Instruction Manual TOSLINE-S20LP

T2N/T3H stations

REQUIREMENTS

- Keep this instruction manual where it can be easily referred to by users and those responsible for the equipment.

- Read this instruction manual carefully before using the equipment.

- After this instruction manual has been read, keep it beside the equipment.

Main Menu
Contents

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TOSHIBA CORPORATION

Important Information

Misuse of this equipment can result in property damage or human injury. Because controlled system applications vary widely, you should satisfy yourself as to the acceptability of this equipment for your intended purpose. In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may result from the use of this equipment.

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Preface

The TOSLINE-S20LP is a Local Area Network (LAN) for Factory Automation (FA) system. Several kinds of TOSLINE-S20LP stations are available for interfacing various equipments, such as PLCs, computers, etc.

This manual describes How To Use the TOSLINE-S20LP stations for Programmable Controller T2N/T3H. The TOSLINE-S20LP enables high speed data linkage between multiple T2N/T3H.

Refer to the separate manual for the TOSLINE-S20LP Loader software (S-LS) operations.

In this manual, the following abbreviations are used.

- S20LP: TOSLINE-S20LP system
- S-LS: TOSLINE-S20LP Loader Software
- S20LP-station: TOSLINE-S20LP station for T2N and/or T3H
- STN #n: Station number n

For details of the programmable controllers T2N, T3H and their programming software T-PDS, refer to the related manuals for these controllers.
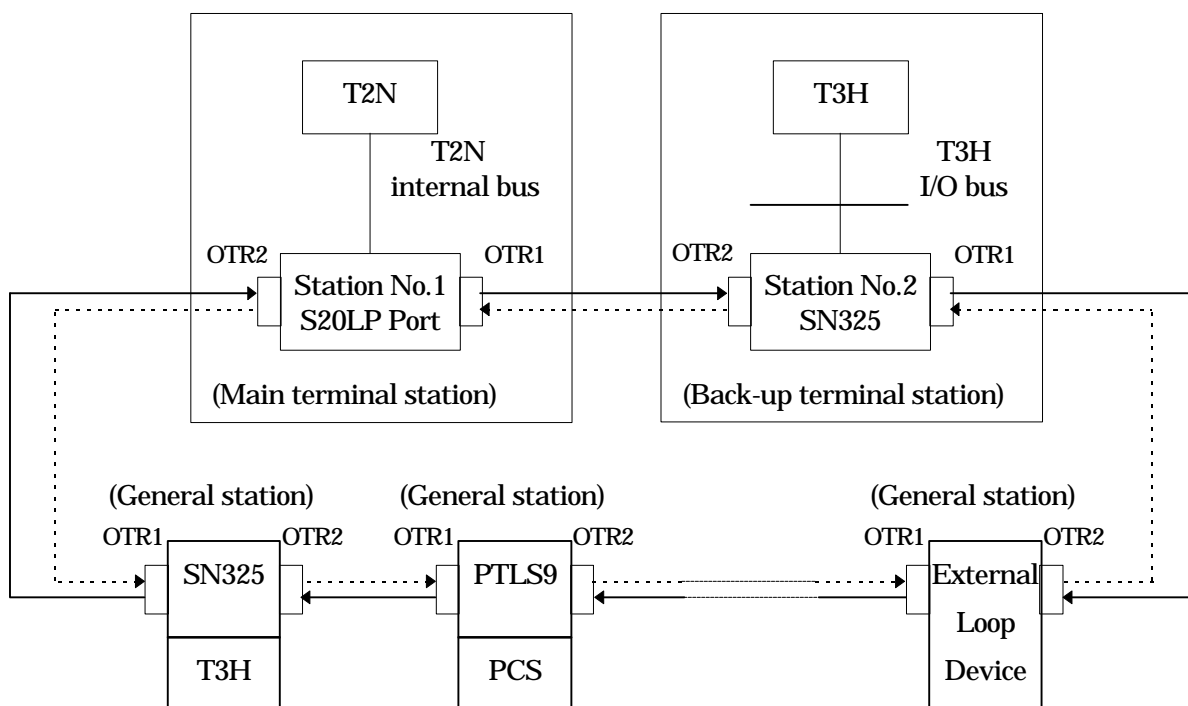
Contents

1. Introduction to S20LP

1.1 System configuration

The following figure shows the typical system configuration of the S20LP.

```
        ┌──────────────────────────────┐      ┌──────────────────────────────┐
        │          ┌──────┐            │      │          ┌──────┐            │
        │          │ T2N  │            │      │          │ T3H  │            │
        │          └──┬───┘            │      │          └──┬───┘            │
        │             │ T2N            │      │             │ T3H            │
        │             │ internal bus   │      │           ──┴── I/O bus      │
        │  OTR2       │        OTR1    │      │  OTR2       │        OTR1    │
        │     ┌──────────────────┐     │      │     ┌──────────────────┐     │
   ────────►  │  Station No.1    │ ◄─────────────►  │  Station No.2    │ ◄──────
        │     │  S20LP Port      │     │      │     │  SN325           │     │
        │     └──────────────────┘     │      │     └──────────────────┘     │
        │      (Main terminal station) │      │    (Back-up terminal station)│
        └──────────────────────────────┘      └──────────────────────────────┘
```

(General station)   (General station)   (General station)

OTR1   OTR2   OTR1   OTR2   OTR1   OTR2
┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│   SN325   │   │   PTLS9   │   │   External   │
│   │   │   │   │   Loop   │
│   T3H   │   │   PCS   │   │   Device   │
└──────────────────┘   └──────────────────┘   └──────────────────┘

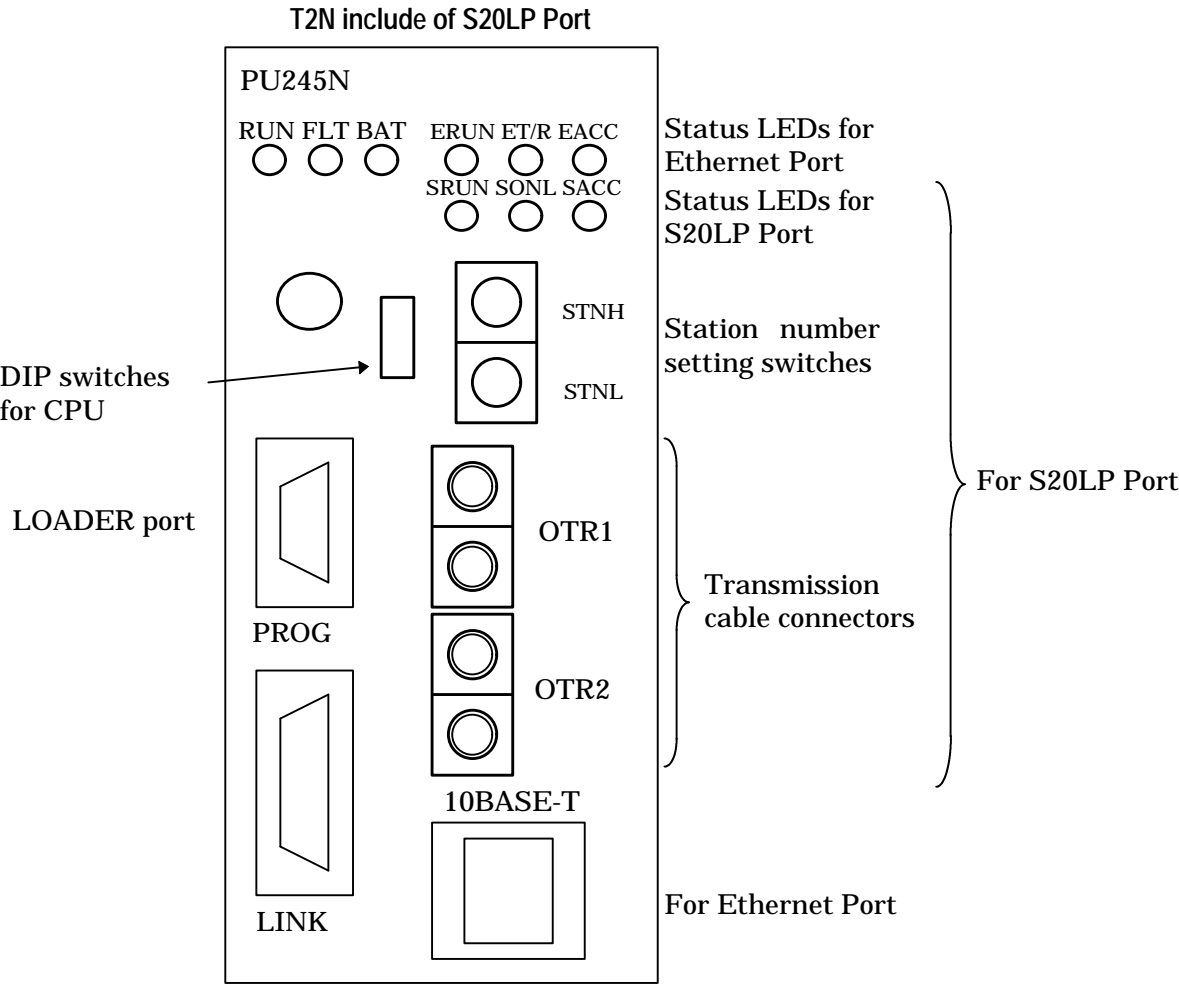——→ Transmission line 1 (Loop 1) : The data is sent from OTR1 to OTR2.

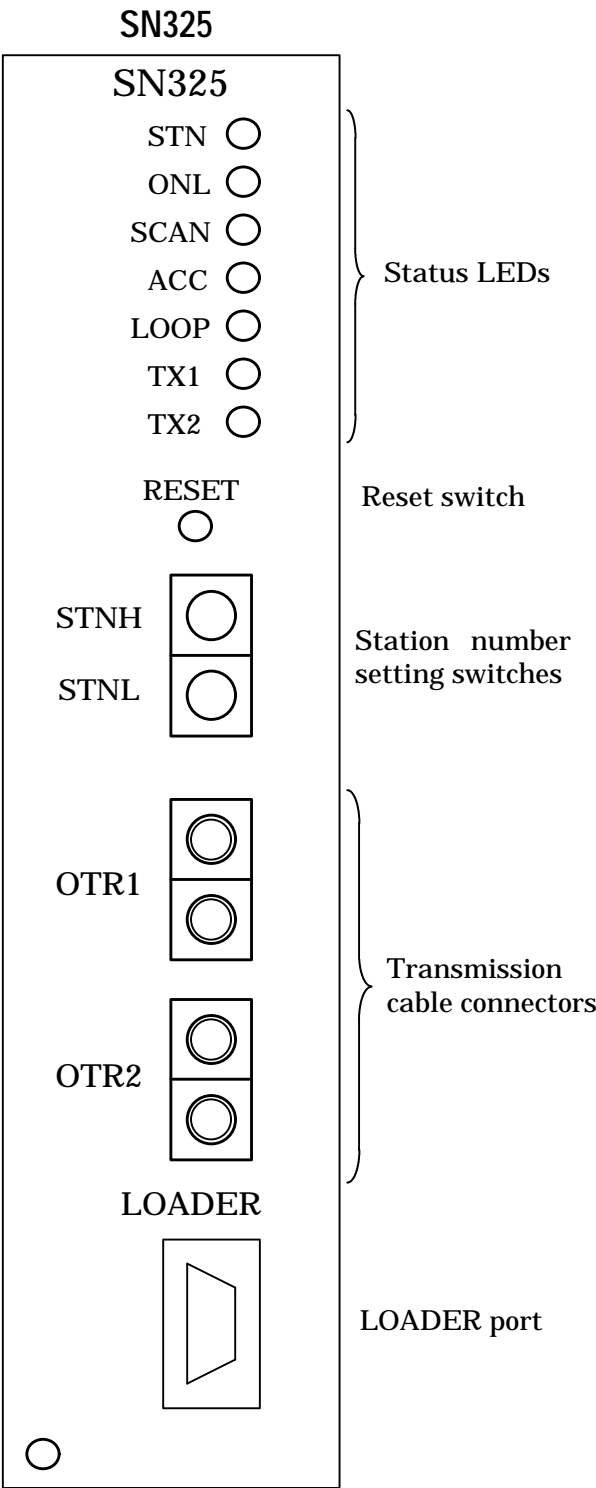·····→ Transmission line 2 (Loop 2) : The data is sent from OTR2 to OTR1.

Total number of stations	Max. 64 stations
Transmission distance	1 km (between stations) 4 km (between stations ; connecting SBR22) 30 km (system totla)
Scan transmission capacity	4096 words
Maximum transmission capacity	1024 words / station
Parameter setting tool	S-LS (runs on personal computer)

(Note 1) SBR22 is the long distance repeater for S20LP

1.2 Station hardware

- Overview

T2N include of S20LP Port

SN325

SN325	
STN ○	
ONL ○	
SCAN ○	
ACC ○	Status LEDs
LOOP ○	
TX1 ○	
TX2 ○	
RESET ○	Reset switch
STNH ▢	
STNL ▢	Station number setting switches
OTR1 ▢▢	
OTR2 ▢▢	Transmission cable connectors
LOADER ▢	LOADER port

- **Status LEDs:**

    Indicate the status of the S20LP-station.(see Section 5.3)

S20LP port for T2N (PU245N)

SRUN	Lit	Station is normal
	Not lit	Down mode
SONL	Lit	Online mode (Scan transmission is executing)
	Blink	Standby mode (Scan transmission is not executing)
	Not lit	Offline mode (Scan transmission is not executing)
SACC	Lit	T2N is accessing the port
	Not lit	T2N is not accessing the port

For SN325

STN	Lit	Station is normal
	Not lit	Down mode
ONL	Lit	Online mode (Scan transmission is executing)
	Blink	Standby mode (Scan transmission is not executing)
	Not lit	Offline mode (Scan transmission is not executing)
SCAN	Lit	Scan transmission is executing
	Not lit	Scan transmission is not executing
ACC	Lit	T3H is accessing the station
	Not lit	T3H is not accessing the station
LOOP	Lit	LOOP is normal (Cut off mode for main terminal station)
	Not lit	LOOP is abnormal
TX1	Lit	TRM1/RCV2 is normal
	Not lit	TRM1/RCV2 is abnormal
TX2	Lit	TRM2/RCV1 is normal (Note 1)
	Not lit	TRM2/RCV1 is abnormal (Note 1)

(Note 1) When the SN325 operates a terminal station, this LED is normally not lit.

- **Station number setting switches:**

  Used to set the station number. (allowable setting is 1 to 64)

  The setting status is read at power-on.

  STNH .... 10's digit

  STNL .... 1's digit

- **Loader port:**

  Used to connect the S-LS (or T-PDS for remote programming / monitoring).

  T2N (PU245N) changes DIP switch (P/S) "ON".

- **Transmission cable connector(s):**

  Used to connect optical fiber cables. (see Section 4)

- **Reset switch (only SN325):**

  Used to reset a SN325.

1.3 S-LS overview

The S-LS (TOSLINE-S20 Loader System) on a personal computer (PC) monitors station conditions, reads/writes control data, and sets up parameters. The transmission parameters set by S-LS is stored in the S20LP-station's built-in EEPROM.

Connection between S-LS and S20LP-station is made by an loader cable, that is the same cable as for T-PDS.

The following are the details of the menu. Select an intended station in the Station Connection Diagram window for display and specify the window in the menu or the toolbar.

[File]

    [Display Scan Address List]Displays the Scan Address List window.

    [Display Station Down Information]   Displays Down Information when the local station is downed.

    [Save Files All Station's Information]   Saves the setup information of all stations in the file.

    [Exit]   Terminates the application.

[Menu]

    [Setting Information]   Displays the Setting Information window.

    [Data Access]   Displays the Data Access window.

    [RAS Information]

        [Online Map]   Displays the Online Map window.

        [Scan Healthy Map]   Displays the Scan Healthy Map window.

        [Loop Map]   Displays the Loop Map window.

        [Station Status]   Displays the Station Status window.

        [Station Down Information]   Displays the Station Down Information.

        [RAS Counter Information]   Displays the RAS Counter Information

        [Online/Standby Request]   Displays the Online/Standby Request window.

    [Test Request]   Displays the Test Request window.

[Option]

    [Station Display Position]

    [Registration]   Registers the display positions of the stations rearranged.

    [Display]   Reflects the display positions of the registered stations in the window.

    [Normal]   Displays the stations rearranged in the ascending order of smaller display position numbers.

    [Communication Environment Setting] Displays the Communication Environment Setting window.

[Window]

    [Display Small Size]   Displays the Station Connection Diagram in small size.

[Help]

    [Contents]   Displays the Help window.

    [Key Word Search]   Displays the Retrieve window in Help.

    [Version Information]   Displays the information of the application version.

The toolbar has buttons for the functions frequently used. The following buttons are found from left to right.

[Exit button]	Exits the application.
[Setting Information button]	Displays the Setup Information window.
[Data Access button]	Displays the Data Access window.
[RAS Information button]	Displays the RAS Information Menu window.
[Online/Standby Request button]	Displays the Online/Standby Request window.
[Test Request button]	Displays the Test Request window.

1.4   Specifications

S20LP system specifications

Transmission cable	Silica glass SI 200/230μm
	H-PCF (Hard-Plastic Clad Fiber)
Cable connection	F07 connector
(cable side connector)	(JIS C5976)
Transmission distance	Max. 1 km (between stations)
	Max. 4 km (between stations ; connecting SBR22)
	Max. 30 km (system total)
Topology	Loop
Number of stations	Max. 64 stations
Transmission speed	2 Mbps
Transmission code	Differential Manchester
Modulation method	Baseband
Communication service	(1) Scan transmission (cyclic broadcast)
	(2) Message transmission (on request)

S20LP-station specifications

|	S20LP port for T2N	S20LP-station for T3H
Station type	PU245N...Optical fiber	SN325...Optical fiber
Max. number on T2N/T3H	1 station (Include of S20LP port)	2 stations (Note 1)
Scan transmission capacity	4096 words (Link register W (2048 words) in T2N/T3H is assigned)	
Message transmission support	S-LS (primary / secondary) T-PDS (primary / secondary) T-series Computer Link Protocol (secondaty)	
RAS information	Station status, Online / Standby map (S20LP port / SN325)	
Consumed current (internal 5Vdc)	S20LP port ... 1.5 [A] or less	SN325 ... 800 [mA] or less

(Note 1) A T3H which has two S20LP-stations can work as a bridge station for two S20LP layers.

2. Scan transmission overview

The Scan transmission method is suitable for real time control data linkage.

In the S20LP, data sending station is rotated cyclically. Each station has common memory for Scan transmission. The size of the common memory is 4096 words. When a station becomes the data sender station, it sends data of prespecified area of the common memory. All other stations receive the data, and store them into their common memory. Therefore, the common memory in each station is totally updated in a transmission cycle.

The common memory is allocated to the Link register (W) in the T2N/T3H. The size of the link register is 2048 words. The link register is a part of common memory. By simply reading/writing data from/to the Link registers, high speed data linkage is achieved.
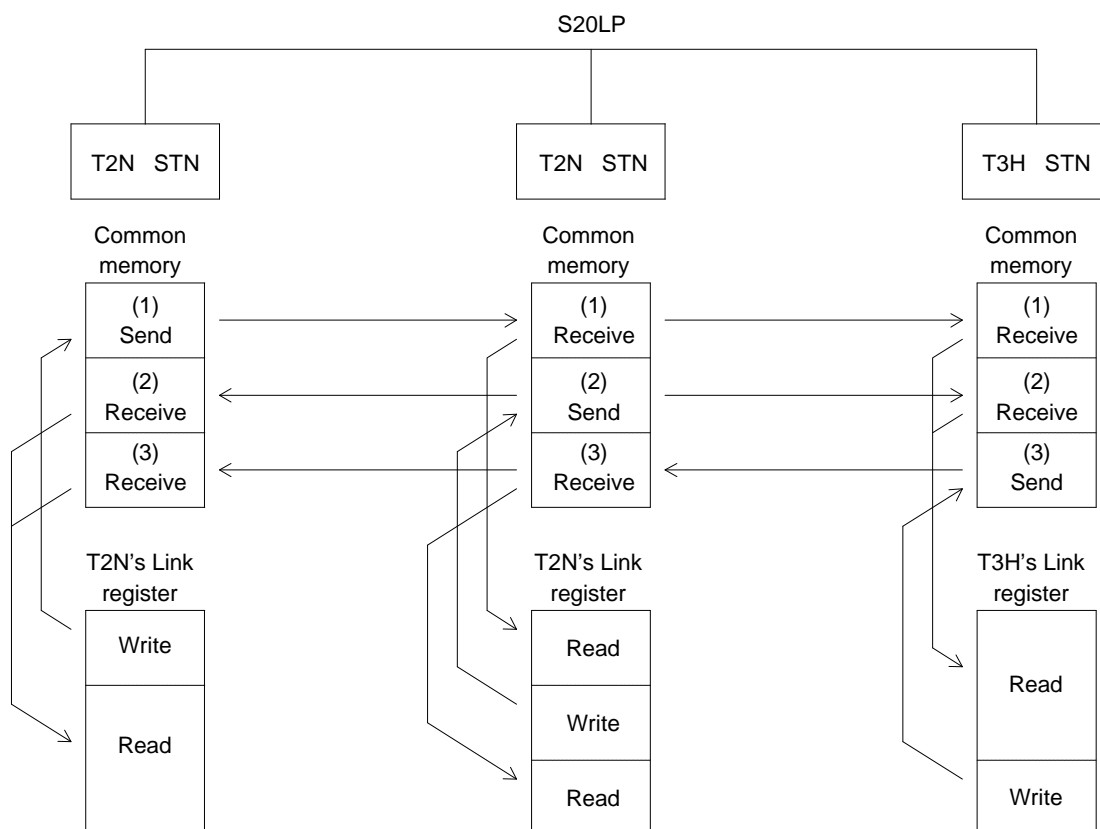
Note 1) The data send block(s) of each station is prespecified by using the S-LS.

Note 2) Data transfer between common memory and Link registers is executed by T2N/T3H's OS. The transfer direction (read or write) is automatically decided.

Main terminal station, back-up terminal station and general station

When power is applied to each S20LP-station, one station must have station address number 1. The station of station number 1 becomes the main terminal station. The station of station number 2 becomes back-up terminal station. Normally stations, except station number 1, become the general stations. The main terminal station controls total timing of the S20LP network. If main terminal station is down, back-up terminal station (station number 2) becomes main terminal station on condition that the back-up enable flag is ON. If the back-up enable flag is OFF, back-up terminal is general station. If both the station of station number 1 and 2 is down, all stations become general station.

To be effective back-up terminal station, the address (1F44H) on the S20LP dual port memory must be set ON. To set the S20LP dual port memory, use the write instruction. Detailed information of write instruction see "T-series Instruction Set (Ladder, SFC)" (UM-TS03***-E004).

Setting the "data send block" (by S-LS)

On each station, the "data send block" is prespecified by using the S-LS. This setting is made by entering the starting addess and the size (number of send words). On a station, up to two "data send blocks" can be specified. (see Section 3.3)

I/O allocation and network assignment (by T-PDS)

On each T2N/T3H, the I/O allocation for S20LP-station and the network assignment are necessary. By using the T-PDS's I/O allocation function, allocate the S20LP-station as "TL-S" (T3H) or E/S (T2N). And by using the T-PDS's Network assignment function, assign (set "LINK" or "GLOBAL") the Link registers (W) to the S20LP-station's common memory (from 0 to 2048), Block by Block. (see Section 3.2)

Block 1: W0000 to W0063	Block 17: W1024 to W1087
Block 2: W0064 to W0127	Block 18: W1088 to W1151
Block 3: W0128 to W0191	Block 19: W1152 to W1215
Block 4: W0192 to W0255	Block 20: W1216 to W1279
Block 5: W0256 to W0319	Block 21: W1280 to W1343
Block 6: W0320 to W0383	Block 22: W1344 to W1407
Block 7: W0384 to W0447	Block 23: W1408 to W1471
Block 8: W0448 to W0511	Block 24: W1472 to W1535
Block 9: W0512 to W0575	Block 25: W1536 to W1599
Block 10: W0576 to W0639	Block 26: W1600 to W1663
Block 11: W0640 to W0703	Block 27: W1664 to W1727
Block 12: W0704 to W0767	Block 28: W1728 to W1791
Block 13: W0768 to W0831	Block 29: W1792 to W1855
Block 14: W0832 to W0895	Block 30: W1856 to W1919
Block 15: W0896 to W0959	Block 31: W1920 to W1983
Block 16: W0960 to W1023	Block 32: W1984 to W2047

T2N/T3H accesses the common memory only for the assigned Blocks. (This "Block" and S20LP's "Data send block" are different.)

"LINK" is normal assignment setting. "GLOBAL" is the setting for multi layers Scan transmission. (effective only in T3H)

3. Setting for data linkage

3.1 Station number setting

Each station should have unique station number. If a station number is duplicated, the S20LP network cannot be established. Allowable station number is 1 to 64. To set the station number, two rotary switches (STNH and STNL) are provided on each station. STNH is for 10's digit setting, and STNL is for 1's digit setting.

(For example)

STNH = 1
STNL = 5

Station number is 15

3.2 Settings on T-PDS

The following settings are necessary for the T2N/T3H on which the S20LP-station is mounted.
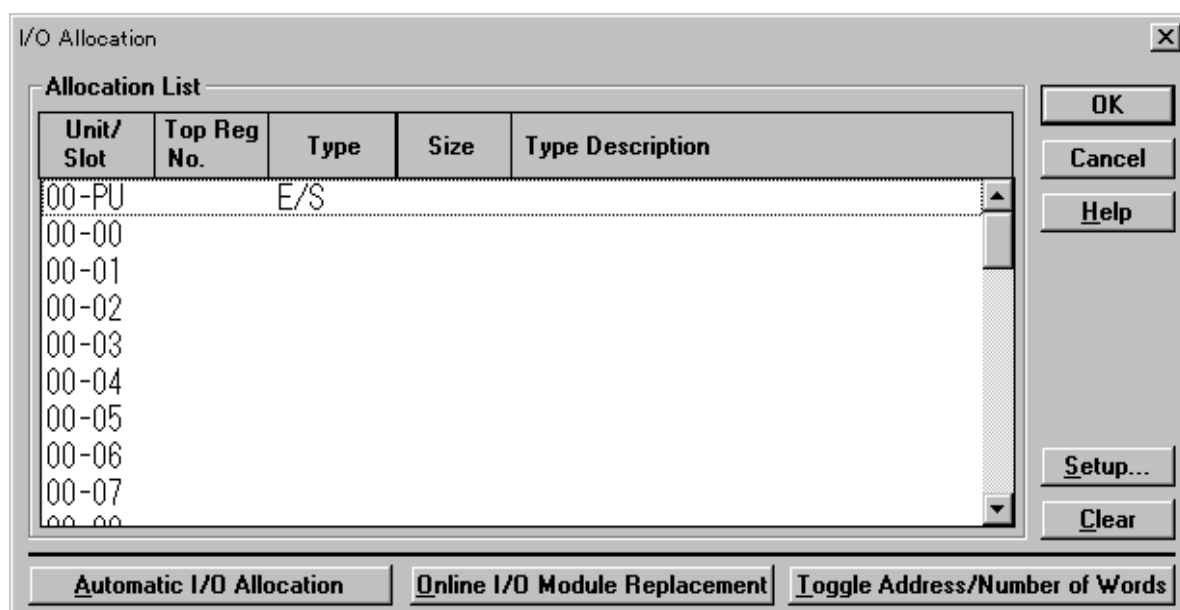
(1) I/O allocation

Allocate the S20LP-station as "TL-S".

<T-PDS screen example 1>

P: PLC

A: I/O Allocation

A: I/O Allocation

I/O Allocation

Allocation List

Unit/ Slot	Top Reg No.	Type	Size	Type Description
00-PU		E/S		
00-00				
00-01				
00-02				
00-03				
00-04				
00-05				
00-06				
00-07				

OK Cancel Help Setup... Clear

Automatic I/O Allocation | Online I/O Module Replacement | Toggle Address/Number of Words

(2) Network assignment

a) Set "LINK" for the Blocks to be assigned.

<Setting example> S20LP-station common memory		T2N/T3H W registers	Network assignment
0	Receive	Block 1 W000-063	LINK
	→	Block 2 W064-127	LINK
100	Send ←		
	← Block 3 W128-191		LINK
230	← Block 4		
	→ W192-255		LINK
	Receive	Block 5 W256-319	
		. . .	
2047	→	Block 32 W1983-2047	LINK

<u><T-PDS screen example 2></u>

└── <u>P: PLC</u>

      └── <u>A: I/O Allocation</u>

N: Network Assignment

b) If two S20LP-stations are mounted on the T3H, the station which is allocated closer to the CPU in the I/O allocation (see (1)) is assigned as CH1. And the other is assigned as CH2. (CH2 is invalid for T2N)

<Setting example 2>

CH1 Network assignment	CH1 S20LP-station common memory		T3H W registers		CH2 S20LP-station common memory	CH2 Network assignment
	Receive		Block 1	→	Send	LINK
			Block 2	→ ←		LINK
LINK		→	Block 3		Receive	
LINK	Send	←	Block 4			
LINK		←	Block 5			
LINK	Receive	→	Block 6			
			. . . .			
			Block 32	←		LINK

<T-PDS screen example 3>

c) If two S20LP-stations are mounted on the T3H and multi layers Scan transmission function is used, use the "GLOBAL" setting. (GLOBAL is invalid for T2N)

<Setting example 3>

CH1 Network assignment	CH1 S20LP-station common memory		T3H W registers		CH2 S20LP-station common memory	CH2 Network assignment
	Receive		Block 1	→	Send 1	LINK
			Block 2	→ ←		LINK
LINK		→	Block 3			
		←				
LINK	Send 1	←	Block 4			
LINK		←	Block 5		Receive	
LINK		→	Block 6			
GLOBAL		→	Block 7	←		
GLOBAL	Send 2	←	Block 8	←		
		←	Block 9	→	Send 2	GLOBAL
		→		→		
		→	Block 10	←		GLOBAL
	Receive		. . . .		Receive	
			Block 32	←		LINK

<T-PDS screen example 4>

Note) The following rules are applied to the Network assignment. Do not set LINK both for CH1 and CH2 for the same Block. If duplicated, CH1 has priority.

In the GLOBAL setting Block, the "receive" side CH data is transferred to the W register and the "send" side CH. In this case, GLOBAL can be set on either CH.

In the GLOBAL setting Block, if both CHs are specified as "send", the W register data is transferred to both CHs.

In the GLOBAL setting Block, if both CHs are specified as "receive", the GLOBAL setting CH data is transferred to the W register. If both CHs have been set as GLOBAL, CH1 has priority.

If TOSLINE-30 is used together, the TOSLINE-30 is allocated to the W registers from the lowest address. In this case, the W registers which are assigned to the TOSLINE-30 should not be assigned to the S20LP. (TOSLINE-30 is available only for T2N)

3.3　Settings on S-LS

(1)　Start-up the S-LS

Connect the S-LS (personal computer) and the S20LP-station by the loader cable. Start-up the S-LS for Windows95.

(2)　Turn the T2N/T3H to HALT

(3)　Confirm the S20LP-station status

Confirm the status of the connected S20LP-station is "STANDBY" by right and upper side.　It is displayed on the S-LS screen as below.
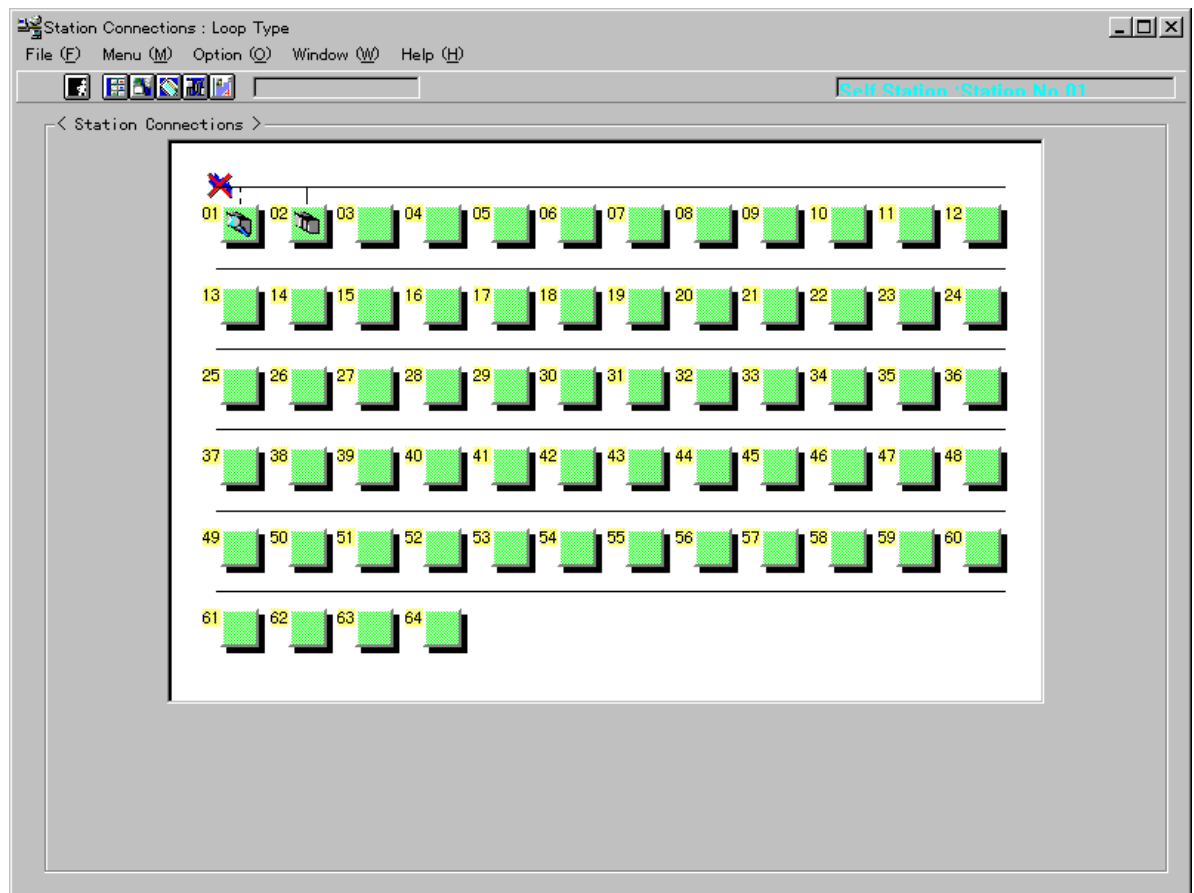
(4) Settings of data send block. Operate the S-LS as follows.

Select menu and Setting Information or click the right side of mouse and select setting information.
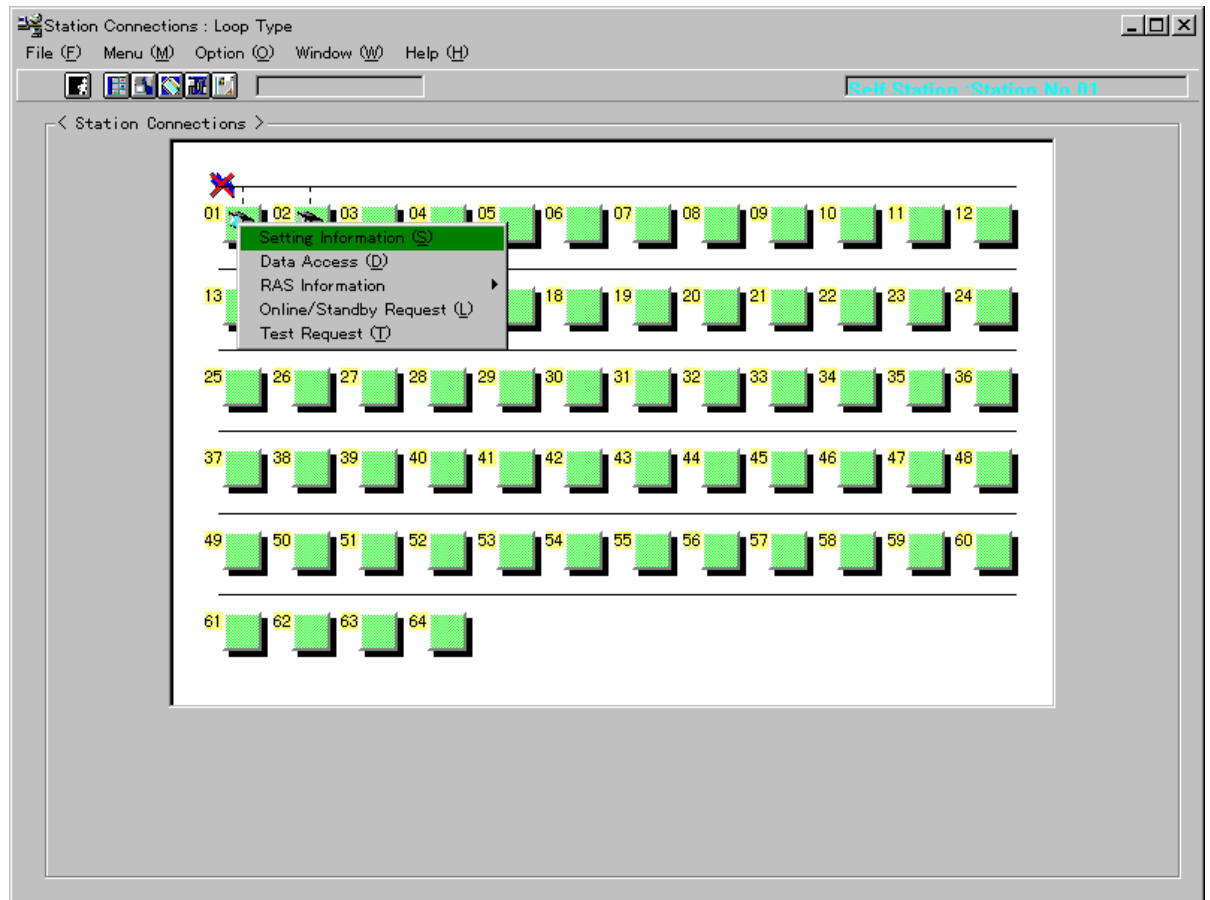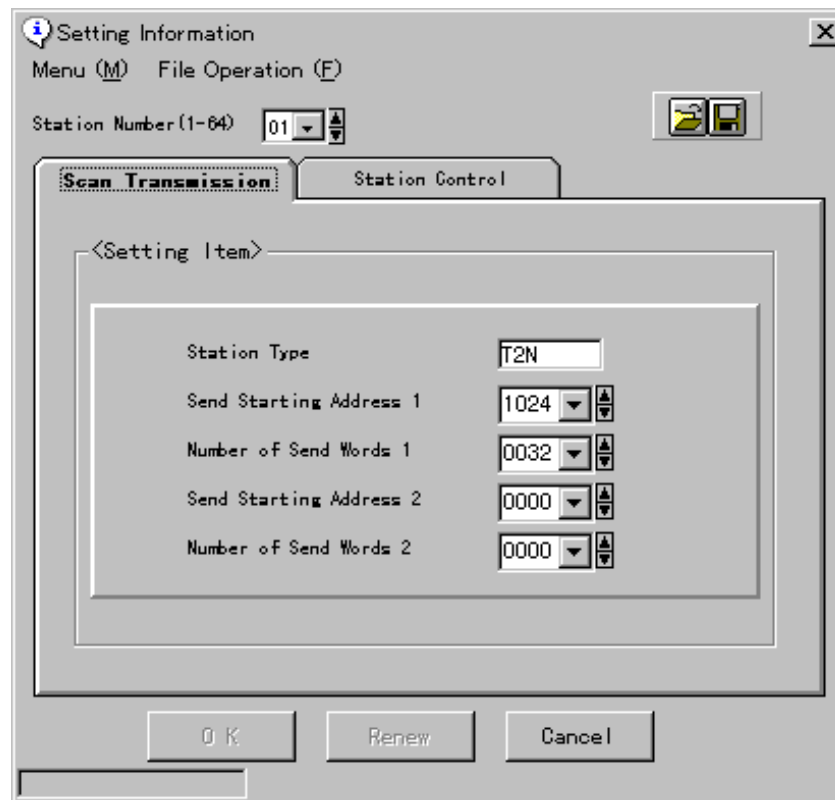
Select the "Station Number" of the connected S20LP-station. Select the "Scan Transmission" and specify the "data send block(s)". The "data send block" is specified by entering the starting address (Send Starting Address 1/2) and the size (Number of Send Words 1/2). Up to two "data send blocks" can be specified. If "data send block 2" is not used, enter 0 both for Send Starting Address 2 and Number of Send Words 2. The maximum size of send words is Number of Send Words 1 and 2, total 1024 words.
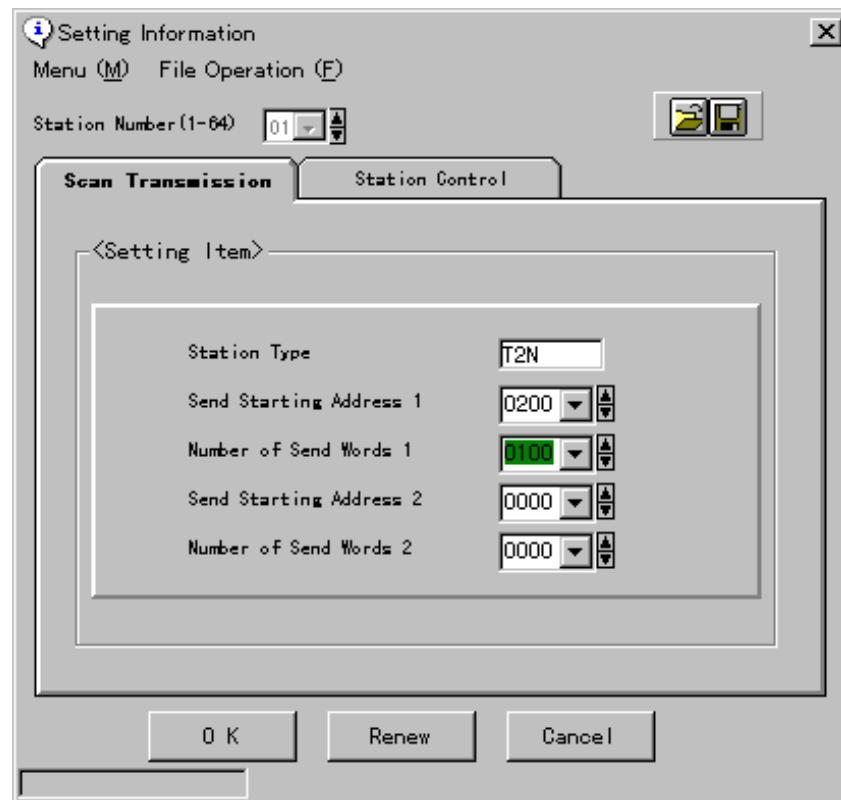
Write the settings into the S20LP-station. Press "OK" button.

When the settings are correctly written into the S20LP-station's EEPROM, it is displayed on the screen as below.

(5) Settings of station control information

Open the "Setting Information", and push the "Station Control" by mouse.
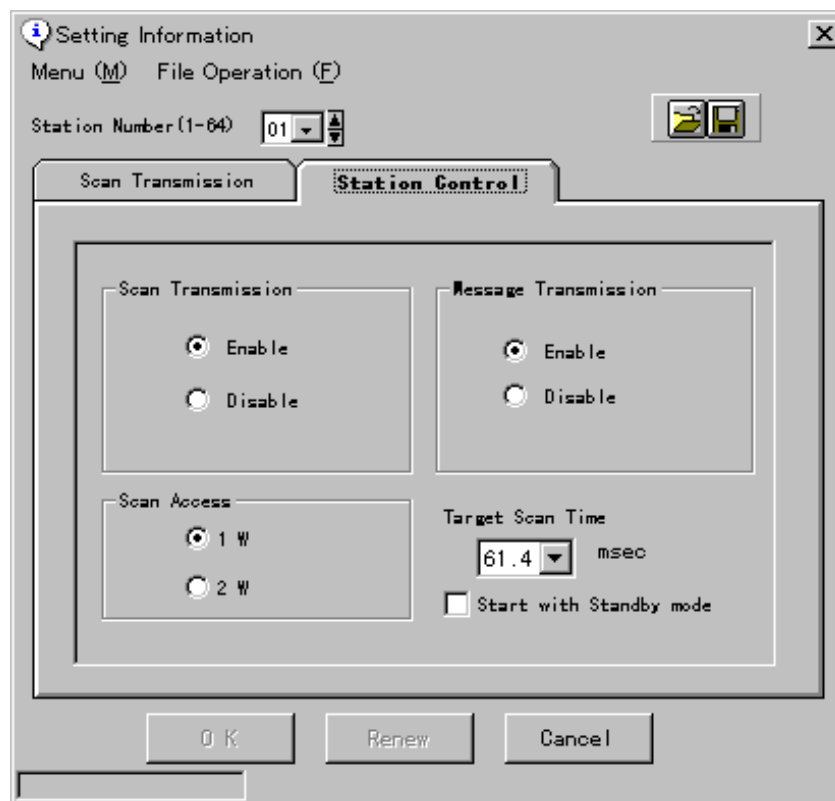
- **Scan Transmission**

    Enable/disable the Scan transmission. Select Enable to use the Scan transmission function.

- **Scan Access**

    Scan data synchronization 1 word or 2 words. If 2W (2 words) is selected, data synchronization of double-word data (lower even and higher odd addresses) is achieved. In this case, 2W setting is needed both on the sender and receiver stations. Also, if 2W is selected, Send Start Address and Send Word Number must be even number.

- **Message Transmission**

    Enable/disable the Message transmission. The Message transmission is used for S-LS remote setting/monitoring, T-PDS remote programming, T-series computer link protocol and PC link protocol. Normally select Enable.

- **Start with Standby mode**

    When this space is not checked, Scan transmission is automatically started at power-up. When this space is checked, Scan transmission is not started until Online request is issued by S-LS. Normally no check.

- Target Scan Time

    A time factor for limiting the time assigned for the Message transmission. The actual Scan time (time of Token passes all stations) is either longer one the Target Scan time or time for Scan transmission. (see Apendix A.1)

    The Target Scan time should be the same value in all stations connected to the S20LP network (layer). The Target Scan time can be selected from the combo box, select the target   cycle time you want to set. Click on the "OK" or "Renew" button. The data you set is transmitted to the corresponding station.

3.07	8.19	13.3	24.6	45.1
4.10	9.22	14.3	28.7	49.2
5.12	10.2	15.4	32.8	53.2
6.14	11.3	16.3	36.9	57.3
7.17	12.3	20.5	41.0	61.4

(Note 1) If Message transmission cannot work normally or a S20LP-station becomes Error down by Receive buffer overflow, the time for Message transmission is not enough. In such case, increase the Target Scan time value.

When the settings are correctly written into the S20LP-station's EEPROM, it is displayed on the screen as below.

(6)   Change connection to other stations, and repeat (2) to (5).

S-LS remote setting (without changing connection) is also available by selecting the station number. In this case, change the station mode to "STANDBY" by S-LS before setting. After all setting complete, change the station mode to "ONLINE" by S-LS.

3.4 Data linkage example

	STN #1			STN #2			STN #3		
	T3H	S20-LP	I/O	T2N	S20-LP	I/O	T2N	S20-LP	I/O

W000 … W0199	Send	⟶	Receive	⟶	Receive
W0200 … W0249	Receive	⟵	Send		No use
W0250 … W0299	Receive	⟵	No use	⟵	Send
W0300 … W2047	No use		No use		No use
common memory (2k words)	No use		No use		No use

Link register (W) can not use Common memory over 2048 words.

STN #1 T3H sends 200 words data (W0000 to W0199) to STN #2 and #3 T2Ns.
STN #2 T2N sends 50 words data (W0200 to W0249) to STN #1 T3H.
STN #3 T2N sends 50 words data (W0250 to W0299) to STN #1 T3H.

Necessary settings for this data linkage configuration are as follows.

- **Settings on T-PDS**

    Allocate the S20LP-station as "TL-S" (for T3H) by using the automatic I/O allocation command or the manual I/O allocation function of the T-PDS in T3H. And automatically allocate the S20LP-station as "E/S" in T2N.

    By using the Network assignment function of the T-PDS, sssign the Blocks to cover the using W registers.

    For STN #1 T3H and STN #3 T2N: set LINK for Blocks 1 to 5 (W0000 to W0319)

    For STN #2 T2N: set LINK for Blocks 1 to 4 (W0000 to W0255)

- Setting on S-LS

Station Number	1	2	3
Send Start Address 1	0000	0200	0250
Send Word Number 1	0200	0050	0050
Send Start Address 2	0000	0000	0000
Send Word Number 2	0000	0000	0000
Scan Transmission	Enable		
Scan Access	1 Word		
Message Transmission	Enable		
Target Scan Time	61.4 msec		
Start with Standby mode	No.		

<S-LS setting screen 1 for STN #2>

<S-LS setting screen 2 for STN #2>
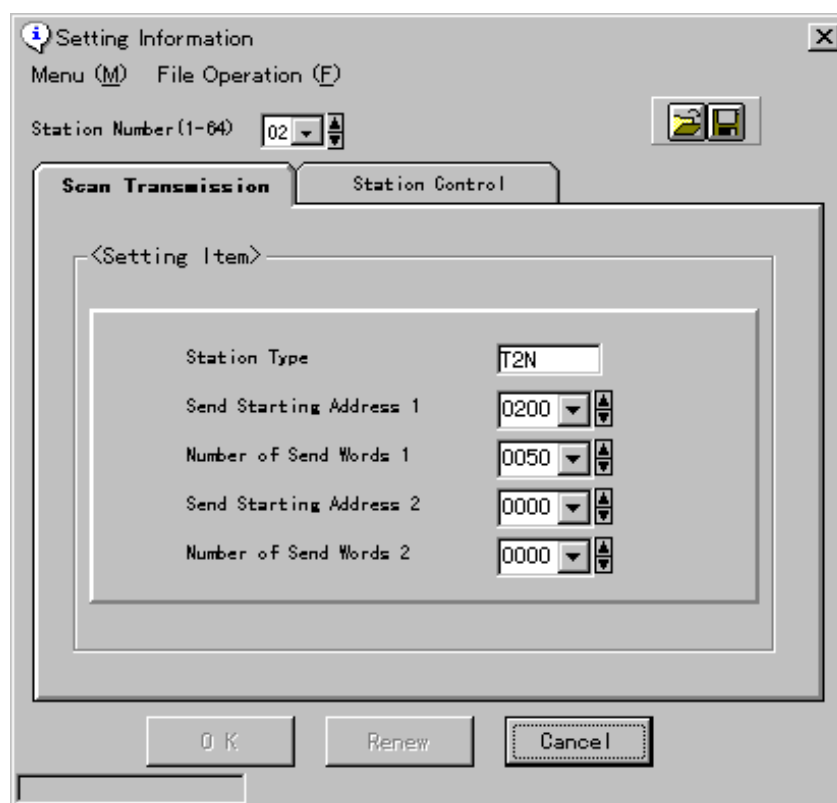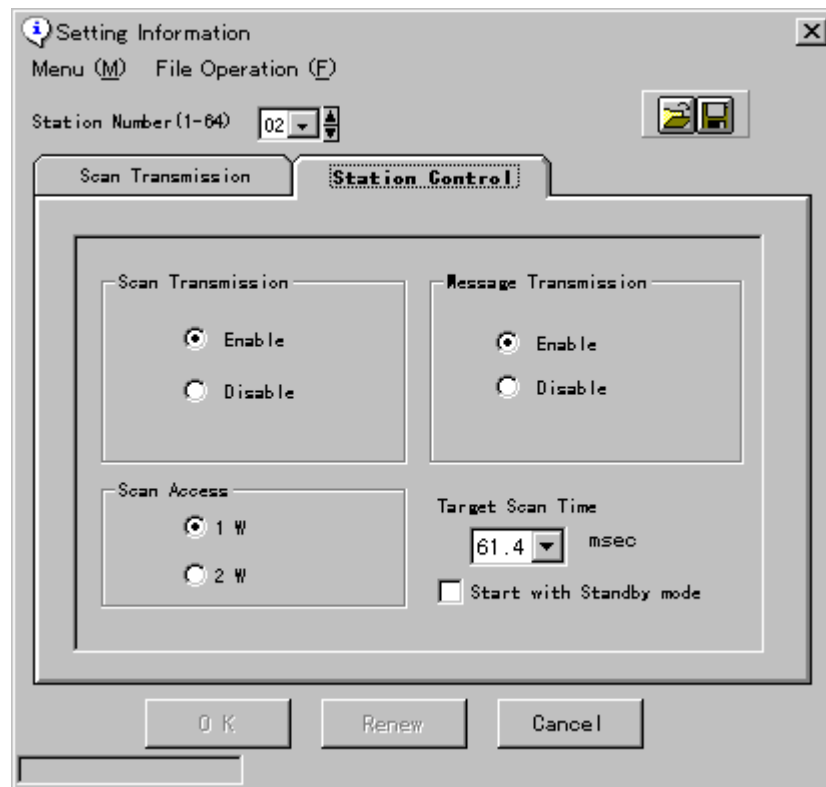
4. Cable connections
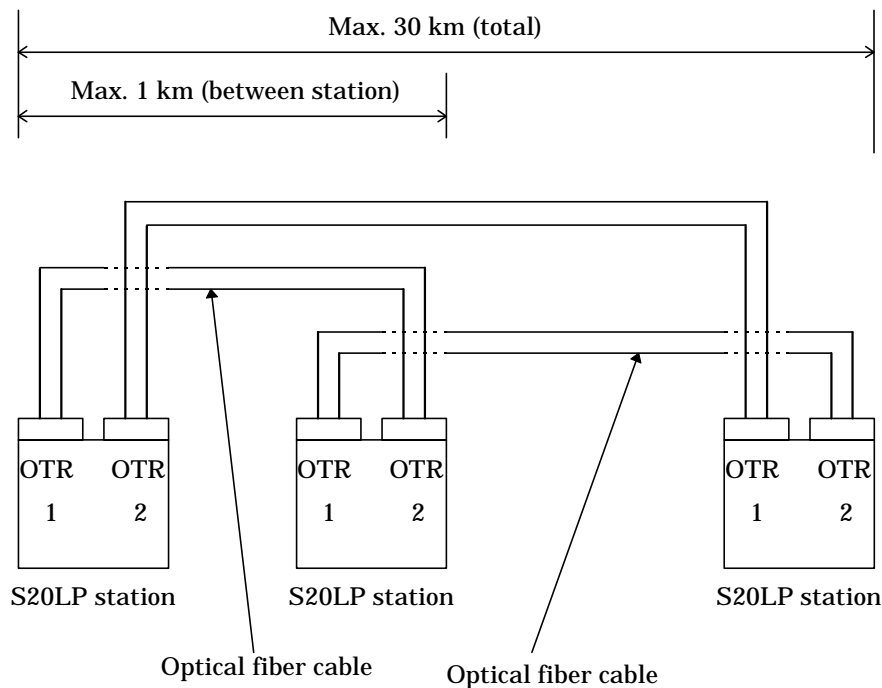
(Note 1) Optical fiber connect OTR1/OTR2 to another station's OTR2/OTR1.

(Note 2) Using the long distance of optical fiber (SBR22) is Max. 4 km between station.

Item	Type
Optical fiber cable	H-PCF (Hard-Plastic clad fiber) 200/230 μm
Optical connector	F07 connector (JIS C5976)

	Optical fiber characteristic
Material	Silica glass, Step index
Core diameter	200 ± 5μm
Cladding diameter	230 + 0, -10μm
Numerical Aperture	0.4
Attenuation	7.0 dB/km or less
Bandwidth	9 MHz•km or more
Wavelength	0.81μm

(Note 1) Securely connect the optical connectors. Otherwise, connection loss will increase.

(Note 2) Do not bend the optical fiber cable/cord more than the allowable limit.

(Note 3) Clamp the optical fiber cable/cord to prevent the optical connector weighted.

5. RAS function

5.1 Behavior in trouble

(1) Optical fiber system

- **Station down**

    If a station (either main, back-up or general) becomes down, the abnormal station will be disconnected from the S20LP system (re-configuration), then communications of remaining stations will be re-started. If two station (either main, back-up or general terminals) become power off, the S20LP system will split into two independent S20LP systems at the power off stations.
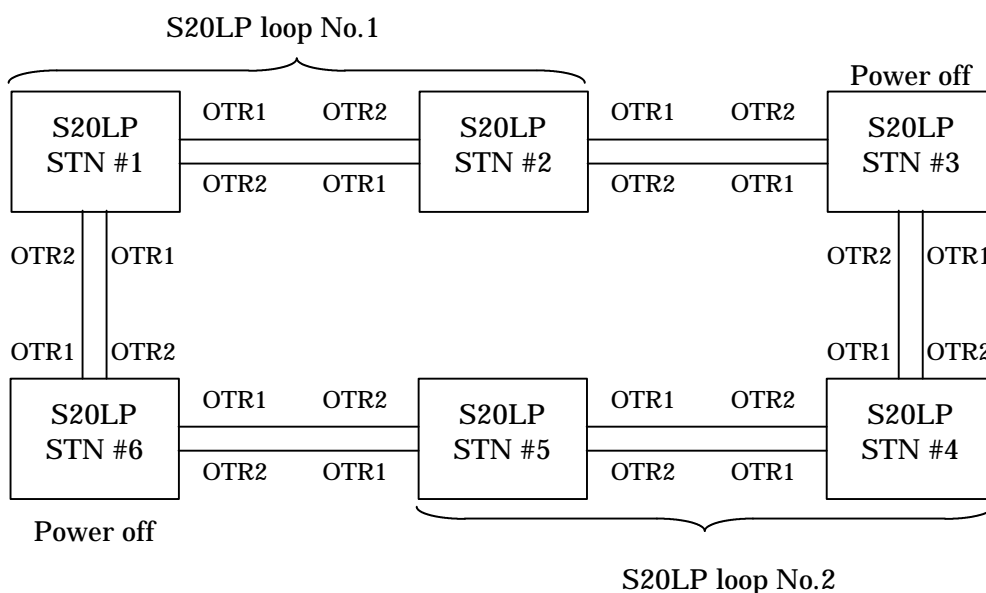
- **Transmission cable breakage**

    If both transmitter and receiver lines are broken (*1) or if one of the two lines is broken (*2), the S20LP system will cut off the broken lines.
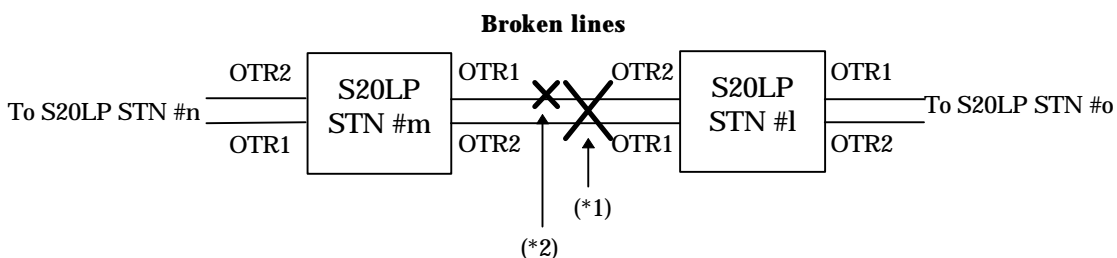
5.2 Self-diagnostic function

The S20LP-station has the following self-diagnostic function.

- **At initialization (at power on)**

Diagnostic item	Station operation abnormal
ROM BCC check	Station moves into Down mode.
RAM read/write check	Communications with other stations are
CPU and peripheral LSI check	not possible. This state will be reset by
Station number check	power off/on (SN325, T2N) or pressing Reset switch (SN325).
Transmission parameter (EEPROM) check	Station moves into Standby mode. In this state, scan transmission is not possible but message transmission is available. Station waits for transmission parameter setting.

- **During operation**

Diagnostic item	Station operation abnormal
Watch dog timer check	Station moves into Down mode.
Abnormal timer check (jabber timer) check	Communications with other stations are not possible. This state will be reset by power off/on (SN325, T2N) or pressing Reset switch (SN325).
Receive frame check (CRC check)	Station ignores the abnormal frame.
Response check	In message transmission, if response from the target station cannot be received, station re-sends the frame.
No signal state check	If no signal state continues more than specified time, station starts re-configuration operation.

5.3 LED indication

(1) SN325

The S20LP-station is equipped with STN, ONL and SCAN LEDs, which indicate the station modes.

STN	ONL	SCAN	Station mode	Remarks
Lit	Lit	Lit	Online	Scan / Message transmission is enabled
		Not lit	Online	Scan transmission is disabled Message transmission is enabled
Lit	Not lit	Not lit	Offline	Scan / Message transmission is disabled
Lit	Blink	Not lit	Standby	Transmission parameter is not written in EEPROM. Transmission information is standby start up. Connection machines is abnormal. T3H is not RUN mode.
Not lit	Blink (simultaneously)	Blink	Down	Station number is illegal
	Blink	Not lit	Down	Jabber timeout
	Not lit	Not lit	Down	Receive buffer is overflow. Target cycle time is shortage.
	Blink (alternately)	Blink	Down	Watch dog timer error

(2) T2N

The S20LP-station is equipped with RUN and SONL LEDs, which indicate the station modes.

SRUN	SONL	Station mode	Remarks
Lit	Lit	Online	Scan / Message transmission is enabled
Lit	Not lit	Offline	Scan / Message transmission is disabled
Lit	Blink	Standby	Transmission parameter is not written in EEPROM. Transmission information is standby start up. Connection machines is abnormal. T2N is not RUN mode.
Not lit	Blink	Down	Station number is illegal. Jabber timeout. Watch dog timer error.
Not lit	Not lit	Down	Receive buffer is overflow. Target cycle time is shortage.

5.4 RAS information monitored in T2N/T3H

RAS information of the S20LP system is reflected in the special registers (SW) of T2N/T3H. This information can be referred in the T2N/T3H's user program.

SW110	CH1 station status	(1 word)
SW111	CH2 station status (only T3H)	(1 word)
SW112	CH1 online map	(4 words)
SW116	CH2 online map (only T3H)	(4 words)
SW120	CH1 standby map	(4 words)
SW124	CH2 standby map (only T3H)	(4 words)
SW128	Loop map (only T2N)	(32 words)

(1) Station status

Indicates the status of the S20LP-station mounted on the T2N/T3H.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
SW110 (SW111)	a	b	c	d	e	f	g	h	I	j	k	l				m

a = 1 : DOWN mode

b = 1 : OFFLINE mode

c = 1 : STANDBY mode

d = 1 : ONLINE mode

e = 1 : LOOP2 reception disabled
0 : LOOP2 reception enabled

f = 1 : LOOP1 transmission disabled
0 : LOOP1 transmission enabled

g = 1 : LOOP1 reception disabled
0 : LOOP1 reception enabled

h = 1 : LOOP2 transmission disabled
0 : LOOP2 transmission enabled

i = 1 : Repeat status
0 : Cut status

j = 1 : Terminal station mode
0 : General station mode

k = 1 : Scan transmission disabled
0 : Scan transmission enabled

l = 1 : Master station
0 : Slave station

m = 1 : Test in progress

(2) Online map

Indicates the online stations in the S20LP network.

	F	E	D	C	....	3	2	1	0
SW112 (SW116)	#16	#15	#14	#13		#4	#3	#2	#1
SW113 (SW117)	#32	#31	#30	#29		#20	#19	#18	#17
SW114 (SW118)	#48	#47	#46	#35		#36	#35	#34	#33
SW115 (SW119)	#64	#63	#62	#61		#52	#51	#50	#49

#n = Station number n is online
= Station number n is other than online

(3) Standby map

Indicates the standby stations in the S20LP network.

	F	E	D	C	....	3	2	1	0
SW120 (SW124)	#16	#15	#14	#13		#4	#3	#2	#1
SW121 (SW125)	#32	#31	#30	#29		#20	#19	#18	#17
SW122 (SW126)	#48	#47	#46	#35		#36	#35	#34	#33
SW123 (SW127)	#64	#63	#62	#61		#52	#51	#50	#49

#n = 1: Station number n is standby
= 0: Station number n is other than standby

(4) Loop map (Only T2N)

Indicates the S20LP-station's loop transfer status on network. This information is the through / terminal status of general station, or the repeat/cut off status of terminal station. This information is updating every 200ms.

	F E D C B A 9 8	7 6 5 4 3 2 1 0
SW128	Station 2 information	Station 1 information
SW129	Station 4 information	Station 3 information
SW159	Station 64 information	Station 63 information

Indicates the detailed station information.

Station (n + 1)   Station (n)

F E D C B	A	9	8	7 6 5 4 3	2	1	0
Unused	a	b	c	Unused	a	b	c

a : This bit indicates repeat or cut off status. This status has terminal station or back-up station.
1 : Repeat
0 : Cut off

b : This bit indicates R1T2 status. This status has general station.
1 : Disconnect
0 : Connect

c : This bit indicates R2T1 status. This status has general station.
1 : Disconnect
0 : Connect

5.5 RAS information monitored on S-LS

By connecting the S-LS, the following RAS information can be monitored.

(1) Online map

(Menu)

R: RAS Information

1: Online Map
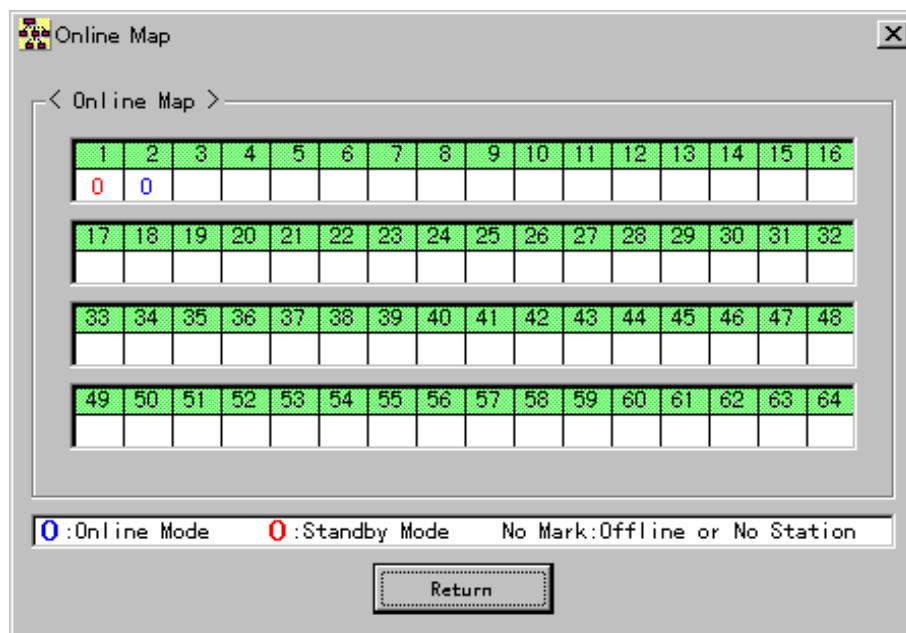
The number (1-64) on the screen shows the Station number.

The operation mode displayed under the Station number means as follows.

○(Blue) Online mode

○(Red) Standby mode

Blank Offline mode or not existing

This information is read out from the S-LS connecting station every three seconds.

If the S-LS connecting station is Offline or Down mode, the following message will be displayed right and upper side on the screen.

Self Station Station No.01 Offline
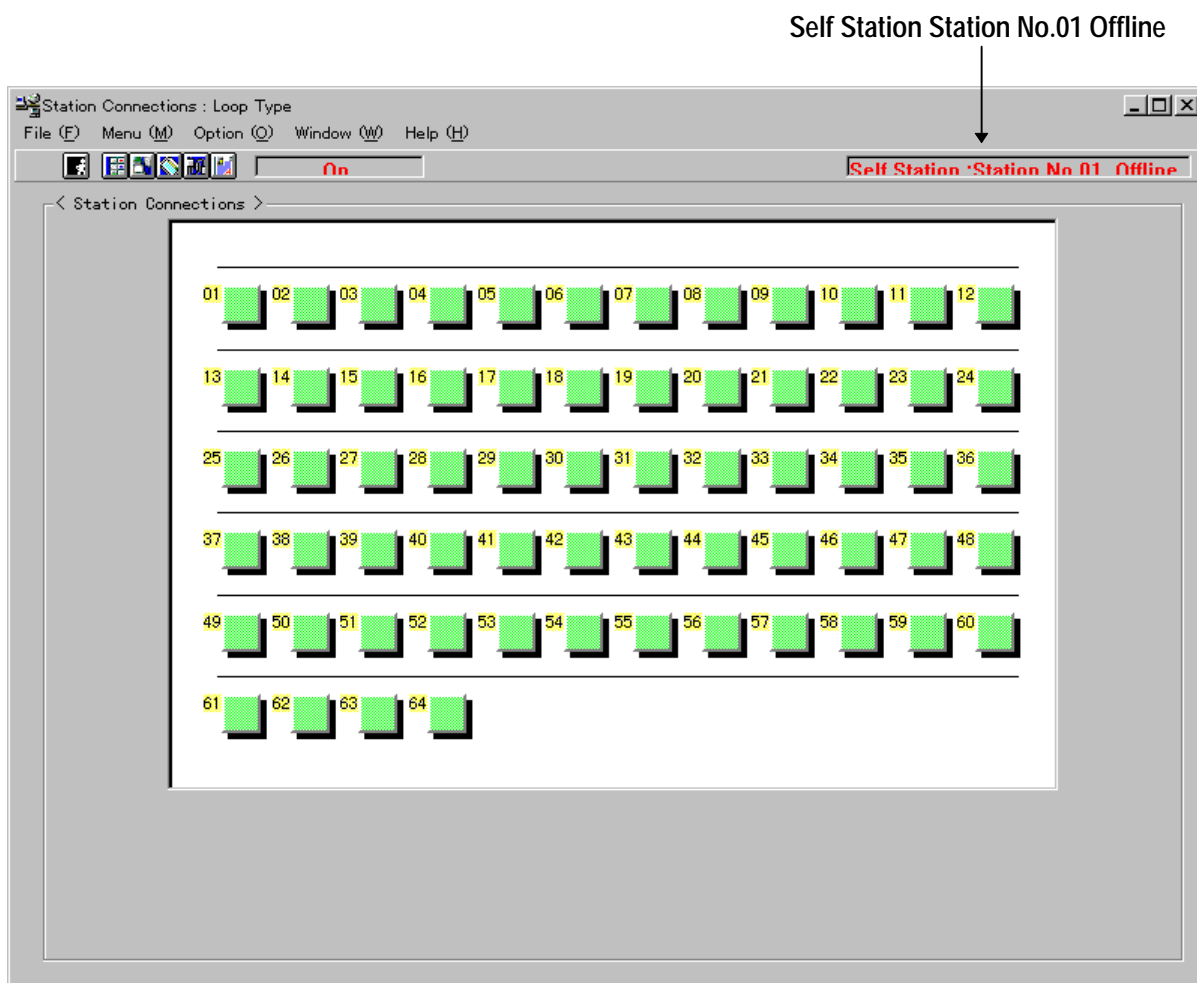
(2) Station status

The operation status of the specified station can be monitored as follows.

1. Select the "Station Number".
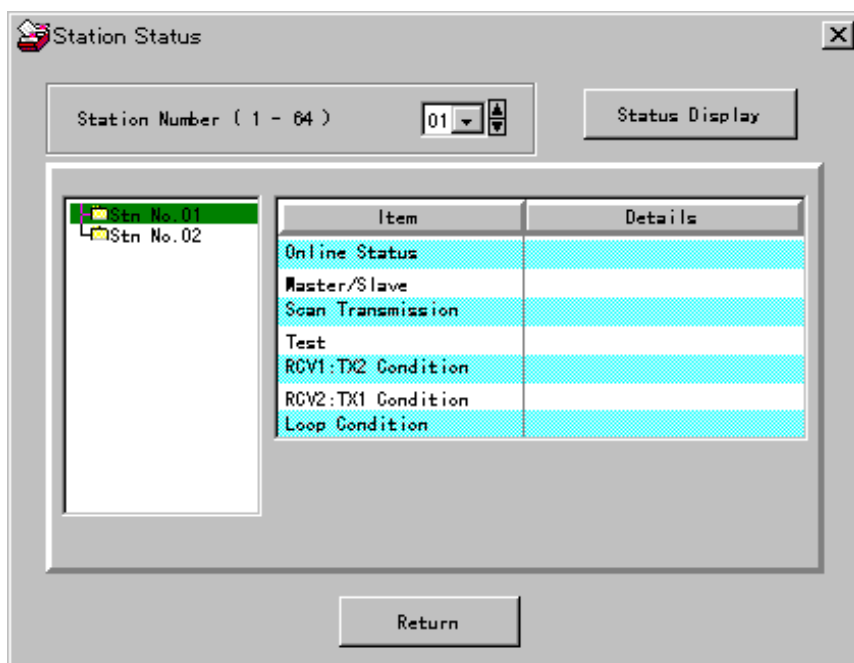
2. Click the "Status Display".
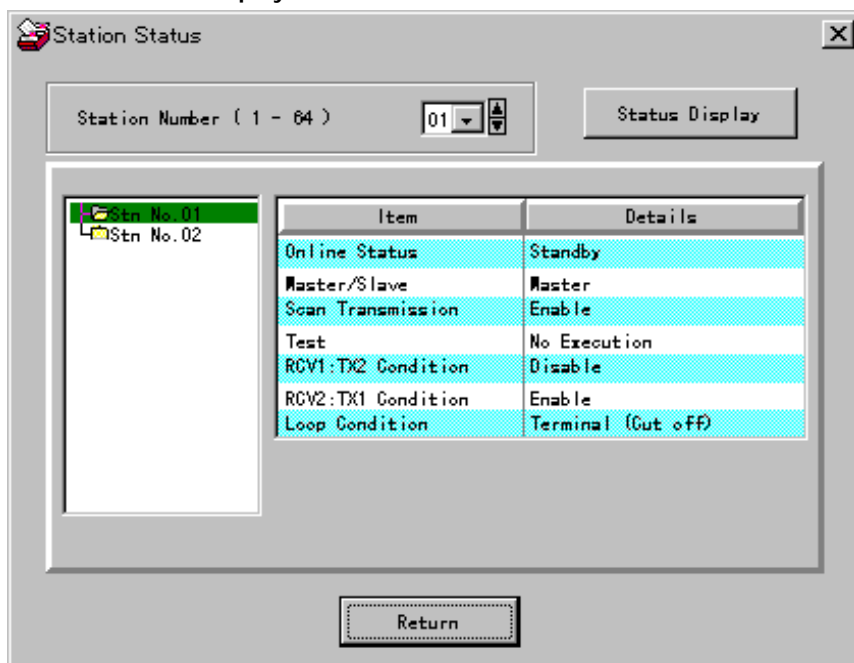
(3) Station down information

If the S-LS connecting station is in Down mode, the error message can be monitored as follows.

R: RAS Information
    └── 4: Station Down Information
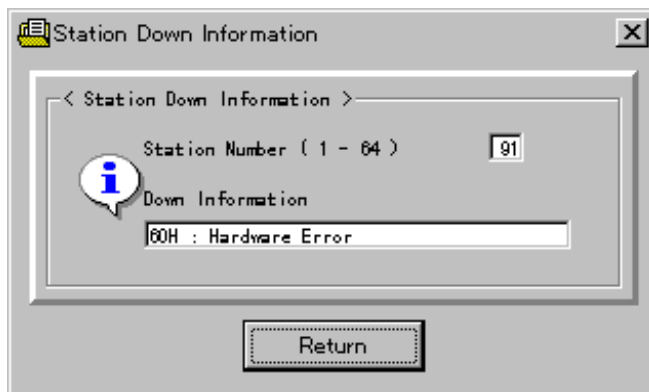
Possible error message are as follows.

Error code	Error message	meanings
10H	Watch dog timer error	Watch dog timer error occured
20H	Overrun	Reception transaction is overrun
40H	Jabber timeout	Abnormal long frame (500ms or more) was transmitted
60H	Hardware error	CPU, RAM, ROM or peripheral LSI is abnormal Station number illegal
6FH	Undefined instruction executing	CPU could not execute the instruction
77H	Receive buffer overflow	Receive buffer overflow occurred

If these errors cannot be reset by power off/on again (except Station number illegal), replace the station.

6. Expanded data transfer instruction

6.1 Instruction Specification

This section presents an overview of the XFER instructions, which is the instruction that is used to control the S20LP-station from T2N/T3H user programs. S20LP-station transmission control is performed solely using the XFER instructions.

(1) Instruction format

The format of XFER instruction.

Input   [A   XFER   B   →   C]   Output

(2) Function

When the input is ON, data block transfer is performed between the source which is indirectly designated by A and A+1 and the destination which is indirectly designated by C and C+1. The transfer size (number of words) is designated by B. The transfer size is 1 to 256 words.

Input	Operation	Output	ERF
OFF	No execution	OFF	—
ON	Normal execution	OFF	—
	When error is occurred	ON	SET

(3) Operand

Operand

	Name	Device						Register										INDEX			Con-stant	Index
		X	Y	S	L	R	Z	XW	YW	SW	LW	RW	W	T	C	D	F	IW	OW	I	J	K		
A	Source parameter							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
B	Transfer size							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
C	Destination parameter							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓

(4) Parameter and construction

Source parameter		Transfer size and status	Destination parameter	

A	Bank/CH	Type
A+1	Leading address	

B	Transfer size

C	Bank/CH	Type
C+1	Leading address	
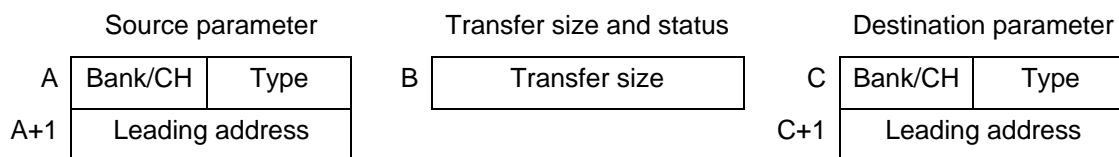
Transfer parameter table

Transfer object		Type	Leading address	Bank/CH	Transfer size	Status flag
XW/YW register	T2N	00H	0 to 127	0	1 to 128	None
	T3H		0 to 511		1 to 256	
W register		01H	0 to 2047	0	1 to 256	None
LW register		02H	0 to 255	0	1 to 256	None
RW register	T2N	03H	0 to 255	0	1 to 256	None
	T3H		0 to 999			
D register		04H	0 to 8191	0	1 to 256	None
F register	T2N	03H	0 to 1023	0	1 to 256	None
	T3H		0 to 32767			
Expanded F register (IC memory card)	T3H	05H	0 to 8191	1 to 15	1 to 256	None
		06H	0 to 65535	1	1 to 256	None
			0 to 57343	2		
Expanded F register (T2N internal memory)	T2N	05H	0 to 8191	1 to 3	1 to 256	None
TOSLINE-S20LP scan memory	T2N	10H	0 to 4095	1	1 to 256	None
	T3H			1 or 2		
EEPROM	T2N	20H	0 to 2047	0	1 to 256 (Note 1)	None
	T3H		0 to 8191			

(Note 1) When the communication is transfer source (receiving), the transfer size is 1 to 256. When it is destination (transmitting), the transfer size is 1 to 128 for T3H, 1 to 32 for T2N.

(5) Sample program

This program transmit the data from TOSLINE-S20LP's scan data memory to T2N/T3H's D register. If the following program is executing, the data of the scan memory from 0000 to 0009 are transmitted to the data register from D0200 to D0209 (D register).

```
X0000
 | |          [00272 MOV RW003]——[00000 MOV RW004]——[00010 MOV RW005]

              [00004 MOV RW020]——[00200 MOV RW021]

               H0110        00010      H0004
              [RW003 XFER RW005 → RW020]
```

Source designation			Transfer size		Destination designation		
RW003	H01	H10	RW005	00010	RW020	H00	H04
RW004	00000				RW021	00200	
Channel 1 S20LP Scan memory address			10 Words transfer		D0200 (CPU register)		
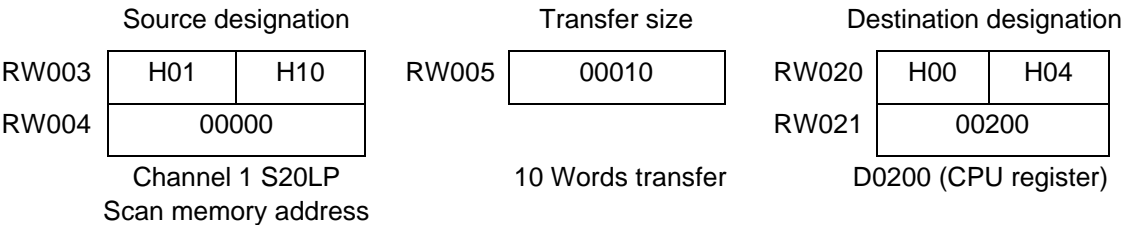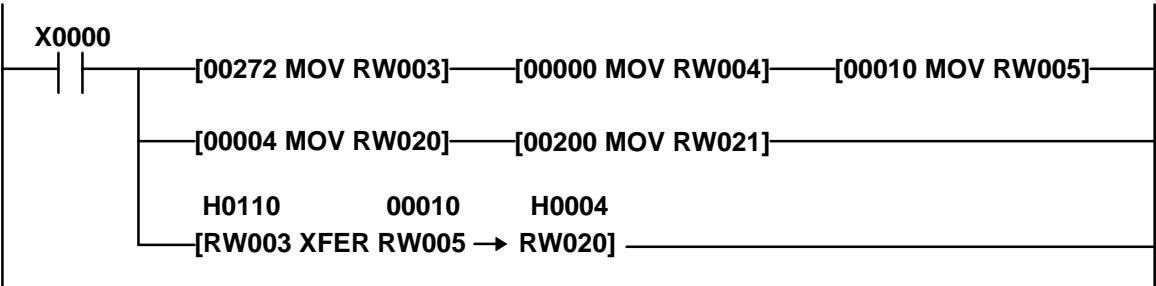
- Operation

When X0000 is ON, 10 words data starting with scan memory address 0 is transferred to D0200 and after.

TOSLINE-S20LP   T2N/T3H's CPU

scan data memory source   register designation

00001		D0200	00001
00100		D0201	00100
12345		D0202	12345

Transmit →

03344		D0207	03344
11565		D0208	11565
00045		D0209	00045
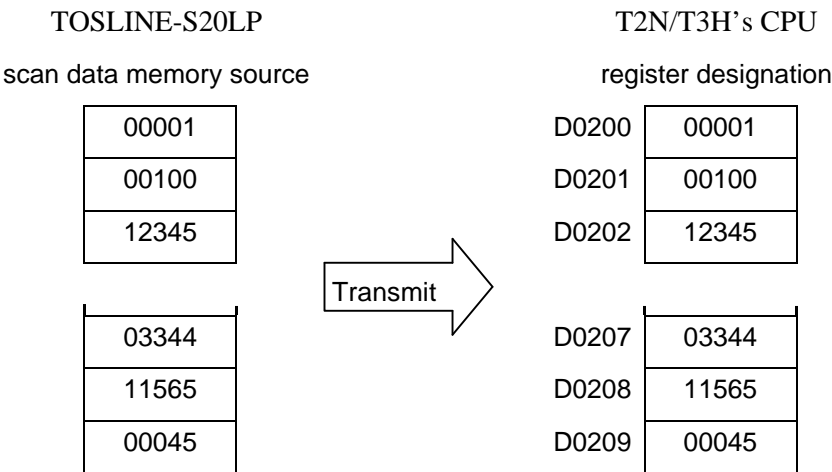
Remarks

- When writing data into S20LP scan memory, confirm that the address range is S20LP's data send block.

- If S20LP scan memory is accessed only by this XFER instruction, the network assignment, i.e. "LINK" or "GLOBAL" setting, is not necessary.

- If W register is designated as source and destination, don't set the network assignment, i.e. "LINK" or "GLOBAL".

7. Message transmission

7.1 Message transmission

The message transmission is text transmission to be performed communication on request. This transmission is following two protocol.

- Computer link protocol
- PC link protocol

7.2 Computer link protocol

The host machine can communicate to a T2N/T3H on the S20LP using the computer link protocol. Since this function executes the station and firmware, there is no need to create pecial user programs for the T2N/T3H using the slave station.

The host machine used this protocol can execute following process for the T2N/T3H.

- Upload or download user programs.
- Status observation (reading out RUN/HALT/ERROR status).
- Read or write register/device data.
- Execute control commands.

The computer link protocol cannot execute following process.

- T2N/T3H is Down mode.
- A S20LP-station except for ONLINE and STANDBY mode.

7.3 PC link protocol

This section presents an overview of the SEND and RECV instructions, which are the instructions that are used to control the S20LP-station from T2N/T3H user programs. S20LP-station transmission control (PC link protocol transmission) is performed solely using the SEND and RECV instructions. See the individual items for details on the actual requests sent to the S20LP.

The PC link protocol allows one T2N/T3H on network to write or read register data to another T2N/T3H.

When this function is used on the PC link slave station, there is no need to create special user programs for the T2N/T3H using the slave station.

The user program that runs on the T2N/T3H of the main station is discussed below.

(1) Instruction format

The format of SEND and RECV instruction

Input ——————— [A   S E N D   B] ——————— Output

Input ——————— [A   R E C V   B] ——————— Output
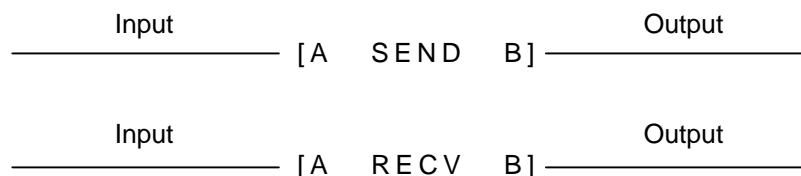
(2) Function

- SEND

    This instruction sends the designated range of register data to another T2N/T3H through the network. The transfer source register (self-station) is designated by A+3 and A+4. The transfer destination register (target-station) is designation by A+5 and A+6. The transfer size (number of words) is designated by A+2. The maximum transfer size is 128 words.

- RECV

    This instruction reads the designated range of register data from another T2N/T3H through the network. The transfer source register (target-station) is designated by A+5 and A+6. The transfer destination register (self-station) is designation by A+3 and A+4. The transfer size (number of words) is designated by A+2. The maximum transfer size is 128 words.

Input	Operation		Output	ERF
OFF	No execution		OFF	OFF
ON	Execution	Transmission port instruction busy/instruction execution in progress (response wait)	OFF	OFF
		Response reception complete (normal complete)	ON	OFF
		Instruction error	ON	ON

Operand

	Name	Device						Register										INDEX				Con-stant	Index
		X	Y	S	L	R	Z	XW	YW	SW	LW	RW	W	T	C	D	F	IW	OW	I	J	K		
A	Transfer parameter							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓
B	Status								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓

(Note 1) ERF is the S0051 special relay. See the T-series Instruction Set for information on ERF usage.

(Note 2) For these instructions, instruction execution starts at the point the input changes state from off to on.

(Note 3) Since these instructions span multiple scans, applications must hold the input in the on state until the output goes to the on state.

(Note 4) After instruction execution terminates, it is possible to start execution again by applying a new input.

(4) Transfer parameters (A)

The data required for a request to the S20LP-station is set up in an area that starts in the register indicated by [A]. Then the application executes a SEND or RECV instruction. Here we present an overview of the structure of the transfer parameters.

A	2□ △ △ H	Module designation
A + 1	CMD	Command number: Normally 0H; request to loopback 000FH
A + 2	Parameters	Parameters: This data differs depending on the type of
A + 3		the request to the S20LP-station.

Module designation:	Designates the S20LP module in the T2N/T3H.
2 (Module ID):	Must be set to 2 for an S20LP-station.
□(channel number):	The values 1 and 2 are allocated in order starting closest to the T3H. T2N must be set to 1.
△ (station number):	This two-digit field set to another station number.

(Note 5) Do not modify the contents of the transfer parameters while an instruction execution is in progress.

(5) Status (B)

The status during the execution of a SEND or RECV instruction and after that instruction terminates is stored in the register shown at B. When TermSTS = 0BH, the detailed information (S20LP-station error information) will be loaded into the registers indicated at location B + 1.

The following figure shows the structure of the status information (register B) and following tables (TermSTS (Part1 and Part2) and detailed information) show the detailed information (register B +1).
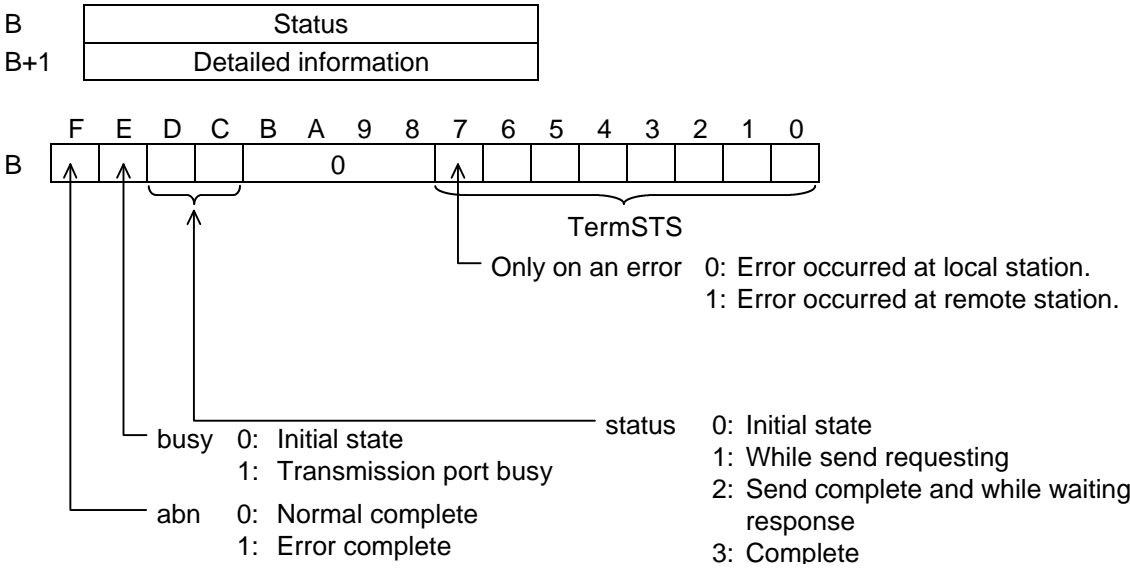
(Note 6) The user program must set bits C and D to 0 before first activating a SEND/RECV instruction. Failure to do so will cause the SEND/RECV instruction to not complete. Also, do not write to the status during instruction execution. This will cause the SEND/RECV instruction to not complete.

TermSTS

TermSTS	Status	Meaning
00H	Normal complete	
01H	Register designation error	• Occurs if a register other than XW, YW,W, LW, RW, D, F, T, C, or SW is designated as the data storage register in one of the following requests. Requests: Remote station loopback, Register read/write. • In a register read or write request, the request designated a read or write from a T register to a register other than a T register. (This also applies to C registers.)
02H	Response timeout	• Occurs if a response is not received within the designated time for a remote station loopback or register read/write request.
03H	Parameter error	• Occurs if a value other than 2 is designated for the module ID. • Occurs if a value other than 1 (T2N/T3H) or 2 (T3H) is designated for the channel number.
04H	Register write protect	• Occurs if an attempt to write is made when the remote registers were write protected. • Occurs if an attempt to read is made when the local registers were write protected.
05H	(Reserved)	
06H	Module error	• Occurs if the module is down.
		• Occurs if the master station of PC link times out
	Initialization in progress	• Occurs if the module is initializing.
07H	No send channel (CH)	• Occurs if the corresponding S20LP-station is not installed.
08H	Invalid station number	• Occurs if the local station address designated 0 or over 64. • Occurs if the remote station address was set up the same local station address.
09H	Transfer size error	• Occurs if either 0 or 129 or more words were designated for either a register read/write or a remote station loopback request.
0AH	Boundary error	• Occurs if the specified area (start address + register range) does not exist in the T2N/T3H data storage registers. Requests: Remote port loopback, Register read/write
0BH	Transmission error	• Occurs if the S20LP-station returns an error response. Detailed information (the S20LP-station response status) is stored at B+1.
0CH	I/O no answer error	• Occurs if the T2N/T3H cannot access S20LP-station.
0DH	IC card designation error (T3H)	• Occurs if an error occurs when the T3H IC card is being used as register (expanded F register) in one of the following request. (See the T3H Instruction Manual.) Request: Register read/write 1. Occurs if IC card is not setting up. 2. IC card type error 3. Register write protected
	(Reserved : T2N)	
0EH	Retry timeout error	• Occurs if a T2N retransmission times out.
0FH	(Reserved)	

Detailed Information (Send completion status)

Error	Code	Description
Normal complete	81H	The remote station normally received message frame from local station.
Busy	90H	The remote station is standby.
Timeout	A0H	The answer frame for the transmitted message frame no returned from remote station on time.
Length error	B0H	Incorrect message frame length in remote station.
Station mode error	D0H	The local station is Offline.
Transmission prohibited state (local station)	E0H	The local station cannot transmit message in the message transmission prohibited state.
Transmission prohibited state (remote station)	E8H	The remote station cannot transmit message in the message transmission prohibited state.
Format error	F0H	Occurs when there is a format error in the request text.

(Note 7) The code (detailed information) number, when SEND/RECV instruction is completed, indicates send completion status.

(6) PC link protocol transmission (Data write)

The T series PC link protocol allows a T2N or T3H on a network to write register data to another T2N or T3H.

- Register write request (using the SEND instruction)

(a) Function

The register data designated by the local station (T2N/T3H) is written to the designated register on the remote station (T2N/T3H).

(b) Transfer parameters

A	2□△ △ H	Module designation
A+1	CMD = 0000H	Command number: Normally 0H; request to loopback
A+2	Transfer Size	1) Transfer register data length: 1 to 128 words
A+3	Register type (self-station)	2) Local station register type code
A+4	Leading address (self-station)	3) Local station leading address
A+5	Register type (target-station)	4) Remote station register type code
A+6	Leading address (target-station)	5) Remote station leading address
A+7	Response time limit	6) Response time limit

1) Transferred register data length

Designates the transmission data length in word units. (1 to 128 words)

2) Local station register type code

This code indicates the type of register in which the local station transmission source data is stored.

3) Local station leading address

Designates the leading address of the register designated by the local station register type code.

4) Remote station register type code

This code designates the type of register at the remote station to which the transmitted data will be written. (see 7.3(6))Local station register code)

5) Remote station leading address

Designates the leading address of the register designated by the remote station register type code.

6) Response time limit

Designates a time used to limit the response time from the remote station in 0.1 second units.

```
      F   E                                                    0
A+7   ↑ |                                                      |
        └──── 0:  Use the user-specified value (0.1 to 3276.7 seconds)
              1:  Use the default value of 30 seconds.
```

This code indicates the type of register code in which the local or remote station transmission source data is stored. See "T-series Instruction Set (Ladder, SFC)" (UM-TS03***-E004).

RID	Meaning		RID	Meaning	
0000H	XW/YW registers		**05H	F register (0 - 8191)	*1
0001H	W register		**06H	F register (0 - 65535)	*2
0002H	LW register		0007H	T register	*3
0003H	RW register		0008H	C register	*3
0004H	D register		0009H	SW register	

*1 Includes the expansion F registers. One bank has 8k words (0 to 8191).

```
F       7     0
| ↑ |  05H  |
  └──── Bank number...00H:  T2N internal registers
                            F0000 to F1023

                      01H to 03H: Expansion F registers
                            F0000 to F8191
```
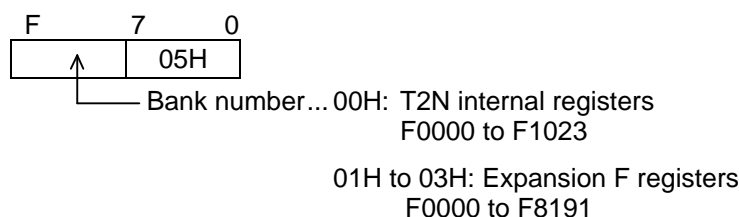
*2 Includes the expansion F registers(Only T3H). One bank has 64K words (0 to 65535).

```
F       7     0
| ↑ |  06  |
  └──── Bank number...00H:  T3H internal registers
                            F0000 to F32767

                      01H:  Expansion F registers (IC card)
                            F0000 to F65535

                      02H:  Expansion F registers (IC card)
                            F0000 to F57343
```
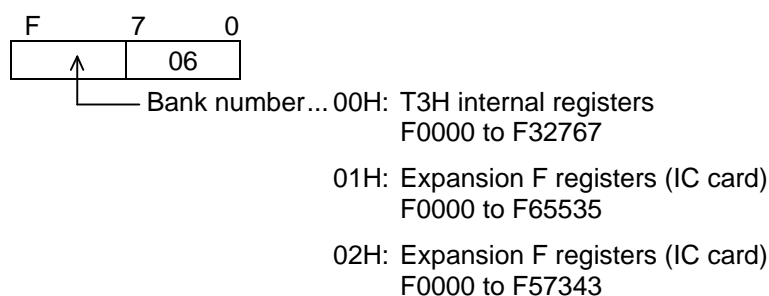
*3 The T and C registers hold data that has flags attached.

Supplement:

The transfer data length has a maximum of 323 words when data is transferred over the Ethernet.

For the T registers, it is not possible to designate a range that spans both the basic T registers (0 to 511) and the expansion T registers (512 to 999). The T3H has the expansion T register, but the T2N does not have.

(c) Status (See 7.3 (5) for details on bits C, D, E, and F.)

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
B					0	0	0	0	TermSTS							
B+1	Detailed information (Only valid when TermSTS = 0BH.)															

(d) Important items

- The command number (0000H) is the same as the "Data Read".

- A transfer size error (TermSTS = 09H) occurs if the transferred register data length exceeds the range 1 to 128 words (or 1 to 83 words for the T and C registers).

- A register designation error (TermSTS = 01H) occurs if a value other than a stipulated value is designated for the register type codes (Register type (self/target-station)).

- A register designation error (TermSTS = 01H) occurs if 0007H (the T register) is designated for the local station register type code and a register other than T register is designated for the remote station register type code. This also holds for the C register.

- A boundary error (TermSTS = 0AH) occurs if a range spanning both the base T registers (0 to 511) and the expansion T registers (512 to 999) is designated for the T register.

- For data storage registers, a boundary error occurs if the designated area (leading address + register range) does not exist in either the local or remote stations.

  Local station : TermSTS = 0AH ; Remote station : TermSTS = 8AH

- A response time-out error (TermSTS = 02H) occurs if the response time from the remote station exceeds the time designated by the response time limit.

- Write protection can be designated for each register type on the local T2N/T3H by using the special coil settings described below. In this case, a register write protect error (TermSTS = 04H) will occur.
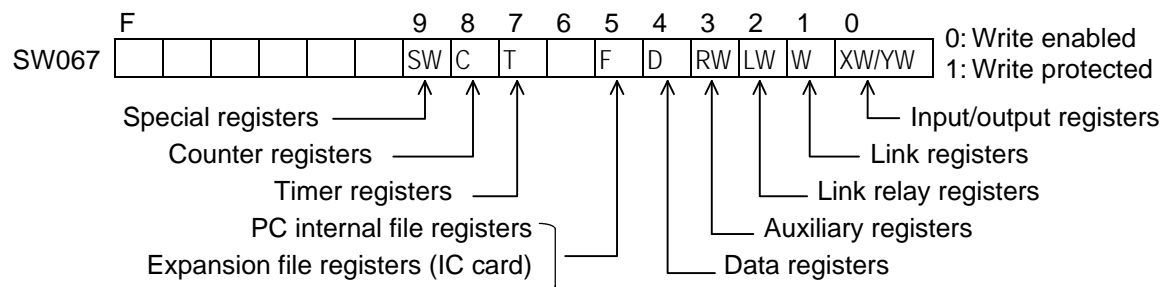
- The write operation is not synchronized with the remote station T2N/T3H scan operation.

(7) PC link protocol transmission (Data read)

The T series PC link protocol allows a T2N or T3H on a network to read register data from another T2N's or T3H's registers into its own registers.

•   Register read request (using the RECV instruction)

(a) Function

The register data designated by the remote station (T2N/T3H) is read to the designated register on the local station (T2N/T3H).

(b) Transfer parameters

A	$2\square\triangle\triangle$H	Module designation
A+1	CMD = 0000H	Command number: Normally 0H; request to loopback
A+2	Transfer Size	1) Transfer register data length: 1 to 128 words
A+3	Register type (self-station)	2) Local station register type code
A+4	Leading address (self-station)	3) Local station leading address
A+5	Register type (target-station)	4) Remote station register type code
A+6	Leading address (target-station)	5) Remote station leading address
A+7	Response time limit	6) Response time limit

1) Transferred register data length

Designates the transmission data length in word units. (1 to 128 words)

2) Local station register type code

This code indicates the type of register in which the local station transmission source   data is stored.

3) Local station leading address

Designates the leading address of the register designated by the local station register type code.

4) Remote station register type code

This code designates the type of register at the remote station to which the transmitted data will be written. (see 7.3(6))Local station register code)

5) Remote station leading address

Designates the leading address of the register designated by the remote station register type code.

6) Response time limit

Designates a time used to limit the response time from the remote station in 0.1 second units.

```
         F   E                                              0
        ┌───┬──────────────────────────────────────────────┐
A+7     │ ↑ │                                                │
        └─┬─┴──────────────────────────────────────────────┘
          └──────── 0:  Use the user-specified value (0.1 to 3276.7 seconds)
                    1:  Use the default value of 30 seconds.
```

(c) Status (See 7.3 (5) for details on bits C, D, E, and F.)

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
B					0	0	0	0	TermSTS							
B+1	Detailed information (Only valid when TermSTS = 0BH.)															

(d) Important items

- The command number (0000H) is the same as the "Data Write".

- A transfer size error (TermSTS = 09H) occurs if the transferred register data length exceeds the range 1 to 128 words (or 1 to 83 words for the T and C   registers).

- A register designation error (TermSTS = 01H) occurs if a value other than a stipulated value is designated for the register type codes (Register type (self/target-station)).

- A register designation error (TermSTS = 01H) occurs if 0007H (the T register) is designated for the local station register type code and a register other than T register is designated for the remote station register type code. This also holds for the C register.

- A boundary error (TermSTS = 0AH) occurs if a range spanning both the base T registers (0 to 511) and the expansion T registers (512 to 999) is designated for the T register.

- For data storage registers, a boundary error occurs if the designated area (leading address + register range) does not exist in either the local or remote stations.

    Local station : TermSTS = 0AH ; Remote station : TermSTS = 8AH

- A response time-out error (TermSTS = 02H) occurs if the response time from the remote station exceeds the time designated by the response time limit.

- Read protection can be designated for each register type on the local T2N/T3H by using the special coil settings described below. In this case, a register write protect error (TermSTS = 04H) will occur.
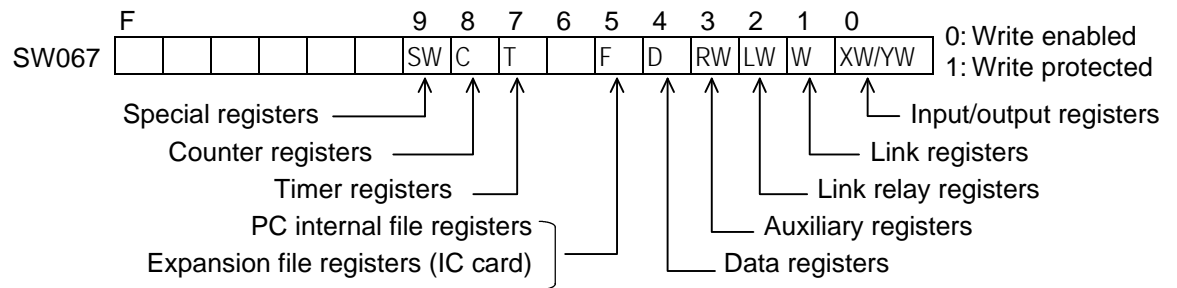
- The read operation is not synchronized with the remote station T2N/T3H scan operation.

(8) PC link protocol transmission program

This section presents a sample program that uses PC link protocol transmission.

This program creates increment data within the local station and writes it to the remote station's registers. Next it reads out the same area and compares it with the data within the local station to check that the function succeeded.

Remarks

Make a point of understanding the content before writing programs that use the S20LP-station. The sample programs present basic examples of S20LP-station usage, and should be reviewed carefully before use in an actual system.

Sample transmission parameter construct

A	2102H	Module designation. S20LP, channel 1, target station No.2
A+1	CMD = 0000H	Command number: 0000H
A+2	Transfer Size = 64	1) Transfer register data length: 64 words
A+3	Register type (self-station) = 0004H	2) Local station register type code: D register
A+4	Leading address (self-station) =1000	3) Local station leading address: 1000
A+5	Register type (target-station) =0004H	4) Remote station register type code: D register
A+6	Leading address (target-station) =1000	5) Remote station leading address: 2000
A+7	Response time limit = 100	6) Response time limit: 10 seconds

Sample register construction

RW090 : Execution count designation (1 to 32767)

RW091 : Operation when a comparison error occurs (continue : 0, stop : 1)

RW092 : Transfer register data length (1 to 128 words)

RW093 : Write time transfer source register type (self-station)

RW094 : Write time transfer source leading address (self-station)

RW095 : Write time transfer destination register type / read time readout source register type (target-station)

RW096 : Write time transfer destination leading address / read time readout source leading address (target-station)

RW097 : Read time storage register type

RW098 : Read time storage register leading address

This ladder program is executed by turn on the R0520 A contact.

```
R0520                                                                    R0090
├─┤ ├──────────────────────────────────────────────────────────────────( )──

    /* PC Link preparation */
R0520
├─┤ ├─┤↑├──────[00010 MOV RW090]──[00000 MOV RW091]──[00064 MOV RW092]──
               /* Number of executions, Operation on error occurrence, Transfer data
                  length */
              ─[00004 MOV RW093]──[01000 MOV RW094]──────────────────────
               /* Transmission source register type, leading address */

              ─[00004 MOV RW095]──[02000 MOV RW096]──────────────────────
               /* Transfer destination register type, leading address */

              └─[00004 MOV RW097]──[03000 MOV RW098]─────────────────────
               /* Storage register type, leading address */

    /* Data preparation */
R0090  R009F
├─┤ ├─┤/├──┤↑├──────[00004 MOV D0901]──[00900 MOV D0902]──[00000 MOV D0918]─
R0091              ─[D0946 MOV D0900]──[RW093 MOV D0916]──[RW094 MOV D0917]─
├─┤ ├              ─[00001 MOV D0990]─────────────────────────────────────

         R0098                                                          R0098
        ─┤/├──[D0901 XFER D0990 → D0916]───[ +1 D0917]───────────────────( )──
                                          ├─[ +1 D0918]──────────────────
                                          ├─[ +1 D0900]──────────────────

        └─[RW092 = D0918]──[SET R0092]──[RST R0091]──[RST R0520]─────────

    /* Data write */
R0092
├─┤ ├──[08450 MOV D0903]──[00000 MOV D0904]──────────────────────────────
        /* Designates the module and sets the CMD number. */

      ─[RW092 MOV D0905]─────────────────────────────────────────────────
        /* Sets the transfer register data length. */

      ─[RW093 MOV D0906]──[RW094 MOV D0907]──────────────────────────────
        /* Sets the transmission source register type, leading address. */

      ─[RW095 MOV D0908]──[RW096 MOV D0909]──────────────────────────────
        /* Sets the transfer destination register type, leading address. */

      ─[00100 MOV D0910]─────────────────────────────────────────────────
        /* Sets the response time limit (10 seconds). */

      └─[D0903 SEND D0911]──[SET R0093]──[RST R0092]─────────────────────
        /* Sets the request, and starts post-completion readout. */
```

/* Register readout */

R0093
```
─┤ ├──────[08450 MOV D0920]────[00000 MOV D0921]──────────────────────────
          /* Designates the module and sets the CMD number. */

        ──[RW092 MOV D0922]──────────────────────────────────────────────
          /* Sets the transfer register data length. */

        ──[RW097 MOV D0923]────[RW098 MOV D0924]──────────────────────────
          /* Sets the transmission source register type, leading address. */

        ──[RW095 MOV D0925]────[RW096 MOV D0926]──────────────────────────
          /* Sets the transfer destination register type, leading address. */

        ──[00100 MOV D0927]──────────────────────────────────────────────
          /* Sets the response time limit (10 seconds). */

        ──[D0920 SEND D0928]────[SET R0094]───[RST R0093]────────────────
          /* Sets the request, and starts post-completion comparison. */
```

/* Comparison check */

R0094
```
─┤ ├──────[00001 MOV D0940]────┬──[00001 MOV D0941]────[00980 MOV D0942]────
                               │
                               └──[00001 MOV D0943]────[00981 MOV D0944]────

   ─┤↑├────[RW094•RW093 DMOV D0948•D0947]────[RW098•RW097 DMOV D0950•D0949]──

   R0095
   ─┤/├┤↑├──┬──[D0947 XFER D0940 → D0941]──────────────────────────────
            │                                                      R0096
            └──[D0949 XFER D0940 → D0943]──────────────────────────( )──
   R0096
   ─┤ ├──────[D0980 = D0981]───[ +1 RW190]──────────────────────────────
                                            R0910
          ──[D0980 <> D0981]──[ +1 RW191]──┤ ├──[SET R0099]──[RST R0094]──
                                                                   R0095
          ──┤↑├──[ +1 D0945]──[ +1 D0948]──[ +1 D0950]────────────( )──
                                                                   R0097
          ──[RW092 = D0945]────[00000 MOV D0945]──[ +1 D0946]──────( )──
   R0097
   ─┤ ├──────[RW090 > D0946]───[SET R0091]────────────[RST R0094]──────
          ──[RW090 = D0946]───[00000 MOV D0946]──┘

   ──────[END]─────────────────────────────────────────────────────────
```
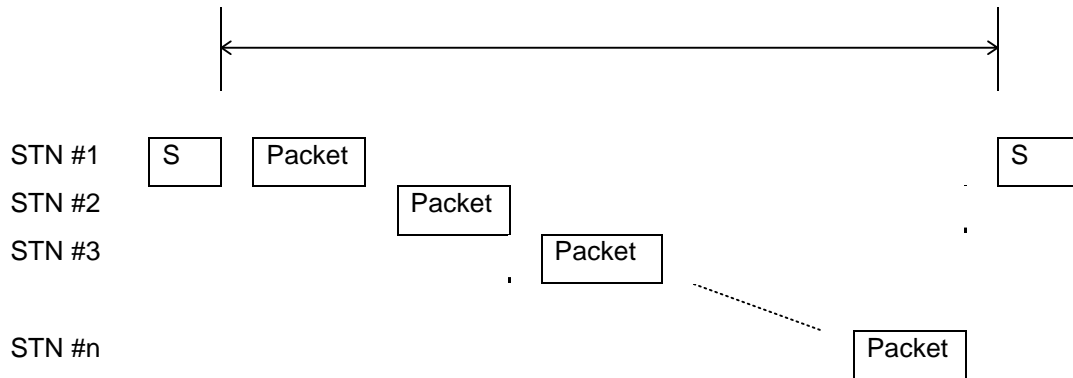
Appendix

A.1 Scan cycle

In the S20LP network, each station sends out the data onto the transmission line as Packet.

The Packet is sent out onto the transmission line in the following sequence.

In the above figure, $\boxed{S}$ means the Synchronization frame which shows the start of transmission cycle (Scan cycle). At first, the main station sends out the Synchronization frame. Then each station sends out the Packet sequencially in the order of Station number. When the final station finishes sending out the Packet, the main station re-sends out the Synchronization frame, and the next transmission cycle is started.

The Packet consists of a Scan frame and a Message frame(s).

The Scan frame is for Scan transmission and it is sent out every time when the station becomes sender and Target Scan Timer is expired. On the other hand, the Message frame is for Message transmission and it is added only when the necessity of Message transmission is generated.

The Target Scan Time (Target Cycle Time) is a time factor for limiting the time assigned for the Message transmission. If the Scan cycle - the time from the station got Token last time to the station get Token this time - is longer than the Target Scan Time, the station sends the Scan frame but does not send the Message frame. Therefore, the Target Scan Time should be selected as longer than the time for total Scan transmission to enable the Message transmission.

The total transmission time (TSCN) can be calculated from the number of connected stations and the total size (number of words) of send data as follows.

$$T_{SCN} = (64 + 128 * N_{STN} + 8 * W_{SCN}) / 1000 \quad [ms]$$

The total message transmission time (TMSG) can be expressed as follows.

$$T_{MSG} = 4 * (15 + 2 * W_{MSG}) * M_{STN} / 1000 \quad [ms]$$

Actual transmission cycle time (TCY) is sum of above TSCN and TMSG. But when TSCN is short, Time for software operation (TSOFT) is not neglected. Therefore, Actual transmission cycle time is expressed as follows.

If $T_{SOFT} < T_{SCN} / 2$

$T_{CY} = T_{SCN} + T_{MSG}$

If $T_{SOFT} > T_{SCN} / 2$

$T_{CY} = T_{SCN} / 2 + T_{SOFT} + T_{MSG}$

$T_{SOFT} = (370 * N_{STN} + 2.8 * W_{SCN}) / 1000$ [ms]

Set the Target Scan Time (Target Cycle Time) larger than above T_{CY}.

Here;

N_{STN}: Number of connected stations

W_{SCN}: Total size of send data (words)

W_{MSG}: Maximum message size of send data (words)

M_{STN}: Number of message transmission stations

(Note 1) The minimum T_{SCN} is about 3 ms. Even if the above calculation result is less than 3 ms, actual TSCN is limited by this value.

A.2   T-PDS remote programming

The T-PDS can be connected through the Loader port on the S-20LP-station, as well as the Programmer port on the T2N/T3H CPU module. By using this function, remote programming/monitoring through S20LP network is available.

(Note 1) T2N must be sellected P/S "ON" with DIP switch 1.

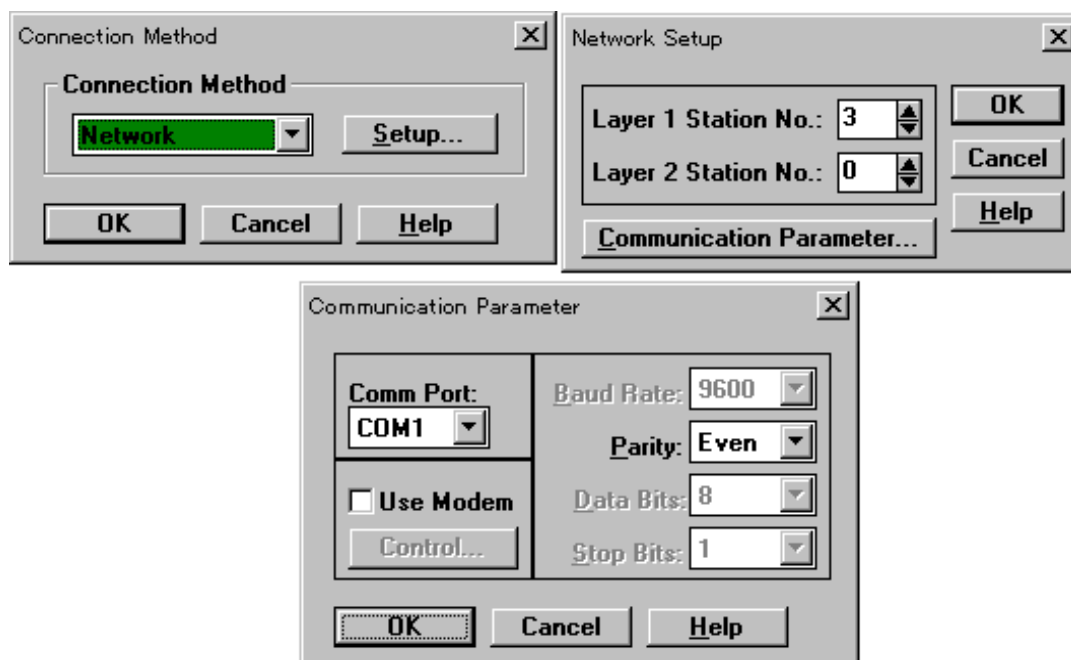(Note 2) When DIP switch 1 is ON/OFF, T2N is Loader port/Programmer port.
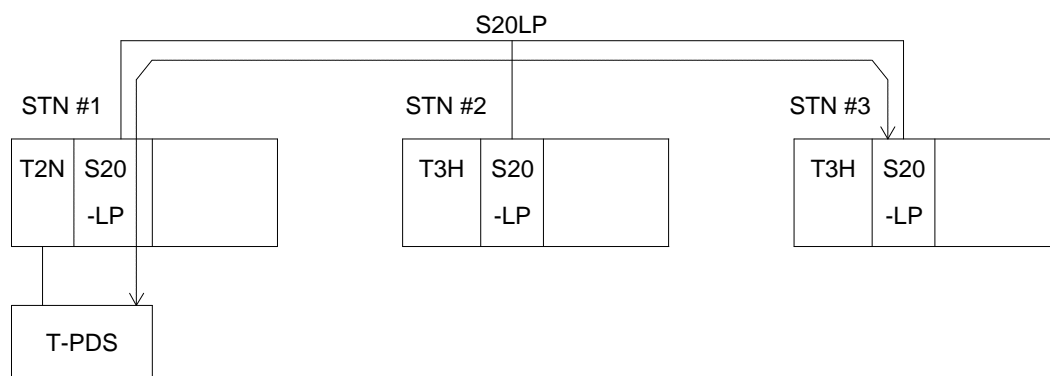
To use this function, T-PDS's connection method should be set as "Network".

The screen below is the setting example of T-PDS's connection method for the above configuration.

Option → Communication (Connection Method) → Setup (Network Setup)
        → Communication Parameter (Communication Parameter)
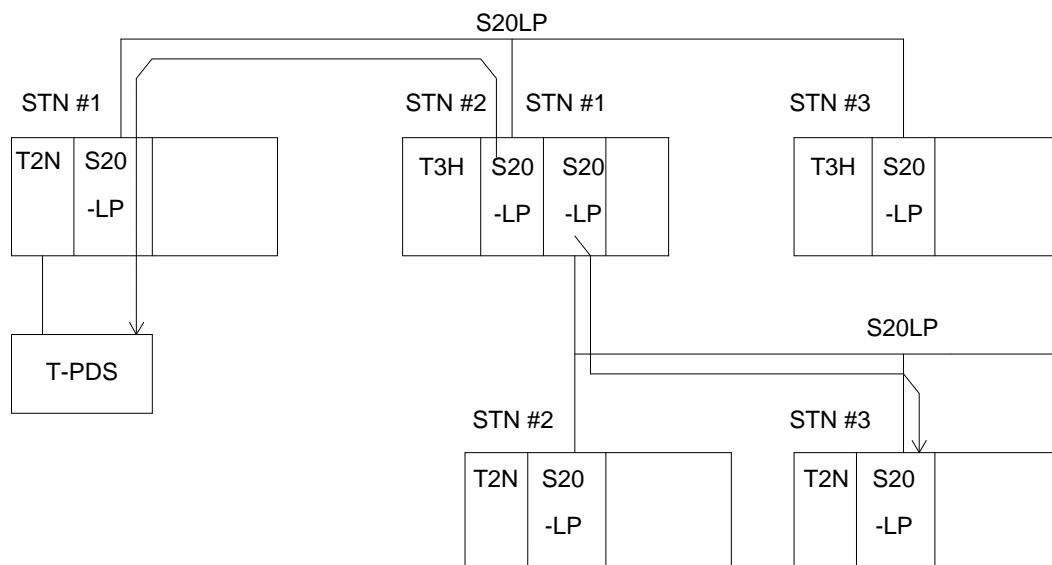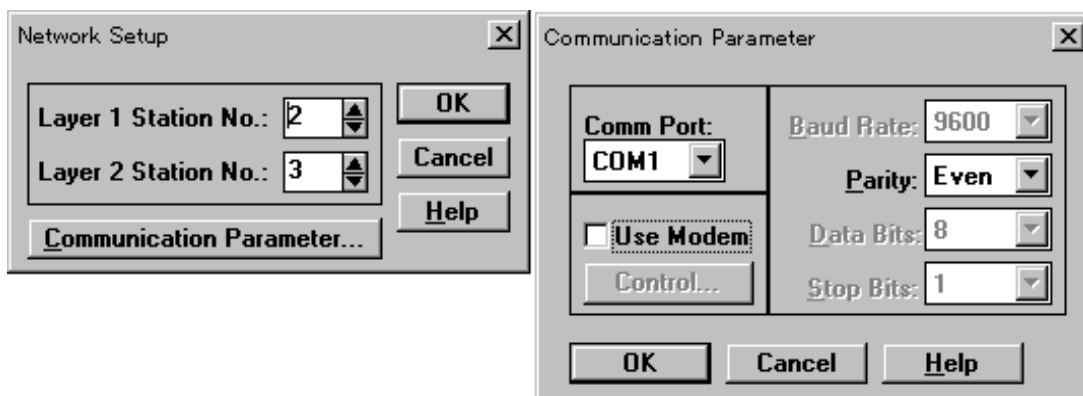
   <T-PDS Setup options screen>

(Note 1) When connecting on single layer, the Layer 2 Station No. should be set as 0.
(Note 2) The Parity is fixed as even.

If the T-PDS is connected to the T2N/T3H on the second layer through the bridge station (T3H only), set the T-PDS's connection method as follow.

<T-PDS Setup options screen>

(Note 1) The Layer 1 Station No. specifies the bridge station and the Layer 2 Station No. specifies the target station on the second layer.

(Note 2) Only T3H is available for the bridge station.

(Note 3) The Parity is fixed as even.

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