

FUJI PROGRAMMABLE CONTROLLER

# **MICREX-F**

---

## **USER'S MANUAL COMMUNICATION**

This user's manual describes the T-link, a communication network of the MICREX-F series. Read this manual carefully to use the T-link correctly. This manual is an English version based on the Japanese user's manual (No.FH161b).

## **Notes**

- (1) This manual may not be reproduced in whole or part in any form without the prior written approval of FUJI Electric.**
- (2) The contents of this manual (including specifications) are subject to change without prior notice.**
- (3) If you find any ambiguous or incorrect descriptions in this manual, please write them down (with the manual No. shown on the cover) and contact FUJI.**

# Safety Precautions

Before mounting, wiring, operation, maintenance and inspection of the device, be sure to read the operating instructions carefully to ensure proper operation. The operating instructions should be furnished to the maintenance supervisors of final users.

 **WARNING** : Incorrect handling of the device may result in death or serious injury.

 **CAUTION** : Incorrect handling of the device may result in minor injury or physical damage.

- Here, the safety precaution items are classified into "Warning" and "Caution".

- Even some items indicated by "Caution" may also result in a serious accident.

## **WARNING**

- Never touch any part of charged circuits as terminals and exposed metal portion while the power is turned ON. It may result in an electric shock to the operator.
- Turn OFF the power before mounting, dismounting, wiring, maintaining or checking, otherwise, electric shock, erratic operation or troubles might occur.
- Place the emergency stop circuit, interlock circuit or the like for safety outside the PC. A failure of PC might break or cause problems to the machine.
- Do not connect in reverse polarity, charge (except rechargeable ones), disassemble, heat, throw in fire or short-circuit the batteries, otherwise, they might burst or take fire.

## **CAUTION**

- Do not use one found damaged or deformed when unpacked, otherwise, failure or erratic operation might be caused.
- Do not shock the product by dropping or tipping it over, otherwise, it might be damaged or troubled.
- Follow the directions of the operating instructions when mounting the product. If mounting is improper, the product might drop or develop problems or erratic operations.
- Use the rated voltage and current mentioned in the operating instructions and manual. Use beyond the rated values might cause fire, erratic operation or failure.
- Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
- Select a wire size to suit the applied voltage and carrying current, and carry out wiring according to the operating instructions and manual. Poor wiring might cause fire.
- Contaminants, wiring chips, iron powder or other foreign matter must not enter the device when installing it, otherwise, erratic operation or failure might occur.
- Connect the ground terminal to the ground, otherwise, an erratic operation might occur.
- Periodically make sure the terminal screws and mounting screws are securely tightened. Operation at a loosened status might cause fire or erratic operation.
- Put the furnished connector covers on unused connectors, otherwise, failure or erratic operation might occur.
- Install the furnished terminal cover on the terminal block, otherwise, electric shock or fire might occur.
- Sufficiently make sure of safety before program change, forced output, starting, stopping or anything else during a run. The wrong operation might break or cause machine problems.
- Replace the fuse with a designated one, otherwise, fire or failure might occur.
- Engage the loader connector in a correct orientation, otherwise, an erratic operation might occur.
- Do not remodel or disassemble the product, otherwise, a failure might occur.
- Follow the regulations of industrial wastes when the device is to be discarded.

# CONTENTS

Page

---

|                           |     |  |     |
|---------------------------|-----|--|-----|
| <b>Section 1. General</b> | 1-1 | Standard System (T-Link/Mini T-Link) ..... | 1-2 |
|                           | 1-2 | Optional Systems .....                     | 1-3 |
|                           | 1-3 | Communication Modules .....                | 1-4 |

---

|                                      |     |   |     |
|--------------------------------------|-----|---|-----|
| <b>Section 2. Overview of T-Link</b> | 2-1 | T-Link (Mini T-Link) Specifications ..... | 2-2 |
|                                      | 2-2 | Basic Rules of T-Link (Mini T-Link) ..... | 2-3 |

---

|   |     |  |     |
|---|-----|--|-----|
| <b>Section 3. T-Link Communication Specifications</b> | 3-1 | T-Link (Mini T-Link) Transmission Basics ..... | 3-2 |
|   | 3-2 | Transmission Types .....                       | 3-3 |
|   | 3-3 | I/O Data Flow .....                            | 3-5 |
|   | 3-4 | Message Transmission Types .....               | 3-8 |

---

|   |     |  |      |
|---|-----|--|------|
| <b>Section 4. T-Link Applications (System definition)</b> | 4-1 | Fail-Soft Operation .....                                      | 4-2  |
|   | 4-2 | T-Link Registration .....                                      | 4-9  |
|   | 4-3 | Fail-Soft Operation Registration and T-Link Registration ..... | 4-16 |
|   | 4-4 | Hold Registration .....  | 4-19 |
|   | 4-5 | Processor Duplex Operation (Backup) .....                      | 4-21 |
|   | 4-6 | Specifying the I/O Expansion Area .....                        | 4-30 |
|   | 4-7 | System Definition and Processor Model .....                    | 4-37 |

---

|                                  |     |  |      |
|----------------------------------|-----|--|------|
| <b>Section 5. T-Link Systems</b> | 5-1 | Mini T-Link Master Modules .....   | 5-2  |
|                                  | 5-2 | T-Link Slave Module/Unit .....   | 5-3  |
|                                  | 5-3 | T-Link (Mini T-Link) Repeater/Converter .....                                | 5-5  |
|                                  | 5-4 | Applicability of Each T-Link Interface Module to Each Processor Series ..... | 5-10 |

---

|  |     |                              |      |
|--|-----|------------------------------|------|
| <b>Section 6. Performing Message Data Transmission</b> | 6-1 | Message Modules .....        | 6-2  |
|  | 6-2 | MSGT/MSGR Instructions ..... | 6-12 |

---

|   |     |                                |     |
|---|-----|--------------------------------|-----|
| <b>Section 7. Overview of P/PE-Link</b> | 7-1 | P/PE-Link Specifications ..... | 7-2 |
|   | 7-2 | Basic Rules of P/PE-Link ..... | 7-3 |

---

|  |     |  |      |
|--|-----|--|------|
| <b>Section 8. P/PE-Link Communication Specifications (Broadcast Communication)</b> | 8-1 | Broadcast Communication .....                    | 8-2  |
|  | 8-2 | P/PE-Link Transmission Timing .....              | 8-7  |
|  | 8-3 | P/PE-Link Address .....                          | 8-11 |
|  | 8-4 | P/PE-Link Station No. ....                       | 8-13 |
|  | 8-5 | P/PE-Link Registration Procedure (Loader) .....  | 8-15 |
|  | 8-6 | P/PE-Link Usage Examples .....                   | 8-20 |
|  | 8-7 | P/PE-Link Troubleshooting .....                  | 8-22 |
|  | 8-8 | Remote Programming/Monitoring on P/PE-Link ..... | 8-28 |

---

---

# Section 1 General

---

|   | Page       |
|---|------------|
| <b>1-1 Standard System (T-Link/Mini T-Link) .....</b> | <b>1-2</b> |
| <b>1-2 Optional Systems .....</b>                     | <b>1-3</b> |
| 1-2-1 T-link optional cards .....                     | 1-3        |
| 1-2-2 P-link (PE-link) optional cards .....           | 1-3        |
| 1-2-3 SUMINET-3200 interface cards .....              | 1-3        |
| 1-2-4 ME-NET interface cards .....                    | 1-3        |
| <b>1-3 Communication Modules .....</b>                | <b>1-4</b> |
| 1-3-1 General-purpose interface module .....          | 1-4        |
| 1-3-2 Remote terminal master module .....             | 1-4        |
| 1. FTM021B .....                                      | 1-4        |
| 2. FTM101B .....                                      | 1-4        |

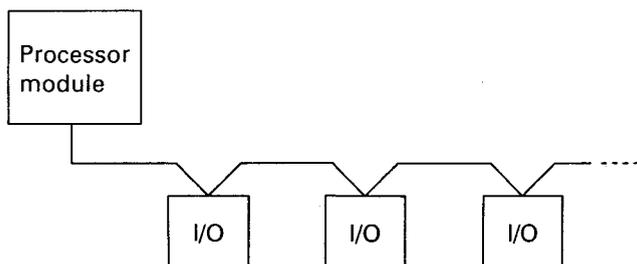
# Section 1. General

## 1-1 Standard System (T-Link/Mini T-Link)

This section describes the various types of networks and communication devices that can be used with the MICREX-F series.

The T-link and mini T-link are serial transmission systems for connecting the MICREX-F series processor to various distributed I/O devices and function units. These systems use shielded twisted pair cables, for high speed economical connection. With T-link, a single processor unit can perform I/O control of up to 32 stations and 1,600 points (9 stations and 560 points with the mini T-link).

- F30/F50/F50H require T-link adapters (Type: FTM050A).
  - F60 is provided with mini T-link.
  - F55 requires T-link master module (Type: NV1L-TL1).
  - F70/F80H are provided with a single T-link system.
  - F70S, F120H, and F120S to F150S are provided with a single T-link system.
- T-link can be expanded by mounting an optional card in these models.



For details, see Section 2.

Five optional cards are available for the MICREX-F series.

### 1-2-1 T-link optional cards

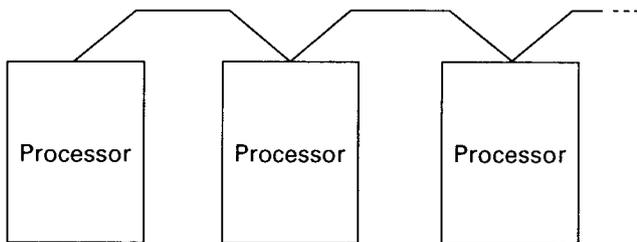
The T-link system can be expanded using optional cards.

- For F70S (Type: NC1L-TL1)
- For F120H and F120S to F150S (Type: FPC120T)

### 1-2-2 P-link (PE-link) optional cards

P-link (PE-link) is a serial transmission system that links distributed MICREX-F series processors in a high-speed and economical way using coaxial cable.

A single P-link system can connect up to 16 stations (64 stations with PE-link), enabling N:N communication between processors.



- Optional cards for P-link:
  - For F70S (Type: NC1H-PL1)
  - For F120H and F120S to F150S (Type: FPC220P)
- Optional cards for PE-link:
  - For 120S to F150S (Type: FPC420P)

For details, see the 'Software' booklet which comes with each series.

### 1-2-3 SUMINET-3200 interface cards

Optional interface cards for the F120H, and F120S to F150S series are available. (Type: FPC320S)

These are communication cards for connecting the F120H, and F120S to F150S series to the SUMINET-3200 general-purpose optical LAN system ('SUMINET-3200' is a registered trademark of Sumitomo Electric Industries). For details, see user's manual No. FH075.

### 1-2-4 ME-NET interface cards

Optional interface cards for the F120S to F150S series are available. (Type: FPC520ME)

These are communication cards for connecting the F120S to F150S series to the ME-NET system. These cards enable the F120S to F150S series to connect to various types of controllers supporting ME-NET.

# 1-3 Communication Modules

## 1-3-1 General-purpose interface module

This is a base board-mounted interface module which has a standard RS-232C or RS-485 interface for personal computers and various other devices. The module is connected to a general-purpose personal computer to read/write data from/to the MICREX-F processor and transfer data to various devices.

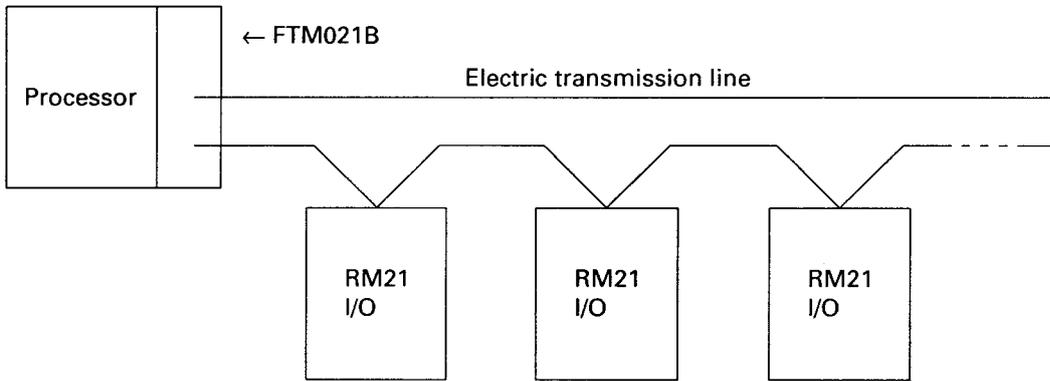
Also available is the FFK120A T-link general-purpose interface capsule (RS-232C/RS-485 type), which can be connected to any processor.

## 1-3-2 Remote terminal master module

### 1. FTM021B

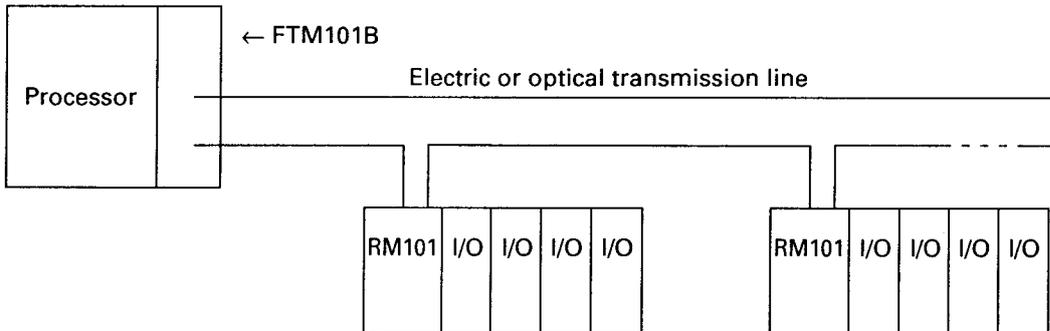
This interface module is mounted on the base board of the F80H, F120H, or F120S to F150S. It performs control

of the remote terminal RM21 series digital and analog I/O.



### 2. FTM101B

This interface module is mounted on the base board of the F80H, F120H, or F120S to F150. It performs control of the remote terminal RM101 series digital and analog I/O.



---

## Section 2 Overview of T-Link

---

|  | Page       |
|--|------------|
| <b>2-1 T-Link (Mini T-Link) Specifications .....</b> | <b>2-2</b> |
| 2-1-1 Basic Specifications .....                     | 2-2        |
| 2-1-2 Cable Specifications .....                     | 2-2        |
| <b>2-2 Basic Rules of T-Link (Mini T-Link) .....</b> | <b>2-3</b> |
| 2-2-1 Station addresses .....                        | 2-3        |
| 2-2-2 I/O area assignment to memory .....            | 2-3        |
| 2-2-3 Number of slave stations connected .....       | 2-4        |
| 2-2-4 Wirings .....                                  | 2-4        |

## Section 2. Overview of T-Link

### 2-1 T-Link (Mini T-Link) Specifications

This section describes an overview of T-link and mini T-link. Where a T-link specification differs from a mini T-link specification, the mini T-link specification is written in parentheses afterwards: T-link (mini T-link). T-link (mini T-link) is a serial transmission system that provides high-speed, economical connection units. It links not only simple remote I/O distributed functions, but also allows information to be exchanged between processors and various distributed function units such as position control devices, display/monitoring units

and personal computers.

T-link (mini T-link) provides 1:N communication for I/O data transmission and message communication, performing polling/selecting control with the processor as the main station.

The T-link slave stations enable T-link (mini T-link) to perform data transmission between processors via I/O memory and data transmission by message communication (may be restricted for some models).

#### 2-1-1 Basic specifications

The specifications of the T-link (mini T-link) are as follows:

| Link type                    | T-link  | Mini T-link   |
|------------------------------|---|---|
| Number of connectable units  | Processors (master stations on T-link system):<br>Max. 2<br>Program loaders: 2 per processor<br>T-link capsules (T-link system slave stations):<br>Max. 32                      | Processors (master stations on mini T-link system): Max. 1<br>Program loaders: 2 per processor<br>Mini T-link capsules<br>(Mini T-link system slave stations): Max. 9 |
| Number of I/O points         | Digital I/O conversion: Max. 1,600 points (per single T-link system)  | Digital I/O conversion: Max. 1,600 points (Per single mini T-link system with T-link converter)   |
| Transmission line format     | Bus configuration (multi-drop)<br>Optical loop connection via inter-bus optical converter<br>(Loop unit may have duplex configuration)  | Bus configuration (multi-drop)  |
| Transmission line            | Bus transmission line: Twisted pair cable (1 pair)<br>Total length: Max. 1km<br>Optical transmission line: SI/GI quartz fiber cable<br>Between optical converters: Max. 1km/3km | Bus transmission line: Twisted pair cable (1 pair)<br>Total length: Max. 100m   |
| Transmission method          | Half-duplex, serial transmission  |   |
| Data exchange method         | 1:N (polling/selecting) method  |   |
| Transmission speed           | 500kbps (kilobits/second)   |   |
| Effective transmission speed | 7k bytes/sec (10ms/digital 512 points)  |   |
| Modulation method            | PDM (pulse duration modulation)   |   |
| Error check                  | FCS (frame check sequence)  |   |
| Transmission line duplexing  | Optical transmission line with optical converter duplexing available  | Not provided  |

#### 2-1-2 Cable specifications

Use the following specified cables for T-link (mini T-link):

| Manufacturer                             | Cable type  |                              | Maximum length |             | Remarks            |
|--|-------------|------------------------------|----------------|-------------|--------------------|
|  |             |                              | T-link         | Mini T-link |                    |
| Furukawa Electric Co., Ltd.              | KPEV-SB     | 0.75mm <sup>2</sup> × 1 pair | 700m           | 100m        | Twisted pair cable |
|  | KPEV-SB     | 1.25mm <sup>2</sup> × 1 pair | 1000m          | 100m        |                    |
|  | KPEV-SB     | 0.5mm <sup>2</sup> × 1 pair  | 700m           | 100m        |                    |
| Daiden Co., Ltd.                         | RMEV-SB     | 0.5mm <sup>2</sup> × 1 pair  | 290m           | 100m        | Robot cable        |
| Taiyo Electric Wire & Cable Co., Ltd.    | RVV-SB      | 0.5mm <sup>2</sup> × 1 pair  | 200m           | 100m        | Robot cable        |
| Sumitomo Electric Industries Co., Ltd.   | TWIN-100    |                              | 250m           | 100m        |                    |
|  | DPEV-SB     | 0.5mm <sup>2</sup> × 1 pair  | 700m           | 100m        |                    |
| Fujikura Electric Wire & Cable Co., Ltd. | IPEV        | 0.5mm <sup>2</sup> × 1 pair  | 700m           | 100m        |                    |
| Hien Denko                               | TTYCYS-1    | × 1 pair                     | 100m           | 100m        | Marine use         |
|  | 250V-TTYCYS | × 1 pair                     | 50m            | 50m         |                    |
| Nippon Electric Wire & Cable Co., Ltd.   | KPEV-SB     | 0.5mm <sup>2</sup> × 1 pair  | 700m           | 100m        |                    |
|  | KNPEV-SB    | 0.5mm <sup>2</sup> × 1 pair  | 700m           | 100m        |                    |
|  | KNPEV-SB    | 1.25mm <sup>2</sup> × 1 pair | 1000m          | 100m        |                    |

Note: The system may not work properly if a cable is used other than those specified in the above table.

## 2-2 Basic Rules of T-Link (Mini T-Link)

This section describes the basic rules on using T-link (mini T-link).

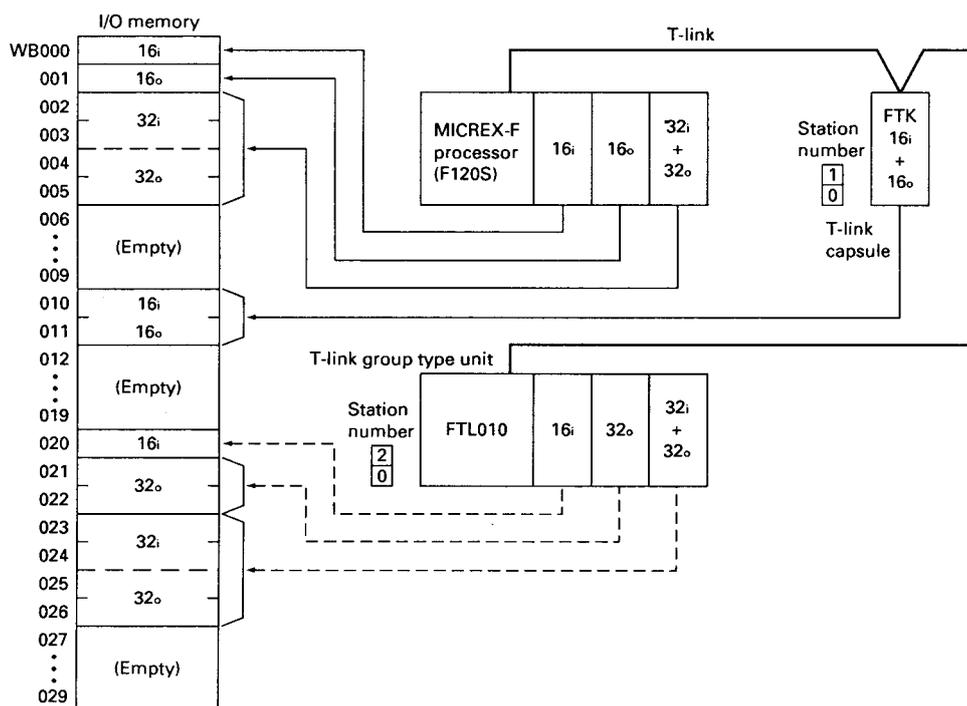
### 2-2-1 Station addresses

The T-link (mini T-link) station address is set using the slave station address setting device. The setting range is decimal 00 to 99. Be sure to set a unique station address for every station. If the master station (processor) has a channel setting switch, the channel number is set in the hundreds digit of the T-link station address and the slave station address is set in the units and tens digits. The channel number setting range is 0 to 3.

### 2-2-2 I/O area assignment to memory

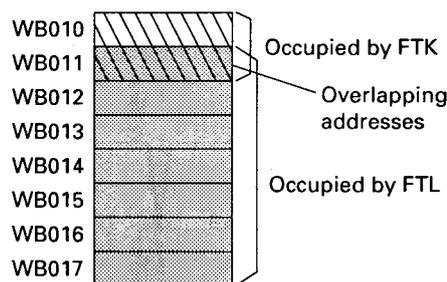
This section describes the I/O area assignment when the MICREX-F processor is the master station. (For the FTM100B MICREX-F mini T-link master module, NS-TL and NJ-TL FLEX-PC T-link master modules, NS-TLM and NJ-TLM mini T-link master modules, and NB3 master module, see the individual manual.) Slave station I/O areas are assigned to the master station memory (WB area) beginning with the slave station address, and going from smaller to larger numbers. An example is given below.

- Slave station I/O area assignment example (i indicates input and o, output.)



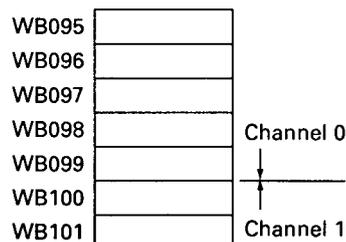
Note 1: Set slave station addresses so that the areas of different stations will not overlap.

Example: In the diagram above, the FTK station number is 10 and the FTL station number is 11. FTK I/O memory occupies WB10 and WB11 and FTL I/O memory occupies WB11 to WB17. Therefore, WB11 is an overlapping address and an error occurs.



Note 2: Set the areas for each slave station to occupy so that they do not cross channel boundaries.

Example: In the diagram above, the FTL station number is 95 and FTL I/O memory occupies WB95 to WB101. Since FTL I/O memory extends over channels 0 and 1, an error occurs.



## 2-2 Basic Rules of T-Link (Mini T-Link)

### 2-2-3 Number of slave station units connected

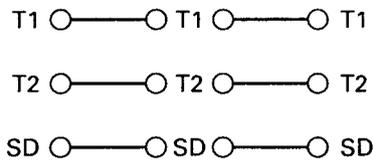
Up to 32 (9) slave station units can be connected to a T-link (mini T-link) system. If more than this number of units is connected, T-link data transmission may not succeed. Note that up to 32 units can be connected to a mini T-link system by converting the mini T-link signal to a T-link signal using a T-link converter

(FRC100A-GO2) or T-link repeater (FRC200A-C10). In this case the repeater and converter are not included in the number of units connected, as they have no local station numbers. An error occurs if more than 32 units with local station numbers are connected to a T-link system.

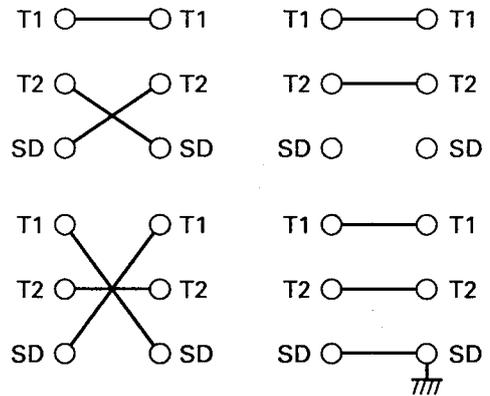
### 2-2-4 Wirings

- T-link (mini T-link) cables with the same signal names, such as T1-T1, T2-T2, and SD-SD (S1-S1, S2-S2, and SD-SD) can be connected. Do not ground the T1, T2, and SD cables.

#### Correct



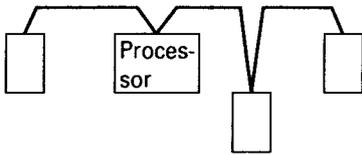
#### Incorrect



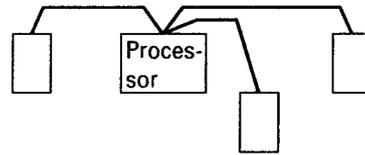
- Cables must be connected in series. (Wiring must not branch.) The processor can be installed at any

place on T-link (mini T-link). Wiring need not be made in the order of slave station addresses.

#### Correct



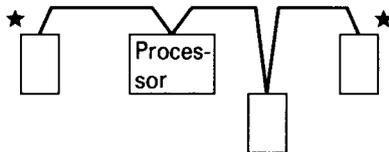
#### Incorrect



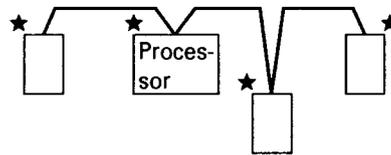
- Terminating resistors ( $100\Omega$ ) are connected only on both ends of T-link (mini T-link) wiring between T1 and T2 (S1 and S2). If a terminating resistor is

connected between both ends or no cable is connected on the end, T-link transmission error may occur.

#### Correct



#### Incorrect



★: Terminating resistor mounting position

---

## Section 3 T-Link Communication Specifications

---

|   | Page       |
|---|------------|
| <b>3-1 T-Link (Mini T-Link) Transmission Basics</b> .....     | <b>3-2</b> |
| 1. Initial transmission .....                                 | 3-2        |
| 2. Normal transmission .....                                  | 3-2        |
| 3. Additional connection check .....                          | 3-2        |
| 4. Transmission errors .....                                  | 3-2        |
| <b>3-2 Transmission Types</b> .....                           | <b>3-3</b> |
| 3-2-1 I/O transmission .....                                  | 3-3        |
| 1. I/O transmission with other than F60 series processors ... | 3-3        |
| 2. I/O transmission with F60 series processors .....          | 3-3        |
| 3-2-2 Message transmission .....                              | 3-4        |
| <b>3-3 I/O Data Flow</b> .....                                | <b>3-5</b> |
| <b>3-4 Message Transmission Types</b> .....                   | <b>3-8</b> |

# Section 3. T-Link Communication Specifications

## 3-1 T-Link (Mini T-Link) Transmission Basics

T-link (mini T-link) data transmission is done by a polling/selecting method in which the master station specifies the slave station to talk to by its number, and the corresponding slave station responds. This section covers data transmission basics. Unless otherwise indicated, T-link refers to both T-link and mini T-link.

### 1. Initial transmission

When the power is turned on, the master station performs initial transmission before starting to operate. Specifically, master station checks the I/O configuration and the address of the slave station connected to T-link at power-on. Checking is performed from station 0 to station 99. After checking completes, the master station begins operating. If the T-link registration function is in use, the master station does not start operating until all registered stations are participating in T-link transmission. (For details on T-link registration, see Section 4-2.)

### 2. Normal transmission

When initial transmission completes, T-link enters normal transmission mode. In this mode, I/O data exchange is done for slave stations which have been confirmed for T-link transmission participation during initial transmission. I/O data exchange is done in ascending station number order. Once data has been transmitted to the final station, the process of data transmission is repeated, again proceeding by station number, in ascending order. This cycle is called a transmission cycle.

### 3. Additional connection check

Sometimes during normal transmission, the master station performs transmission to check whether a new station is participating in transmission. This is called additional connection check. This process allows a slave station to participate in T-link transmission even if its power is turned on after the master station has been turned on. If the T-link registration function is in use, additional connection check is not performed for stations other than registered stations, so a new unregistered station cannot participate in transmission that has already started.

### 4. Transmission errors

If an error occurs during T-link transmission, communication fails, so the T-link master station performs transmission retry. Errors may be caused by disconnection of slave station power supply, T-link cable disconnection, noise, or malfunctioning T-link transmission elements in the master station or slave stations. If communication returns to normal state after transmission retry, T-link transmission continues and the master station continues to operate. If communication still fails after transmission retry has been repeated three times for the same slave station, under normal operation, the master station assumes a T-link fatal fault has occurred, and stops operation. In this case, the master station does not resume operation until the cause of the fault is removed and master station power is reset. However, if fail-soft operation has been set, the master station assumes only a nonfatal fault has occurred, and continues operation. (For details of fail-soft operation, see Section 4-1.)

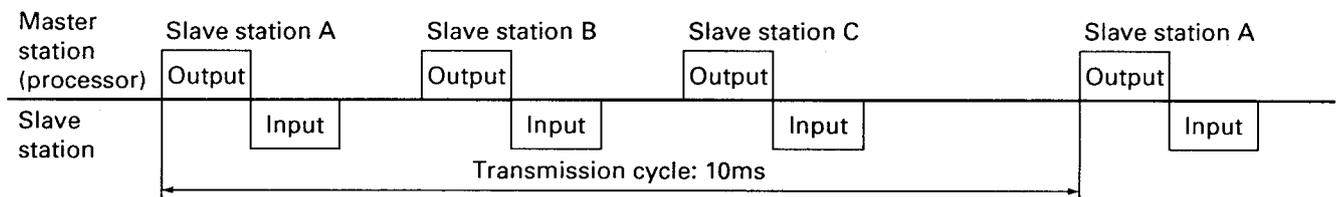
T-link performs two types of transmission:  
I/O transmission and message transmission.

### 3-2-1 I/O transmission

#### 1. I/O transmission with other than F60 series processors

I/O transmission is a high-speed communication method enabling transmission of signals from distributed I/O devices to a programmable controller (PC). With T-link systems, data refresh is usually performed every 10ms (every scan end for the F60 series).

The data refresh cycle may exceed 10ms, however, if many I/O devices are connected to a T-link system, or there is a large number of occupied words. I/O transmission takes place in the I/O area (B area) and the area to which I/O expansion has been specified.

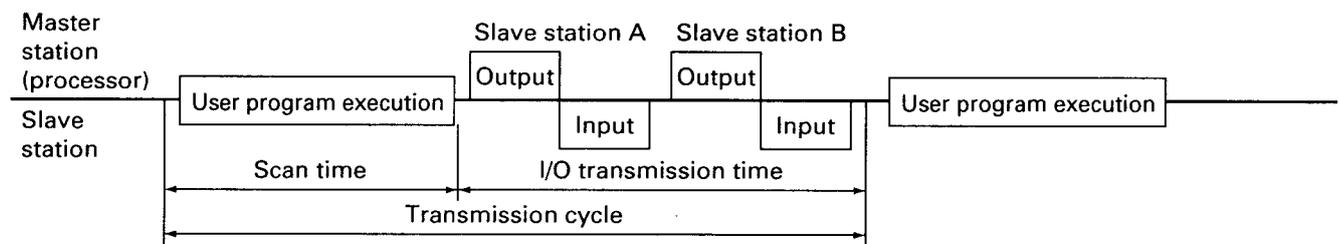


#### 2. I/O transmission with F60 series processors

Unlike other MICREX-F series processors, F60 series processors perform I/O transmission synchronized to scanning (the scan synchronous method).

The transmission cycle of this method is scan time + I/O transmission time. (See diagram below.)

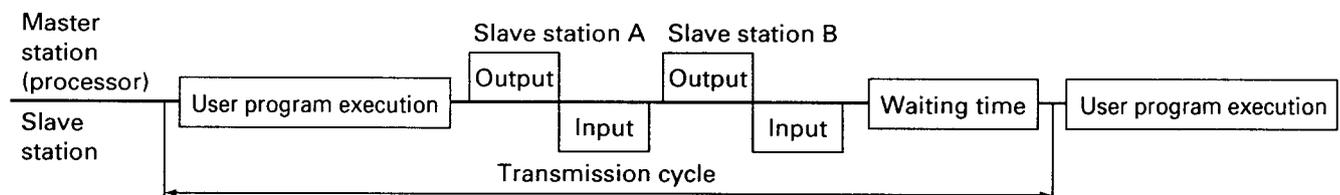
#### Scan synchronous method



- The scan time depends on the system configuration, number of user program steps, and command type used.
- The I/O transmission time depends on the number of stations connected to mini T-link and the number of occupied words. Normally, it is 10ms or shorter. In addition to the above method, the F60 series can also perform I/O transmission by the fixed-cycle method. This method operates in basically the

same manner as the scan synchronous method, but if scan time + I/O transmission time < 10ms, it inserts a waiting time before executing the next user program, so that transmission cycle = 10ms. If scan time + I/O transmission time ≥ 10ms, the next user program is executed immediately after I/O transmission ends (the same operation as that of the scan synchronous method).

#### Fixed-cycle method



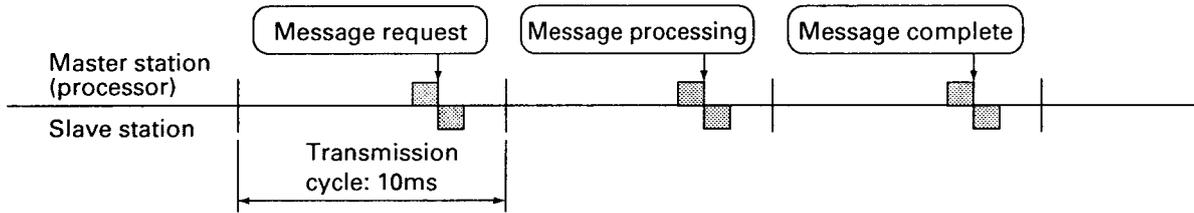
## 3-2 Transmission Types

### 3-2-2 Message transmission

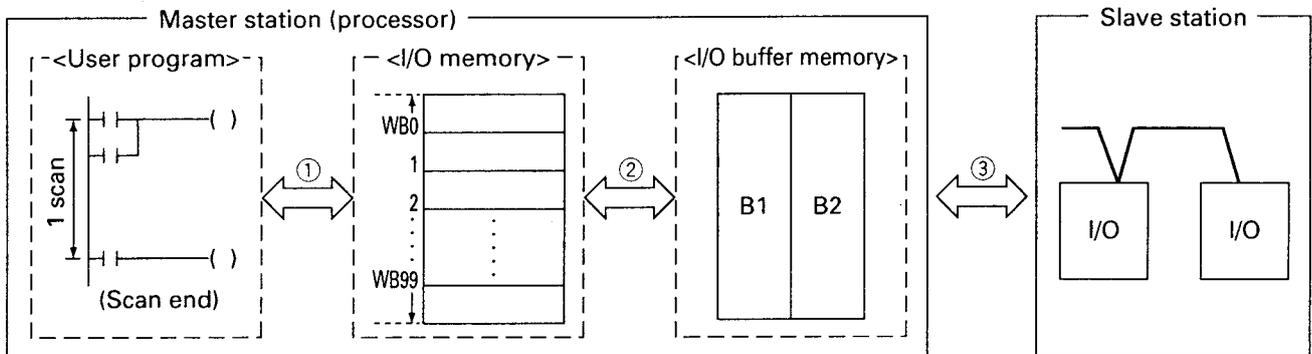
Message transmission is a communication method for exchanging large amounts of data between the master station and slave stations. With T-link systems, message transmission is slower than I/O transmission because time is required for a number of I/O transmissions from when a message request is issued, until data transfer completes.

Also, if more than one message transmission device (POD, FFK120A), or a PC loader is connected to a single master station, communication becomes slower in proportion to the number of units connected, since the master station performs message transmission for one station at a time.

#### Example of message transmission



This section describes data flow in T-link transmission. I/O data is exchanged via various types of memory as shown below.



- ① Data exchange between the user program and I/O memory is performed as each step of the user program is executed.
- ② Data exchange between I/O memory and I/O buffer memory (B1) is performed all at once at each master station scan end. I/O buffer memory consists of B1 and B2, which are of equal size.
- ③ Data exchange between I/O buffer memory and a slave station is performed by writing input data from the slave station to B2 during I/O transmission and reading output data to the slave station from B1. The contents of I/O buffer memory B1 and B2 are exchanged at the end of every I/O transmission cycle.

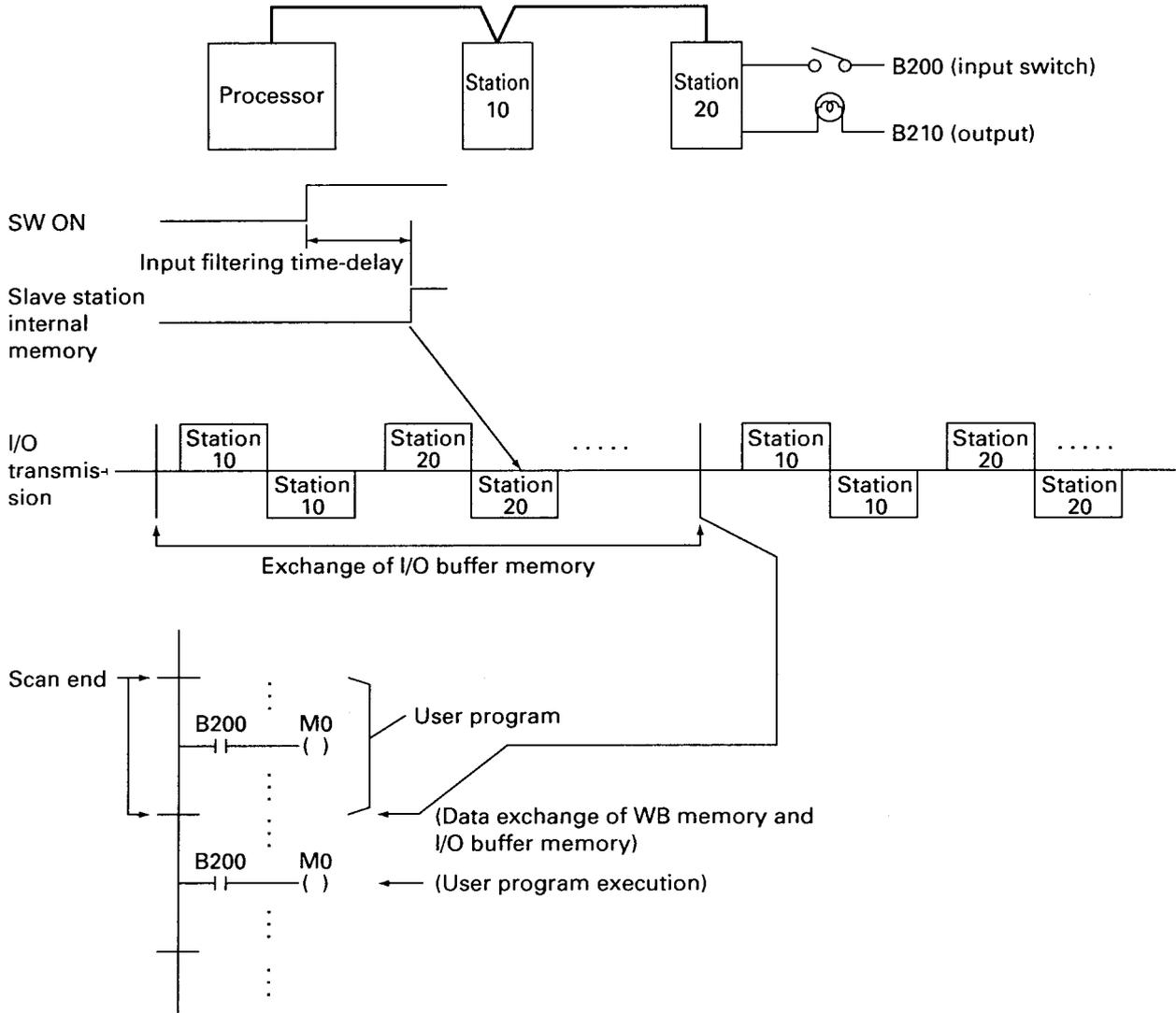
### 3-3 I/O Data Flow

#### Input data flow

This section shows data flow and timing for a system with slave stations 10 and 20, from the time that the slave station turns ON the input switch of station 20,

until the processor user program turns ON address B200.

#### System configuration



Data transmission time is calculated as the total of the following items:

- ① From input switch ON time to slave station internal memory (input filtering time-delay)  
Input filtering time-delay (response time) depends on the type of input module used. For details, see the 'Hardware' user's manual.
- ② From when data is read out from slave station internal memory for I/O transmission until I/O transmission ends (I/O buffer memory exchange timing)
- ③ From I/O transmission end to scan end (data exchange timing between WB memory and I/O buffer memory) to user program execution

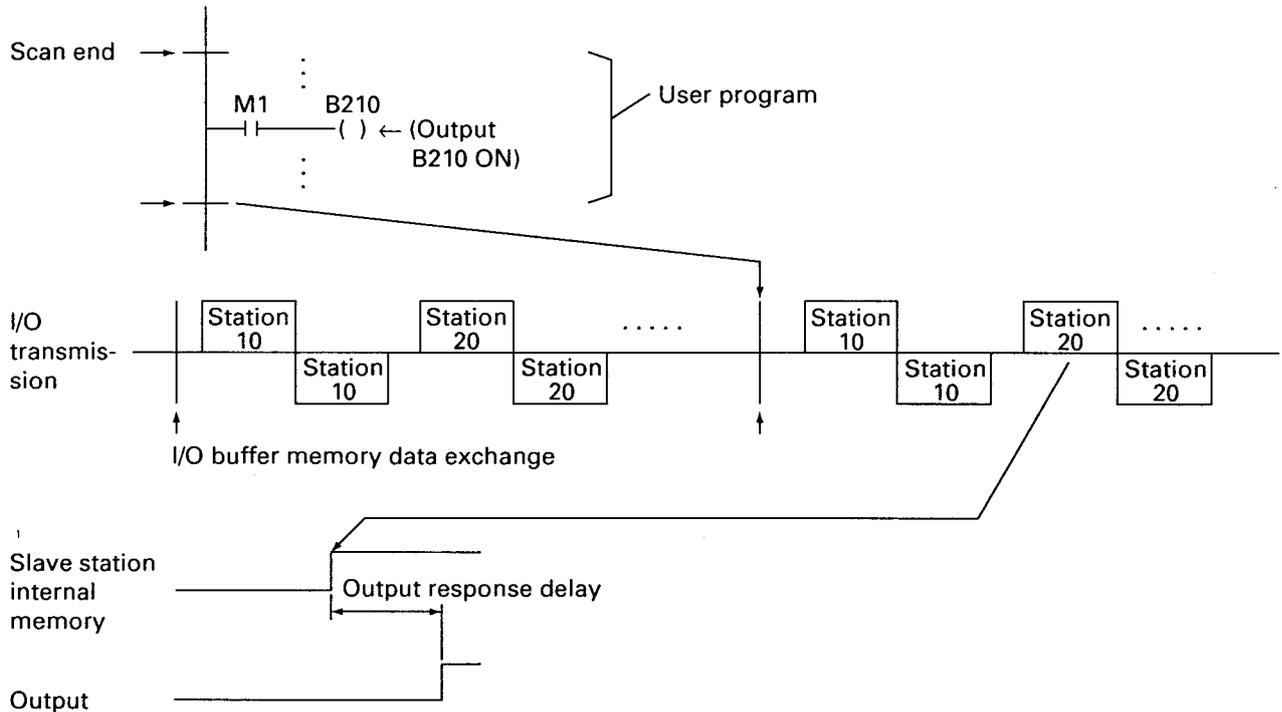
$$\begin{aligned} \text{Data transmission time (minimum value)} &= \text{Input filtering time-delay} + (\text{scan time}) \times 1 \\ \text{Data transmission time (maximum value)} &= \text{Input filtering time-delay} + (\text{transmission cycle}) \times 2 \\ &\quad + (\text{scan time}) \times 2 \end{aligned}$$

**Caution:** If the input switch ON (or OFF) time is shorter than  $(\text{transmission cycle}) \times 2 + (\text{scan time})$ , the switch may not be turned ON (or OFF) because the processor program misses it.

#### Output data flow

The system configuration is the same as that for 'Input data flow' on the previous page. This section shows data flow and timing from when the processor user program turns ON station 20 output data B210, until

the actual output is turned ON.  
(Output data flow is done in the reverse manner of input data flow.)



Data transmission time is calculated as the total of the following items:

- ① From when the user program turns ON output B210 to scan end
- ② From scan end to I/O transmission end to arrival of transmission from station 20 (data write in the slave station internal memory)
- ③ From slave station internal memory to output ON (output response delay)  
Output response delay (response time) depends on the output module type used. For details, see the 'Hardware' user's manual.

Data transmission time (minimum value) =  
(Scan time) × 1 + output response delay

Data transmission time (maximum value) =  
(Scan time) × 1 + (transmission cycle) × 2 + output response delay

Caution: If the ON (OFF) time is shorter than (scan time) × 1 + (transmission cycle) × 2 in the output program, actual output may not be turned ON (OFF).

### 3-4 Message Transmission Types

There are three types of message transmission:

- ① Data transmission by message module (registering message modules using annunciator relay)
- ② Data transmission by message communication command (MSGT/MSGR)

③ Data transmission by loader command  
Table 1 below shows the features of these data transmission methods.

| Item \ Type  | Message module | MSGT/MSGR           | Loader command |
|--|----------------|---------------------|----------------|
| Creation of communication program in the processor | Required       | Required            | Not required   |
| Creation of system definition in the processor     | Required       | Not required        | Not required   |
| Target processor                                   | Not restricted | Restricted (Note 1) | Not restricted |

**Table 1**

Note 1: The table below shows whether the MSGT/MSGR command can be used in each processor.

| F30 | F50, F50H | F55 | F60 | F70, F70S | F80H | F120H | F120S - F150S |
|-----|-----------|-----|-----|-----------|------|-------|---------------|
| ×   | ×         | ○   | ×   | ○         | ○    | ○     | ○             |

○: Available    ×: Not available

### 3-4 Message Transmission Types

Table 2 below shows whether message transmission is performed on the slave station in each type.

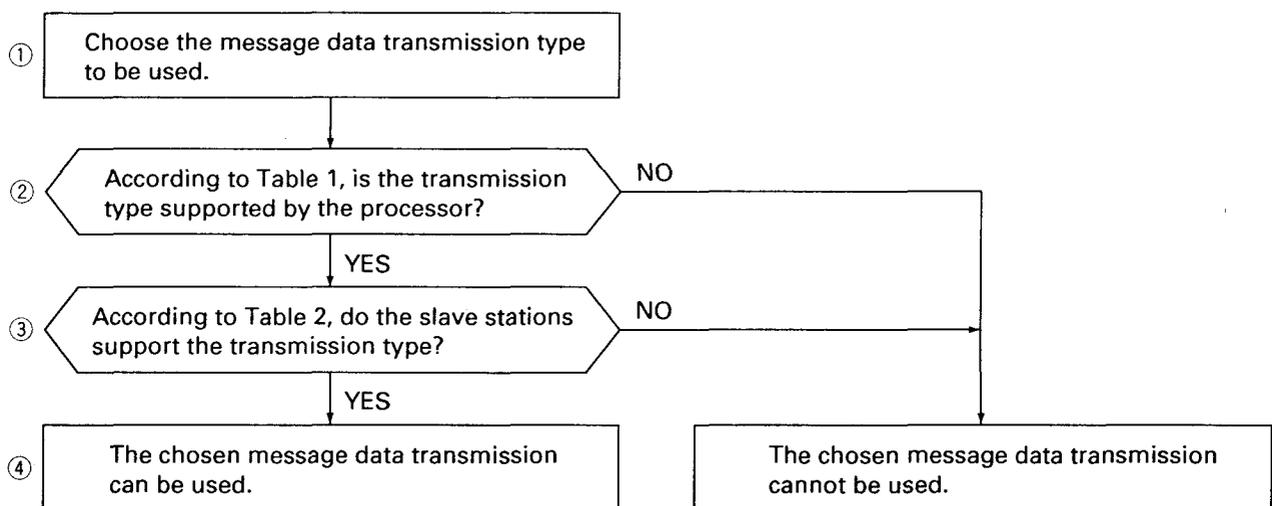
(For types other than those shown in the table below, refer to the manual of the individual type.)

| Type              |              |   | Message module | MSGT/MSGR | Loader command |
|-------------------|--------------|---|----------------|-----------|----------------|
| T-link connection | FFK100A      | General-purpose interface capsule                 | ○              | ×         | ○              |
|                   | FFK120A      | General-purpose interface capsule                 | ○              | ×         | ○              |
|                   | FFU098B      | T-link interface board for PC9801 series          | ○              | ×         | ○              |
|                   | FFU050A      | T-link interface board for FMR series             | ○              | ×         | ○              |
|                   | FFU080A      | T-link interface board for IBM PC/AT              | ○              | ×         | ○              |
|                   | FMK140A      | Memory capsule                                    | ○              | ○         | ○              |
| Base mounting     | FFU120B      | General-purpose interface module                  | ○              | ×         | ○              |
|                   | FTL651B      | T-link slave module                               | ○              | ○         | ×              |
|                   | FTM021B      | Remote terminal master module (RM21 type)         | ×              | ○         | ×              |
|                   | FTM101B      | Remote terminal master module (RM101 type)        | ×              | ○         | ×              |
|                   | FGU120B      | Servo module                                      | ×              | ○         | ×              |
|                   | FGU130B      | Stepping motor module                             | ×              | ○         | ×              |
|                   | FFU610B      | Magnetic card interface module                    | ×              | ○         | ×              |
|                   | NC1L-RS2/RS4 | General-purpose interface module (for F70 series) | ○              | ×         | ○              |
|                   | NC1L-TS1     | T-link slave module (for F70 series)              | ○              | ○         | ×              |
|                   | NV1L-TS1     | T-link slave module (for F55 series)              | ○              | ○         | ×              |
|                   | NV1L-RS2     | General-purpose interface module (for F55 series) | ○              | ×         | ○              |

Table 2

○: Available ×: Not available

Message data transmission is possible only if it is supported by both the processor and slave stations.



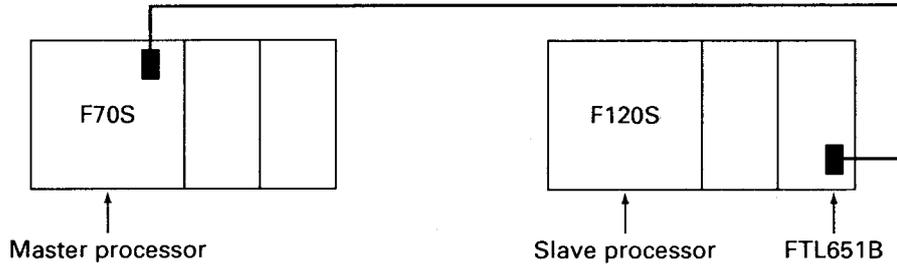
### 3-4 Message Transmission Types

#### Example 1

- ① Processor: F120S (slave) and F70S (master)  
Slave station: FTL651B  
Message data transmission type used:  
MSGT/MSGR
- ② According to Note 1 of Table 1, the processors (F120S and F70S) support MSGT/MSGR message data transmission.

- ③ According to Table 2, the slave station (FTL651B) supports MSGT/MSGR message data transmission.
- ④ This system can perform MSGT/MSGR message data transmission.

System configuration diagram

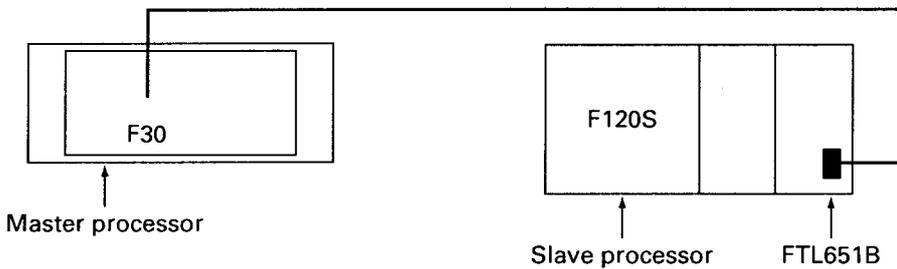


#### Example 2

- ① Processor: F120S (slave) and F30 (master)  
Slave station: FTL651B  
Message data transmission type used:  
MSGT/MSGR
- ② According to Note 1 of Table 1, F120S supports MSGT/MSGR message transmission, but F30 doesn't.
- ③ According to Table 2, the slave station (FTL651B) supports MSGT/MSGR message data transmission.

- ④ In item ②, we see that the F30 master processor does not support MSGT/MSGR message data transmission, so this system cannot perform MSGT/MSGR message data transmission. Note however that message module data transmission is possible with this system. Items ② and ③ show that the processors and slave station support message module data transmission.

System configuration diagram



See Section 6 for information on how to use each type of message transmission.

---

## Section 4 T-Link Applications (System Definition)

---

|   | Page        |
|---|-------------|
| <b>4-1 Fail-Soft Operation</b> .....                                      | <b>4-2</b>  |
| 4-1-1 Fail-soft operation (general fail-soft) .....                       | 4-2         |
| 4-1-2 Individual fail-soft operation .....                                | 4-7         |
| <b>4-2 T-Link Registration</b> .....                                      | <b>4-9</b>  |
| 4-2-1 Overview .....  | 4-9         |
| 4-2-2 Specifying the control range .....                                  | 4-9         |
| 1. Operation at power-on .....  | 4-9         |
| 2. Operation during processor running .....                               | 4-9         |
| 4-2-3 Notes on T-link registration .....                                  | 4-15        |
| <b>4-3 Fail-Soft Operation Registration and T-Link Registration</b> ..... | <b>4-16</b> |
| <b>4-4 Hold Registration</b> .....  | <b>4-19</b> |
| 4-4-1 Overview .....  | 4-19        |
| 4-4-2 Setting hold registration .....                                     | 4-19        |
| <b>4-5 Processor Duplex Operation (Backup)</b> .....                      | <b>4-21</b> |
| 4-5-1 Overview .....  | 4-21        |
| 4-5-2 Duplex specifications .....   | 4-23        |
| 4-5-3 Duplex special relay .....  | 4-23        |
| 4-5-4 Duplex processor mutual monitoring .....                            | 4-24        |
| 1. Items the master processor monitors in the slave<br>processor .....    | 4-24        |
| 2. Items the slave processor monitors in the master<br>processor .....    | 4-24        |
| 4-5-5 Duplex system T-link connection and operation .....                 | 4-24        |
| 1. Normal connection .....  | 4-24        |
| 2. T-link disconnection or non-connection .....                           | 4-24        |
| 4-5-6 Duplex system and program loader (LITE) .....                       | 4-25        |
| 4-5-7 System definition registration .....                                | 4-26        |
| 4-5-8 Duplex system troubleshooting .....                                 | 4-28        |
| 1. Start-up .....   | 4-28        |
| 2. Duplex system switching .....  | 4-28        |
| 4-5-9 Caution on duplex system with optional T-link .....                 | 4-29        |
| <b>4-6 Specifying the I/O Expansion Area</b> .....                        | <b>4-30</b> |
| 4-6-1 Overview .....  | 4-30        |
| 4-6-2 How to specify I/O expansion .....                                  | 4-32        |
| <b>4-7 System Definition and Processor Model</b> .....                    | <b>4-37</b> |

# Section 4. T-Link Applications (System Definition)

## 4-1 Fail-Soft Operation

This section describes the MICREX-F series F-NET system's various functions for improving reliability.

When an error occurs in a unit/capsule on the T-link (mini T-link) system, fail-soft operation allows the other units/capsules to continue operating. Note that fail-soft operation will not prevent the system from stopping if an error occurs in a bus expansion unit directly connected to an F30, F50 or F50H series processor.

Fail-soft operation registration is performed during the programming loader's 'system definition' procedure. In a process control plant for example, registration of fail-soft operation is an effective way to prevent stoppage of the entire system, and minimize the extent of operation stoppage using line control.

### 4-1-1 Fail-soft operation (general fail-soft)

The operating condition, display, and alarm contact of each capsule during fail-soft operation may differ depending on whether T-link configuration registration is set. For all MICREX-F series, the operation mode is

classified according to the settings of fail-soft operation and T-link configuration registration, as shown in the table below.

|   | Operation mode  | Setting of fail-soft operation | T-link configuration registration | Typical system                                     |
|---|---|--------------------------------|-----------------------------------|--|
| 1 | Standard use  | No                             | No                                | Standard system                                    |
| 2 | Monitoring of disconnected I/O capsule  | Yes                            | No                                | Monitoring system                                  |
| 3 | Monitoring of distributed I/O capsule   | No                             | Yes                               | FTK capsule (link type capsule) distributed system |
| 4 | Removing of disconnected I/O capsule<br>Monitoring of distributed I/O capsule | Yes                            | Yes                               |  |

If the following conditions occur during PC running (execution), the processor operation and display for

each fail-soft and T-link configuration registration setting are as shown below (same for all MICREX-F series).

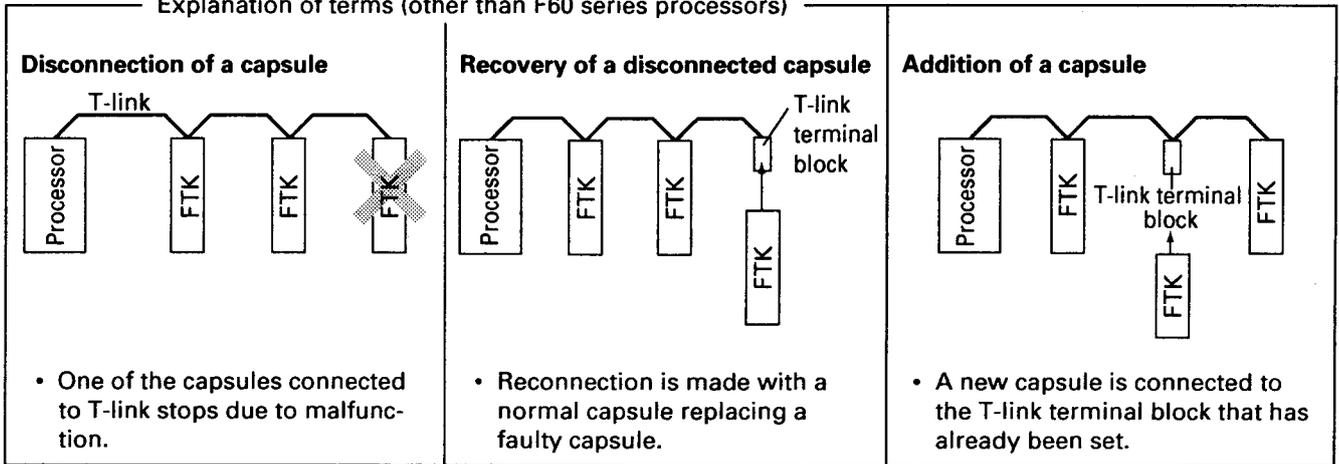
| Condition                   |     | T-link configuration registration  |  |  |
|-----------------------------|-----|------------------------------------|--|--|
|                             |     | Yes                                | No   |  |
| Fail-soft operation setting | Yes | Disconnection of a capsule         | RUN → Stays lit.<br>ALARM2 (nonfatal fault) → Lights up.<br>Processor continues execution.                   | 2RUN → Stays lit.<br>ALARM2 (nonfatal fault) → Lights up.<br>Processor continues execution.                  |
|                             |     | Recovery of a disconnected capsule | Processor continues execution.<br>Recovered capsule becomes capable of I/O.                                  | Processor continues execution.<br>Recovered capsule becomes capable of I/O.                                  |
|                             |     | Adding of a capsule                | Processor continues execution.<br>Added capsule is not capable of I/O.                                       | Processor continues execution.<br>Added capsule is capable of I/O.   |
|                             | No  | Disconnection of a capsule         | RUN → Goes off.<br>ALARM1 (fatal fault) → Lights up.<br>Processor stops execution.                           | RUN → Goes off.<br>ALARM1 (fatal fault) → Lights up.<br>Processor stops execution.                           |
|                             |     | Recovery of a disconnected capsule | RUN → Goes off.<br>ALARM1 (fatal fault) → Lights up.<br>Processor stops execution.<br>(Entire system stops.) | RUN → Goes off.<br>ALARM1 (fatal fault) → Lights up.<br>Processor stops execution.<br>(Entire system stops.) |
|                             |     | Adding of a capsule                | Processor continues execution.<br>Added capsule is not capable of I/O.                                       | Processor continues execution.<br>Added capsule is capable of I/O.   |

#### Available types

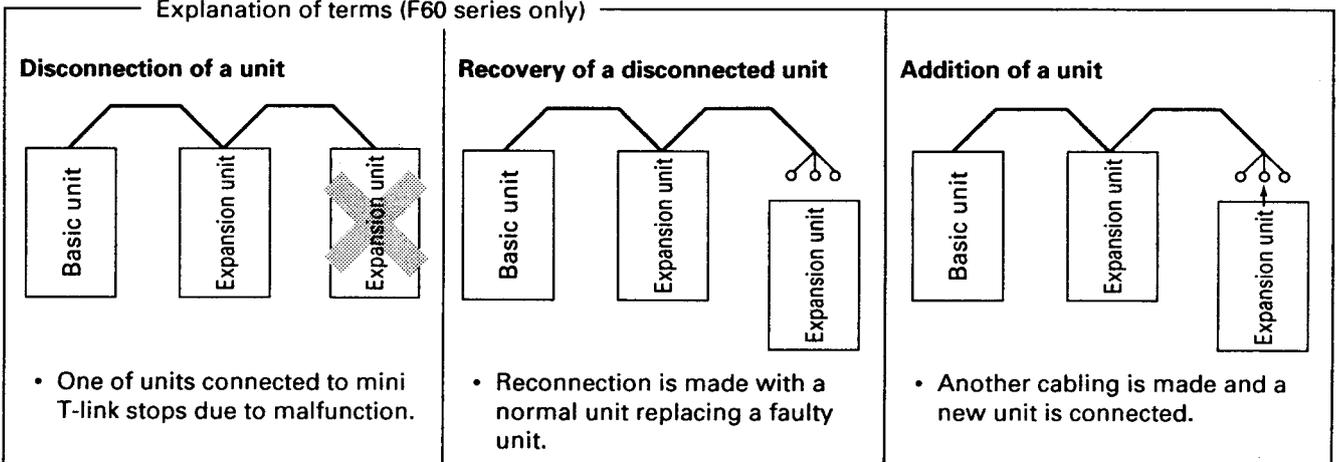
- F30 series
- F50/F50H series
- F55 series
- F60 series
- F70 series
- F80H series
- F120H series
- F120S/F140S/F150S series

Here we explain terms used in the tables on the previous page.

### Explanation of terms (other than F60 series processors)



### Explanation of terms (F60 series only)



Operating conditions, indications, and alarm contact operations in the case of error (malfunction) and its recovery are explained beginning on the next page.

• **Explanation of operating condition symbols shown on subsequent pages**

**Processor operation**

**RUN**:

Processor judges that the system is normal, and proceeds with operation.

**RUN** **ALM** or **RUN** **ALM2**:

Processor judges that a T-link configuration fault has occurred, displays ALM or ALM2, and continues operating.

**ALM** or **ALM1** **ALM2**:

Processor judges that a T-link fault or T-link configuration fault have occurred, displays **ALM** or **ALM1** and **ALM2**, and stops.

**I/O unit operation**

○: Normal — I/O unit communicates with the processor normally.

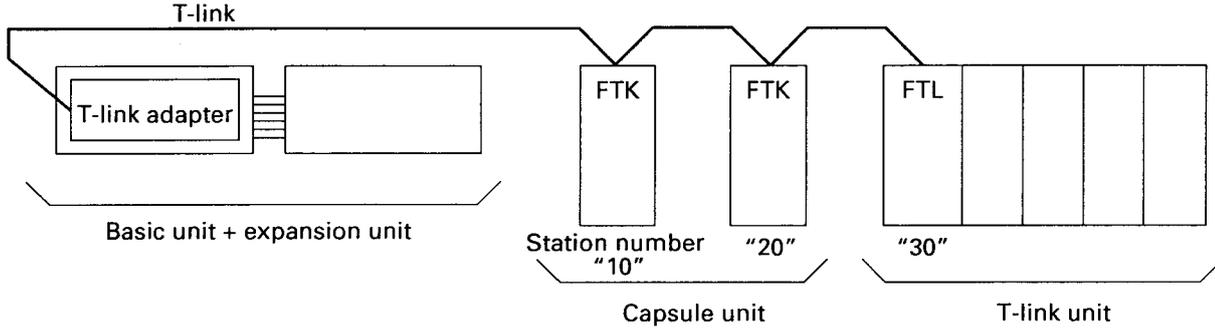
×: Disconnected or stopped — I/O unit does not operate.

# 4-1 Fail-Soft Operation

## Case 1: Fail-soft operation (removing of disconnected I/O)

The differences in operation with fail-soft operation YES and NO for the F30, F50 and F50H systems are shown below.

### Example of system



Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

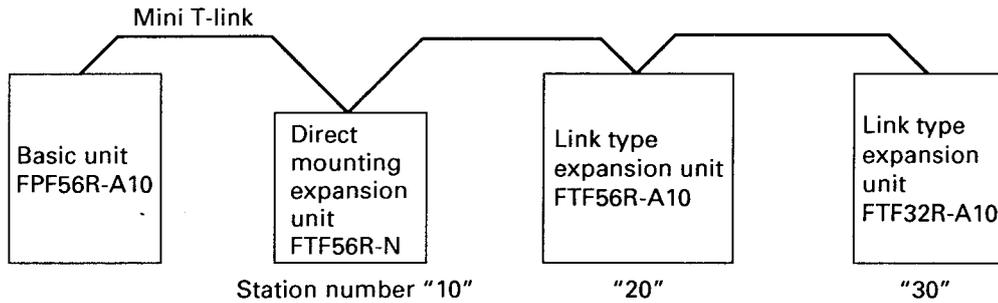
| Operating condition              |                     | Start-up Status <b>A</b> |     | During operation Status <b>B</b> |            | Power recovery (I/O) Status <b>A</b> |  |
|----------------------------------|---------------------|--------------------------|-----|----------------------------------|------------|--------------------------------------|--|
| Fail-soft operation registration |                     | NO                       | YES | NO                               | YES        | NO                                   | YES  |
| Basic unit                       | Processor unit '00' | RUN                      | RUN | ALM                              | RUN<br>ALM | ALM                                  | RUN  |
|                                  | I/O unit            | ○                        | ○   | ×                                | ○          | ×                                    | ○  |
| Capsule unit                     | Station number 10   | ○                        | ○   | ×                                | ○          | ×                                    | ○  |
|                                  | Station number 20   | ○                        | ○   | ×                                | ○          | ×                                    | ○  |
| FTL unit                         | Station number 30   | ○                        | ○   | ×                                | ×          | ×                                    | ○<br>Operates within 10 seconds after recovery |

| Operating condition              |                     | Start-up Status <b>A</b> |     | During operation Status <b>B</b> |            | Start-up Status <b>B</b> |     | During operation Status <b>A</b>               |  |
|----------------------------------|---------------------|--------------------------|-----|----------------------------------|------------|--------------------------|-----|--|--|
| Fail-soft operation registration |                     | NO                       | YES | NO                               | YES        | NO                       | YES | NO   | YES  |
| Basic unit                       | Processor unit '00' | RUN                      | RUN | ALM                              | RUN<br>ALM | RUN                      | RUN | RUN  | RUN  |
|                                  | I/O unit            | ○                        | ○   | ×                                | ○          | ○                        | ○   | ○  | ○  |
| Capsule unit                     | Station number 10   | ○                        | ○   | ×                                | ○          | ○                        | ○   | ○  | ○  |
|                                  | Station number 20   | ○                        | ○   | ×                                | ○          | ○                        | ○   | ○  | ○  |
| FTL unit                         | Station number 30   | ○                        | ○   | ×                                | ×          | ×                        | ×   | ○<br>Operates within 10 seconds after recovery | ○<br>Operates within 10 seconds after recovery |

**Case 2:** Fail-soft operation (removing of disconnected I/O)

The differences in operation with fail-soft operation YES and NO for the F60 system are shown below.

**Example of system**



Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

| Operating condition              |                     | Start-up Status <b>A</b> |            | During operation Status <b>B</b> |                           | Power recovery (I/O) Status <b>A</b> |  |
|----------------------------------|---------------------|--------------------------|------------|----------------------------------|---------------------------|--------------------------------------|--|
| Fail-soft operation registration |                     | NO                       | YES        | NO                               | YES                       | NO                                   | YES  |
| Basic unit                       | Processor unit '00' | <b>RUN</b>               | <b>RUN</b> | <b>ALM1</b><br><b>ALM2</b>       | <b>RUN</b><br><b>ALM2</b> | <b>ALM1</b><br><b>ALM2</b>           | <b>RUN</b>                                     |
|                                  | I/O unit            | ○                        | ○          | ×                                | ○                         | ×                                    | ○  |
| Expansion unit                   | Station number 10   | ○                        | ○          | ×                                | ○                         | ×                                    | ○  |
|                                  | Station number 20   | ○                        | ○          | ×                                | ○                         | ×                                    | ○  |
|                                  | Station number 30   | ○                        | ○          | ×                                | ×                         | ×                                    | ○<br>Operates within 10 seconds after recovery |

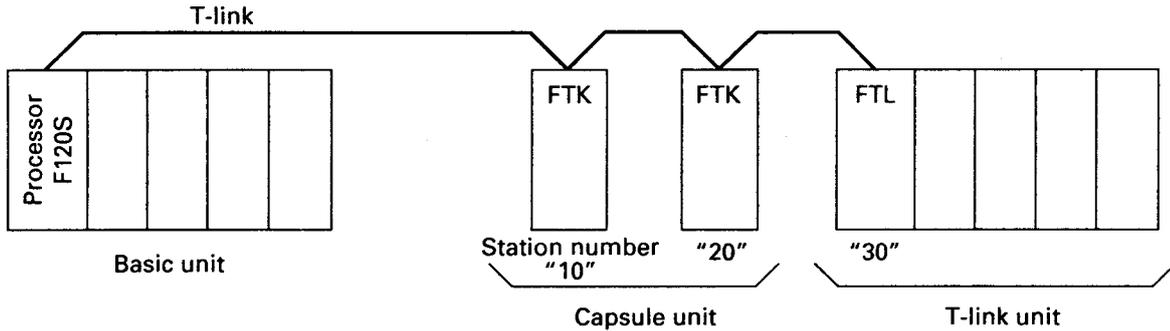
| Operating condition              |                     | Start-up Status <b>A</b> |            | During operation Status <b>B</b> |                           | Start-up Status <b>B</b> |            | During operation Status <b>A</b>               |  |
|----------------------------------|---------------------|--------------------------|------------|----------------------------------|---------------------------|--------------------------|------------|--|--|
| Fail-soft operation registration |                     | NO                       | YES        | NO                               | YES                       | NO                       | YES        | NO   | YES  |
| Basic unit                       | Processor unit '00' | <b>RUN</b>               | <b>RUN</b> | <b>ALM1</b><br><b>ALM2</b>       | <b>RUN</b><br><b>ALM2</b> | <b>RUN</b>               | <b>RUN</b> | <b>RUN</b>                                     | <b>RUN</b>                                     |
|                                  | I/O unit            | ○                        | ○          | ×                                | ○                         | ○                        | ○          | ○  | ○  |
| Expansion unit                   | Station number 10   | ○                        | ○          | ×                                | ○                         | ○                        | ○          | ○  | ○  |
|                                  | Station number 20   | ○                        | ○          | ×                                | ○                         | ○                        | ○          | ○  | ○  |
|                                  | Station number 30   | ○                        | ○          | ×                                | ×                         | ×                        | ×          | ○<br>Operates within 10 seconds after recovery | ○<br>Operates within 10 seconds after recovery |

## 4-1 Fail-Soft Operation

### Case 3: Fail-soft operation (removing of disconnected I/O)

The differences in operation with fail-soft operation YES and NO for the F55, F70, F70S, F80H, and F120S to F150S systems are shown below.

#### Example of system



Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

| Operating condition              |                     | Start-up Status <b>A</b> |     | During operation Status <b>B</b> |              | Power recovery (I/O) Status <b>A</b> |  |
|----------------------------------|---------------------|--------------------------|-----|----------------------------------|--------------|--------------------------------------|--|
| Fail-soft operation registration |                     | NO                       | YES | NO                               | YES          | NO                                   | YES  |
| Basic unit                       | Processor unit '00' | RUN                      | RUN | ALM1<br>ALM2                     | RUN<br>ALM2  | ALM1<br>ALM2                         | RUN  |
|                                  | I/O unit            | ○                        | ○   | ×                                | ○            | ×                                    | ○  |
| Capsule unit                     | Station number 10   | ○                        | ○   | ×                                | ○            | ×                                    | ○  |
|                                  | Station number 20   | ○                        | ○   | ×                                | ○            | ×                                    | ○  |
| FTL unit                         | Station number 30   | ○                        | ○   | ×                                | Disconnected | ×                                    | Stopped<br>Operates within 10 seconds after recovery |

| Operating condition              |                     | Start-up Status <b>A</b> |     | During operation Status <b>B</b> |              | Start-up Status <b>B</b> |              | During operation Status <b>A</b> |   |
|----------------------------------|---------------------|--------------------------|-----|----------------------------------|--------------|--------------------------|--------------|----------------------------------|---|
| Fail-soft operation registration |                     | NO                       | YES | NO                               | YES          | NO                       | YES          | NO                               | YES                                       |
| Basic unit                       | Processor unit '00' | RUN                      | RUN | ALM1<br>ALM2                     | RUN<br>ALM2  | RUN                      | RUN          | RUN                              | RUN                                       |
|                                  | I/O unit            | ○                        | ○   | ×                                | ○            | ○                        | ○            | ○                                | ○   |
| Capsule unit                     | Station number 10   | ○                        | ○   | ×                                | ○            | ○                        | ○            | ○                                | ○   |
|                                  | Station number 20   | ○                        | ○   | ×                                | ○            | ○                        | ○            | ○                                | ○   |
| FTL unit                         | Station number 30   | ○                        | ○   | ×                                | Disconnected | ×                        | Disconnected | ○                                | Operates within 10 seconds after recovery |

## 4-1-2 Individual fail-soft operation (Not available on F30/F50/F50H/F60 series processors.)

Individual fail-soft operation is set (registered) for each individual T-link I/O or FDL station number. I/O units on the processor base board is registered as station 00 in channel 0. (Fail-soft registration for I/O units on the processor base board cannot be done in direct access

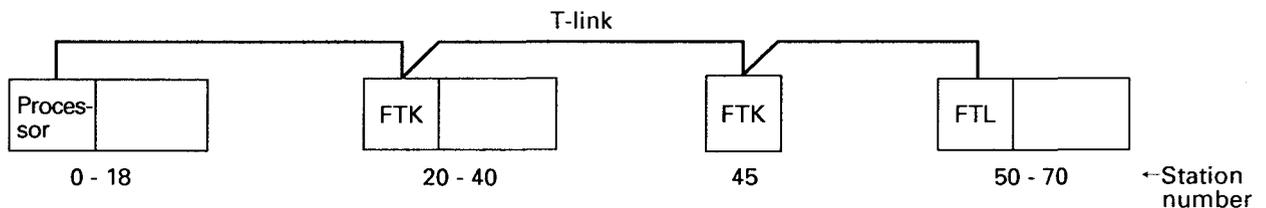
mode.) Individual fail-soft operation is useful for continuing system operation only for certain specified I/O unit errors, and stopping operation for others.

- ① Processor operation during individual fail-soft operation  
The chart below shows processor condition in the case of I/O unit disconnected.

| T-link I/O (FTL, FTK, etc.)        | Processor condition                   |
|------------------------------------|---------------------------------------|
| Individual fail-soft operation YES | 'Nonfatal fault', operation continues |
| Individual fail-soft operation NO  | 'Fatal fault', operation stops        |

- If I/O unit disconnection occurs when either general fail-soft or individual fail-soft is set, configuration relay is turned OFF and configuration fault relay is turned ON for all stations.
- If I/O unit disconnection occurs in any input unit when general fail-soft is set, or if I/O unit disconnection occurs in an input unit for which individual fail-soft is set, the processor enters 'nonfatal fault' operation mode and all input data are turned OFF.

- ② Setting individual fail-soft operation  
Individual fail-soft is set (registered) for each T-link I/O or FDL station number.  
A typical system setting is shown below.



| T-LINK REGISTRAION (1/4) CHANNEL 0 |       |   |     |     |       |   |     |      |       |   |     |
|------------------------------------|-------|---|-----|-----|-------|---|-----|------|-------|---|-----|
| NO.                                | GROUP |   |     | NO. | GROUP |   |     | NO.  | GROUP |   |     |
|                                    | 0     | 1 | 2 3 |     | 0     | 1 | 2 3 |      | 0     | 1 | 2 3 |
| 00                                 |       |   |     | 25  |       |   |     | 50 * |       |   |     |
| 01                                 |       |   |     | 26  |       |   |     | 51   |       |   | 75  |
| 02                                 |       |   |     | 27  |       |   |     | 52   |       |   | 76  |
| 03                                 |       |   |     | 28  |       |   |     | 53   |       |   | 77  |
| 04                                 |       |   |     | 29  |       |   |     | 54   |       |   | 78  |
| 05                                 |       |   |     | 30  |       |   |     | 55   |       |   | 79  |
| 06                                 |       |   |     | 31  |       |   |     | 56   |       |   | 80  |
| 07                                 |       |   |     | 32  |       |   |     | 57   |       |   | 81  |
| 08                                 |       |   |     | 33  |       |   |     | 58   |       |   | 82  |
| 09                                 |       |   |     | 34  |       |   |     | 59   |       |   | 83  |
| 10                                 |       |   |     | 35  |       |   |     | 60   |       |   | 84  |
| 11                                 |       |   |     | 36  |       |   |     | 61   |       |   | 85  |
| 12                                 |       |   |     | 37  |       |   |     | 62   |       |   | 86  |
| 13                                 |       |   |     | 38  |       |   |     | 63   |       |   | 87  |
| 14                                 |       |   |     | 39  |       |   |     | 64   |       |   | 88  |
| 15                                 |       |   |     | 40  |       |   |     | 65   |       |   | 89  |
| 16                                 |       |   |     | 41  |       |   |     | 66   |       |   | 90  |
| 17                                 |       |   |     | 42  |       |   |     | 67   |       |   | 91  |
| 18                                 |       |   |     | 43  |       |   |     | 68   |       |   | 92  |
| 19                                 |       |   |     | 44  |       |   |     | 69   |       |   | 93  |
| 20 *                               |       |   |     | 45  |       |   |     | 70   |       |   | 94  |
| 21                                 |       |   |     | 46  |       |   |     | 71   |       |   | 95  |
| 22                                 |       |   |     | 47  |       |   |     | 72   |       |   | 96  |
| 23                                 |       |   |     | 48  |       |   |     | 73   |       |   | 97  |
| 24                                 |       |   |     | 49  |       |   |     | 74   |       |   | 98  |
|                                    |       |   |     |     |       |   |     |      |       |   | 99  |

FAIL-SOFT YES/NO  
 REGISTRATION YES/NO  
 STOP WITH HELD

BACK: SYSTEM-REG  
 NEXT: T-LINK (2/4)  
 END: SET END MODE

SET: PUSH \* KEY.  
 RESET: PUSH SPACE KEY.  
 F10 MENU

[SYS-DEF]      [PROC]      AUX.  
                  [MODE]      ONLINE      RUN

READY FOR END KEY

The T-link registration screen in the 'System definition' menu

The following registration screens are also available for T-link registration:  
 (2/4) Channel 1: WB 100 to WB 199  
 (3/4) Channel 2: WB 200 to WB 299  
 (4/4) Channel 3: WB 300 to WB 399

Note: If T-link registration is done with F30, F50, F50H or F60 series processors, the settings are ignored.

In the example above, individual fail-soft operation has been set for I/O units of station numbers 20 to 40 and 50 to 70.

Note: I/O units mounted on the base board (rack) are registered beginning with the top station number.

## 4-1 Fail-Soft Operation

### ③ Using individual fail-soft operation

#### Usage method 1

T-link I/O line cable mounting or removing  
If general fail-soft operation is not set, individual fail-soft operation must be used to mount or remove a T-link I/O that has a detachable block connected to the cable while the processor is operating. If individual fail-soft operation is set for

T-link I/O station in which line cable and module are mounted or removed, the processor goes into 'nonfatal fault' status and continues operation regardless of I/O power failure or transmission cable disconnection.  
(FDL modules must not be removed while the processor is in operation.)

#### Usage method 2

For classifying by I/O type whether the system will go into 'fatal fault' status and stop, or continue operation

The explanation is given with reference to the following type of system:

- If there is a disconnection in the digital I/O or analog which actually controls external signal, the processor goes into 'fatal fault' status and stops.

- If there is a disconnection in the personal computer capsule which processes monitoring information, or in a personal computer T-link interface such as FFU098B or FFU050A, the processor continues operation.

To classify by I/O type whether the processor goes into 'fatal fault' status and stops, or continues operating, set individual fail-soft operation in station numbers of I/O in which operation is to continue even if an I/O fault occurs.

### ④ Example of setting individual fail-soft operation

Figure 1

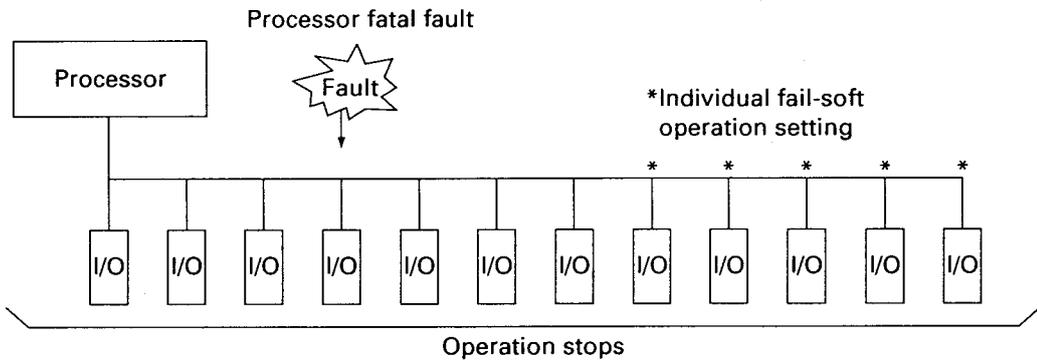
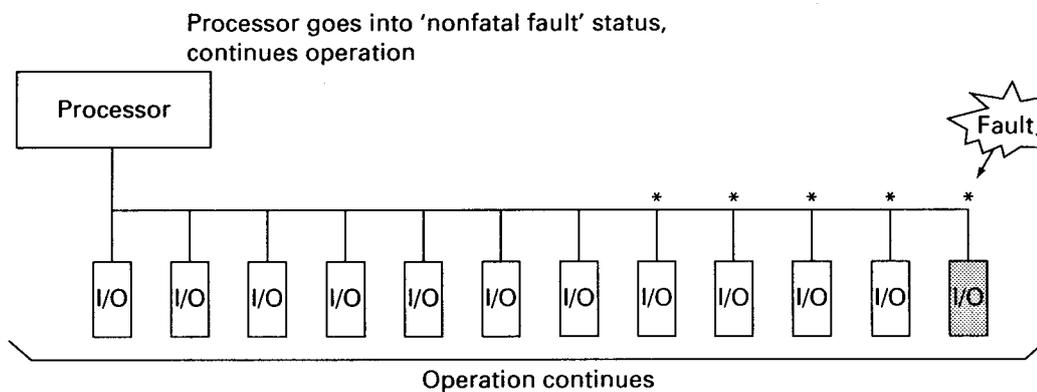


Figure 2



Configuration and individual fail-soft settings are identical in Figures 1 and 2.

As shown in Figure 1, if a fault occurs in I/O where individual fail-soft operation is not set, the processor goes into 'fatal fault' status and stops.

As shown in Figure 2, if a fault occurs in I/O where individual fail-soft operation is set, the processor goes into 'nonfatal fault' status and continues operation.

### ⑤ Setting general fail-soft and individual fail-soft simultaneously

If both types of fail-soft operation are set, the system operates as for general fail-soft operation, that is, the processor goes into 'nonfatal fault' status and continues operation if a fault occurs in I/O regardless of whether individual fail-soft operation for that unit is set or not set.

### 4-2-1 Overview

The T-link registration function is used for limiting the control range of a MICREX-F series system with many I/O points (for start-up and checking).

### 4-2-2 Specifying the control range

The control range is specified by using the program loader to perform T-link registration (system definition) on the I/O units to be operated. See the individual program loader manual for information on the registration method.

For registration, set the station number of the first capsule distributed on T-link (mini T-link). Base board mounting type I/O units are registered for each base board.

#### 1. Operation at power-on

If a registered station is not connected at power-on due to station malfunction, T-link cable disconnection, or because the processor power is OFF, the processor operates as follows:

##### ① F30/F50/F50H/F60 series

- When fail-soft operation is not set:  
The processor goes into 'fatal fault' status and does not start operation. Even if a registered station is connected, the operation is not started.
- When fail-soft operation is set:  
The processor goes into 'nonfatal fault' status and starts the operation. 'Nonfatal fault' disappears when connection is redone to a registered station.

##### ② F55/F70/F70S/F80H/F120H/F120S to F150S series

The processor performs the same operations whether or not fail-soft operation is set. The processor waits for a registered station to be connected while it is stopped in 'nonfatal fault' status. If a registered station is connected, 'nonfatal fault' disappears and the processor starts the operation.

Once a single station number has been specified for registration, all unregistered station numbers are always ignored.

If a station number is specified for registration which is not connected to a capsule or module, a T-link configuration fault occurs and the processor does not start the operation.

#### 2. Operation during processor running

If a registered station becomes disconnected while the processor and registered station are running, the processor operates as follows (common to all processors in the series):

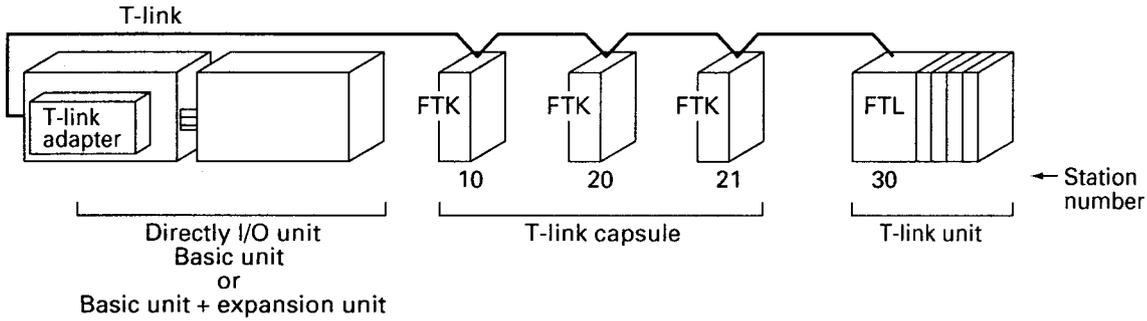
- When fail-soft operation is not set:  
The processor enters 'fatal fault' status and stops the operation. After the faulty registered station is recovered, normal operation can be resumed by turning the processor OFF and ON.
- When fail-soft operation is set:  
The processor enters 'nonfatal fault' status and continues the operation. After the faulty registered station is recovered, 'nonfatal fault' disappears and the operation continues.

## 4-2 T-Link Registration

### Case 1: T-link registration (registered and unregistered I/O operation)

For the F30, F50 and F50H systems in this case, fail-soft operation is not set and T-link registration is done.

### Example of system



### ① I/O registration on T-link

Only the first station number of each I/O unit distributed on T-link is registered. Registration is

done on the T-link definition screen from the program loader during system definition.

T-LINK REGISTRATION (1/4) CHANNEL 0

FAIL-SOFT YES/NO  
 REGISTRATION YES/NO  
 STOP WITH HELD

| NO.  | GROUP   | NO.  | GROUP   | NO.  | GROUP   | NO. | GROUP   |
|------|---------|------|---------|------|---------|-----|---------|
|      | 0 1 2 3 |      | 0 1 2 3 |      | 0 1 2 3 |     | 0 1 2 3 |
| 00   |         | 25   |         | 50 * |         | 75  |         |
| 01   |         | 26   |         | 51   |         | 76  |         |
| 02   |         | 27   |         | 52   |         | 77  |         |
| 03   |         | 28   |         | 53   |         | 78  |         |
| 04   |         | 29   |         | 54   |         | 79  |         |
| 05   |         | 30 * |         | 55   |         | 80  |         |
| 06   |         | 31   |         | 56   |         | 81  |         |
| 07   |         | 32   |         | 57   |         | 82  |         |
| 08   |         | 33   |         | 58   |         | 83  |         |
| 09   |         | 34   |         | 59   |         | 84  |         |
| 10 * |         | 35   |         | 60   |         | 85  |         |
| 11   |         | 36   |         | 61   |         | 86  |         |
| 12   |         | 37   |         | 62   |         | 87  |         |
| 13   |         | 38   |         | 63   |         | 88  |         |
| 14   |         | 39   |         | 64   |         | 89  |         |
| 15   |         | 40   |         | 65   |         | 90  |         |
| 16   |         | 41   |         | 66   |         | 91  |         |
| 17   |         | 42   |         | 67   |         | 92  |         |
| 18   |         | 43   |         | 68   |         | 93  |         |
| 19   |         | 44   |         | 69   |         | 94  |         |
| 20 * |         | 45   |         | 70   |         | 95  |         |
| 21   |         | 46   |         | 71   |         | 96  |         |
| 22   |         | 47   |         | 72   |         | 97  |         |
| 23   |         | 48   |         | 73   |         | 98  |         |
| 24   |         | 49   |         | 74   |         | 99  |         |

BACK: SYSTEM-REG  
 NEXT: T-LINK (2/4)  
 END: SET END MODE

SET: PUSH \* KEY.  
 RESET: PUSH SPACE KEY.  
 F10 MENU

|                    |                                  |
|--------------------|----------------------------------|
| [SYS-DEF]          | [PROC] AUX.<br>[MODE] ONLINE RUN |
| READY FOR END KEY. |                                  |

The program loader D25 (LITE) screen is displayed on the left.

Station number 10: Capsule unit registration  
 Station number 20: Capsule unit registration  
 Station number 30: T-link interface unit registration

In the above system configuration example, I/O operations in station numbers 10, 20, and 30 are enabled. I/O in capsule number 21 is ignored.

## 4-2 T-Link Registration

Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

| T-link registration station number |                     | 10, 20, 30 (21 is not registered.) |                                  |                                      |
|------------------------------------|---------------------|------------------------------------|----------------------------------|--------------------------------------|
| Operating condition                |                     | Start-up Status <b>A</b>           | During operation Status <b>B</b> | Power recovery (I/O) Status <b>A</b> |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM</b>                       | <b>ALM</b>                           |
|                                    | I/O unit            | ○                                  | ×                                | ×                                    |
| Capsule unit                       | Station number 10   | ○                                  | ×                                | ×                                    |
|                                    | Station number 20   | ○                                  | ×                                | ×                                    |
|                                    | Station number 21   | × (Ignored)                        | × (Ignored)                      | × (Ignored)                          |
| FTL unit                           | Station number 30   | ○                                  | × Disconnected                   | ×*1                                  |

\*1: Once disconnected I/O has been recovered, turn on the basic unit power supply again. ○: Normal ×: Disconnected or stopped

| T-link registration station number |                     | 10, 20, 30 (21 is not registered.) |                                  | 10, 20, 30 (21 is not registered.) |                                  |
|------------------------------------|---------------------|------------------------------------|----------------------------------|------------------------------------|----------------------------------|
| Operating condition                |                     | Start-up Status <b>A</b>           | During operation Status <b>B</b> | During operation Status <b>B</b>   | During operation Status <b>A</b> |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM</b>                       | <b>ALM</b>                         | <b>ALM</b>                       |
|                                    | I/O unit            | ○                                  | ×                                | ×                                  | ×                                |
| Capsule unit                       | Station number 10   | ○                                  | ×                                | ×                                  | ×                                |
|                                    | Station number 20   | ○                                  | ×                                | ×                                  | ×                                |
|                                    | Station number 21   | × (Ignored)                        | × (Ignored)                      | × (Ignored)                        | × (Ignored)                      |
| FTL unit                           | Station number 30   | ○                                  | × Disconnected                   | × Disconnected                     | ×*2                              |

\*2: I/O unit registered for T-link is recognized when the basic unit starts up.

○: Normal ×: Disconnected or stopped

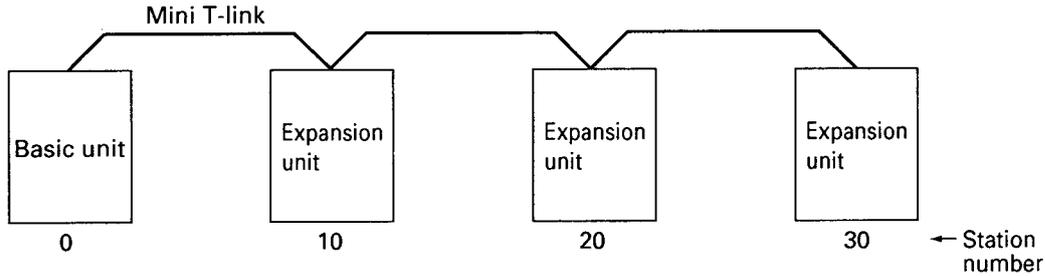
### [Notes]

- ① Station number is set in units of 16 I/O points. T-link registration is also effective by registering only a start number for 32 and 64 I/O points.  
 Note that the processor enters 'fatal fault' status if all occupied station numbers (addresses) are registered.
- ② With T-link registration, once any station number is specified for registration, unregistered station numbers are ignored. If the processor enters 'fatal fault' status during T-link registration, it may be due to the following:
  - A T-link I/O unit is not connected to a station number registered for T-link.
  - T-link registration is set for a direct I/O station number.
  - A station number other than the starting station number of a T-link I/O unit is registered.
 Each case is diagnosed as either a T-link fault or T-link configuration fault using D25 (LITE). Check the registration contents to make the correct settings.
- ③ For T-link registration, turn registered stations ON in the order of registration (or all registered stations simultaneously).

## 4-2 T-Link Registration

**Case 2:** T-link registration (operation of registered and unregistered I/O units)  
 For the F60 system in this case, fail-soft operation is not set and T-link registration is done.

### Example of system



### ① I/O registration on mini T-link

Only the first station number of each I/O unit distributed on T-link is registered. Registration is

done on the T-link definition screen from the program loader during system definition.

T-LINK REGISTRATION (1/4) CHANNEL 0

FAIL-SOFT YES/NO  
 REGISTRATION YES/NO  
 STOP WITH HELD

| NO.  | GROUP |   |   |   | NO.  | GROUP |   |   |   | NO. | GROUP |   |   |   |    |  |  |  |  |
|------|-------|---|---|---|------|-------|---|---|---|-----|-------|---|---|---|----|--|--|--|--|
|      | 0     | 1 | 2 | 3 |      | 0     | 1 | 2 | 3 |     | 0     | 1 | 2 | 3 |    |  |  |  |  |
| 00   |       |   |   |   | 25   |       |   |   |   | 50  |       |   |   |   | 75 |  |  |  |  |
| 01   |       |   |   |   | 26   |       |   |   |   | 51  |       |   |   |   | 76 |  |  |  |  |
| 02   |       |   |   |   | 27   |       |   |   |   | 52  |       |   |   |   | 77 |  |  |  |  |
| 03   |       |   |   |   | 28   |       |   |   |   | 53  |       |   |   |   | 78 |  |  |  |  |
| 04   |       |   |   |   | 29   |       |   |   |   | 54  |       |   |   |   | 79 |  |  |  |  |
| 05   |       |   |   |   | 30 * |       |   |   |   | 55  |       |   |   |   | 80 |  |  |  |  |
| 06   |       |   |   |   | 31   |       |   |   |   | 56  |       |   |   |   | 81 |  |  |  |  |
| 07   |       |   |   |   | 32   |       |   |   |   | 57  |       |   |   |   | 82 |  |  |  |  |
| 08   |       |   |   |   | 33   |       |   |   |   | 58  |       |   |   |   | 83 |  |  |  |  |
| 09   |       |   |   |   | 34   |       |   |   |   | 59  |       |   |   |   | 84 |  |  |  |  |
| 10   |       |   |   |   | 35   |       |   |   |   | 60  |       |   |   |   | 85 |  |  |  |  |
| 11   |       |   |   |   | 36   |       |   |   |   | 61  |       |   |   |   | 86 |  |  |  |  |
| 12   |       |   |   |   | 37   |       |   |   |   | 62  |       |   |   |   | 87 |  |  |  |  |
| 13   |       |   |   |   | 38   |       |   |   |   | 63  |       |   |   |   | 88 |  |  |  |  |
| 14   |       |   |   |   | 39   |       |   |   |   | 64  |       |   |   |   | 89 |  |  |  |  |
| 15   |       |   |   |   | 40   |       |   |   |   | 65  |       |   |   |   | 90 |  |  |  |  |
| 16   |       |   |   |   | 41   |       |   |   |   | 66  |       |   |   |   | 91 |  |  |  |  |
| 17   |       |   |   |   | 42   |       |   |   |   | 67  |       |   |   |   | 92 |  |  |  |  |
| 18   |       |   |   |   | 43   |       |   |   |   | 68  |       |   |   |   | 93 |  |  |  |  |
| 19   |       |   |   |   | 44   |       |   |   |   | 69  |       |   |   |   | 94 |  |  |  |  |
| 20 * |       |   |   |   | 45   |       |   |   |   | 70  |       |   |   |   | 95 |  |  |  |  |
| 21   |       |   |   |   | 46   |       |   |   |   | 71  |       |   |   |   | 96 |  |  |  |  |
| 22   |       |   |   |   | 47   |       |   |   |   | 72  |       |   |   |   | 97 |  |  |  |  |
| 23   |       |   |   |   | 48   |       |   |   |   | 73  |       |   |   |   | 98 |  |  |  |  |
| 24   |       |   |   |   | 49   |       |   |   |   | 74  |       |   |   |   | 99 |  |  |  |  |

BACK: SYSTEM-REG                      SET: PUSH \* KEY.  
 NEXT: T-LINK (2/4)                     RESET: PUSH SPACE KEY.  
 END: SET END MODE                        F10 MENU

[SYS-DEF]
[PROC]      AUX.  
[MODE]      ONLINE      RUN

READY FOR END KEY.

The program loader D25 (LITE) screen is displayed on the left.

Station number 00: Basic unit registration  
 Station number 20: Expansion unit registration  
 Station number 30: Expansion unit registration

In the above system configuration example, I/O operations in station numbers 20 and 30, and basic unit number 0 are enabled. I/O in station number 10 is ignored.

## 4-2 T-Link Registration

Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

|                                    |                     |                                    |                                    |  |
|------------------------------------|---------------------|------------------------------------|------------------------------------|--|
| T-link registration station number |                     | 00, 20, 30 (10 is not registered.) |                                    |  |
| Operating condition                |                     | Start-up Status <b>A</b>           | → During operation Status <b>B</b> | → Power recovery (I/O) Status <b>A</b> |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM1</b><br><b>ALM2</b>         | <b>ALM1</b><br><b>ALM2</b>             |
|                                    | I/O unit            | ○                                  | ×                                  | ×                                      |
| Expansion unit                     | Station number 10   | × (Ignored)                        | × (Ignored)                        | × (Ignored)                            |
|                                    | Station number 20   | ○                                  | ×                                  | ×                                      |
|                                    | Station number 30   | ○                                  | × Disconnected                     | ×*1                                    |

\*1: Once disconnected I/O has been recovered, turn on the basic unit power supply again      ○: Normal    ×: Disconnected or stopped

|                                    |                     |                                    |                                    |                                    |                                    |
|------------------------------------|---------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| T-link registration station number |                     | 00, 20, 30 (10 is not registered.) |                                    | 00, 20, 30 (10 is not registered.) |                                    |
| Operating condition                |                     | Start-up Status <b>A</b>           | → During operation Status <b>B</b> | → During operation Status <b>B</b> | → During operation Status <b>A</b> |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM1</b><br><b>ALM2</b>         | <b>ALM1</b><br><b>ALM2</b>         | <b>ALM1</b><br><b>ALM2</b>         |
|                                    | I/O unit            | ○                                  | ×                                  | ×                                  | ×                                  |
| Expansion unit                     | Station number 10   | × (Ignored)                        | × (Ignored)                        | × (Ignored)                        | × (Ignored)                        |
|                                    | Station number 20   | ○                                  | ×                                  | ×                                  | ×                                  |
|                                    | Station number 30   | ○                                  | × Disconnected                     | × Disconnected                     | ×*2                                |

\*2: I/O unit registered for T-link is recognized when the basic unit starts up.      ○: Normal    ×: Disconnected or stopped

### [Notes]

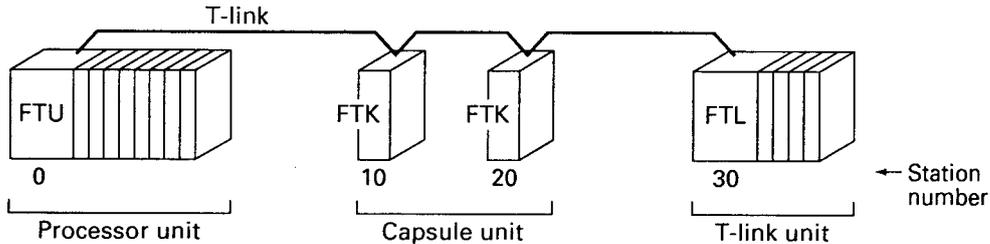
- ① With T-link registration, once any station number is specified for registration, unregistered station numbers are ignored. If the processor enters 'fatal fault' (ALARM1) status during T-link registration, it may be due to the following:
  - A T-link I/O unit is not connected to a station number registered for T-link.
  - A number other than the start station number of a T-link I/O unit is registered.
 Each case is diagnosed as either a T-link fault or T-link configuration fault using D25 (LITE). Check the registration contents to make the correct settings.
 

\* The basic unit must also be registered for T-link, under station number '00'.  
 If station number 0 is not registered, the I/O of that station is ignored.  
 The specifications of the basic unit conform to those of the F55, F70, F70S, F80H, F120H, and F120S to F150S series, and not the MICREX-F30, F50, and F50H series.
- ② For T-link registration, turn registered stations ON in the order of registration (or all registered stations simultaneously).

## 4-2 T-Link Registration

**Case 3:** T-link registration (operation of registered and unregistered I/O units)  
 For the F55, F70, F70S, F80H, F120H, and F120S to F150S systems in this case, fail-soft operation is not set and T-link registration is done.

### Example of system



Only the first station number of each I/O unit distributed on T-link is registered. Registration is done on the T-link registration screen. For the processor and FDL

units also, I/O units are registered on this screen. If an I/O unit is not mounted on the processor base board, registration for the processor is not necessary.

**T-LINK REGISTRATION (1/4) CHANNEL 0**

FAIL-SOFT YES/NO  
 REGISTRATION YES/NO  
 STOP WITH HELD

| NO. | GROUP   | NO.     | GROUP   | NO. | GROUP   | NO. | GROUP   |
|-----|---------|---------|---------|-----|---------|-----|---------|
|     | 0 1 2 3 | 0 1 2 3 | 0 1 2 3 |     | 0 1 2 3 |     | 0 1 2 3 |
| 00  | *       | 25      |         | 50  |         | 75  |         |
| 01  |         | 26      |         | 51  |         | 76  |         |
| 02  |         | 27      |         | 52  |         | 77  |         |
| 03  |         | 28      |         | 53  |         | 78  |         |
| 04  |         | 29      |         | 54  |         | 79  |         |
| 05  |         | 30      | *       | 55  |         | 80  |         |
| 06  |         | 31      |         | 56  |         | 81  |         |
| 07  |         | 32      |         | 57  |         | 82  |         |
| 08  |         | 33      |         | 58  |         | 83  |         |
| 09  |         | 34      |         | 59  |         | 84  |         |
| 10  | *       | 35      |         | 60  |         | 85  |         |
| 11  |         | 36      |         | 61  |         | 86  |         |
| 12  |         | 37      |         | 62  |         | 87  |         |
| 13  |         | 38      |         | 63  |         | 88  |         |
| 14  |         | 39      |         | 64  |         | 89  |         |
| 15  |         | 40      |         | 65  |         | 90  |         |
| 16  |         | 41      |         | 66  |         | 91  |         |
| 17  |         | 42      |         | 67  |         | 92  |         |
| 18  |         | 43      |         | 68  |         | 93  |         |
| 19  |         | 44      |         | 69  |         | 94  |         |
| 20  |         | 45      |         | 70  |         | 95  |         |
| 21  |         | 46      |         | 71  |         | 96  |         |
| 22  |         | 47      |         | 72  |         | 97  |         |
| 23  |         | 48      |         | 73  |         | 98  |         |
| 24  |         | 49      |         | 74  |         | 99  |         |

BACK: SYSTEM-REG  
 NEXT: T-LINK (2/4)  
 END: SET END MODE

SET: PUSH \* KEY.  
 RESET: PUSH SPACE KEY.  
 F10 MENU

[SYS-DEF]
[PROC]    AUX.  
[MODE]    ONLINE    RUN

READY FOR END KEY.

Station number 00: Processor unit registration  
 Station number 10: Capsule units registration  
 Station number 30: T-link interface unit registration

In the above example, I/O operation in the processor unit (station number 0), T-link capsule unit (station number 10), and T-link interface unit (station number 30) are enabled.

T-link registration is done by registering only the first station number for each processor unit, FTL unit, and FDL unit.

Note that operation will not start if all the occupied station numbers (addresses) are registered.

## 4-2 T-Link Registration

Status **A**: All units operating normally  
 Status **B**: Station number 30 disconnected

|                                    |                     |                                    |                                    |  |
|------------------------------------|---------------------|------------------------------------|------------------------------------|--|
| T-link registration station number |                     | 00, 20, 30 (20 is not registered.) |                                    |  |
| Operating condition                |                     | Start-up Status <b>A</b>           | → During operation Status <b>B</b> | → Power recovery (I/O) Status <b>A</b> |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM1</b><br><b>ALM2</b>         | <b>ALM1</b><br><b>ALM2</b>             |
|                                    | I/O unit            | ○                                  | ×                                  | ×                                      |
| Capsule unit                       | Station number 10   | ○                                  | ×                                  | ×                                      |
|                                    | Station number 20   | × (Ignored)                        | × (Ignored)                        | × (Ignored)                            |
| FTL unit                           | Station number 30   | ○                                  | × Disconnected                     | ×*1                                    |

\*1: For station number 30, RUN flickers.

○: Normal ×: Disconnected or stopped

|                                    |                     |                                    |                                    |                                    |   |
|------------------------------------|---------------------|------------------------------------|------------------------------------|------------------------------------|---|
| T-link registration station number |                     | 00, 10, 30 (20 is not registered.) |                                    | 00, 10, 30 (10 is not registered.) |   |
| Operating condition                |                     | Start-up Status <b>A</b>           | → During operation Status <b>B</b> | Start-up Status <b>B</b>           | → During operation Status <b>A</b>              |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>ALM1</b><br><b>ALM2</b>         | <b>ALM</b>                         | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                                  | ×                                  | ×                                  | ○   |
| Capsule unit                       | Station number 10   | ○                                  | ×                                  | ×                                  | ○   |
|                                    | Station number 20   | × (Ignored)                        | × (Ignored)                        | × (Ignored)                        | × (Ignored)                                     |
| FTL unit                           | Station number 30   | ○                                  | × Disconnected                     | × Disconnected                     | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

### [Note]

With T-link registration, once any station number is specified for registration, unregistered station numbers are ignored. If the processor enters 'nonfatal fault' (ALARM2) status during T-link registration, it may be due to the following:

- A T-link I/O unit is not connected to a registered station number.
- An incorrect station number is specified for T-link registration.
- A station number other than the starting station number of a T-link I/O unit is registered.

Each case is diagnosed as a T-link configuration fault using error diagnosis.  
 Check the registration contents to make the correct settings.

### 4-2-3 Notes on T-link registration

The following points should be taken into account when undertaking system design.

① For F55, F60, F70, F70S, F80H, F120H, and F120S to F150S series processors, an I/O unit mounted on the processor base is assumed to be a T-link expansion unit with station number 0, and can be registered for T-link.

For other series processors, a processor base-mounted I/O unit cannot be registered for T-link. If an attempt is made to register such an I/O unit for T-link, the processor enters 'fatal fault' status.

- ② Once any T-link I/O unit is registered for T-link configuration, unregistered T-link I/O units and expansion I/O modules do not function (they are ignored by the processor), with the exception of I/O units on the basic unit or expansion unit of the F30, F50 and F50H series processors.
- ③ When the T-link registration function is in use, the processor does not start operating until registered stations in error have been recovered, even if the processor power supply is turned OFF and ON. (This does not apply to the F30, F50, F50H, and F60 series when fail-soft operation is in use.)

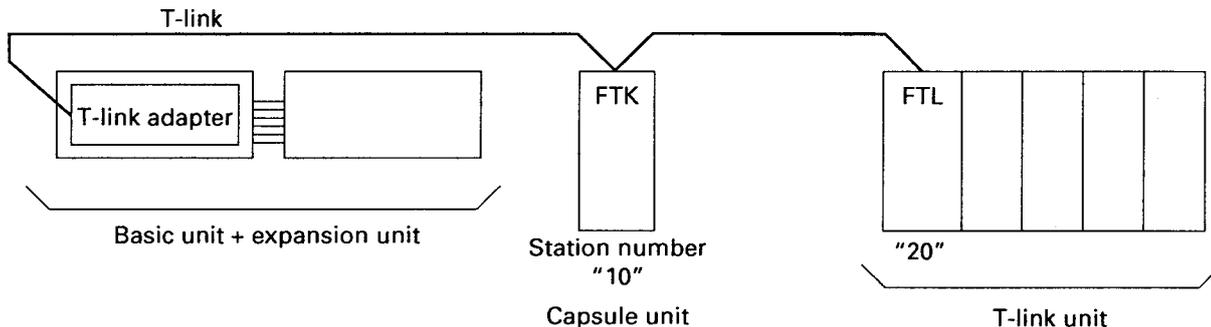
### 4-3 Fail-Soft Operation Registration and T-Link Registration

This section describes the operating condition of each system where fail-soft operation (general fail-soft) and T-link registration are set.

**Case 1: Fail-soft operation and T-link registration (removing disconnected I/O)**

For the F30, F50 and F50H systems, fail-soft operation is set and T-link registration is done.

**Example of system**



Status **A**: All units operating normally  
 Status **B**: Station number 20 disconnected

|                                    |                     |                                |                                    |   |
|------------------------------------|---------------------|--------------------------------|------------------------------------|---|
| T-link registration station number |                     | 00, 20 (10 is not registered.) |                                    |   |
| Operating condition                |                     | Start-up Status <b>A</b>       | → During operation Status <b>B</b> | → Power recovery (I/O) Status <b>A</b>          |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                     | <b>RUN</b><br><b>ALM</b>           | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                              | ○                                  | ○   |
| Capsule unit                       | Station number 10   | × (Ignored)                    | × (Ignored)                        | × (Ignored)                                     |
| FTL unit                           | Station number 20   | ○                              | × Disconnected                     | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

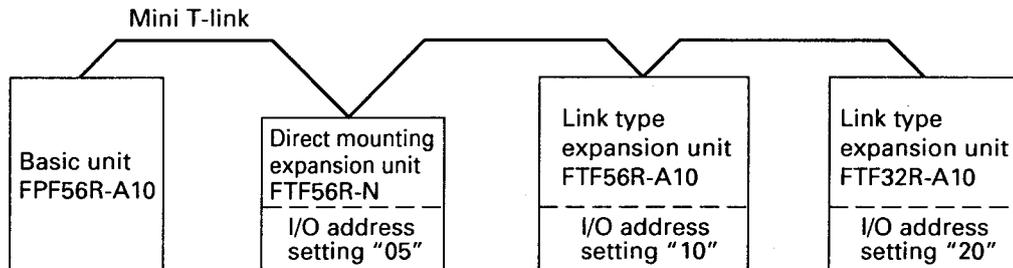
|                                    |                     |                          |                                    |                          |   |
|------------------------------------|---------------------|--------------------------|------------------------------------|--------------------------|---|
| T-link registration station number |                     | 00, 10, 20               |                                    | 00, 10, 20               |   |
| Operating condition                |                     | Start-up Status <b>A</b> | → During operation Status <b>B</b> | Start-up Status <b>B</b> | → During operation Status <b>A</b>              |
| Basic unit                         | Processor unit '00' | <b>RUN</b>               | <b>RUN</b><br><b>ALM</b>           | <b>RUN</b><br><b>ALM</b> | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                        | ○                                  | ○                        | ○   |
| Capsule unit                       | Station number 10   | ○                        | ○                                  | ○                        | ○   |
| FTL unit                           | Station number 20   | ○                        | × Disconnected                     | × Disconnected           | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

## 4-3 Fail-Soft Operation Registration and T-Link Registration

**Case 2:** Fail-soft operation and T-link registration  
(removing disconnected I/O)  
For the F60 system, T-link registration is done.

### Example of system



Status **A**: All units operating normally  
Status **B**: Station number 20 disconnected

| T-link registration station number |                     | 00, 05, 20 (10 is not registered.) |                                  |   |
|------------------------------------|---------------------|------------------------------------|----------------------------------|---|
| Operating condition                |                     | Start-up Status <b>A</b>           | During operation Status <b>B</b> | Power recovery (I/O) Status <b>A</b>            |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                         | <b>RUN</b><br><b>ALM2</b>        | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                                  | ○                                | ○   |
| Expansion unit                     | Station number 05   | ○                                  | ○                                | ○   |
|                                    | Station number 10   | × (Ignored)                        | × (Ignored)                      | × (Ignored)                                     |
|                                    | Station number 20   | ○                                  | × Disconnected                   | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

| T-link registration station number |                     | 00, 05, 10, 20           |                                  | 00, 05, 10, 20            |   |
|------------------------------------|---------------------|--------------------------|----------------------------------|---------------------------|---|
| Operating condition                |                     | Start-up Status <b>A</b> | During operation Status <b>B</b> | Start-up Status <b>B</b>  | During operation Status <b>A</b>                |
| Basic unit                         | Processor unit '00' | <b>RUN</b>               | <b>RUN</b><br><b>ALM2</b>        | <b>RUN</b><br><b>ALM2</b> | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                        | ○                                | ○                         | ○   |
| Expansion unit                     | Station number 05   | ○                        | ○                                | ○                         | ○   |
|                                    | Station number 10   | ○                        | ○                                | ○                         | ○   |
|                                    | Station number 20   | ○                        | × Disconnected                   | × Disconnected            | ○<br>Operates within 10 seconds after recovery. |

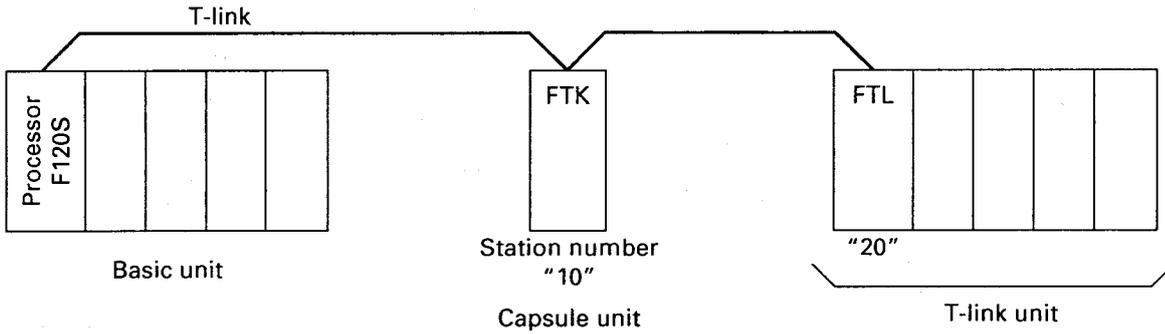
○: Normal ×: Disconnected or stopped

## 4-3 Fail-Soft Operation Registration and T-Link Registration

### Case 3: Fail-soft operation and T-link registration (removing disconnected I/O)

For the F55, F70, F70S, F80H, F120H and F120S to F150S systems, fail-soft operation is set and T-link registration is done.

#### Example of system



Status **A**: All units operating normally  
 Status **B**: Station number 20 disconnected

|                                    |                     |                                |                                    |   |
|------------------------------------|---------------------|--------------------------------|------------------------------------|---|
| T-link registration station number |                     | 00, 20 (10 is not registered.) |                                    |   |
| Operating condition                |                     | Start-up Status <b>A</b>       | → During operation Status <b>B</b> | → Power recovery (I/O) Status <b>A</b>          |
| Basic unit                         | Processor unit '00' | <b>RUN</b>                     | <b>RUN</b><br><b>ALM2</b>          | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                              | ○                                  | ○   |
| Capsule unit                       | Station number 10   | × (Ignored)                    | × (Ignored)                        | × (Ignored)                                     |
| FTL unit                           | Station number 20   | ○                              | × Disconnected                     | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

|                                    |                     |                          |                                    |                          |   |
|------------------------------------|---------------------|--------------------------|------------------------------------|--------------------------|---|
| T-link registration station number |                     | 00, 10, 20               |                                    | 00, 10, 20               |   |
| Operating condition                |                     | Start-up Status <b>A</b> | → During operation Status <b>B</b> | Start-up Status <b>B</b> | → During operation Status <b>A</b>              |
| Basic unit                         | Processor unit '00' | <b>RUN</b>               | <b>RUN</b><br><b>ALM2</b>          | <b>ALM2</b>              | <b>RUN</b>                                      |
|                                    | I/O unit            | ○                        | ○                                  | ○                        | ○   |
| Capsule unit                       | Station number 10   | ○                        | ○                                  | ○                        | ○   |
| FTL unit                           | Station number 20   | ○                        | × Disconnected                     | × Disconnected           | ○<br>Operates within 10 seconds after recovery. |

○: Normal ×: Disconnected or stopped

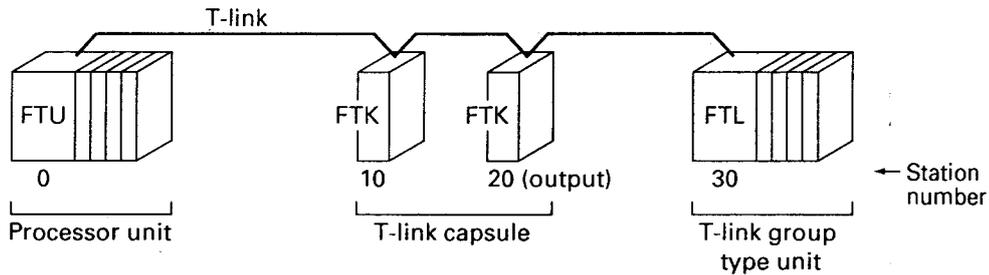
## 4-4-1 Overview

Hold registration is used when the MICREX-F system processor stops operating due to an error, to hold (save) output immediately before the error occurs or immediately before the processor stops. Hold can be specified by registering a target output capsule or

module station number (in the system registration area) using the program loader. Base board-mounted I/O units are registered as a single unit for each base board.

## 4-4-2 Setting hold registration

### Example of system



The station specified holds output when transmission stops in the following cases:

- ① The program loader or processor mode changeover switch stops the processor
- ② The processor stops due to a fatal fault
- ③ The processor power supply is turned OFF
- ④ A T-link cable is disconnected

Even if a user program instructs the processor to turn ON output when the processor power supply is turned ON again, all output is turned OFF before the processor begins operating. Hold registration is set differently for direct I/O units, capsules and T-link (mini T-link) units.

- ① Capsule, FDL unit, T-link (mini T-link) I/O unit registration

The first station number of each I/O unit distributed on T-link (mini T-link) is registered. Registration is

performed on the T-link registration screen with the program loader during system definition.

T-LINK REGISTRATION (2/4) CHANNEL 0

FAIL-SOFT YES/NO  
 REGISTRATION YES/NO  
 STOP WITH HELD

| NO. | GROUP   | NO. | GROUP   | NO. | GROUP   | NO. | GROUP   |
|-----|---------|-----|---------|-----|---------|-----|---------|
|     | 0 1 2 3 |     | 0 1 2 3 |     | 0 1 2 3 |     | 0 1 2 3 |
| 00  |         | 25  |         | 50  |         | 75  |         |
| 01  |         | 26  |         | 51  |         | 76  |         |
| 02  |         | 27  |         | 52  |         | 77  |         |
| 03  |         | 28  |         | 53  |         | 78  |         |
| 04  |         | 29  |         | 54  |         | 79  |         |
| 05  |         | 30  | *       | 55  |         | 80  |         |
| 06  |         | 31  |         | 56  |         | 81  |         |
| 07  |         | 32  |         | 57  |         | 82  |         |
| 08  |         | 33  |         | 58  |         | 83  |         |
| 09  |         | 34  |         | 59  |         | 84  |         |
| 10  |         | 35  |         | 60  |         | 85  |         |
| 11  |         | 36  |         | 61  |         | 86  |         |
| 12  |         | 37  |         | 62  |         | 87  |         |
| 13  |         | 38  |         | 63  |         | 88  |         |
| 14  |         | 39  |         | 64  |         | 89  |         |
| 15  |         | 40  |         | 65  |         | 90  |         |
| 16  |         | 41  |         | 66  |         | 91  |         |
| 17  |         | 42  |         | 67  |         | 92  |         |
| 18  |         | 43  |         | 68  |         | 93  |         |
| 19  |         | 44  |         | 69  |         | 94  |         |
| 20  | *       | 45  |         | 70  |         | 95  |         |
| 21  |         | 46  |         | 71  |         | 96  |         |
| 22  |         | 47  |         | 72  |         | 97  |         |
| 23  |         | 48  |         | 73  |         | 98  |         |
| 24  |         | 49  |         | 74  |         | 99  |         |

BACK: T-LINK (1/4)                      SET: PUSH \* KEY  
 NEXT: T-LINK (3/4)                     RESET: PUSH SPACE KEY  
 END: SET END MODE                      F10 MENU

|                    |   |
|--------------------|---|
| [SYS-DEF]          | [PROC]    AUX.<br>[MODE]    ONLINE    RUN |
| READY FOR END KEY. |   |

In the above example, output hold is effective for station numbers 20 and 30.

## 4-4 Hold Registration

### ② Registration of the processor unit (F55/F70/F70S/ F80H/F120H/F120S to F150S)

As shown in Figure A, in direct access mode, hold is specified for shelf 0 in the system registration screen. Although displayed, settings for shelves 1 to

7 cannot be made. As shown in Figure B, in scan synchronous mode, station number 0 is registered on the T-link registration screen.

Screen A

| SYSTEM REGISTRATION              |                   |                   |          |
|----------------------------------|-------------------|-------------------|----------|
| DIRECT PIO DEFINITION            |                   |                   |          |
| SHELF 0 (                        | <del>DIRECT</del> | / SCAN            | )        |
|                                  | ( RESET           | / <del>HOLD</del> | )        |
| SHELF 1 (                        | RESET             | / HOLD            | )        |
| SHELF 2 (                        | RESET             | / HOLD            | )        |
| SHELF 3 (                        | RESET             | / HOLD            | )        |
| SHELF 4 (                        | RESET             | / HOLD            | )        |
| SHELF 5 (                        | RESET             | / HOLD            | )        |
| SHELF 6 (                        | RESET             | / HOLD            | )        |
| SHELF 7 (                        | RESET             | / HOLD            | )        |
| SELECT DATA BY ARROW KEY (->,<-) |                   |                   |          |
| BACK: MODEL CODE                 |                   |                   | F10 MENU |
| NEXT: PIO CONF                   |                   |                   |          |
| END: SET END MODE                |                   |                   |          |
| [SYS-DEF]                        | [PROC]            | AUX.              | RUNNING  |
|                                  | [MODE]            | OFFLINE           |          |
| READY FOR END KEY.               |                   |                   |          |

In this example, direct I/O unit output hold is effective.

Screen B

| T-LINK REGISTRATION (2/4) CHANNEL 0                       |         |        |                        |     |         |          |         |     |         |     |         |
|---|---------|--------|------------------------|-----|---------|----------|---------|-----|---------|-----|---------|
| FAIL-SOFT YES/NO<br>REGISTRATION YES/NO<br>STOP WITH HELD |         |        |                        |     |         |          |         |     |         |     |         |
| NO.   | GROUP   | NO.    | GROUP                  | NO. | GROUP   | NO.      | GROUP   | NO. | GROUP   | NO. | GROUP   |
|   | 0 1 2 3 |        | 0 1 2 3                |     | 0 1 2 3 |          | 0 1 2 3 |     | 0 1 2 3 |     | 0 1 2 3 |
| 00  | *       | 25     |                        | 50  |         | 75       |         |     |         |     |         |
| 01  |         | 26     |                        | 51  |         | 76       |         |     |         |     |         |
| 02  |         | 27     |                        | 52  |         | 77       |         |     |         |     |         |
| 03  |         | 28     |                        | 53  |         | 78       |         |     |         |     |         |
| 04  |         | 29     |                        | 54  |         | 79       |         |     |         |     |         |
| 05  |         | 30     | *                      | 55  |         | 80       |         |     |         |     |         |
| 06  |         | 31     |                        | 56  |         | 81       |         |     |         |     |         |
| 07  |         | 32     |                        | 57  |         | 82       |         |     |         |     |         |
| 08  |         | 33     |                        | 58  |         | 83       |         |     |         |     |         |
| 09  |         | 34     |                        | 59  |         | 84       |         |     |         |     |         |
| 10  |         | 35     |                        | 60  |         | 85       |         |     |         |     |         |
| 11  |         | 36     |                        | 61  |         | 86       |         |     |         |     |         |
| 12  |         | 37     |                        | 62  |         | 87       |         |     |         |     |         |
| 13  |         | 38     |                        | 63  |         | 88       |         |     |         |     |         |
| 14  |         | 39     |                        | 64  |         | 89       |         |     |         |     |         |
| 15  |         | 40     |                        | 65  |         | 90       |         |     |         |     |         |
| 16  |         | 41     |                        | 66  |         | 91       |         |     |         |     |         |
| 17  |         | 42     |                        | 67  |         | 92       |         |     |         |     |         |
| 18  |         | 43     |                        | 68  |         | 93       |         |     |         |     |         |
| 19  |         | 44     |                        | 69  |         | 94       |         |     |         |     |         |
| 20  | *       | 45     |                        | 70  |         | 95       |         |     |         |     |         |
| 21  |         | 46     |                        | 71  |         | 96       |         |     |         |     |         |
| 22  |         | 47     |                        | 72  |         | 97       |         |     |         |     |         |
| 23  |         | 48     |                        | 73  |         | 98       |         |     |         |     |         |
| 24  |         | 49     |                        | 74  |         | 99       |         |     |         |     |         |
| BACK: T-LINK  |         |        | SET: PUSH * KEY.       |     |         | F10 MENU |         |     |         |     |         |
| NEXT: T-LINK (2/4)  |         |        | RESET: PUSH SPACE KEY. |     |         |          |         |     |         |     |         |
| END: SET END MODE   |         |        |                        |     |         |          |         |     |         |     |         |
| [SYS-DEF]   | [PROC]  | AUX.   | RUN                    |     |         |          |         |     |         |     |         |
|   | [MODE]  | ONLINE |                        |     |         |          |         |     |         |     |         |
| READY FOR END KEY.  |         |        |                        |     |         |          |         |     |         |     |         |

In this example, direct I/O unit output and output hold of station numbers 20 and 30 are effective.

# 4-5 Processor Duplex Operation (Backup)

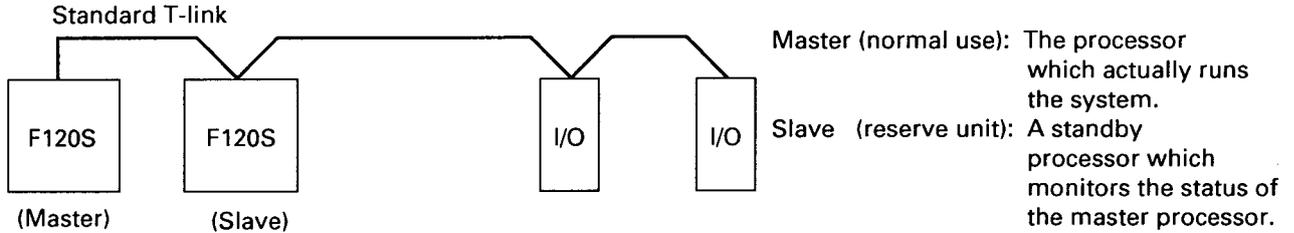
## 4-5-1 Overview

As insurance against processor errors or malfunctions, the F70S, F120H, and F120S to F150S series can be

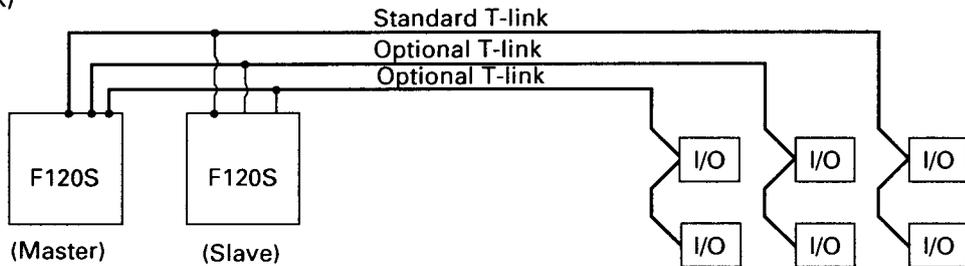
configured as a 'processor duplex system' for backup. This system can be configured on any point of T-link.

### Example of duplex system configuration

① For a single T-link system (basic configuration)

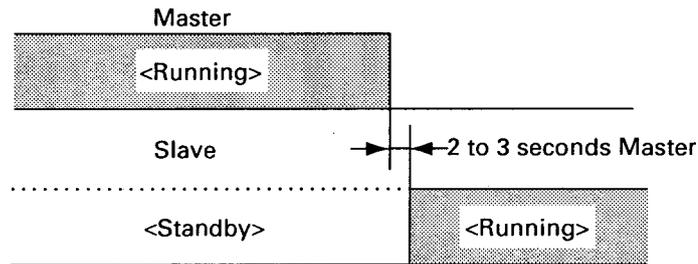


② For two or more T-link systems (duplex with optional T-link)



This duplex function enables system control to be switched from the master processor to the slave

processor in case of an error. (Switching time is 2 to 3 seconds.)



If an error occurs, the slave processor begins operation in the same condition that the master processor was operating in just before the error occurred (according

to the mode changeover key switch status). Note, however that internal data memory changes as follows.

### Memory status at time of processor switching

| Relay data memory retaining preceding values | The new master processor starts running in the status it was in during standby condition.<br>Note: When the processor is switched, data memory contents are not passed between the processors. (Initial start)  |                            |        |                       |              |           |                            |
|--|---|----------------------------|--------|-----------------------|--------------|-----------|----------------------------|
| Other relay data memory                      | The slave processor starts running in the following status: <table border="1" style="width: 100%;"> <tr> <th>Mode changeover key switch</th> <th>Memory</th> </tr> <tr> <td>RUN, STOP, TERM sides</td> <td>Initialized.</td> </tr> <tr> <td>TEST side</td> <td>Preceding values retained.</td> </tr> </table> | Mode changeover key switch | Memory | RUN, STOP, TERM sides | Initialized. | TEST side | Preceding values retained. |
| Mode changeover key switch                   | Memory  |                            |        |                       |              |           |                            |
| RUN, STOP, TERM sides                        | Initialized.  |                            |        |                       |              |           |                            |
| TEST side                                    | Preceding values retained.  |                            |        |                       |              |           |                            |

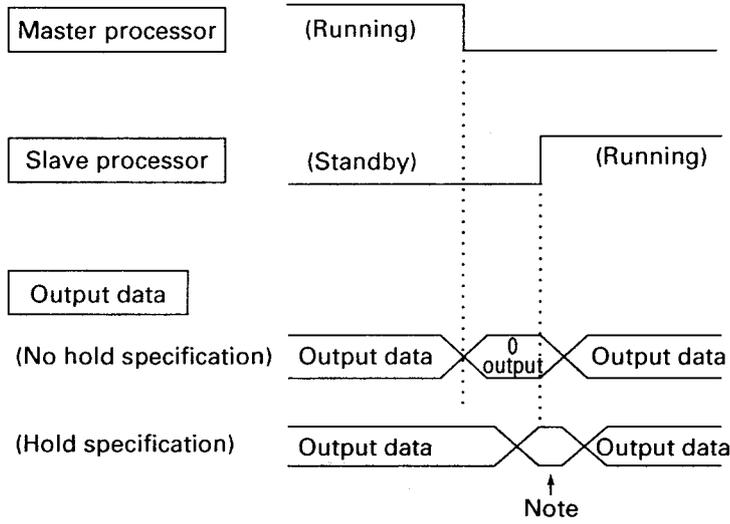
\*1: I/O duplex is not possible for the processor base and FDL base.

\*2: The slave processor starts running as the master processor in the status governed by the mode changeover key switch of the old master processor.

# 4-5 Processor Duplex Operation (Backup)

- I/O data at the time of duplex switching  
If duplex switching carries out, the slave station starts running after it has taken input data from the

T-link slave stations (I/O capsules). See the diagram below for information on the output operation.



Note: If hold has been set, output data is retained even during a master processor disconnect. However, zeroes are output for a few hundred milliseconds before the processor starts running.

## 4-5-2 Duplex specifications

Duplex specifications

| Item                         | Details  |   |
|------------------------------|--|---|
| Processors supporting duplex | F70S, F120H, F120S - 150S  |   |
| Duplex mode                  | Initial start (data is not passed between processors when processor is switched.)              |   |
| Error detection              | Self detection   | Detected by self diagnosis and passed to the slave (reserve) processor. |
|                              | Line monitoring  | T-link access is monitored by the slave (reserve) processor.            |
| Switching time               | 2 to 3 seconds   |   |
| System start                 | Master/slave determined automatically  |   |
| System operation             | Master/slave switching, switching of communicating processor possible using the program loader |   |
| Display status               | Master (normal use)  | Same as for single (non-duplex) system                                  |
|                              | Slave (reserve unit)   | 'RUN' LED flickers. (RUN contact is not output.)                        |

## 4-5-3 Duplex special relay

The duplex condition can be checked by checking flags shown below. Check it in each of the master processor and slave processor.

| Classification      | Relay No. | Name                               | Description  |
|---------------------|-----------|------------------------------------|--|
| Operating condition | F0008     | Duplex system master               | This relay is set ON when the processor serves as the master in duplex mode.                                   |
|                     | F0009     | Duplex system slave                | This relay is set ON when the processor serves as a slave in duplex mode.                                      |
|                     | F000A     | Duplex mode                        | This relay is set ON in duplex mode.   |
|                     | F000B     | Duplex continue/initial            | This relay always OFF in the F70S, F120H, F120S to F150S series. (Initialized)                                 |
| Fatal fault         | F001B     | Duplex setting error               | This relay is set ON when the same processor station number is used twice and duplex mode is not normally set. |
| Nonfatal fault      | F0021     | Duplex system T-link not connected | This relay is set ON when reserve processor is not connected in duplex mode.                                   |

From the initial screen, press the following keys: **F5**, **F2**, **F1**

| FLAG ( 1/15) |                | RUNNING STATE |                    |
|--------------|----------------|---------------|--------------------|
| F000         |                |               |                    |
| 0            | RUN            | 8             | DUPLEX MASTER      |
| 1            | STOP           | 9             | DUPLEX SLAVE       |
| 2            | FATAL FAULT    | A             | DUPLEX/SINGLE      |
| 3            | NONFATAL FAULT | B             | DUPLEX CONTINUOUS  |
| 4            |                | C             | AUTO/MANUAL SWITCH |
| 5            |                | D             | RUN/TEST SWITCH    |
| 6            |                | E             | STOP SWITCH        |
| 7            |                | F             | MODE LOCK          |

| FLAG ( 3/15) |                   |      |                  |
|--------------|-------------------|------|------------------|
| F002         |                   |      |                  |
| 0            | BATTERY ERROR     | 8    |                  |
| 1            | DUP T-LK IS CUT   | 9    | I/O CONF FAULT   |
| 2            | OPTION ERR        | A    |                  |
| 3            |                   | B    |                  |
| 4            | T-LINK FAULT      | C    | SYNC BUS ERR     |
| 5            | P/PE LINK FAULT   | D    | SYNC CONF ERR    |
| 6            | T-LINK CONF FAULT | E    | LONG EXEC. CYCLE |
| 7            | P-LK CONF FAULT   | F    | PLANT FAULT      |
| F10 MENU     |                   |      |                  |
| [PROC]       | AUX.              | DIAG |                  |
| [MODE]       | ONLINE            | MNT  | RUN              |

| FLAG ( 2/15) |                  | FATAL FAULT |                   |
|--------------|------------------|-------------|-------------------|
| F001         |                  |             |                   |
| 0            | MEMORY ERROR     | 8           | USER PROGRAM ERR  |
| 1            | MICRO DIAG ERR   | 9           | WDT ERROR         |
| 2            | AUX-POWER FAULT  | A           | BUS ERROR         |
| 3            | POWER FAULT      | B           | DUPLEX SET-UP ERR |
| 4            | T-LINK FAULT     | C           | I/O AREA DOUBLE   |
| 5            | OPTION ERR       | D           | TOO MANY CAPSULE  |
| 6            | SYS' STACK ERROR | E           | I/O AREA OVER     |
| 7            | PUSH/POP ERROR   | F           | PLANT FAULT       |
| F10 MENU     |                  |             |                   |
| [PROC]       | AUX.             | DIAG        |                   |
| [MODE]       | ONLINE           | MNT         | STOP              |

## 4-5 Processor Duplex Operation (Backup)

### 4-5-4 Duplex processor mutual monitoring

The master processor and slave processor monitor the following items for each other:

#### 1. Items the master processor monitors in the slave processor

The master processor monitors whether the slave processor exists. If the master processor cannot recognize the existence of the slave processor, a nonfatal fault (DUP T-LK IS CUT) is displayed.

The following items are detected as nonfatal fault:

- ① Slave processor power OFF
- ② Incorrect duplex system setting between processors
- ③ Incorrect T-link connection between processors

Once the correct settings have been made in the slave processor, the master processor exits nonfatal fault status and the slave processor enters normal (standby) status.

#### 2. Items the slave processor monitors in the master processor

The slave processor monitors the master processor's duplex system settings, operating condition, and existence.

- ① Monitoring of duplex system settings  
If the duplex settings contain an error, a fatal fault occurs in the slave processor and it does not respond to inquiry from the master processor. In this case, the master processor enters single (non-duplex) operation.
- ② Monitoring the operating condition  
If a fatal fault occurs in the master processor, the slave processor exits standby mode and starts running as the master processor (see note).  
If a fatal fault occurs in a local station, the status is the same as in item ① above.

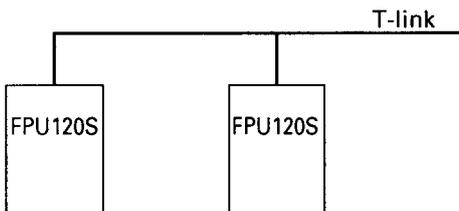
- ③ Monitoring existence  
If duplex system T-link non-connection (power failure, T-link disconnection) occurs in the master processor, the slave processor exits standby mode and starts running as the master processor (see note).

Note: If the master processor is switched to the slave processor, it takes over the operation mode immediately before switching (RUN/STOP). Note however that internal data is not passed. (Refer to the memory status at the time of processor switching on page 4-21)

### 4-5-5 Duplex system T-link connection and operation

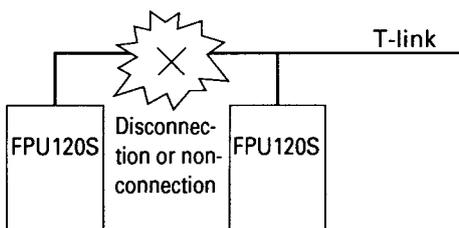
#### 1. Normal connection

Two processors monitor each other normally as duplex system processors.



#### 2. T-link disconnection or non-connection

If a nonfatal fault (duplex system T-link non-connection) occurs in one processor, the other serves as the master processor.



| Indication lamp name | Indication lamp status |                      |
|----------------------|------------------------|----------------------|
|                      | Master (normal use)    | Slave (reserve unit) |
| POWER                | ON                     | ON                   |
| RUN                  | ON                     | ON (blinking)        |
| ALARM1               | OFF                    | OFF                  |
| ALARM2               | OFF                    | OFF                  |
| BATTERY              | OFF                    | OFF                  |

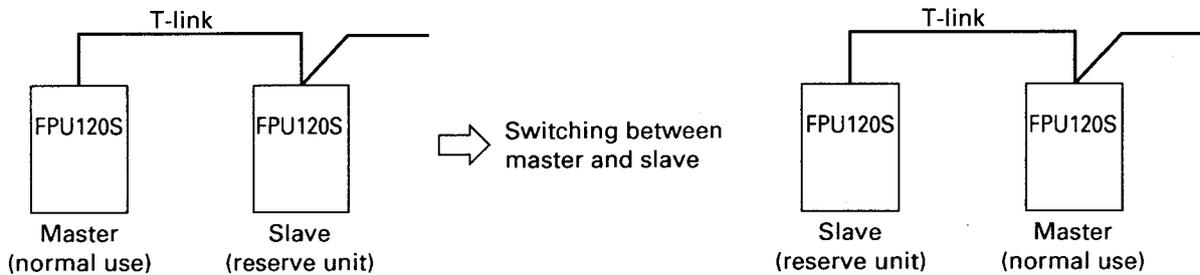
| Indication lamp name | Indication lamp status |                     |
|----------------------|------------------------|---------------------|
|                      | Master (normal use)    | Master (normal use) |
| POWER                | ON                     | ON                  |
| RUN                  | ON                     | ON                  |
| ALARM1               | OFF                    | OFF                 |
| ALARM2               | ON                     | ON                  |
| BATTERY              | OFF                    | OFF                 |

### 4-5-6 Duplex system and program loader (LITE)

In addition to conventional programming functions, a duplex system also has the following program loader setting and operation functions:

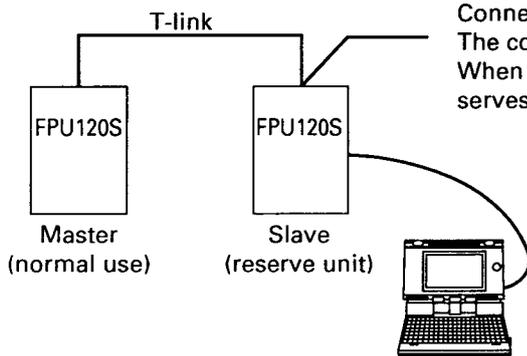
- ① Duplex system master/slave switching
  - ② Communicating processor switching
  - ③ Duplex system definition (duplex YES/NO)
- Note: Use the program loader (LITE) in a duplex system.

- ① Switching between master processor (normal use) and slave processor (reserve unit)  
In a duplex system, use the program loader to reverse the relationship between master and slave processor.



- ② Switching the communicating processor  
Even if the program loader is connected to the slave processor, communication is always made with the master processor when the program loader is started up.

To switch the communicating processor, use the program loader.



Connect the program loader LITE to either the master or slave processor. The communicating processor can be selected using program loader. When the program loader is started up, the master processor always serves as the communicating processor.

- ③ Duplex system definition (duplex YES/NO)  
A duplex system requires system definition, including identification of master and slave.

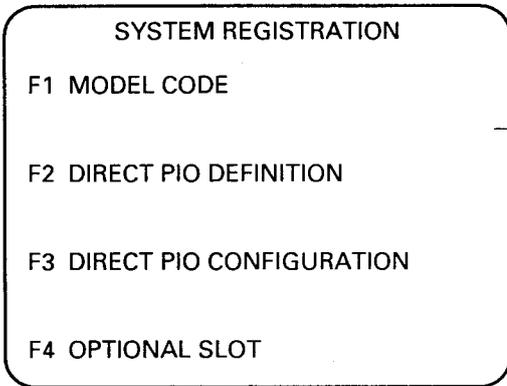
See 4-5-7, 'System definition registration' for setting methods.

| Item                  | Setting | Explanation  |
|-----------------------|---------|--|
| Duplex                | YES/NO  | Sets whether the processor operates as a duplex system or a single system.   |
| Duplex mode           | -       | 'Initial' is always set.   |
| T-link station number | 0 or 1  | If two processors are turned ON simultaneously, the processor serving as the master is set to 0, and the other processor to 1. |

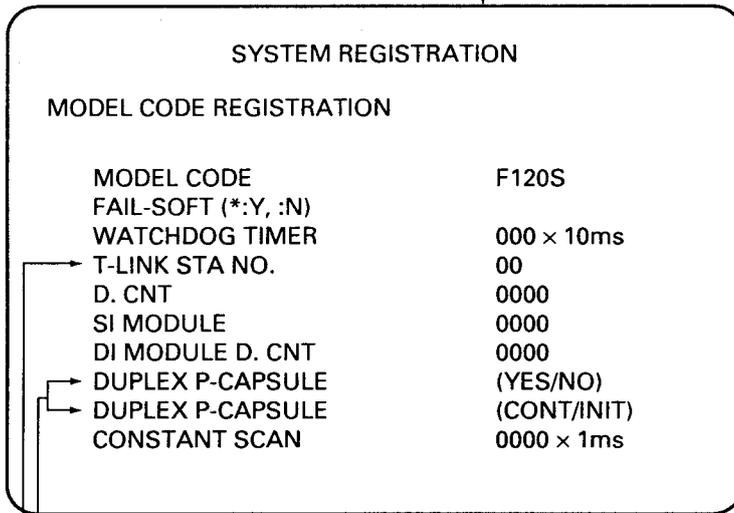
# 4-5 Processor Duplex Operation (Backup)

## 4-5-7 System definition registration

System registration selection screen



F1

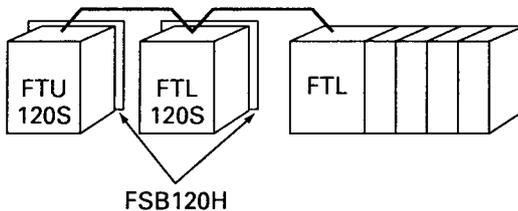


Duplex YES/NO    Duplex mode selection

These items set duplex to 'YES' or 'NO', and data status at the time of duplex processor switching to 'Continue' or 'Initial'.  
(Only 'Initial' can be set with F70S, F120H, and F120S to F150S processors.)

T-link station number

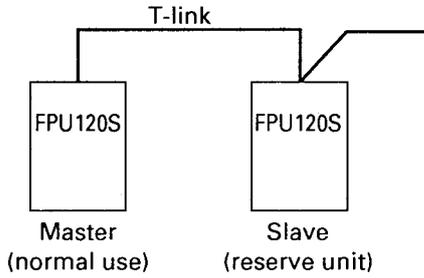
This item sets whether the processor is used normally (0) or as the reserve unit (1) at power-on.



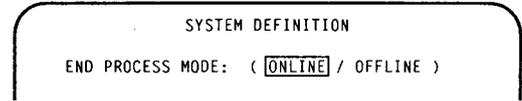
Generally, the first processor turned ON is the normal-use processor. If two processors are turned ON simultaneously, a processor capsule specified to "0" is the normal-use processor.

# 4-5 Processor Duplex Operation (Backup)

## Duplex system definition (duplex YES/NO) registration



From the initial screen, press the following keys:  
**(F5), (F1)**



A transmission error occurs if T-link cables are connected in the configuration shown in the figure on the left, and the **[ENT]** key is pressed.

Set each system definition registration so that T-link cables are disconnected from the master and slave processors.

SYSTEM DEFINITION

F1: SYSTEM REGISTRATION  
 F2: T-LINK REGISTRATION  
 F3: P-LINK REGISTRATION  
 F4: MESSAGE REGISTRATION  
 F5: ME-NET REGISTRATION

SYSTEM REGISTRATION

F1: MODEL CODE  
 F2: DIRECT PIO DEFINITION  
 F3: DIRECT PIO CONFIGURATION  
 F4: OPTION SLOT

SYSTEM REGISTRATION

|                         |                      |
|-------------------------|----------------------|
| MODEL CODE REGISTRATION | F120S                |
| MODEL CODE              |                      |
| FAIL-SOFT (*: Y, :N)    | 009 × 10ms           |
| WATCHDOG TIMER          | 00 ← *1              |
| T-LINK STA NO.          | 0000                 |
| BD MODULE D. CNT        | 0000                 |
| SI MODULE D. CNT        | 0000                 |
| DI MODULE D. CNT        | ( YES / NO ) ← *2    |
| DUPLEX P-CAPSULE        | ( CONT / INIT ) ← *3 |
| DUPLEX P-CAPSULE        | 0000 × 1ms           |
| CONSTANT SCAN           |                      |

SELECT PROCESSOR BY ARROW KEY.

F10 MENU

|                  |                  |                |      |
|------------------|------------------|----------------|------|
| [SYS-DEF]        | [PROC]<br>[MODE] | AUX.<br>ONLINE | STOP |
| SELECT FUNCTION. |                  |                |      |

- Master settings
- \*1: 00
- \*2: (YES / NO )
- \*3: ( CONT / INIT )
- Slave settings
- \*1: 01
- \*2: (YES / NO )
- \*3: ( CONT / INIT )

When finished making settings, press the **[END]** and **[ENT]** keys.  
 Each processor displays the minor error indication, **[RUN][ALM2]**, indicating that registration is complete.

Connect the T-link cable and turn the power OFF and ON again. Normal operation is now enabled.

## 4-5 Processor Duplex Operation (Backup)

### 4-5-8 Duplex system troubleshooting

#### 1. Start-up

If ALARM1 lights up (fatal fault) in one of the two processors or in both processors at the time of turning ON the duplex system, eliminate the cause of the fatal fault with the following procedure:

- ① Turn OFF the processor power supply which does not have ALARM1 lit up. (If ALARM1 is lit up in both processors, turn OFF either processor.)
- ② Connect the program loader to perform error diagnosis.

| Key operation           | Fatal fault status             |                                 |
|-------------------------|--------------------------------|---------------------------------|
| From the initial screen | F001                           |                                 |
| (F5) (Auxiliary)        | 0 Memory error                 | 8 User program error            |
| (F2) (Diagnosis)        | 1 Microprogram diagnosis error | 9 WDT error                     |
| (F1) (Flag)             | 2 Auxiliary power supply error | A Bus error                     |
| (NEXT FRAME)            | 3 Power supply fault           | B * Duplex system setting error |
|                         | 4 T-link fault                 | C I/O area double-assignment    |
|                         | 5 Option fault                 | D Too many capsules on T-link   |
|                         | 6 System stack error           | E Too many I/O points           |
|                         | 7 PUSH/POP error               | F Plant fault                   |

Note: If a fatal fault other than a duplex system setting error occurs, the cause of the ALARM must be eliminated.

An asterisk (\*) indicates the error location.

- ③ After releasing the ALARM1 status of each processor, turn the processors OFF and ON again to check that they work normally.

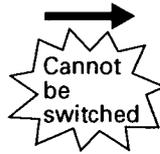
#### 2. Duplex system switching

If switching between master and slave cannot be made, there is an error in the system definition or user

program. Repeat the troubleshooting procedure described in item "1" above.

| Indication lamp name | Master (normal use)<br>Example | Slave (reserve unit)<br>Example |
|----------------------|--------------------------------|---------------------------------|
| POWER                | ON                             | ON                              |
| RUN                  | ON                             | ON (blinking)                   |
| ALARM1               | OFF                            | OFF                             |
| ALARM2               | OFF                            | OFF                             |
| BATTERY              | OFF                            | OFF                             |

Switching between master and slave

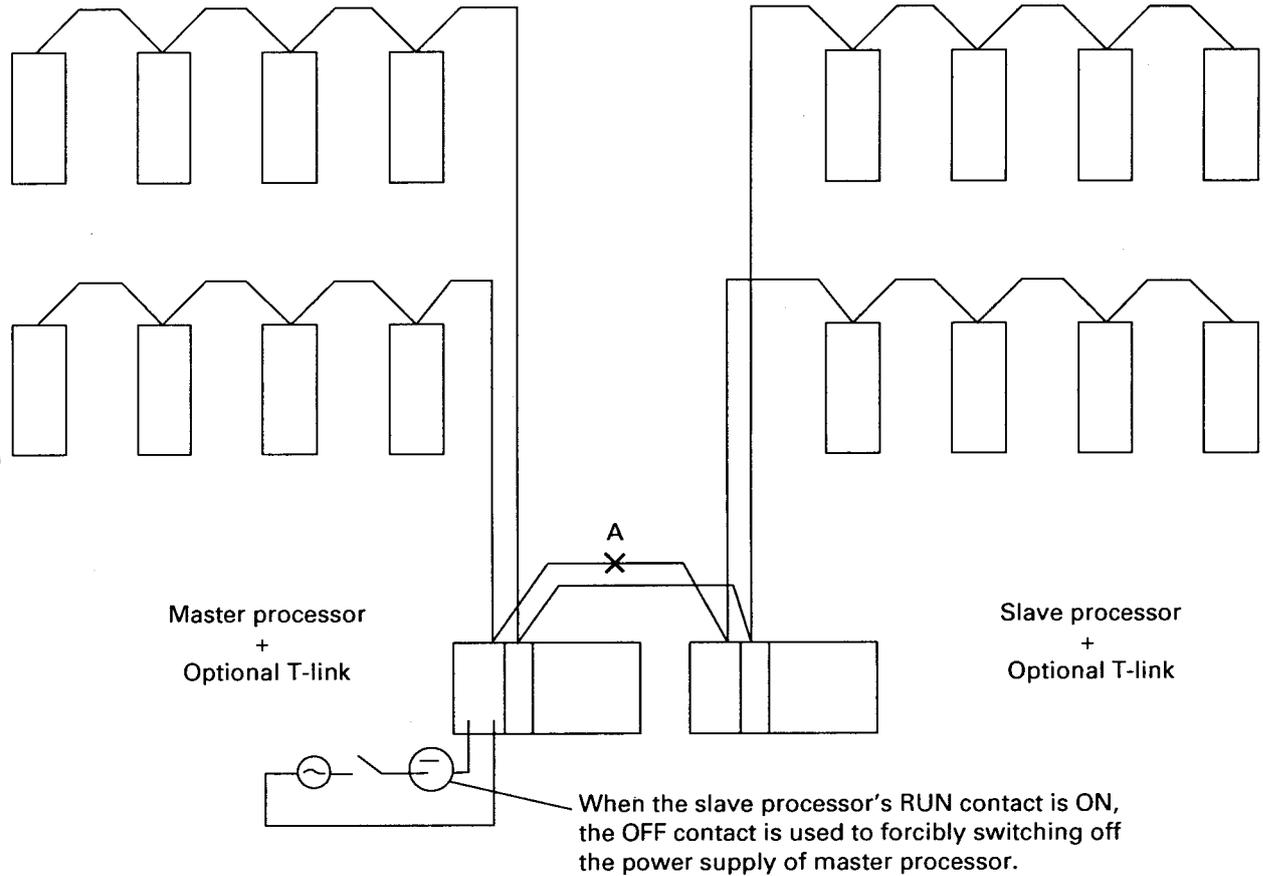


| Indication lamp name | Master (normal use)<br>Example | Slave (reserve unit)<br>Example |
|----------------------|--------------------------------|---------------------------------|
| POWER                | "ON"                           | "ON"                            |
| RUN                  | "ON"                           | "ON (blinking)"                 |
| ALARM1               | "OFF"                          | "ON"                            |
| ALARM2               | "OFF"                          | "OFF"                           |
| BATTERY              | "OFF"                          | "OFF"                           |

## 4-5-9 Caution on duplex system with optional T-link

As shown in the figure below, in a duplex system using standard T-link and optional T-link, master processor power must be turned OFF once the slave processor starts up after switching between master and slave. If it is not turned OFF, both processors remain in

operating status when the T-link cable is disconnected at point A, and transmission is performed between the optional T-link units. In this case, a conflict in the transmission lines arises, and normal operation becomes impossible.



## 4-6 Specifying the I/O Expansion Area

### 4-6-1 Overview

Normally the F70S, F120S, F140S, and F150S series allow connection of up to 32 T-link I/O units with a total of 100 words to a single T-link system. If T-link I/O units with large numbers of words are connected,

32 units may exceed the 100 word system limit. In this case, in the system definition, the I/O expansion area can be used to specify only the T-link I/O units which have large numbers of words.

#### Specification of the I/O expansion area

While normal I/O is assigned to the processor B area, T-link I/O specified for the I/O expansion area is assigned to the user file area (W30 and after). Although the memory assignment is W30 and after, the transmission itself is I/O transmission.

Address and the number of occupied words are as follows:

Start address:

$(\text{Channel No.} \times 512) + (\text{T-link station number} \times 16)$

Channel No.: 0 to 3

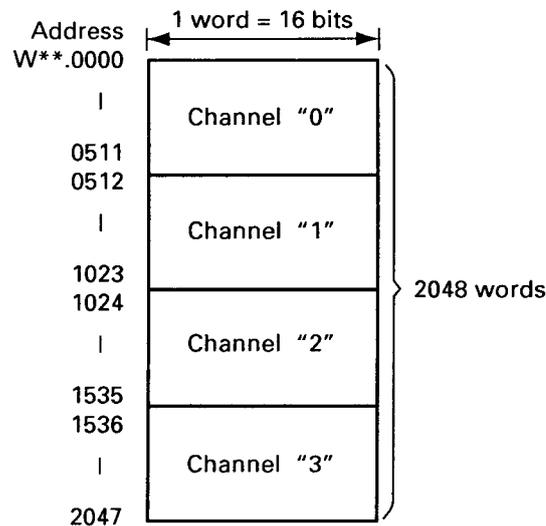
T-link station number: 00 to 31 (32 to 99 cannot be assigned to expansion area.)

For correspondence between address and station number, refer to the I/O expansion address correspondence table.

Number of occupied words:

A single station number consists of 16 words. However, if a single I/O unit consists of 64 words, the T-link station number is used for four stations. For a 64-word I/O unit, the station number must be set to 28 or a smaller number.

For modules on the processor base or on FTL and FDL units, a module consists of 16 words.



#### Cautions when specifying the I/O expansion area

When the I/O expansion area is used, all of the following items must be set in the system definition:

- ① Specification of I/O expansion area use ('I/O expansion area YES/NO' of I/O expansion area registration)
- ② Specification of T-link I/O station number assigned to the I/O expansion area ('Group 1 setting' of T-link registration)
- ③ Specification of data module No. (file No.) used as the I/O expansion area ('Module No. ...' of I/O expansion area registration)

The processor recognizes settings ① and ② above when the processor power supply is turned ON, and recognizes setting ③ when the system definition is changed.

If the same FILE or TABL instruction as that of the specified data module No. (W30 and after) exists, the processor assumes the instruction is a user program error, and stops in fatal fault status. If use of the I/O expansion area has been specified, the data memory capacity (file memory) is 2048 words (1 word = 16 bits). Since memory expansion can be performed only in this system definition, do not perform FILE definition for the same module No. If multiple devices with large numbers of words are connected in a single T-link system with I/O expansion, the T-link I/O refresh time may exceed 10ms. If I/O response time is important for the system, division of the T-link system using the optional T-link system is recommended.

## 4-6 Specifying the I/O Expansion Area

T-link station No. and I/O expansion address

| Channel 0             |                   | Channel 1             |                   | Channel 2             |                   | Channel 3             |                   |
|-----------------------|-------------------|-----------------------|-------------------|-----------------------|-------------------|-----------------------|-------------------|
| T-link station number | Expansion address |
| 00                    | W**.0000 -        | 00                    | W**.0512 -        | 00                    | W**.1024 -        | 00                    | W**.1536 -        |
| 01                    | W**.0016 -        | 01                    | W**.0528 -        | 01                    | W**.1040 -        | 01                    | W**.1552 -        |
| 02                    | W**.0032 -        | 02                    | W**.0544 -        | 02                    | W**.1056 -        | 02                    | W**.1568 -        |
| 03                    | W**.0048 -        | 03                    | W**.0560 -        | 03                    | W**.1072 -        | 03                    | W**.1584 -        |
| 04                    | W**.0064 -        | 04                    | W**.0576 -        | 04                    | W**.1088 -        | 04                    | W**.1600 -        |
| 05                    | W**.0080 -        | 05                    | W**.0592 -        | 05                    | W**.1104 -        | 05                    | W**.1616 -        |
| 06                    | W**.0096 -        | 06                    | W**.0608 -        | 06                    | W**.1120 -        | 06                    | W**.1632 -        |
| 07                    | W**.0112 -        | 07                    | W**.0624 -        | 07                    | W**.1136 -        | 07                    | W**.1648 -        |
| 08                    | W**.0128 -        | 08                    | W**.0640 -        | 08                    | W**.1152 -        | 08                    | W**.1664 -        |
| 09                    | W**.0144 -        | 09                    | W**.0656 -        | 09                    | W**.1168 -        | 09                    | W**.1680 -        |
| 10                    | W**.0160 -        | 10                    | W**.0672 -        | 10                    | W**.1184 -        | 10                    | W**.1696 -        |
| 11                    | W**.0176 -        | 11                    | W**.0688 -        | 11                    | W**.1200 -        | 11                    | W**.1712 -        |
| 12                    | W**.0192 -        | 12                    | W**.0704 -        | 12                    | W**.1216 -        | 12                    | W**.1728 -        |
| 13                    | W**.0208 -        | 13                    | W**.0720 -        | 13                    | W**.1232 -        | 13                    | W**.1744 -        |
| 14                    | W**.0224 -        | 14                    | W**.0736 -        | 14                    | W**.1248 -        | 14                    | W**.1760 -        |
| 15                    | W**.0240 -        | 15                    | W**.0752 -        | 15                    | W**.1264 -        | 15                    | W**.1776 -        |
| 16                    | W**.0256 -        | 16                    | W**.0768 -        | 16                    | W**.1280 -        | 16                    | W**.1792 -        |
| 17                    | W**.0272 -        | 17                    | W**.0784 -        | 17                    | W**.1296 -        | 17                    | W**.1808 -        |
| 18                    | W**.0288 -        | 18                    | W**.0800 -        | 18                    | W**.1312 -        | 18                    | W**.1824 -        |
| 19                    | W**.0304 -        | 19                    | W**.0816 -        | 19                    | W**.1328 -        | 19                    | W**.1840 -        |
| 20                    | W**.0320 -        | 20                    | W**.0832 -        | 20                    | W**.1344 -        | 20                    | W**.1856 -        |
| 21                    | W**.0336 -        | 21                    | W**.0848 -        | 21                    | W**.1360 -        | 21                    | W**.1872 -        |
| 22                    | W**.0352 -        | 22                    | W**.0864 -        | 22                    | W**.1376 -        | 22                    | W**.1888 -        |
| 23                    | W**.0368 -        | 23                    | W**.0880 -        | 23                    | W**.1392 -        | 23                    | W**.1904 -        |
| 24                    | W**.0384 -        | 24                    | W**.0896 -        | 24                    | W**.1408 -        | 24                    | W**.1920 -        |
| 25                    | W**.0400 -        | 25                    | W**.0912 -        | 25                    | W**.1424 -        | 25                    | W**.1936 -        |
| 26                    | W**.0416 -        | 26                    | W**.0928 -        | 26                    | W**.1440 -        | 26                    | W**.1952 -        |
| 27                    | W**.0432 -        | 27                    | W**.0944 -        | 27                    | W**.1456 -        | 27                    | W**.1968 -        |
| 28                    | W**.0448 -        | 28                    | W**.0960 -        | 28                    | W**.1472 -        | 28                    | W**.1984 -        |
| 29                    | W**.0464 -        | 29                    | W**.0976 -        | 29                    | W**.1488 -        | 29                    | W**.2000 -        |
| 30                    | W**.0480 -        | 30                    | W**.0992 -        | 30                    | W**.1504 -        | 30                    | W**.2016 -        |
| 31                    | W**.0496 -        | 31                    | W**.1008 -        | 31                    | W**.1520 -        | 31                    | W**.2032 -        |

## 4-6 Specifying the I/O Expansion Area

### 4-6-2 How to specify I/O expansion

I/O expansion is specified in the system definition.  
An example setting using the program loader LITE is explained below.

- ① Select 'Auxiliary' with **F5** from the initial screen.

```
F1 PROGRAMMING
F2 MONITOR
F3 TRANSFER/VERIFY
F4 DOCUMENT
F5 AUXILIARY
```



- ② Select 'System definition' with **F1**, 'Online' with **←**, and press **ENT**.

```
F1 DEFINING SYSTEM      F6
F2 DIAGNOSTICS          F7
F3 PROGRAMMING AUX.    F8
F4 I/O FORCE ON/OFF     F9
F5 CHECK SCAN TIME     F10
```



```
MODE: ( ONLINE / OFFLINE )
```



- ③ Select 'T-link registration' with **F2**.

```
SYSTEM DEFINITION
F1 SYSTEM REGISTRATION
F2 T-LINK REGISTRATION
F3 P-LINK REGISTRATION
F4 MESSAGE REGISTRATION
F5 ME-NET REGISTRATION
```



Continued on next page

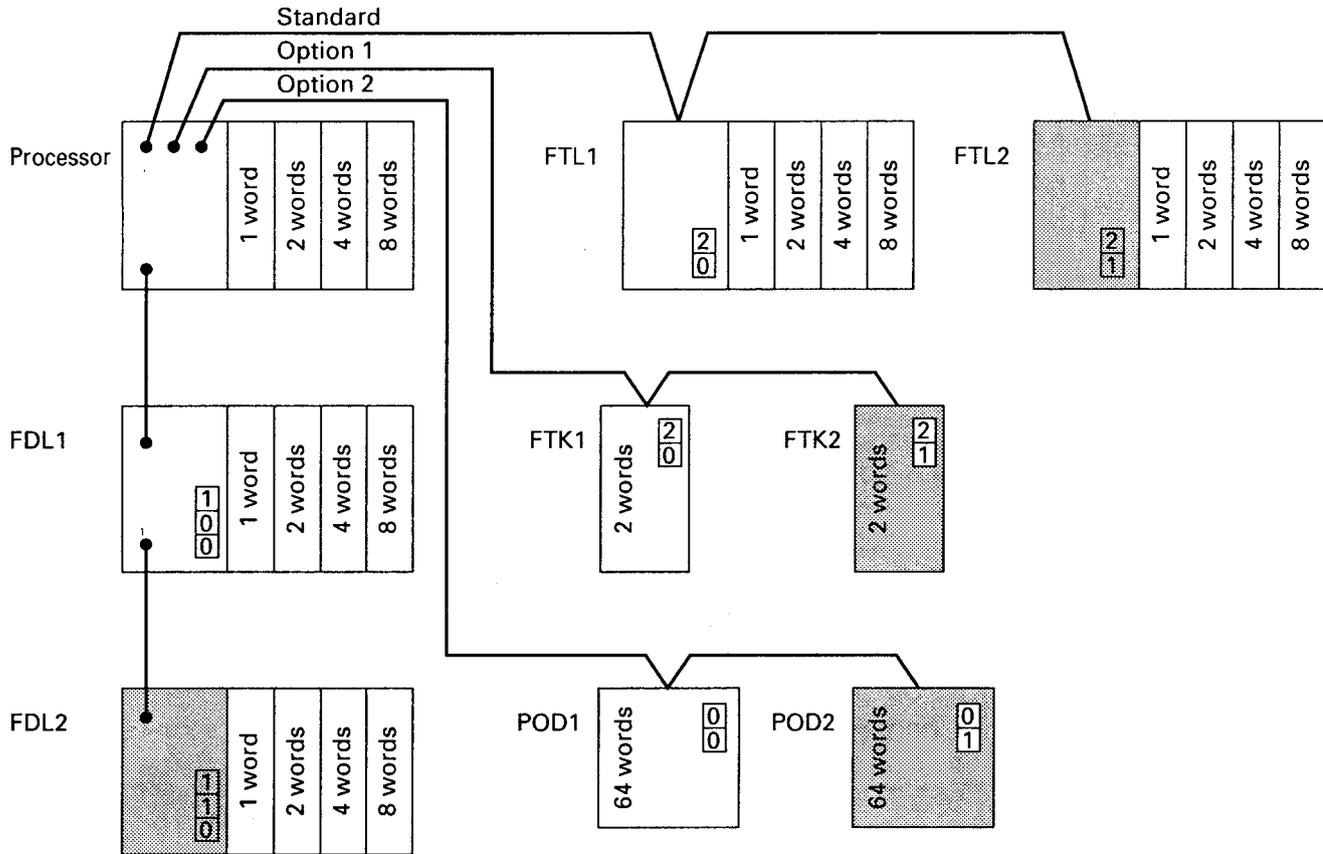


## 4-6 Specifying the I/O Expansion Area

### Setting example

|                           |       |          |
|---------------------------|-------|----------|
| FDL expansion I/O Channel | No. 1 | } In use |
| Standard I/O Channel      | No. 0 |          |
| Option 1 I/O Channel      | No. 2 |          |
| Option 2 I/O Channel      | No. 3 |          |

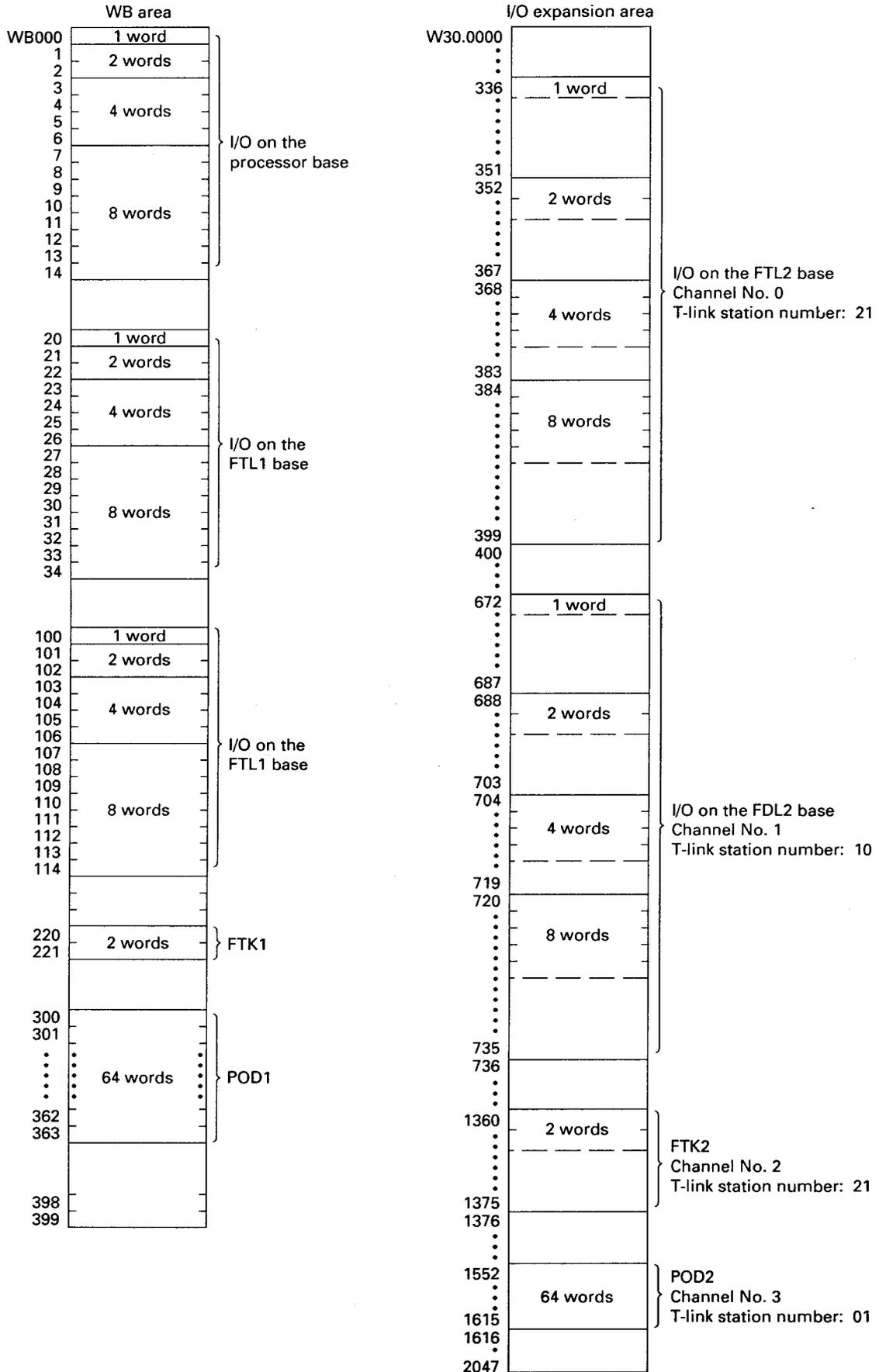
- The FDL, FTL, and FTK in the shaded sections must have been specified for I/O expansion.



- See the next page for the I/O address assignment (when W30 is specified as the I/O expansion area).
- Do not set the same T-link number to be used for FTL, FDL, and FTK. If the same station number is set in a different area, the processor stops in fatal fault status due to the station number duplication.
- Note that data exchange with capsules or modules specified in the I/O expansion area is performed by word access only. Bit specification cannot be done.

## 4-6 Specifying the I/O Expansion Area

- I/O address map

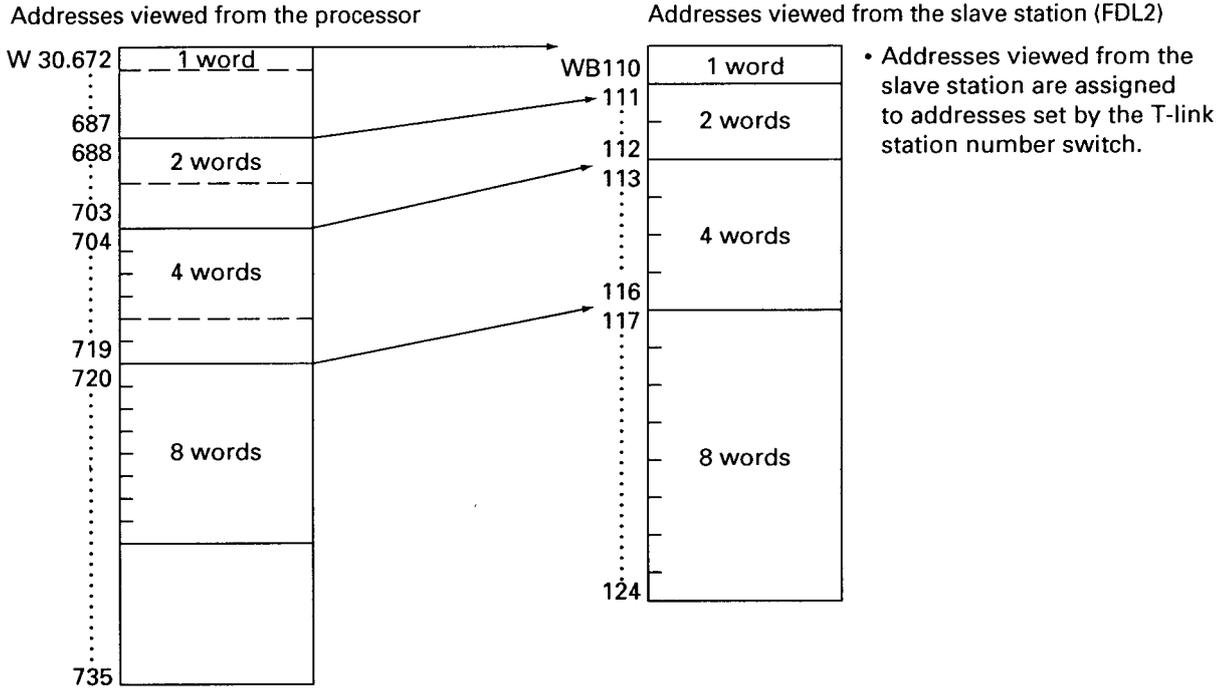


## 4-6 Specifying the I/O Expansion Area

- Address assignment viewed from POD or other slave station  
If the I/O expansion area has been specified, the assigned address viewed from the processor is different from that viewed from a slave station.

All the addresses viewed from a slave station, such as POD, are assigned to the WB area. An example is given on the previous page.

### I/O on the FDL2 base



### POD2



## 4-7 System Definition and Processor Model

The system definition items described in this section and the processor models which support them are listed below.

| Processor model                | F30/F50/F50H | F60 | F55/F70/F80H | F120H | F70S/F120S - F150S |
|--------------------------------|--------------|-----|--------------|-------|--------------------|
| Function                       |              |     |              |       |                    |
| Fail-soft operation (general)  | ○            | ○   | ○            | ○     | ○                  |
| Individual fail-soft operation | ×            | ×   | ○            | ○     | ○                  |
| Output hold                    | ○            | ○   | ○            | ○     | ○                  |
| T-link registration            | A1           | A1  | A2           | A2    | A2                 |
| T-link duplex                  | ×            | ×   | ×            | ○     | ○                  |
| I/O expansion                  | ×            | ×   | ×            | ×     | ○                  |

○: Supported

×: Not supported

Different operation is performed when the power is turned ON in A1 and A2 groups.

- A1 group (F30, F50, F50H, F60 series)

- ① Fail-soft operation "NO" setting  
The processor does not start operating due to fatal fault. Even if a registered station is connected, it does not start.
- ② Fail-soft operation "YES" setting  
The processor starts operating in nonfatal fault status. If a registered station is connected, nonfatal fault status disappears.

- A2 group (F55, F70, F70S, F80H, F120H, F120S, F140S, F150S series)

Operation is the same whether fail-soft operation is YES or NO. The processor stops in nonfatal fault status and waits for a registered station to be connected. Once a registered station is connected, nonfatal fault status disappears and the processor starts operating.

---

## Section 5 T-Link Systems

---

|  | Page        |
|--|-------------|
| <b>5-1 Mini T-Link Master Modules .....</b>  | <b>5-2</b>  |
| <b>5-2 T-Link Slave Module/Unit .....</b>  | <b>5-3</b>  |
| 1. T-link slave system configuration example .....   | 5-3         |
| 2. Setting a T-link slave station number .....   | 5-3         |
| 3. Programming example .....   | 5-4         |
| 4. List of T-link slave and processor .....  | 5-4         |
| <b>5-3 T-Link (Mini T-Link) Repeater/Converter .....</b>   | <b>5-5</b>  |
| 5-3-1 Overview of the T-link repeater (FRC200A-C10) .....  | 5-5         |
| 5-3-2 Overview of the mini T-link repeater (FRC060A-G02) .....                                     | 5-5         |
| 5-3-3 Overview of the T-link converter (FRC100A-G02) .....   | 5-6         |
| 5-3-4 Notes on connecting the T-link repeater, mini T-link<br>repeater, and T-link converter ..... | 5-6         |
| 5-3-5 Overview of the T-link optical converter<br>(FNC100C-C10/A20) .....                          | 5-9         |
| <b>5-4 Applicability of Each T-Link Interface Module to Each<br/>      Processor Series .....</b>  | <b>5-10</b> |

# Section 5. T-Link Systems

## 5-1 Mini T-Link Master Modules

### (Example of the FTM100B system configuration)

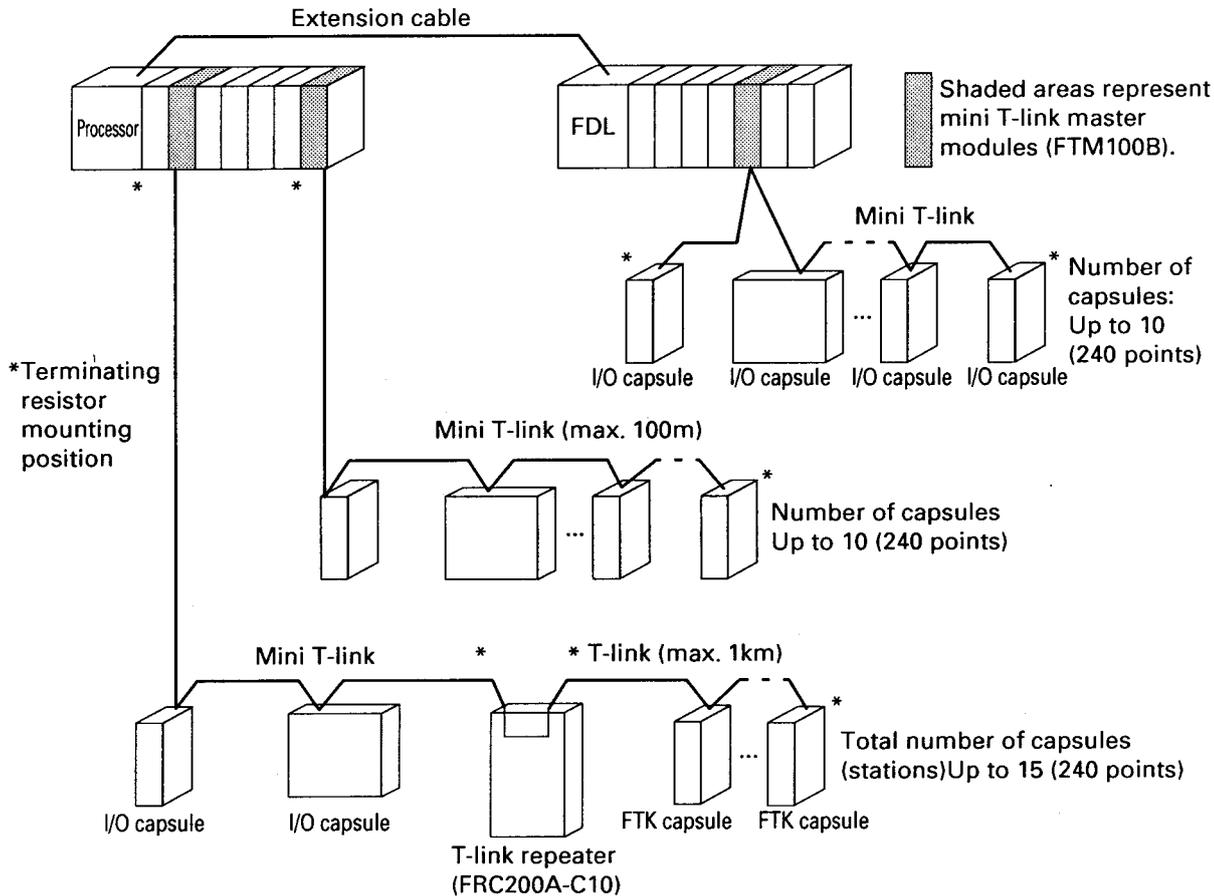
This section describes the various units which can be used with expanded T-link (mini T-link) systems. With the processor as the main station, T-link (mini T-link) transmission performs polling/selecting control to provide 1:N communication for both I/O data stations.

Mini T-link master modules are mounted on the base board for mounting F80H, F120H, and F120S to F150S series processor modules and F120H, and F120S to F150S series FDL modules. (They cannot be mounted

transmission and messages. Through T-link slave stations,

T-link (mini T-link) systems can perform I/O level communication among multiple processors. The following sections explain the use of T-link slave

on T-link interface FTL modules.) These modules have a master function for controlling mini T-link and can be expanded by up to 10 capsules, or up to 15 capsules if combined with a T-link converter or T-link repeater (240 I/O points in either case).



- ① Up to 8 mini T-link systems (8 mini master modules) can be configured with one processor.
- ② Up to 10 capsules (240 points) can be connected to a single mini T-link system. If an FTK capsule is connected using a T-link repeater (FRC200A-C10) or T-link converter (FRC100A-G02), up to 15 capsules (240 points) can be connected.
- ③ Terminating resistors must be mounted on modules or capsules indicated by the \* marks. (The master module is connected to a built-in terminating resistor by a switch.)

Note 1: The program loader cannot be connected to a capsule on a link which uses the mini T-link master module.

2: Items connectable to an FTK capsule which uses a T-link repeater may be restricted (to computer interface capsules for example) by specifications.



## 5-2 T-Link Slave Module/Unit

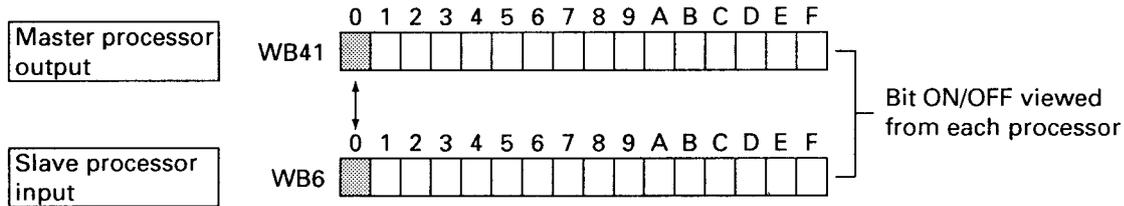
### 3. Programming example

In the configuration example on the previous page,

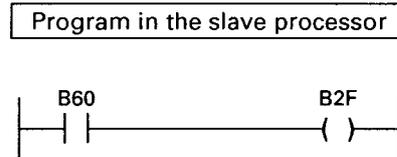
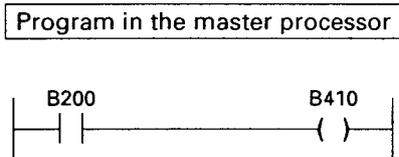
- The input switch is connected to the master processor capsule B200
- The output lamp is connected to the slave processor (FPB56) B2F

Here we present a sample program to light the lamp on the slave processor when the switch on the master processor is operated.

- ① A program is created using the first bit of WB6 in the slave processor (WB41 in the master processor).



- ② The following programs are stored in each processor:



Slave processor input B60 is turned ON when master processor output B410 is turned ON.  
(Conversely, master processor input B400 is turned ON when slave processor output B70 is turned ON.)

\* The FTL651B and NV1L-TS1 processor can also perform data transfer by message communication (message instruction).

### 4. List of T-link slave and processor

| T-link slave | Processor connected         | Number of occupied words (input/output)      | Data communication method        | Remarks                                   |
|--------------|-----------------------------|--|----------------------------------|---|
| FTL003A      | F30, F50, F50H              | 1/1  | I/O level                        |   |
| FTL003A-Z046 | F30, F50, F50H              | 2/2  | I/O level                        |   |
| FTL005A      | F50, F50H                   | 1/1  | I/O level                        |   |
| FTL006A-G02  | F60                         | 2/2  | I/O level                        |   |
| FTL650B      | F80H, F120H, F120S to F150S | 2/2  | I/O level                        |   |
| FTL651B      | F80H, F120H, F120S to F150S | 1/1, 2/2, 4/4, or 8/8 selected by DIP switch | I/O level, message communication | When 8/8, first input word cannot be used |
| NV1L-TS1     | F55                         | 1/1, 2/2, 4/4, or 8/8 selected by DIP switch | I/O level, message communication | When 8/8, first input word cannot be used |
| NC1L-TS1     | F70S                        | 1/1, 2/2, 4/4, or 8/8 selected by DIP switch | I/O level, message communication | When 8/8, first input word cannot be used |

## 5-3 T-Link (Mini T-Link) Repeater/Converter

### 5-3-1 Overview of the T-link repeater (FRC200A-C10)

The T-link repeater is a capsule which enables a T-link network to be freely configured, and has the following functions:

- Extension of T-link transmission distance  
Two repeaters can be used in a single T-link system, enabling extended transmission distance of up to 3 km.
- Transmission line branching  
Enables T-shaped transmission lines
- Connection with mini T-link  
Can be connected to mini T-link. Has four sets of terminals for connecting cables (T-link 1, T-link 2, T-link 3, and mini T-link terminals). Either the T-link 3 terminals or mini T-link terminals can be used for connection to mini T-link, selected by the changeover switch.

- Note 1: When mounting the FRC200A-C10 on both ends of T-link, or on an unused link terminal, connect the supplied terminating resistor (100Ω/1W) to the capsule. It is not necessary to connect a terminating resistor to whichever set of terminals (either T-link 3 or mini T-link) is not selected by the changeover switch.
- 2: Signals are transmitted only to the terminals selected by the changeover switch: either the T-link 3 terminals or mini T-link terminals.

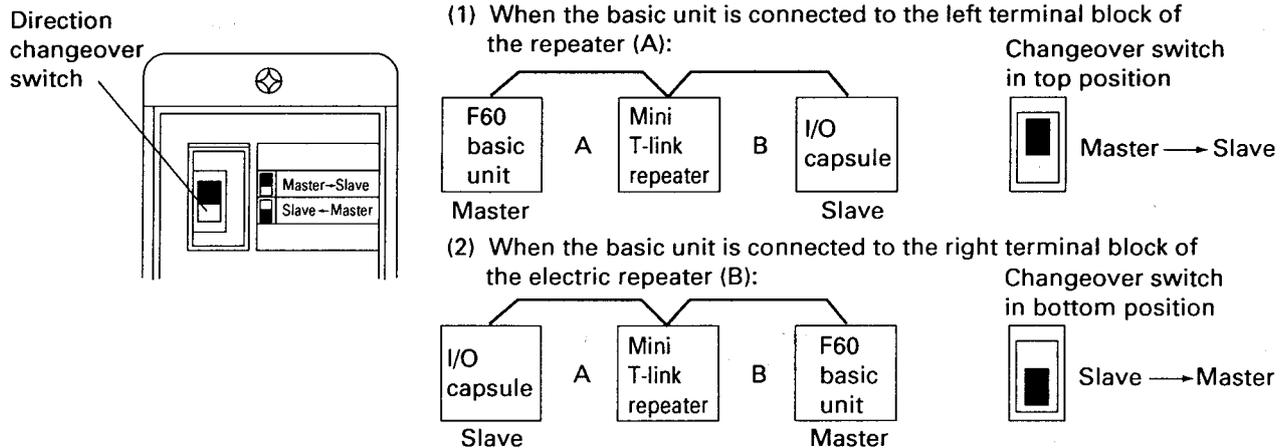
### 5-3-2 Overview of the mini T-link repeater (FRC060A-G02)

Using a mini T-link electric repeater capsule, the mini T-link maximum transmission distance of 100 meters

can be extended by a further 100 meters, also increasing the number of mini T-link capsules connectable.

#### Direction changeover switch

The communication direction is switched by changing the position at which the mini T-link repeater is connected to the F60 basic unit.



- Note 1: When mounting the FRC060A-G02 on both ends of each mini T-link, or on an unused link terminal, connect the supplied terminating resistor (100Ω/1W) to the repeater.
- 2: The repeater uses a 24 VDC input power supply. Be sure to connect the power supply in the correct polarity.
- 3: As the NC terminal is isolated from the internal circuit, it can be used as a relay terminal.
- 4: Never ground the mini T-link shield line (SD), as it is a signal ground for the communication signal line. To prevent distorted waveforms and communication malfunctions, keep this line separate from the FGs of other devices.

## 5-3 T-Link (Mini T-Link) Repeater/Converter

### 5-3-3 Overview of the T-link converter (FRC100A-G02)

The T-link converter capsule enables T-link to be converted to mini T-link (and vice versa) and various types of T-link or mini T-link I/O to be connected.

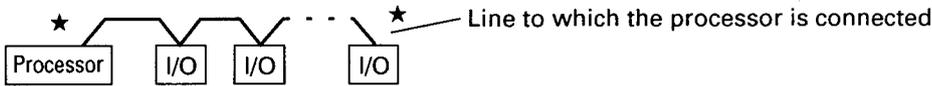
Note: Mount the supplied terminating resistor (100Ω/1W) on the T-link or mini T-link transmission line termination.

### 5-3-4 Notes on connecting the T-link repeater, mini T-link repeater, and T-link converter

When a T-link (mini T-link) system is configured, the following requirements must all be satisfied:

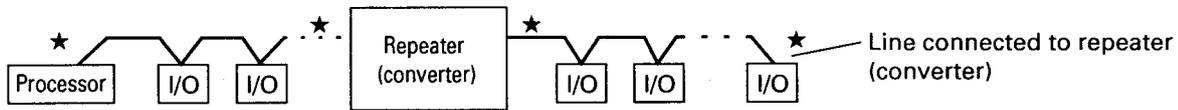
- With T-link, up to 32 units can be electrically connected directly to the line on which the processor is connected (transmission line serial connection), not counting the processor and loader.

With mini T-link, up to 9 units can be connected. In both cases, repeaters and converters are included in the number of units connectable.



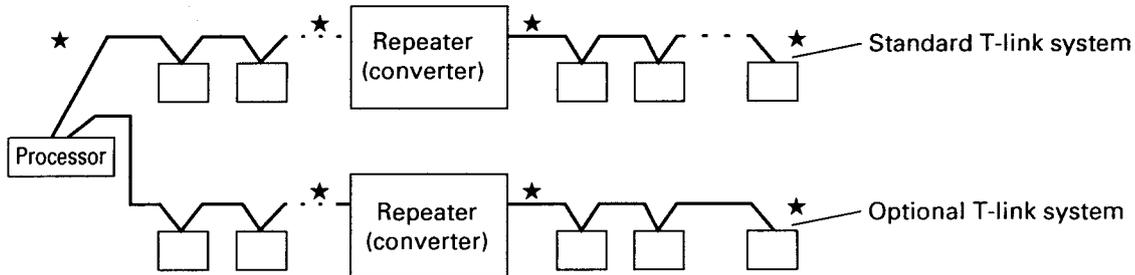
- With T-link, up to 32 units can be electrically connected to a line connected to a repeater (converter),

not counting the repeater (converter) itself. With mini T-link, up to 10 units can be connected this way.

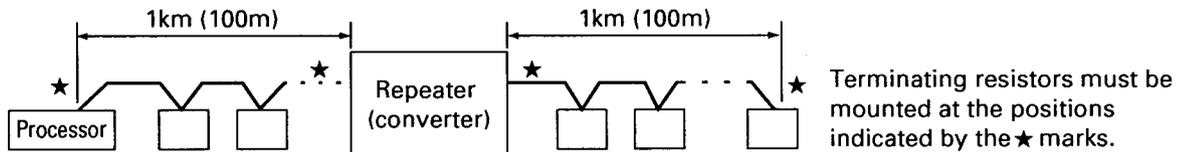


- Up to 32 I/O units (T-link slave units with their own station numbers) can be connected to a single processor T-link (mini T-link) system (including systems extended or branched with repeaters or

converters). (The processor checks the number of I/O stations connected.) If optional T-link systems are added, these function as separate systems, so an additional 32 I/O units can be connected per optional T-link.



- The maximum connection distance of each T-link (mini T-link) line is 1km (100m). Both ends of each line must be provided with terminating resistors.



## 5-3 T-Link (Mini T-Link) Repeater/Converter

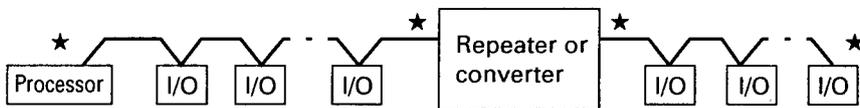
- ⑤ The numbers of repeaters or converters that can be used in a single system are as follows:

|                                      | Connection in series | Connection in parallel |
|--------------------------------------|----------------------|------------------------|
| Mini T-link repeaters (FRCC060A-G02) | 1                    | 2                      |
| T-link converters (FRC100A-G02)      | 1                    | 2                      |
| T-link repeaters (FRC200A-C10)       | 2                    | 2                      |

Note: A repeater can be connected in parallel with a converter in a single system.

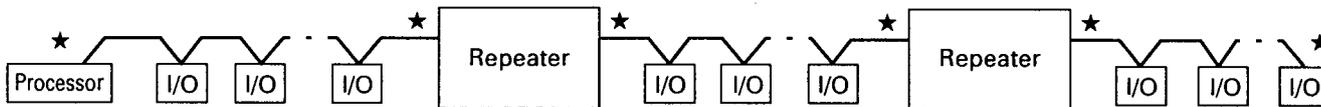
- Possible connection configurations:

### Connection in series: 1 unit

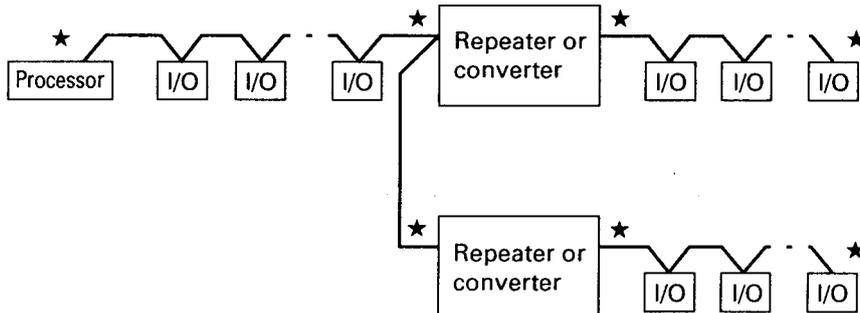


### Connection in series: 2 units

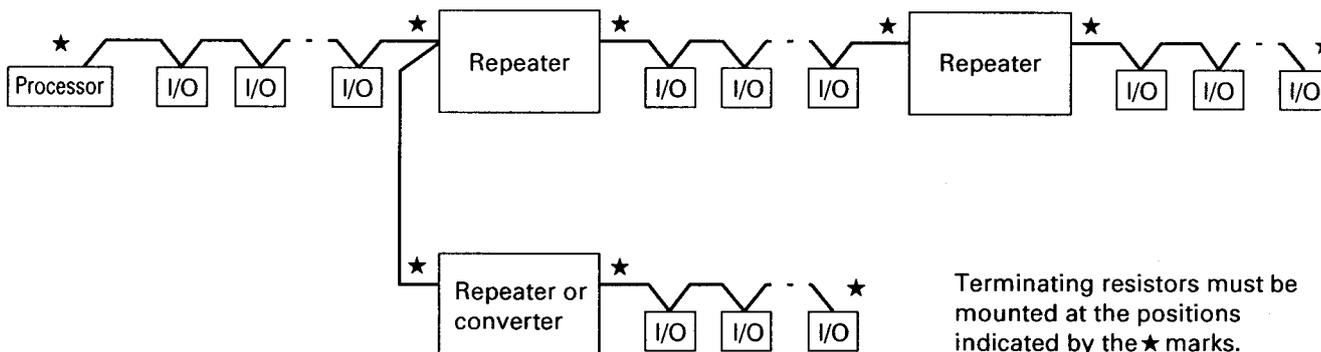
This configuration is only possible for the T-link repeater (FRC200A-C10).



### Parallel connection



### Series and parallel connection

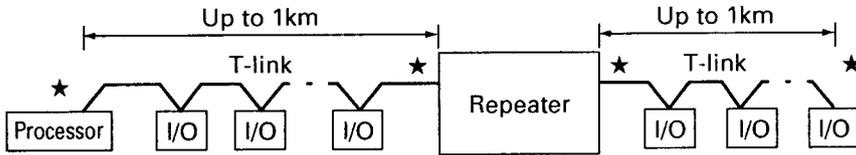


Terminating resistors must be mounted at the positions indicated by the ★ marks.

## 5-3 T-Link (Mini T-Link) Repeater/Converter

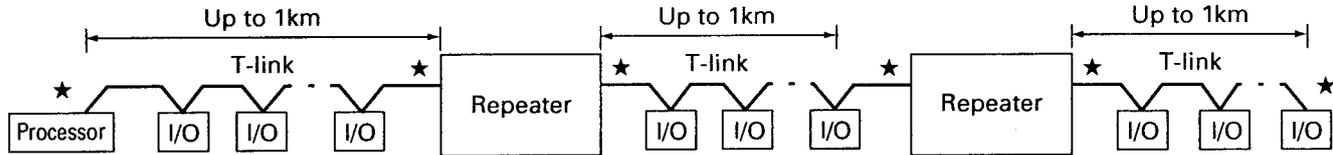
### Connection example

- Extended transmission distance (using a T-link repeater)



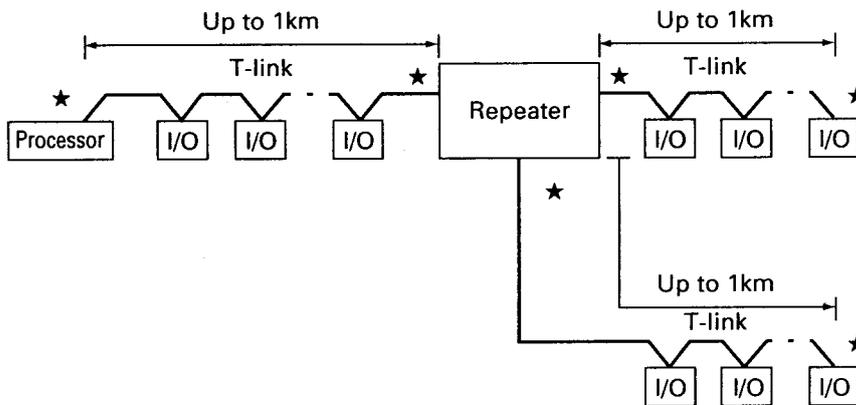
© A total of up to 32 I/O units can be connected.

- Extended transmission distance (using 2 T-link repeaters)



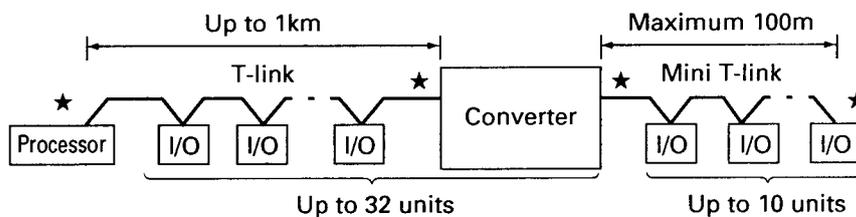
© A total of up to 32 I/O units can be connected.

- Branching (T-link branching)



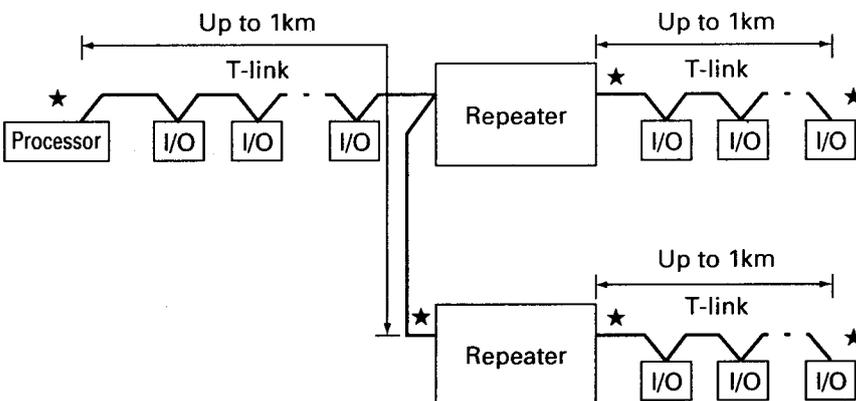
© A total of up to 32 I/O units can be connected.

- Connecting mini T-link devices (using a T-link converter)



© A total of up to 32 I/O units can be connected.

- Connecting T-link devices in parallel (using 2 T-link repeaters)

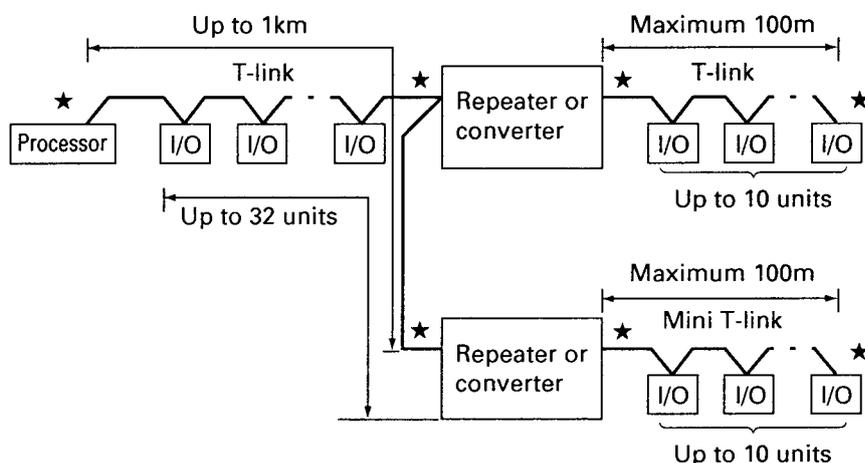


© A total of up to 32 I/O units can be connected.

Terminating resistors must be mounted at the positions indicated by the ★ marks.

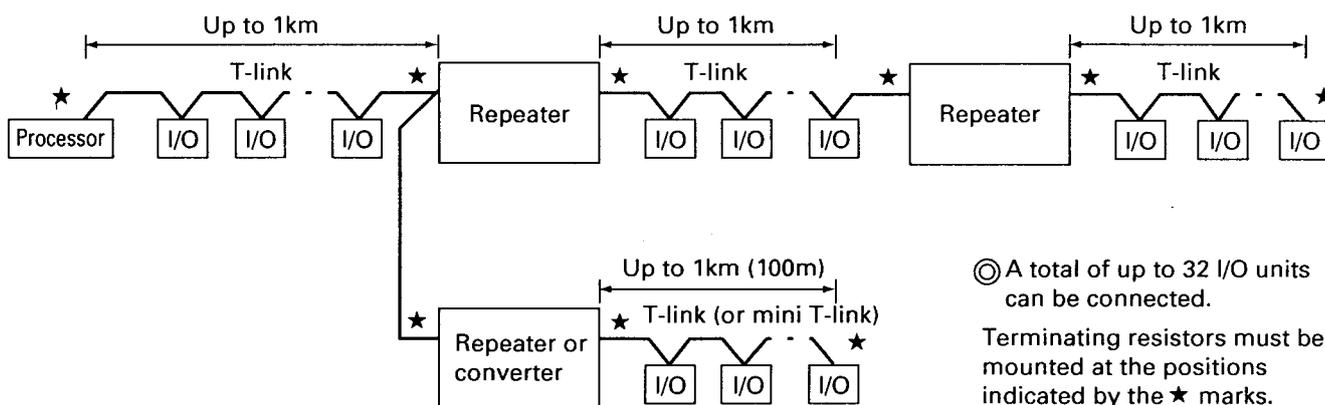
## 5-3 T-Link (Mini T-Link) Repeater/Converter

- Connecting mini T-link devices in parallel (using 2 T-link repeaters, 2 T-link converters, or 1 of each)



◎ A total of up to 32 I/O units can be connected.

- Maximum configuration



◎ A total of up to 32 I/O units can be connected.

Terminating resistors must be mounted at the positions indicated by the ★ marks.

### 5-3-5 Overview of the T-link optical converter (FNC100C-C10/A20)

The T-link optical converter enables excellent network noise resistance, for use in outdoor cabling or other situations where T-link may encounter lightning surges, or where excess noise is a problem. The following connection methods are available to meet user applications:

- Cascade connection: Ideal for long distance transmission systems, can be extended up to 17km.

- Star connection: Minimizes system fault area, enables a long-distance radially distributed system.
- Duplex connection: Provides duplex connection of optical cables.
- Loop connection: Provides looped connection of optical cables.

## 5-4 Applicability of Each T-Link Interface Module to Each Processor Series

The table below shows which T-link interface modules can be connected for use with which processor series:

| T-link interface |       | Processor        |  |
|------------------|-------|------------------|--|
|                  |       | F30/F50/F50H/F60 | F55/F70/F80H/F120H/F70S/F120S to F150S |
| FTL010A          |       | ○                | ○                                      |
| FTL010H          | MODE1 | ×                | ○                                      |
|                  | MODE2 | ○                | ○                                      |
| NC1ET            |       | ×                | ○                                      |

○: Can be used together

×: Cannot be used together

---

## Section 6 Performing Message Data Transmission

---

|   | Page        |
|---|-------------|
| <b>6-1 Message Modules .....</b>  | <b>6-2</b>  |
| 6-1-1 Message module basics .....                                       | 6-2         |
| 6-1-2 Examples of transmission and reception by<br>message module ..... | 6-7         |
| 1. T-link (mini T-link) .....   | 6-7         |
| 2. P-link (PE-link) .....   | 6-10        |
| <b>6-2 MSGT/MSGR Instructions .....</b>                                 | <b>6-12</b> |
| 6-2-1 MSGT/MSGR instruction basics .....                                | 6-12        |
| 6-2-2 Examples of MSGT/MSGR instruction usage .....                     | 6-15        |

# Section 6. Performing Message Data Transmission

## 6-1 Message Modules

This section describes how to perform message data transmission with message modules.

### 6-1-1 Message module basics

Data transmission with message modules uses a different message module No. for transmission and reception to or from each local station.

Three annunciator relays (identifier A) are assigned to

each message module to control and monitor it. The correspondence between message module No. and annunciator relays is shown below.

| Message module No. | Transmission request relay | Transmission/recp-tion completion relay | Transmission error relay | Applicable processors |                |
|--------------------|----------------------------|---|--------------------------|-----------------------|----------------|
| 0                  | A50                        | A100                                    | A150                     | F30                   | F55            |
| 1                  | A51                        | A101                                    | A151                     | F50/F50H              | F70            |
| 2                  | A52                        | A102                                    | A152                     | F60                   | F70s           |
| .                  | .                          | .                                       | .                        |                       | F80H/F120H     |
| .                  | .                          | .                                       | .                        |                       | F120S to F150S |
| 15                 | A65                        | A115                                    | A165                     |                       |                |
| 16                 | A66                        | A116                                    | A166                     |                       |                |
| .                  | .                          | .                                       | .                        |                       |                |
| .                  | .                          | .                                       | .                        |                       |                |
| 49                 | A99                        | A149                                    | A199                     |                       |                |

The data memory area actually transmitted is specified by message module registration in the processor system definition. Message module Nos. are displayed on the left side of the message module registration screen. Data memory areas are in the next field to the right. Settings are made with values known as data module Nos., instead of identifiers such as WB, WM, and WK.

#### • Transmission request relay (A50 to A99)

This relay is turned ON by the processor program at the time of desired transmission. It must be ON continuously until the transmission completion relay turns ON. Normally, it is turned ON using a set coil (S). The transmission request relay is automatically reset when the transmission completion relay is reset (turned OFF), so the transmission request relay need not be reset (turned OFF) by the program. Setting transmission request relay and resetting transmission completion relay in the same group (for example, A50, A100, A150) must not be performed simultaneously in the same scan, or else the transmission request relay is reset.

#### • Transmission/reception completion relay (A100 to A149)

##### (Transmission completion relay)

This relay is turned ON when transmission completes. The transmission completion relay must be reset (turned OFF) before a transmission request relay is set (turned ON) in the next scan or after. Even if the next transmission request relay is set, data is not transmitted unless the transmission completion relay is reset. Normally, it is turned OFF using a reset coil (R).

#### (Reception completion relay)

This relay is turned ON when data is received from a remote station and written in the internal memory of the processor. It must be reset (turned OFF) as soon as possible, since the next data cannot be received while it is ON. If data is transmitted from a remote station while it is ON, a transmission error is detected in that remote station and data transmission or reception is not performed.

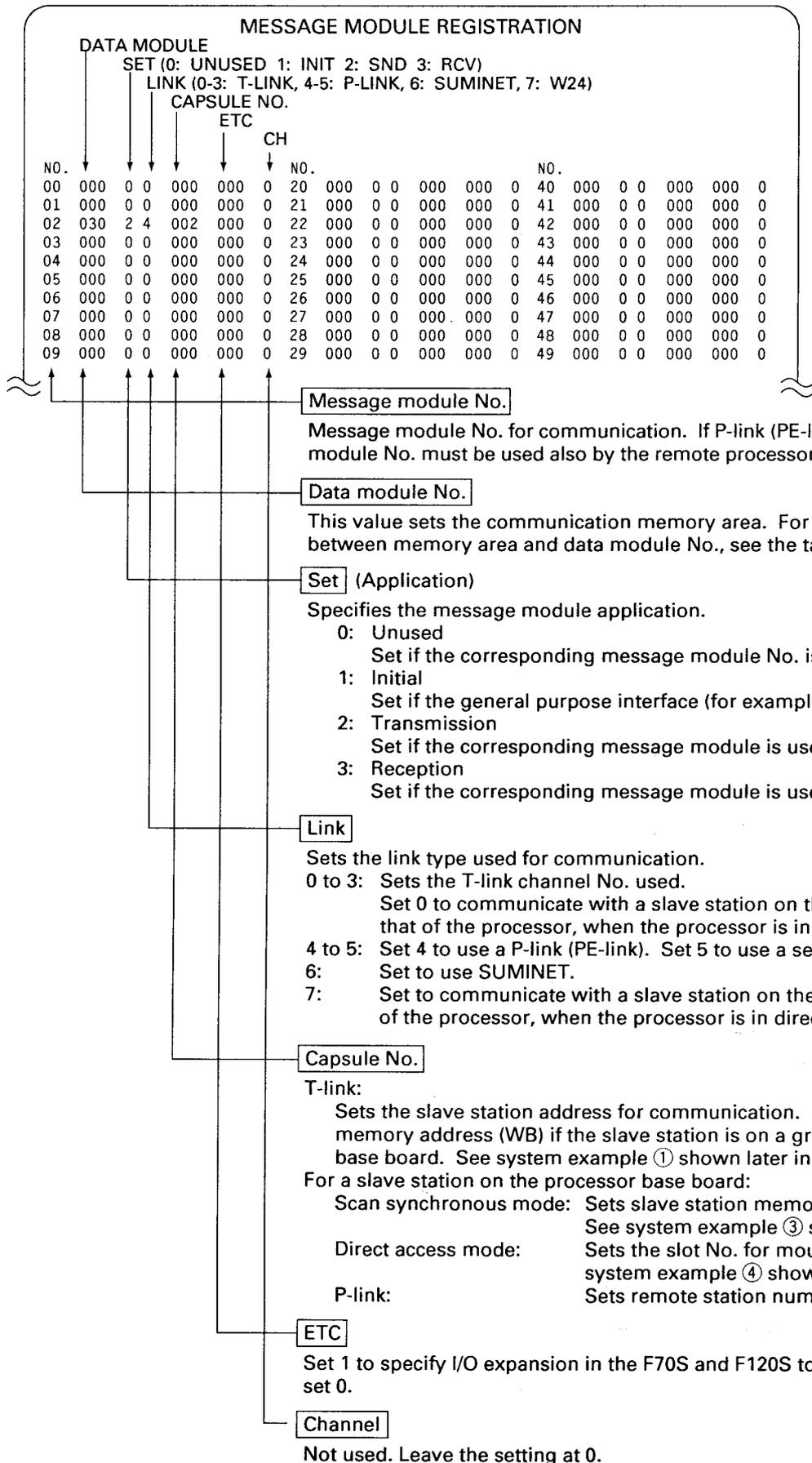
The minimum unit of data transmission or reception is a word. New received data is written over the previous data. If the length of new received data is shorter than the length of the previous received data, part of the previous data is left unchanged in an excess area.

#### • Transmission error relay (A150 to A199)

This relay is turned OFF when transmission ends normally and ON when transmission ends due to error. If turned ON, the transmission completion relay is turned ON, but data is not written in the remote station. Both transmission completion relay and transmission error relay must be reset (turned OFF) before transmission can be redone (transmission request relay must be set).

The transmission error relay need not be reset to redo transmission. If transmission is redone successfully, the transmission error relay is reset, if not, it remains set.

There is no error relay for reception.

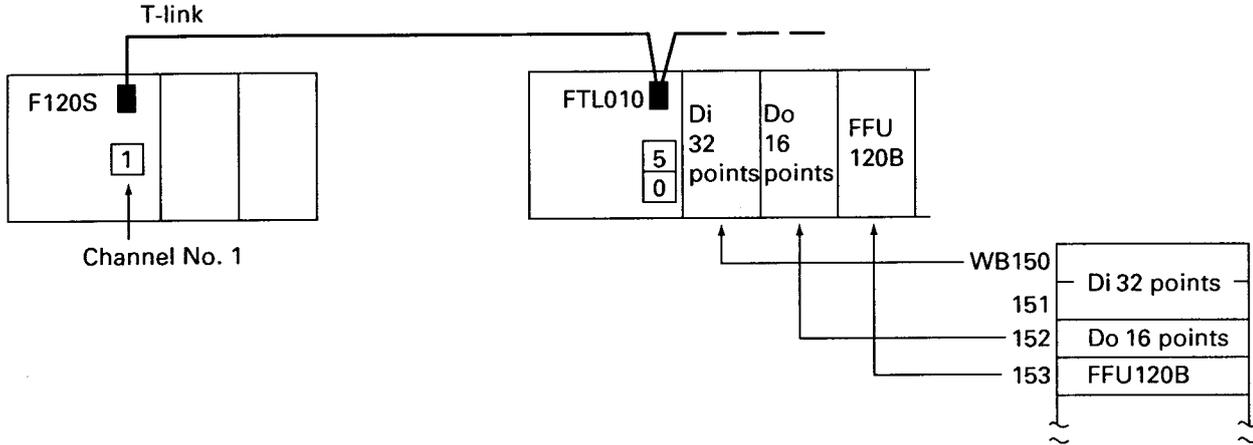


# 6-1 Message Modules

## Setting capsule No.

### System example ①

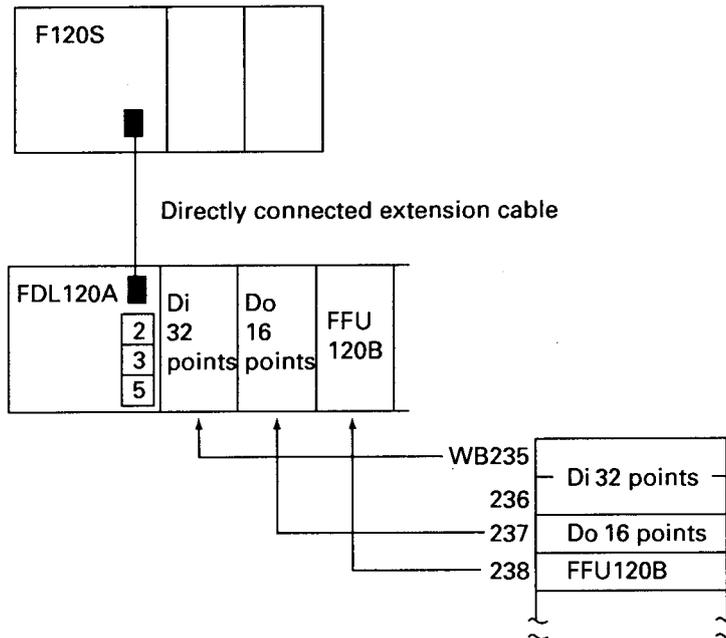
Slave station (FFU120B) on the same base board as that of the group type T-link interface module (FTL010):



For this system, set capsule No. to the lower two digits of the first slave station address, '53'.  
Set link No. to processor channel No., '1'.

### System example ②

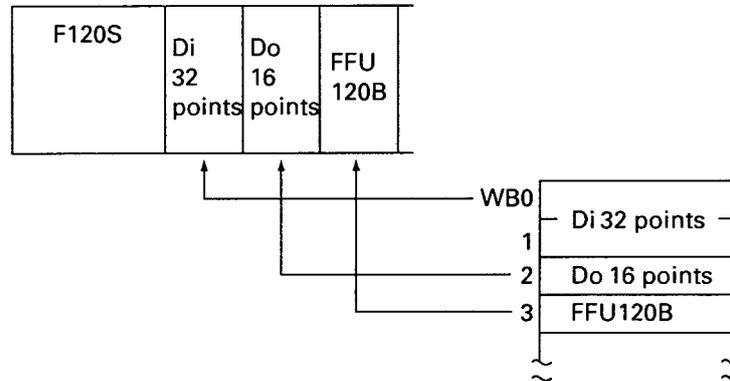
Slave station (FFU120B) on the same base board as that of a direct I/O expansion module (FDL120A):



For this system, set capsule No. to the lower two digits of the first slave station address, '38'.  
Set link No. to the highest digit of the first slave station address, '2'.

## System example ③

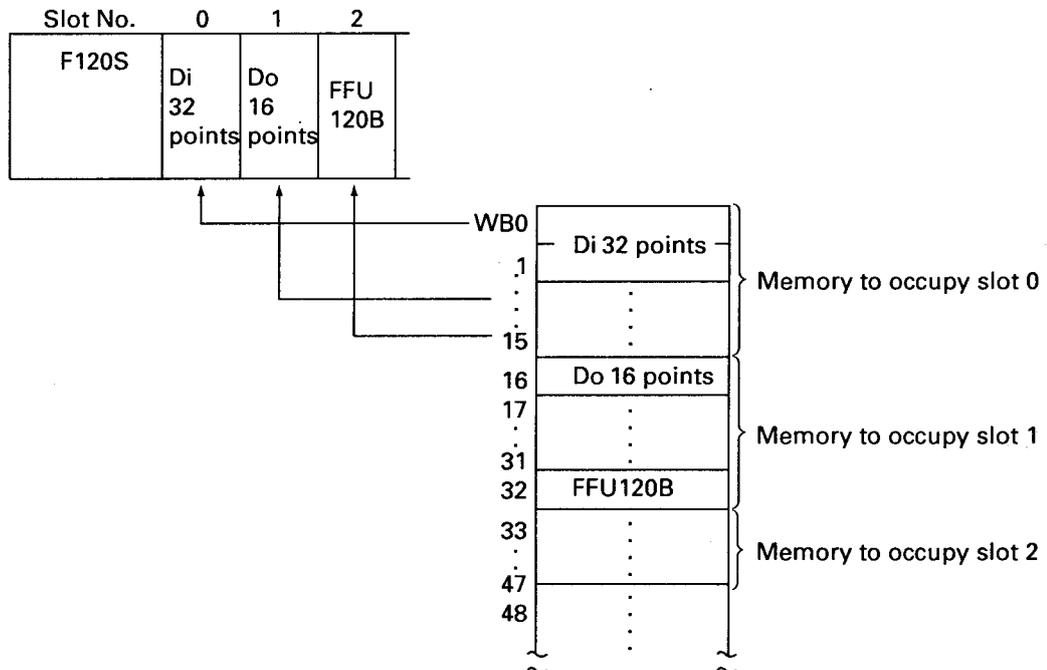
System definition of a slave station on the processor base board in scan synchronous mode:



For this system, set capsule No. to the first slave station address, '3'. Always set link No. to 0.

## System example ④

System definition of a slave station on the processor base board in direct access mode:  
(In direct access mode, the first address of each slave station is slot No. × 16.)



For this system, set capsule No. to the slave station mounting slot No., '2'. Always set link No. to 7.

# 6-1 Message Modules

## Data module No. list

| Memory          |              | Processor | F30<br>F50/F50H | F60 | F55<br>F80H<br>F70 | F120H | F70S<br>F120S to F150S |
|-----------------|--------------|-----------|-----------------|-----|--------------------|-------|------------------------|
| Data module No. | Identifier   |           |                 |     |                    |       |                        |
| 0               | B            |           | T/R             |     |                    | R     |                        |
| 1               | M            |           | T/R             |     |                    | R     |                        |
| 2               | K            |           |                 |     | T/R                |       |                        |
| 3               | F            |           |                 |     | T                  |       | x                      |
| 4               | A            |           |                 |     | T/R                |       |                        |
| 5               | D            |           |                 |     | T/R                |       |                        |
| 8               | S            |           |                 |     | T/R                |       |                        |
| 9               | W9           |           | -               |     |                    | R     |                        |
| 10              | TS           |           |                 |     | R                  |       |                        |
| 11              | TR           |           |                 |     | R                  |       |                        |
| 12              | CS           |           | T/R             |     |                    | R     |                        |
| 13              | CR           |           | T/R             |     |                    | R     |                        |
| 14              | BD           |           |                 |     | R                  |       |                        |
| 20              | WL           |           |                 | -   |                    |       | R                      |
| 21 to 23        | W21 to W23   |           |                 | -   |                    |       | R                      |
| 24              | W24          |           |                 | -   |                    | R     |                        |
| 25              | W25          |           |                 |     |                    |       | R                      |
| 26              | W26          |           |                 |     | T/R                |       |                        |
| 30 to 45        | W30 to W45   |           |                 |     | T/R                |       |                        |
| 46 to 109       | W46 to W109  |           |                 | -   |                    | T/R   |                        |
| 120 to 123      | W120 to W123 |           |                 |     |                    |       | R                      |
| 125             | W125         |           |                 |     | -                  |       | T                      |

Symbols in the table:

- T: Area capable of transmission from the local station.
- R: Area capable of reception in the local station.
- x: Neither transmission nor reception possible at the local station.
- : No target memory in local station

Note: WL and W21 to W23 are memory areas used when the first optional P-link (PE-link) is mounted.  
W120 to W123 are memory areas used when the second optional P-link (PE-link) is mounted.

### Message module transmission and reception rules

- ① Data cannot be received in read-only areas (such as data module No. 3: F area). Reception is also not possible in areas defined by the TABL instruction.
- ② Up to 220 bytes of data can be transmitted at one time (110 words for areas where 1 word is 16 bits, and 55 words for areas where 1 word is 32 bits). With message data transmission, specified data modules are transmitted all at once, so data modules with a memory capacity of over 220 bytes cannot be transmitted. Normally, variable capacity file memory areas (W30 to W109) should be used as data modules.

Note that file definition must be performed to use file memory. An example of file definition is shown below.

- Defining data module No. 30 (W30) as SI type (1 word = 16 bits), with a 110-word size:

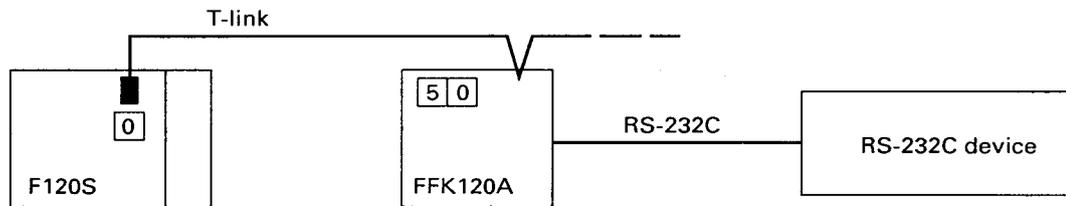
```
[FILE 30 : 1 : 110 : SI] Allocated memory: W30.000 to 30.109
```

- ③ Received data is stored beginning in the first address of the specified data module. The memory capacity of the data module used for reception must be equal to or more than the amount of data transmitted from the remote station.

## 6-1-2 Examples of transmission and reception by message module

### 1. T-link (mini T-link)

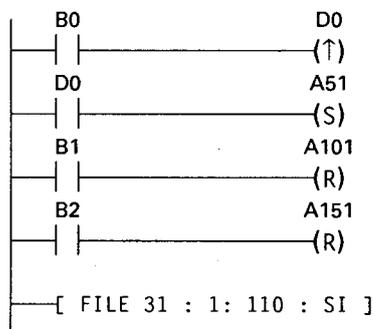
Here we describe transmission and reception by message module in the following system:



#### Transmission System definition example

| Message module No. | Data module No. | Set | Link | Capsule No. | ETC | Channel |
|--------------------|-----------------|-----|------|-------------|-----|---------|
| 01                 | 31              | 2   | 0    | 50          | 0   | 0       |

#### Program example

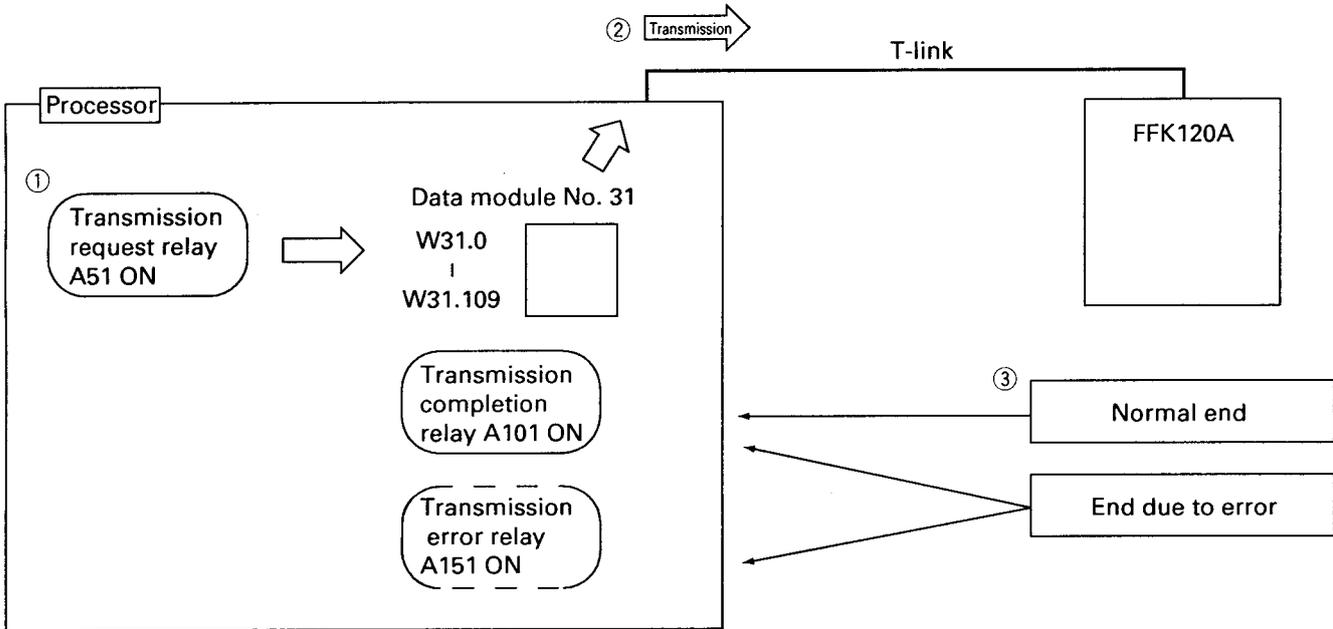


#### Program operation

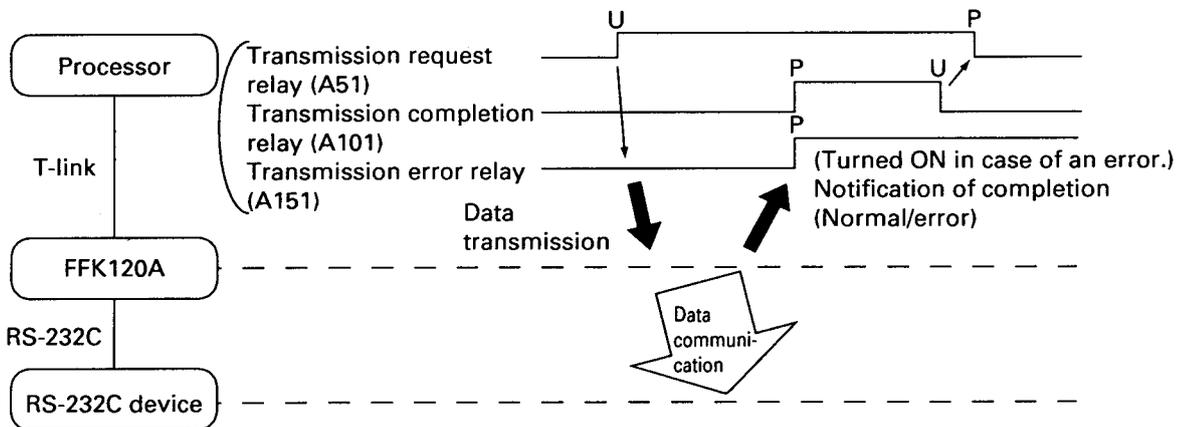
- ① By turning ON the input switch (B0), the rising edge differential relay (D0) is turned ON for 1 scan and the transmission request relay (A51) is turned ON. Leave the input switch (B0) OFF.
- ② If data transmission from F120S to FFK120A completes, the transmission completion relay (A101) is turned ON. If transmission ends due to an error, the transmission error relay (A151) is also turned ON.
- ③ The transmission completion relay (A101) is reset (turned OFF) by turning ON the input switch (B1). At that time, the transmission request relay (A51) is also turned OFF. The transmission error relay is reset (turned OFF) by turning ON the input switch (B2).
- ④ Switches B1 and B2 are turned OFF.

# 6-1 Message Modules

## Data flow



## Annunciator relay operation



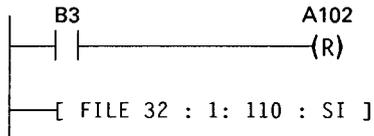
Meanings of symbols in the timing chart above:  
 U: Set or reset by a user program  
 P: Processor sets or resets by itself automatically

## Reception

### System definition example

| Message module No. | Data module No. | Set | Link | Capsule No. | ETC | Channel |
|--------------------|-----------------|-----|------|-------------|-----|---------|
| 02                 | 32              | 3   | 0    | 50          | 0   | 0       |

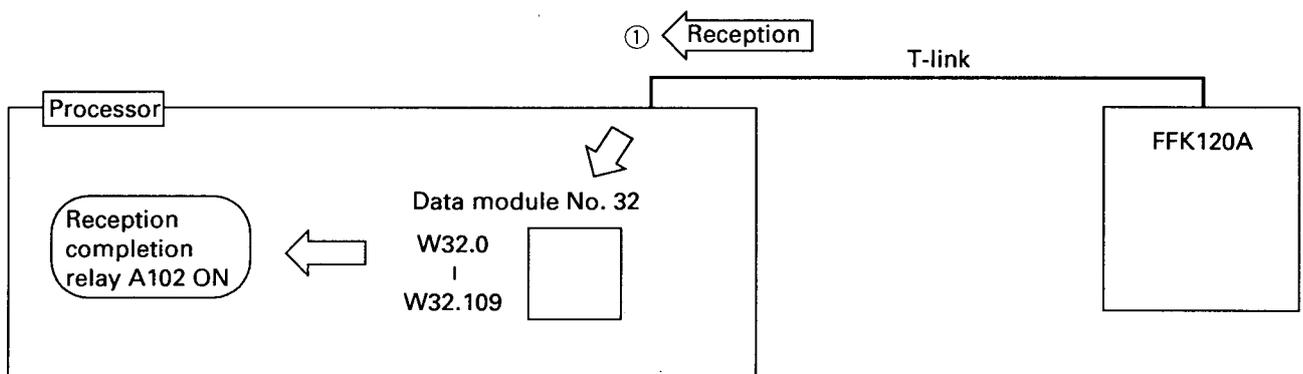
### Program example



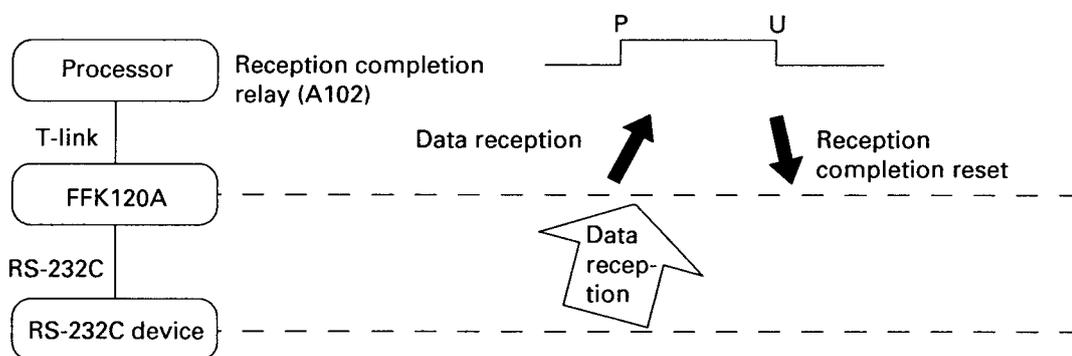
### Program operation

- ① If data reception from FFK120A to F120S completes, the reception completion relay (A102) is turned ON.
- ② The reception completion relay (A102) is reset (turned OFF) by turning ON the input switch (B3).

### Data flow



### Annunciator relay operation

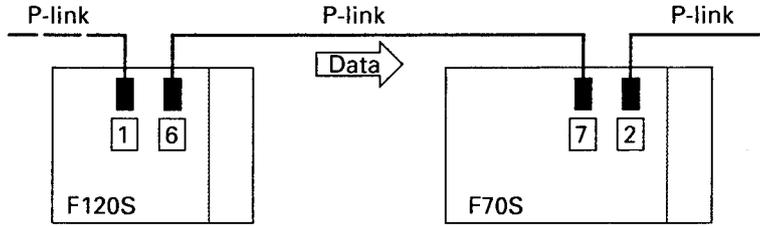


Meanings of symbols in the timing chart above:  
 U: Set or reset by a user program  
 P: Processor sets or resets by itself automatically

# 6-1 Message Modules

## 2. P-link (PE-link)

Here we describe transmission and reception by message module in the following system:



Data is transmitted as follows:

From F120S second P-link (channel 1):

P-link station number 6

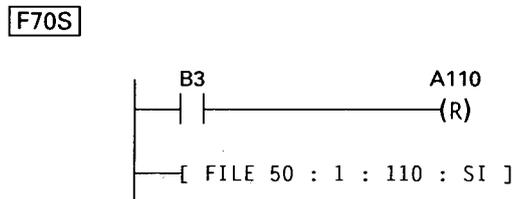
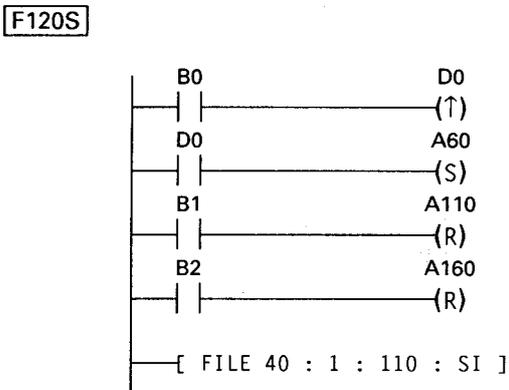
To F70S first P-link (channel 0):

P-link station number 7

### System definition example

| F120S | Message module No.                 | Data module No. | Set                            | Link   | Capsule No.                             | ETC | Channel |
|-------|------------------------------------|-----------------|--------------------------------|--|---|-----|---------|
|       | 10                                 | 40              | 2                              | 5  | 7                                       | 0   | 0       |
|       | ↑<br>Must be the same number.<br>↓ |                 | Transmission<br>↓<br>Reception | Set local station link used for communication. | Remote station number for communication |     |         |
| F70S  | Message module No.                 | Data module No. | Set                            | Link   | Capsule No.                             | ETC | Channel |
|       | 10                                 | 50              | 3                              | 4  | 6                                       | 0   | 0       |

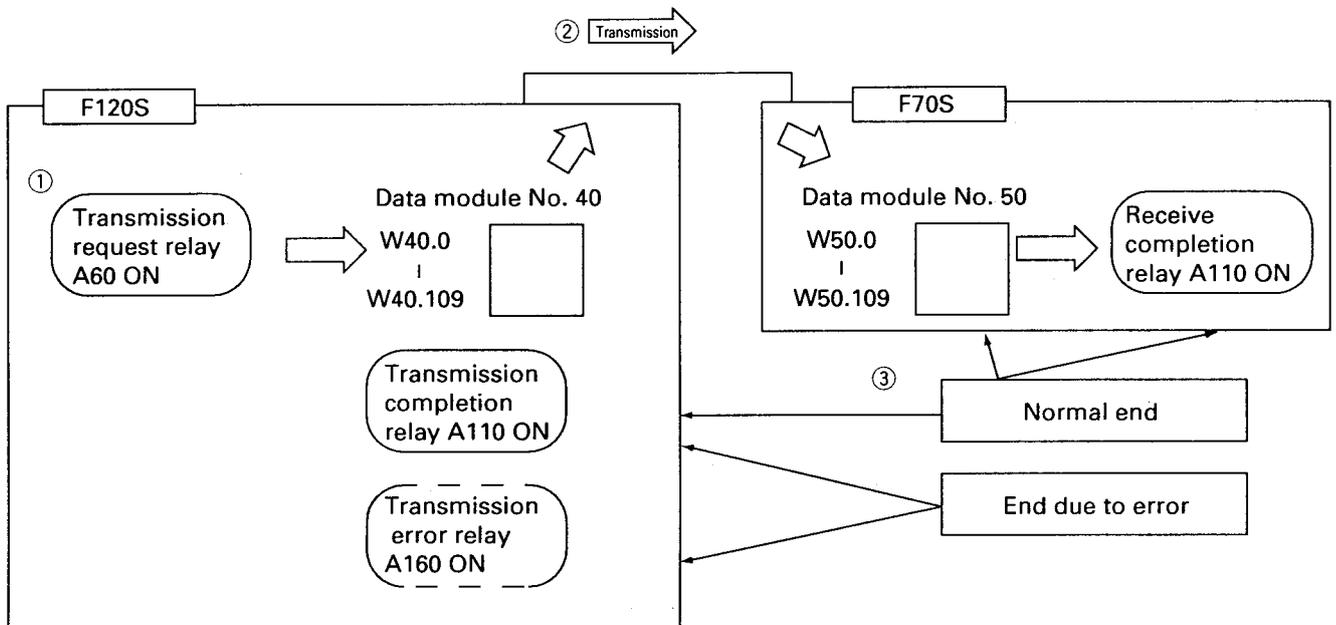
### Program example



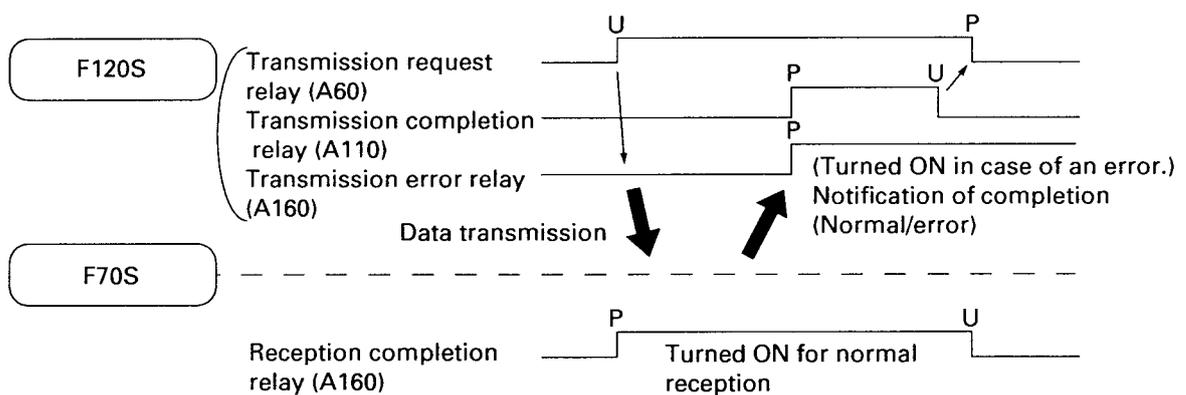
## Program operation

- ① The rising edge differential relay (D0) is turned ON for 1 scan and the transmission request relay (A60) is turned ON when the input switch (B0) on F120S is turned ON. Leave the input switch (B0) OFF.
- ② If data transmission from F120S to F70S completes, the transmission completion relay (A110) on F120S is turned ON. If transmission ends due to error, the transmission error relay (A160) is also turned ON. If transmission from F120S ends normally, the receive completion relay (A110) is turned ON in F70S. Reception data is input to data module No. 50.
- ③ The transmission completion relay (A110) is reset when the input switch (B1) on F120S is turned ON. At that time, the transmission request relay (A60) is turned OFF automatically. Turning ON the input switch (B3) on F70S resets the receive completion relay (A110). The transmission error relay is reset on F120S by turning ON the input switch (B2).
- ④ Turn OFF B1 and B2 on F120S and B3 on F70S.

## Data flow



## Annunciator relay operation



Meanings of symbols in the timing chart above:

U: Set or reset by a user program

P: Processor sets or resets by itself automatically

## 6-2 MSGT/MSGR Instructions

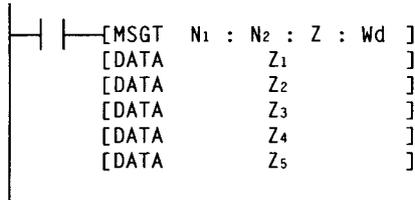
This section describes message data transmission using the MSGT/MSGR instructions.

### 6-2-1 MSGT/MSGR instruction basics

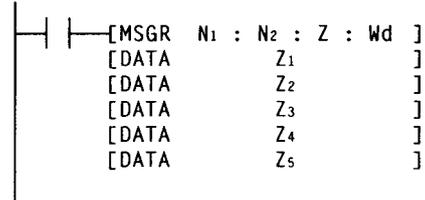
The MSGT/MSGR instructions enable data transmission to be done more easily, since there are no restrictions on system definition registration for

message module data transmission, or on data module capacity. However, the MSGT/MSGR instructions must be supported by the processor and remote device.

#### Format of the MSGT instruction



#### Format of the MSGR instruction



#### Meaning of each parameter

- N<sub>1</sub>: Link type
- |   |                                  |
|---|----------------------------------|
| { | 1: T-link (including FDL)        |
| { | 2: P-link (PE-link)              |
| { | 3: Direct access                 |
| { | 4: SUMINET                       |
| { | 5: I/O expansion (including FDL) |
| { | 6: ME-NET                        |

- N<sub>2</sub>: Monitoring timer (10ms base)  
 This setting is effective only when the link type is SUMINET.  
 Setting value: 0 to 9999. 0 setting indicates 1s.

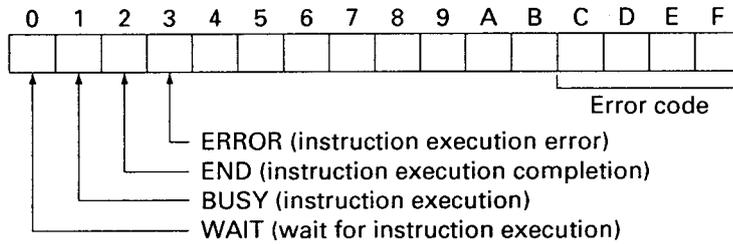
### Z: Station number specification

| Link name                     | Specification method | Configuration   | Specification range  |
|-------------------------------|----------------------|---|--|
| T-link (including FDL)        | Decimal              | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>Channel No.</span> <span>Station number</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 99</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 03</span> </div> </div>  | d0000 to d0399   |
| P-link                        | Hexadecimal          | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>P-link No.</span> <span>Station number</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 0F</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00, 01</span> </div> </div>   | h0000 to h000F<br>h0100 to h010F                                     |
| P-link No.                    | Hexadecimal          | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>P-link No.</span> <span>Station number</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 3F</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00, 01</span> </div> </div>   | h0000 to h003F<br>h0100 to h013F                                     |
| Direct access                 | Decimal              | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="text-align: center;">Slot No.</div> <div style="display: flex; justify-content: center; margin-top: 5px;"> <span>↑</span> </div> <div style="display: flex; justify-content: center; margin-top: 5px;"> <span>0 to 9</span> </div> </div>  | d0 to d9   |
| SUMINET                       | Hexadecimal          | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>00</span> <span>Network No.</span> <span>Node address</span> <span>Port No.</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span></span> <span>00</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span></span> <span>01 to 7E</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span></span> <span>00 to 7F</span> </div> <div style="text-align: right; margin-top: 5px;">(0: Same network)</div> </div> | h00000100<br>h007F7E00   |
| I/O expansion (including FDL) | Decimal              | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>Channel No.</span> <span>Station number</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 31</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 03</span> </div> </div>  | d0000 to d0031<br>d0100 to d0131<br>d0200 to d0231<br>d0300 to d0331 |
| ME-NET                        | Hexadecimal          | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <span>ME-NET No.</span> <span>Station number</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span>↑</span> <span>↑</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00 to 3F</span> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <span></span> <span>00, 01</span> </div> </div>   | h0000 to h003F<br>h0100 to h013F                                     |

Note: If Z is indirectly specified in P/PE-link, SUMINET or NE-NET data is recognized as decimal data, so data must be stored (specified) using the binary/BCD conversion instruction.

## 6-2 MSGT/MSGR Instructions

Wd: Status (indicates the communication status and communication result.)



• Error code

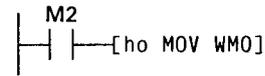
An error code is set if bit 2 of the status (END) is turned ON.

The following types of error codes exist:

- 0 **0000**: Normal end
- 1 **0001**: No corresponding station
- 2 **0010**: Parameter setting error
- 3 **0011**: Remote station disconnection
- 4 **0100**: Remote station processing
- 5 **0101**: Reception data error
- 6 **0110**: Remote station processing disabled
- 7 **0111**: System error (local station system error)
- 8 **1000**: Response time over
- 9 **1001**: Reception file error

\* When the MSGT/MSGR instruction execution ends (bit 2 of the status ON), the status must be zero-cleared for the next MSGT/MSGR instruction to be executed. Normally, the status is zero-cleared as follows:

Example: When the status is WMO:



- Z1: Transmission source, file No.
- Z2: Transmission source, first address
- Z3: Transmission destination, file No.
- Z4: Transmission destination, first address
- Z5: Number of words transmitted/received

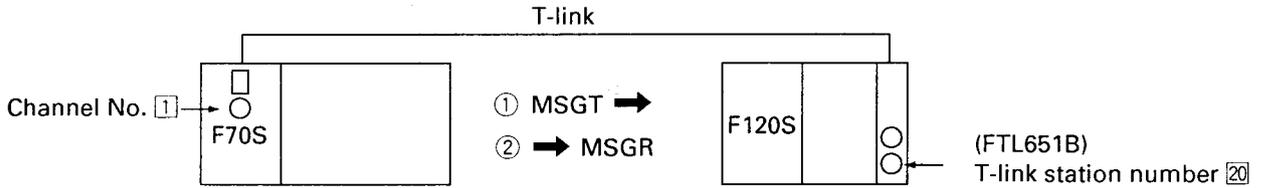
When 1 word = 16 bits, the maximum number of words transmitted are as follows:

| Type                       | Maximum number of words transmitted | Maximum number of words received |
|----------------------------|-------------------------------------|----------------------------------|
| Direct bus (including FDL) | 1018                                | 1018                             |
| T-link                     | 108                                 | 108                              |
| P-link                     | 108                                 | 108                              |
| PE-link                    | 498                                 | 498                              |
| Direct access              | 1018                                | 1018                             |
| SUMINET                    | 1002.5                              | 1004                             |
| I/O expansion (T-link)     | 108                                 | 108                              |
| ME-NET                     | 108                                 | 108                              |

File No. means the same as data module No. See the data module No. list for details.

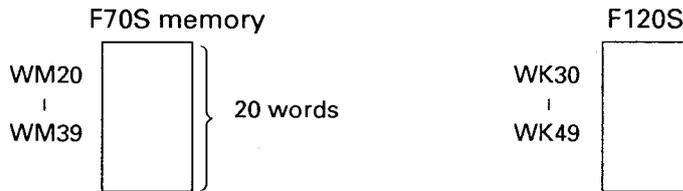
## 6-2-2 Examples of MSGT/MSGR instruction usage

Here we show examples of use of the MSGT/MSGR instructions in the following system:



Example 1: Data is transmitted from F70S to F120S through FTL651B by the MSGT instruction.

### Data flow



### F70S program

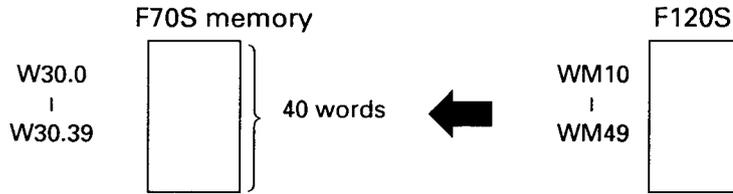
```

B0
| | [MSGT 1:0:d120 WM10]
| | [DATA d1 ]
| | [DATA d20 ]
| | [DATA d2 ]
| | [DATA d30 ]
| | [DATA d20 ]
M102
| | [h0 LMOV WM10 ]
    
```

## 6-2 MSGT/MSGR Instructions

Example 2: Data is received (read) from F120S to F70S through FTL651B by the MSGR instruction.

### Data flow



### F70S program

```

| B0 | | [MSGR 1:0:d120 WMO ]
|    | | [DATA d1          ]
|    | | [DATA d10         ]
|    | | [DATA d30         ]
|    | | [DATA d0          ]
|    | | [DATA d40         ]
| M2 | | [h0 LMOV WMO       ]
|    | | [FILE 30:1:40:SI ]

```

---

## Section 7 Overview of P/PE-Link

---

|  | Page       |
|--|------------|
| <b>7-1 P/PE-Link Specifications .....</b>      | <b>7-2</b> |
| 7-1-1 Basic specifications .....               | 7-2        |
| 7-1-2 Cable specifications .....               | 7-3        |
| <b>7-2 Basic Rules of P/PE-Link .....</b>      | <b>7-4</b> |
| 7-2-1 Station addresses .....                  | 7-4        |
| 7-2-2 Memory assignment .....                  | 7-4        |
| 7-2-3 Number of units connectable .....        | 7-4        |
| 7-2-4 Wirings .....                            | 7-4        |
| 7-2-5 Processors which support P/PE-link ..... | 7-4        |

# Section 7. Overview of P/PE-Link

## 7-1 P/PE-Link Specifications

This section gives an overview of P-link and PE-link (expressed as P/PE-link from now on). P/PE-link are high-speed, highly functional and highly reliable serial transmission systems for linking processors distributed over a wide area. Up to 16 processors can be connected with P-link, and up to 64 processors with PE-link. P/PE link provide N:N communication by

controlling the right of transmission between capsules, using token passing.

Processors linked by P/PE-link can perform the following:

- ① Data exchange between processors
- ② User program download from upper level computer
- ③ Processor start/stop executed by upper level computer

### 7-1-1 Basic specifications

P/PE-link specifications are shown below.

| Link type                        | P-link  | PE-link   |
|----------------------------------|---|---|
| Number of processors connectable | Up to 16 (including the P-link interface upper level computer)  | Up to 64  |
| Transmission line format         | Bus configuration (multi-drop)<br>Optical loop connection via optical converter between buses<br>(Looped portion is capable of duplex configuration.)                         |   |
| Transmission line                | Bus transmission line: Coaxial cable<br>Total length: Max. 250m<br>Optical transmission line:<br>Multicomponent glass optical fiber<br>(Up to 1km between optical converters) | Bus transmission line: Coaxial cable<br>Total length: Max. 500m<br>Optical transmission line:<br>Multicomponent glass optical fiber<br>(Up to 1km between optical converters) |
| Transmission method              | Half-duplex, serial transmission  |   |
| Data exchange method             | N:N (token passing) method<br>Memory refresh method   |   |
| Transmission speed               | 5Mbits/sec  |   |
| Effective transmission speed     | 400K bytes/sec  |   |
| Modulation method                | PDM (Pulse Duration Modulate)   |   |
| Error check                      | FCS (Frame Check Sequence)<br>Number of data words check<br>Collision detection   |   |
| Data transfer                    | Broadcast communication (transfer to all the capsules)  |   |
| System control                   | Processor start/stop from other processor   |   |
| Failure information detection    | Each processor monitors transmission line status  |   |
| Duplex transmission line         | Duplex optical loop between optical converters  |   |

#### Reference (explanation of terms)

- Token passing: A method of network control in which the right of control access is passed from terminal to terminal by moving tokens.
- Broadcast communication: Communication from a single station (analogous to a radio broadcasting station) to multiple stations simultaneously.

**Note:** P-link cannot be connected to PE-link.

### 7-1-2 Cable specifications

To avoid system shutdown due to transmission line malfunctions, only use P/PE-link cables with the specifications listed below. Do not use KIV wire or twisted pair cables.

| Item                     |  | Type  |
|--------------------------|--|---|
|                          |  | Coaxial cable<br>5C-2V (JIS C 3501 standard)        |
| Conductor                | Material                               | JIS C 3102, annealed copper wire for electrical use |
|                          | Outer diameter (mm)                    | 0.8   |
| Insulation               | Material                               | Polyethylene  |
|                          | Outer diameter (mm)                    | 4.9   |
| Shielding                |  | Flexible wire braid                                 |
| Sheath                   | Material                               | PVC (black)   |
|                          | Finished outside diameter (mm)         | 7.4   |
| Mass (kg/km)             |  | Approx. 7.4   |
| Electric characteristics | Conductor resistance ( $\Omega$ /km)   | 35.9  |
|                          | Insulation resistance ( $M\Omega$ -km) | 1000  |
|                          | Withstand voltage (V AC/1 minute)      | 1000  |

## 7-2 Basic Rules of P/PE-Link

This section explains the basic rules of P/PE-link.

### 7-2-1 Station addresses

P/PE-link station addresses can be set with the P/PE-link card hard switch or program loader. Station addresses can be set alternately, but settings must not overlap. The address setting range is 0 to 15 (hexadecimal 00 to 0F) for P-link and 0 to 63 (hexadecimal 00 to 3F) for PE-link.

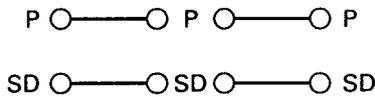
### 7-2-3 Number of units connectable

Up to 16 units can be connected to a single P-link system, and up to 64 units to a single PE-link system, not counting repeaters or converters.

### 7-2-4 Wirings

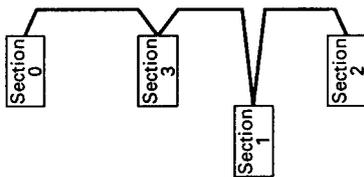
- P/PE-link cables must have P connected to P (internal core cables) and SD connected to SD (external shield cables). Neither P nor SD must be grounded.

Correct



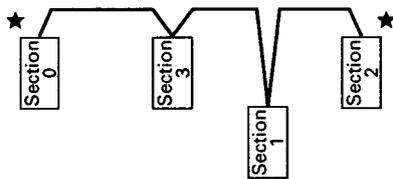
- Wiring must be connected in series, never branched. Wiring need not be made in the order of station numbers.

Correct



- Terminating resistors (75 Ω) must be connected to both ends of P/PE-link (between P and SD). If terminating resistors are not connected at the cable

Correct



★: Terminating resistor mounting position

### 7-2-5 Processors which support P/PE-link

The following processors support P/PE-link:

- P-link: FPK105, FPK125, FPK205, FPK225, F70S, F120H, F120S to F150S
- PE-link: F120S to F150S

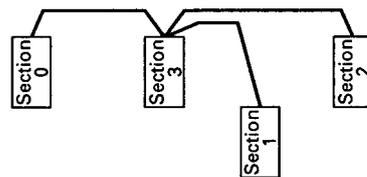
### 7-2-2 Memory assignment

P/PE-link data transfer is done through the MICREX-F processor's link memory. This memory can be used by mounting a P/PE link card in the MICREX-F processor. The processor registers a 'instruction error' if an attempt is made to use a P/PE-link area address without mounting a P/PE-link card.

Incorrect

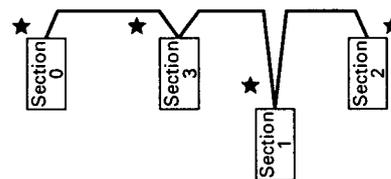


Incorrect



ends, or connected in another location, a P-link transmission error may occur.

Incorrect



---

## **Section 8 P/PE-Link Communication Specifications (Broadcast Communication)**

---

|   | Page        |
|---|-------------|
| <b>8-1 Broadcast Communication .....</b>                    | <b>8-2</b>  |
| 8-1-1 Overview of broadcast communication .....             | 8-2         |
| 8-1-2 Operation of broadcast communication .....            | 8-2         |
| 8-1-3 P/PE-link memory .....                                | 8-3         |
| <b>8-2 P/PE-Link Transmission Timing .....</b>              | <b>8-7</b>  |
| <b>8-3 P/PE-Link Address .....</b>                          | <b>8-11</b> |
| <b>8-4 P/PE-Link Station No. ....</b>                       | <b>8-13</b> |
| 8-4-1 Optional card switches .....                          | 8-13        |
| <b>8-5 P/PE-Link Registration Procedure (Loader) .....</b>  | <b>8-15</b> |
| <b>8-6 P/PE-Link Usage Examples .....</b>                   | <b>8-20</b> |
| <b>8-7 P/PE-Link Troubleshooting .....</b>                  | <b>8-22</b> |
| <b>8-8 Remote Programming/Monitoring on P/PE-Link .....</b> | <b>8-28</b> |

# Section 8. P/PE-Link Communication Specifications (Broadcast Communication)

## 8-1 Broadcast Communication

### 8-1-1 Overview of broadcast communication

In P/PE-link, data transmitted by a local station is received by all the other connected stations. This is like a radio broadcasting station (one transmitting

station) and listeners (multiple receiving stations). We refer to this communication method as broadcast communication.

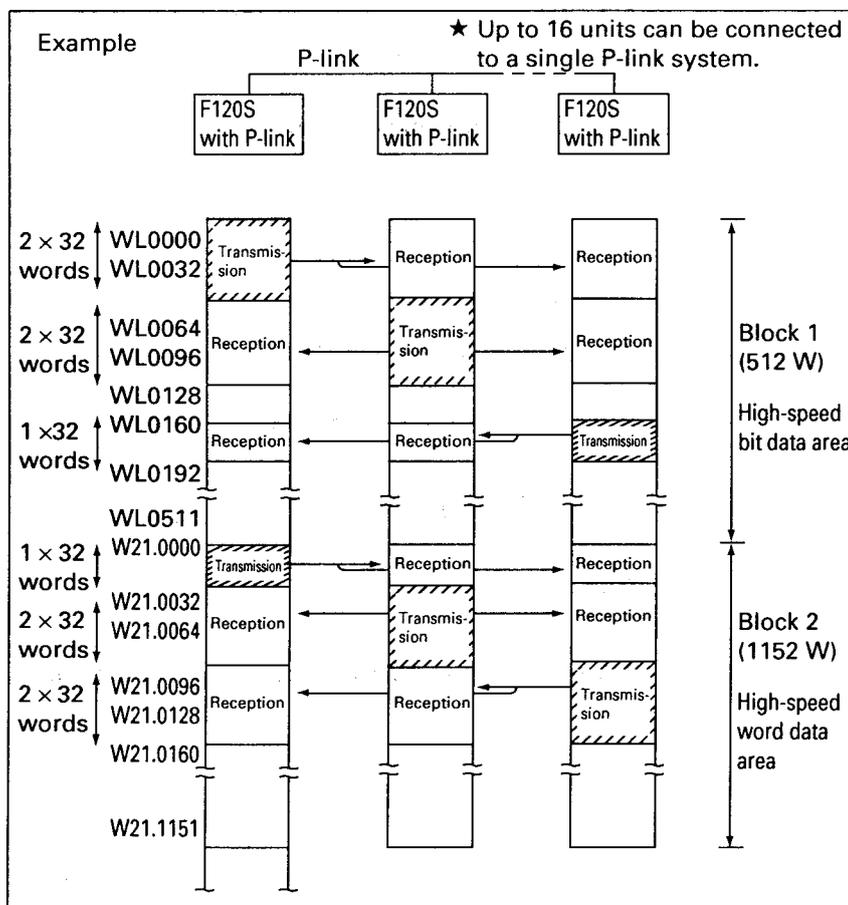
### 8-1-2 Operation of broadcast communication

Each P/PE-link processor sets the following rules (classifications) by system definition:

- ① Local station No. setting
- ② Transmission area setting

The P-link memory area is divided into 32 words (8 words for PE-link) for setting each local station transmission area. Data written in the transmission

area of one local station is automatically transmitted to the same address in the other stations. Areas other than the transmission area serve as reception areas. Reception areas are not set. All the processors connected to P/PE-link can share data, with P/PE-link memory as their common memory. P-link configuration and data area classification are shown below:



User programs can access P/PE-link memory at any time, without reference to transmission.

## 8-1-3 P/PE-link memory

P/PE-link memory has two areas where high-speed data refresh (data update) is performed (blocks 1 and 2) and two areas where low-speed data refresh is performed (blocks 3 and 4).

To use P/PE-link memory, an optional P/PE-link card must be mounted in a processor supporting P/PE-link (F70S, F120H, F120S to F150S). Note that a user program error occurs if an attempt is made to use a P/PE-link area address for a user program without mounting a P/PE-link card.

The total P/PE-link memory size is shown below (1 word = 16 bits).

The capacity that can be allocated as the local station transmission area is shown next to the memory size. The minimum transmission unit is 32 words for P-link and 8 words for PE-link. The size of the transmission area allocated must be an integral multiple of this minimum unit.

Up to two P/PE-link systems can be used with a single processor. If 1 P/PE-link system is used, the first P/PE-link memory area is used. If two systems are used, the system closer to the processor uses the first P/PE-link memory area and the other system uses the second P/PE-link memory area.

### P-link memory

| Block | Refresh    | Type | Total area size     | FPK105 | FPK125 | FPK205 | FPK225 | F70S, F120H, F120S to F150S |               |
|-------|------------|------|---------------------|--------|--------|--------|--------|-----------------------------|---------------|
|       |            |      |                     |        |        |        |        | First P-link                | Second P-link |
| 1     | High-speed | Bit  | 8192 points (512 W) | ○*1    | ○      | ○      | ○      | ○                           | ○*1           |
| 2     |            | Word | 1152 W              | ○      | ○      | ○      | ○      | ○                           | ○             |
| 3'    | Low-speed  | Word | 3072 W              | -      | -      | ○      | ○      | ○                           | ○             |
| 4     |            |      | 3072 W              | -      | -      | ○      | ○      | ○                           | ○             |

\*1: Data must be processed in words, and cannot be processed in bits.

○: Available - : Not available

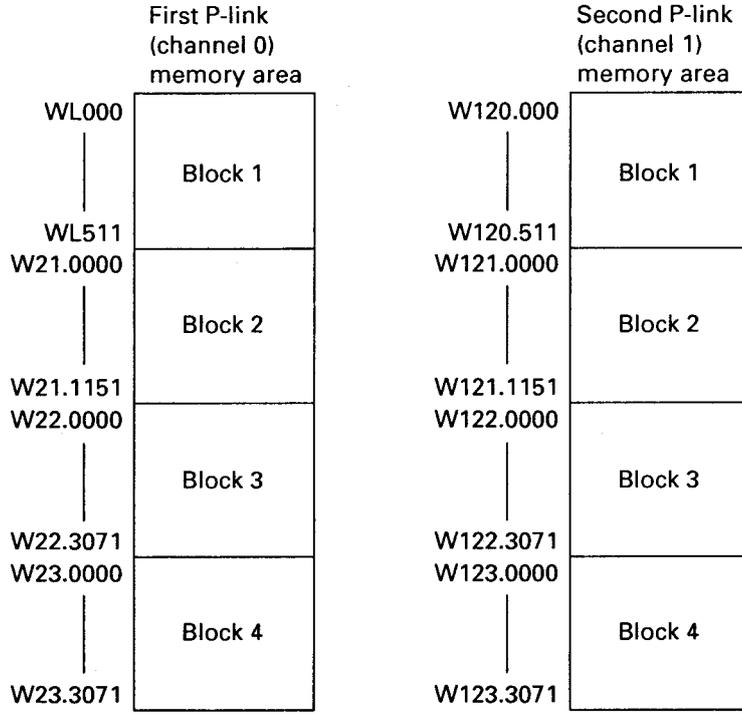
### Maximum setting value of local transmission area memory size

| Link No.              | First P-link (channel 0) | Second P-link (channel 1) | Remarks    |
|-----------------------|--------------------------|---------------------------|------------|
| High-speed bit area   | (WL)<br>2 × 32           | (W120)<br>2 × 32*         | Word only* |
| High-speed word area  | (W21)<br>8 × 32          | (W121)<br>8 × 32          |            |
| Low-speed 1 word area | (W22)<br>16 × 32         | (W122)<br>16 × 32         |            |
| Low-speed 2 word area | (W23)<br>16 × 32         | (W123)<br>16 × 32         |            |

After P-link registration is stored in the processor, the power of the registered processor must be reset. The P-link system definition is recognized when the processor is turned ON.

# 8-1 Broadcast Communication

## P-link memory map



## PE-link memory

| Block             | Refresh    | Type | Total area size     | Remarks                                     |
|-------------------|------------|------|---------------------|---|
| 1                 | High-speed | Bit  | 8192 points (512 W) | Only word access is possible for W120.      |
| 2                 |            | Word | 4096 W              |   |
| Block 2 expansion |            |      | 4096 W              | Expansion can be done by system definition. |
| 3                 | Low-speed  | Word | 4096 W              |   |
| 4                 |            |      | 4096 W              |   |
| Block 4 expansion |            |      | 4096 W × 2          | Expansion can be done by system definition. |

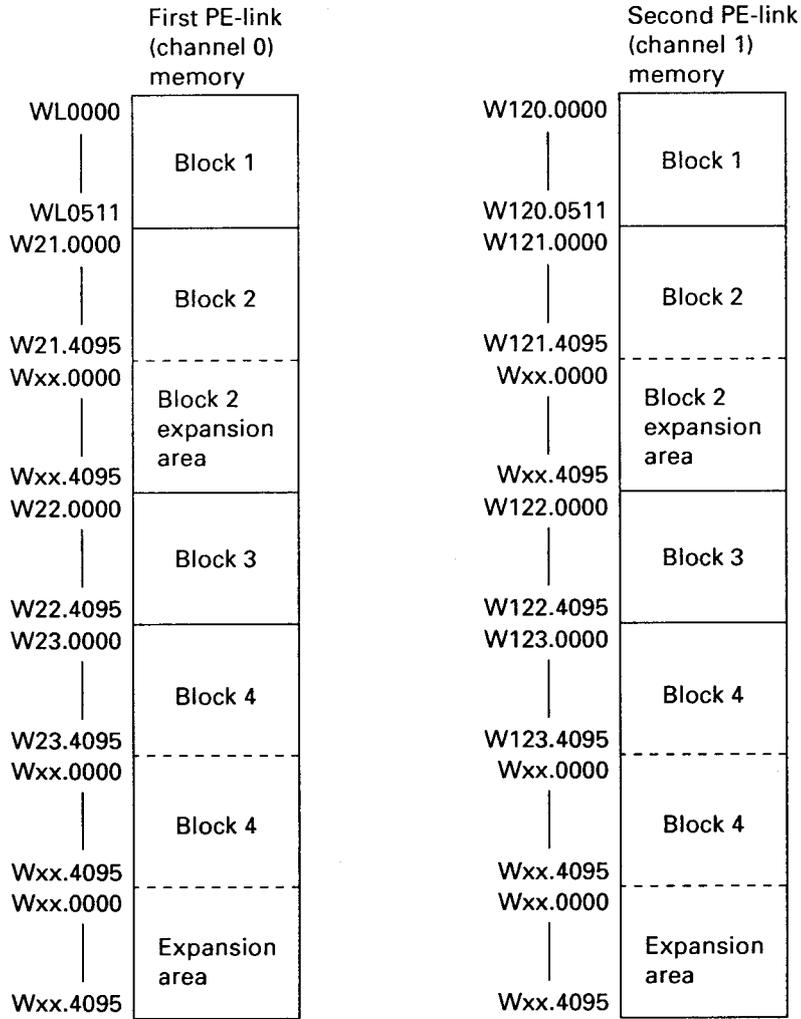
Maximum memory size which can be set for local transmission area

| Link No.              | First PE-link (channel 0) | Second PE-link (channel 2) | Remarks  |
|-----------------------|---------------------------|----------------------------|--|
| High-speed bit area   | (WL)<br>64 × 8            | (W120)<br>64 × 8           | Maximum 128 × 8 (1024 words) for both high-speed bit and word areas in total |
| High-speed word area  | (W21 or Wxx)<br>128 × 8   | (W121 or Wxx)<br>128 × 8   |  |
| Low-speed 1 word area | (W22)<br>128 × 8          | (W122)<br>128 × 8          |  |
| Low-speed 2 word area | (W23 or Wxx)<br>128 × 8   | (W123 or Wxx)<br>128 × 8   |  |

After PE-link registration is stored in the processor, the power of the registered processor must be reset. The system definition of PE-link is recognized when the processor is turned ON.

# 8-1 Broadcast Communication

## PE-link memory map



Wxx are PE-link expansion areas. Area identification numbers (W30 to W109) are set by PE-link system definition registration.

When PE-link area self-setting is done, it is assumed that expansion areas follow standard memory blocks. For example, if Wxx.0000 of the block 2 expansion area is set as a first address, this is the 4096th word from the top of block 2, so '512 x 8' is set to the high-speed

word area. Settings can also extend from a standard memory block to an expansion memory block. (PE-link memory, including expansion memory, is all contained in the PE-link card.)

## 8-2 P/PE-Link Transmission Timing

A processor connected to a P/PE-link system moves a right of transmission token, and transmit data in high-speed and low-speed areas and message communication area to the other stations in turn.

### High-speed area:

Data is transmitted each time the right of transmission is acquired by each processor. (Block 1 and block 2)

### Low-speed area:

Only one station transmits data while the right of transmission moves around all the processors.

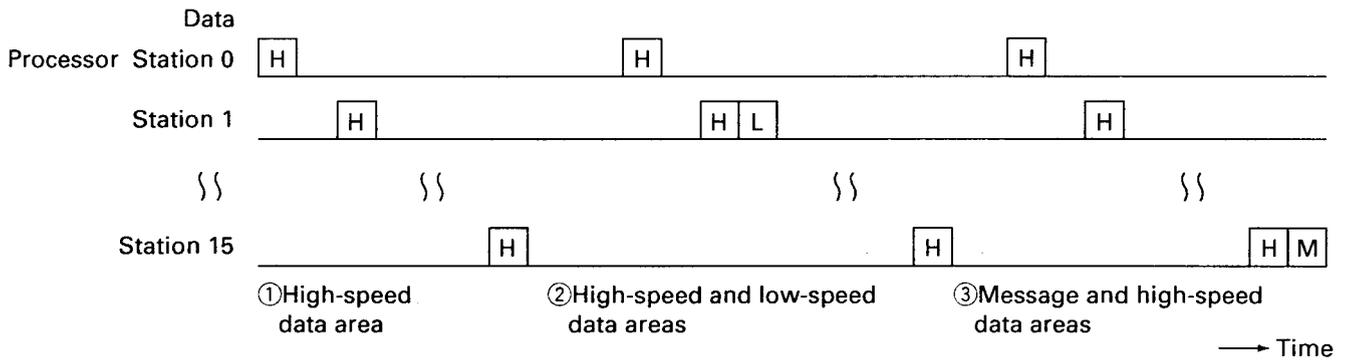
If the right of transmission is set in both block 3 and

block 4, only one of the blocks is transmitted at first, and then the other block data is transmitted in the next turn.

### Message communication:

A message is transmitted each time the right of transmission is acquired by each processor. If there is no message, transmission is not performed.

### P/PE-link refresh



## 8-2 P/PE-Link Transmission Timing

P/PE-link refresh time can be estimated by the following expressions:

### ① High-speed data area refresh time

Minimum value  $T_{RH(MIN)}$

- $T_{RH(MIN)} = T_B + T_H$

Maximum value  $T_{RH(MAX)}$

- P-link:  $T_{RH(MAX)} = T_{RH(MIN)} + T_L + T_M$
- PE-link:  $T_{RH(MAX)} = T_{RH(MIN)} + T_L + T_M + 2000\mu s$

$T_B$ : Base time

- P-link:  $600\mu s \times \text{number of stations}$
- PE-link:  $300\mu s \times \text{number of stations}$

$T_H$ : High-speed refresh addition time (same in both P-link and PE-link)  
 $3.2\mu s \times \text{Number of high-speed data words (total)}$

$T_L$ : Low-speed refresh addition time (same in both P-link and PE-link)

$3.2\mu s \times \text{number of low-speed data words (number of words of a station with maximum setting)}$

$T_M$ : Message addition time

- P-link:  $(3.2\mu s \times 120 \text{ words} + 1200\mu s) \times \text{number of stations to perform message communication}$
- PE-link:  $(3.2\mu s \times \text{average of maximum number of words of a message} + 600\mu s) \times \text{number of stations to perform message communication}$

Average maximum number of words in a message = total maximum number of words of each station message  $\div$  number of stations to perform message communication

Note: The low-speed refresh addition time,  $T_L$ , is added when low-speed data area communication is performed. The message addition time,  $T_M$ , is added when message communication is performed.

### ② Low-speed data area refresh time: $T_{RL}$

$$T_{RL} = (T_B + T_H) \times T_{L1} + T_{L2}$$

$$= T_{RH(MIN)} \times T_{L1} + T_{L2}$$

$T_B$ : Base time

- P-link:  $600\mu s \times \text{number of stations}$
- PE-link:  $300\mu s \times \text{number of stations}$

$T_H$ : High-speed refresh addition time (same in both P-link and PE-link)  
 $3.2\mu s \times \text{Number of high-speed data words (total)}$

$T_{L1}$ : Low-speed refresh addition time (same in both P-link and PE-link)  
 (Number of stations defining low-speed data + 1)  $\times$  N

Setting N:

N = 1 if a station defining a transmission area uses either (but not both) of low-speed data areas 1 or 2.

N = 2 if a station defining a transmission area uses both low-speed data areas 1 and 2.

$T_{L2}$ : Low-speed refresh addition time 2 (same in both P-link and PE-link)

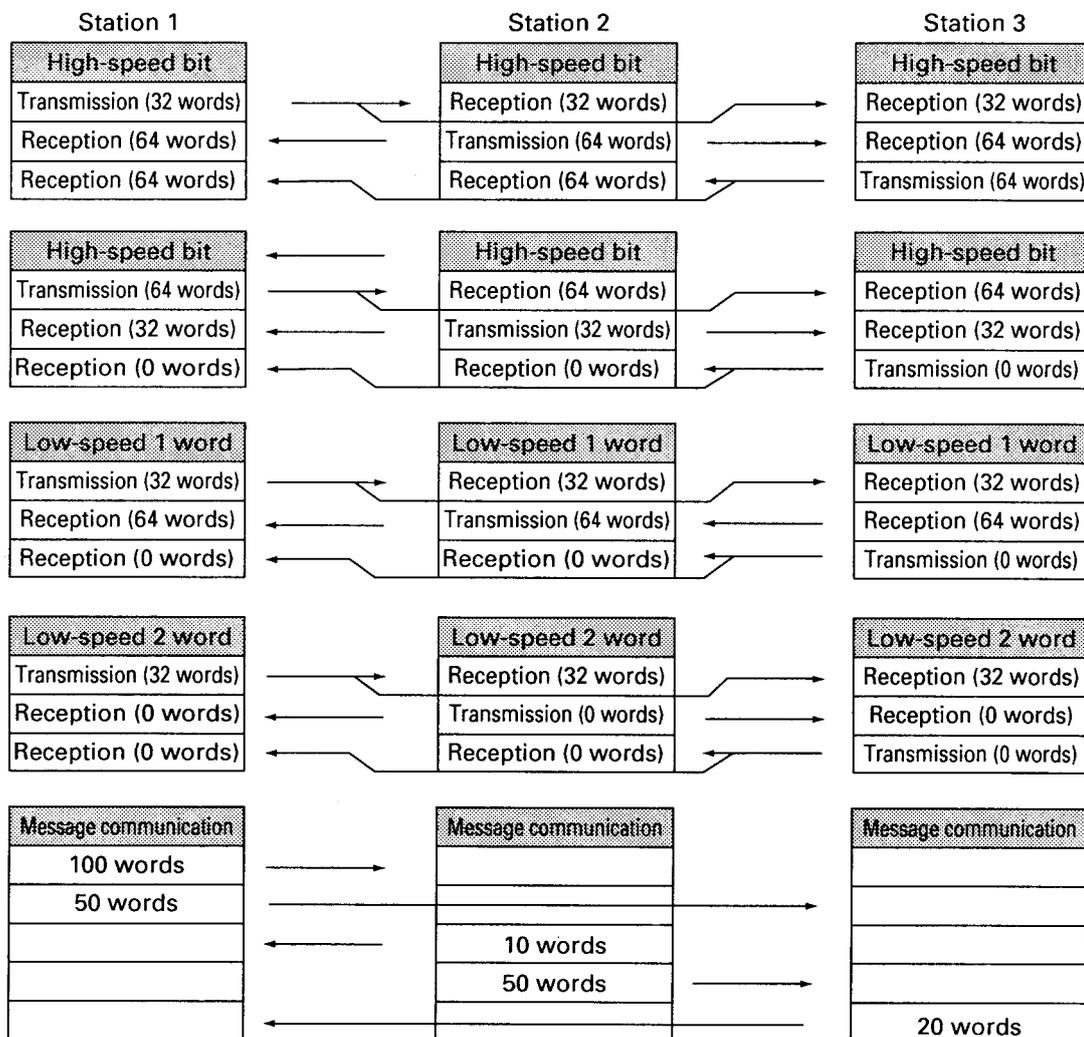
$3.2\mu s \times \text{Number of low-speed data words (total)}$

Note: High-speed refresh addition time  $T_H$  is added when high-speed data area is used.

## 8-2 P/PE-Link Transmission Timing

### Example of calculation

Here we calculate the refresh time when the transmission area of each station is defined as follows:



### Example 1: P-link

High-speed data area refresh time  $T_{RH}$

Minimum value  $T_{RH(MIN)}$

$$= \frac{600\mu s \times 3}{T_B} + \frac{3.2\mu s \times (32 + 64 + 64 + 64 + 32)}{T_H}$$

$$= 2619.2\mu s \doteq 2.6ms$$

Maximum value  $T_{RH(MAX)}$

$$= \frac{2619.2\mu s}{T_{RH(MIN)}} + \frac{3.2\mu s \times 64}{T_L} +$$

$$\frac{(3.2\mu s \times 120 + 1200\mu s) \times 3}{T_M}$$

$$= 7576\mu s \doteq 7.6ms$$

Low-speed data area refresh time  $T_{RL}$  (calculated for low-speed data transmission area of station 1)

- A total of two stations define low-speed data, stations 1 and 2.
- $N = 2$ , since station 1 defines both low-speed data areas 1 and 2.

$$T_{RL} = \frac{2619.2\mu s}{T_{RH(MIN)}} \times \frac{(2 + 1) \times 2}{T_{L1}} +$$

$$\frac{3.2\mu s \times (32 + 64 + 32)}{T_{L2}}$$

$$= 16124.8\mu s \doteq 16.1ms$$

## 8-2 P/PE-Link Transmission Timing

Example 2: PE-link

High-speed data area refresh time TRH

Minimum value TRH(MIN)

$$= \frac{300\mu\text{s} \times 3}{T_B} + \frac{3.2\mu\text{s} \times (32 + 64 + 64 + 64 + 32)}{T_H}$$

$$= 1719.2\mu\text{s} \doteq 1.7\text{ms}$$

Maximum value TRH(MAX)

$$= \frac{1792.2\mu\text{s}}{T_{RH(MIN)}} + \frac{3.2\mu\text{s} \times 64}{T_L} + \frac{(3.2\mu\text{s} \times (100 + 50 + 20) \div 3 + 600\mu\text{s}) \times 3}{T_M} + 2000\mu\text{s}$$

$$= 6268\mu\text{s} \doteq 6.3\text{ms}$$

Low-speed data area refresh time TRL (calculated for low-speed data transmission area of station 1)

$$T_{RL} = \frac{1719.2\mu\text{s}}{T_{RH(MIN)}} \times \frac{(2 + 1) \times 2}{T_{L1}} + \frac{3.2\mu\text{s} \times (32 + 64 + 32)}{T_{L2}}$$

$$= 10724.8\mu\text{s} = 10.7\text{ms}$$

### Comparison of refresh time

Low-speed data refresh time and high-speed data refresh time for P-link and PE-link are as follows:

- ① For a system consisting of 16 stations, with each station defining a 32 word transmission area (only high-speed data area used)

Minimum value:

- P-link:  $600\mu\text{s} \times 16 + 3.2\mu\text{s} \times 32 \times 16 = 11238.4\mu\text{s} \doteq 11.2\text{ms}$
- PE-link:  $300\mu\text{s} \times 16 + 3.2\mu\text{s} \times 32 \times 16 = 6438.4\mu\text{s} \doteq 6.4\text{ms}$

Maximum value:

- P-link:  $11238.4\mu\text{s} + 0 + 0 = 11238.4\mu\text{s} \doteq 11.2\text{ms}$
- PE-link:  $6438.4\mu\text{s} + 0 + 0 + 2000\mu\text{s} = 8438.4\mu\text{s} \doteq 8.34\text{ms}$

- ② For a system consisting of 16 stations, with each station defining a 32 word transmission area (only low-speed data area used)

- P-link:  $(600\mu\text{s} \times 16 + 0) \times (16 + 1) \times 1 + 3.2\mu\text{s} \times 32 \times 16 = 164838.4\mu\text{s} \doteq 164.8\text{ms}$
- PE-link:  $(300\mu\text{s} \times 16 + 0) \times (16 + 1) \times 1 + 3.2\mu\text{s} \times 32 \times 16 = 83238.4\mu\text{s} \doteq 83.2\text{ms}$

- ③ For a system consisting of 16 stations, each station defining a 32 word transmission area and performing a 100 word message communication to the other stations (only high-speed data area and message communication used)

Minimum value

- P-link: Same as in item 1 above: 11.2ms.
- PE-link: Same as in item 1 above: 6.4ms.

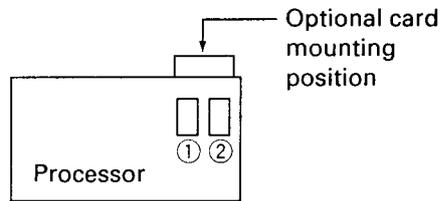
Maximum value

- P-link:  $11238.4\mu\text{s} + (3.2\mu\text{s} \times 120 + 1200\mu\text{s}) \times 16 = 36582.4\mu\text{s} \doteq 36.6\text{ms}$
- PE-link:  $6438.4\mu\text{s} + (3.2\mu\text{s} \times (100 \times 16 \div 16) + 600) \times 16 + 2000\mu\text{s} = 23158.4\mu\text{s} \doteq 23.2\text{ms}$

|  | P-link  | PE-link |
|--|---------|---------|
| ① High-speed data refresh time (min.)                                  | 11.2ms  | 6.4ms   |
| (max.)   | 11.2ms  | 8.4ms   |
| ② Low-speed data refresh time  | 164.8ms | 83.2ms  |
| ③ High-speed refresh time when performing message communication (min.) | 11.2ms  | 6.4ms   |
| (max.)   | 36.6ms  | 23.2ms  |

Mounting an optional P/PE-link card on a single processor provides two P/PE-link systems (channels 0

and 1) in the F120S to F150S series. The mounting position and address are shown below.



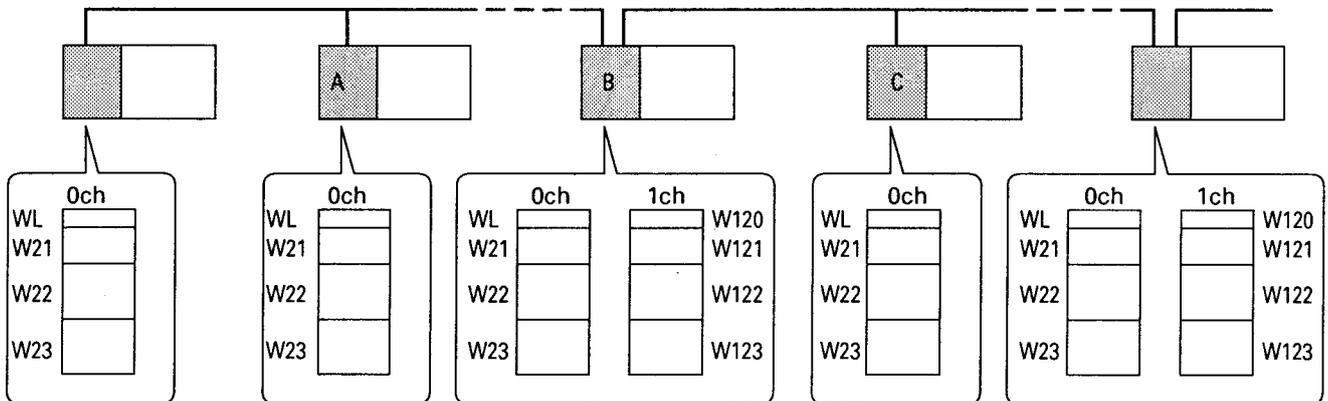
### Mounting position and link No. (\*)

(1) If a card is mounted in position ① or position ② only, it serves as the first P/PE-link (channel 0). (Mounting for a single system)

(2) If cards are mounted in both positions ① and ②, the card in position ① serves as the first P/PE-link (channel 0) and the card in position ② as the second P/PE-link (channel 1). (Mounting for two systems)

\*: Link No. is different from P/PE-link station No.  
Link No. (channel No.) indicates P/PE-link system No. The first P/PE-link uses a different memory area than that of the second P/PE-link. For station No. setting, see Section 8-4.

(3) Memory map for mounting two optional P/PE-link cards  
The memory map for mounting two optional P/PE-link cards on the processor is shown below.



Data transmission depends on which channel is connected to each P/PE-link memory.  
Data transmission is performed between processor B channel 0 (WL to W23) and processor A channel 0 (WL to W23).  
Data transmission is performed between processor B channel 1 (W120 to W123) and processor C channel 0 (WL to W23).

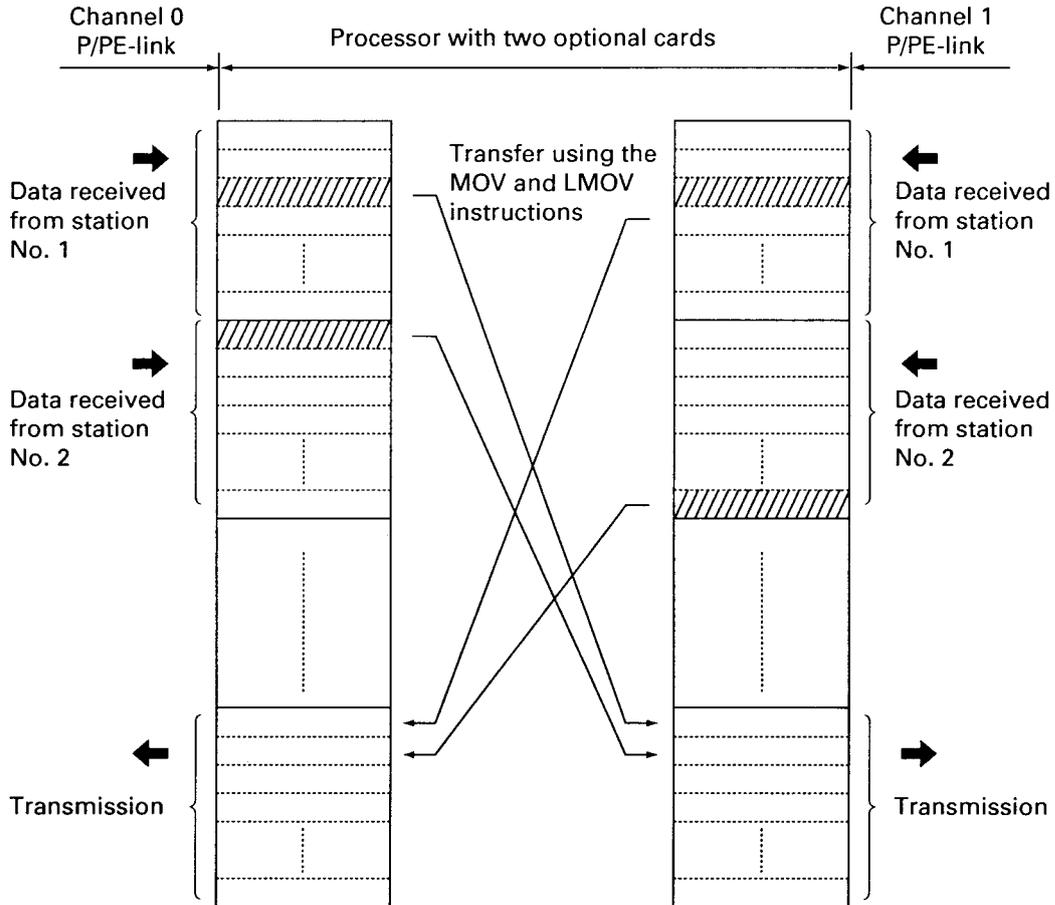
For example, if the processor B allocates local station transmission areas WL0 to W31 and W120.0 to W120.31, data transmission is as follows:  
Data transmitted from processor B WL0 to W31 is received by processor A WL0 to W31. Data transmitted from processor B W120.0 to 120.31 is received by processor C WL0 to W31.

## 8-3 P/PE-Link Address

### (4) Optional P/PE-link card applications

If two P/PE-link cards are mounted in a processor and data exchange is performed between the systems, P/PE-link of channel 0 must be linked to that of channel 1 with an application program. Data exchange between channel 0 P/PE-link and

channel 1 P/PE-link is performed by transmitting data received by one channel of each station to a transmission area of the other channel with the MOV and LMOV instructions.



Mounting an optional P/PE-link card on a single processor provides two P/PE-link systems (channels 0 and 1) in the F70S, F120H, and F120S to F150S series. Optional P/PE-link cards have a station No. setting

## 8-4-1 Optional card switches

Station No. setting switch

P-link



0 to F on the dial correspond to station numbers 0 to 15

PE-link (upper two rotary switches)

Upper digit



Setting range is 00 to 3F, corresponding to station numbers 0 to 63.

Lower digit



Duplex system setting switch (PE-link only)



This switch is not used in the F120S to F150S series. Set to 0.

switch and station No. setting select switch. The station No. setting method depends on whether the station No. setting select switch is set to the top or bottom position. Details are described below.

Station No. setting select switch



Top position:  
Station No. setting switch  
Bottom position:  
System definition

### 1. When set to 'station No. setting switch' (top position)

When the station No. setting switch position is selected, P/PE-link station Nos. are set with the station No. setting switch. When the power is turned ON, the processor reads the setting switch data as the P/PE-link station Nos. These station Nos. cannot be changed after the power is turned ON. Settings of local station Nos. in the system definition are ignored, and P/PE-link station Nos. are read from the station No. setting switch data. Note that system definition settings other than local station Nos. are still effective.

### 2. When set to 'system definition' (bottom position)

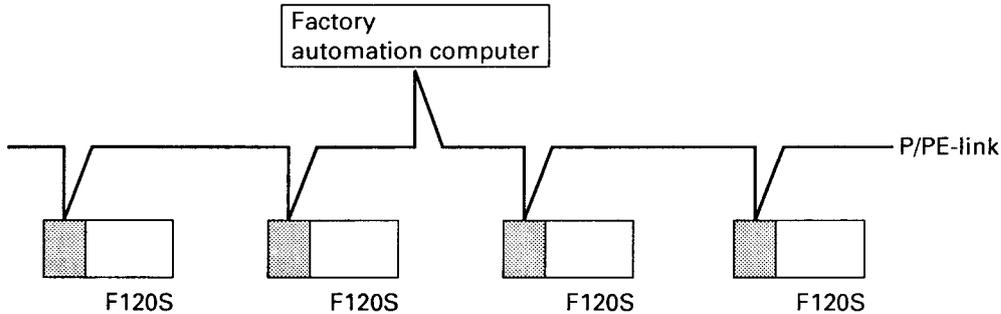
P/PE-link station Nos. are set by P/PE-link registration in the system definition using the program loader. For details, see Section 8-5, 'P/PE-Link Registration Procedure (Loader)'.

## 8-4 P/PE-Link Station No.

### 3. Using the station No. setting switch

This section describes a system where a computer for factory automation and F120S processors are connected on P/PE-link. Application programs are

downloaded to each F120S processor from the computer.



Application programs are downloaded to the F120S processors in the following manner:

- ① A P-link station No. is set for each F120S processor
- ② The computer downloads programs to each station No. set in step 1

If P/PE-link station No. settings are done by system definition, the program loader is required. If the station No. setting switch is used, P/PE-link station Nos. can be set before the processors are turned ON, so the program loader is not required.

For remote programming or monitoring via P/PE-link, P/PE-link station Nos. must be set before programming. If processor station Nos. have already been set by registering P/PE-link in the system definition, programs can be transferred, created, and corrected via P/PE-link. However, if station Nos. have not been registered due to memory clear status, station number settings can be done as follows:

- P/PE-link station Nos. can be registered by system definition, using the program loader. In this case station Nos. cannot be set via P/PE-link.
- P/PE-link station Nos. can be registered using the station No. setting switch. In this case, remote programming or monitoring via P/PE-link is possible using the station Nos. set before the processors are turned ON. Therefore, even if the processors are in memory clear status, remote programming or monitoring via P/PE-link is possible.

An additional advantage to setting station Nos. using the setting switch is that processor station Nos. can be checked from the outside without using the program loader.

## 8-5 P/PE-Link Registration Procedure (Loader)

This section explains the P/PE-link registration procedure using program loader LITE (or a personal computer loader).

① Select the following items from the loader initial screen:

(F5) Auxiliary → (F1) System definition → (ONLINE)  
 → (ENT) → (F3) P/PE-link registration

② In the screen below, select the link type used, and press .

| P/PE-LINK REGISTRATION   |   | (1/3)    |
|--|---|----------|
| P/PE-LINK SELECT   |   |          |
| LINK 1 (OCH)   | <input checked="" type="checkbox"/> P-LINK / <input type="checkbox"/> PE-LINK | ←        |
| LINK 2 (ICH)   | <input type="checkbox"/> P-LINK / <input checked="" type="checkbox"/> PE-LINK | ←        |
| P/PE-LINK REFRESH SELECT   |   |          |
| ( <input checked="" type="checkbox"/> SCAN / <input type="checkbox"/> CHT / <input type="checkbox"/> NON ) |   |          |
| SELECT DATA BY ARROW KEY   |   |          |
|  |   | F10 MENU |
| [SYS-DEF]  | [PROC] AUXILIARY<br>[MODE] OFFLINE  | RUN      |
| READY FOR END KEY  |   |          |

For setting the type of the first optional card mounted on the processor

For setting the type of the second optional card mounted on the processor

- P/PE-link selection is set according to the optional card used.
- P/PE-link refresh selection is not supported in the F70S, F120H, and F120S to F150S processors.

Do not change the 'scan synchronous' setting.

## 8-5 P/PE-Link Registration Procedure (Loader)

- ③ Setting configuration, station number registration, and self area (local station transmission area).  
The following example is for P-link:

Channel number to register  
Switch channel number with the **PREV FRAME** and **NEXT FRAME** keys.

**P/PE-LINK REGISTRATION (2/3)**

LINK 1 (0CH)

CONFIGURATION

|               |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STA REG (Y/N) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|               |   | * |   | * |   | * |   |   |   |   |   |   |   |   |   |   |

SELF: 1

SELF AREA

|           |         |      |
|-----------|---------|------|
|           | TOP     | SIZE |
| H SP BIT  | 10 x 32 | 1    |
| H SP WORD | 15 x 32 | 1    |
| L SP WORD | 10 x 32 | 2    |
| L SP WORD | 20 x 32 | 2    |

SET : PUSH \* KEY  
RESET: PUSH SPACE KEY

F10 MENU

---

[SYS-DEF]      [PROC]      AUXILIARY OFFLINE      RUN  
[MODE]      READY FOR END KEY

**Configuration registration**  
Set asterisks (\*) on all processor station Nos. to set on P-link. In this example, stations 1, 3, and 5 are set.

**Local station No.**  
Sets P-link local station No. of processor connected to the program loader. In this example, station 1 is set.

**Self area registration**  
Sets the first address and size of local station transmission area. In this example, self area is as follows:  
High-speed bits: WL320 to 351  
High-speed words: W21.480 to 511  
Low-speed words: W22.320 to 383  
Low-speed words: W23.640 to 703

### Configuration registration

The flag operation when configuration registration is set is shown below.

|                               | F0003<br>Nonfatal fault | F0005<br>Remote station nonfatal fault | F0027<br>P/PE-link configuration fault | F0060 to 6F,<br>F0080 to 8F<br>P-link configuration | F0070 to 7F,<br>F0090 to 9F<br>P-link fault |
|-------------------------------|-------------------------|--|--|---|---|
| Remote stations OFF           | ON                      | ON                                     | ON                                     | Only connected stations ON                          | Only remote stations ON                     |
| All configuration stations ON | OFF                     | OFF                                    | OFF                                    | All configuration stations ON                       | OFF   |

Configuration registration must be set for all the processor stations to be connected. If any configuration station is not activated, communication begins

with the other stations. Configuration registration need not be set. If not set, asterisks (\*) must not be set for any station, and the flag operation is as follows:

|                               | F0003<br>Nonfatal fault | F0005<br>Remote station nonfatal fault | F0027<br>P/PE-link configuration fault | F0060 to 6F,<br>F0080 to 8F<br>P-link configuration | F0070 to 7F,<br>F0090 to 9F<br>P-link fault |
|-------------------------------|-------------------------|--|--|---|---|
| Remote stations OFF           | OFF                     | OFF                                    | OFF                                    | Only connected stations ON                          | OFF   |
| All configuration stations ON | OFF                     | OFF                                    | OFF                                    | All configuration stations ON                       | OFF   |

## 8-5 P/PE-Link Registration Procedure (Loader)

The following example is for PE-link:

Channel number to register  
Switch channel number with the PREV and NEXT keys.

PE-LINK REGISTRATION (3/3)

LINK 2 (1CH)

| STA | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00  | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 10  |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 20  |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 30  |   |   |   | * |   |   |   |   |   |   |   |   |   |   |   |   |

SELF 33 ←

| TOP    | SIZE | MODULE NO. |
|--------|------|------------|
| 20 x 8 | 3    |            |
| 30 x 8 | 5    | W000       |
| 20 x 8 | 10   |            |
| 20 x 8 | 10   | W30 W31    |

SET : PUSH \* KEY  
RESET: PUSH SPACE KEY

F10 MENU

|                   |                  |                      |     |
|-------------------|------------------|----------------------|-----|
| [SYS-DEF]         | [PROC]<br>[MODE] | AUXILIARY<br>OFFLINE | RUN |
| READY FOR END KEY |                  |                      |     |

**Configuration registration**  
Set asterisks (\*) on all processor station Nos. to set on P-link. In this example, stations 0, 11, 22, and 23 are set.

**Local station No.**  
Sets the PE-link local station No. of processor connected to the program loader. In this example, station 33 is set.

**Self area registration**  
Sets the first address and size of local station transmission area. In this example, self area is as follows:  
 High-speed bits: WL120.160 to 183  
 High-speed words: W121.240 to 279  
 Low-speed words: W122.160 to 239  
 Low-speed words: W123.160 to 239

Expansion module Nos. are set from 30 to 109. Make sure that expansion module Nos. do not overlap I/O expansion, ME-NET expansion, or program FILE or TABL Nos. Set 0 if not used.

### Configuration registration

The flag operation when configuration registration is set is shown below.

|                               | F0003<br>Nonfatal fault | F0005<br>Remote station nonfatal fault | F0027<br>P/PE-link configuration fault | F1110 to 113F,<br>F1180 to 121F<br>P-link configuration | F1140 - 117F,<br>F1220 - 125F<br>P-link fault |
|-------------------------------|-------------------------|--|--|---|---|
| Remote stations OFF           | ON                      | ON                                     | ON                                     | Only connected stations ON                              | Only remote stations ON                       |
| All configuration stations ON | OFF                     | OFF                                    | OFF                                    | All configuration stations ON                           | OFF   |

Configuration registration must be set for all the processor stations to be connected. If any configuration station is not activated, communication begins

with the other stations. Configuration registration need not be set. If not set, asterisks (\*) must not be set for any station, and the flag operation is as follows:

|                               | F0003<br>Nonfatal fault | F0005<br>Remote station nonfatal fault | F0027<br>P/PE-link configuration fault | F1110 to 113F,<br>F1180 to 121F<br>P-link configuration | F1140 to 117F,<br>F1220 to 125F<br>P-link fault |
|-------------------------------|-------------------------|--|--|---|---|
| Remote stations OFF           | OFF                     | OFF                                    | OFF                                    | Only connected stations ON                              | OFF   |
| All configuration stations ON | OFF                     | OFF                                    | OFF                                    | All configuration stations ON                           | OFF   |

8-17

## 8-5 P/PE-Link Registration Procedure (Loader)

- Expansion module Nos.  
Expansion module Nos. are set from 30 to 109.  
Make sure that expansion module Nos. do not overlap I/O expansion, NE-NET expansion, and program FILE or TABL Nos. PE-link card memory is used, so even if expansion module

④ Press **END**, select 'Store system definition', and press **ENT**.

Nos. are set, processor file memory remains unchanged.

A single expansion module allocates 4096 words (1 word = 16 bits). If expansion is not set, expansion module No. must be set to W0.

Note: After storing registered data in the processor, turn the processor OFF and ON to make the data effective.

## 8-5 P/PE-Link Registration Procedure (Loader)

- Assigning addresses using expansion module Nos. Here we describe how to assign addresses using expansion module Nos., for the settings on the previous page. In this example, low-speed word

area (block 4) expansion module Nos. are set to W30 and W31 in the second PE-link (channel 1).

| First address set by system definition | Actual address assignment range |
|--|---------------------------------|
| 0                                      | W123.0000 to 0007               |
| 1                                      | W123.0008 to 0015               |
| ⋮                                      | ⋮                               |
| 511                                    | W123.4088 to 4095               |
| 512                                    | W30.0000 to 0007                |
| 513                                    | W30.0008 to 0015                |
| ⋮                                      | ⋮                               |
| 1023                                   | W30.4088 to 4095                |
| 1024                                   | W31.0000 to 0007                |
| 1025                                   | W31.0008 to 0015                |
| ⋮                                      | ⋮                               |
| 1535                                   | W31.4088 to 4095                |

The first address and size are set for each block by system definition. When expansion module Nos. are set, the first address is assumed to be assigned immediately

after the standard PE-link memory as shown in the example above. Self area settings can extend from the standard PE-link memory to expansion areas or from one expansion area to another.

### Self area setting example

|                 | First address | Size | Expansion module No. |
|-----------------|---------------|------|----------------------|
| Low-speed words | 510 × 8       | 4    | W30 W31              |

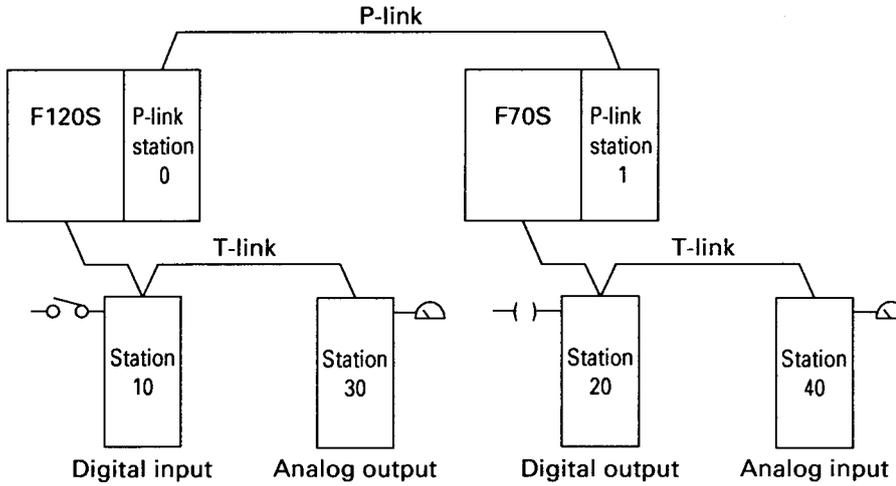
In the table below, shaded boxes represent self area addresses.

|                 | First address set by system definition | Actual address assignment range |
|-----------------|--|---------------------------------|
|                 | 0                                      | W123.0000 to 0007               |
|                 | ⋮                                      | ⋮                               |
| First address → | 510                                    | W123.4080 to 4087               |
|                 | 511                                    | W123.4088 to 4095               |
|                 | 512                                    | W30.0000 to 0007                |
|                 | 513                                    | W30.0008 to 0015                |
| Size ↓          | ⋮                                      | ⋮                               |

# 8-6 P/PE-Link Usage Examples

Examples given here are for data communication between F120S and F70S connected with P-link.

## System configuration diagram



## System definition

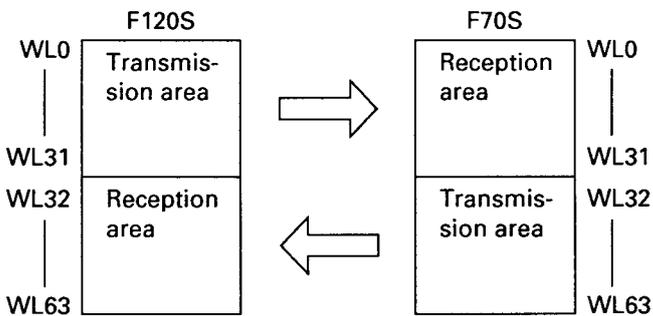
**F120S**

| LINK 1 (OCH) CONFIGURATION |                                 | P/PE-LINK REGISTRATION (2/3) |                   |
|----------------------------|---------------------------------|------------------------------|-------------------|
| STA                        | 0 1 2 3 4 5 6 7 8 9 A B C D E F | REG (Y/N)                    | * *               |
| SELF                       | 0                               |                              |                   |
| SELF AREA                  |                                 |                              |                   |
|                            | TOP                             | SIZE                         |                   |
| H SP BIT                   | 0 x32                           | 1                            |                   |
| H SP WORD                  | 0 x32                           | 0                            |                   |
| L SP WORD                  | 0 x32                           | 0                            |                   |
| L SP WORD                  | 0 x32                           | 0                            |                   |
| SET : PUSH * KEY           |                                 |                              |                   |
| RESET: PUSH SPACE KEY      |                                 |                              |                   |
| [SYS-DEF]                  |                                 | [PROC] [MODE]                | AUXILIARY OFFLINE |
| READY FOR END KEY          |                                 | RUN                          |                   |

**F70S**

| LINK 1 (OCH) CONFIGURATION |                                 | P/PE-LINK REGISTRATION (2/3) |                   |
|----------------------------|---------------------------------|------------------------------|-------------------|
| STA                        | 0 1 2 3 4 5 6 7 8 9 A B C D E F | REG (Y/N)                    | * *               |
| SELF                       | 1                               |                              |                   |
| SELF AREA                  |                                 |                              |                   |
|                            | TOP                             | SIZE                         |                   |
| H SP BIT                   | 1 x32                           | 1                            |                   |
| H SP WORD                  | 0 x32                           | 0                            |                   |
| L SP WORD                  | 0 x32                           | 0                            |                   |
| L SP WORD                  | 0 x32                           | 0                            |                   |
| SET : PUSH * KEY           |                                 |                              |                   |
| RESET: PUSH SPACE KEY      |                                 |                              |                   |
| [SYS-DEF]                  |                                 | [PROC] [MODE]                | AUXILIARY OFFLINE |
| READY FOR END KEY          |                                 | RUN                          |                   |

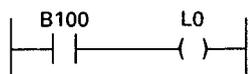
## Address assignment



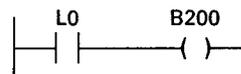
### Program example 1

In this example, the lamp (B200) connected to the F70S digital output is turned ON/OFF by the input switch (B100) connected to the F120S digital input switch. Bit 0 (L0) of the F120S transmission area WL0 is used as the P-link communication area.

(F120S program)



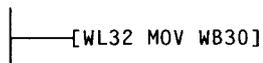
(F70S program)



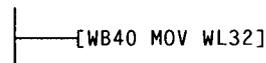
### Program example 2

In this example, the F70S analog input (0 to 10 V, converted value 0 to 4000, address WB40) is output unchanged at the F120S analog output (0 to 10 V, converted value 0 to 4000, address WB30). The F70S transmission area WL32 is used as the P-link communication area.

(F120S program)



(F70S program)



## 8-7 P/PE-Link Troubleshooting

Since P/PE-link employ a token control method, no corrective actions for changes during initialization or link configuration are required. If the next station does not receive the right of transmission after waiting for a specified time, the previous station retries transmission up to 3 times, after which the system recognizes a

transmission error. In cases of transmission error, the faulty station can be found with the special relays F0060 to F009F or F1100 to F125F. These special relays are reset automatically when normal transmission resumes.

### 1. P/PE-link status indication lamps and special relays

Processors supporting P/PE-link are equipped with P/PE-link status indication lamps. Lamp names and descriptions are as follows:

| Name | Lights up during:  | Description   |
|------|--------------------|---|
| SND  | Transmission       | Data transmission   |
| RCV  | Reception          | Data reception  |
| HER  | Fatal fault        | Local station hardware error  |
| LER  | Nonfatal fault     | Remote station error (Remote station error due to incorrect system definition setting or cable disconnection) |
| TER  | Transmission error | Transmission/reception error (Cable disconnection or cable noise)   |

Special relays monitoring the P/PE-link system status are as follows:

| Relay No.      | Name   | Description  |
|----------------|--|--|
| F0025          | P/PE-link fault  | P/PE-link transmission error   |
| F0027          | P/PE-link configuration fault                          | Fault of processor connected to P/PE-link  |
| F0056          | First PE-link  | This relay is set ON when the first link is PE-link.   |
| F0057          | Second PE-link   | This relay is set ON when the second link is PE-link.  |
| F0060 to F006F | P-link configuration (Station Nos. 0 to 15) Channel 0  | This relay indicates to each processor that the first P-link transmission has been carried out normally. Stopped station or faulty station is turned OFF.      |
| F0070 to F007F | P-link error (Station Nos. 0 to 15) Channel 0          | This relay indicates to each processor that the first P-link transmission error occurs.  |
| F0080 to F008F | P-link configuration (Station Nos. 0 to 15) Channel 1  | This relay indicates to each processor that the second P-link transmission has been carried out normally. Stopped stations or faulty stations are turned OFF.  |
| F0090 to F009F | P-link fault (Station Nos. 0 to 15) Channel 1          | This relay indicates to each processor that the second P-link transmission error occurs.   |
| F1100 to F113F | PE-link configuration (Station Nos. 0 to 63) Channel 0 | This relay indicates to each processor that the first PE-link transmission has been carried out normally. Stopped stations or faulty stations are turned OFF.  |
| F1140 to F117F | PE-link fault (Station Nos. 0 to 63) Channel 0         | This relay indicates to each processor that the first PE-link transmission contains an error occurs.   |
| F1180 to F121F | PE-link configuration (Station Nos. 0 to 63) Channel 1 | This relay indicates to each processor that the second PE-link transmission has been carried out normally. Stopped stations or faulty stations are turned OFF. |
| F1220 to F125F | PE-link fault (Station Nos. 0 to 63) Channel 1         | This relay indicates to each processor that the second PE-link transmission error occurs.  |

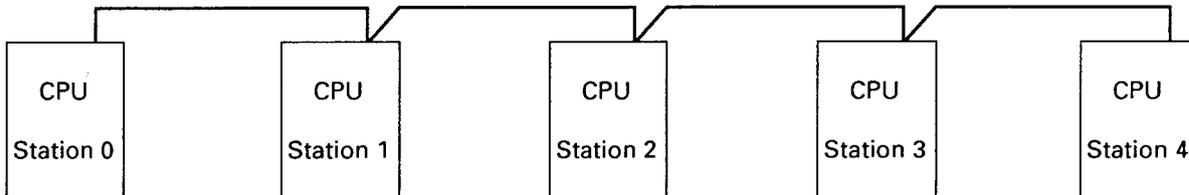
\*: For F0060 to F009F, the lowermost digit corresponds to each station No. For F1100 to F125F, the lower two digits correspond to each station No. Station Nos. must be converted from hexadecimal to decimal.

Example: F006F → Station 15

F113F → Station 63

Here we explain P/PE-link statuses and flag relationships. Examples given here are for P-link. (For PE-link, replace the flag numbers.)

### 2. P-link normal operation (channel 0)



With all stations operating normally, the special relay statuses are as follows:

| Station No.                                 | Special relay status             |                                  |                                  |                                  |                                  |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Relay No. (name)                            | Station 0                        | Station 1                        | Station 2                        | Station 3                        | Station 4                        |
| F0025<br>(P-link fault)                     | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0027<br>(P-link configuration fault)       | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0060 to<br>F006F<br>(P-link configuration) | F60 F61 F62 F63 F64<br>1 1 1 1 1 | F60 F61 F62 F63 F64<br>1 1 1 1 1 | F60 F61 F62 F63 F64<br>1 1 1 1 1 | F60 F61 F62 F63 F64<br>1 1 1 1 1 | F60 F61 F62 F63 F64<br>1 1 1 1 1 |
| F0070 to<br>F007F<br>(P-link fault)         | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 |

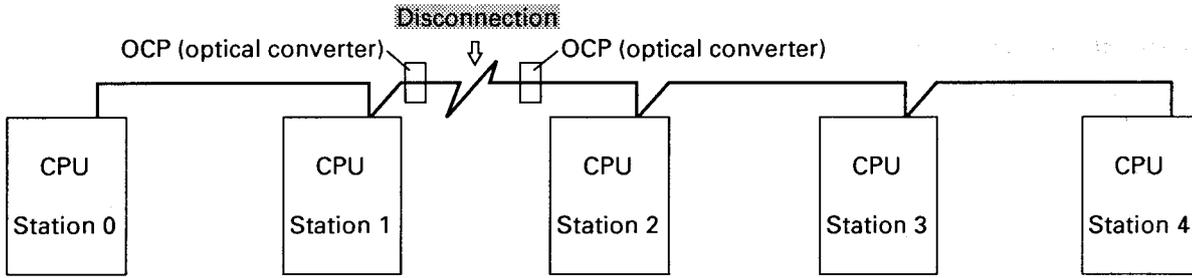
The above table is for P-link channel 0. For P-link channel 1, P-link configuration relay Nos. are from F0080 to F0080F, and P-link fault relay Nos. are from F0090 to F009F.

(1 = flag ON, 0 = flag OFF)

## 8-7 P/PE-Link Troubleshooting

### 3. P-link fault operation

#### ① P-link cable disconnection



#### Operating condition

In the above example, a P-link optical cable is disconnected between station 1 and station 2.

In this case,

- ① Broadcast communication continues between stations 0 and 1.
- ② Broadcast communication continues among stations 2, 3, and 4.

In other words, broadcast communication continues in groups of stations containing no disconnected cable.

#### Status indication LEDs

The ALARM2 and LER (remote station error) lamps of all processors light up.

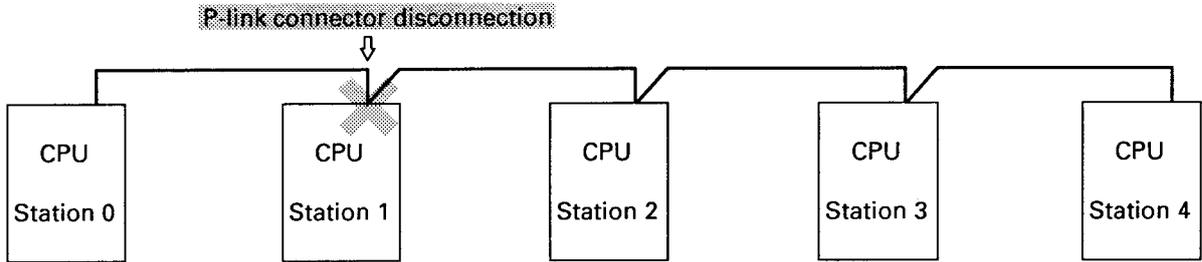
The special relay statuses are as follows:

| Station No.<br>Relay No. (name)          | Special relay status             |                                  |                                  |                                  |                                  |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|  | Station 0                        | Station 1                        | Station 2                        | Station 3                        | Station 4                        |
| F0025<br>(P-link fault)                  | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0027<br>(P-link configuration fault)    | 1                                | 1                                | 1                                | 1                                | 1                                |
| F0060 to F006F<br>(P-link configuration) | F60 F61 F62 F63 F64<br>1 1 0 0 0 | F60 F61 F62 F63 F64<br>1 1 0 0 0 | F60 F61 F62 F63 F64<br>0 0 1 1 1 | F60 F61 F62 F63 F64<br>0 0 1 1 1 | F60 F61 F62 F63 F64<br>0 0 1 1 1 |
| F0070 to F007F<br>(P-link fault)         | F70 F71 F72 F73 F74<br>0 0 1 1 1 | F70 F71 F72 F73 F74<br>0 0 1 1 1 | F70 F71 F72 F73 F74<br>1 1 0 0 0 | F70 F71 F72 F73 F74<br>1 1 0 0 0 | F70 F71 F72 F73 F74<br>1 1 0 0 0 |

Note: Disconnection of a P-link optical cable results in an end cable without a terminating resistor, so the processor may not be able to distinguish faulty stations from normal stations.

(1 = flag ON, 0 = flag OFF)

② Example of P-link connector disconnection



**Operating condition**

In the above example, the station 1 P-link connector has become disconnected. In this case, broadcast communication continues between stations 0 to 4, except for station 1.

**Status indication LEDs**

ALARM2 and LER (remote station error) lamps light up on all processors.

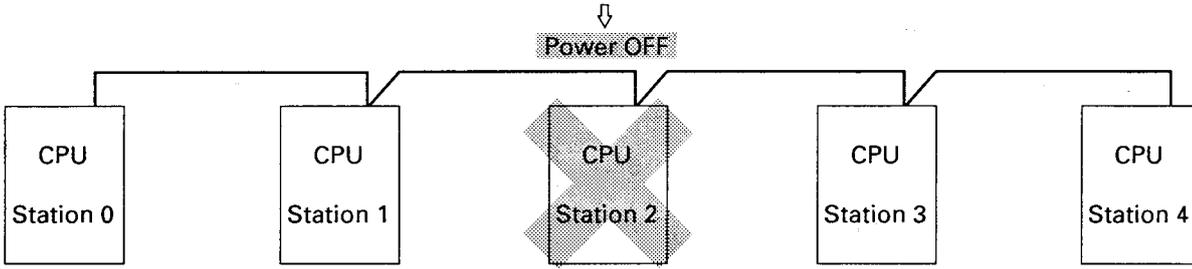
The special relay statuses are as follows:

| Station No.<br>Relay No. (name)          | Special relay status             |                                  |                                  |                                  |                                  |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
|  | Station 0                        | Station 1                        | Station 2                        | Station 3                        | Station 4                        |
| F0025<br>(P-link fault)                  | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0027<br>(P-link configuration fault)    | 1                                | 1                                | 1                                | 1                                | 1                                |
| F0060 to F006F<br>(P-link configuration) | F60 F61 F62 F63 F64<br>1 0 1 1 1 | F60 F61 F62 F63 F64<br>0 1 0 0 0 | F60 F61 F62 F63 F64<br>1 0 1 1 1 | F60 F61 F62 F63 F64<br>1 0 1 1 1 | F60 F61 F62 F63 F64<br>1 0 1 1 1 |
| F0070 to F007F<br>(P-link fault)         | F70 F71 F72 F73 F74<br>0 1 0 0 0 | F70 F71 F72 F73 F74<br>1 0 1 1 1 | F70 F71 F72 F73 F74<br>0 1 0 0 0 | F70 F71 F72 F73 F74<br>0 1 0 0 0 | F70 F71 F72 F73 F74<br>0 1 0 0 0 |

(1 = flag ON, 0 = flag OFF)

## 8-7 P/PE-Link Troubleshooting

### ③ Example of processor power failure



#### Operating condition

In the above example, the processor power of station 2 is failure. Broadcast communication continues among stations 0 to 4, excluding station 2.

#### Status indication LEDs

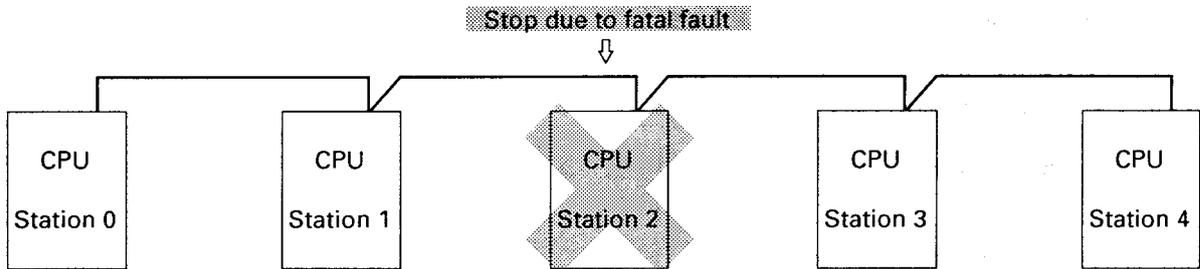
The ALARM2 and LER (remote station error) lamps light up on all processors, except for station 2. The station 2 processor is shut down, so the LED is OFF.

The special relay statuses are as follows:

| Station No.<br>Relay No. (name)          | Special relay status             |                                  |                          |                                  |                                  |
|--|----------------------------------|----------------------------------|--------------------------|----------------------------------|----------------------------------|
|  | Station 0                        | Station 1                        | Station 2                | Station 3                        | Station 4                        |
| F0025<br>(P-link fault)                  | 0                                | 0                                | -                        | 0                                | 0                                |
| F0027<br>(P-link configuration fault)    | 1                                | 1                                | -                        | 1                                | 1                                |
| F0060 to F006F<br>(P-link configuration) | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>- | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 |
| F0070 to F007F<br>(P-link fault)         | F70 F71 F72 F73 F74<br>0 0 1 0 0 | F70 F71 F72 F73 F74<br>0 0 1 0 0 | F70 F71 F72 F73 F74<br>- | F70 F71 F72 F73 F74<br>0 0 1 0 0 | F70 F71 F72 F73 F74<br>0 0 1 0 0 |

(1 = flag ON, 0 = flag OFF)

④ Example of processor stop due to fatal fault



**Operating condition**

In the above example, the station 2 processor has stopped due to a fatal fault. In this case, broadcast communication continues among stations 0 to 4, except for station 2. (Data transmitted from station 2 before it stopped is retained.)

**Status indication LEDs**

ALARM1 of the station 2 processor lights up. Other processors remain in normal status.

The special relay statuses are as follows:

| Station No.                              | Special relay status             |                                  |                                  |                                  |                                  |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Relay No. (name)                         | Station 0                        | Station 1                        | Station 2                        | Station 3                        | Station 4                        |
| F0025<br>(P-link fault)                  | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0027<br>(P-link configuration fault)    | 0                                | 0                                | 0                                | 0                                | 0                                |
| F0060 to F006F<br>(P-link configuration) | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 | F60 F61 F62 F63 F64<br>1 1 0 1 1 |
| F0070 to F007F<br>(P-link fault)         | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 | F70 F71 F72 F73 F74<br>0 0 0 0 0 |

(1 = flag ON, 0 = flag OFF)

## 8-8 Remote Programming/Monitoring on P/PE-Link

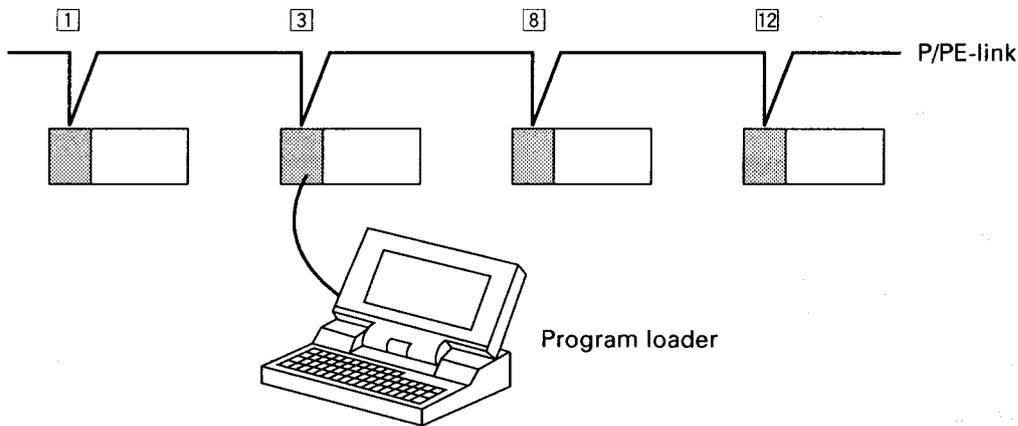
For the F70S, F120H, and F120S to F150S series, if a loader (LITE or a computer loader) is connected to one processor system (including T-link I/O, such as FTL and FTK) the other P/PE-link processors can be programmed and monitored (F70S, F120H, and F120S to F150S only), as described below.

Note: The message communication speed of connected stations is delayed while this function is in use.

### 1. Uses of remote programming/monitoring

#### Use 1:

The loader is connected to P/PE-link station No. 3 to provide remote programming/monitoring for processor station No. 8.

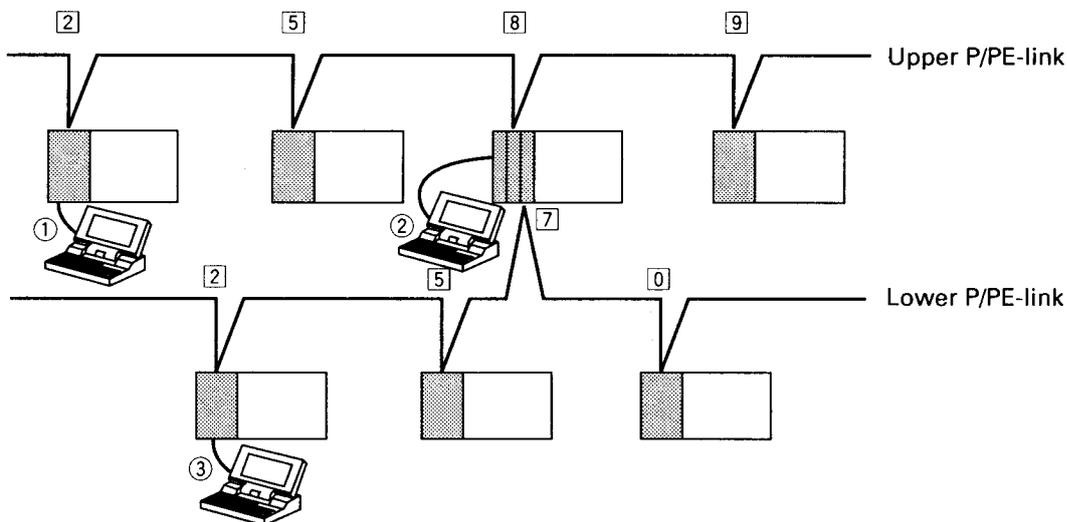


The procedure is done as follows:

- ① Set a communicating processor on P/PE-link, and set channel 0 and station No. 8. using the loader.
- ② When finished making the settings, programming and monitoring are possible for the No. 8 station processor under normal operation.

#### Use 2:

A two-stage P/PE-link system is equipped with two optional P/PE-link cards.

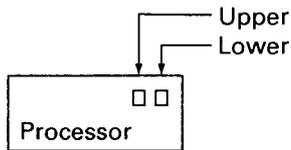


As in Use 1, loader ① in the figure above enables the station number 2, 5, 8, and 9 processors to communicate with each other by setting channel 0 and

the station No. on which to communicate. In this case, communication is not possible with station numbers 2, 5, and 0 connected to the lower P/PE-link.

## 8-8 Remote Programming/Monitoring on P/PE-Link

Loader ② in the figure is connected to a processor equipped with two optional cards, and enables processors connected to either upper or lower P/PE-link to communicate with each other. The upper P/PE-link is mounted on optional slot 0 and the lower on optional slot 1.



- Channel 0 is set with the loader for communication with station numbers ②, ⑤, and ⑨, connected to the upper P/PE-link.
- Channel 1 is set with the loader for communication with station numbers ②, ⑤, and ⑩, connected to the lower P/PE-link.

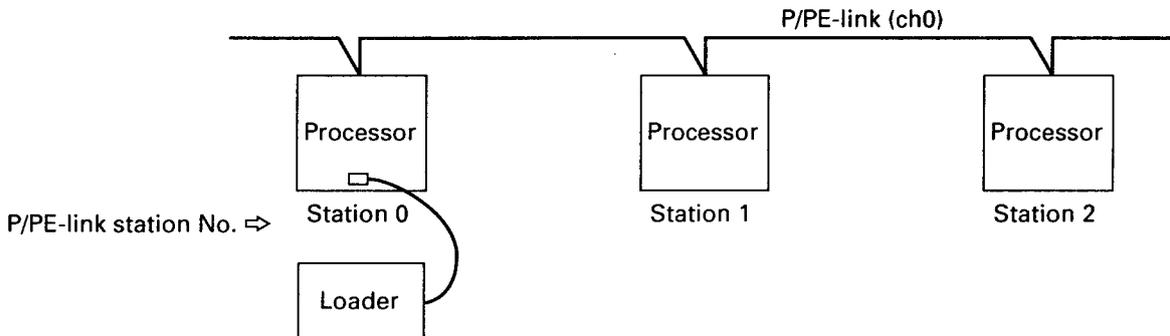
As in Use 1, loader ③ in the figure enables station numbers ②, ⑤, ⑦, and ⑩ connected to the lower P/PE-link to communicate with each other by setting channel 0 and a station No. In this case, communication is not possible with station numbers ②, ⑤, and ⑨ connected to the upper P/PE-link.

### Important:

- (1) When the loader is connected to a processor equipped with two P/PE-link cards:
  - Set channel 0 and a station No. to communicate with a processor connected to optional slot 0 P/PE-link.
  - Set channel 1 and a station No. to communicate with a processor connected to optional slot 1 P/PE-link.
- (2) When the loader is connected to a processor equipped with one P/PE-link card, set channel 0 and a station No. to communicate with another processor. In this case, only communication with processors connected to the same P/PE-link system is possible.

### 2. Setting communicating processors

P/PE-link communicating processors are switched using the loader. The procedure is shown below.



In the above case, the loader is mounted on station No. 0, and the station No. 0 processor is to communicate with the station No. 2 processor.

## 8-8 Remote Programming/Monitoring on P/PE-Link

### Setting procedure

Register a communicating processor.

- Press **[F5]** AUXILIARY and **[F10]** NEXT from the loader's initial screen to display the auxiliary screen (2/3).

|   |                                     |
|---|-------------------------------------|
| D25 PROGRAM LOADER<br>FUJI ELECTRIC Co.,Ltd.                                      |                                     |
| F1 PROGRAMMING<br>F2 MONITOR<br>F3 TRANSFER/VERIFY<br>F4 DOCUMENT<br>F5 AUXILIARY | Ver.2.51<br>1996/ 4/14/SUN<br>14:11 |
| [PROC] MENU   | RUN                                 |
| [MODE]  |                                     |
| [MEM]   |                                     |
| SELECT FUNCTION   |                                     |



|  |  |
|--|--|
| ** AUXILIARY ** (2/3)  |  |
| F1 CONTACT USE LIST<br>F2 ZERO SUPPRESSION<br>F3 DUPLICATE CHECK<br>F4 DUPLEX PC CHANGE<br>F5 SAMPLING TRACE | F6 STATUS LATCH<br>F7 TIMER SET<br>F8 LOADER NETWORK<br>F9 EXT CRT TURNING<br>F10 NEXT |
| [PROC] AUXILIARY   | RUN  |
| [MODE]   |  |
| SELECT FUNCTION  |  |

- From the auxiliary screen

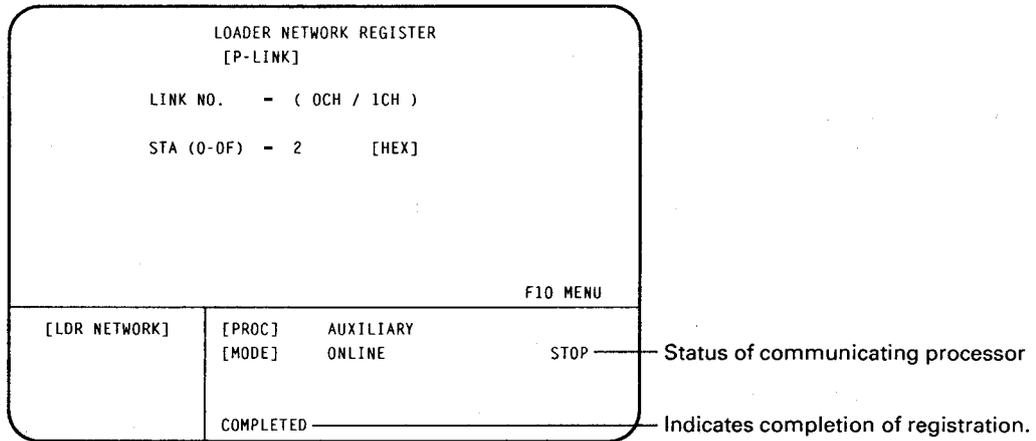
|                                      |          |
|--------------------------------------|----------|
| LOADER NETWORK                       |          |
| F1 REGISTER<br>F2 CANCEL<br>F3 CHECK |          |
|                                      | F10 MENU |
| [LDR NETWORK]                        | RUN      |
| [PROC] AUXILIARY                     |          |
| [MODE] ONLINE                        |          |
| SELECT FUNCTION                      |          |

- Register station No. 2 for communication.

|                                     |                              |
|-------------------------------------|------------------------------|
| LOADER NETWORK REGISTER<br>[P-LINK] |                              |
| LINK NO. - (0CH / 1CH)              | CH No.                       |
| STA (0-0F) - 2 [HEX]                | Remote processor station No. |
|                                     | F10 MENU                     |
| [LDR NETWORK]                       | RUN                          |
| [PROC] AUXILIARY                    |                              |
| [MODE] ONLINE                       |                              |
| PUSH ENT KEY                        |                              |

## 8-8 Remote Programming/Monitoring on P/PE-Link

- ④ Press **ENT** to complete registration and enable communication with the station No. 2 processor.

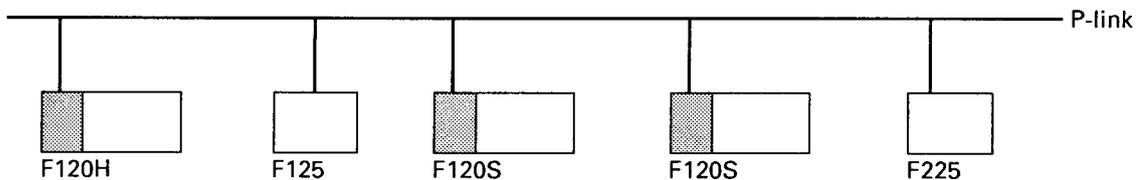


### Resetting communicating processor

Follow steps ① to ④ to reset the communicating processor. (Can also be done by other methods. See item (3) below.)

### 3. Other restrictions and notes

- ① The loader type is limited to LITE (D25) or personal computer loaders. Remote programming/monitoring via P/PE-link cannot be done with D10 or D20.
  - Turn off power supply for the processor connected to the loader.
- ② The processor connected to the loader is the communicating processor unless a different communicating processor is set with the loader. If a communicating processor is already set, it is reset by the following actions:
  - Resetting using the loader
  - Turning the loader OFF
  - Disconnecting the loader connection cable
- ③ Remote programming/monitoring via P/PE-link is not supported in the conventional F series (F105, F125, F205, and F225). When the conventional F series is connected together with F70S, F120H, or F120S to F150S as shown in the figure below, there are some restrictions, explained below.



Communication is possible only among F70S, F120H, and F120S to F150S. If the processor connected to the loader or a communicating processor is other than the F120H or F120S to F150S, when an attempt is made to set the channel No. or station No. of the processor for communication with the loader, the message 'Execution disabled' appears.

- ④ When communicating with a processor connected to the loader, reset the loader network. Even if a local station No. is set by registration, communication cannot be performed.

## 8-8 Remote Programming/Monitoring on P/PE-Link

### 4. Loader messages and how to deal with them

Loader messages during P/PE-link remote programming/monitoring and how to deal with them are shown below.

| Loader operation  | Message                        | Cause  | Required action  |
|---|--------------------------------|--|--|
| Setting a communicating processor station No. by loader network | Execution disabled             | Setting station No. does not exist.<br>Setting channel and No. do not exist.<br>Remote station is the conventional F series.<br>Remote station is not a processor.<br>Setting for a local station<br>Transmission error. | Check the remote station No. again.<br>Set channel 1 for a processor equipped with one P/PE-link card.<br>Not possible with conventional F series (F105, F125, F205, F225)<br>Not possible with L25 and FASMIC<br>Local station need not be set. |
|   | Registering remote station     | Setting of P/PE-link local station   | Local station need not be set.   |
|   | Busy                           | Remote station is busy in message communication.   | If it is an always busy, connect the loader directly to the processor for communication instead of connecting it via P/PE-link.  |
| Communicating   | Interaction has been disabled. | Transmission error   |  |
|   | Busy                           | Remote station is busy in message communication  | Do not connect the loader via P/PE-link.   |
| Reset   | No error message               |  |  |

---

## **Fuji Electric FA Components & Systems Co., Ltd.**

Mitsui Sumitomo Bank Ningyo-cho Bldg.,  
5-7, Nihonbashi Odemma-cho, Chuo-ku, Tokyo 103-0011, Japan  
Phone: +81-3-5847-8011  
Fax: +81-3-5847-8172  
URL <http://www.fujielectric.co.jp/fcs/eng/>