R.ERR./M.R.ERROR/M RE : Main-loop Receive LED
- S.R.ERR./S.R.ERROR/S RE : Sub-loop Receive LED
- 1 ERR./1 ERROR/1 E : Error 1 LED
- 2 ERR./2 ERROR/2 E : Error 2 LED

■ Explanation of test modes

Test Mode	Content	Switch Position of Mode Selector Switch	Connecting Method	Test Result
Test 1 mode	Checks the communication state of main loop and sub loop communicating modes.	SW3 : OFF SW4 : OFF	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > ERROR 1 LED : ON ERROR 2 LED : OFF
Test 2 mode	Checks the communication state of main loop with backup power, sub loop with backup power and main and sub loop with backup power communicating modes.	SW3 : ON SW4 : OFF	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > ERROR 1 LED : ON ERROR 2 LED : OFF
Test 3 mode	Checks the loop backup function.	SW3 : OFF SW4 : ON	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > M.R.ERROR LED : OFF S.R.ERROR LED : OFF ERROR 1 LED : ON ERROR 2 LED : OFF

• The test result is stored in special data registers (DT9171, DT9201, and DT9231), too.

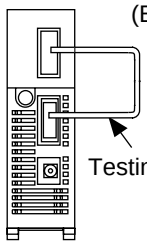
Refer to page 68, "5) Testing Result by Special Data Register," for details about test result.

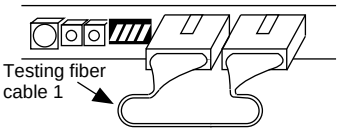
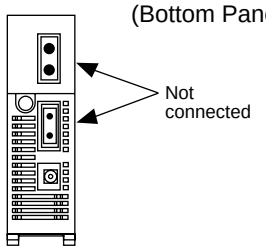
Test Mode	Content	Switch Position of Mode Selector Switch	Connecting Method	Test Result
Test 3 mode	Checks the loop backup function	SW3 : OFF SW4 : ON	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > M.R.ERROR LED : ON S.R.ERROR LED : OFF ERROR 1 LED : ON ERROR 2 LED : Flashes
		SW3 : OFF SW4 : ON	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > M.R.ERROR LED : OFF S.R.ERROR LED : ON ERROR 1 LED : ON ERROR 2 LED : Flashes
		SW3 : OFF SW4 : ON	•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)  •RS232C Link Unit (Rear Panel)  	< Normal > M.R.ERROR LED : OFF S.R.ERROR LED : OFF ERROR 1 LED : ON ERROR 2 LED : Flashes

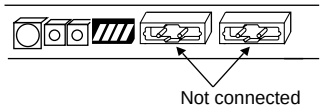
• When the test results of all 4 connecting methods in the test 3 mode are normal, the loop backup function is available.

• The test result is stored in special data registers (DT9171, DT9201 and DT9231) ,too.

Refer to page 68, "5) Testing Result by Special Data Register," for details about test result.

<table>
<tr><th>Test Mode</th><th>Content</th><th>Switch Position of Mode Selector Switch</th><th>Connecting Method</th><th>Test Result</th></tr>
<tr><td rowspan="2">Test 4 mode</td><td rowspan="2">Checks the link function availability</td><td>SW3 : ON
SW4 : ON</td><td>•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)
 

•RS232C Link Unit (Rear Panel)
 
</td><td>< Normal >
M.R.ERROR LED : OFF
S.R.ERROR LED : OFF
ERROR 1 LED : ON
ERROR 2 LED : OFF</td></tr>
<tr><td>SW3 : ON
SW4 : ON</td><td>•FP3/FP5P Type(Optical) Link Unit (Bottom Panel)
 

•RS232C Link Unit (Rear Panel)
 
</td><td>< Normal >
M.R.ERROR LED : ON
S.R.ERROR LED : ON
ERROR 1 LED : ON
ERROR 2 LED : Flashes</td></tr>
</table>

• When the test results of both connecting methods in the test 4 mode are normal, the link function is available.

• The test result is stored in special data registers (DT9171, DT9201 and DT9231), too.
Refer to page 68, "5) Testing Result by Special Data Register", for details about test result.

5) Testing Result by Special Data Register

• The test results of P/W Link 1 to P/W Link 3 are stored in special data registers as follows :

Address	P/W Link status	Description
DT9171	P/W Link 1	The result of the transmission self-diagnostic test in the test 1 to 4 modes.
DT9201	P/W Link 2	
DT9231	P/W Link 3	

• The test results of the special data registers (DT9171, DT9201, and DT9231) is expressed as :

When bit 7 becomes "0"

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
Register			0	

Becomes "1" when the test is not executed independently.
Becomes "1" when the receive disabled error occurs.
Becomes "1" when the receive verify error occurs.

When bit 7 becomes "1"

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
Register			1	

Becomes "1" when the no signal status at sub loop communicating mode.
Becomes "1" when the signal input status at sub loop back communicating mode.
Becomes "1" when disconnecting status at sub loop.

Sub signal present when all bit 0 to bit 2 becomes "0".

Becomes "1" when the no signal status at main loop communicating mode.
Becomes "1" when the signal input status at main loop back communicating mode.
Becomes "1" when disconnecting status at main loop.

Main signal present when all bit 0 to bit 2 becomes "0".

Refer to page 96, "7-1. How to Read the Special Internal Relays (R) and Special Data Registers (DT)", for details about read method of special data registers (DT).

5-7. Communication Times

1. Outline

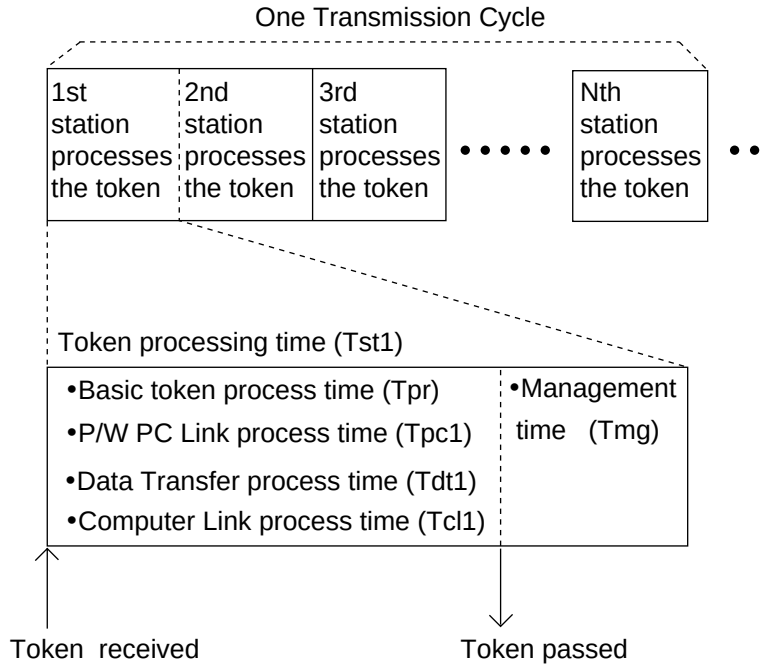
The communication time is the time required for communications to be completed in a loop.
This depends upon the transmission cycle, transmission timing, delay time at optical fiber cable and P Type (Optical) Link Unit and the time needed for CPU processing (CPU scan time).

2. Transmission Cycle Time

In the P Type (Optical) Link System, a token is passed from one station to the next in a sequential manner.
One transmission cycle is specified as the time required for "one token to be passed from one station to the next, etc., until it returns to the same station."

One Transmission Cycle

When N stations are connected in a loop
N = 1 to 63



Note :

The transmission cycle of the P Type (Optical) Link System is not synchronous with the CPU scan.

The time needed for one transmission cycle is called the transmission cycle time.
The total transmission cycle time "Ttc" is calculated by adding the time needed for each station token processing cycle as shown in the following equation :

$$Ttc = \sum_{i=1}^{63} Tsti + Tde + 0.6\ ms$$
$$= Tst1 + Tst2 + \ .\ .\ .\ .\ .\ + Tsti + 0.6\ ms$$
$$= (Tpr + Tpc1 + Tdt1 + Tcl1 + Tmg) + (Tpr + Tpc2 + Tdt2 + Tcl2 + Tmg) + \ .\ .\ .\ .\ .\ + (Tpr + Tpci + Tdti + Tcli + Tmg) + Tde + 0.6\ ms$$

where :

Ttc = Time needed for one transmission cycle

Tsti (ms) = Time needed for token processing at station i (UNIT NO. i).

Tpr (ms) = Time needed for basic token processing at each station
The Tpr value at each station is fixed as : Tpr = 0.6 ms

Tpci = Time needed for P/W PC Link processing a station in PC Link Mode(station i) (i = 0 to 16).

Tdti = Time needed for Data Transfer processing at station i (UNIT NO. i).

Tmg (ms) = Time needed for basic token management at each station after transmission operation
- When 2 to 62 stations are linked in the loop
  The Tmg value at each station should be calculated as : Tmg = 0.4 ms
- When 63 stations are linked in the loop
  The Tmg value at each station should be calculated as : Tmg = 0 ms

Tcli = Time needed for Computer Link processing at station i (UNIT NO. i).

Tde (ms) = Time needed for delay time in the optical fiber cable and P Type (Optical) Link Unit in the following equation :

Tde = $\{30 + (2.2 \times N + 5 \times L) \times I\}/1000$
N : Number of connected P Type (Optical) Link Unit
L (km) : Total length of optical fiber cable

I = 1 : When the unit is communicating at main loop and sub loop mode
2 : When the unit is communicating at loop back mode

1) Time for P/W PC Link Processing at Each Station

The time needed for P/W PC Link Processing at a station in PC Link Mode is calculated using the following equation :

■ When the station is not in PC Link Mode

Tpci = 0 ms

■ When the station is in PC Link Mode

Tpci = 1.0 ms + 0.04 ms × Bpci

where :

Bpci = Number of bytes (= 8 bits, = 1/2 word) used for the send relay & data link areas in station i (UNIT NO. i).
[number of bytes used for the send relay link area = points/8 (= words × 2)]
[number of bytes used for the send data link area = words × 2]

2) Time for Data Transfer Processing at Each Station

The time needed for Data Transfer Processing at a station is calculated using the following equations :

■ When the Data Transfer Function is not performed

Tdti = 0 ms

■ When the Data Transfer Function is performed at station i (UNIT NO. i)

Tdti = 1.0 ms + 0.04 ms × Bdti + Tadi

where :

Bdti = Number of bytes needed for Data Transfer instruction.
One instruction consists of one command and one response message.
The number of bytes for each message is calculated as :

- F145 (P145) Command Message : 6 bytes + (Number of data sent) × 2
- F145 (P145) Response Message : 3 bytes
- F146 (P146) Command Message : 7 bytes
- F146 (P146) Response Message : 3 bytes + (Number of data received) × 2

Tadi = Time additionally needed for the Data Transfer operation when the station is in PC Link Mode.

- When the station is not in PC Link Mode
  Tadi = 0 ms
- When the station is in PC Link Mode
  Tadi = 1.0 ms

3) Time for Computer Link Processing at Each Station

The time needed for the Computer Link Processing at a station is calculated using the following equations :

■ When the Computer Link Function is not performed

Tcli = 0 ms

■ When the Computer Link Function is performed at station i (UNIT NO. i)

Tcli = 1.0 ms + 0.04 ms × Bcli + Tadi

where :

Bcli = Number of bytes set as transmission message data (from header to terminator).
Tadi = Time additionally needed for the Computer Link operation when the station is in PC Link Mode

- When the station is not in PC Link Mode
  Tadi = 0 ms
- When the station is in PC Link Mode
  Tadi = 1.0 ms

Refer to page 118, "7-4. MEWTOCOL-COM (Communication Protocol)", for details about the header and terminator of message data.

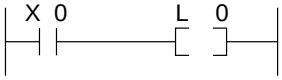
3. P/W PC Link Response Time

The P/W PC Link Response Time is the time between an input transition at one station and the corresponding output transition to another station.
The P/W PC Link Response Time is explained using the following example :

Example :

Station number 01 (UNIT NO. 01) of P Type (Optical) Link Unit

Program

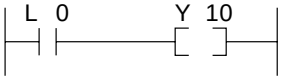


Synchronous with CPU scan operation

Asynchronous operation

Station number 02 (UNIT NO. 02) of P Type (Optical) Link Unit

Program



Synchronous with CPU scan operation

In the above example, the operation flow from an input transition to an output transition is explained as follows :

The operations of station number 01 (UNIT NO. 01)

Input transition :
The external input relay X 0 in the station number 01 (UNIT NO. 01) is turned ON.

I/O Update :
At the time of I/O update in the CPU scan[station number 01 (UNIT NO. 01)], the X 0 status is taken into CPU.

Program execution :
The external input relay X 0 turns ON and the L 0 turns ON.

PC Link buffer update :
The buffer in the P Type (Optical) Link Unit at station number 01 (UNIT NO. 01) is updated at the P/W PC Link update time in the CPU scan, after the buffer is ready to be updated.

The operations of station number 02 (UNIT NO. 02)

Buffer update signal :
To confirm the buffer availability, the buffer update signal is transmitted during the link buffer update time.

Token reception :
When the first token is passed after the reception of the buffer update signal, the send area data in the buffer is prepared for transfer.

Data distribution :
The data are actually distributed during one transmission cycle time plus the transmission time needed for next station after the buffer update signal only when the buffer is ready to receive the data.

PC Link buffer update :
The data in the buffer at station number 02 (UNIT NO. 02) is transferred to the CPU memory.

Program execution :
The link relay L 0 turns ON and Y10 turns ON.

I/O Update :
At the time of I/O update in the CPU scan[station number 02 (UNIT NO. 02)], the Y10 status is updated.

Output transition :
The external output relay Y10 in the station number 02 (UNIT NO. 02) is turned ON.

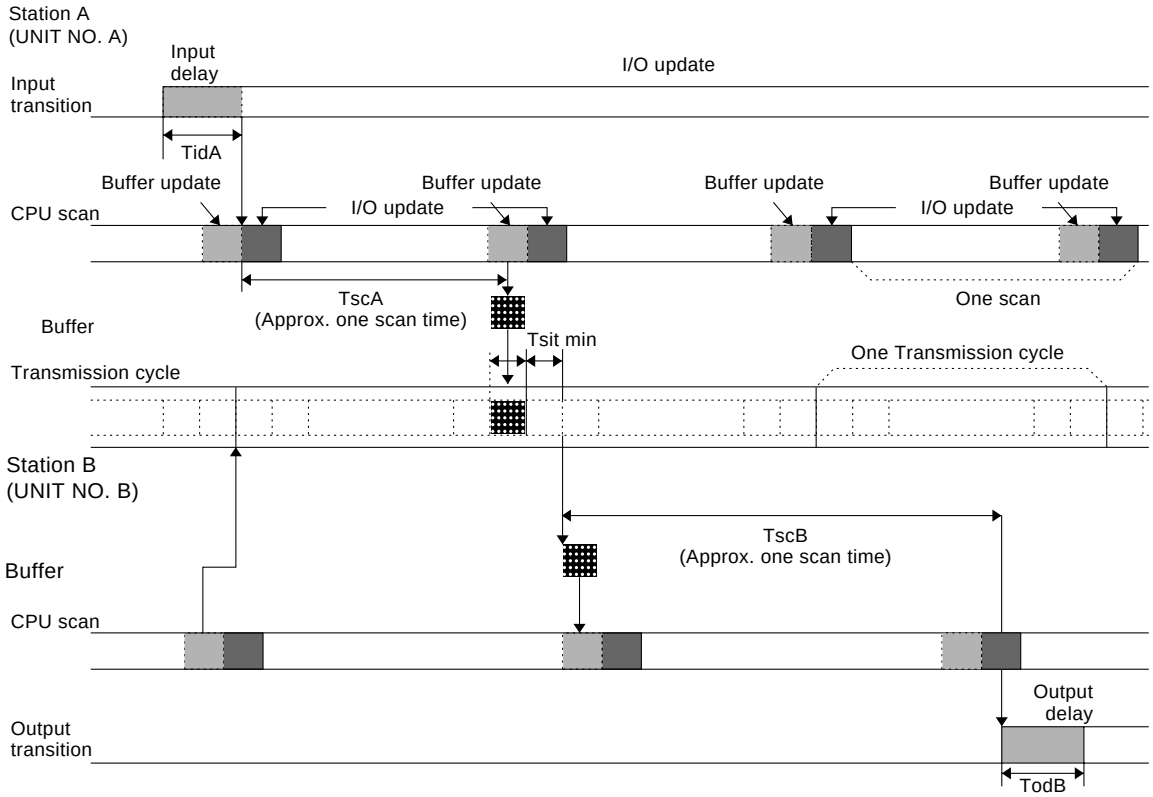
1) Minimum P/W PC Link Response Time "Minimum Rpc"

The minimum amount of time needed between an input transition from a Programmable Controller and the corresponding output transition to the next Programmable Controller is calculated as follows :

Minimum Rpc = TidA + TscA + TstA + Tsti min. + TscB + TodB

where :

TidA = Input delay time of the input transition at Programmable Controller "A".
TscA = Scan time of Programmable Controller "A".
TstA = Time needed for the PC Link processing by "A".
Tsti min. = Time needed for the PC Link processing by station " i (UNIT NO. i)".
Here, the Tsti min. is supposed to be the shortest time needed for processing by one station.
TscB = Scan time of Programmable Controller "B".
TodB = Output delay time for the output transition of Programmable Controller "B".



2) Maximum P/W PC Link Response Time "Maximum Rpc"

The maximum amount of time needed between an input transition from a Programmable Controller and the corresponding output transition to the next Programmable Controller is calculated as follows :

Maximum Rpc = TidA + TscA + T1 + Ttc + TscB + T2 + TscB + TodB

where :

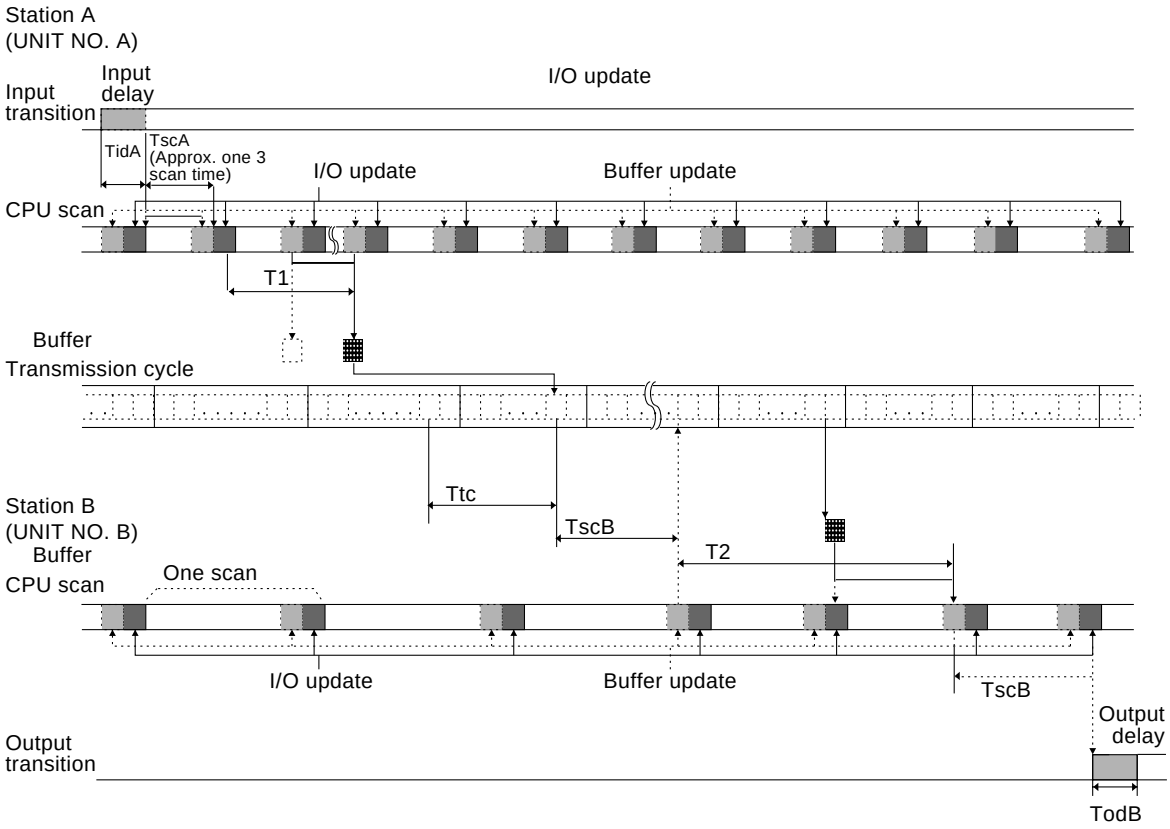
TidA = Input delay time of the input transition at Programmable Controller "A".
TscA = Scan time of the Programmable Controller "A".
T1 = Time needed between the I/O update and the P Type (Optical) Link Unit's buffer update.

$$T1 = \left(1 + \frac{Ttc}{TscA}\right) \times TscA$$

Ttc = Time needed for one transmission cycle.
TscB = Scan time of Programmable Controller "B".
T2 = Time needed from the buffer update signal reception and the CPU memory update at station "B".

$$T2 = \left(1 + \frac{Ttc + Tsti\ max.}{TscB}\right) \times TscB$$

Tsti max. = Time needed for PC Link processing by station "i (UNIT NO. i)".
Here, the Tsti max. is supposed to be the longest time needed for processing by one station.
TodB = Output delay time of the output transition from Programmable Controller "B".



4. Data Transfer Response Time

The Data Transfer Response Time is the time between the point when a data transfer command message is transferred from one station to the point when the response message is sent back to the original station. Since the actual Data Transfer Response Time depends upon the transmission cycle time, the transmission timing and the time needed for CPU processing (CPU scan time) etc., the Data Transfer Response Time will deviate between the minimum and the maximum Data Transfer Response Times. When installing a loop, these values should also be taken into consideration.

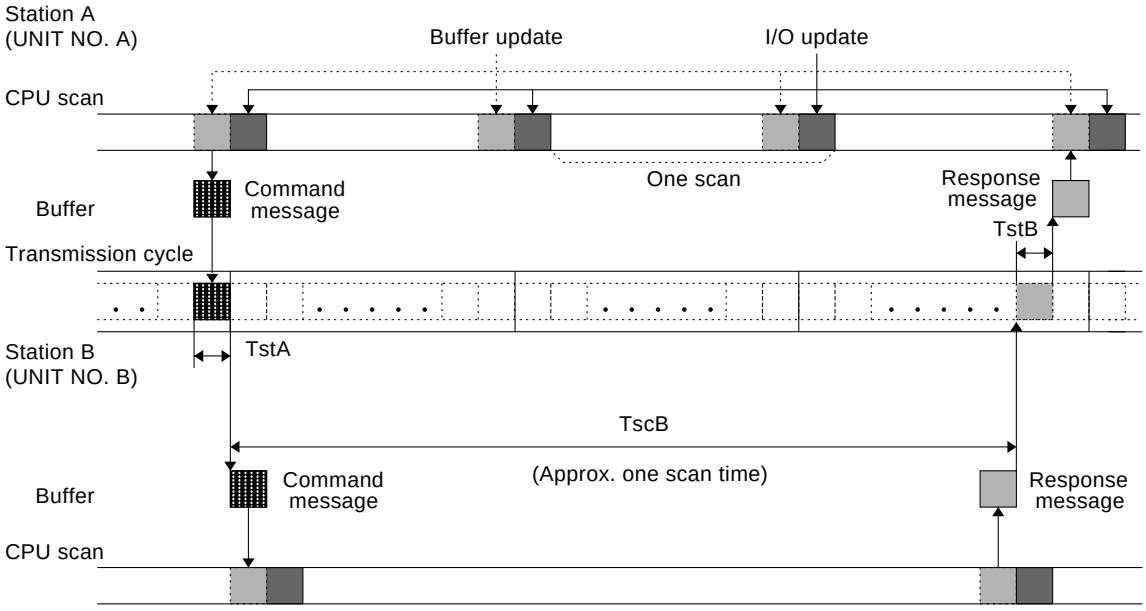
1) Minimum Data Transfer Response Time "Minimum Rdt"

The minimum amount of time needed from the point when a data transfer command message is transferred from one station to the point when the response message is sent back to the original station is calculated as follows :

Minimum Rdt = TstA + TscB + TstB

where :

TstA = Time needed for PC Link processing by station "A".
TscB = Scan time of Programmable Controller "B".
TstB = Time needed for PC Link processing by station "B".



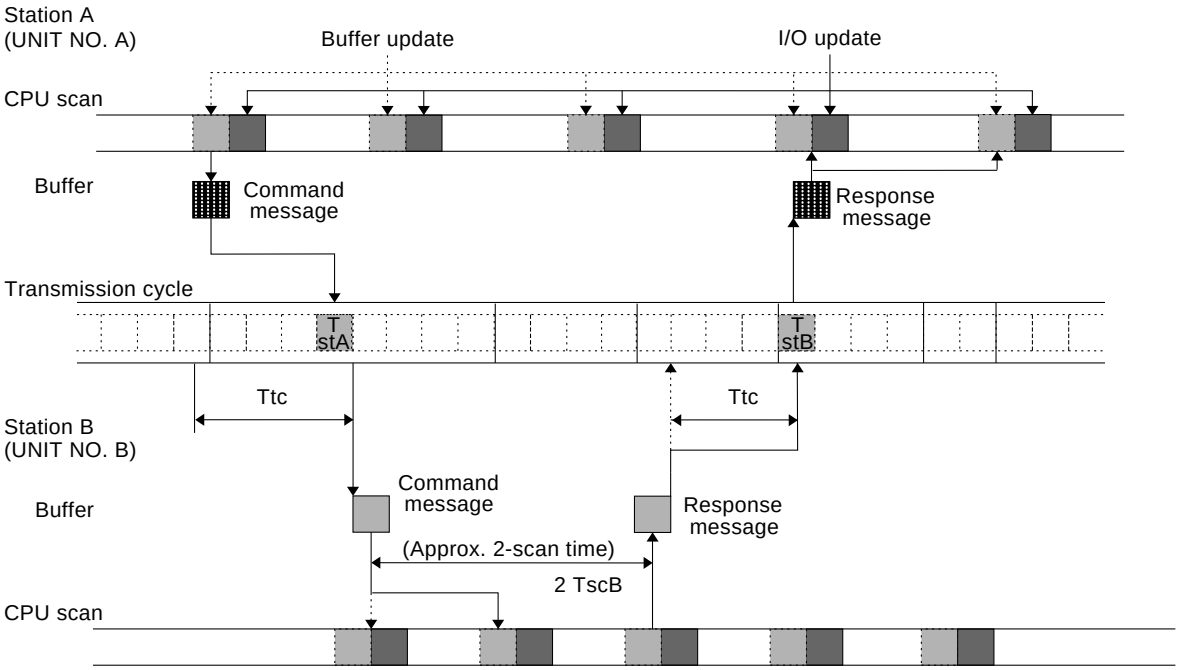
2) Maximum Data Transfer Response Time "Maximum Rdt"

The maximum amount of time needed from the point when a data transfer command message is transferred from one station to the point when the response message is sent back to the original station is calculated as follows :

Maximum Rdt = Ttc + TscB + TscB + Ttc + TscA

where :

Ttc = Time needed for one transmission cycle
TscA = Scan time of Programmable Controller "A".
TscB = Scan time of Programmable Controller "B".
.



5. Computer Link Response Time

Computer Link Response Time is the time from when a data transfer command message is transferred from one station (computer) to when the response message is sent back to the station (computer).
Since the actual Computer Link Response Time depends upon the transmission cycle time, the transmission timing and the time needed for CPU processing (CPU scan time) etc., the Computer Link Response Time will deviate between the minimum and the maximum Computer Link Response Times.
When installing a loop, these values should also be taken into consideration.

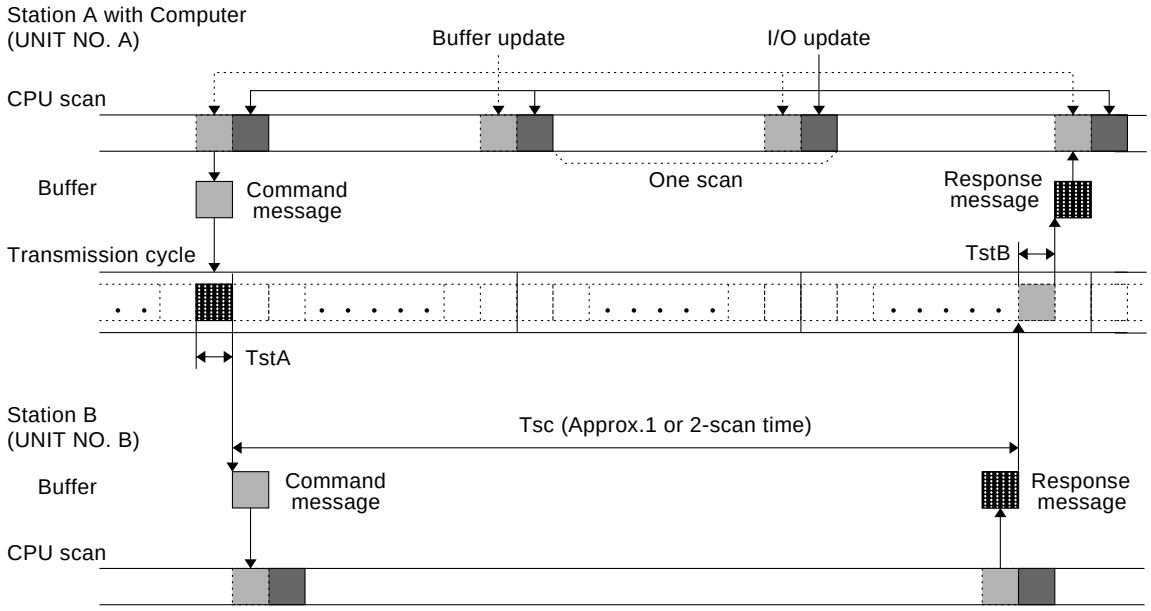
1) Minimum Computer Link Response Time "Minimum Rcl"

The minimum amount of time needed from the point when a data transfer command is transferred from one station (computer) to the point when the response message is sent back to the original station (computer) is calculated as follows :

Minimum Rcl = TstA + Tsc + TstB

where :

TstA = Time needed for PC Link processing by station "A".
Tsc = Scan time (processing time) of Programmable Controller "B".
TstB = Time needed for PC Link processing by station "B".



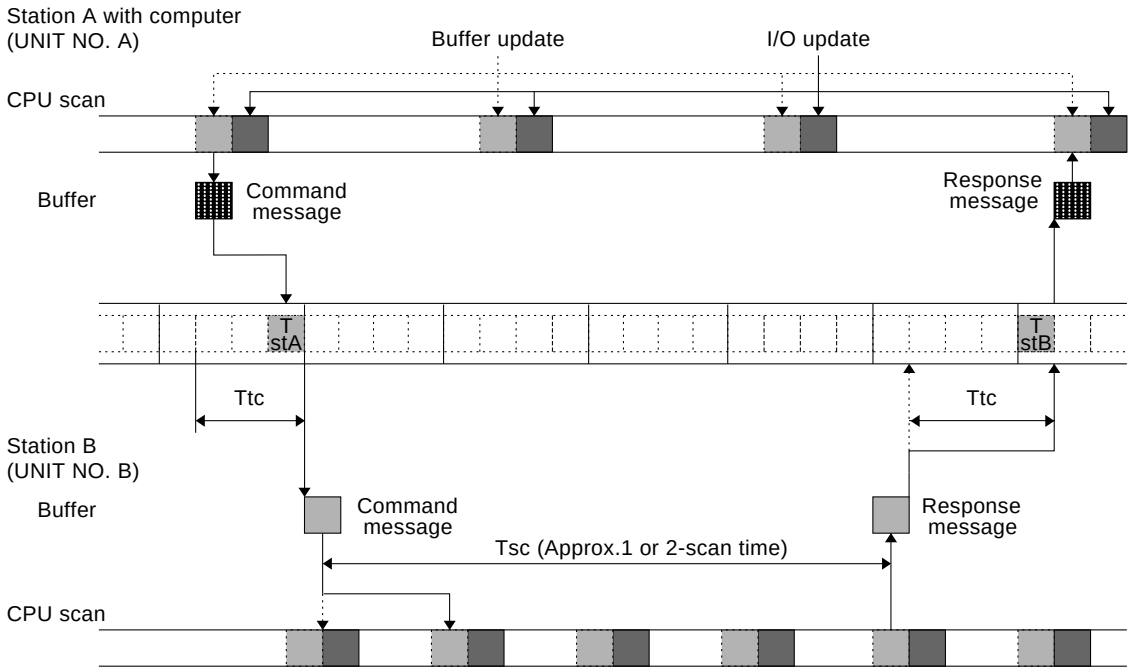
2) Maximum Computer Link Response Time “Maximum Rcl”

The maximum amount of time needed from the point when a data transfer command message is transferred from one station (computer) to the point when the response message is sent back to the original station (computer) is calculated as follows :

Maximum Rcl = Ttc + Tsc + Tsc + Ttc

where :

Ttc = Time needed for one transmission cycle.
Tsc = Scan time (processing time) of Programmable Controller “B”.



6. Computer Communication Time

Computer Communication Time is the time from when a communication data is transferred from one station (computer) to when the communication data is stored in the destination one station (computer).
Since the actual Computer Communication Time depends upon the transmission cycle time, the Computer Communication Time will deviate between the minimum and the maximum Computer Communication Times. When installing a loop, these values should also be taken into consideration.

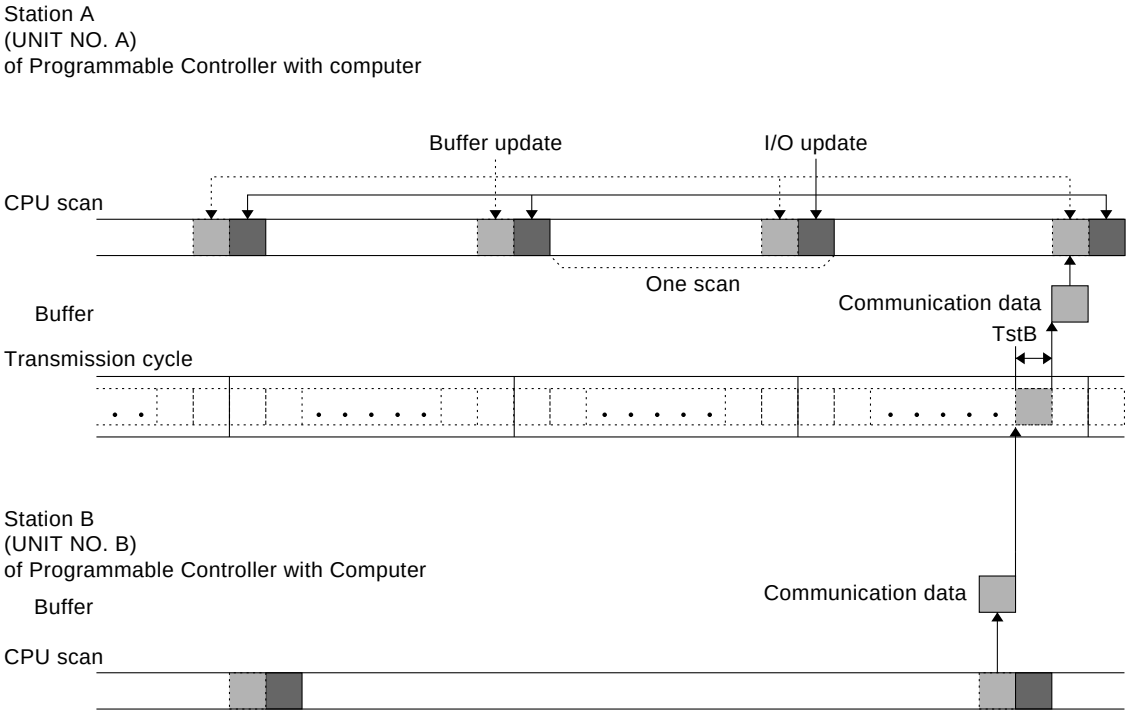
1) Minimum Computer Communication Time “Minimum Tcc”

The minimum amount of time needed from the point when a communication data is transferred from one station (computer) to the point when the communication data is stored in the destination one original station (computer) is calculated as follows :

Minimum Tcc = TstB

where :

TstB = Time needed for PC Link processing by station “B”.



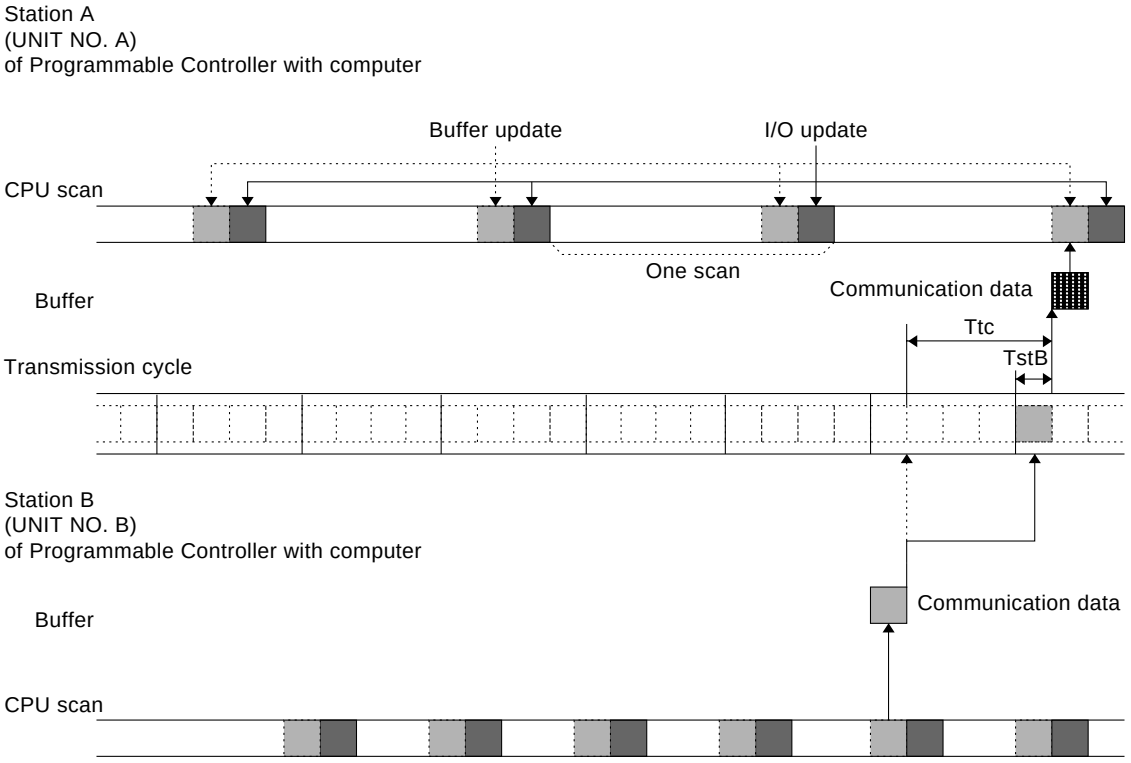
2) Maximum Computer Communication Time “Maximum Tcc”

The maximum amount of time needed from the point when a communication data is transferred from one station (computer) to the point when the communication data is stored in the destination one original station (computer) is calculated as follows :

Maximum Tcc = Ttc

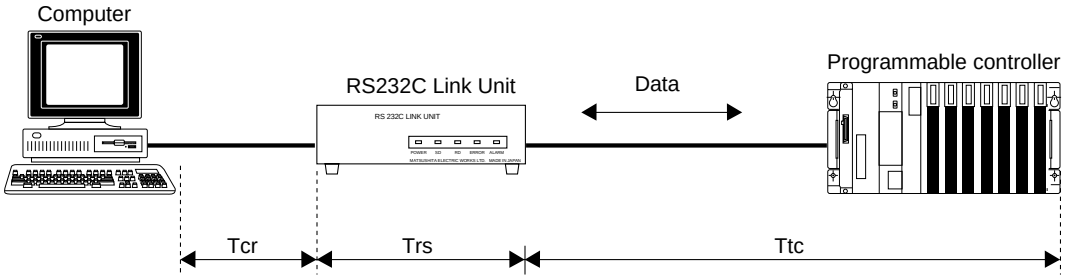
where :

Ttc = Time needed for one transmission cycle.
TstB = Time needed for PC Link processing by station “B”.



7. Communication Time of Between Computer and RS232C Link Unit

The communication time is the time required for communications between the station (Programmable Controller) and one computer through the RS232C Link Unit.
This time depends upon the data transmission time (between computer and RS232C Link Unit), data processing time in RS232C Link Unit and the time needed for communications in a system loop [transmission cycle, transmission timing and the time needed for CPU processing (CPU scan time)].



Tcr : data transmission time of between computer and RS232C Link Unit
Trs : data processing time in RS232C Link Unit
Ttc : time needed for communications in a loop "Transmission Cycle Time"
Refer to page 69, "2. Transmission Cycle Time", for details about transmission cycle time in a loop.

1) Data Transmission Time of Between Computer and RS232C Link Unit

The time needed for data transmitting between computer and RS232C Link Unit is calculated in the following equation :

$$Tcr\ (ms) = \left(\frac{TN}{BPS} + TA + \frac{RN}{BPS} \right) \times 1000$$

where :

TN = Number of bits transmitted in one command frame
[= Number of characters × Number of bits in one character *]
TA = Delay time occurring at transmission
This is caused by the idle bits between two characters.
[Average idle time between two characters × (Number of characters - 1)]
RN = Number of transmitted bits in a response frame
[= Number of characters × Number of bits in one character *]
BPS = Baud rate

* The number of bits in one character
= Start bit (: 1) + Data bits (: 7 or 8) + Parity bit (: 0 or 1) + Stop bits (: 1 or 2)
The start bit is fixed at 1 bit.

2) Data Processing Time in RS232C Link Unit

The time needed for data processing time in RS232C Link Unit is calculated in the following equation :

- When using header character “%” of command message data :

sending Trs = 0.3 + 0.012 × Number of command text data receiving Trs = 1.2 + 0.03 × Number of command text data

- When using header character “*****” of command character mode data :

sending Trs = 0.7 + 0.01 × Number of command text data receiving Trs = 1.0 + 0.04 × Number of command text data

- When using header character “*****” of command binary mode data :

sending Trs = 0.8 + 0.042 × Number of command text data receiving Trs = 1.07 + 0.018 × Number of command text data

- When using header character “8”, “0” of command message data :

sending Trs = 0.5 + 0.05 × Number of command text data receiving Trs = 1.0 + 0.042 × Number of command text data

- When using header character “@”

@ RLA of P/W PC Link mode Trs = 30.00 @ RLS of P/W PC Link mode Trs = 20.00 + 0.063 × Number of words for reading

CHAPTER 6

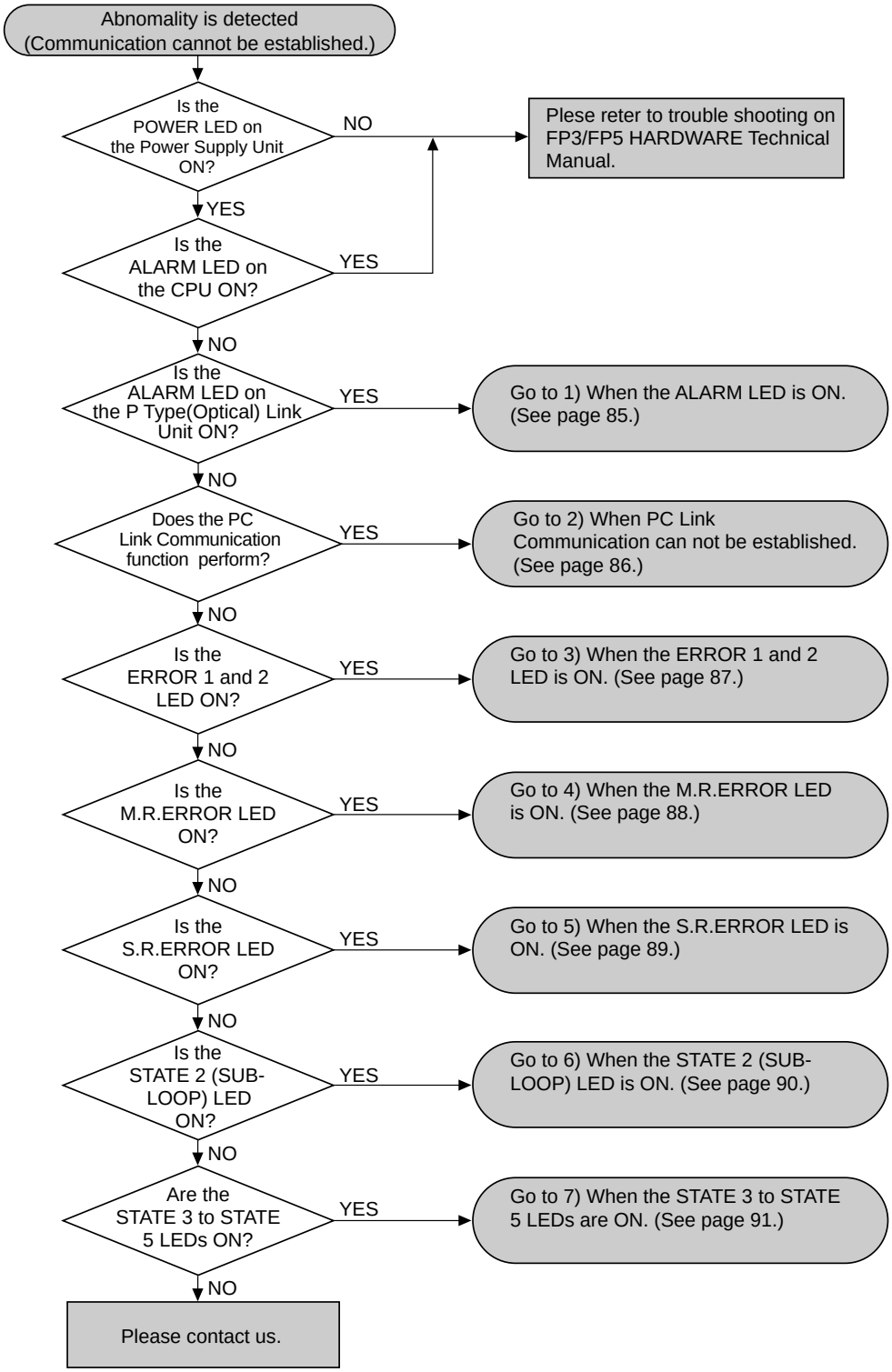
TROUBLESHOOTING

"PC" is an abbreviation of Programmable Controller.

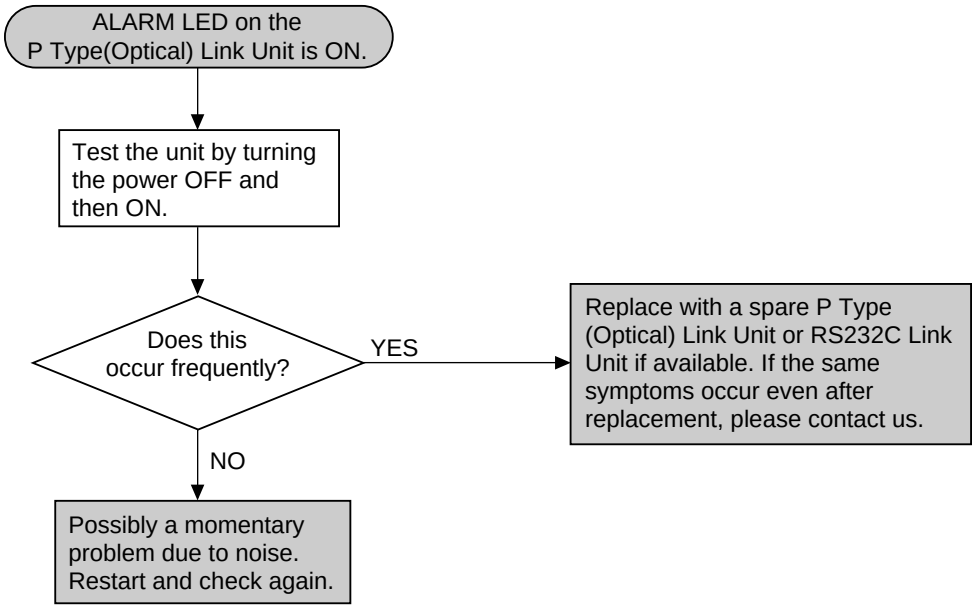
6-1. Troubleshooting

If an error has occurred in the P Type (Optical) Link System, the error can be checked and the correct steps to take can be determined with the following flowcharts.

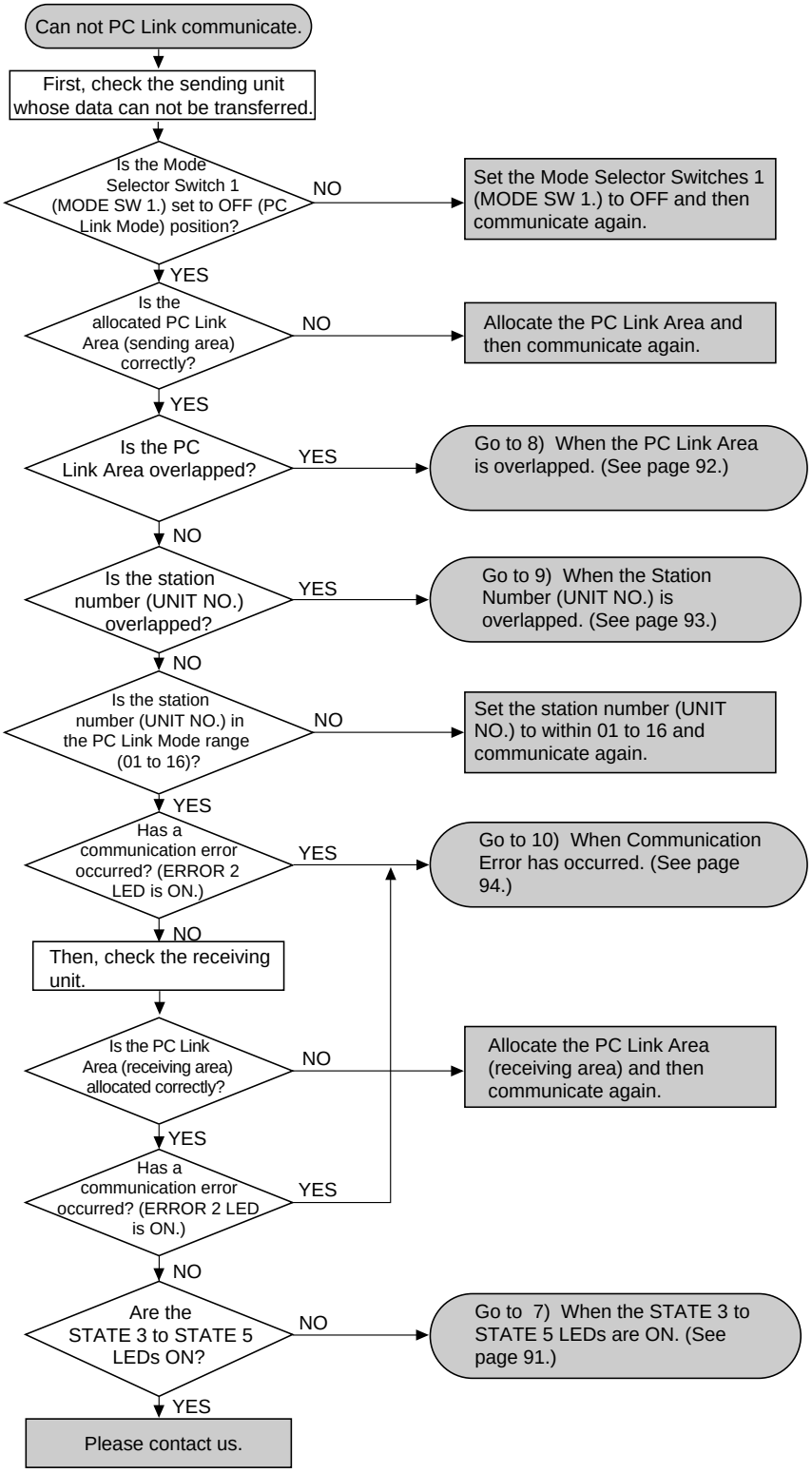
1. Main Flowchart



1) When the ALARM LED is ON.

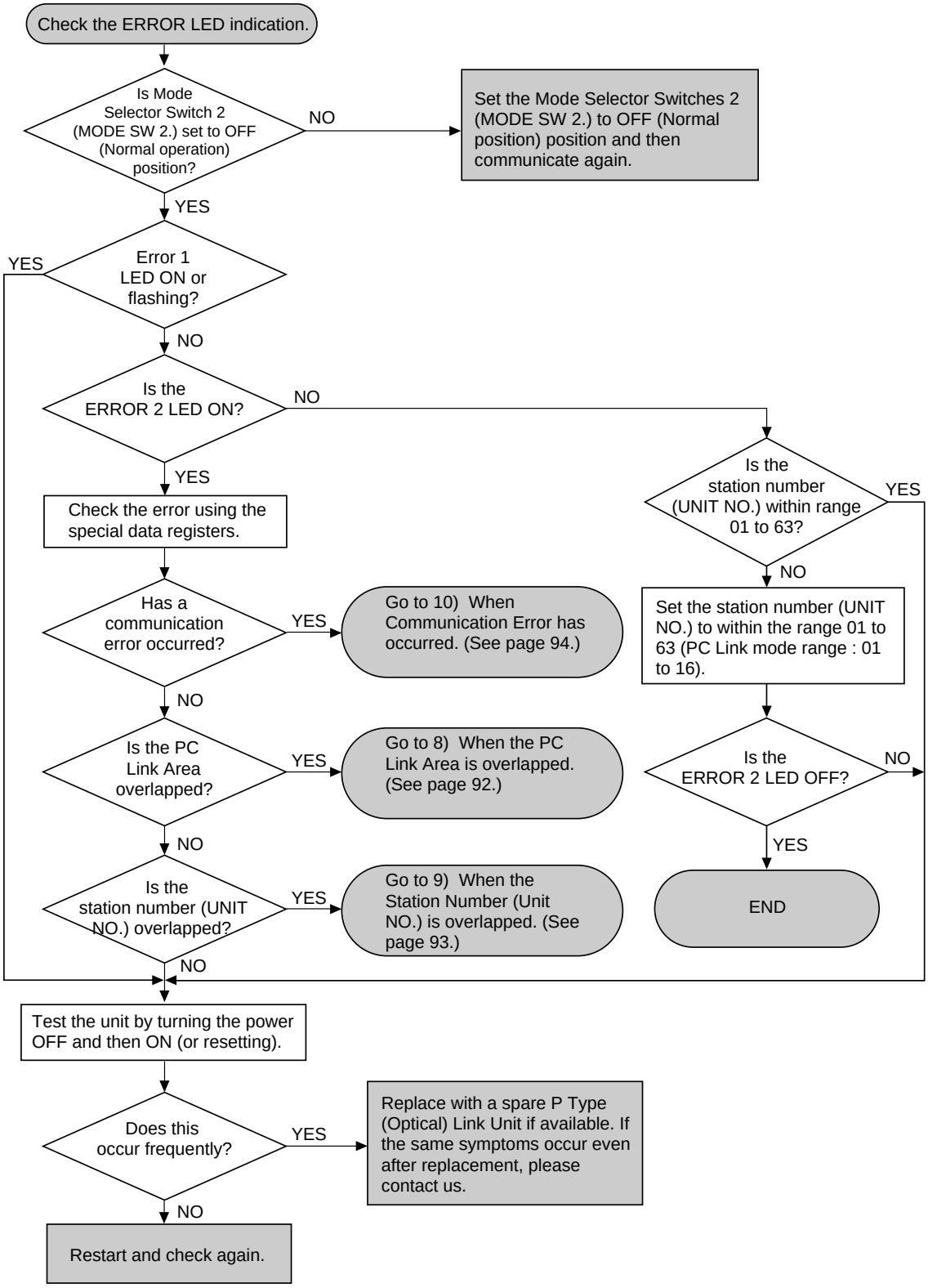


2) When PC Link Communication can not be established.



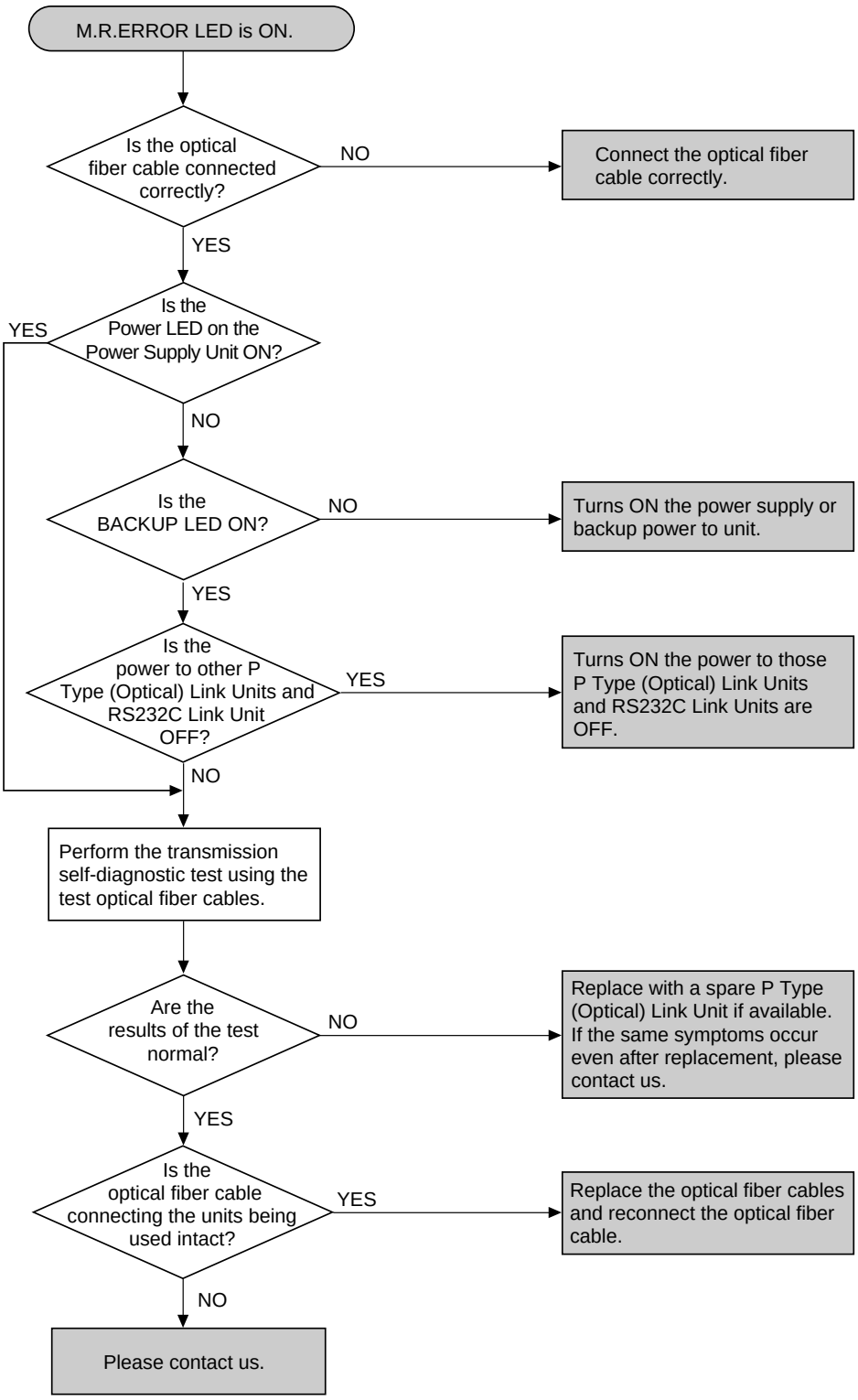
- Refer to page 36, "1. P/W PC Link Function", for details about the allocating the P/W PC Link Area.
- Refer to page 58, "2. Automatic Loop Reset Transmitting Function", for details about communication loop.

3) When the ERROR 1 and 2 LED is ON.



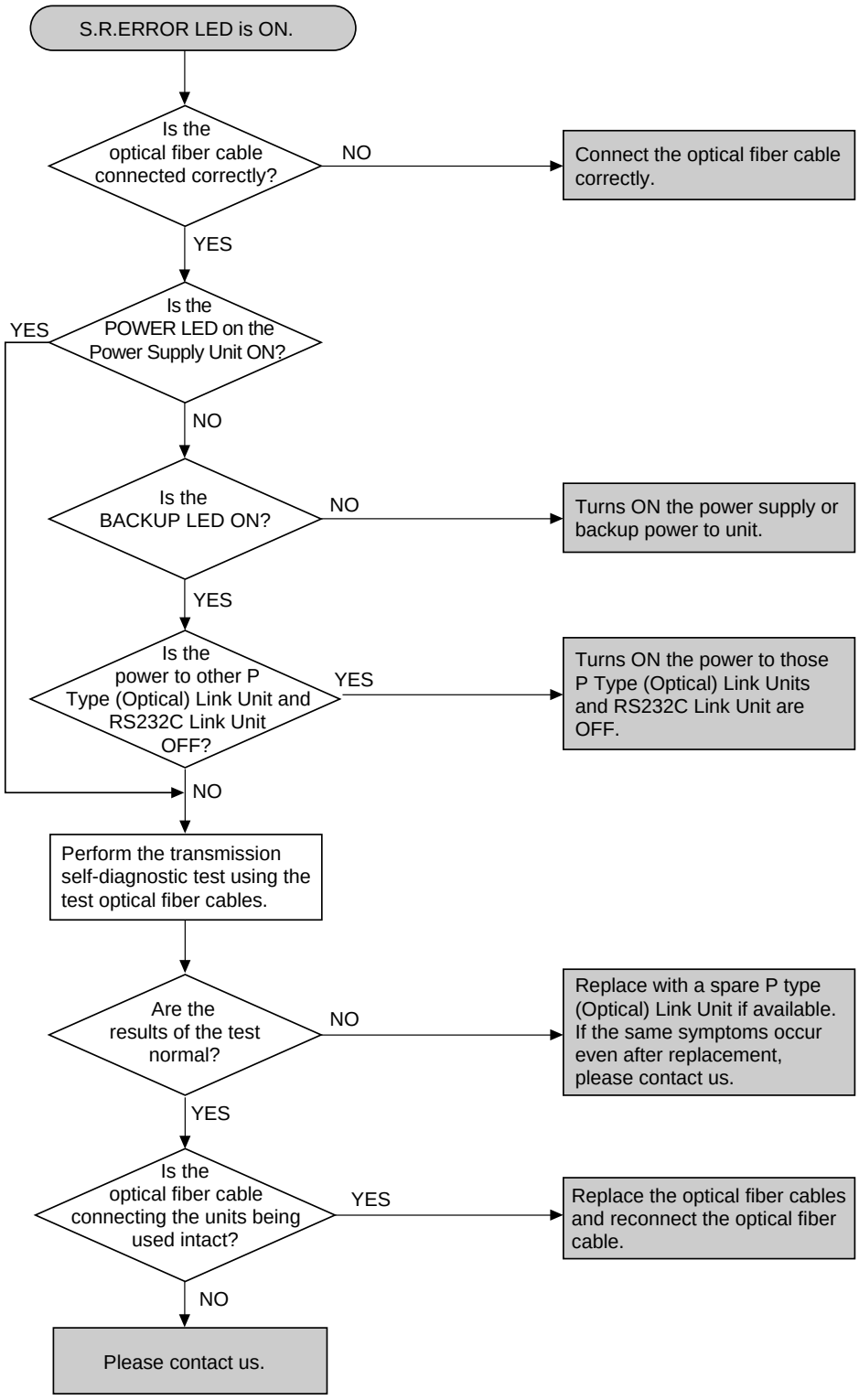
- Refer to page 44, "6) Special Internal Relays and Special Data Registers for the P/W PC Link".
- Refer to page 56, "5-5. Error Checking during Transmission", for details about error contents.

4) When the M.R.ERROR LED is ON.



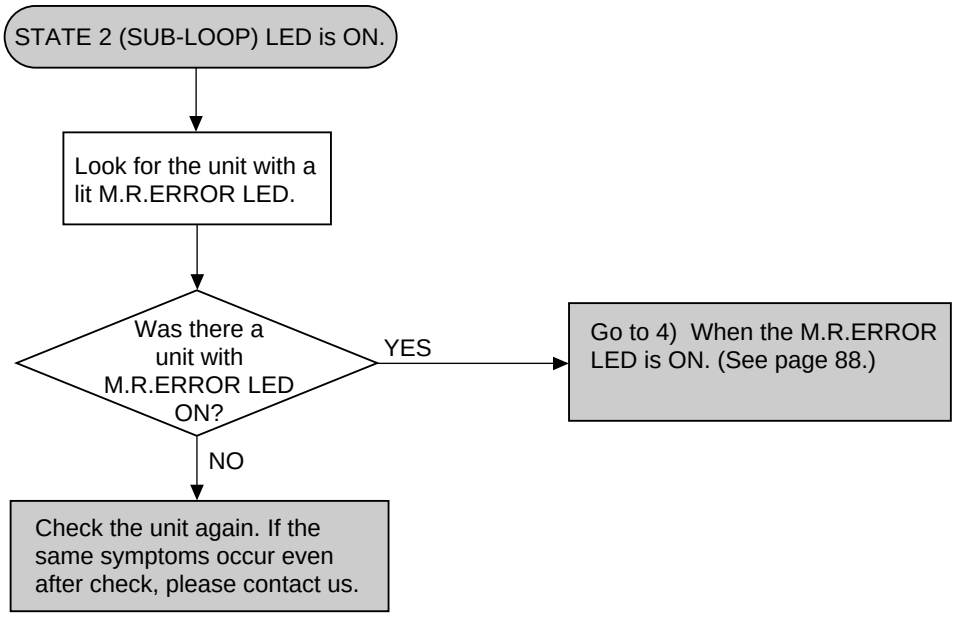
- Refer to page 62, "4. Transmission Self-diagnostic Testing Function", for details about transmission self-diagnostic test.

5) When the S.R.ERROR LED is ON.

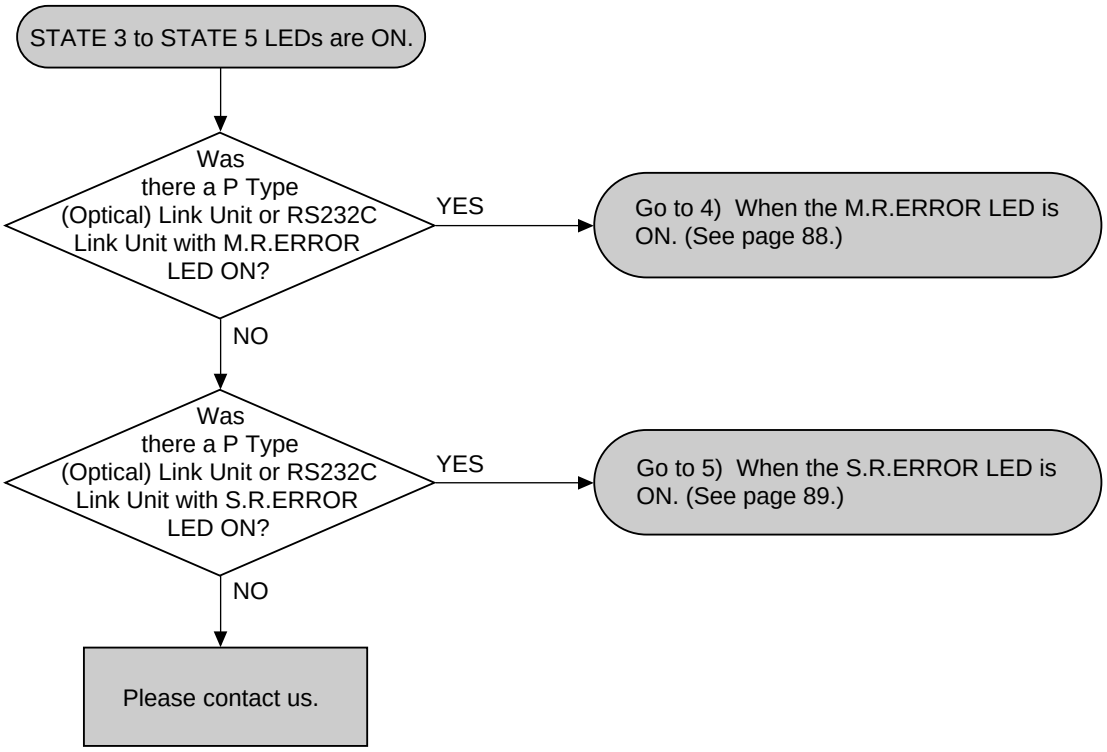


- Refer to page , 62, "4. Transmission Self-diagnostic Testing Function", for details about transmission self-diagnostic test.

6) When the STATE 2 (SUB-LOOP) LED is ON.



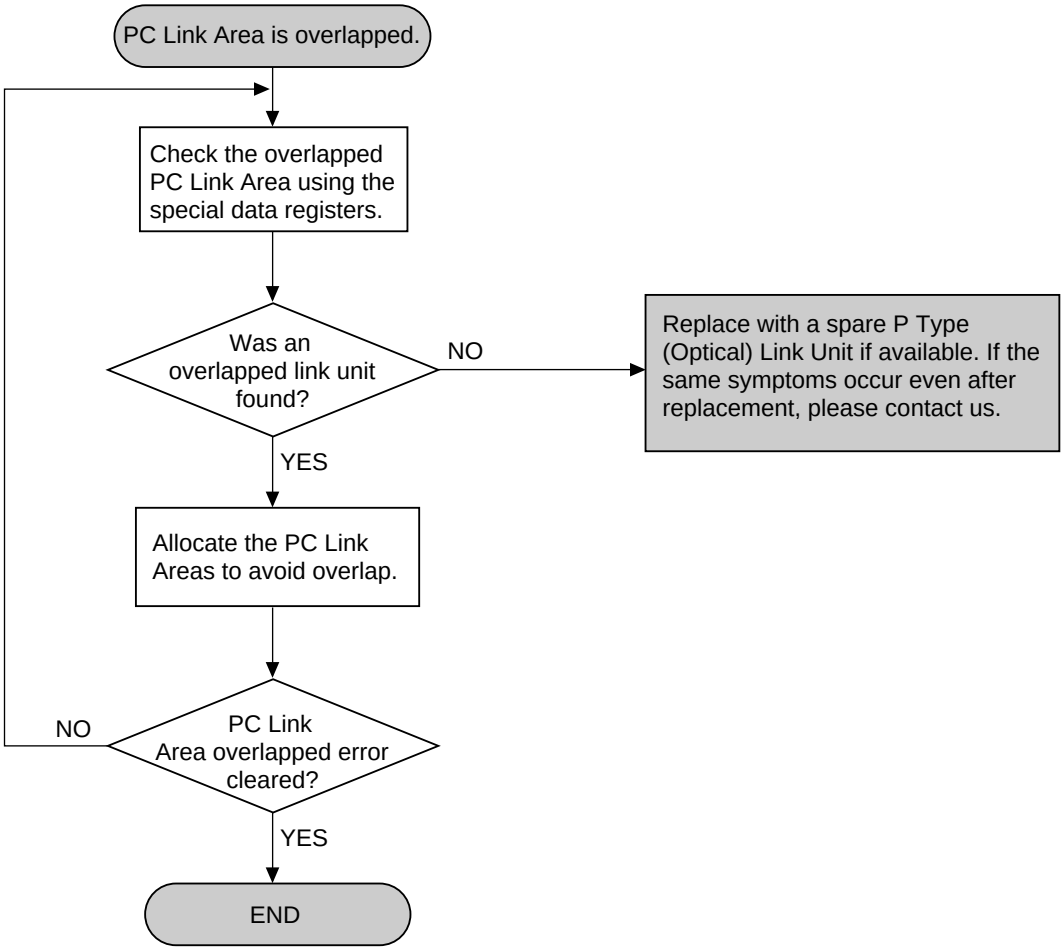
7) When the STATE 3 to STATE 5 LEDs are ON.



Note :

STATE 3 LED : MAIN-LOOP BACK LED
STATE 4 LED : SUB-LOOP BACK LED
STATE 5 LED : MAIN/SUB-LOOP BACK LED

8) When the PC Link Area is overlapped.

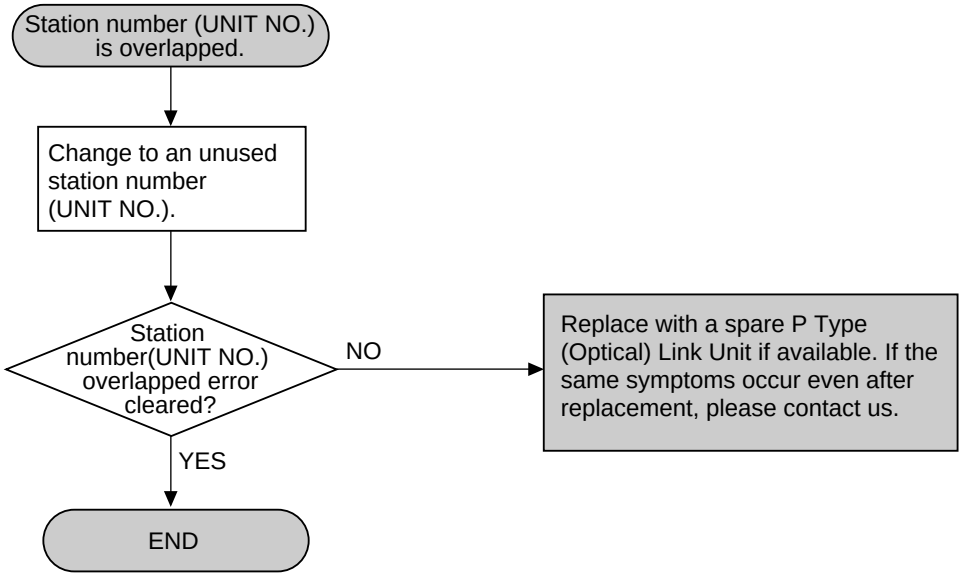


Notes :

Check the special register to determine whether the overlapped error is cleared.
ERROR 2 LED may be ON or flashing even though the special data register shows the error to be cleared.
In this case, it is possible that another error[transmission error, station number (UNIT NO.) overlapped error, station number (UNIT NO.) setting error] may have occurred simultaneously.

- Refer to page 96, "7-1. How to Read Special Internal Relays (R) and Special Data Registers (DT)", for details about special data register.
- Refer to page 44, "6) Special Internal Relays and Special Data Registers for the P/W PC Link", for details about PC Link Area overlapped error.

9) When the Station Number (UNIT NO.) is overlapped.

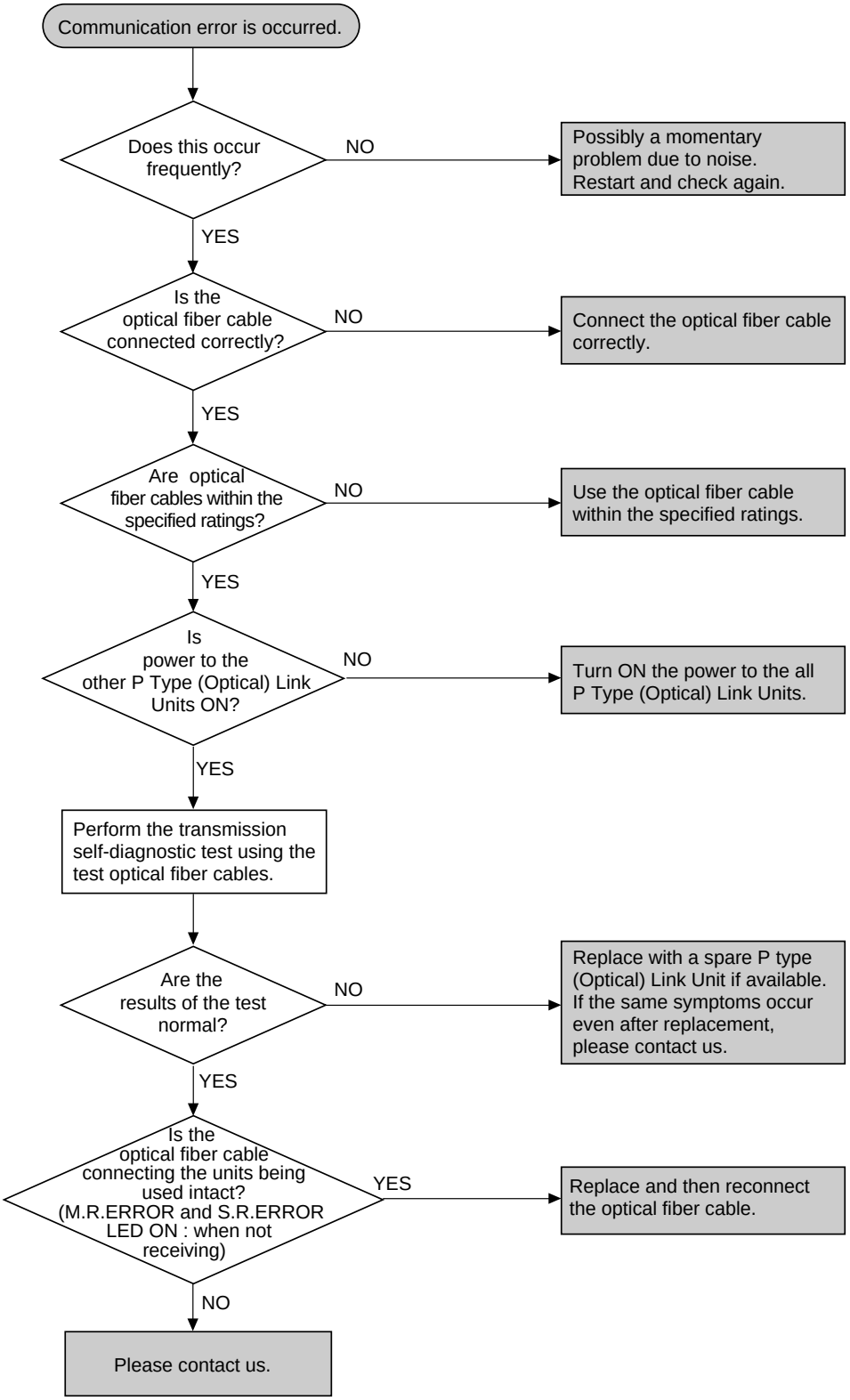


Notes :

Check the special register to determine whether the station number (UNIT NO.) overlapped error is cleared.
ERROR 2 LED may be ON or flashing even though the special data register shows the error to be cleared. In this case, it is possible that another error [transmission error, PC Link Area overlapped error, station number (UNIT NO.) setting error] may have been occurred simultaneoulsy.

- Refer to page 44, "6) Special Internal Relays and Special Data Registers for the P/W PC Link", for details about station number (UNIT NO.) overlapped.

10) When Communication Error has occurred.



• Refer to page 62, "4. Transmission Self-diagnostic Testing Function", for details about transmission self-diagnostic test.

CHAPTER 7

APPENDIX

“PC” is an abbreviation of Programmable Controller.

7-1. How to Read Special Internal Relays (R) and Special Data Registers (DT)

Internal relays (R) and data registers (DT) whose usage has been already determined by the system design are called "special internal relays (R)" and "special data registers (DT)".
Since they are specialized for indicating the setting conditions or operating status of a loop, it is very effective to use them for loop operation checking and operation control.
In this section, the special internal relays (R) and the special data registers (DT) used for the P Type (Optical) Link System are described.

1. Monitoring Special Internal Relays (R) and Special Data Registers (DT)

The operating condition can be checked by monitoring the special internal relays (R) and special data registers (DT). Monitoring is performed using a programming tool which is explained as follows :

1) Using the FP Programmer/FP Programmer II

The tools to be prepared : FP Programmer : AFP1112A or AFP1112
FP Programmer II : AFP1114
FP Peripheral Cable : AFP5520 (0.5 m/1.640 ft.) or AFP5523 (3 m/9.843 ft.)

Procedure :

① Connect the FP Programmer or FP Programmer II to the RS422 port on the CPU using the FP Peripheral Cable.

Note :

- If the AFP1112 type FP Programmer is used, the baud rate must be set at the CPU. Be sure to set the baud rate of the CPU for 19,200.

② Select the special internal relays (in unit of words) or special data registers to be monitored.

ACLR	＊＊
(–) OP → 8 → ENT	OP – 8 WORD DATA

③ Select a word of special internal relays (WR) or a special data register (DT).

The data from the specified address will be displayed in decimal.

[word special internal relay]

OR R·WR → Word address → READ ▼

[special data register]

NOT DT/Ld → Address → READ ▼

Select a number system from the three possibilities (Decimal, Hexadecimal, Binary)

[Decimal]

When the address is selected using the procedure above, the data will be displayed in decimal.

To change the number system to decimal from hexadecimal or binary, press the (BIN) K/H key.

Note :

- When the data is displayed in decimal, the letter "K" will be displayed on the FP Programmer or FP Programmer Ⅱ.

[Hexadecimal]

To change the number system to hexadecimal from decimal or binary, press the (BIN) K/H key.

Note :

- When the data is displayed in hexadecimal, the letter "H" will be displayed on the FP Programmer or FP Programmer Ⅱ.

[Binary]

To change the number system to binary from decimal or hexadecimal, press the SHIFT SC key and then press the (BIN) K/H key.

Note :

- On the AFP1112 and the AFP1112A FP Programmers, the SC key is used in the same way as the SHIFT SC key on the AFP1114.

④ If you wait to monitor the data in the previous address or the next address, use the READ ▼ or the SRC ▲ key.

⑤ If the (HELP) CLR key is pressed twice in succession, you can select another word special internal relay or special data register using the same procedure as described in the step ③.

⑥ If the ACLR key is pressed, the FP Programmer or FP Programmer Ⅱ will exit from the OP 8 mode.

2) Using the NPST-GR (Programming Support Tool) Software

The tools to be prepared :	NPST-GR Software	: AFP266538
	FP Peripheral Cable	: AFP5520 (0.5 m/1.640 ft.) or AFP5523 (3 m/9.843 ft.)
	RS422/232C Adapter	: AFP8550
	RS232C Cable	: Refer to page 208, "■ Programming Tools".
	Computer	: IBM PC-AT or 100 % compatible MS-DOS or PC-DOS (Ver.3.3 or above)

Procedure :

① Connect the RS422 port on the CPU to the RS422 port on the RS422/232C Adapter with the FP Peripheral Cable. Then, connect the RS232C port on the RS422/232C Adapter to RS232C port on your computer using an RS232C cable.

② Run the NPST-GR Software on the computer.
Set the NPST configurations.
<PLC Type, Port selection, Transmission rate selection, etc.>

③ Set the NPST-GR to ONLINE mode.
Pressing the "Esc" key while holding down the "Ctrl" key on the keyboard, will switch between ONLINE ↔ OFFLINE.

④ Select "X. DATA MONITOR" from the ONLINE MONITOR FUNCTION MENU.
By pressing the "F10" key while holding down the "Ctrl" key, the FUNCTION MENU window will appear.

⑤ Set an operand (in the memory area) to be monitored.
Press the "F6" key and select the operand to be monitored.
Then enter the address.
To store the selection, press the "Enter" key. If all the operands you want to monitor have been selected, press the "Esc" key .

⑥ Begin monitoring.
Press the "F5" key to start monitoring.

⑦ Select the number system you want from the three possibilities (Hexadecimal, Decimal, Binary).
Press the "F7" (hexadecimal), "F8" (decimal) or "F9" (binary) key while holding down the "Shift" key to change the number system.

⑧ Pressing the "F3" key will close the data monitor window.

2. Table of Special Internal Relays (R) and Special Data Registers (DT)

1) Table of Special Internal Relays (R)

The special internal relays are used for special purposes in the Programmable Controller.
Since these relays cannot be used as outputs, they should only be used as contacts.

■ WR900 (Data Transfer instructions : Error flags)

Word number	Address	Description
900	R9007	Turns ON (becomes "1") and the ON status is maintained when the data is specified in an F145 (SEND) /P145 (PSEND) or an F146 (RECV) /P146 (PRECV) instruction. The error program address is stored in special data register DT9017. (See page 104.)
	R9008	Turns ON (becomes "1") for an instant when data is specified in an F145 (SEND) /P145 (PSEND) or an F146 (RECV) /P146 (PRECV) instruction. The error program address is stored in special data register DT9018. (See page 104.)

■ WR903 (Data Transfer instructions : Execution flags)

Word number	Address	Description
903	R9030	0 (OFF) : When a Data Transfer instruction cannot be executed. (including the period while a Data Transfer instruction is being executed.) 1 (ON) : When a Data Transfer instruction can be executed.
	R9031	0 (OFF) : When a Data Transfer operation is completed without error. 1 (ON) : When a Data Transfer error occurs. The error code is stored in special data register DT9039. (See page 104.)

■ WR905 (P/W Link : Error flags)

Word number	Address	Description	
905	R9050	P/W Link 1	Turns ON, • when a communication error occurs. • when a station number (UNIT NO.) overlap occurs. • when a PC Link send area overlap occurs.
	R9051	P/W Link 2	Turns ON, • when a communication error occurs. • when a station number (UNIT NO.) overlap occurs. • when a PC Link send area overlap occurs.
	R9052	P/W Link 3	Turns ON, • when a communication error occurs. • when a station number (UNIT NO.) overlap occurs. • when a PC Link send area overlap occurs.

■ WR906 (P/W PC Link 0 : PC Link Mode status)

Word number	Address	Description	
906	R9060	P/W PC Link 0	Station number 01 (UNIT NO. 01) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9061		Station number 02 (UNIT NO. 02) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9062		Station number 03 (UNIT NO. 03) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9063		Station number 04 (UNIT NO. 04) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9064		Station number 05 (UNIT NO. 05) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9065		Station number 06 (UNIT NO. 06) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9066		Station number 07 (UNIT NO. 07) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9067		Station number 08 (UNIT NO. 08) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9068		Station number 09 (UNIT NO. 09) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9069		Station number 10 (UNIT NO. 10) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906A		Station number 11 (UNIT NO. 11) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906B		Station number 12 (UNIT NO. 12) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906C		Station number 13 (UNIT NO. 13) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906D		Station number 14 (UNIT NO. 14) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906E		Station number 15 (UNIT NO. 15) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R906F		Station number 16 (UNIT NO. 16) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode

■ WR907 (P/W PC Link 0 : CPU Mode status)

Word number	Address	Description	
907	R9070	P/W PC Link 0	Station number 01 (UNIT NO. 01) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9071		Station number 02 (UNIT NO. 02) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9072		Station number 03 (UNIT NO. 03) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9073		Station number 04 (UNIT NO. 04) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9074		Station number 05 (UNIT NO. 05) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9075		Station number 06 (UNIT NO. 06) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9076		Station number 07 (UNIT NO. 07) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9077		Station number 08 (UNIT NO. 08) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9078		Station number 09 (UNIT NO. 09) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9079		Station number 10 (UNIT NO. 10) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907A		Station number 11 (UNIT NO. 11) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907B		Station number 12 (UNIT NO. 12) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907C		Station number 13 (UNIT NO. 13) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907D		Station number 14 (UNIT NO. 14) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907E		Station number 15 (UNIT NO. 15) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R907F		Station number 16 (UNIT NO. 16) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode

■ WR908 (P/W PC Link 1 : PC Link Mode status)

Word number	Address	Description	
908	R9080	P/W PC Link 1	Station number 01 (UNIT NO. 01) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9081		Station number 02 (UNIT NO. 02) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9082		Station number 03 (UNIT NO. 03) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9083		Station number 04 (UNIT NO. 04) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9084		Station number 05 (UNIT NO. 05) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9085		Station number 06 (UNIT NO. 06) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9086		Station number 07 (UNIT NO. 07) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9087		Station number 08 (UNIT NO. 08) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9088		Station number 09 (UNIT NO. 09) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R9089		Station number 10 (UNIT NO. 10) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908A		Station number 11 (UNIT NO. 11) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908B		Station number 12 (UNIT NO. 12) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908C		Station number 13 (UNIT NO. 13) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908D		Station number 14 (UNIT NO. 14) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908E		Station number 15 (UNIT NO. 15) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode
	R908F		Station number 16 (UNIT NO. 16) 0 (OFF) : Not in PC Link Mode or in an error condition 1 (ON) : In PC Link Mode

■ **WR909 (P/W PC Link 1 : CPU Mode status)**

Word number	Address	Description	
909	R9090	P/W PC Link 1	Station number 01 (UNIT NO. 01) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9091		Station number 02 (UNIT NO. 02) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9092		Station number 03 (UNIT NO. 03) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9093		Station number 04 (UNIT NO. 04) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9094		Station number 05 (UNIT NO. 05) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9095		Station number 06 (UNIT NO. 06) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9096		Station number 07 (UNIT NO. 07) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9097		Station number 08 (UNIT NO. 08) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9098		Station number 09 (UNIT NO. 09) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R9099		Station number 10 (UNIT NO. 10) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909A		Station number 11 (UNIT NO. 11) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909B		Station number 12 (UNIT NO. 12) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909C		Station number 13 (UNIT NO. 13) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909D		Station number 14 (UNIT NO. 14) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909E		Station number 15 (UNIT NO. 15) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode
	R909F		Station number 16 (UNIT NO. 16) 0 (OFF) : In PROG. mode 1 (ON) : In RUN mode

2) Table of Special Data Registers (DT)

The special data registers are used for special purposes in the Programmable Controller. Data cannot be transfered to the special data registers (except for DT9060 to DT9122).

Note :

- If you can not do something, there is no reason to give on example of a method you can not use.

■ DT9017/DT9018 (Data Transfer instructions : Error program address)

Address	Description
DT9017	The error program address is stored, when special internal relay R9007 turns ON.
DT9018	The error program address is stored, when special internal relay R9008 turns ON.

■ DT9039 (Data Transfer instructions : Error code)

Address	Description
DT9039	The following error code is stored, when special internal relay R9031 turns ON. 71 (hexadecimal) : Response signal meaning that a Data Transfer operation cannot be received. 72 (hexadecimal) : The Data Transfer buffer is full. 73 (hexadecimal) : Response message cannot be received. When one of the above mentioned errors occurs, check the time-out value in system register number 32. The time-out value can be set in the range of 10 ms to 81.9 s (defaut = 2 s).

■ DT9140 to DT9149 (P/W PC Link status)

Address	Description	
DT9140	P/W PC Link 0	Ring counter : Counts how many times data is received from the other stations.
DT9141		Current data reception interval : Multiply the value stored here by 2.5 ms
DT9142		Minimum data reception interval : Multiply the value stored here by 2.5 ms
DT9143		Maximum data reception interval : Multiply the value stored here by 2.5 ms
DT9144		Ring counter : Counts how many times data is sent to the other stations.
DT9145		Current data sending interval : Multiply the value stored here by 2.5 ms
DT9146		Minimum data sending interval : Multiply the value stored here by 2.5 ms
DT9147		Maximum data sending interval : Multiply the value stored here by 2.5 ms
DT9148	P/W PC Link 1	Ring counter : Counts how many times data is received from the other stations.
DT9149		Current data reception interval : Multiply the value stored here by 2.5 ms

■ DT9150 to DT9159 (P/W PC Link status)

Address	Description	
DT9150	P/W PC Link 1	Minimum data reception interval : Multiply the value stored here by 2.5 ms
DT9151		Maximum data reception interval : Multiply the value stored here by 2.5 ms
DT9152		Ring counter : Counts how many times data is sent to the other stations.
DT9153		Current data sending interval : Multiply the value stored here by 2.5 ms
DT9154		Minimum data sending interval : Multiply the value stored here by 2.5 ms
DT9155		Maximum data sending interval : Multiply the value stored here by 2.5 ms
DT9156	P/W PC Link 0	Work area for calculating the data reception interval
DT9157		Work area for calculating the data sending interval
DT9158	P/W PC Link 1	Work area for calculating the data reception interval
DT9159		Work area for calculating the data sending interval

■ DT9160 to DT9169 [P/W Link : Station number (UNIT NO.) and Error flags]

Address	Description	
DT9160	P/W Link 1	Station number (UNIT NO.)
DT9161		The error status (See Note below)
DT9162	P/W Link 2	Station number (UNIT NO.)
DT9163		The error status (See Note below)
DT9164	P/W Link 3	Station number (UNIT NO.)
DT9165		The error status (See Note below)
DT9166 to DT9169	————	Unused

Note :

• The error status of DT9161, DT9163 and DT9165 is expressed as :

Bit position	15 • • 12	11 • • 8	7 • • 4	3 • • 0
Bit data				

Invalid data

Bit No. 0 becomes "1" :
- when a communication error occurs.
- when the ERROR 2 LED turns ON.

Bit No. 1 becomes "1" :
- when the station numbers (UNIT NO.) are overlapped in a loop
- when the ERROR 2 LED turns ON.

Bit No. 2 becomes "1" :
- when the send areas are overlapped in a loop.
- when the ERROR 2 LED turns ON.

Bit No. 3 becomes "1" :
- when the station numbers (UNIT NO.) are outside of the specified range (01 to 32)
- when the station numbers (UNIT NO.) in the PC link mode are outside of the specified range (01 to 16)
- when the ERROR 2 LED flashes.

■ DT9170 to DT9194 (P/W Link 1 status)

Address	Description	
DT9170	P/W Link 1	The P/W PC Link overlapped station number (UNIT NO.) is stored here.
DT9171		The results of the trial operation in the test mode.
DT9172		Counts how many times a token is lost.
DT9173		Counts how many times two or more tokens are detected.
DT9174		Counts how many times the signal is lost.
DT9175		Counts how many times a synchronous abnormality is detected.
DT9176		Send NACK
DT9177		Send NACK
DT9178		Send WACK
DT9179		Send WACK
DT9180		Send answer
DT9181		Send answer
DT9182		Unidentified command
DT9183		Counts how many times a parity error occurred.
DT9184		End code receive error
DT9185		Format error
DT9186		Not supported error
DT9187		The self-diagnosis results
DT9188		Counts how many times loop change is detected.
DT9189		Counts how many link error occurred.
DT9190		Counts how many main loop breaks are detected.
DT9191		Counts how many sub loop breaks are detected.
DT9192		Loop reconstructing
DT9193		Loop operation mode
DT9194		Loop input status

■ DT9200 to DT9224 (P/W Link 2 status)

Address	Description	
DT9200	P/W Link 2	The P/W PC Link overlapped station number (UNIT NO.) is stored here.
DT9201		The results of the trial operation in the test mode.
DT9202		Counts how many times a token is lost.
DT9203		Counts how many times two or more tokens are detected.
DT9204		Counts how many times the signal is lost.
DT9205		Counts how many times a synchronous abnormality is detected.
DT9206		Send NACK
DT9207		Send NACK
DT9208		Send WACK
DT9209		Send WACK
DT9210		Send answer
DT9211		Send answer
DT9212		Unidentified command
DT9213		Counts how many times a parity error occurred.
DT9214		End code receive error
DT9215		Format error
DT9216		Not supported error
DT9217		The self-diagnosis results
DT9218		Counts how many times loop change is detected.
DT9219		Counts how many link error occurred.
DT9220		Counts how many main loop breaks are detected.
DT9221		Counts how many sub loop breaks are detected.
DT9222		Loop reconstructing
DT9223		Loop operation mode
DT9224		Loop input status

■ DT9230 to DT9254 (P/W Link 3 status)

Address	Description	
DT9230	P/W Link 3	The P/W PC Link overlapped station number (UNIT NO.) is stored here.
DT9231		The results of the trial operation in the test mode.
DT9232		Counts how many times a token is lost.
DT9233		Counts how many times two or more tokens are detected.
DT9234		Counts how many times the signal is lost.
DT9235		Counts how many times a synchronous abnormality is detected.
DT9236		Send NACK
DT9237		Send NACK
DT9238		Send WACK
DT9239		Send WACK
DT9240		Send answer
DT9241		Send answer
DT9242		Unidentified command
DT9243		Counts how many times a parity error occurred.
DT9244		End code receive error
DT9245		Format error
DT9246		Not supported error
DT9247		The self-diagnosis results
DT9248		Counts how many times loop change is detected.
DT9249		Counts how many link error occurred.
DT9250		Counts how many main loop breaks are detected.
DT9251		Counts how many sub loop breaks are detected.
DT9252		Loop reconstructing
DT9253		Loop operation mode
DT9254		Loop input status

7-2. Computer Link Function Using C.C.U. (Computer Communication Unit)

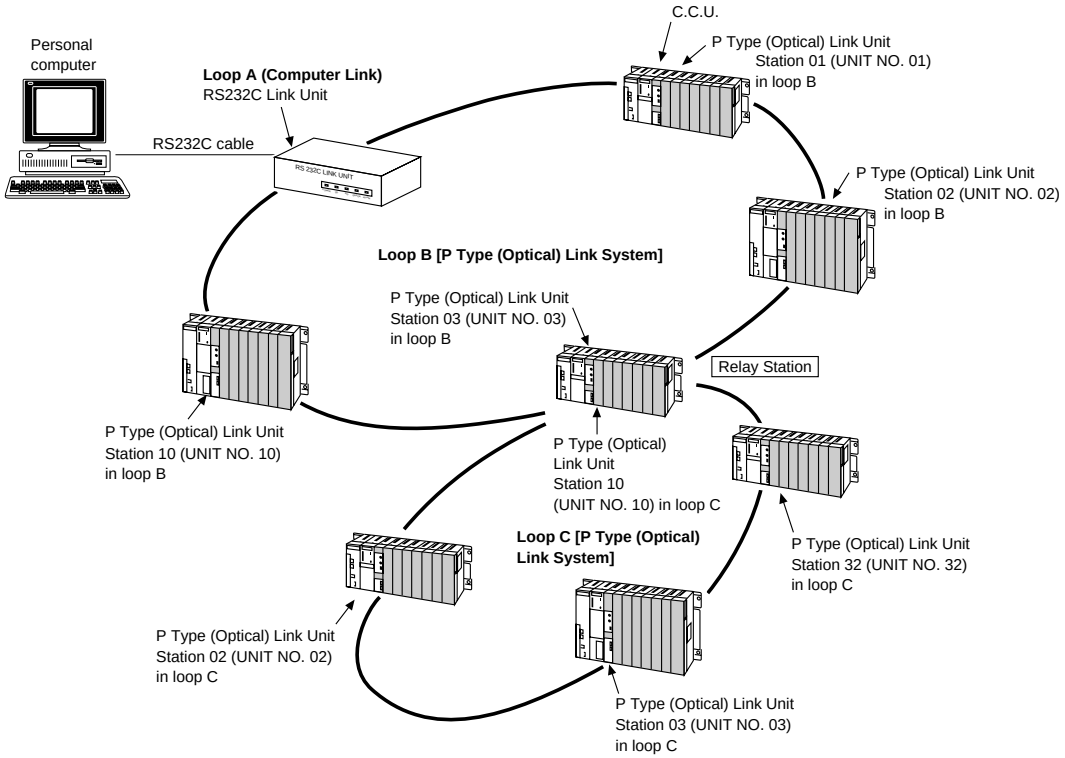
The FP3/FP5 Programmable Controllers can communicate with a computer which is also in the P Type (Optical) Link System by using a C.C.U. (Computer Communication Unit).
In the Computer Link function, communication is performed using the MEWTOCOL-COM protocol, the half-duplex communication protocol for the FP Series Programmable Controllers. With the MEWTOCOL-COM, you can read, write or monitor data stored in the memory of the Programmable Controller (such as contact data and timer values) from the computer. The program used by the computer can be created with any programming language such as BASIC or C.

Note :

- The details of the MEWTOCOL-COM protocol are explained in the “FP3/FP5 C.C.U. (Computer Communication Unit) Technical Manual”.

1. Configuration of the Computer Link in a P Type (Optical) Link System

To configure the Computer Link in a P Type (Optical) Link System, a C.C.U. (Computer Communication Unit) is required. The Computer Link function is performed using the inter-network link function of the C.C.U.. When the inter-network function is used, first, communications take place on the loop that the target programmable Controller belongs to, and then Computer Link function is performed using the MEWTOCOL-COM.



Notes :

- In the relay stations, no more than 3 link units can be installed.
- The C.C.U.'s (Computer Communication Unit's) version should be 1.3 or higher.
- The position of each loop relative to the computer is specified using the word "depth" and starting from 0 as follows :
  Relative position counting from the computer
  Loop A : depth 0
  Loop B : depth 1
  Loop C : depth 2
- The Computer Link function is available up to a relative depth of 2 (as shown above).
- At the relay stations, each Programmable Controller belongs to 2 Loops.
  Example : Station number 01 (UNIT NO. 01) in Loop B also belongs to Loop A.

2. How to Specify the Loop

1) Procedure

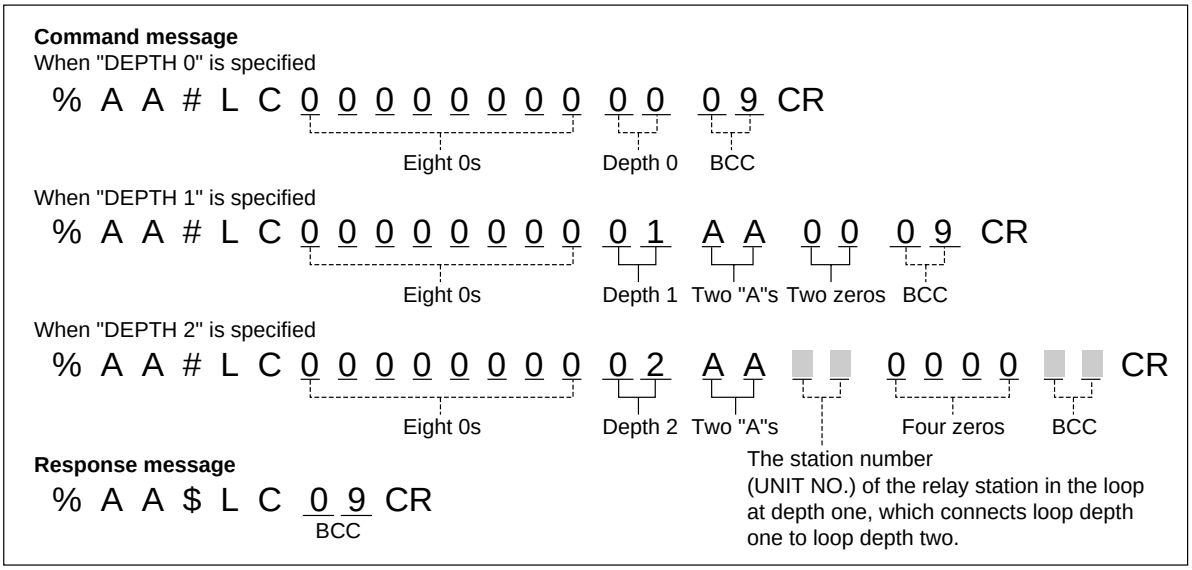
① Specify the target loop with the "LC" MEWTOCOL-COM command when a Computer Link function is used in a P Type (Optical) Link System.

② Perform the communication using MEWTOCOL-COM.
The station number (UNIT NO.) in the target P Type (Optical) Link System is used as the destination number (UNIT NO.) in MEWTOCOL-COM.

③ Specify a different target loop with the "LC" MEWTOCOL-COM command when the target loop is changed.

2) LC Command

Basic message format



Notes :

- In the relay stations, no more than 3 link units can be installed.
- The C.C.U. (Computer Communication Unit) version should be 1.3 or higher.
- The Computer Link function is available up to a relative depth of 2.
- The Programmable Controllers at the relay stations belong to 2 loops.

Descriptions :

- Changes the target loop to which the Computer Link communication will be performed.
- Actual communication between the computer and the Programmable Controllers in the specified loop is performed using other MEWTOCOL-COM commands which follow the "LC" command. For details about the commands (such as RD or RS), see page 153, 162.
- To change the target loop, use the "LC" command as often as necessary.

7-3. MEWTOCOL-DAT (Data Transmission Protocol)

1. Outline

- **Data Transfer Function (Between Programmable Controllers and between a Programmable Controller and a Computer)**

  In the P Type (Optical) Link System, data can be transferred between Programmable Controllers and between a Programmable Controller and a Computer using send/receive instructions.

  This function is available in all the station (max. 63 stations) in a loop.

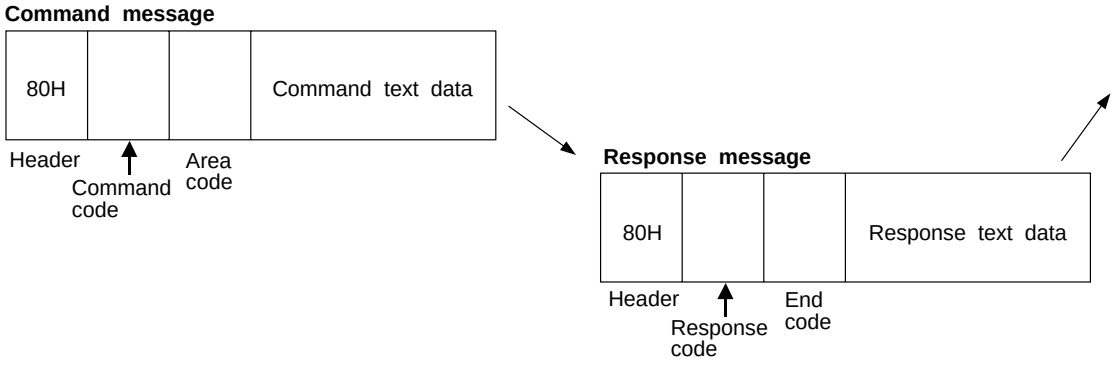
- **MEWTOCOL-DAT (Half-duplex data transmission protocol)**

  In the Data Transmission, transmission is performed using MEWTOCOL-DAT, the half-duplex data transmission protocol for the FP series of Programmable Controllers and computer. From the computer, you can read, write or monitor data stored in the memory of the Programmable Controller, such as contact data and timer values. Create communication programs so that they accommodate the format of MEWTOCOL-DAT.

Features

All the messages are transmitted as binary codes.

When a command message is sent to a Programmable Controller, the response is sent back to the computer in turn using the specified format. The initiative for data transmission is changed each time a command message is sent.



Note :

• Basic terminology of MEWTOCOL-COM

Message : A series of characters combining commands and text which are sent in one or more frames.

Command message : A message which provides to the Programmable Controller or computer. A command message can be issued with send instruction (SEND) and receive instruction (RECV).

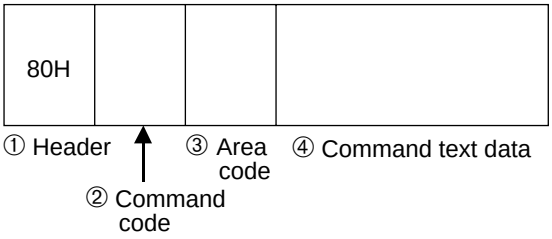
Item	Send/Receive Instruction	Command code of MEWTOCOL-DAT
Write contact data	F145 (SEND)	52
Write data area	P145 (PSEND)	50
Read contact data	F146 (RECV)	53
Read data area	P146 (PRECV)	51

Response message : A message which responds to a command.

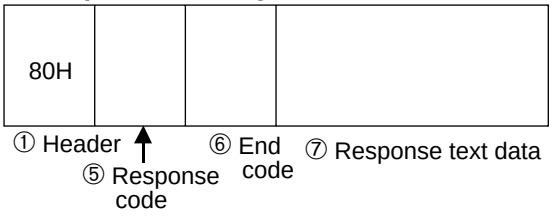
The maximum message length that the P Type (Optical) Link Unit can receive or send at one time is 118 characters which always includes a header, command code, area code and a text block.

2. Basic Message Format

■ Command message format

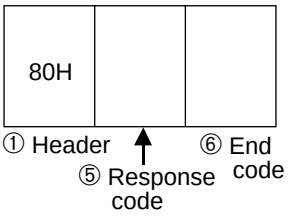


■ Response message format



■ Error response message format

When an error occurs during data transmission, the following response will be returned by a Programmable Controller.

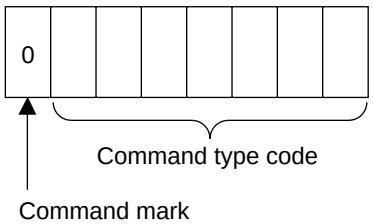


① **Header ["80H"] :**

The character "80H" is used for the header in both command and response messages.

② **Command code ["50H" to "53H"] :**

The command code format is shown below. See the list of command codes for command type code.



List of Command codes

Command code	Description
50H	Write data area
51H	Read data area
52H	Write contact data
53H	Read contact data

③ **Area code**

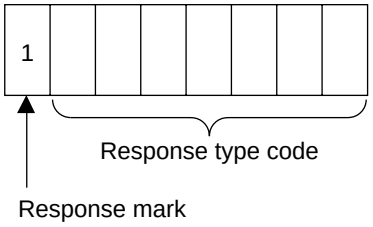
Area code	Description
00H	Word link relay (WL)
01H	Word internal relay (WR)
02H	Word external output relay (WY)
03H	Word external input relay (WX)
04H	Timer/Counter set(Preset) value (SV)
05H	Timer/Counter elapse(Count) value (EV)
06H	Link data register (LD)
07H	Word special internal relay (WR)
08H	Special data register (DT)
09H	Data register (DT)
0AH	File register (FL)

④ **Command text data**

Depending on the command, the content of text data will vary.
Information such as memory address that subjected to the data transmission, and data (if any), will be specified here.

⑤ **Response code ("D0H" to "D3H")**

The response code format is shown below. See the list of response codes for response type code.



List of Response codes

Response code	Description
D0H	Write data area
D1H	Read data area
D2H	Write contact data
D3H	Read contact data

⑥ **End code ["FFH" or except "FFH"] :**

- When normal completion : "FFH" code
- When error completion : except "FFH" code

⑦ **Response text data :**

When data must be returned in the response message, the response text data is added after the response code.

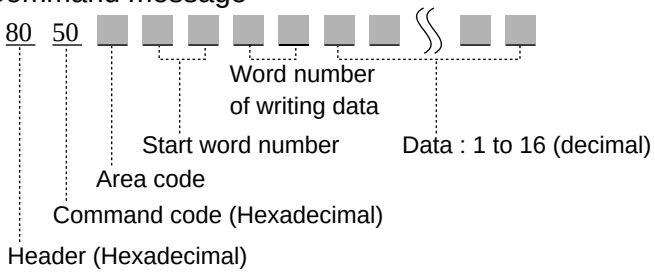
3. Command Descriptions

50H Write data area (word units)

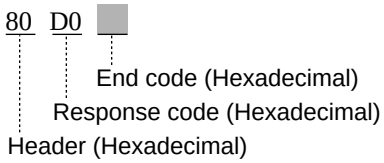
Outline Writes the specified number of data words from the specified start word number in the data area.

Basic message format

Command message



Response message



■ **List of Area codes**

Area code	Description
00H	Word link relay(WL)
01H	Word internal relay(WR)
02H	Word external output relay(WY)
03H	Word external input relay(WX)
04H	Timer/Counter set(Preset) value(SV)
05H	Timer/Counter elapse(Count) value(EV)

Area code	Description
06H	Link data register(LD)
07H	Word special internal relay(WR)
08H	Special data register(DT)
09H	Data register(DT)
0AH	File register(FL)

Program example

The data of 3 words from the Programmable Controller are written into DT0 to DT2 of specified Programmable Controller.

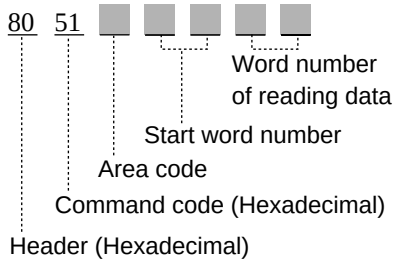
Command message	80H	50H	09H 00H 00H	03H 00H	01H 00H	02H 00H	03H 00H
			Start word "DTO"	3 words	"1"	"2"	"3"

51H Read data area (word units)

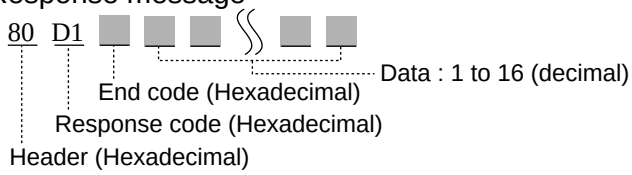
Outline Reads the specified number of data words from the specified start word number in the data area.

Basic message format

Command message



Response message



■ List of Area codes

Area code	Description
00H	Word link relay(WL)
01H	Word internal relay(WR)
02H	Word external output relay(WY)
03H	Word external input relay(WX)
04H	Timer/Counter set(Preset) value(SV)
05H	Timer/Counter elapse(Count) value(EV)

Area code	Description
06H	Link data register(LD)
07H	Word special internal relay(WR)
08H	Special data register(DT)
09H	Data register(DT)
0AH	File register(FL)

Program example

The data of 3 words are read from DT0 to DT2 of specified Programmable Controller and written to memory area of Programmable Controller.

Command message 80H 51H 09H 00H 00H 03H 00H
(Start word "DTO", 3 words)

Response message 80H D1H FFH 01H 00H 02H 00H 03H 00H
("1", "2", "3")

52H Write contact data

Outline Writes for the specified contact in the contact area

Basic message format

Command message

80 52 ■ ■ ■ ■ ■

- Contact state (OFF : 00H, ON : 01H)
- Bit number (00H to 0FH)
- Start word number
- Area code
- Command code (Hexadecimal)
- Header (Hexadecimal)

Response message

80 D2 ■

- End code (Hexadecimal)
- Response code (Hexadecimal)
- Header (Hexadecimal)

■ List of Area codes

Area code	Description
00H	Word link relay(WL)
01H	Word internal relay(WR)
02H	Word external output relay(WY)
03H	Word external input relay(WX)
04H	Timer/Counter set(Preset) value(SV)
05H	Timer/Counter elapse(Count) value(EV)

Area code	Description
06H	Link data register(LD)
07H	Word special internal relay(WR)
08H	Special data register(DT)
09H	Data register(DT)
0AH	File register(FL)

Program example

The data of Programmable Controller is written to bit number 15 to DT0 of specified Programmable Controller.

Command message 80H 52H 09H 00H 00H 0FH 01H

"DTO" ↑ Contact state : ON

Bit number : 15

53H Read contact data

Outline Reads the specified contact in the contact area.

Basic message format

Command message

80 53 ■ ■ ■ ■ 00

- Bit number (00H to 0FH)
- Start word number
- Area code
- Command code (Hexadecimal)
- Header (Hexadecimal)

Response message

80 D3 FF ■ 00

- Contact state (OFF : 00H, ON : 01H)
- End code (Hexadecimal)
- Response code (Hexadecimal)
- Header (Hexadecimal)

■ List of Area codes

Area code	Description
00H	Word link relay(WL)
01H	Word internal relay(WR)
02H	Word external output relay(WY)
03H	Word external input relay(WX)
04H	Timer/Counter set(Preset) value(SV)
05H	Timer/Counter elapse(Count) value(EV)

Area code	Description
06H	Link data register(LD)
07H	Word special internal relay(WR)
08H	Special data register(DT)
09H	Data register(DT)
0AH	File register(FL)

Program example

The data of Programmable Controller is read from the specified Programmable Controller of contact state (bit number 10 of DT0).

Command message 80H 53H 09H 00H 00H 0AH 00H

DT0 ↑ Bit number :10

Response message 80H D3H FFH 00H 00H

↑ Contact state : OFF

7-4. MEWTOCOL-COM (Communication Protocol)

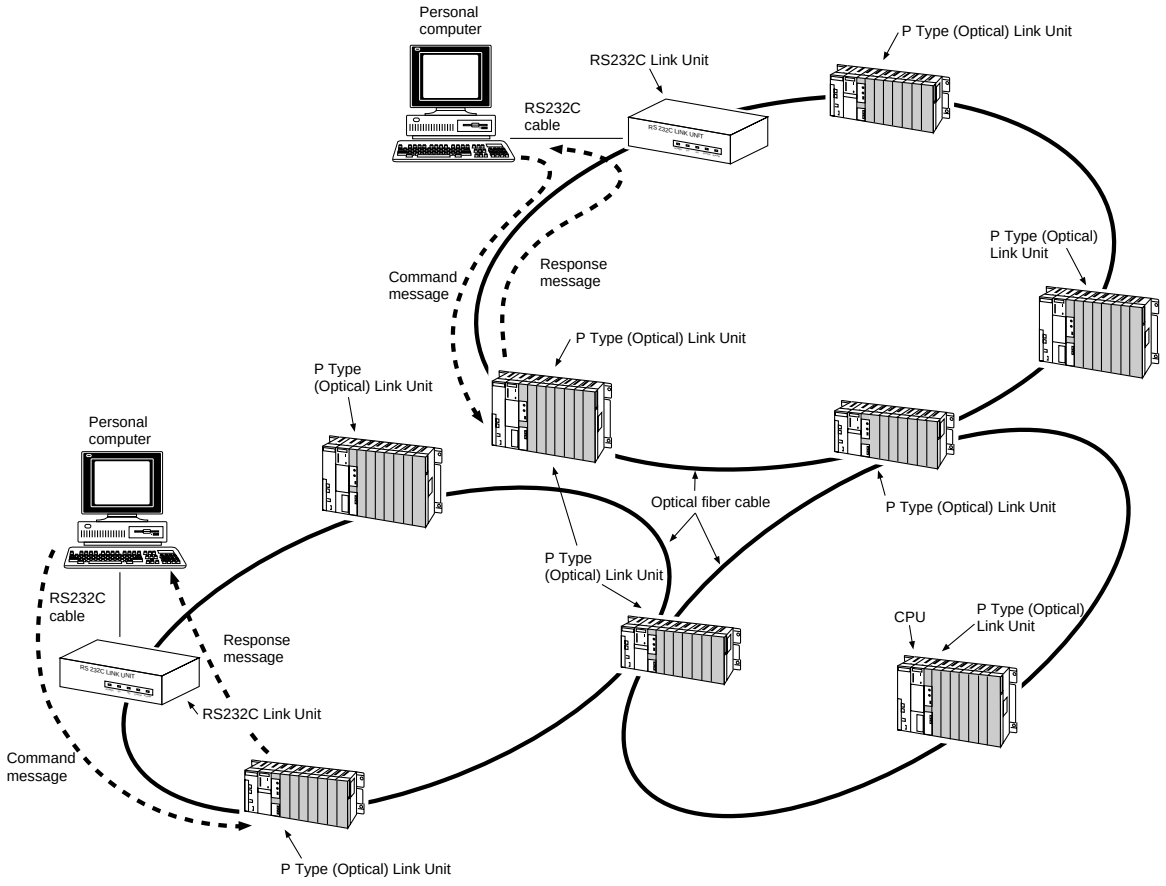
1. Computer Link Function

1) Computer Link Function [Between a computer and a P type (Optical) Link Unit]

The computer is capable of reading and writing relays and registers for the Programmable Controller using MEWTOCOL-COM.
The Computer Link Function is particularly useful in applications ranging from process monitoring to production management, because types of information, such as operation mode monitoring, production data settings, and logging functions can be transmitted.

2) MEWTOCOL-COM (Half-duplex communication protocol)

In the computer link, communication is performed using MEWTOCOL-COM, the half-duplex communication protocol for the FP series of Programmable Controllers. From the computer, you can read, write or monitor data stored in the memory of the Programmable Controller, such as contact data and timer value. Create communication programs so that they accommodate the format of MEWTOCOL-COM. You can use any program language such as BASIC or C to write the computer programs. The details of MEWTOCOL-COM are explained in the following sections.



3) Memory Configurations of the FP3/FP5

The memory area of the FP3/FP5 Programmable Controller that you can read/write/monitor from a computer are as follows :

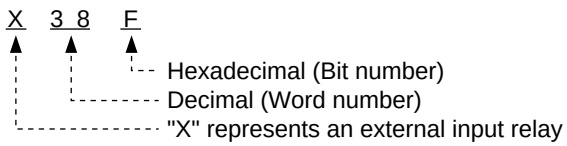
■ Operand

Type	Name of memory area	Avallable number of points /words	Numbering system
Relays	External input relay(X)	2,048points(X0 to X127F) 128words(WX0 to WX127)	Relay bit numbering system Word numbering system
	External output relay(Y)	2,048points(Y0 to Y127F) 128words(WY0 to WY127)	Relay bit numbering system Word numbering system
	Internal relay(R)	1,568points(R0 to R97F) 98words(WR0 to WR97)	Relay bit numbering system Word numbering system
	Link relay(L)	2,048points(L0 to L127F) 128words(WL0 to WL127)	Relay bit numbering system Word numbering system
Registers	Data register(DT)	2,048words(DT0 to DT2047)	Word numbering system
	File register(FL)	FP3 : 8,189words(FL0 to FL8188) FP5 : 22,525words(FL0 to FL22524)	Word numbering system
	Link data register(LD)	256words(LD0 to LD255)	Word numbering system
	Index register(IX/IY)	2words(IX & IY)	IX or IY (No numbering system)
Timers/ Counters	Timer/Counter contact(T/C)	256points(0 to 255)	Decimal numbering
	Timer/Counter Set(Preset)value(SV)	256words(SV0 to SV255)	Word numbering system
	Timer/Counter Elapse(Count)value(EV)	256words(EV0 to EV255)	Word numbering system

Note :

Explanation of basic terminology

- Bit
  One binary digit. The smallest unit of binary information.
  A bit can express a value of "1" or "0".
- Word
  A word is composed of 16 bits which are operated on simultaneously when a computer is performing an instruction. Word addresses are expressed as decimal numbers.
- Relay bit address
  Addresses for relay bits (X,Y,R and L) are expressed as a combination of a word address (decimal) and hexadecimal number designating a specific bit. The rightmost digit is hexadecimal and the rest of the digits are decimal.
  Example : X38F



■ Other memory areas

System register : Memory area for system settings used by the Programmable Controller.

Program area : Memory area where the program is stored.

2. Basic Format of MEWTOCOL-COM

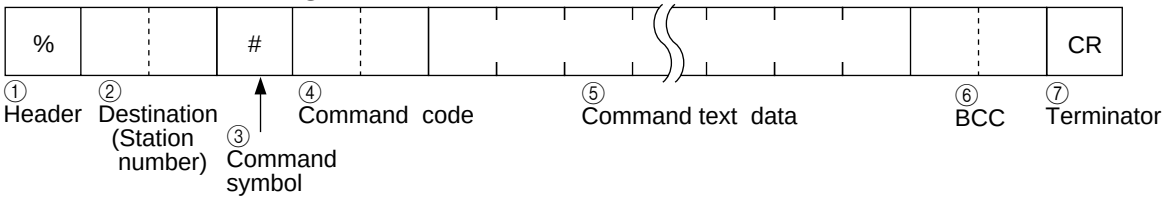
- The initiative for communication is taken by the computer. When a command is sent to a Programmable Controller, the response is sent back to the computer in turn using the specified format.
- All the messages are transmitted as ASCII codes. Therefore, all characters you send to or receive from a Programmable Controller should be converted to the ASCII HEX code. Regarding ASCII HEX code, refer to page 202, "ASCII Codes".

Note :

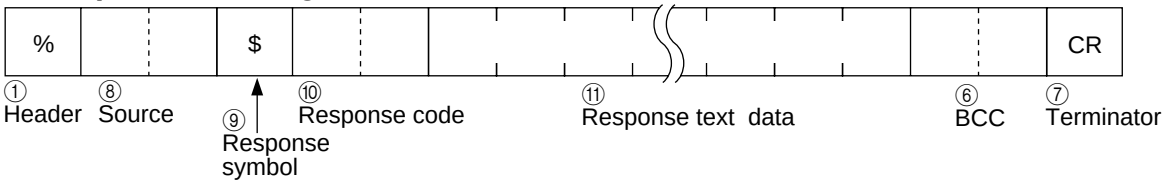
- Basic terminology of MEWTOCOL-COM
  Message : A series of characters combining commands and text which are sent in one or more frames.
  Command message : A message from the computer to the Programmable Controller.
  Response message : A message from the Programmable Controller to the computer.
  Frame : A group of not more than 118 characters which always includes a header "%", a station number (source or destination), a text block, a block check code, and a terminator.

1) Basic Message Format

■ Command message format

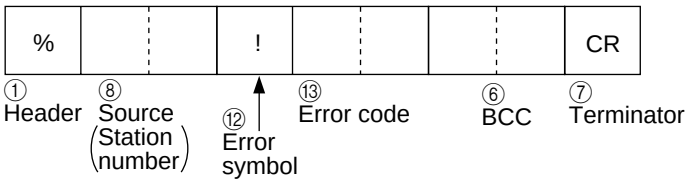


■ Response message format



■ Error response message

When an error occurrs during data transmission, the following response will be returned by a Programmable Controller.



① Header ["%" (ASCII code : 25H)]
The percent character "%" is used for the header in both command and response messages.

② Destination (Station number) ["01" through "63" (decimals) or "FF"]
The station that should read the command message is specified as 2 characters representing a decimal station number. Accordingly, the station number must be specified in the range of "01" to "63".
You also can specify it as "FF" to send the command message to all of the stations. In this case, no response message will be returned.

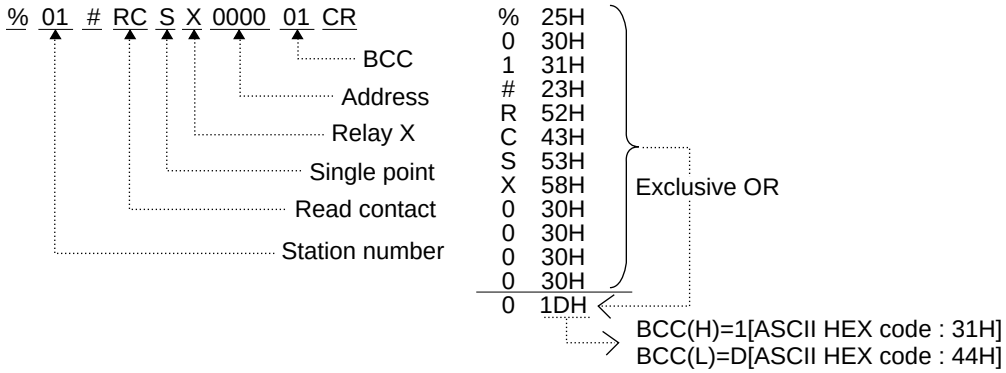
③ Command symbol ["#"(ASCII code : 23H)]
The pound sign "#" is used for the command symbol.

④ Command code [2 characters(capital letters)]
The command code is specified as 2 uppercase characters. For details of the command codes, refer to page 128, "5) List of Command/Response Codes".

⑤ Command text data
Depending on the command, the content of text data will vary.
Information such as memory address that subjected to the data transmission, and data (if any), will be specified here.

⑥ Block Check Code (BCC) [2 characters]
This code is used to detect errors in the message transmissions.
If "**" is sent from a computer as the BCC, no block check will be performed on the command message. Even if a computer sending a command message has specified that no BCC is being sent, the receiving station will insert its own BCC in the response message.
It is created by Exclusive ORing all of the codes from the header through the last text character, then translating the resulting 8-bit data into two ASCII characters.

Example :



⑦ Terminator [CR (ASCII code : 0DH)]
The carriage return "CR" is used as the terminator in both command and response messages.

⑧ Source (Station number) ["01" through "63" (decimals) or "FF"]
The station number specified in the command message as the destination will be returned as source station number.

⑨ Response symbol ["$" (ASCII code : 24H)]
The dollar sign "$" is used in the response message. This indicates that a data transmission was successfully received.

⑩ Response code [2 characters (capital letters)]
The same code as the one sent in the command message will be returned to indicate the Programmable Controller is responding to the command message.

⑪ Response text data
When data must be returned in the response message, the response text data is added after the response code.
For example, when a register read command(RD) is sent from a computer, the Programmable Controller will respond with text data.

⑫ Error symbol ["!" (ASCII code : 26H)]
The exclamation character "!" is used to identify an error message. This indicates that a data transmission error occurred.

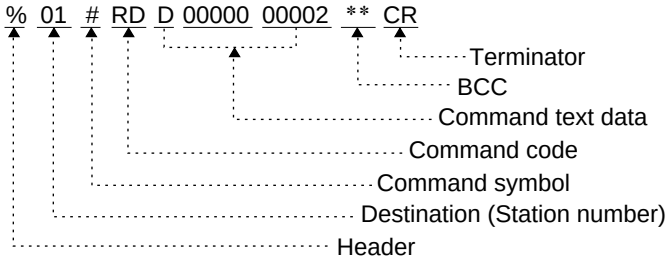
⑬ Error code[2 characters(hexadecimals)]
The error code is specified as 2-character hexadecimal number in ASCII format.
For details about MEWTOCOL-COM error codes, refer to page 130, "6) List of Error Codes".

■ Example

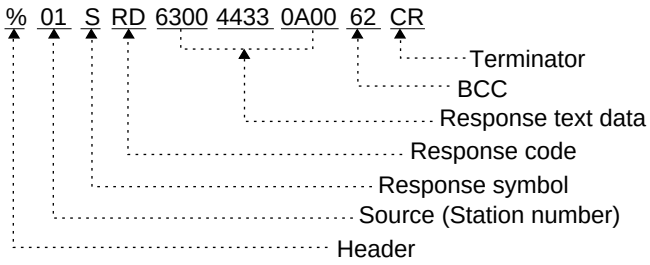
Reading data from data registers, DT0000 through DT0002 in a Programmable Controller which has assigned number is 01.

The data in the data registers are : DT0000 0063 (Hexadecimal)
DT0001 3344 (Hexadecimal)
DT0002 000A (Hexadecimal)

Command message



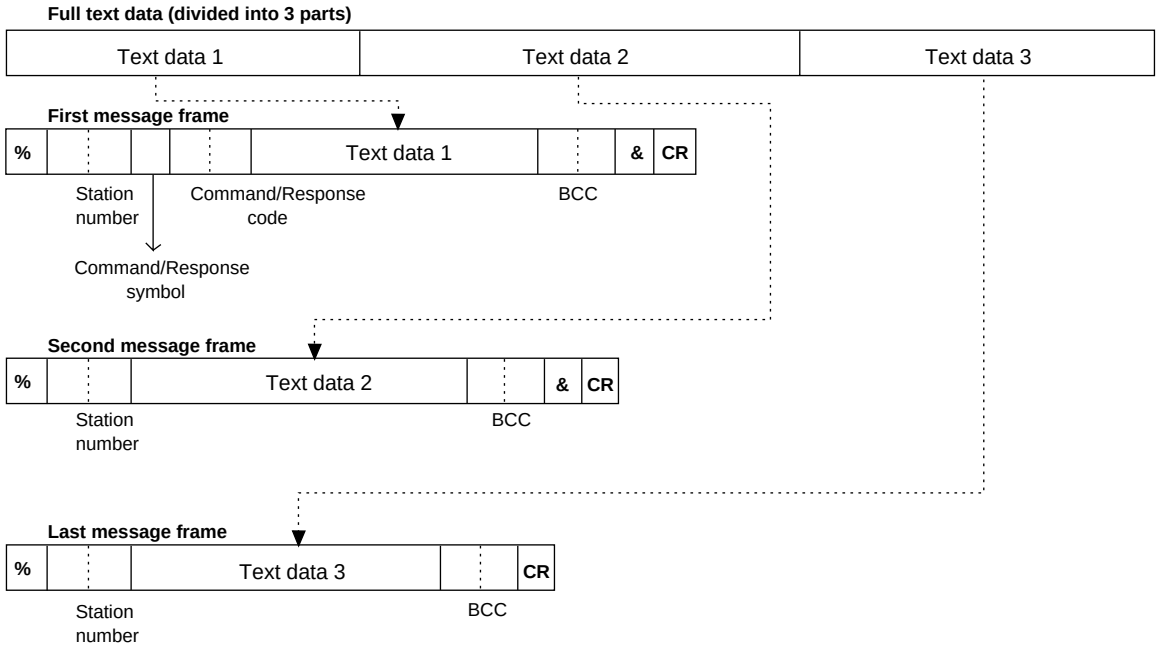
Response message



2) Multiple Frames

The maximum of message length that the FP3/FP5 P Type (Optical) Link Unit can receive or send at one time is 118 characters. If the message to be sent exceeds 118 characters, it must be divided into separate frames as shown below.

■ How to divide a message into multiple frames



The characters included in each frame are slightly different.

- 1st frame
  The delimiter character "&" is added after the BCC.
  In all other respects it is just like a single frame message.

- 2nd (and 3rd, etc) frames
  The second, third, etc. frames do not use the command or response symbols ("#", "$"), but the second frame does require the "&" character between the BCC and the terminator (CR).

- Last frame
  The last frame does not use the command or response symbols ("#", "$").
  It also does not include the "&" delimiter character. In other words, it is just like a regular message frame, without a command or response symbol.

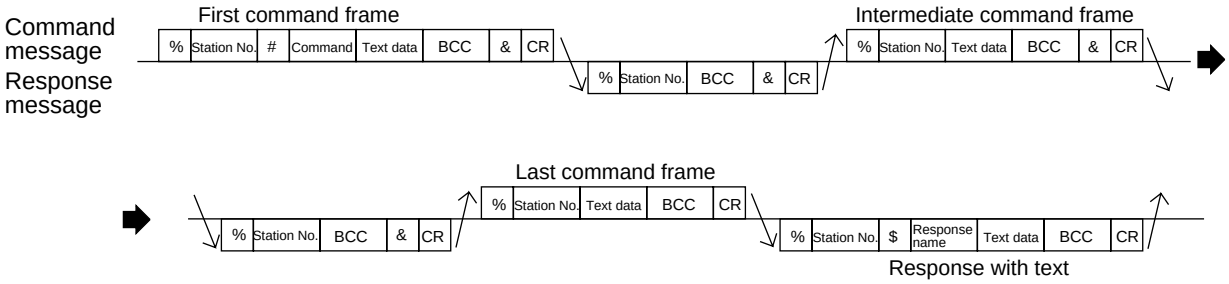
■ Data request message frame

When a Programmable Controller or a computer receives a message that contains an "&" delimiter, they must send a data request message that contains the station number, the BCC and an "&". For details, refer to the next sections.

■ Data flow using multiple frame

Using multiple frame command message

After each frame of the command message that contains an "&" delimiter is received, the Programmable Controller responds with its station number and the BCC. Then the Programmable Controller waits for the next piece of the command message.

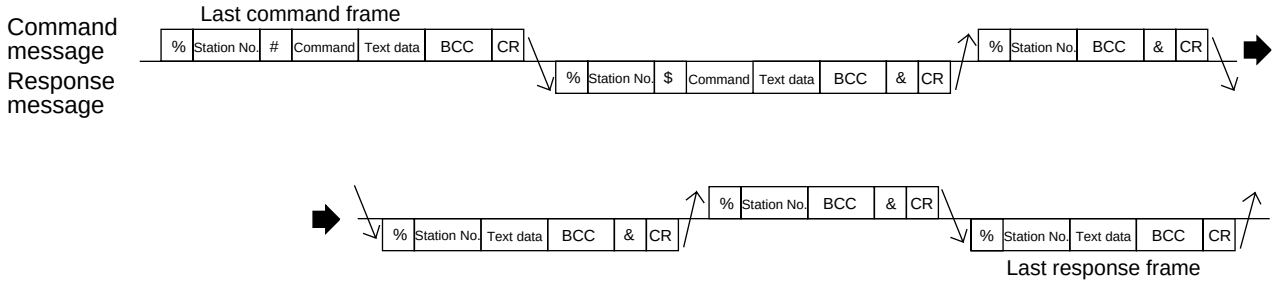


Note :

- The response message frame parentheses with text ("$" response symbol/response code/text data) are not sent back to the computer until all of the command message frames with text have been sent to the Programmable Controller.

Using a multiple frame response message

After receiving each frame of a response message that contains an "&" delimiter, the computer responds with the station number and the BCC. Then the computer waits for the next piece of the response message.



Notes :

- Command message frames without text (station number/BCC) are sent back to the Programmable Controller until all the response message frames have been received by computer.
- When a message is divided into multiple frames, the next frame can not be sent without first receiving a confirmation that the most recent frame was received correctly.
- As a message in multiple frames can not be interrupted without the abort (AB) command, it is recommended that the number of frames in one message should be limited to as small a number as possible.

3) List of Main Symbols

Symbol name	Character	ASCII code (Hexadecimal)	Description
Header	%	25	Indicates the start of a message frame.
Command symbol	#	23	Indicates a command message.
Response symbol	$	24	Indicates a normal response message frame.
Error symbol	!	21	Indicates a response message when an error has occurred.
Terminator	CR	0D	Indicates the end of a message frame.
Delimiter	&	26	Indicates more to follow when a message is sent as several frames.

4) List of Memory Area Codes in MEWTOCOL-COM

The memory area codes are specified as 1 or 2 characters (capital letters).
These codes are a little bit different from the names used in the Programmable Controller for the memory area in numbering or their specifications. Be sure to check the coincidence of each code before use.

Memory Area Name	Memory Area Code (ASCII HEX code)	Description	Applicable command
External input relay	X (58)	•This code is used when the external input relays in the memory area are specified. •In the "RC" command, this code is used also to specify the word units address of the memory.	RC MC WC* SC*
	WX (57)(58)	•This code is used only when the word external input relays are specified in the "MD" command. •In other commands, the code "X" is used to specify also word external input relays.	MD
External output relay	Y (59)	•This code is used when the external output relays in the memory area are specified. •In the "RC" , "WC" and "SC" commands, this code is used also to specify the word units address of the memory.	RC WC SC MC
	WY (57)(59)	•This code is used only when the word external output relays are specified in the "MD" command. •In other commands, the code "Y" is used to specify also word external output relays.	MD
Internal relay	R (52)	•This code is used when the internal relays in the memory area are specified. •In the "RC" , "WC" and "SC" commands, this code is used also to specify the word units address of the memory.	RC WC SC MC
	WR (57)(52)	•This code is used only when the word internal relays are specified in the "MD" command. •In other commands, the code "R" is used to specify also word internal relays.	MD
Link relay	L (4C)	•This code is used when the link relays in the memory area are specified. •In the "RC" , "WC" and "SC" commands, this code is used also to specify the word units address of the memory.	RC, WC, SC, MC
	WL (57)(4C)	•This code is used only when the word link relays are specified in the "MD" command. •In other commands, the code "L" is used to specify also word internal relays.	MD
Data register	D (44)	•This code is used when the data registers in the memory area are specified. •Its addresses are expressed as a decimal number.	RS, WD, SD, MD
File register	F (46)	•This code is used when the file registers in the memory area are specified. •Its addresses are expressed as a decimal number.	RS, WD, SD, MD
Link data register	L (4C)	•This code is used when the link data registers in the memory area are specified. •Its addresses are expressed as a decimal number.	RS, WD, SD, MD

Note :

• The commands with the "✻" mark are available only for the FP3.

Memory Area Name	Memory Area Code (ASCII HEX code)	Description	Applicable command
Index register (IX/IY)	IX (49)(58)	•This code is used when the index register IX in the memory area are specified. As each Programmable Controller has only one IX index register, the imaginary address of "0000" or "00000" is specified in the command message.	RD WD MD
	IY (49)(59)	•This code is used when the index register IY in the memory area are specified. As each Programmable Controller has only one IY index register, the imaginary address of "0000" or "00000" is specified in the command message.	RD WD MD
	ID (49)(44)	•This code is used when both X type and Y type index registers in the memory area are specified. As each Programmable Controller has only one set of index registers (IX and IY), the imaginary address of "0000" or "00000" is specified in the command message.	RD WD
Timer/Counter contact	T (54)	•This code is used when the timer contacts in the memory area are specified. As they are expressed in decimal number, be sure to check its contact address when the address should be specified in word units. •Even if you specify "T" in the counter contact area address number, no error will occur.	RC WC MC
	C (43)	•This code is used when the counter contacts in the memory area are specified. As they are expressed in decimal number, be sure to check its contact address when the address should be specified in word units. •Even if you specify "C" in the counter contact area address number, no error will occur.	RC WC MC
Timer/Counter Set (Preset) value area	S (53)	•This code is used when the timer and/or counter set (preset) value areas in the memory area are specified in the "MD" command.	MD
Timer/Counter Elapsed (Counter) value area	K (4B)	•This code is used when the timer and/or counter set (preset) value areas in the memory area are specified in the "MD" command.	MD

5) List of Command/Response Codes

The command/response codes are specified as 2 characters (capital letters).
The same code as the one sent in the command message will returned to indicate that the Programmable Controller is responding to the command message.

Command/ Response code (ASCII HEX code)	**Function**	**Available memory area**	**Memory area code in MEWTOCOL-COM**
Relay Basic Commands			
RC (52)(43)	Reads the contents stored in external input relays, external output relays, internal relays, link relays and timer or counter contacts. A computer can read a single bit of data, or an optional number of bits (1 to 8 bits) in one command message. It can also read data in units of words (one word = 16 bits).	External input relay External output relay Internal relay Timer contact Counter contact Link relay	X Y R T C L
WC (57)(43)	Writes data into external output relays, internal relays, link relays and timer or counter contacts. A computer can write a single bit of data, or an optional number of bits (1 to 8 bits) in one command message. It can also write data in units of words (one word = 16 bits).	External output relay Internal relay Timer contact Counter contact Link relay	Y R T C L X*
SC (53)(43)	Sets a data pattern in external output relays, internal relays or link relays. The data pattern is written in units of words.(one word = 16 bits)	External output relay Internal relay Link relay	Y R L X*
Register Basic Commands			
RD (52)(44)	Reads the contents stored in data registers, link data registers, file registers or index registers (IX or/and IY). As the memory area is configured as 16 bits, a piece of data will be returned as a 4-digit hexadecimal number (in ASCII format).	Data register Link data register File register Index register IX Index register IY Index register IX & IY	D L F IX IY ID
WD (57)(44)	Writes data into data registers, link data registers, file registers or index registers (IX or/and IY). As the memory area is configured as 16 bits, the data to be written into is specified as a 4-digit hexadecimal number (in ASCII format).	Data register Link data register File register Index register IX Index register IY Index register IX & IY	D L F IX IY ID
SD (53)(44)	Sets a data pattern in data registers, link data registers or file registers. As the memory area is configured as 16 bits, the data is specified as a 4-digit hexadecimal number (in ASCII format).	Data register Link data register File register	D L F
Timer/Counter Set (Preset)/Elapsed (Count) Value Commands			
RS (52)(53)	Reads the Timer/Counter Set (Preset) value stored in the Set (Preset) value area.	Set (Preset) Value area	No need to specify the memory area code.
WS (57)(53)	Writes data into the Timer/Counter Set (Preset) value area in the Programmable Controller.	Set (Preset) Value area	No need to specify the memory area code.
RK (52)(4B)	Reads the Timer/Counter Elapsed (Count) value stored in the Elapsed (Count) value area.	Elapsed (Count) Value area	No need to specify the memory area code.
WK (57)(4B)	Writes data into the Timer/Counter Elapsed (Count) value area in the Programmable Controller.	Elapsed (Count) Value area	No need to specify the memory area code.

Note :

• The memory area code with the "✻" mark are available only for the FP3.

Command/ Response code (ASCII HEX code)	**Function**	**Available memory area**	**Memory area code in MEWTOCOL-COM**
Monitor Commands			
MC (4D)(43)	Specifies the address of external input relays, external output relays, internal relays, link relays and timer or counter contacts which will be monitored. Resets the points specified by previous "MC" commands.	External input relay External output relay Internal relay Timer contact Counter contact	X Y R T C
MD (4D)(44)	Specifies the address of external input relays (word units), external output relays (word units), internal relays (word units), link relays (word units), data registers, link data registers, file registers, index registers (IX or IY) or Timer/Counter Set/Elapsed value which will be monitored. Resets the points specified by previous "MD" commands.	Data register Link data register File register Set (Preset) Value area Elapsed (Count) Value area Index register IX Index register IY Word external input relay Word external output relay Word internal relay	D L F S K IX IY WX WY WR
MG (4D)(47)	Monitors the points specified in "MC" and "MD" commands.	Specified in "MC" and "MD" commands.	No need to specify the memory area code.
System Register Commands			
RR (52)(52)	Reads the contents stored in system registers of the Programmable Controller.	System registers	No need to specify the memory area code.
WR (57)(52)	Writes data into the system registers of the Programmable Controller.	System registers	No need to specify the memory area code.
Status Command			
RT (52)(54)	Reads the status of the Programmable Controller. (Programmable Controller type, program capacity)	Status of the Programmable Controller	No need to specify the memory area code.
Program Command			
RP (52)(50)	Reads a program stored in the Programmable Controller. Use this command only for a program backup.	Program	No need to specify the memory area code.
WP (57)(50)	Writes the program saved with the "RP" command back into the Programmable Controller. Use this command only for uploading program.	Program	No need to specify the memory area code.
Remote Control Command			
RM (52)(4D)	Remotely controls the operation mode. The operation mode is remotely set to RUN or PROG. mode.	Operation mode	No need to specify the memory area code.
Control Command			
AB (41)(42)	Aborts a series of messages. Used to abort receiving a response message sent in multiple.	_____	No need to specify the memory area code.

6) List of Error Codes

The error code is expressed in 2-digit hexadecimal number in the response message.

① Link system errors

Error code Hexadecimal (Decimal)	**Content**	**Description**	**Step to take**
15H(21)	NACK error	The setting of the data communication(data bit/ parity bit/stop bit etc.) is sent to the P Type (Optical) Link Unit in different format.	Check the format of communication setting. Check the connection of the cables and environmental noise level.
16H(22)	WACK error	In one command frame, two or more headers (%) or terminators(CR) are recognized at the P Type(Optical) Link Unit.	Check the frame format of the command messages. Check the connection of the cables and environmental noise level.
17H(23)	Duplicate board error	The unit number(station number) is the same as the target unit number.	See to it that Link Unit numbers are not identical.
18H(24)	Transmission format error	The data does not match the transmission protocol format. Otherwise, a frame overflow or a data error occurred.	Check Link Unit, and see page 84, "6-1. Troubleshooting".
19H(25)	Hardware error	The hardware for transmission does not operated normally.	Check Link Unit, and see page 84, "6-1. Troubleshooting".
1AH(26)	Station number (UNIT NO.) error	The unit number (station number) is out of range(01 to 63).	Set a correct range of unit number (01 to 63).
1BH(27)	Not support error	119 or more characters are sent to the P Type (Optical) Link Unit in one command frame.	Check the number of characters in one frame.
1CH(28)	No response error	There is no available station.	Check Link Unit, and see page 84, "6-1. Troubleshooting.
1DH(29)	Buffer close error	The buffer is closed when you sent or received data.	Check Link Unit, and see page 84, "6-1". Troubleshooting".
1EH(30)	Time out error	Transmission disabled state continues.	Check the connection of the cables.

② Basic errors

Error code Hexadecimal (Decimal)	**Content**	**Description**	**Step to take**
28H(40)	BCC error	BCC error occurs.	Check the connection of the cables and environmental noise level.
29H(41)	Format error	The command message does not match the transmission protocol format.	Check the command message. (header/command code etc.)
2AH(42)	Not support error	The command message is sent to not available station. The command is not supported, etc.	Check the station number, command and numbers of data specification.
2BH(43)	Procedure error	Another series of message is sent to the Programmable Controller when a series of message in multiple frames is going.	Change a program so that another series of message is not sent to the Programmable Controller while one message in multiple frames are not completed.

③ Processing errors

Error code Hexadecimal (Decimal)	**Content**	**Description**	**Step to take**
32H(50)	No link error	The link number does not exist.	Check the link number.
33H(51)	Simultaneous operation error	Impossible to send the data to the other unit since the sending buffer is already full.	———
34H(52)	Sending disabled error	The P Type(Optical) Link Unit can not transmit to another unit.	Replace with P Type (Optical) Link Unit.
35H(53)	Busy error	Another command message is sent to the Programmable Controller through another link unit (P/W link units/C.C.U.), when a series of message is going.	Change a program so that two or more messages are sent to one Programmable Controller simultaneously.

④ Application errors in P Type (Optical) Link Unit

Error code Hexadecimal (Decimal)	**Content**	**Description**	**Step to take**
3CH(60)	Parameter error	The specified data or data area code is not available.	Check the data or data area code.
3DH(61)	Data error	The specified data or data area is not available.	Check the data or data area numbering.
3EH(62)	Registration error	The specified data or data area to be monitored or traced are not registered. The registered data or data area is beyond the limit.	Check the registration status of the data or data area to be monitored or traced.
3FH(63)	Programmable Controller mode error	The remote mode setting operation is performed when the mode set switch is not set in remote mode.	Set the mode set switch to the remote mode.
41H(65)	Protect error	"Write" command message is sent to the Programmable Controller, when the program is in protect enabled (program masked) condition.	Open the protect.
42H(66)	Address error	The specified address is not available.	Check the address.
43H(67)	No data error	There is no comment registration to be read out.	Register the comment.

⑤ Application errors in RS232C Link Unit

Error code Hexadecimal (Decimal)	**Content**	**Description**	**Step to take**
4FH(80)	Parameter error	The specified data or data area code is not available.	Check the data or data area code.
50H(81)	Data error	The specified data or data area is not available.	Check the data or data area numbering.
51H(82)	Number of data error	The specified number of data is not available.	Check the number of data.
52H(83)	Number of byte error	The specified number of byte is not available.	Check the number of byte.
53H(84)	Register number error	The specified register number is not available.	Check the register number.
54H(85)	Address error	The specified address is not available.	Check the address.
55H(86)	Protect error	"Write" command message is sent, when the program is in protect enabled (program masked) condition.	Open the protect.
56H(87)	Not support error	The command message is sent to not available station. The command is not supported, etc.	Check the station number, command and numbers of data specification.
57H(88)	Format error	The command message does not match the transmission protocol.	Check the command message. (header, command code etc.)
58H(89)	BCC error	BCC error occurs.	Check the connection of the cables and environmental noise level.
59H(90)	Full buffer error	The buffer is filled when sent or received data.	Check the Link Unit.
5AH(91)	Frame over error	The specified command frame is not available.	Check the frame format of command messages.
5BH(92)	Transmission disabled error	Transmission disabled state continues.	Check the connection of the cables.

3. Description of Commands

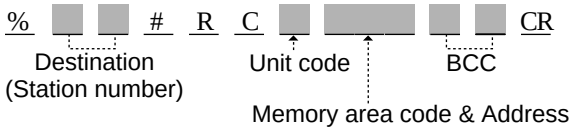
1) List of Command Code

RC Read contact (single point/plural points/word units)

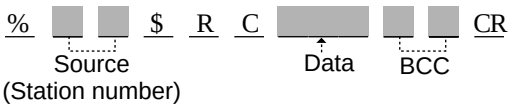
Outline Reads the contents stored in external input relays, external output relays, internal relays, link relays and timer or counter contacts.

Basic message format

Command message



Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A

A : Available
N/A : Not Available

Notes :

- The codes "X", "Y", "R" and "L" are also used to read data in one word units (1 word = 16 bits).
- Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

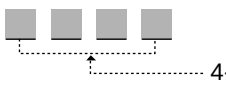
■ Unit Codes

A computer can read a single bit of data, an optional number of bits (1 to 8 bits) or in units of words (1 word = 16 bits). In order to set the data size for "RC" command, use the following unit codes.

Unit Code	Description	Address numbering system	
		X, Y, R, L	T, C
S	Specify "S" to read a single bit of data.	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
P	Specify "P" to read an optional number of bits (1 to 8 bits).	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
C	Specify "C" to read data in units of words (1 word = 16 bits).	Word numbering (4-digit)	See notes

Notes :

- You can read timer/counter contacts in units of words. However, since timer/counter contacts are not normally treated in units of words, it is recommended that you do not read them in units of words to avoid any numbering system confusion.
  When you specify the timer/counter contacts in this command, refer to the following.



Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0015	240 to 255

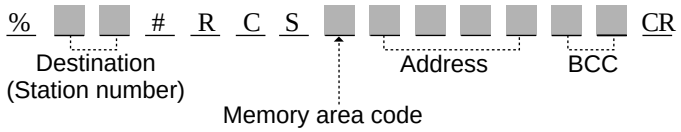
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details of numbering systems.

Description

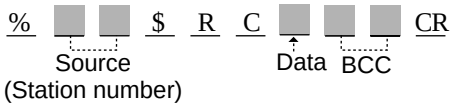
- Reads the contents stored in external input relays, external output relays, internal relays, link relays and timer or counter contacts.
  A computer can read a single bit of data, or an optional number of bits (1 to 8 bits) in one command message.
  It can also read data in units of words (1 word = 16 bits).
- Refer to following pages for detailed explanations.

■ When the unit code "S" is specified. [When you want to read a single bit of data.]

Command message



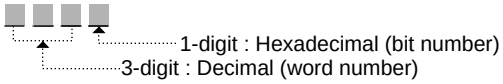
Response message



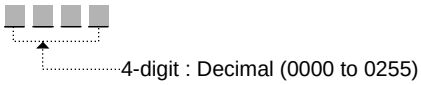
Explanation

① Memory area code : Specify the memory area code of the Programmable Controller to be read from, referring to the codes given in page 134, "■ Memory Area Codes".

② Address : The address for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows:



When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will read the contents of the address specified in the command message.

③ Data : Contact data is specified as :
0 : OFF state
1 : ON state

Program example

Command message

% 0 1 # R C S X 0 0 0 A ✻ ✻ CR

Response message

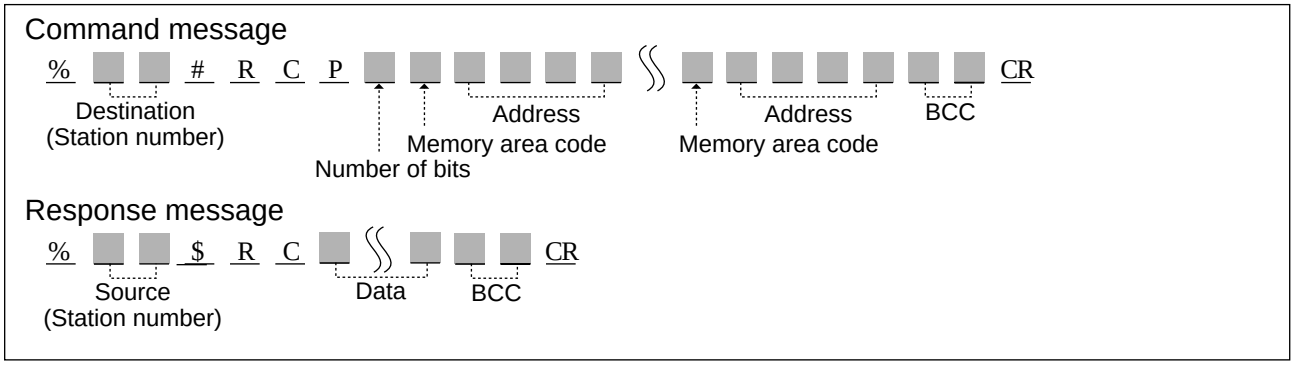
% 0 1 $ R C 0 2 1 CR

The contents of XA are read by the Programmable Controller whose station number is 01.

Command message
Destination : 01 station
Point : XA

Response message
Source : 01 station
Data : XA = 0 (OFF)

■ When the unit code "P" is specified.[To read one or more bits of data (1 to 8 bits).]



Explanation

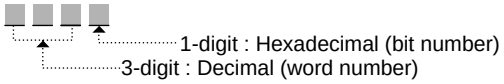
① Number of bits : When you specify "P" in the unit code, you must specify how many bits to read. Specify a number in the range of 1 to 8.

Notes :

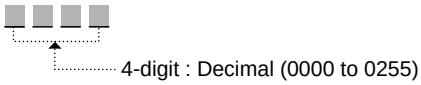
- You must specify a separate memory area code and address for each bit of data you want to access. Thus, you will have to give from 1 to 8 memory area codes and addresses depending on the number of bits you specified.
- A single bit can also be accessed with the unit code "S".

② Memory area code : Specify the memory area code for the Programmable Controller to be read from, referring to the codes given in page 134, "■ Memory Area Codes".

③ Address : The address for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows:



When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then use a counter contact address, the computer will read the contents of the address specified in the command message.

④ Data : Contact data is specified as :

0 : OFF state
1 : ON state

Program example

Command message

% 0 1 # R C P 3 X 0 0 0 A Y 0 0 1 F T 0 0 0 5 ✻ ✻ CR

Response message

% 0 1 $ R C 1 0 0 2 0 CR

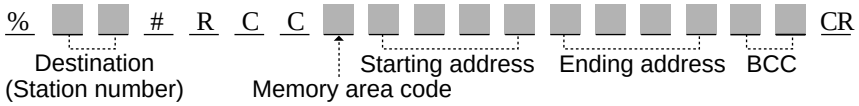
The contents of XA, Y1F and T5 will be read from the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Number of bits : 3 bits (XA, Y1F, T5)

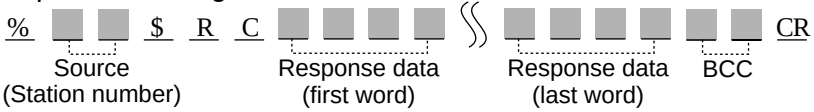
Response message
- Source : 01 station
- Data : XA = 1 (ON), Y1F = 0 (OFF), T5 = 0 (OFF)

■ When the unit code "C" is specified.[To read bit data in units of words (1 word = 16 bits).]

Command message



Response message



Explanation

① Memory area code : Specify the memory area code for the Programmable Controller to read f from, referring to the codes given in page 134, "■ Memory Area Codes".

Note:

- The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

② Starting address
& Ending address : The starting and ending word addresses for X (external input relay), Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :

You can read timer/counter contacts in units of words. However, since timer/counter contacts are not normally treated in unit of words, it is recommended that you do not read them in units of words to avoid any numbering system confusion.
When you specify the timer/counter contacts in this command, refer to the following.

Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0015	240 to 255

When you read a timer contact, specify the contact with "T" and when you read a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will read the contents of the address specified in the command message.

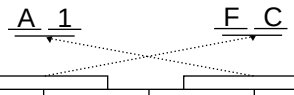
Note :

- The ending address must be equal to or larger than the starting address.

③ Response data : 4 characters are returned for each word relay address included in the command in the form shown below.
Data will be returned starting with the data stored in the starting word address specified in the command message.

Response data

4-digit (Hexadecimal)



Programmable Controller (word data)

Hexadecimal	F	C	A	1
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	1 1 1 1	1 1 0 0	1 0 1 0	0 0 0 1
		High-byte		Low-byte

Notes :

- The number of words of data that are returned is equal to the ending address minus the starting address plus one.
- The Programmable Controller stores words in low-byte, high-byte order. Thus, data returned by the Programmable Controller are in that order.

Program example

Command message

% 0 1 # R C C X 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R C 6 3 0 0 4 4 3 3 0 A 0 0 6 2 CR

The contents of external input relays[WX0 to WX2 (X0 to X2F)] will be read from the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : WX0
- Ending address : WX2
- Read out range : WX0 to WX2 (X0 to X2F)

Response message
- Source : 01 station
- Response data : 6300 (H), 4433 (H), 0A00 (H)
- Actual data in Programmable Controller : WX0 = 0063 (H), WX1 = 3344 (H), WX2 = 000A (H)

Response data: 6 3 0 0

Programmable Controller WX0

Hexadecimal	0	0	6	3
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 1 1 0	0 0 1 1

XF X0

Response data: 4 4 3 3

Programmable Controller WX1

Hexadecimal	3	3	4	4
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 1 1	0 0 1 1	0 1 0 0	0 1 0 0

X1F X10

Response data: 0 A 0 0

Programmable Controller WX2

Hexadecimal	0	0	0	A
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 0

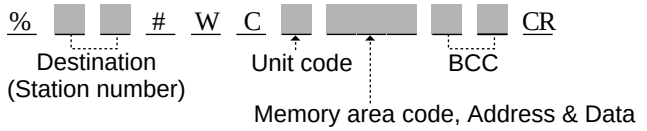
X2F X20

WC Write contact (single point/plural points/word units)

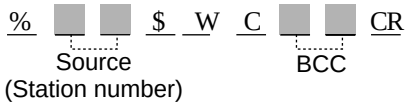
Outline Writes data into external input relays (only for the FP3), output relays, internal relays, link relays and timer or counter contacts.

Basic message format

Command message



Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A

A : Available
N/A : Not Available

Notes :

- The memory area code "X" (external input relay) can be specified only for the FP3.
- The codes "X" (only for the FP3), "Y", "R" and "L" also are used to write data in units of words (1 word = 16 bits).
- Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

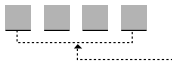
■ Unit Codes

A computer can write a single bit of data, an optional number of bits (1 to 8 bits) or in units of words (1 word = 16 bits). In order to set the data size for "WC" command, use the following unit codes.

Unit Code	Description	Address numbering system	
		X, Y, R, L	T, C
S	Specify "S" to write a single bit of data.	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
P	Specify "P" to write an optional number of bits (1 to 8 bits).	Relay bit numbering (4-digit)	Decimal numbering (4-digit)
C	Specify "C" to write data in units of words (1 word = 16 bits).	Word numbering (4-digit)	See notes

Notes :

- You can write data to timer/counter contacts in units of words. However, since timer/counter contacts are not normally treated in units of words, it is recommended that you do not write them in units of words to avoid any numbering system confusion.
  When you specify the timer/counter contacts in this command, refer to the following.



Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0015	240 to 255

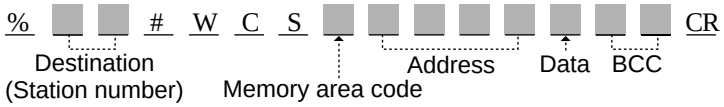
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details of numbering systems.

Description

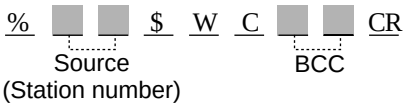
- Writes data into external input relays (only for the FP3), external output relays, internal relays, link relays and timer or counter contacts.
  A computer can write a single bit of data, or an optional number of bits (1 to 8 bits) in one command message.
  It can also write data in units of words (1 word = 16 bits).
- Refer to the following pages for detailed explanations.

■ When the unit code "S" is specified. [When you want to write a single bit of data.]

Command message



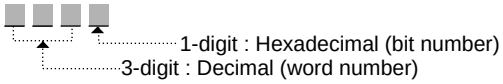
Response message



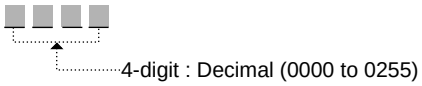
Explanation

① Memory area code : Specify the memory area code for the Programmable Controller to be written into, referring to the codes given in page 142, "■ Memory Area Codes".

② Address : The address for X [(external input relay) only for the FP3], Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows :



When you write data to a timer contact, specify the contact with "T" and when you write a data to a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will write the contents of the address specified in the command message.

③ Data : Contact data is specified as :

0 : OFF state
1 : ON state

Program example

Command message

% 0 1 # W C S Y 0 0 0 A 1 ✻ ✻ CR

Response message

% 0 1 $ W C 1 4 CR

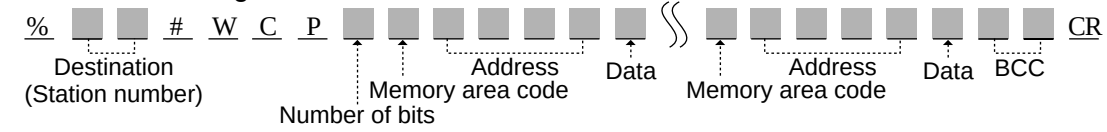
The data (1 = ON) is written to external output relay (YA) of the Programmable Controller whose station number is 01.

Command message
Destination : 01 station
Point : YA
Data written : 1 (ON)

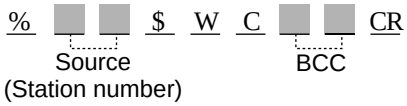
Response message
Source : 01 station

■ When the unit code "P" is specified.[To write one or more bits of data (1 to 8 bits).]

Command message



Response message



Explanation

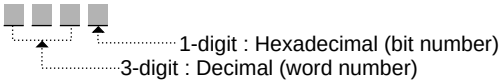
① Number of bits : When you specify "P" in the unit code, you must specify how many bits to write. Specify a number in the range of 1 to 8.

Notes :

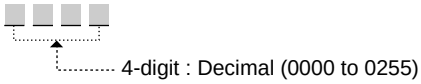
- You must specify a separate memory area code, address and data for each bit of data you want to access. Thus, you will have to give from 1 to 8 memory area codes, addresses and data depending on the number of bits you specified.
- A single bit can also be accessed with the unit code "S".

② Memory area code : Specify the memory area code for the Programmable Controller to be written into, referring to the codes given in page 142, "■ Memory Area Codes".

③ Address : The address for X [(external input relay) only for FP3], Y (external output relay), R (internal relay) and L (link relay) is expressed using a relay bit numbering system as follows :



The contact address for T (timer contact) and C (counter contact) is expressed using a decimal numbering system as follows :



When you write a data to a timer contact, specify the contact with "T" and when you write a data to a counter contact, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will write the contents of the address specified in the command message.

④ Data : Contact data is specified as :

0 : OFF state
1 : ON state

Program example

Command message

% 0 1 # W C P 3 Y 0 0 0 A 0 Y 0 0 1 F 1 T 0 0 0 5 0 ✻ ✻ CR

Response message

% 0 1 $ W C 1 4 CR

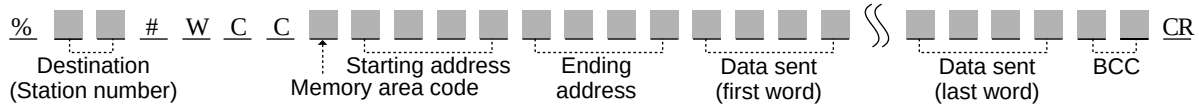
The data (0 = OFF, 1 = ON, 0 = OFF) are written to the external relays (YA and Y1F) and the timer contact (T5) of the Programmable Controller.

Command message
- Destination : 01 station
- Number of bits : 3 bits (YA, Y1F, T5)
- Data written : YA = 0 (OFF), Y1F = 1 (ON), T5 = 0 (OFF)

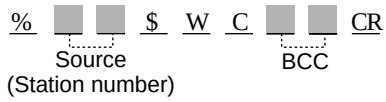
Response message
- Source : 01 station

■ When the unit code "C" is specified. [To write data in units of words (1 word = 16 bits).]

Command message



Response message



Explanation

① Memory area code : Specify the memory area code of the Programmable Controller to be written into, referring to the codes given in page 142, "■ Memory Area Codes".

Note :

The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

② Starting address

& Ending address : The starting and ending word addresses for X[(external input relay)only for FP3], Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :

You can write data to timer/counter contacts in units of words. However, since timer/counter normally contacts are not normally treated in units of words, it is recommended that you do not read them in units of words to avoid any numbering system confusion.
When you specify the timer/counter contacts in this command, refer to the following.

Setting	T/C contact number
0000	0 to 15
0001	16 to 31
⋮	⋮
0015	240 to 255

When you write data to the timer contacts, specify the contact with "T" and when you write data to the counter contacts, specify the contact with "C". However, even if you specify "C" but then use a timer contact address or if you specify "T" and then a counter contact address, the computer will write the contents of the address specified in the command message.

Note :

The ending address must be equal to or larger than the starting address.

③ Data sent : 4 characters are used to write one of word data in the form shown below.
Data will be sent to the Programmable Controller in order from the starting to the ending addresses.

Sent data

4-digit (Hexadecimal) A 1 F C

Programmable Controller (word data)

Hexadecimal	F	C	A	1
Bit position	15 · · 12	11 · · 8	7 · · 4	3 · · 0
Binary	1 1 1 1	1 1 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Notes :

- The number of words of data that are sent is equal to the ending address minus the starting address plus one.
- The Programmable Controller stores words in low-byte, high-byte order. Thus, data sent to the Programmable Controller must be in that order.

Program example

Command message

% 0 1 # W C C R 0 0 0 0 0 0 0 2 6 3 0 0 4 4 3 3 0 A 0 0 ✻ CR

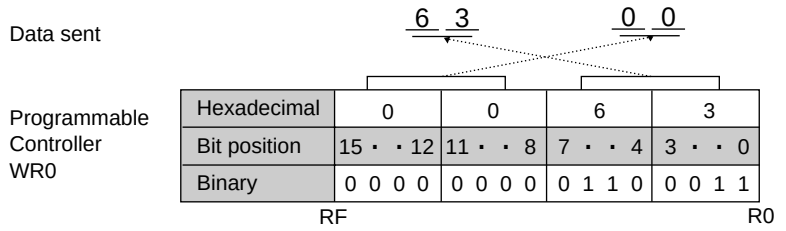
Response message

% 0 1 $ W C 1 4 CR

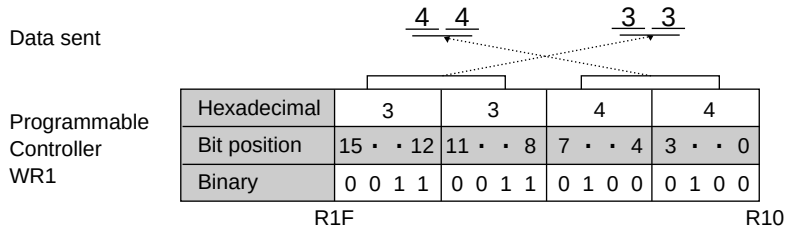
The data[6300(H), 4433(H), 0A00(H)] will be written into the address block [WR0 to WR2(R0 to R2F)].

Command message
Destination : 01 station
Starting address : WR0
Ending address : WR2
Data write block : WR0 to WR2 (R0 to R2F)
Data sent : 6300(H), 4433(H), 0A00(H)
Actual data in Programmable Controller : WR0=0063(H), WR1=3344(H), WR2=000A(H)

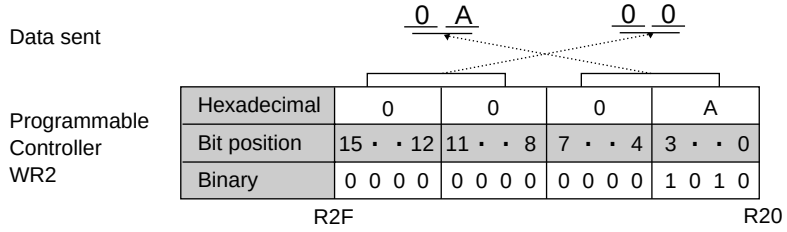
Data sent



Data sent



Data sent



Response message

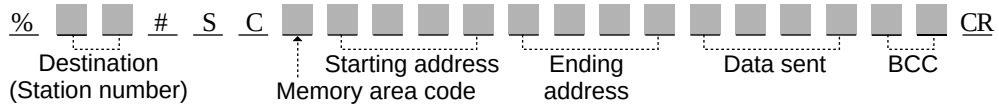
Source : 01 station

SC Set contact (word units)

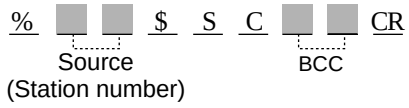
Outline Sets a data pattern (in word units) in external input relays (only for the FP3), output relays, internal relays or link relays.

Basic message format

Command message



Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes :

- The memory area code "X" (external input relay) can be specified only for the FP3.
- The codes "X" (only for the FP3), "Y", "R" and "L" are also used to write data patterns in units of words (1 word = 16 bits).
- Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

- Sets the data pattern in external input relays (only for the FP3), external output relays, internal relays or link relays.
  The data pattern is written in units of words (one word = 16 bits).

■ Memory area code

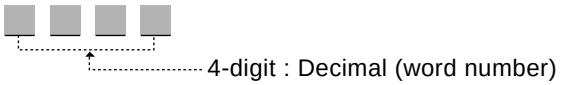
- Specify the memory area code for the Programmable Controller to be written into, referring to the codes given above in "Memory Area Codes".

Note :

- The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

■ Starting address/Ending address

• The starting and ending word addresses for X[(external input relay) only for the FP3], Y (external output relay), R (internal relay) and L (link relay) are expressed using a word numbering system as follows :

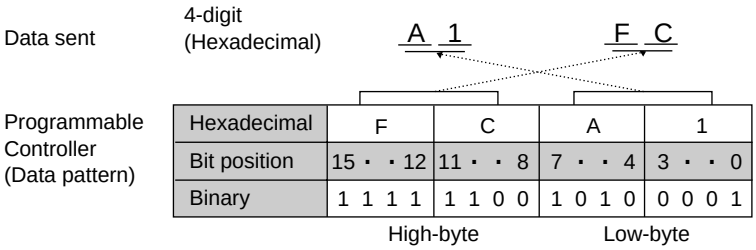


Note :

The ending address must be equal to or larger than the starting address.

■ Data set

• 4 characters are used to set a data pattern in the form shown below.
Data will be sent to the Programmable Controller in order from the starting to the ending addresses.



Note :

• The Programmable Controller stores words in low-byte, high-byte order.
Thus, data sent to the Programmable Controller must be in that order.

Program example

Command message

% 0 1 # S C Y 0 0 0 0 0 0 3 0 A B C D ✻ ✻ CR

Response message

% 0 1 $ S C 1 0 CR

The data[ABCD (H)] will be written to the address block (WY0000 to WY0030).
The command and response messages are recognized as :

Command message
- Destination : 01 station
- Starting address : WY0
- Ending address : WY30
- Data set block : WY0 to WY30 (Y0 to Y30F)
- Data sent : ABCD (H)
- Actual data in Programmable Controller : CDAB (H)

Data sent

4-digit (Hexadecimal) A B C D

Data pattern

Hexadecimal	C	D	A	B
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Programmable Controller

Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Address				
WY0000	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0001	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0002	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0003	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0004	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
・	・	・	・	・
・	・	・	・	・
・	・	・	・	・
WY0026	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0027	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0028	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0029	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
WY0030	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Response massage
- Source : 01 station

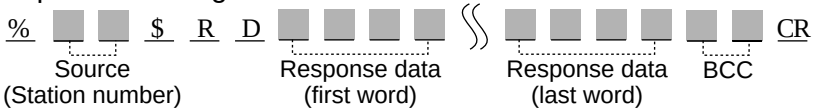
RD Read registers

Outline Reads the contents stored in data registers, link data registers, file registers or index registers.

Basic message format

Command message

Response message



■ **Memory Area Codes**

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes :

- The memory area code "ID" is used when both the "X" and the "Y" index registers.
- Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

- Reads the contents stored in data registers, link data registers, file registers, or index registers (IX or/and IY).
  Since the memory area of each register is configured as 16 bits (one word), data from a register will be returned in the form of 4-digit hexadecimal.

■ **Memory area code**

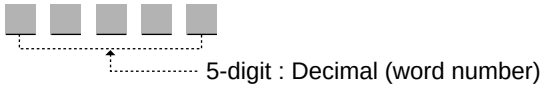
- Specify the memory area code for the Programmable Controller to be read from, referring to the codes given above in "Memory Area Codes".

Note :

- The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

■ Starting address/Ending address

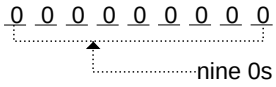
• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :



Note :

• The ending address must be equal to or larger than the starting address.

• The “IX” (index register IX), “IY” (index register IY) and “ID” (index registers IX and IY) are specified with nine 0s instead of specifying the starting and ending addresses, as the index registers do not have their own numbers with them.



■ Response data

• 4 characters are returned for each register address included in the command as shown below.
Data will be returned from the Programmable Controller starting with the starting to the ending address.

Response data — 4-digit (Hexadecimal): A 1 F C

Programmable Controller (register data)

Hexadecimal	F	C	A	1
Bit position	15 ▪ ▪ 12	11 ▪ ▪ 8	7 ▪ ▪ 4	3 ▪ ▪ 0
Binary	1 1 1 1	1 1 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Notes :

• The number of words of data that are returned is equal to the ending address minus the starting address plus one. • The Programmable Controller stores words in low-byte, high-byte order. Thus, data returned by the Programmable Controller are in that order.

Program example

Command message

% 0 1 # R D D 0 1 1 0 5 0 1 1 0 7 ✻ ✻ CR

Response message

% 0 1 $ R D 6 3 0 0 4 4 3 3 0 A 0 0 6 2 CR

• The contents of data registers (DT1105 to DT1107) will be read by the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : DT1105
- Ending address : DT1107
- Read out block : DT1105 to DT1107

Response message
- Source : 01 station
- Response data : 6300 (H), 4433 (H), 0A00 (H)
- Actual data in Programmable Controller : DT1105 = 0063 (H), DT1106 = 3344 (H), DT1107 = 000A (H)

• DT1105

Response data — 4-digit (Hexadecimal): 6 3 0 0

Programmable Controller DT1105

Hexadecimal	0	0	6	3
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 1 1 0	0 0 1 1

• DT1106

Response data — 4-digit (Hexadecimal): 4 4 3 3

Programmable Controller DT1106

Hexadecimal	3	3	4	4
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 1 1	0 0 1 1	0 1 0 0	0 1 0 0

• DT1107

Response data — 4-digit (Hexadecimal): 0 A 0 0

Programmable Controller DT1107

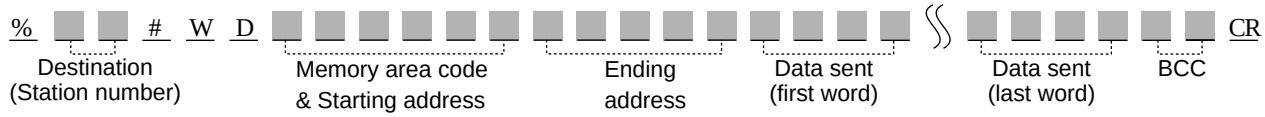
Hexadecimal	0	0	0	A
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 1 0

WD Write registers

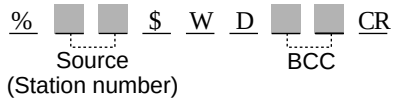
Outline Writes data into data registers, link data registers, file registers or index registers.

Basic message format

Command message



Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Notes :

- The memory area code "ID" is used when both the "X" and the "Y" index registers.
- Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

- Writes data into data registers, link data registers, file registers or index registers (IX or/and IY) of the Programmable Controller.
  Since the memory area of each register is configured as 16 bits (one word), data to a register will be written in the form of 4-digit hexadecimal.

■ Memory area code

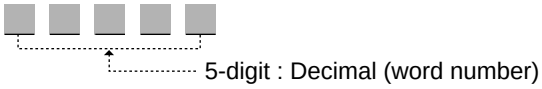
- Specify the memory area code for the Programmable Controller to be written into, referring to the codes given above in "Memory Area Codes".

Note :

- The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

■ Starting address/Ending address

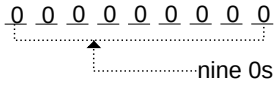
• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :



Note :

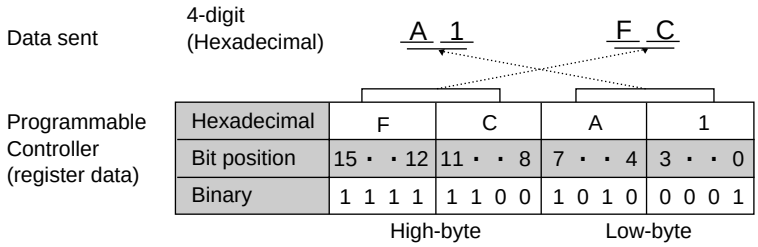
• The ending address must be equal to or larger than the starting address.

• The “IX” (index register IX), “IY” (index register IY) and “ID” (index registers IX and IY) are specified with nine 0s instead of specifying the starting and ending addresses, as the index registers do not have their own numbers with them.



■ Data sent

• 4 characters are needed for each word of data (one word per register address) as shown below. Data will be sent to the Programmable Controller in order from the starting to the ending address.



Notes :

- The number of words of data that are sent is equal to the ending address minus the starting address plus one.
- The Programmable Controller stores words in low-byte, high-byte order. Thus, data sent to the Programmable Controller must be in that order.
- When the memory area code is "ID", two words of data (8 characters) should be sent in the order IX register data, IY register data.

Program example

Command message

% 0 1 # W D D 0 0 0 0 1 0 0 0 0 3 0 5 0 0 0 7 1 5 0 0 0 9 ✻ ✻ CR

Response message

% 0 1 $ W D 1 3 CR

• The data[0500 (H), 0715 (H), 0009 (H)] will be sent to the specified registers (DT1, DT2, DT3) in the Programmable Controller.

Command message
Destination : 01 station
Starting address : DT1
Ending address : DT3
Data write block : DT1 to DT3
Data sent : 0500 (H), 0715 (H), 0009 (H)
Actual data in Programmable Controller : DT1 = 0005 (H), DT2 = 1507 (H), DT3 = 0900 (H)

Response message
Source : 01 station

Data sent: 0 5 | 0 0

Programmable Controller DT1

Hexadecimal	0	0	0	5
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent: 0 7 | 1 5

Programmable Controller DT2

Hexadecimal	1	5	0	7
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 1	0 1 0 1	0 0 0 0	0 1 1 1

Data sent: 0 0 | 0 9

Programmable Controller DT3

Hexadecimal	0	9	0	0
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	1 0 0 1	0 0 0 0	0 0 0 0

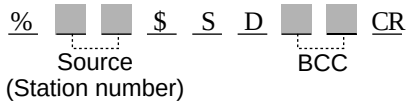
SD Set registers

Outline Sets a data pattern in data registers, link data registers or file registers.

Basic message format

Command message

Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A : Available
N/A: Not Available

Note :

• Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

• Sets a data pattern in data registers, link data registers or file registers in the Programmable Controller. Since the memory area of each register is configured as 16 bits (one word), data to a register will be written in the form of 4-digit hexadecimal.

■ Memory area code

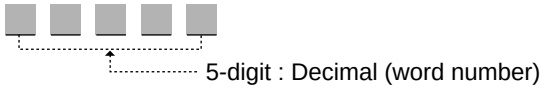
• Specify the memory area code for the Programmable Controller to be written into, referring to the codes given above in "Memory Area Codes".

Note :

• The memory area codes used in this command do not have same name as those that are used in programming the Programmable Controller.

■ Starting address/Ending address

• The starting and ending addresses for “D” (data registers), “L” (link data registers) and “F” (file registers) are expressed using a word numbering system as follows :

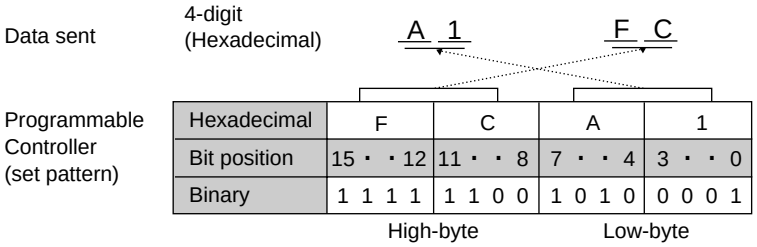


Note :

• The ending address must be equal to or larger than the starting address.

■ Data sent

• 4 characters are needed for each word of data (one word per register address) as shown below. Data will be sent to the Programmable Controller in order from the starting to the ending addresses.



Note :

• The Programmable Controller stores words in low-byte, high-byte order. Thus, data sent to the Programmable Controller must be in that order.

Program example

Command message

% 0 1 # S D L 0 0 0 0 0 0 0 0 3 0 A B C D ✻ ✻ CR

Response message

% 0 1 $ S D 1 6 CR

The data[ABCD (H)] will fill the address block (WY0000 to WY0030).

Command message
- Destination : 01 station
- Starting address : LD0
- Ending address : LD30
- Data set block : LD0 to LD30
- Data sent : ABCD (H)
- Actual data in Programmable Controller : CDAB (H)

Data sent — 4-digit (Hexadecimal): A B C D

Data pattern

Hexadecimal	C	D	A	B
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Programmable Controller

Bit position		15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Address	LD0	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD1	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD2	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD3	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD4	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	・	・	・	・	・
	・	・	・	・	・
	・	・	・	・	・
	LD26	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD27	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD28	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD29	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1
	LD30	1 1 0 0	1 1 0 1	1 0 1 0	1 0 1 1

Response message
- Source : 01 station

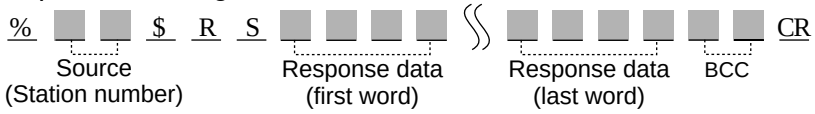
RS Read the Set (Preset) value "SV" from a Timer/Counter

Outline Reads the Timer/Counter Set (Preset) value stored in the Set value area.

Basic message format

Command message

Response message

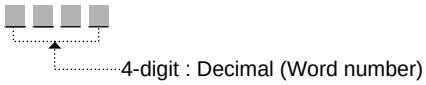


Description

- Reads the Timer/Counter Set (Preset) value stored in the Set value area.
- Since this command is dedicated to reading the Timer/Counter Set (Preset) value from the Programmable Controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for Timer/Counter Set (Preset) value are expressed using a word numbering system as follows :

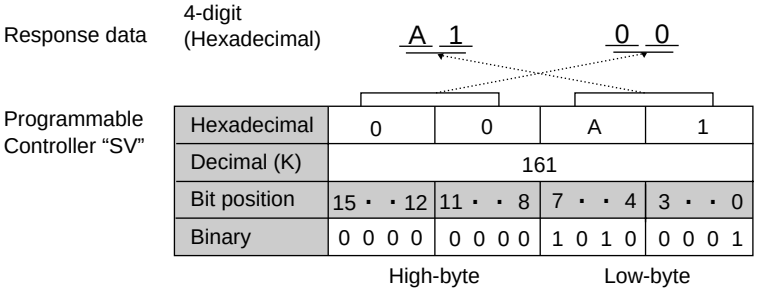


Notes :

- The ending address must be equal to or larger than the starting address.
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details.

■ Response data

- 4 characters are needed for each word of data (one word per "SV" address) as shown below. Data will be read from the Programmable Controller in order from the starting to the ending addresses.



Note :

- The Programmable Controller stores words in low-byte, high-byte order. Thus, data returned by the Programmable Controller are in that order.

Program example

Command message

% 0 1 # R S 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R S 0 5 0 0 1 4 0 0 2 8 0 0 0 B CR

• The contents of Timer/Counter Set (Preset) value area (SV0, SV1, SV2) will be returned by the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : SV0
- Ending address : SV2
- Read out block : SV0 to SV2

Response message
- Source : 01 station
- Response data : 0500 (H), 1400 (H), 2800 (H)
- Actual data in Programmable Controller : SV0 = 0005 (H)[5 (K)], SV1 = 0014 (H)[20 (K)], SV2 = 0028 (H)[40 (K)]

Response data — 4-digit (Hexadecimal): 0 5 0 0

Programmable Controller "SV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Response data — 4-digit (Hexadecimal): 1 4 0 0

Programmable Controller "SV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Response data — 4-digit (Hexadecimal): 2 8 0 0

Programmable Controller "SV2"

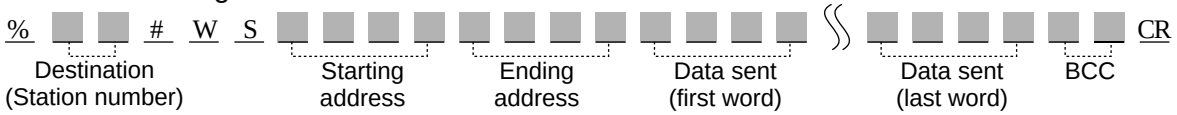
Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

WS Write a Set (Preset) value for a Timer/Counter into a Set (Preset) value area

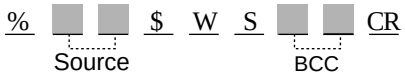
Outline Writes data into the Timer/Counter Set (Preset) value area in the Programmable Controller.

Basic message format

Command message



Response message

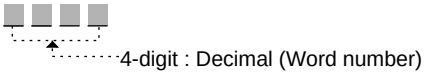


Description

- Writes the data into the specified Timer/Counter Set (Preset) value area.
- Since this command is dedicated to writing the Timer/Counter Set (Preset) value into a Set (Preset) value area of the Programmable Controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for Timer/Counter Set (Preset) value are expressed using a word numbering system as follows :

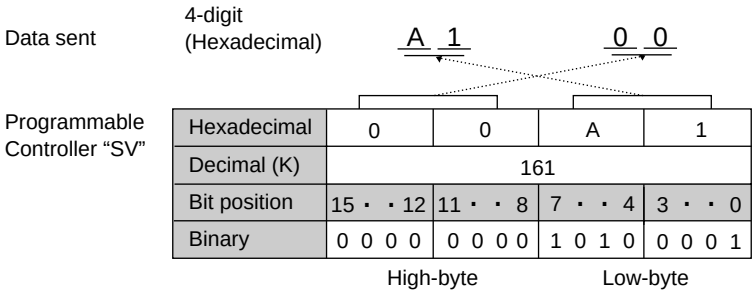


Notes :

- The ending address must be equal to or larger than the starting address.
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details.

■ Data sent

- 4 characters are needed for each word data (one word per "SV" address) as shown below. Data will be sent to the Programmable Controller in order from the starting to the ending addresses.



Note :

- The Programmable Controller stores words in low-byte, high-byte order. Thus, data sent to the Programmable Controller must be in that order.

Program example

Command message

% 0 1 # W S 0 0 0 0 0 0 0 2 0 5 0 0 1 4 0 0 2 8 0 0 ✻ ✻ CR

Response message

% 0 1 $ W S 0 4 CR

The data [0500 (H), 1400(H), 2800(H)] will be sent to the Timer/Counter Set (Preset) value areas (SV0, SV1, SV2) of the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : SV0
- Ending address : SV2
- Read out block : SV0 to SV2
- Data sent : 0500 (H), 1400 (H), 2800 (H)

Response message
- Source : 01 station
- Actual data in Programmable Controller : SV0 = 0005 (H)[5 (K)], SV1 = 0014 (H)[20 (K)], SV2 = 0028 (H)[40 (K)]

Data sent — 4-digit (Hexadecimal): 0 5 | 0 0

Programmable Controller "SV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent — 4-digit (Hexadecimal): 1 4 | 0 0

Programmable Controller "SV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data sent — 4-digit (Hexadecimal): 2 8 | 0 0

Programmable Controller "SV2"

Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

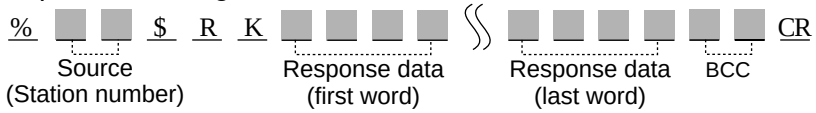
RK Read the Elapsed (Count) value "EV" from a Timer/Counter

Outline Reads the Timer/Counter Elapsed (Count) value stored in the Elapsed value area.

Basic message format

Command message

Response message

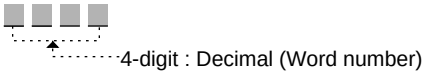


Description

- Reads the Timer/Counter Elapsed (Count) value stored in the Elapsed value area.
- Since this command is dedicated to reading the Timer/Counter Elapsed (Count) value from the Programmable Controller, a memory area code is not required.

■ Starting address/Ending address

- The starting and ending addresses for Timer/Counter Elapsed (Count) value are expressed using a word numbering system as follows :



Notes :

- The ending address must be equal to or larger than the starting address.
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details.

■ Response data

- 4 characters are needed for each word data (one word per "EV" address) as shown below. Data will be read from the Programmable Controller in order from the starting to the ending addresses.

Response data 4-digit (Hexadecimal) A 1 0 0

Programmable Controller "EV"

Hexadecimal	0	0	A	1
Decimal (K)	161			
Bit position	15 ・ ・ 12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 0 1 0	0 0 0 1
	High-byte		Low-byte	

Note :

- The Programmable Controller stores words in low-byte, high-byte order. Thus, data returned by the Programmable Controller are in that order.

Program example

Command message

% 0 1 # R K 0 0 0 0 0 0 0 2 ✻ ✻ CR

Response message

% 0 1 $ R K 0 5 0 0 1 4 0 0 2 8 0 0 1 F CR

The contents of Timer/Counter Elapsed (Count) value area (EV0, EV1, EV2) will be returned by the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : EV0
- Ending address : EV2
- Read out block : EV0 to EV2

Response message
- Source : 01 station
- Response data : 0500 (H), 1400 (H), 2800 (H)
- Actual data in Programmable Controller : EV0 = 0005 (H)[5 (K)], EV1 = 0014 (H)[20 (K)], EV2 = 0028 (H)[40(K)]

Response data — 4-digit (Hexadecimal): 0 5 0 0

Programmable Controller "EV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15・・12	11・・8	7・・4	3・・0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Response data — 4-digit (Hexadecimal): 1 4 0 0

Programmable Controller "EV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15・・12	11・・8	7・・4	3・・0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Response data — 4-digit (Hexadecimal): 2 8 0 0

Programmable Controller "EV2"

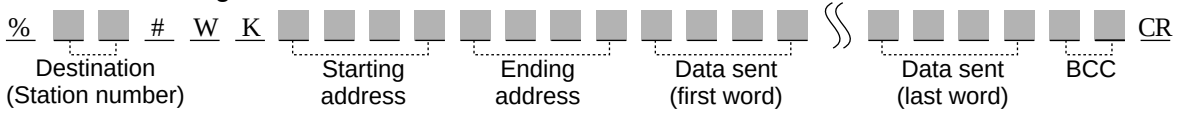
Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15・・12	11・・8	7・・4	3・・0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

WK Write an Elapsed (Count) value for a Timer/Counter into an Elapsed (Count) value area

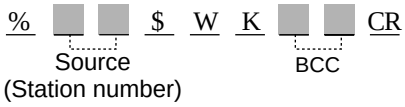
Outline Writes data into the Timer/Counter Elapsed (Count) value area in the Programmable Controller.

Basic message format

Command message



Response message



Description

- Writes data into the specified Timer/Counter Elapsed (Count) value area.
- Since this command is dedicated to writing the Timer/Counter Elapsed (Count) value into an Elapsed (Count) value area of the Programmable Controller, a memory area code is not required.

■ Starting address/Ending address

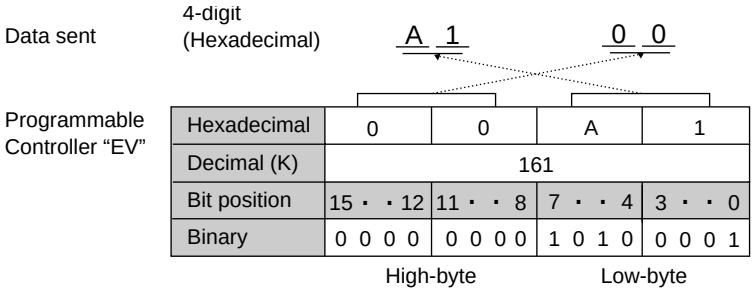
- The starting and ending addresses for Timer/Counter Elapsed (Count) value are expressed using a word numbering system as follows :

Notes :

- The ending address must be equal to or larger than the starting address.
- Refer to page 119, "3) Memory Configurations of the FP3/FP5" for details.

■ Data sent

- 4 characters are needed for each word data (one word per "EV" address) as shown below. Data will be sent to the Programmable Controller in order from the starting to the ending addresses.



Note :

- The Programmable Controller stores words in low-byte, high-byte order. Thus, data sent to the Programmable Controller must be in that order.

Program example

Command message

% 0 1 # W K 0 0 0 0 0 0 0 2 0 5 0 0 1 4 0 0 2 8 0 0 ✻ ✻ CR

Response message

% 0 1 $ W K 1 A CR

The data [0500 (H), 1400(H), 2800(H)] will be sent to the Timer/Counter Set (Preset) value areas (EV0, EV1, EV2) of the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting address : EV0
- Ending address : EV2
- Read out block : EV0 to EV2
- Data sent : 0500 (H), 1400 (H), 2800 (H)

Response message
- Source : 01 station
- Actual data in Programmable Controller : EV0 = 0005 (H)[5 (K)], EV1 = 0014 (H)[20 (K)], EV2 = 0028 (H)[40(K)]

Data sent — 4-digit (Hexadecimal): 0 5 0 0

Programmable Controller "EV0"

Hexadecimal	0	0	0	5
Decimal (K)	5			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	0 1 0 1

Data sent — 4-digit (Hexadecimal): 1 4 0 0

Programmable Controller "EV1"

Hexadecimal	0	0	1	4
Decimal (K)	20			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 1	0 1 0 0

Data sent — 4-digit (Hexadecimal): 2 8 0 0

Programmable Controller "EV2"

Hexadecimal	0	0	2	8
Decimal (K)	40			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 0	1 0 0 0

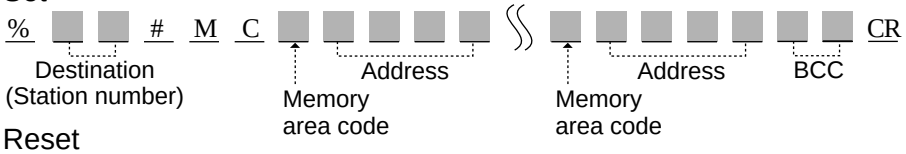
MC Specify contact addresses to be monitored Reset contact addresses that are being monitored

Outline Specifies the addresses of external input relays, external output relays, internal relays, link relays and timer or counter contacts.
Resets the points specified by previous "MC" commands.

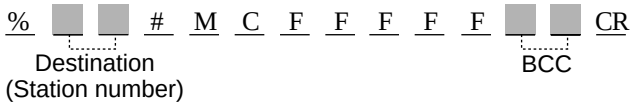
Basic message format

Command message

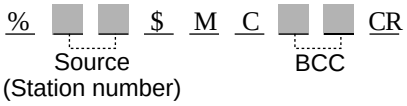
Set



Reset



Response message



■ Memory Area Codes

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
A	N/A	A	N/A	A	N/A	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	A	N/A	N/A

A : Available
N/A : Not Available

Note :

• Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

• Specifies addresses of external input relays, external output relays, internal relays, link relays and timer or counter contacts to be monitored, or it resets the points previously specified by an "MC" command.

Notes :

• A maximum of 20 contacts can be specified in one command message.
• A maximum of 80 points can be specified for one station.

• The points specified in an "MC" command are monitored by executing an "MG" command.

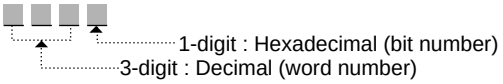
■ When specifying the contacts to be monitored

① Memory area code : Specify the memory area code for the Programmable Controller contacts to be monitored, referring to the codes given page 170, "■ Memory Area Codes".

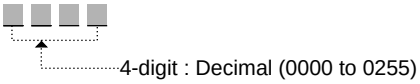
Notes :

- You can specify several different memory areas in one command message.
- When you want to specify plural points, you should specify each point with a combination of memory area codes and addresses.
- When you reset the points specified by "MC" commands, memory area codes are not required.

② Address setting : The addresses for “X” (external input relay), “Y” (external output relay), “R” (internal relay) and “L” (link relay) are expressed using relay bit numbering system as follows :



The contact address for “T” (timer contact) and “C” (counter contact) are expressed using a decimal numbering system as follows :



When you specify a timer contact, specify the contact with “T” and when you specify a counter contact, specify the contact with “C”. However, even if you specify “C” but then use a timer contact address or if you specify “T” and then a counter contact address, the computer will read the contents of the address specified in the command message.

Program example

Command message

% 0 1 # M C X 0 0 0 0 Y 0 0 1 A T 0 0 0 2 ✻ ✻ CR

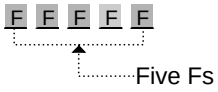
Response message

% 0 1 $ M C 0 E CR

The points to be monitored (X0, Y1A, T2) will be specified.

■ To reset the points specified by a previous "MC" command

- To reset the points specified by a previous "MC" command, five "F"s are used in place of a memory area code and address as follows :



Program example

Command message

% 0 1 # M C F F F F F ✻ ✻ CR

Response message

% 0 1 $ M C 0 E CR

All points specified using the "MC" command will be cancelled.

MD Specify registers, relays (word units) or Timer/Counter Set/Elapsed values to be monitored

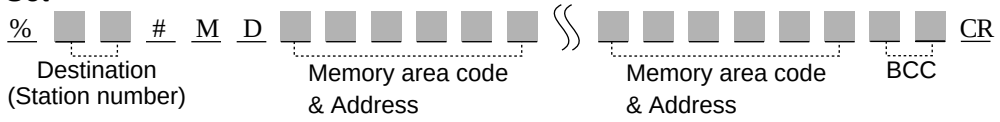
Reset the registers, relays (word units) or Timer/Counter Set/Elapsed values to be monitored

Outline Specifies the addresses of external input relays (word units), external output relays (word units), internal relays (word units), link relays (word units), data registers, link data registers, file registers, index registers (IX or IY) or Timer/Counter Set/Elapsed value which will be monitored.
Resets the points specified by previous "MD" commands.

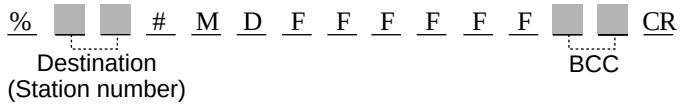
Basic message format

Command message

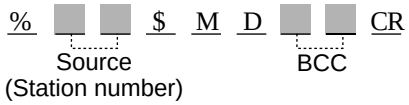
Set



Reset



Response message



■ **Memory Area Codes**

Relay								Register			Index register			Timer/Counter			
X	WX	Y	WY	R	WR	L	WL	D	L	F	IX	IY	ID	T	C	S	K
N/A	A	N/A	A	N/A	A	N/A	A	A	A	A	A	A	N/A	N/A	N/A	A	A

A : Available
N/A : Not Available

Note :

• Refer to page 126, "4) List of Memory Area Codes in MEWTOCOL-COM" for details.

Description

• Specifies the addresses of external input relays (word units), external output relays (word units), internal relays (word units), link relays (word units), data registers, link data registers, file registers or Timer/Counter Set/Elapsed value to be monitored, or it resets the points specified by a previous "MD" command.

Notes :

• A maximum of 16 registers can be specified in one command message.
• A maximum of 16 points can be specified for one station.

• The points specified in an "MD" command are monitored by executing an "MG" command.

■ When specifying the points to be monitored

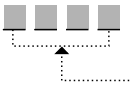
① Memory area code : Specify the memory area code of the Programmable Controller to be monitored, referring to the codes given page 173, "■ Memory Area Codes".

Notes :

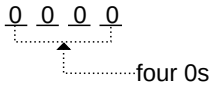
- You can specify several different memory area codes in one command message.
- When you want to specify plural points, you should specify each point with a combination of memory area codes and addresses.
- When you reset the points specified by "MD" commands, memory area codes are not required.

② Address setting : The addresses for "D" (data registers), "L" (link data registers), "F" (file registers), "S" (Timer/Counter Set value) and "E" (Timer/Counter Elapsed value) are expressed using a 5-digit word numbering system as follows :

The addresses for "WX" (word external input relays) and "WY" (word external output relays), "WR" (word internal relays) and "WL" (word link relays) are expressed using a 4-digit word numbering system as follows :



The "IX" (X type index registers) and the "IY" (Y type index registers) are specified using four 0s instead of specifying an address since the index registers do not have their multiple addresses.



Program example

Command message

% 0 1 # M D W X 0 0 0 0 D 0 0 0 1 0 S 0 0 0 0 2 ✻ ✻ CR

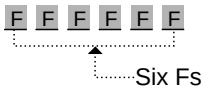
Response message

% 0 1 $ M D 0 9 CR

The points to be monitored [WX0 (X0 to XF), DT10, SV2] will be specified.

■ To reset the points specified by a previous "MD" command

- To reset the points specified by a previous "MD" command, six "F"s are used in place of a memory area code and address as follows :



Program example

Command message

% 0 1 # M D F F F F F F ✻ ✻ CR

Response message

% 0 1 $ M D 0 9 CR

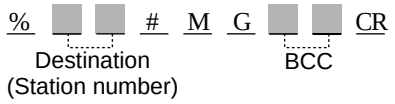
All points specified using the "MD" command will be cancelled.

MG Monitor the points specified in "MC" and "MD" commands

Outline Monitor the points specified in “MC” and “MD” commands.

Basic message format

Command message



Response message

Description • The contacts and registers preset with the "MC" and "MD" commands are monitored.

■ Pace counter

• The number of scans executed since last "MG" response message is returned.
If 1 to 9 scans, a one digit number (1 to 9) is returned.
If 10 scans or more, the character "A" is returned.

■ Number of characters for "MC" data

• The total number of characters of data required to return information about each of the points specified in the "MC" command will be expressed as 2-digit hexadecimal number [00 (H) to 14 (H)].

Note :

• Since a maximum of 80 points can be specified and 8 points are expressed using a 2-digit hexadecimal number, a maximum of 20[14 (H)] characters will be used to return this information.

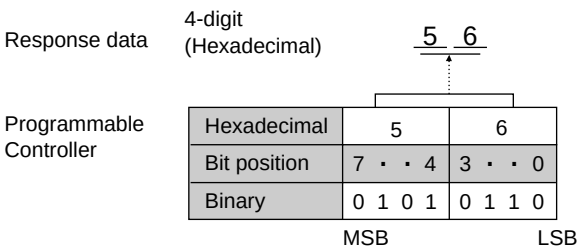
■ "MC" data

• 8 bits of data will be returned as a 2-digit hexadecimal number using 2 characters as shown below.

Response data (Hex)	Binary	Specification
Lower digit	0th LSB	Status of the 1st set bit
	1st	Status of the 2nd set bit
	2nd	Status of the 3rd set bit
	3rd	Status of the 4th set bit
Upper digit	4th	Status of the 5th set bit
	5th	Status of the 6th set bit
	6th	Status of the 7th set bit
	7th MSB	Status of the 8th set bit

0 = OFF
1 = ON

Example : Response data : “56”



■ Number of characters for "MD" data

• The total number of characters of data required to return information about each of the points specified in the "MD" command will be expressed as a 2-digit hexadecimal number [00 (H) to 40 (H)].

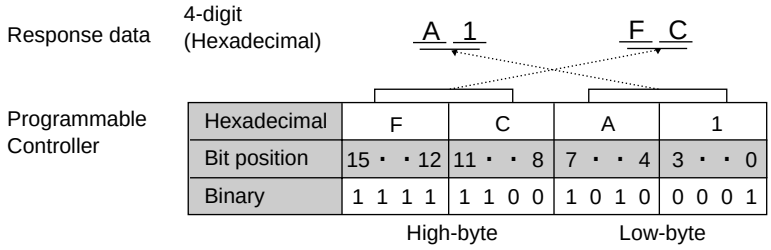
Note :

• Since a maximum of 16 points can be specified and each point is expressed using a 4-digit hexadecimal number, a maximum of 64[40 (H)] characters will be used to return this information.

■ "MD" data

• Each data will be returned as hexadecimal number using 4 characters as shown below.

Example : Response data : “A1FC”

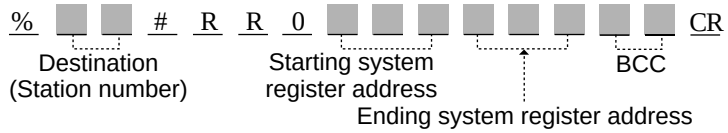


RR Read the contents of the system registers

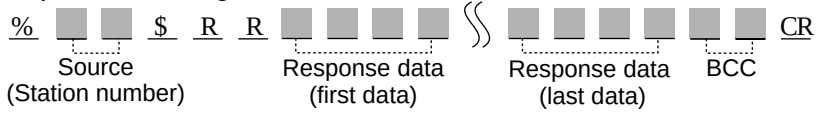
Outline Reads the contents stored in the system registers of the Programmable Controller.

Basic message format

Command message



Response message

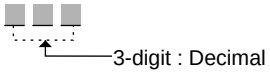


Description

- The contents of the system registers in the Programmable Controller are returned.
- "0" must be always placed between the command code and the starting system register number.

■ Starting/Ending system register addresses

- The starting and ending system register addresses are expressed using a form as shown below :

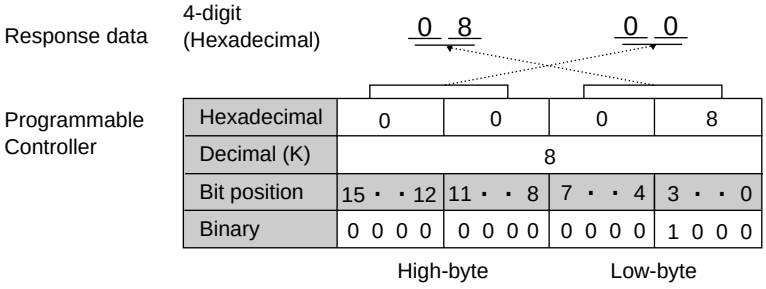


Note :

The ending system register address must be equal to or larger than the starting system register address.

■ Response data

- 4 characters are needed for each system register data (one word per system register address) as shown below.
  Data will be returned from the Programmable Controller in order from the starting to the ending system register addresses.



Note :

Refer to page 198, "7-6. Table of FP3/FP5 System Registers", for detailed information of the system registers.

Program example

Command message

% 0 1 # R R 0 0 0 5 0 0 7 ✻ ✻ CR

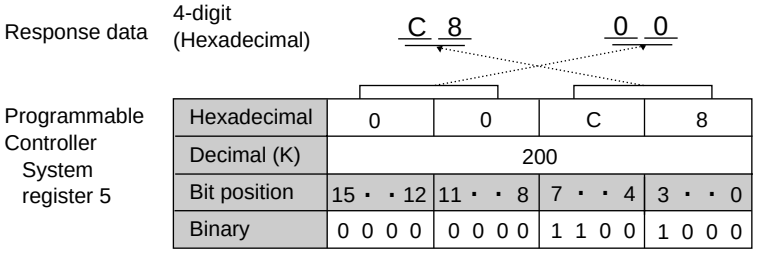
Response message

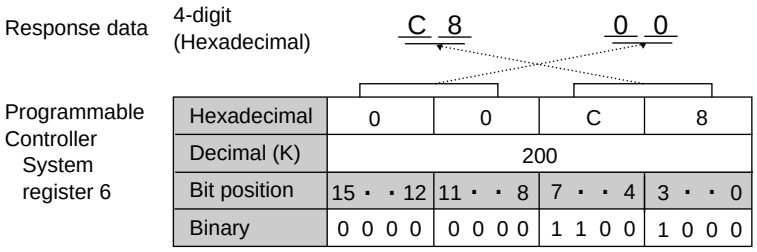
% 0 1 $ R R C 8 0 0 C 8 0 0 3 C 0 0 7 0 CR

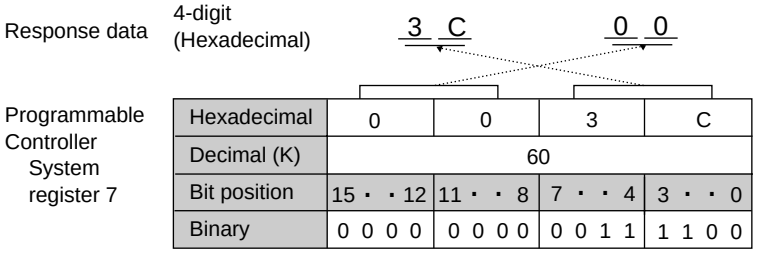
The contents of system registers (numbers 5 to 7) will be returned by the Programmable Controller whose station number is 01.

Command message
- Destination : 01 station
- Starting number : System register 5
- Ending number : System register 7

Response message
- Source : 01 station
- Response data : C800 (H), C800 (H), 3C00 (H)
- Actual data in Programmable Controller : System register 5 = 00C8 (H), System register 6 = 00C8 (H), System register 7 = 003C (H)





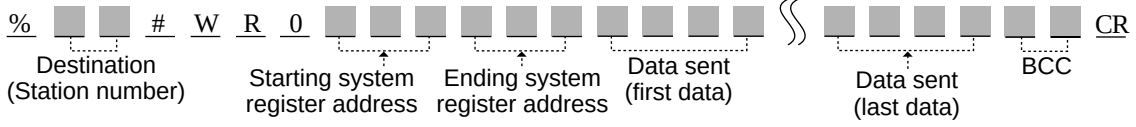


WR Write data into the system registers

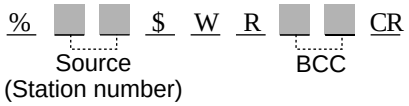
Outline Writes data into the system registers of the Programmable Controller.

Basic message format

Command message



Response message

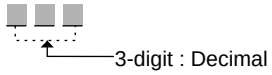


Description

- Data is written into the system registers of the Programmable Controller.
- "0" must be always placed between the command code and the starting system register address.

■ Starting/Ending system register addresses

- The starting and ending system register addresses are expressed using a form as shown below :



Note :

The ending system register address must be equal to or larger than the starting system register address.

■ Data sent

- 4 characters are needed for each system register data (one word per system register address) as shown below.
  Data will be sent to the Programmable Controller in order from the starting to the ending system register addresses.

Data sent — 4-digit (Hexadecimal): 0 8 0 0

Programmable Controller

Hexadecimal	0	0	0	8
Decimal (K)	8			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 0 0	1 0 0 0
	High-byte		Low-byte	

Note :

Refer to page 198, "7-6. Table of FP3/FP5 System Registers", for detailed information of the system registers.

Program example

Command message

% 0 1 # W R 0 0 0 5 0 0 7 C 8 0 0 C 8 0 0 3 C 0 0 ✻ ✻ CR

Response message

% 0 1 $ W R 0 5 CR

The data are written into the system registers (numbers 5 to 7) of the Programmable Controller whose station number is 01.

Command message

Destination	:	01 station
Starting number	:	System register 5
Ending number	:	System register 7
Data sent	:	C800 (H), C800 (H), 3C00 (H)
Actual data in Programmable Controller	:	System register 5 = 00C8 (H), System register 6 = 00C8 (H), System register 7 = 003C (H)

Data sent — 4-digit (Hexadecimal): C 8 | 0 0

Programmable Controller System register 5

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Response sent — 4-digit (Hexadecimal): C 8 | 0 0

Programmable Controller System register 6

Hexadecimal	0	0	C	8
Decimal (K)	200			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	1 1 0 0	1 0 0 0

Response data — 4-digit (Hexadecimal): 3 C | 0 0

Programmable Controller System register 7

Hexadecimal	0	0	3	C
Decimal (K)	60			
Bit position	15 ・ ・12	11 ・ ・ 8	7 ・ ・ 4	3 ・ ・ 0
Binary	0 0 0 0	0 0 0 0	0 0 1 1	1 1 0 0

Response message

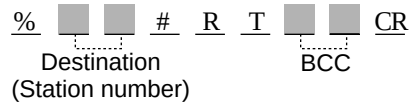
Source	:	01 station

RT Read the status of the Programmable Controller

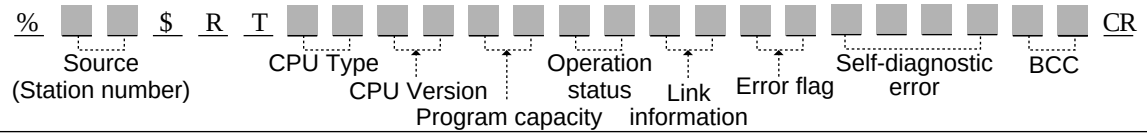
Outline Reads the status of the Programmable Controller.

Basic message format

Command message



Response message



Description

- Reads the status of the Programmable Controller.
- The type of Programmable Controller, program capacity, operation mode and error flag status can be read with "RT" command.

■ CPU Type

- The type of CPU which is controlling the C-NET Link Unit, whose station number is specified in the command message, will be returned using 2 characters as shown below :

Code	Specification
03	FP3 type CPU (10 k program capacity type)
13	FP3/FP5 type CPU (16 k program capacity type)

■ CPU version

- The version of the CPU which is controlling the C-NET Link Unit, whose station number is specified in the command message, will be returned using 2 characters as shown below :

Code	Specification
10	Version 1.0
11	Version 1.1
12	Version 1.2
•	•
•	•
35	Version 3.5
•	•
•	•

■ Program capacity

• The program capacity will be returned using 2 characters as shown below :

Capacity code	Program capacity setting	Actual program capacity (steps)
02	2k	1534
04	4k	3582
06	6k	5630
08	8k	7678
10	10k	9726
12	12k	11774
14	14k	13822
16	16k	15870

Notes :

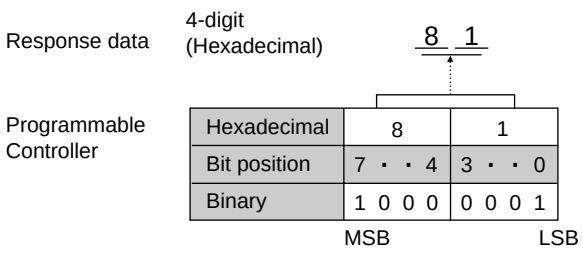
• Program capacity is set in the even numbers.
• The actual program capacity can be calculated as :
1024 × (Setting number) - 512 - 2

■ Operation status

• The operation status is expressed as a 2-digit hexadecimal number.
The contents of the operation status are the same as the data in the special relays (R9020 to R9027).
• How to look up the operation status

Response data (Hex)	Bit position	Specification	Content
Lower digit	0th LSB	Operation mode setting flag (R9020)	0 : In PROG. mode 1 : In RUN mode
	1st	Test run mode condition flag (R9021)	0 : Not in TEST RUN mode 1 : In TEST RUN mode
	2nd	Break execution flag (R9022)	0 : Break not executing 1 : Break executing
	3rd	Break condition flag (R9023)	0 : Break is in invalid condition 1 : Break is valid in TEST RUN mode
Upper digit	4th	Output enable/disable condition flag in the TEST RUN mode (R9024)	0 : Output disabled 1 : Output enabled in TEST RUN mode
	5th	Step run condition flag (R9025)	0 : Not in step run mode 1 : In step run mode
	6th	Message instruction [F149 (MSG) /P149 (PMSG)] flag (R9026)	0 : Message instruction not executing 1 : Message instruction executing
	7th MSB	Remote mode set flag (R9027)	0 : Not in REMOTE mode 1 : In REMOTE mode

Example : Response data : “81”



■ Link information

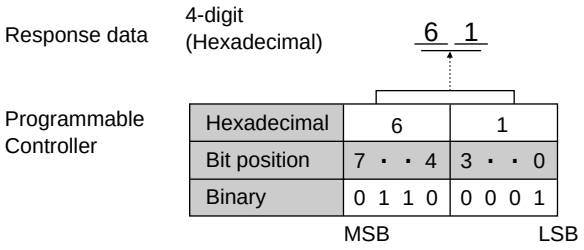
• Link information is returned using 2 characters. However, as this information is meaningless for reading the status of the Programmable Controller, ignore this information.

■ Error flags (R9000 to R9007)

• The status of 8 error flags will be returned using 2 characters.
• How to look up the status of the error flags

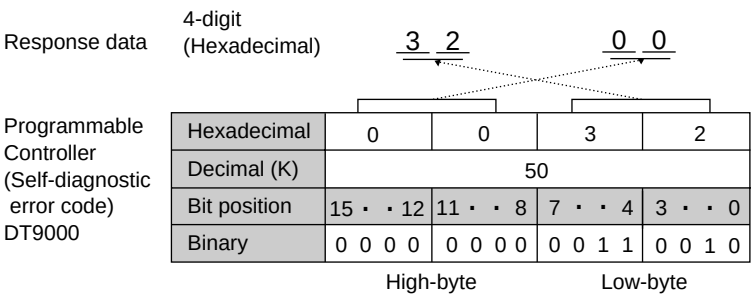
Response data (Hex)	Bit position	Specification	Content
Lower digit	0th LSB	Self-diagnostic error flag (R9000)	0 : Self-diagnostic error has not occurred 1 : Self-diagnostic error occurred
	1st	Voltage dip detection flag (R9001)	0 : Voltage dip not detected 1 : Voltage dip detected
	2nd	Fuse blow detection flag (R9002)	0 : Fuse blow not detected 1 : Fuse blow detected
	3rd	Intelligent unit error flag (R9003)	0 : Intelligent unit error not detected 1 : Intelligent unit error detected
Upper digit	4th	I/O verify error flag (R9004)	0 : I/O verify error not detected 1 : I/O verify error detected
	5th	Battery voltage drop detection flag (Momentary flag) (R9005)	0 : No battery voltage drop detected 1 : Battery voltage drop detected
	6th	Battery voltage drop detection flag (Hold type flag) (R9006)	0 : No battery voltage drop detected 1 : Battery voltage drop detected
	7th MSB	Operation error flag (Momentary flag) (R9007)	0 : Operation error not detected 1 : Operation error detected

Example : Response data : “61”



■ Self-diagnostic error (DT9000)

• The self-diagnostic error code is read out from the Programmable Controller.
The content of the self-diagnostic error code is same as the data in the DT9000.
Refer to the self-diagnostic error list regarding the error code.
The specifications of the self-diagnostic error code is :

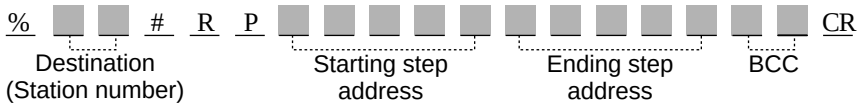


RP Read a program stored in the Programmable Controller

Outline Reads a program stored in the Programmable Controller.
This command is available only for program backup purposes.

Basic message format

Command message



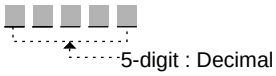
Response message

Description

- The program from the specified address is returned by the Programmable Controller.
- This command should be used to save the program block only for backup purposes.

■ Starting step address/Ending step address

- Starting and ending step addresses for the program are expressed as 5-digit decimal numbers as shown below :



Note :

The ending step address must be equal to or larger than the starting step address.

■ Program

- Each program step will be returned as 4 characters.

Note :

- To avoid malfunctions in the Programmable Controller, it is recommended that you do not modify or review the program that is read out.

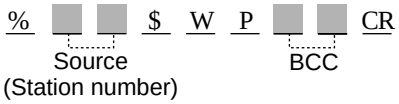
WP Write a program which was saved by using the “RP” command back into the Programmable Controller

Outline Writes the program saved with the “RP“ command back into the Programmable Controller.
This command is available only for program downloading purpuses.

Basic message format.

Command message

Response message

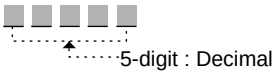


Description

- A program which was saved using the “RP” command is written back into the Programmable Controller.
- This command should be used only for downloading the program block saved by using the “RP” command.

■ Starting step address/Ending step address

- Starting and ending step addresses for the program are expressed using a 5-digit decimal as shown below :



Note :

The ending step address must be equal to or larger than the starting step address.

■ Program

- Each program step will require 4 characters to be written back into the Programmable Controller.

Note :

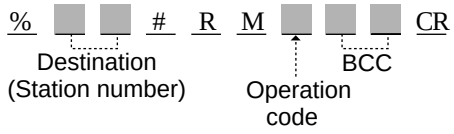
The program which is downloaded must be a program which was saved using the “RP" command.
If you modify or revise the program, malfunction may occur.

RM Remote control operation mode

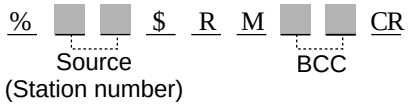
Outline Remotely controls the operation mode.
The operation mode is remotely set to the RUN or PROG. mode.

Basic message format

Command message



Response message



Description • Controls the operation mode.
The operation mode is remotely set to the RUN or PROG. mode.

Note :

- The “RM” command is only valid when the Programmable Controller is set to REMOTE mode. For details, refer to the FP3 Hardware manual.

■ Operation code

Operation code	Specification
R	PROG. mode ⟶ RUN mode
P	RUN mode ⟶ PROG. mode

Program example

Command message

% 0 1 # R M R ✻ ✻ CR

Response message

% 0 1 $ R M 1 F CR

The operation mode of the Programmable Controller, whose station number is 01, is set to the RUN mode.

Command message
Destination : 01 station
Data sent : PROG. mode → RUN mode

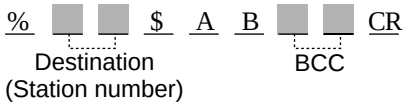
Response message
Source : 01 station

AB Abort a series of response messages

Outline Aborts a series of messages.
This command is used to abort the reception of a response message sent in multiple frames.

Basic message format

Command message



Response message

No response message

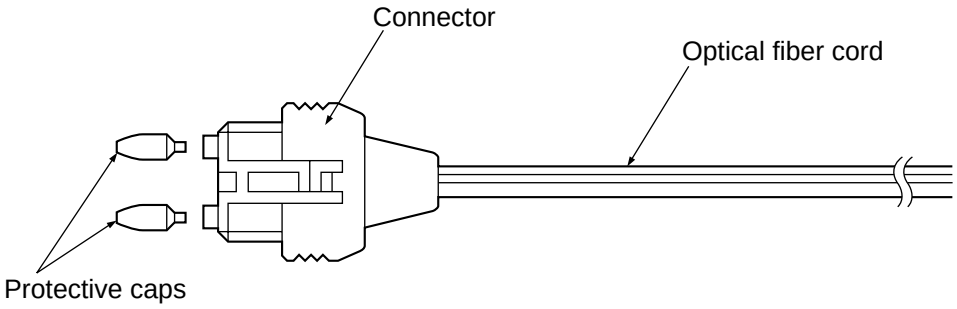
Description
- This command cancels a message being sent in multiple frames. The cancellation occurs in the middle of the communication, when you want to stop receiving the response message for any reason.

7-5. Optical Fiber Cord and Optical Fiber Cable

1. Description

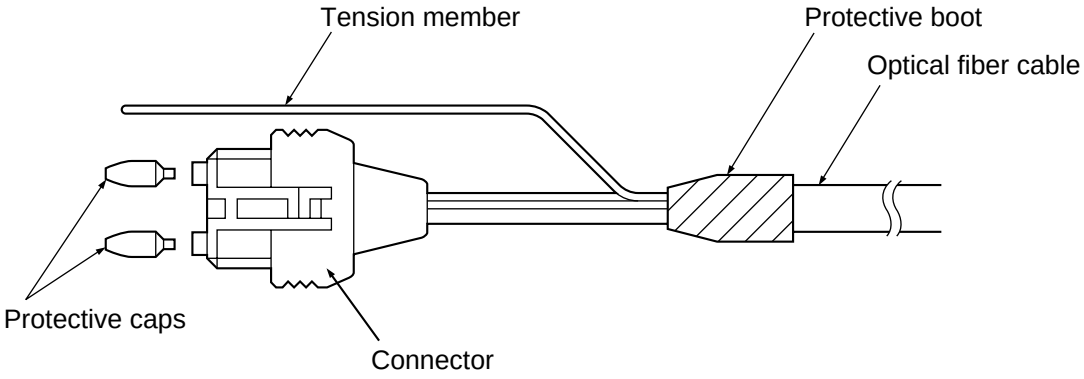
1) Part Names of Optical Fiber Cord and Cable

■ **Optical Fiber Cord**

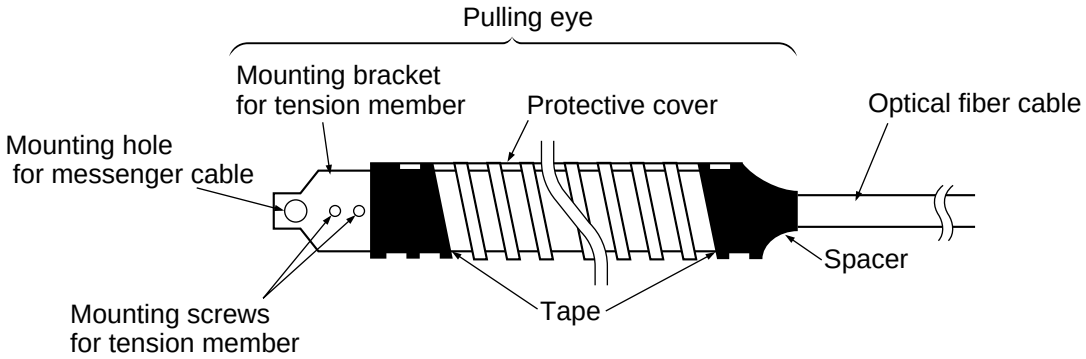


■ **Optical Fiber Cable**

• Optical Fiber Cable



• Optical Fiber Cable with Pulling Eye

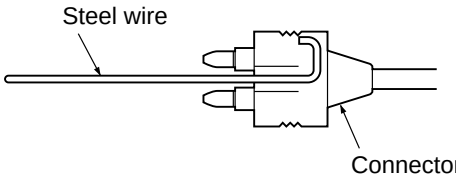


2) Preparation for Installation

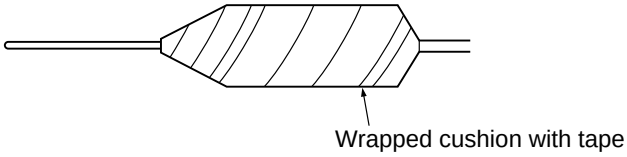
■ Optical Fiber Cord

Procedure

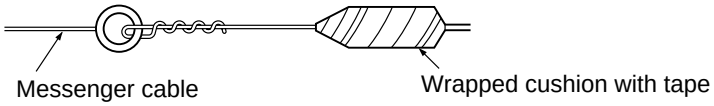
① Place a steel wire with its tip bent into a "U" on the connector.



② Wrap the connector and steel wire in cushion and tape.



③ Attach the messenger cable for installation to the steel wire.



Note :

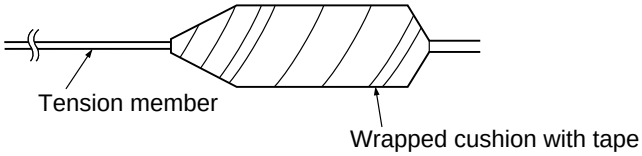
The allowable tension at the connector is 2 kg. Exercise care during handling.

■ Optical Fiber Cable

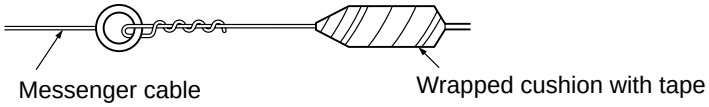
• Optical Fiber Cable

Procedure

① Wrap the connector and tension member in cushion and tape.



② Attach the messenger cable for installation to the steel wire.



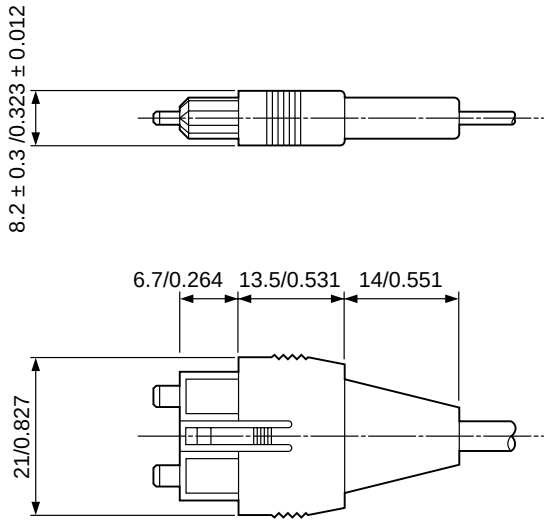
Note :

The allowable tension at the connector is 2 kg. Exercise care during handling.

• Optical Fiber Cable with Pulling Eye

Attach the messenger cable to the messenger cable attachment hole as shown in the illustration on page 189.

■ **Dimension of Connector**

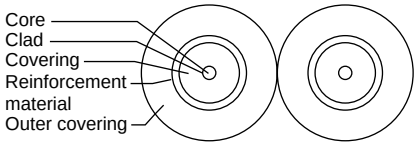
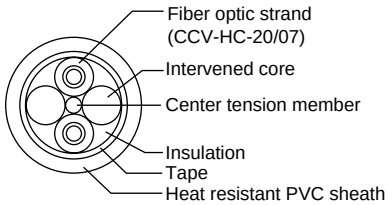


(unit : mm/in.)

3) Specifications of Optical Fiber Cord and Cable

In particular, applying unreasonable forces(tension strength, lateral compression, bending radius etc) on the connector cord bushing or protective boot.

Table of general specifications for the Optical Fiber Cord/Cable as follows :

Item		Description	
Types		Optical Fiber Cord	Optical Fiber Cable
Construction			
Cable diameter		2.2 × 4.4 mm/0.087 × 0.173 in.	8.4 mm/0.331 in.
Allowable bending radius	Temporary bend	15 mm/0.591 in. or more	25 mm/0.984 in. or more
	Long term bend	50 mm/1.969 in. or more	85 mm/3.346 in. or more
Allowable tension	Temporary tension	25 kg/55.188 lb.	75 kg/165.563 lb.
Storage and Ambient temperature		-20° C to 70° C/-4° F to 158° F	
Transmission loss		Max. 7 dB/km	
Transmission band		Min. 14 MHz·km	
Core diameter		200 μm	
Clad diameter		230 μm	
Conductor		Two-conductor	
Weight		8 kg/17.660 lb. per 1 km	70 kg/154.525 lb. per 1 km

4) Installing Environment

• The installing environments(installing place and installed conditions) for optical fiber cord/cable are as below.

Item		Description
Cord/Cable	**Installing environment**	
Optical fiber cord	Rack	• Installation : Available • Condition : Provide suitable protection.
	Trough	• Installation : Available • Condition : Provide suitable protection such as a cover.
	Conduit tube	• Installation : Available • Condition : Use the steel conduit tube or PVC tube.
	Outdoor conduit line	• Installation : Not available • Condition : ——————
	Aerial	• Installation : Not available • Condition : ——————
Optical fiber cable	Rack	• Installation : Available • Condition : Provide protection if excessive external force is present.
	Trough	• Installation : Available • Condition : Provide protection if excessive external force is present.
	Conduit tube	• Installation : Available • Condition : Use the steel conduit tube or PVC tube.
	Outdoor conduit line	• Installation : Available • Condition : Avoid water submersion and high temperatures.
	Aerial	• Installation : Available • Condition : Avoid excessive tension and vibration.

• **Example :** When installing at conduit tube
Select the conduit tube (steel or PVC conduit tube) to match the conditions for optical cord/cable installation as below.

Conduit tube			
Outside diameter	Inside diameter	Thick wall	Thin wall
Dia. 25 to 27 mm/0.984 to 1.063 in.	Dia. 22 mm/0.866 in.	22 mm/0.866 in.	25 mm/0.984 in.
Dia. 32 to 33 mm/1.260 to 1.299 in.	Dia. 28 mm/1.102 in.	28 mm/1.102 in.	31 mm/1.220 in.

• The optical fiber cable is not available in conduit tube of outside diameter "Dia. 25 to 27 mm/0.984 to 1.063 in."

Notes :

- Use a conduit tube with a smooth inner surface without projections and joints.
- Install a pull box approx. every 25 m/82.021 ft. for straight horizontal conduit lines, approx. every 20 m/65.617 ft. for conduit lines with bends and approx. every 8 m/26.247 ft. for vertical conduit lines.
- As much as possible, avoid bends in the conduit tube used to install the optical fiber cord/cable. It is recommended that a pull box be provided. If the conduit tube is to be bent, the bending radius should be six times or more the inner diameter of the conduit tube.
- Keep the bending radius of the optical fiber cord/cable as large as possible within the pull box.(The bending radius should be equal to or larger than the allowable bending radius.)
- After installation, secure the optical fiber cord/cable so that it will not move within the pull box.
- Attach a bushing to the end of the tube and use guides so as not to sharply bend or twist the optical fiber cord/cable.

2. Installation

Install the optical fiber cable using a conduit tube, rack, duct or trough.

1) Installation Method

■ Conduit Tube Installation

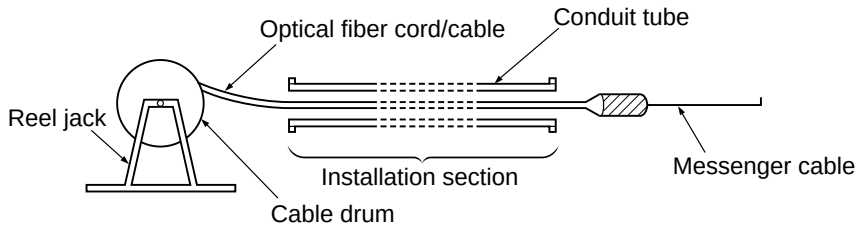
• There are 3 installation method types as given below.

Installation method	Installation condition
One-way installation method	Practically straight
Sequential installation method	Relatively many bends
Divided installation method	Many bends where sequential installation cannot be used

For each conduit tube, install one optical fiber cable.

• One-way installation method

Install or lay the cable in one direction as shown in the figure below. If the section to be installed has differences in height, install from the high end to the low end. If there is a bend, install or lay the cable from the side closest to the bend.



Notes :

- Gently pull the optical fiber cord/cable by hand or with a winch.
- During installation, keep the tension within 2/3 of the allowable tension and the laying speed within 10 m/min (32.808 ft./min).
- During installation, post a person at important locations so that external forces do not exceed the allowable strength(pulling tension, lateral compression, bending, twisting) of the optical fiber cord/cable.
- Lift the cable drum above the ground(for example with a reel jack) to enable it to turn easily. While turning the drum, feed the cable without exerting unreasonable force onto it.

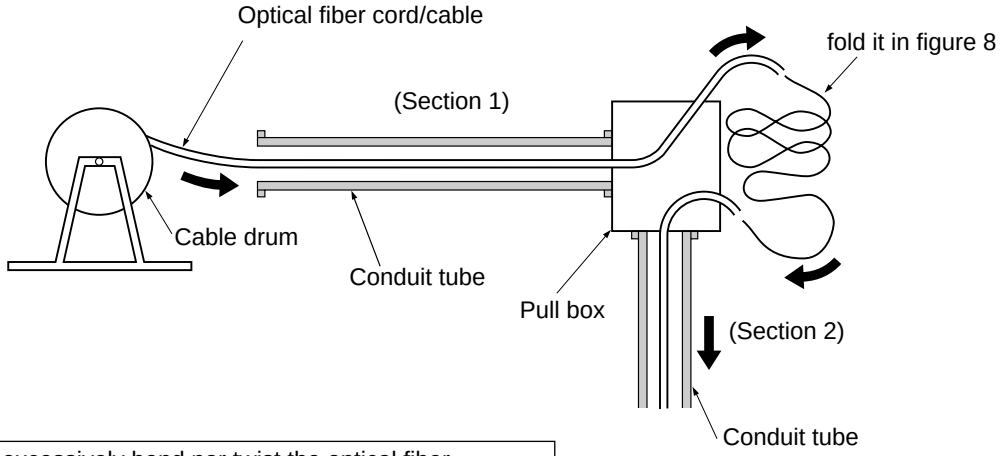
• Sequential installation method

Procedure :

① Completely install the optical fiber cord/cable in section 1. Use the one-way installation method. Pull out the extra length of optical fiber cord/cable at the intermediate point and fold it in a figure 8.

② Without tangling or twisting the optical fiber cord/cable at the intermediate point, feed it to the next section 2.

③ Repeat steps ① and ②.



Notes :

- Be sure not to excessively bend nor twist the optical fiber cord/cable when folding it in a figure 8.
- During installation, keep the tension within 2/3 of the allowable tension and the laying speed within 10 m/min (32.808 ft./min).

• Divided installation method

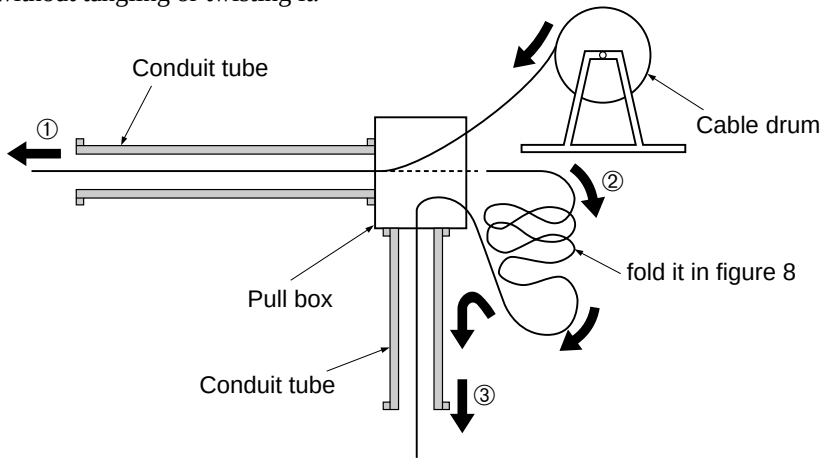
If one-way installation is impossible, or if the entrance for the optical fiber cord/cable is physically restricted, or if there are sharp bends, insert the optical fiber cord/cable from the easier side depending on the bend or where entry is possible.
After installing the optical fiber cord/cable in one direction, pull the optical fiber cord/cable, to be installed in the opposite direction, from the drum and fold it a figure 8. This will permit the end of the optical fiber cord/cable to be fed in the opposite direction. (Observe the conditions given in one-way installation method. Furthermore, after installation, distribute the bends and twists so that they are not concentrated.)

Procedure :

① Feed the optical fiber cord/cable in one direction from the dividing point.

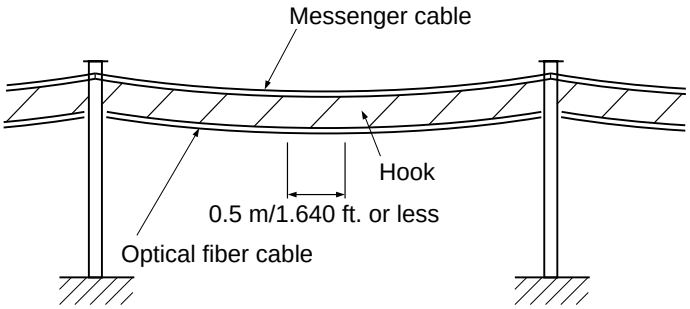
② Pull out the remaining optical fiber cord/cable from the drum and fold it in a figure 8.

③ Take the end of the optical fiber cord/cable folded in a figure 8 and feed it into the section in the opposite direction without tangling or twisting it.



■ Aerial Installation

- Install the optical fiber cable as shown below. (The optical fiber cord cannot be installed in this manner.)
- Using a messenger cable (22 mm/0.866 in. thickness or more), hang the fiber optic cable with hooks spaced 0.5 m/1.640 ft. or less.



Notes :

- During installation, turn the cable drum so that the tension on the optical fiber cable is 0. Keep the pulling speed within 10 m/min (32.808 ft./min).
- During installation, be sure not exert a mechanical force on the optical fiber cable greater than the allowable limits.

■ Duct Installation

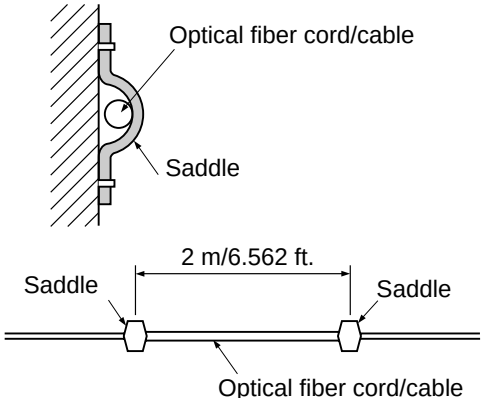
- Follow the same procedure for conduit tube installation.

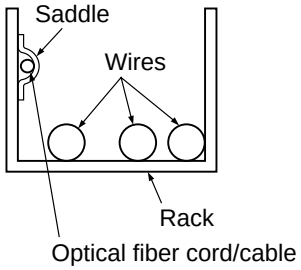
Note :

- There may the danger of water submersion depending on the tube. To prevent water from entering the cable connector, use a water-soluble compound or tape at the connector.

■ Rack and Trough Installation

- Place the optical fiber cord/cable gently on the rack or in the trough. Provide the optical fiber cord/cable with some slack and avoid excessive tension, bends and twists.
- To prevent other wires from lying on or sandwiching the optical fiber cord/cable and exerting lateral compression, keep a suitable distance between the optical fiber cord/cable and other wires [for example 10 mm/0.394 in. or more] or use a saddle to hold the optical fiber cord/cable to the side of the rack.





Notes :

- Avoid installing a optical fiber cord/cable over or between other wires since doing so will cause the optical fiber cord/cable to be squeezed between the other wires or cause the tension to increase.
- Carefully protect the connector. In particular, do not get the mirrored surface of the connector dirty and don't bend the optical fiber cord/cable excessively at the connector.
- Be sure to observe the allowable conditions of tension, bends, lateral compression and twists.

2) Handling After Installation

■ Optical Transmission Loss Measurement

After installing the optical fiber cord/cable, measure and check that the optical fiber cord/cable satisfies the conditions below.

- When L ≤ 100 m/328.084 ft. : Transmission loss (P) ≤ 1.1 (dB)
- When 100 m/328.084 ft. < L ≤ 800 m/2,624.672 ft. : Transmission loss (P) ≤ (7 - 4 log L) × L + 1.0 (dB)
  [L (km) : Length of optical fiber cord/cable, P (dB) : Transmission loss]

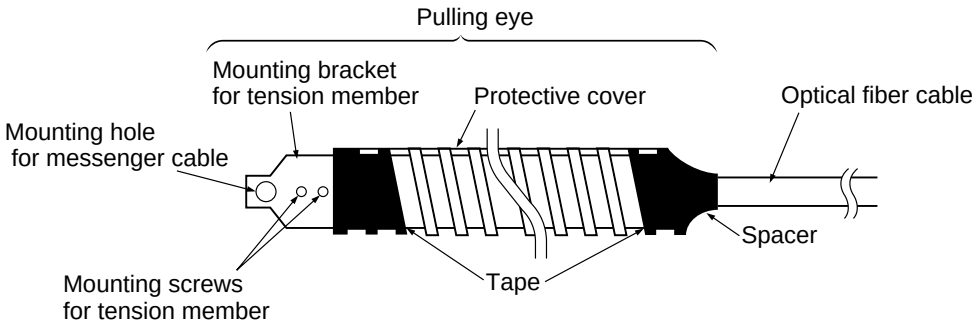
■ Handling the Optical Fiber Cable

- After installing the optical fiber cable with pulling eye, remove the protective tube or pulling eye used for protection of the end without applying unreasonable force to or scratching the optical fiber cable.

  Removing the Pulling Eye

  1. Remove the tape and then the spacer.
  2. While holding the tension member mounting bracket, remove the tension member mounting screws.
  3. Remove the optical connector while making sure it does not catch on the optical connector protective cover.

- If the tension member is unnecessary, cut and remove it at the protective boot.

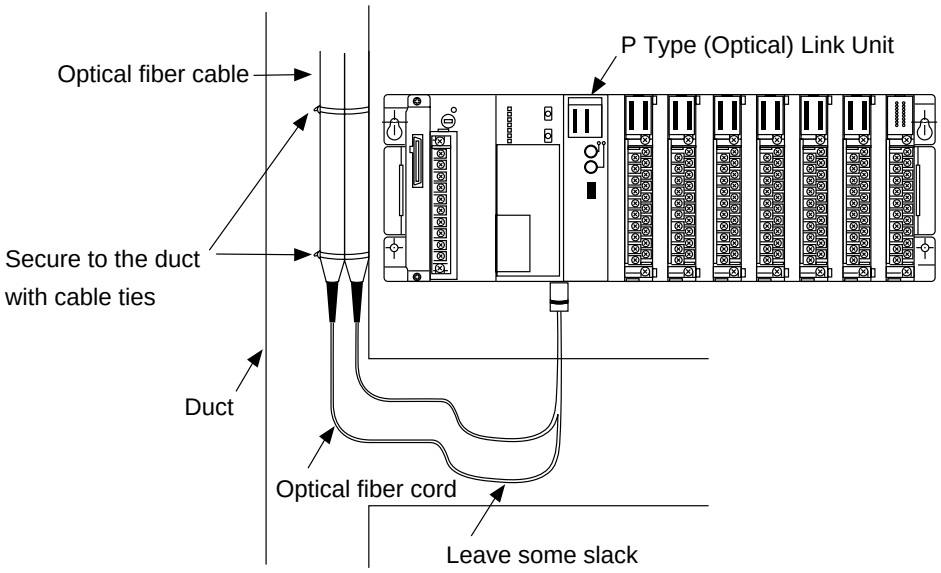


■ Handling the Wiring

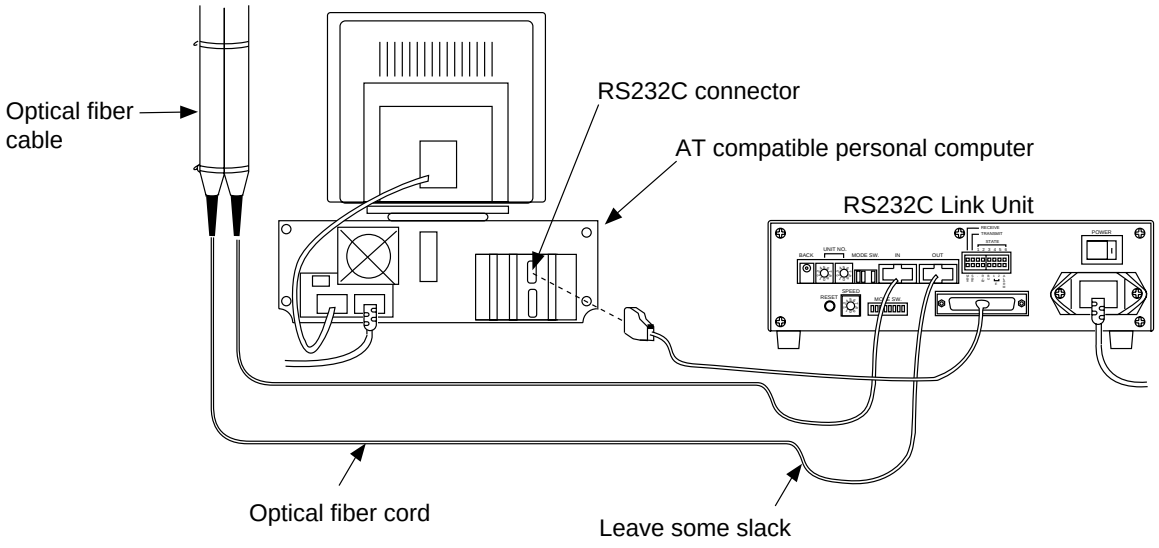
• Use cable ties and secure the optical fiber cord/cable to the duct within the panel as shown in the figure. Be sure not to apply unreasonable force on the optical fiber cord and optical fiber cable.

Example :

• P Type (Optical) Link Unit Wiring



• RS232C Link Unit Wiring



7-6. Table of FP3/FP5 System Registers

Number	Description	Default value	Allowable range
Memory Allocation			
0	Sequence program memory size (See note 1. on the next page)	8	FP3 : 2 to 10 k words FP3 (16 k type) and FP5 : 2 to 16 k words
1	Machine language program memory size (See note 1. on the next page)	0	FP3 : 0 to 8 k words FP3 (16 k type) and FP5 : 0 to 14 k words
2	Comment memory size	3	Use default value “3”.
3, 4	Unused	——	——
Internal I/O Setting			
5	Counter start number setting (See note 2.)	200	0 to 256
6	Timer/Counter hold area start number setting (See note 2. on the next page)	200	0 to 256
7	Internal relay hold a a start number setting (See note 3. on the next page)	60	0 to 98
8	Data register hold area start number setting (See note 3. on the next page)	0	0 to 2,048
9	File register hold area start number setting (See note 3. on the next page)	0	0 to 22,525
10	Link relay hold area setting for Link 0 (See note 3. on the next page)	0	0 to 64
11	Link relay hold area setting for Link 1 (See note 3. on the next page)	64	64 to 128
12	Link register hold area setting for Link 0 (See note 3. on the next page)	0	0 to 128
13	Link register hold area setting for Link 1 (See note 3. on the next page)	128	128 to 256
14	Step ladder hold/non-hold setting	1 (Non-hold)	0 : Hold, 1 : Non-hold
15	Data output hold/non-hold setting	0 (Non-hold)	0 : Non-hold, 1 : Hold
16 to 19	Unused	——	——
RUN Mode During an Error			
20	Duplicate output	0 (Disabled)	0 : Output disabled 1 : Output enabled
21	Output unit fuse blow	0 (Stop)	0 : Stop 1 : Continue
22	Intelligent unit error	0 (Stop)	
23	I/O verification error	0 (Stop)	
24	Watchdog timer time out (This register number is only used by the FP5)	0 (Stop)	0 : Stop, 1 : Continue Refer to system register number 30
25	Unused	——	——
26	Operation error	0 (Stop)	0 : Stop 1 : Continue
27	Remote I/O slave link error	0 (Stop)	
28	I/O error in the Remote I/O slave station	0 (Stop)	
29	Unused	——	——
Wait Time Setting			
30	Watchdog timer's time-out value (This register number is only used by the FP5)	120 (300 ms)	4 to 256 (10 ms to 640 ms)
31	Time setting for managing multiple frames	2,600 (6.5 s)	4 to 32,760 (10 ms to 81.9 s)
32	Data transfer's wait times setting for F145 (SEND), P145 (PSEND)/ F146 (RECV), P146 (PRECV) instructions, F152 (RMRD), P152 (PRMRD)/ F153 (RMWT), P153 (PRMWT) instructions (See note 4. on the next page.)	800 (2.0 s)	4 to 32,760 (10 ms to 81.9 s)
33	Assigned time for a block change in the RUN mode.	5,000 (10 ms)	1,000 to 65,535 (2,000 to 131,070 μs)

Remote I/O Operating Mode Setting				
35	Confirmation connection of a slave station		1 (set)	0 : Release 1 : Set
36	Selection of Remote I/O update method		0	0 : Synchronous 1 : Asynchronous
Setting for P/W PC Link 0				
40	Link relay memory size		0	0 to 64 words (0 to 1,024 points)
41	Link data register memory size		0	0 to 128 words
42	Link relay send memory size	starting words number	0	0 to 63
43		number of words to be sent	0	0 to 64 words
44	Link data register send memory size	starting words number	0	0 to 127
45		number of words to be sent	0	0 to 127 words
46 to 49	Unused		–	————
Setting for P/W PC Link 1				
50	Link relay memory size		0	0 to 64 words (0 to 1,024 points)
51	Link data register memory size		0	0 to 128 words
52	Link relay send memory size	starting words number	64	64 to 127
53		number of words to be sent	0	0 to 64 words
54	Link data register send memory size	starting words number	128	128 to 255
55		number of words to be sent	0	0 to 127 words
56 to 59	Unused		–	————

Notes :

1. The total maximum memory available for the sequence program area size and machine language program area size is 10 k words for the FP3.
2. The value of address number 5 and 6 must be the same. The Preset (Set) value area (SV) and the Count (Elapsed) value area (EV) are also Hold/Non-hold according to the value of number 6.
3. Each holding area is divided by the word number you use. The area from 0 to the specified number is Non-hold, and from that number to the end is Hold. To set the whole area hold, use a word number which is 1 word larger than the maximum.
4. Set addresses number 30 to 32 as shown below :
   Set time = Set value × 2.5 ms (Set value is decimal.)
   The default values are shown below :
   Address number 30 ... default value : 120 (set time : 300 ms)
   Address number 31 ... default value : 2,600 (set time : 6.5 s)
   Address number 32 ... default value : 800 (set time : 2.0 s)
5. Set address number 33 as shown below :
   Set time = Set value × 2.0 μs (Set value is decimal.)
   The default value : 5,000 (set time : 10 ms)
6. The terms "Hold" and "Non-hold" are specified as :
   • Hold area : the memory area whose contents are not lost or modified if the operating power is lost.
   • Non-hold area : the memory area whose contents will be lost or modified if the operating power is lost.

7-7. Table of FP3/FP5 Operands

1. Organized by Processing Size

Processing size	Name	Symbol	Numbering
Bit	External input relay	X	X0 to X127F (=WX0 to WX127)
	External output relay	Y	Y0 to Y127F (=WY0 to WY127)
	Internal relay	R	R0 to R97F (=WR0 to WR97)
	Special internal relay	R	R9000 to R910F (=WR900 to WR910)
	Link relay	L	L0 to L127F (WL0 to WL127)
	Timer contact	T	T0 to T255 ┐ Shared area
	Counter contact	C	C0 to C255 ┘
Word	Word external input relay	WX	WX0 to WX127 (=X0 to X127F)
	Word external output relay	WY	WY0 to WY127 (=Y0 to Y127F)
	Word internal relay	WR	WR0 to WR97 (=R0 to R97F)
	Word special internal relay	WR	WR9000 to WR910 (=R9000 to R910F)
	Word link relay	WL	WL0 to WL127 (=L0 to L127F)
	Data register	DT	DT0 to DT2047
	Special data register	DT	DT9000 to DT9255
	Link data register	LD	LD0 to LD255
	File register	FL	FP3 : FL0 to FL8188 FP3 (16 K Type) and FP5 : FL0 to FL22524
	Index register	IX	┐ One word each (No numberings system)
	Index register	IY	┘
	Timer/Counter Set (Preset) value	SV	SV0 to SV255
	Timer/Counter Elapsed (Count) value	EV	EV0 to EV255
	Word decimal constant	K	K-32768 to K32767
	Word hexadecimal constant	H	H0 to HFFFF
Double word	Double word decimal constant	K	K-2147483648 to K2147483647
	Double word hexadecimal constant	H	H0 to HFFFFFFFF
12 Characters	Character constant	M	None

Notes :

Explanation of basic terminology

- Bit : One binary digit. The smallest unit of binary information. A bit can express a value of "1" or "0"
- Word : A word is composed of 16 bits which are operated on simultaneously when a computer is performing an instruction. Word addresses are expressed as decimal numbers.
- Relay bit address : Addresses for relay bets (X, Y, R and L) are expressed as a combination of a word address (decimal) and a hexadecimal bit identifier. The least significant digit is hexadecimal and the rest of the digits are decimal.

Example : X 38 F

Hexadecimal (Bit number)
Decimal (Word number)

2. Organized by Function

Function	Name	Symbol (unit)	Numbering
External Input/ Output Relays	External input relay	X/WX (bit/word)	X0 to X127F (bit)/WX0 to WX127 (word)
	External output relay	Y/WY (bit/word)	Y0 to Y127F (bit)/WY0 to WY127 (word)
Internal Relays	Internal relay	R/WR (bit/word)	R0 to R97F (bit)/WR0 to WR97 (word)
	Special internal relay	R/WR (bit/word)	R9000 to R910F (bit)/WR9000 to WR910 (word)
Link area	Link relay	L/WL (bit/word)	L0 to L127F (bit)/WL0 to WL127 (word)
	Link data register	LD (word)	LD0 to LD255
Data area	Data register	DT (word)	DT0 to DT2047
	Special data register	DT (word)	DT9000 to DT9255
	File register	FL (word)	FP3 : FL0 to FL8188 FP3 (16 k Type) and FP5 : FL0 to FL22524
Index modifier	Index register	IX (word)	One word each (No numberings system)
	Index register	IY (word)	
Timer/ Counter	Timer contact	T (bit)	T0 to T255 (Shared area)
	Counter contact	C (bit)	C0 to C255 (Shared area)
	Timer/Counter Set (Preset) value	SV (word)	SV0 to SV255
	Timer/Counter Elapsed (Count) value	EV (word)	EV0 to EV255
Constant	Decimal constant (word unit) (double word unit) Hexadecimal constant (word unit) (double word unit)	K H	K-32768 to K32767 (word) K-2147483648 to K2147483647 (double word) H0 to HFFFF (word) H0 to HFFFFFFFF (double word)
Character	Character constant	M	None

7-8. ASCII Code

b_7	b_6	b_5	b_4	b_3	b_2	b_1	ASCII HEX code		0	1	2	3	4	5	6	7
									Most significant digit							
			0	0	0	0	Least significant digit	0	NUL	DLE	SPACE	0	@	P		p
			0	0	0	1		1	SOH	DC1	!	1	A	Q	a	q
			0	0	1	0		2	STX	DC2	”	2	B	R	b	r
			0	0	1	1		3	ETX	DC3	#	3	C	S	c	s
			0	1	0	0		4	EOT	DC4	$	4	D	T	d	t
			0	1	0	1		5	ENQ	NAK	%	5	E	U	e	u
			0	1	1	0		6	ACK	SYN	&	6	F	V	f	v
			0	1	1	1		7	BEL	ETB	’	7	G	W	g	w
			1	0	0	0		8	BS	CAN	(	8	H	X	h	x
			1	0	0	1		9	HT	EM	)	9	I	Y	i	y
			1	0	1	0		A	LF	SUB	*	:	J	Z	j	z
			1	0	1	1		B	VT	ESC	+	;	K	[	k	{
			1	1	0	0		C	FF	FS	,	<	L	\	l	|
			1	1	0	1		D	CR	GS	–	=	M	]	m	}
			1	1	1	0		E	SO	RS	.	>	N	^	n	~
			1	1	1	1		F	SI	US	/	?	O	_	o	DEL

7-9. Product Types

■ Basic Configurations

CPU

Type		Part number	Description
FP3	10 k-step program capacity type	AFP3210	ROM/RAM operation
		AFP3211	ROM/RAM operation with comment and trace functions
		AFP3212	RAM operation
	16 k-step program capacity type	AFP3220C	ROM/RAM operation (EEPROM memory function available)
FP5	16 k-step program capacity type	AFP5220	ROM/RAM operation
		AFP5221	ROM/RAM operation with comment and trace functions

Power Supply Unit

Type		Part number	Description
FP3	100 V AC to 120 V AC/200 V AC to 240 V AC operating type	AFP3631	Power supply to backplanes : 2.4 A, 5 V DC External power supply : 0.8 A, 24 V DC
	24 V DC operating type	AFP3634	Power supply to backplanes : 2.4 A, 5 V DC External power supply : Not available
	Power Supply Dummy Unit	AFP3639	Used when extra power is needed by the Expansion Backplanes.
FP5	100 V AC to 120 V AC/200 V AC to 240 AC operating type	AFP5631	Power supply to backplanes : 7 A, 5 V DC External power supply : 1.6 A, 24 V DC
	100 V AC to 120 V AC/200 V AC to 240 AC operating type	AFP5632	Power supply to backplanes : 3 A, 5 V DC External power supply : 2.5 A, 24 V DC

Input Unit

Type		Part number	Description
FP3	DC input type	AFP33023	16 points, screw terminal style Input voltage : 12 V DC to 24 V DC
		AFP33024	32 points, connector style Input voltage : 12 V DC to 24 V DC
		AFP33027	64 points, connector style Input voltage : 12V DC to 24 V DC
		AFP33014	32 points, connector style Input voltage : 5 V DC to 12 V DC
		AFP33017	64 points, connector style Input voltage : 5 V DC to 12 V DC
	AC input type	AFP33041	8 points, screw terminal style Input voltage : 100 V AC to 120 V AC
		AFP33043	16 points, screw terminal style Input voltage : 100 V AC to 120 V AC
		AFP33051	8 points, screw terminal style Input voltage : 200 V AC to 240 V AC
		AFP33053	16 points, screw terminal style Input voltage : 200 V AC to 240 V AC
FP5	DC input type	AFP53021	16 points, screw terminal style Input voltage : 12 V DC to 24 V DC
		AFP53023	32 points, screw terminal style Input voltage : 12 V DC to 24 V DC
		AFP53022	32 points, screw terminal style Input voltage : 12 V DC to 24 V DC (High-speed input version of AFP53023)
		AFP53027	64 points, connector style Input voltage : 12 V DC to 24 V DC
		AFP53011	16 points, screw terminal style Input voltage : 5 V DC to 12 V DC
		AFP53013	32 points, screw terminal style Input voltage : 5 V DC to 12 V DC
	AC input type	AFP53041	16 points, screw terminal style Input voltage : 100 V AC to 120 V AC
		AFP53043	32 points, screw terminal style Input voltage : 100 V AC to 120 V AC
		AFP53051	16 points, screw terminal style Input voltage : 200 V AC to 240 V AC
		AFP53053	32 points, screw terminal style Input voltage : 200 V AC to 240 V AC
	Dynamic input type	AFP53026	64 points, screw terminal style Input voltage : 12 V DC to 24 V DC

Output Unit

Type		Part number	Description
FP3	Relay output type	AFP33103	16 points, screw terminal style without relay socket 2 A/circuit, 5 A/common, 250 V AC, 30 V DC
		AFP33203	16 points, screw terminal style with relay socket 2 A/circuit, 5 A/common, 250 V AC, 30 V DC
	Transistor output type	AFP33483	16 points, screw terminal style, NPN open collector 0.1 A/circuit (at 5 V DC), 0.5 A/circuit (at 12 V DC to 24 V DC), 5 V DC to 24 V DC
		AFP33583	16 points, screw terminal style, PNP open collector 0.1 A/circuit (at 5 V DC), 0.3 A/circuit (at 12 V DC), 0.5 A/circuit (at 24 V DC), 5 V DC to 24 V DC
		AFP33484	32 points, connector style, NPN open collector 50 mA/circuit (at 5 V DC), 0.1 A/circuit (at 12 V DC to 24 V DC), 5 V DC to 24 V DC
		AFP33584	32 points, connector style, PNP open collector 0.1 A/point (at 24 V DC), 5 V DC to 24 V DC
		AFP33487	64 points, connector style, NPN open collector 0.1 A/point (at 24 V DC), 5 V DC to 24 V DC
		AFP33587	64 points, connector style, PNP open collector 0.1 A/point (at 24 V DC), 5 V DC to 24 V DC
	Triac output type	AFP33703	16 points, screw terminal style 0.5 A/circuit, 2 A/common, 100 V AC to 240 V AC
FP5	Relay output type	AFP53101	16 points, screw terminal style without relay socket 2 A 250 V AC, 2 A 30 V DC
		AFP53103	32 points, screw terminal style without relay socket 2 A 250 V AC, 2 A 30 V DC
		AFP53201	16 points, screw terminal style with relay socket 2 A 250 V AC, 2 A 30 V DC
		AFP53203	32 points, screw terminal style with relay socket 2 A 250 V AC, 2 A 30 V DC
	Transistor output type	AFP53481	16 points, screw terminal style, NPN open collector 2.0 A/circuit, 5 A/common, 12 V DC to 24 V DC
		AFP53483	32 points, screw terminal style, NPN open collector 0.5 A/circuit, 4 A/common, 12 V DC to 24 V DC Fuse (5 A) with fuse blowing detection function
		AFP53493	32 points, connector style, NPN open collector 0.5 A/circuit, 4 A/common, 12 V DC to 24 V DC Fuse (5 A) without fuse blowing detection function
		AFP53473	32 points, screw terminal style, NPN open collector 0.2 A/circuit, 1.6 A/common, 5 V DC to 12 V DC
		AFP53487	64 points, connector style, NPN open collector 0.1 A/circuit (at 24 V DC), 5 V DC to 24 V DC

Output Unit

Type		Part number	Description
FP5	Transistor output type	AFP53581	16 points, screw terminal style PNP open collector 2 A/circuit, 5 A/common, 12 V DC to 24 V DC Fuse(7.5 A) with fuse blowing detection function
		AFP53583	32 points, screw terminal style PNP open collector 0.5 A/circuit, 4 A/common, 12 V DC to 24 V DC Fuse(5 A) with fuse blowing detection function
		AFP53573	32 points, screw terminal style PNP open collector 0.2 A/circuit, 1.6 A/common, 5 V DC to 12 V DC
	Triac output type	AFP53701	16 points, screw terminal style 1.0 A/circuit, 5 A/common, 100 V AC to 240 V AC Fuse(5 A) with fuse blowing detection function
		AFP53703	32 points, screw terminal style 0.5 A/circuit, 2 A/common, 100 V AC to 240 V AC Fuse(3.2 A) with fuse blowing detection function
	Dynamic output type	AFP53486	64 points, screw terminal style 0.2 A/circuit, 12 V DC to 24 V DC

Master Backplane

Type		Part number	Description
FP3	3-slot type	AFP3505	In addition to a slot for the CPU and a slot for the Power Supply Unit, 3 slots are available for other units.
	5-slot type	AFP3501	In addition to a slot for the CPU and a slot for the Power Supply Unit, 5 slots are available for other units.
	8-slot type	AFP3502	In addition to a slot for the CPU and a slot for the Power Supply Unit, 8 slots are available for other units.
FP5	5-slot type	AFP5501	In addition to a slot for the CPU and a slot for the Power Supply Unit, 5 slots are available for other units.
	8-slot type	AFP5502	In addition to a slot for the CPU and a slot for the Power Supply Unit, 8 slots are available for other units.

Expansion Backplane

Type		Part number	Description
FP3	3-slot type	AFP3506	In addition to a slot for the Power Supply Unit, 3 slots are available for other units.
	5-slot type	AFP3503	In addition to a slot for the Power Supply Unit, 5 slots are available for other units.
	8-slot type	AFP3504	In addition to a slot for the Power Supply Unit, 8 slots are available for other units.
FP5	5-slot type	AFP5503	In addition to a slot for the Power Supply Unit, 5 slots are available for other units.
	8-slot type	AFP5504	In addition to a slot for the Power Supply Unit, 8 slots are available for other units.

Expansion Cable

Type		Part number	Description
FP3	0.5 m/1.640 ft.	AFP3510	Cable used between Master and Expansion Backplanes or between Expansion Backplanes.
	1 m/3.281 ft.	AFP3511	
	3 m/9.843 ft.	AFP3513	
	10 m/32.808 ft.	AFP35110	
	15 m/49.213 ft.	AFP35115	
	25 m/82.021 ft.	AFP35125	
FP5	0.6 m/1.969 ft.	AFP5510	Cable used between Master and Expansion Backplanes or between Expansion Backplanes.
	1.2 m/3.937 ft.	AFP5511	
	3 m/9.843 ft.	AFP5513	

■ Maintenance parts

Type	Part number	Description
Lithium Battery	AFP8801 AFP8805	for FP3/FP5 CPU, FP3/FP5 Data Process Unit for FP3/FP5 Data Process Unit
Fuse	AFP88021 AFP88032 AFP88042 AFP8802 AFP8803 AFP8804 AFP88031 AFP88041	2 A, for FP3 Power Supply Units (AFP3631, AFP3634) 5 A, for FP3 Output Unit (AFP33703) 5 A, for FP3 Output Units (AFP33483, AFP33583) 4 A, for FP5 Power Supply Units (AFP5631, AFP5632) 5 A, for FP5 Output Unit (AFP53701) 5 A, for FP5 Output Units (AFP53481, AFP53483, AFP53583) 3.2 A, for FP5 Output Unit (AFP53703) 7.5 A, for FP5 Output Unit (AFP53581)
Relay	PC1a-24V	for Output Unit (Relay type)
Cover for FP3 I/O unit's I/O terminal block	AFP3801	———————————

■ Programming Tools

FP Programmer II

Type		Part number	Description
FP Programmer II		AFP1114	Handheld programming device for FP Series Programmable Controllers.
FP Peripheral Cable	0.5 m/ 1.640 ft.	AFP5520	Cable needed for connection between the CPU's RS422 port and the FP Programmer II's communication port.
	3 m/ 9.843 ft.	AFP5523	

NPST-GR Programming Support Tools

Type		Part number	Description
NPST-GR Software (Ver. 3)		AFP266538	Program editing software used with commercially available computer (IBM PC-AT or 100% compatible).
FP Peripheral Cable	0.5 m/ 1.640 ft.	AFP5520	Cable needed for connection between the CPU's RS422 port and the RS422/232C Adapter's RS422 port.
	3 m/ 9.843 ft.	AFP5523	
RS422/232C Adapter		AFP8550	RS422 ◄► RS232C signal converter Used for connection between the computer's RS232C port and the FP3/FP5 CPU's RS422 port when programming with the NPST-GR etc.
RS232C cable		Needs to be made to match your computer.	Cable needed for connection between the RS422/232C Adapter's RS232C port and your computer. Refer to the wiring example on the following page.

RS232C Cable Example :

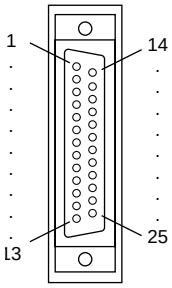
① RS422/232C Adapter & IBM PC-AT (9-pin)

RS422/232C Adapter (RS232C connector side, 25-pin)		IBM PC-AT side (9-pin female type)	
Pin number	Abbreviation	Pin number	Abbreviation
1	FG	1	CD (DCD)
2	SD (TXD)	2	RD (RXD)
3	RD (RXD)	3	SD (TXD)
4	RS (RTS)	4	ER (DTR)
5	CS (CTS)	5	SG
6	DR (DSR)	6	DR (DSR)
7	SG	7	RS (RTS)
8	CD (DCD)	8	CS (CTS)
20	ER (DTR)	9	RI (CI)

② RS422/232C Adapter & Personal Computer (25-pin)

RS422/232C Adapter (RS232C connector side, 25-Pin)		Personal computer side (25-pin male type)	
Pin number	Abbreviation	Pin number	Abbreviation
1	FG	1	FG
2	SD (TXD)	2	SD (TXD)
3	RD (RXD)	3	RD (RXD)
4	RS (RTS)	4	RS (RTS)
5	CS (CTS)	5	CS (CTS)
6	DR (DSR)	6	DR (DSR)
7	SG	7	SG
8	CD (DCD)	8	CD (DCD)
20	ER (DTR)	20	ER (DTR)

RS232C interface female connector pins of RS422/232C Adapter



Memory

Type	Part number	Description
EPROM (16 k-step, 2 pcs in a set)	AFP5202	27C256 or equivalent
EEPROM (16 k-step, 2 pcs in a set)	AFP5206	28C256 or equivalent

FP ROM Writer

Type		Part number	Description
FP ROM Writer		AFP5651	ROM Programmer for FP Series Programmable Controllers [EEPROM (28C256 or equivalent) cannot be programmed]
FP Peripheral Cable	0.5 m/ 1.640 ft.	AFP5520	Cable needed for connection between the CPU's RS422 port and the FP ROM Writer's RS422 port.
	3 m/ 9.843 ft.	AFP5523	

■ Link System

P Type (Optical) Link Unit and Peripherals

Type	Part number	Description
FP3 P Type (Optical) Link Unit	AFP3710	One of the P/W link units Main Functions : P/W PC Link, Data Transfer, Remote Programming, Computer Link, Fiber optics medium
FP5 P Type (Optical) Link Unit	AFP5710	One of the P/W link units Main Functions : P/W PC Link, Data Transfer, Remote Programming, Computer Link Fiber optics medium
Optical fiber cord	AFP4200***	*** : 001 to 100 length : 1 m/3.281 ft. to 100 m/328.084 ft. example : AFP4200001 : 1 m/3.281 ft. AFP4200100 : 100 m/328.084 ft.
Optical fiber cable	AFP4402***	*** : 001 to 800 length : 1 m/3.281 ft. to 800 m/2,624.672 ft. example : AFP4402010 : 10 m/32.808 ft. AFP4402100 : 100 m/328.084 ft.
RS232C Link Unit	AFP8760	Used as an interface for communication between a P Type (Optical) Link System and your computer when a Computer Link function is configured in the system.

W Type (Wire) Link Unit and Peripherals

Type	Part number	Description
FP3 W Type (Wire) Link Unit	AFP3720	One of the P/W link units Main Functions : P/W PC Link, Data Transfer, Remote Programming, Medium : Twisted pair cable
FP5 W Type (Wire) Link Unit	AFP5720	One of the P/W link units Main Functions : P/W PC Link, Data Transfer, Remote Programming, Medium : Twisted pair cable

C.C.U. (Computer Communication Unit) and Peripherals

Type	Part number	Description
FP3 C.C.U. (Computer Communication Unit)	AFP3462	One of the P/W link units Main Functions : Computer Link (1 computer : 1 Programmable Controller) Communication medium : RS232C cable
FP5 C.C.U. (Computer Communication Unit)	AFP5462	One of the P/W link units Main Functions : Computer Link (1 computer : 1 Programmable Controller) Communication medium : RS232C cable
RS232C cable	AFB85833 AFB85853	Cable needed for connection between the C.C.U.'s RS232C port and your computer. Refer to wiring below.

C-NET Link Unit and Peripherals

Type		Part number	Description
FP3 C-NET Link Unit		AFP3463	One of the P/W link units Main Functions : Computer Link (1 computer : 1 Programmable Controller) Communication medium : 2-conductor cable or twisted pair cable
C-NET Adapter	100 V AC to 240 V AC	AFP8536	RS485 ⟷ RS422/RS232C signal converter Used for communication between the Programmable Controller and your computer. Communication medium (RS485 port) : 2-conductor cable or twisted pair cable
	24 V DC	AFP8532	
RS232C cable		AFB85833 AFB85853	Cable needed for connection between the C.C.U.'s RS232C port and your computer. Refer to wiring below.

RS232C Cables :

AFB85833

Connected to C-NET Adapter (9 Pins Male) — Connected to computer (25 Pins Female)

Pin number	Abbreviation	Pin number	Abbreviation
1	FG	1	FG
2	SD (TXD)	2	SD (TXD)
3	RD (RXD)	3	RD (RXD)
4	RS (RTS)	4	RS (RTS)
5	CS (CTS)	5	CS (CTS)
6	RI (CI)	6	DR (DSR)
7	SG	7	SG
8	CD (DCD)	8	CD (DCD)
9	ER (DTR)	20	ER (DTR)

AFB85853

Connected to C-NET Adapter (9 Pins Male) — Connected to IBM PC-AT (9 Pins Female)

Pin number	Abbreviation	Pin number	Abbreviation
1	FG	1	CD (DCD)
2	SD (TXD)	2	RD (RXD)
3	RD (RXD)	3	SD (TXD)
4	RS (RTS)	4	ER (DTR)
5	CS (CTS)	5	SG
6	RI (CI)	6	DR (DCD)
7	SG	7	RS (RTS)
8	CD (DCD)	8	CS (CTS)
9	ER (DTR)	9	RI (CI)

■ Remote I/O System

Master Unit

Type	Part number	Description
FP3 Master Unit	AFP3740	Main Functions : Remote I/O Control, Remote Programming, Memory Access
FP5 Master Unit	AFP5740	

Slave Unit

Type	Part number	Description
FP3 Slave Unit	AFP3741	One of the slave stations
FP5 Slave Unit	AFP5741	

FP I/O Terminal Board and Cables

Type		Part number	Description
FP I/O Terminal Board	MIL connector style	AFP87441	Power supply : 12 V DC Input : 16 points 12 V DC input power supply Output : 16 points Transistor NPN (0.2 A/12 V DC)
		AFP87442	Power supply : 24 V DC Input : 16 points 24 V DC input power supply Output : 16 points Transistor NPN (0.2 A/24 V DC)
	Screw terminal style	AFP87432	Power supply : 24 V DC Input : 16 points 24 V DC input power supply Output : 8 points Relay (2 A/250 V AC, 2 A/30 V DC)
		AFP87444	Power supply : 24V DC Input : 16 points 24 V DC input power supply Output : 16 points Transistor NPN (0.2 A/24 V DC)
I/O Cable	1 m/3.281 ft.	AFB8521	Cable for Input connector (30 pins) For FP I/O Terminal Board (MIL connector style)
	2 m/6.562 ft.	AFB8522	
	3 m/9.843 ft.	AFB8523	
	4 m/13.123 ft.	AFB8524	
	1 m/3.281 ft.	AFB8531	Cable for Output connector (34 pins) For FP I/O Terminal Board (MIL connector style)
	2 m/6.562 ft.	AFB8532	
	3 m/9.843 ft.	AFB8533	
	4 m/13.123 ft.	AFB8534	
	1 m/3.281 ft.	APL9511	Cable for Power supply connector
	1 m/3.281 ft.	AY15313	Cable for Input Terminals (30 pins) For PC relay terminal M type (Screw terminal style)
	2 m/6.562 ft.	AY15315	
	3 m/9.843 ft.	AY15316	
	5 m/16.404 ft.	AY15317	
	1 m/3.281 ft.	AY15523	Cable for Output Terminals (34 pins) For PC relay terminal M type (Screw terminal style)
	2 m/6.562 ft.	AY15525	
	3 m/9.843 ft.	AY15526	
	4 m/13.123 ft.	AY15527	

FP I/O Terminal Unit and Cables

Type		Part number	Description
Primary FP I/O Terminal Unit		AFP87421	Power supply : 24 V DC Input : 8 points 24 V DC input power supply
		AFP87422	Power supply : 24 V DC Input : 16 points 24 V DC input power supply
		AFP87423	Power supply : 24 V DC Output : 8 points Transistor NPN (0.5 A/24 V DC)
		AFP87424	Power supply : 24 V DC Output : 16 points Transistor NPN (0.5 A/24 V DC)
Expansion FP I/O Terminal Unit		AFP87425	Power supply : 24 V DC Input : 8 points 24 V DC input power supply
		AFP87426	Power supply : 24 V DC Input : 16 points 24 V DC input power supply
		AFP87427	Power supply : 24 V DC Output : 8 points Transistor NPN (0.5 A/24 V DC)
		AFP87428	Power supply : 24 V DC Output : 16 points Transistor NPN (0.5 A/24 V DC)
I/O Cable	0.08 m/0.262 ft.	APL2510	Connection between Expansion Unit and Primary Unit of FP/IO Terminal Unit
	0.28 m/0.919 ft.	APL2511	
	0.48 m/1.575 ft.	APL2515	

FP I/O Link Unit and Cables

Type		Part number	Description
FP1 I/O Link Unit	DC type	AFP1732	Power supply : 24 V DC
	AC type	AFP1736	Power supply : 100 V AC to 240 V AC
I/O Cable	0.07 m/0.230 ft.	AFP15101	Connection between FP1 I/O Link Unit and the FP1 Expansion I/O Link Unit
	0.30 m/0.984 ft.	AFP15103	
	0.50 m/1.640 ft.	AFP15105	

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RECORD OF CHANGES

ACG Number	Date	Description of Changes
ACG-M0015-2	MAY. 1993	First edition

These materials are printed on ECF pulp.
These materials are printed with earth-friendly vegetable-based (soybean oil) ink.

Please contact .....

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