TOSHIBA

UM-TLF10**-E001

FIELD NETWORK

TOSLINE-F10

SYSTEM DESCRIPTION
FOR
T2/T3 SYSTEM

Main Menu
Contents

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.

No patent liability is assumed by Toshiba Corporation with respect to use of information, illustrations, circuits, equipment or examples of application in this publication.

Toshiba Corporation reserves the right to make changes and improvements to this publication and/or related products at any time without notice. No obligation shall be incurred other than as noted in this publication.

Publication number: UM-TLF10**-E001
1st edition Dec. 1994

Preface

The TOSLINE-F10 is a Field Network for Factory Automation (FA) system.
Several kinds of TOSLINE-F10 stations are available for interfacing various equipment, such as PLCs, remote I/Os, etc.

This manual describes How To Use the TOSLINE-F10 stations for Programmable Controller T2/T3 and the remote I/Os. The TOSLINE-F10 enables data linkage between T2/T3s and remote I/O configuration by economical twisted-pair cables.

In this manual, the following abbreviations are used.

F10:	TOSLINE-F10 system
MS:	TOSLINE-F10 master station
RS:	TOSLINE-F10 remote PLC station
RIO:	TOSLINE-F10 remote I/O station
STN#n:	Station number n

For details of the programmable controllers T2, T3 and their programming software T-PDS, refer to the related manuals for these controllers.

NOTE ▽▲▽ To use the TOSLINE-F10, the following CPU OS versions of T2/T3 are necessary.

T2: CPU OS version 1.2 or later
T3: CPU OS version 1.34 or later

Contents

1. System Overview

1.1 Introduction

The F10 is a field network for T2/T3 Programmable Controllers. The F10 enables high-speed data linkage between T2/T3s by simple setting. And also, the F10 configures the effective remote I/O system. It can save wiring time and cost.
The outline of F10 is as follows.

Types of F10 stations:
- Master station (MS) for T2 (MS211)
- Master station (MS) for T3 (MS311)
- Remote station (RS) for T2 (RS211)
- Remote station (RS) for T3 (RS311)
- Remote I/O (RIO) - 16 points 24 Vdc input (DI633)
- Remote I/O (RIO) - 16 points relay output (RO663)
- Remote I/O (RIO) - 16 points 24 Vdc output (DO633)

Number of stations: Max. 32 remote stations on one F10 system
(It is also limited by Scan transmission capacity)

Scan Transmission Capacity: 32 words (512 points) in one F10 system
(Link register LW is assigned)

Number of F10 systems on a PLC: Max. 8 F10 systems on a T2/T3
(It is also limited by T2/T3's 5 Vdc power capacity. See Note)

Transmission Cable: Shielded twisted-pair cable
(Optical fiber cable between repeaters)

Transmission distance: Max. 500 m (total w/o repeater) ..... High speed mode
Max. 1 km (total w/o repeater) ..... Long distance mode

Scan cycle: 7 ms / 32 words (high speed mode)
12 ms / 32 words (long distance mode)

Functions: Scan Transmission between MS and RS or MS and RIO.
F10 has two transmission modes, High speed mode and Long distance mode (selectable).

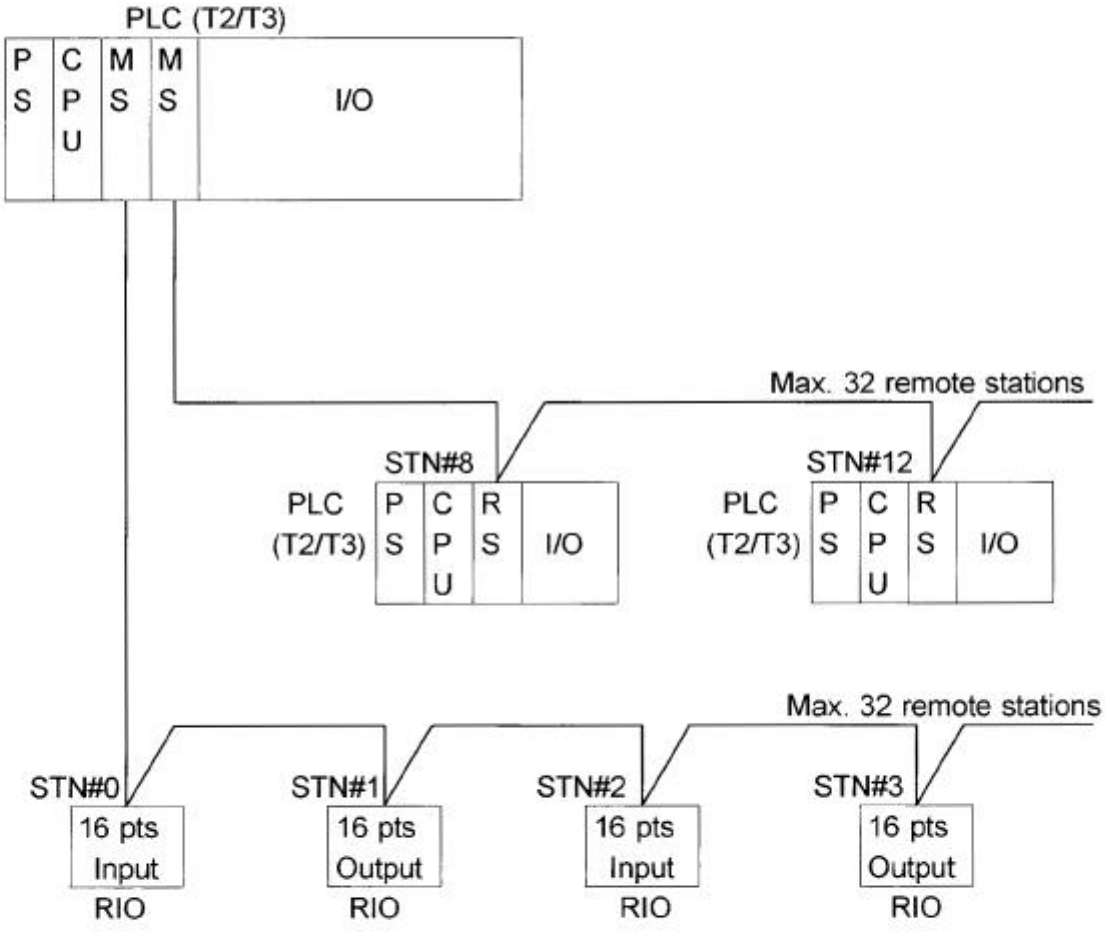
NOTE 5 Vdc current consumption of the MS211/311 and RS211/311 is 600 mA.
▽▲▽ Check the total 5 Vdc current consumption. Refer to T2/T3 User's Manual.

1.2 System configuration

One F10 system is configured by one master station (MS) and some remote stations (RS and/or RIO).
The MS is mounted on T2/T3's rack, interfaces with T2/T3 CPU and controls overall F10 data transmission.
On the other hand, the remote stations (RS and RIO) communicate with the MS under the MS's transmission control.

RS ···· Remote PLC station which is mounted on T2/T3's rack and interfaces with T2/T3 CPU.
RIO ···· Remote I/O station which controls I/O

The following figure shows the F10 system configuration example.

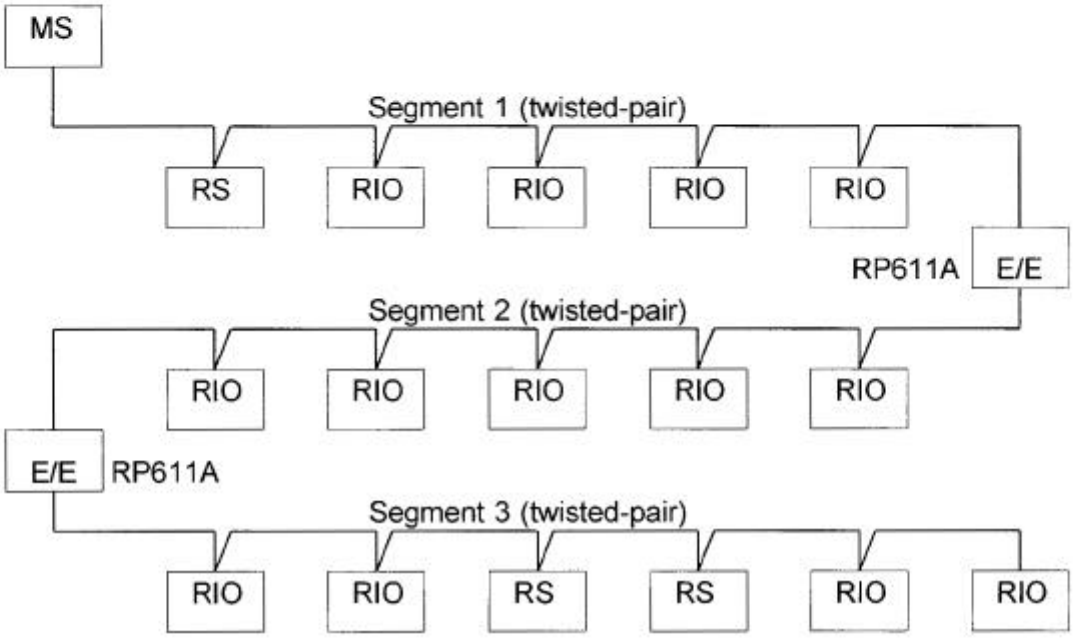


Each remote station must have a unique Station number (0 to 31). And the Link register assignment for the remote station is determined by the Station number. The Link register assignment is explained in Section 2.

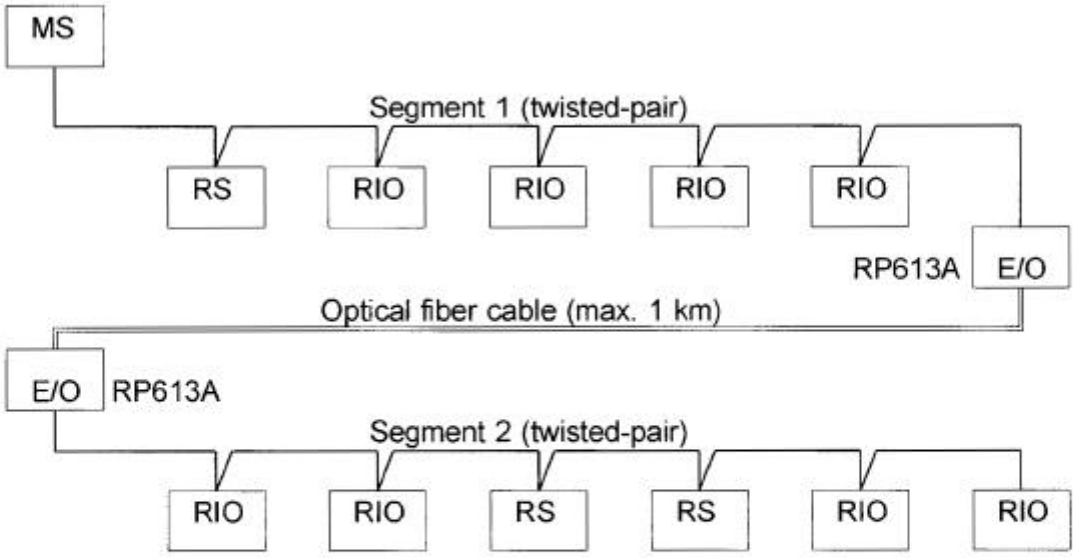
The repeaters are available to extend the F10 transmission line.
There are two types of repeaters as follows.

RP611A ····· Electric/electric
RP613A ····· Electric/optic

One or two RP611A(s) can be used in a F10 system.



One pair of RP613As can be used in a F10 system.



Max. cable length in each segment is 500 m in the high speed mode or 1 km in the long distance mode. Total number of stations on a F10 system cannot be expanded.

1.3 System components

(1) Master station (MS)

The MS controls overall F10 data transmission. Only one MS must exist in a F10 system. On a T2/T3, up to 8 MS/RSs can be mounted on any I/O slots.
(It is limited by T2/T3's 5 Vdc power capacity. See Note on page 5)
The following two types are available.

Type	Part number	Remarks
MS211	FMS211AM	MS for T2
MS311	FMS311AM	MS for T3

(2) Remote PLC station (RS)

The RS is used for data linkage between T2/T3s. On a T2/T3, up to 8 MS/RSs can be mounted on any I/O slots. (See Note on page 5)
The following two types are available.

Type	Part number	Remarks
RS211	FRS211AM	RS for T2
RS311	FRS311AM	RS for T3

(3) Remote I/O station (RIO)

The RIO is used for distributed I/O system. The following three types are available.

Type	Part number	Description
DI633	FDI633*K	16 points 24 Vdc input, 24 Vdc power
RO663	FRO663*K	16 points relay output, 24 Vdc power
DO633	FDO633*K	16 points 24 Vdc output, 24 Vdc power

(4) Repeater

The Repeater is used to extend the F10 transmission line. Up to two repeaters can be used in a F10 system. The following two types are available.

Type	Part number	Description
RP611A	FRP611AK	Electric/electric, 24 Vdc power
RP613A	FRP613AK	Electric/optic, 24 Vdc power

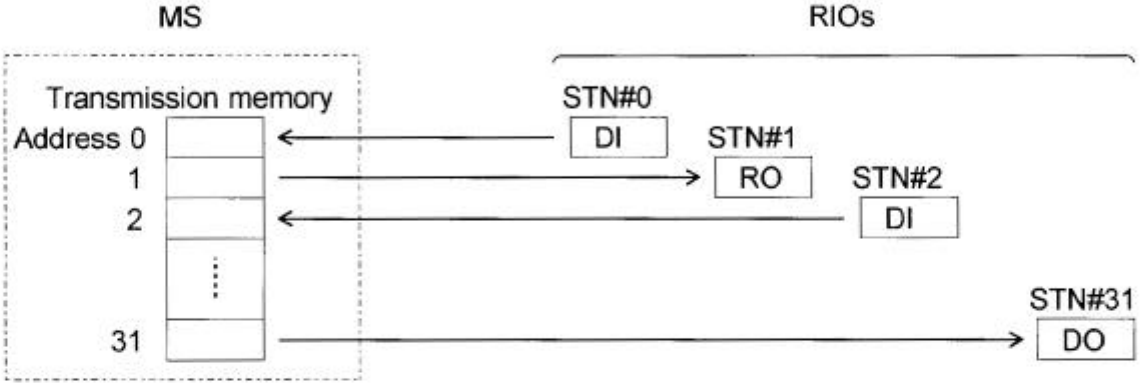
(5) Transmission cable

Shielded twisted-pair cable is used to connect each station. Refer to Section 6.5 to select the cable.
When the repeaters (RP613A) are used, optical fiber cable is used to connect the repeaters.

2. Data Transmission Overview

2.1 Scan transmission

In the F10 system, the MS sends data to the output type RIOs and receives data from the input type RIOs. In the MS, there is a memory for this data transmission. The capacity of this memory is 32 words. (1 word = 16 bits)



The correspondence between the memory address and a RIO is determined by the RIO's Station number.

STN#0 — Address 0
STN#1 — Address 1
STN#2 — Address 2
⋮ ⋮
STN#31 — Address 31

That is why an unique Station number is required for each RIO.

The MS updates (sends or receives) data from the lowest address through the highest address which correspond to RIOs, and repeats this operation. This is called Scan transmission.

When power to the MS comes on, the MS recognizes existing stations and types (input or output), and determines the direction of data transmission (send or receive) automatically.

NOTE (1) The MS does not have a specific Station number.
▽▲▽ (2) In the normal mode, the MS recognizes existing stations only at power on. For the automatic re-configuration mode, refer to Sections 2.3 and 7.2.

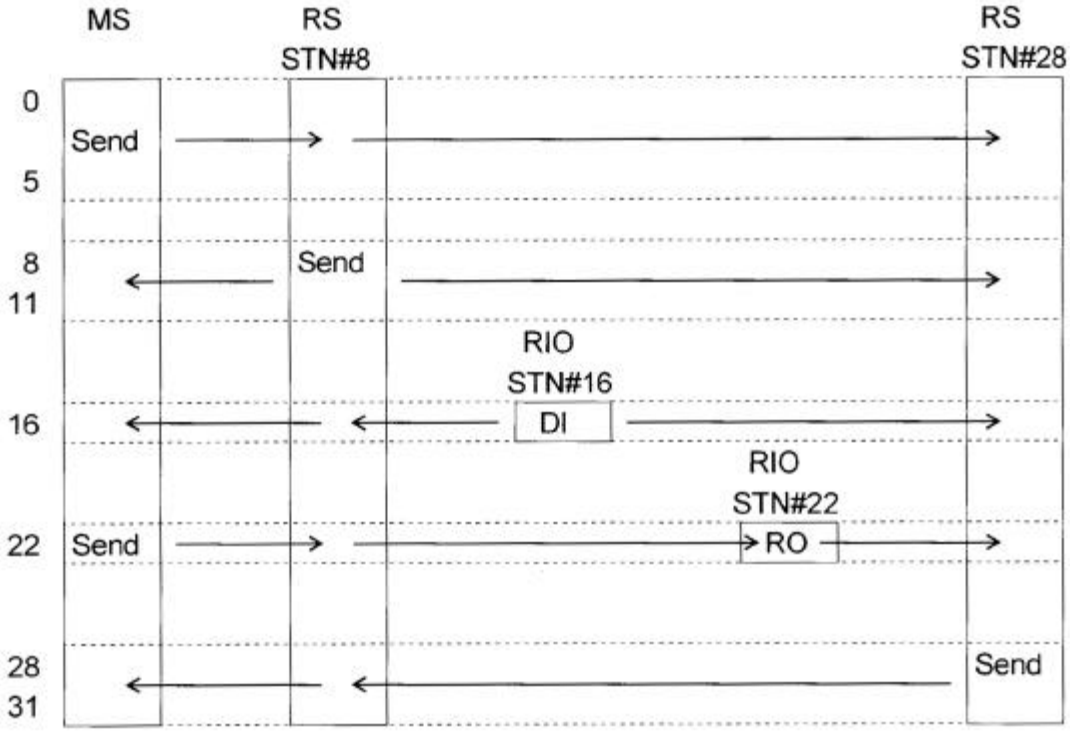
On the other hand, in case of RS (remote PLC station), the RS has the same size of transmission memory. The RS receives data which are sent by other stations, and sends specified block of data to the MS. The RS's Data send block is specified as follows.

Block start address: Address corresponds to the RS's Station number
Block data size: Specified by RS's DIP switches (0 to 32 words, 1 word units)

For data linkage between MS and RSs, the MS can have the Data send block specification in addition to the addresses which correspond to the output type RIOs. The MS's Data send block is specified as follows.

Block start address: Address 0 (fixed)
Block data size: Specified by MS's DIP switches (0 to 32 words, 1 word units)

The figure below shows the data flow example in a RS and RIO mixed system.



The RS's Data send block and RIO's Station number must not overlap with other station's Data send blocks.

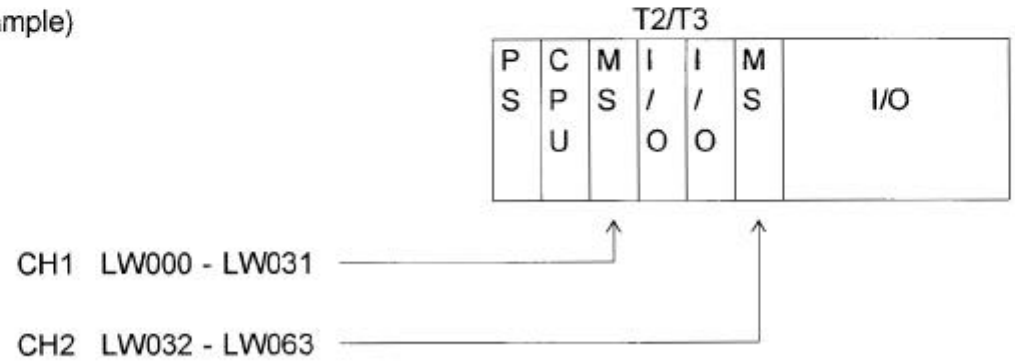
NOTE ▽▲▽ The Station number and the Data send block settings are explained in Section 3.

2.2 Register assignment

This section explains about the correspondence between the T2/T3's data memory and the F10's transmission memory.

The transmission memory of the MS or RS is assigned to the Link register LW of T2/T3. In the T2/T3, total 256 words of LW registers are available. When multiple MS/RSs are mounted on a T2/T3, the LW registers are assigned to each MS/RS in 32 words units.

Example)



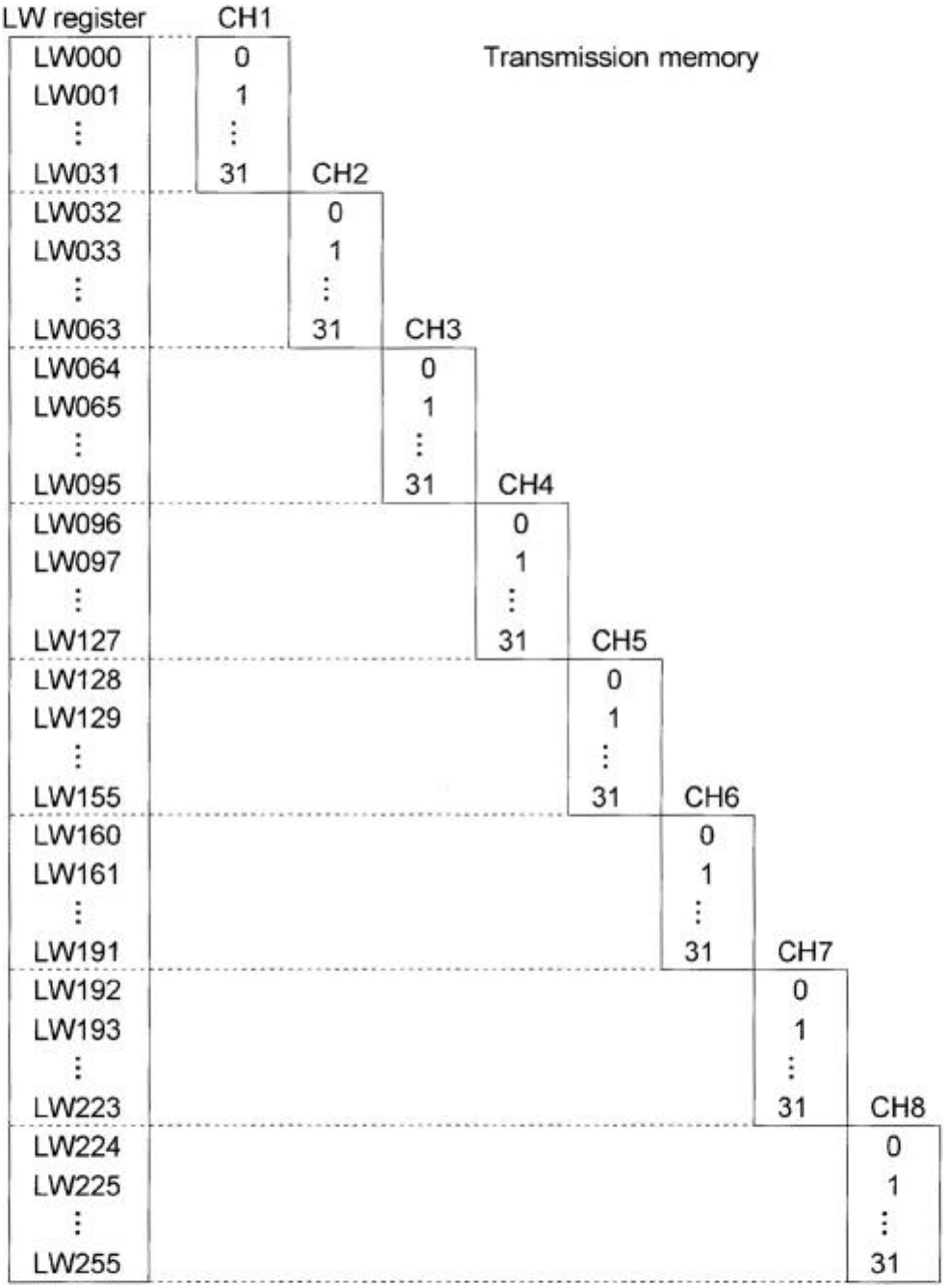
(1) Concerning the register assignment, there is no difference between MS and RS.

(2) The T2/T3 recognizes the MS/RS by executing the I/O allocation.
The module type of the MS/RS is "TL-F".
The MS/RS which is mounted nearest to the CPU is allocated as CH1. And the next one is CH2, and in this order. Maximum 8 MS/RSs can be allocated. (CH1 to CH8)

(3) To assign the LW registers to the allocated MS/RSs, the network assignment is necessary. Set "LINK" to each allocated CH.
By setting "LINK", the LW registers are assigned to the CH from LW000 in 32 words units.
If all CH1 to CH8 are allocated, the LW registers are assigned as follows.

CH1 [LW000 - LW031]	CH5 [LW128 - LW159]
CH2 [LW032 - LW063]	CH6 [LW160 - LW191]
CH3 [LW064 - LW095]	CH7 [LW192 - LW223]
CH4 [LW096 - LW127]	CH8 [LW224 - LW255]

(4) The correspondence between the assigned LW registers and the MS/RS's transmission memory is determined as follows.



For example, when an output type RIO is corresponding to the address 2 of CH2, the outputs can be controlled by LW034 (L0340 to L034F).
Refer to T2/T3 User's Manual for details of the Link register LW and Link relay L.

2.3 Transmission modes

Basically, the F10 system can be established without changing the transmission modes (at the factory setting). However, to meet the various application requirements, some transmission modes are provided in the F10. You can select the required modes by setting the DIP switches on each station.
This section outlines the F10's transmission modes. For details, see Section 7.

(1) High speed mode and Long distance mode:
The F10's data transmission speed can be selected either 750 kbps or 250 kbps. The 750 kbps mode is called High speed mode and the 250 kbps mode is called Long distance mode.
In the Long distance mode, although the scan cycle is longer, the allowable transmission distance becomes longer than the High speed mode.
All the stations on the F10 system (including the repeaters) must be set to the same mode.
Factory setting is the High speed mode (750 kbps).

(2) Automatic re-configuration mode:
As mentioned in Section 2.1, the MS checks existing stations on the F10 system only at the timing of power to the MS comes on, in the standard mode. Therefore, if power to a remote station (RS or RIO) comes on after MS power on, the remote station will not be recognized by the MS and cannot join in the F10 system.
To enable random power on to the stations, the automatic re-configuration mode is provided. (switch setting on the MS)
In the automatic re-configuration mode, the MS checks the existence of a station every scan. Therefore the scan cycle becomes longer.
Factory setting is the standard mode (non-re-configuration mode).

(3) Read-back check mode:
In the standard mode, it cannot be monitored whether an output type RIO has received the data correctly or not.
If the read-back check mode is selected (switch setting on the MS), the MS reads back the data from the output type RIO and reflects the result on the scan error map. The check mode can be selected from 1 station check per scan or all stations check per scan. In the read-back check mode, the scan cycle becomes longer.
The read-back check is not valid for the RS.
Factory setting is the standard mode (non-read-back check).

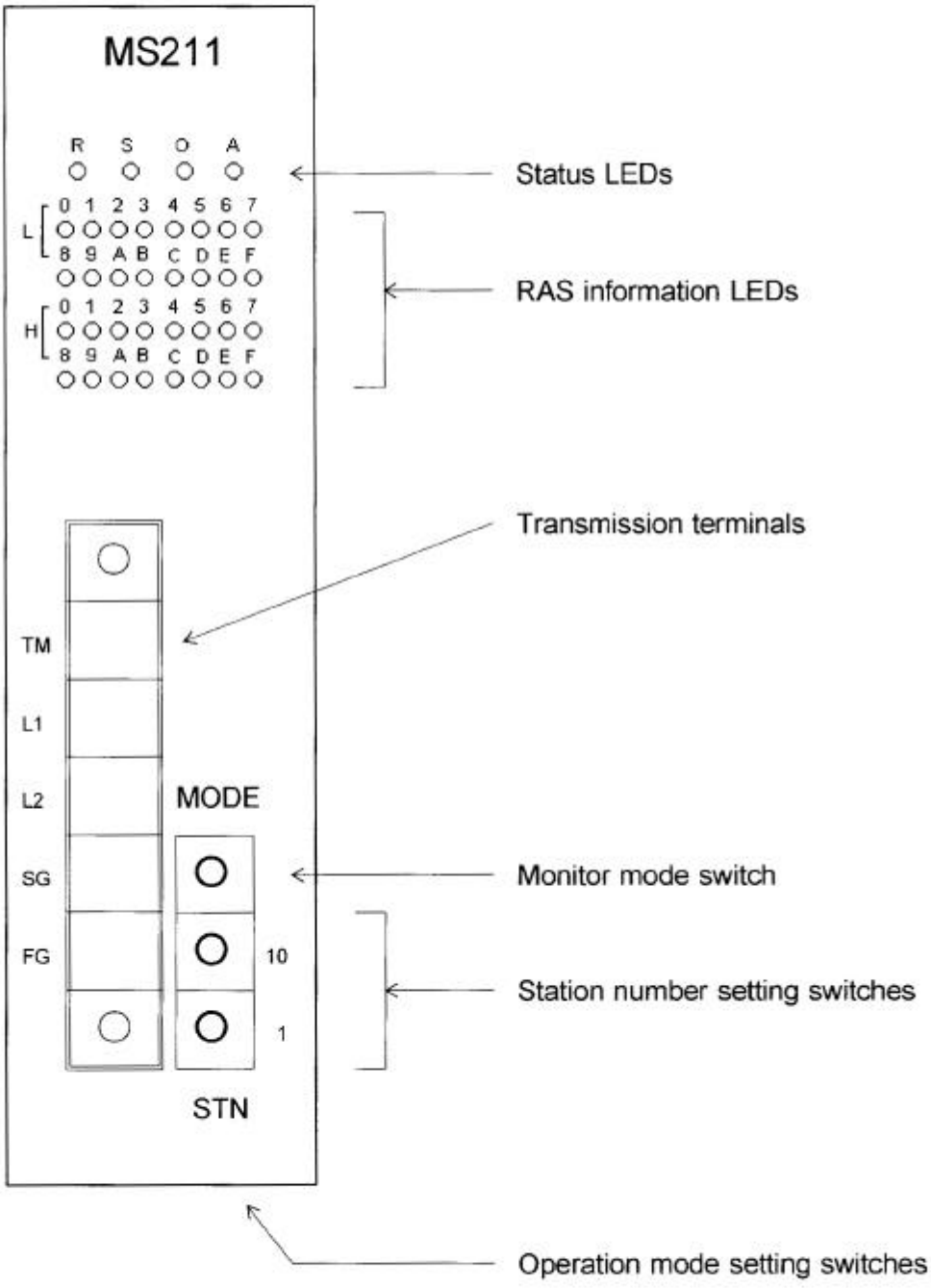
(4) Scan data synchronization mode:
The synchronization of 32 words of scan data is guaranteed in this mode. This mode is valid for MS and RS. When this mode is selected, the transmission delay from PLC to PLC becomes longer.
This mode selection is available for the MS/RS for T3. Factory setting is the non-synchronization mode.
The MS/RS for T2 is fixed in the synchronization mode.

(5) Scan data hold/reset selection in error:
In the case of time-out error is detected in an output type RIO, the output status of the RIO can be selected either hold or reset (all OFF) by switch setting.
This selection is valid for output type RIO and MS.
In case of MS, when the reset mode is selected, the receive area of scan data will be reset to 0 if time-out error is detected.
Factory setting for RIO is the reset mode, and for MS is the hold mode.
The RS is fixed in the hold mode.

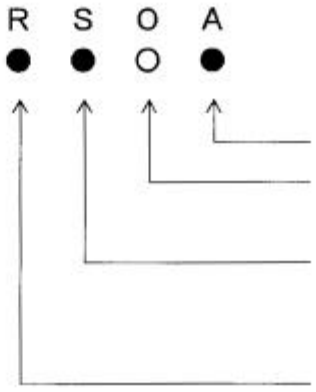
3. Station Hardware

3.1 Station for T2

External feature of the MS211 (MS for T2) is shown below. Externally, the RS211 (RS for T2) is same as the MS211.



- Status LEDs:
  Indicates the station operation status.

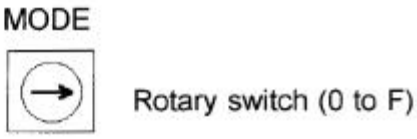


A (Access):	Flickers when T2 accesses the station.	
O (Option):	Not lit when normal.	
	Blinks when error has occurred.	
S (Scan):	Lit during scan transmission.	
	Not lit when scan transmission has stopped.	
	Blinks when error has occurred.	
R (Run):	Lit when the station is normal.	
	Not lit or blinks when error has occurred.	

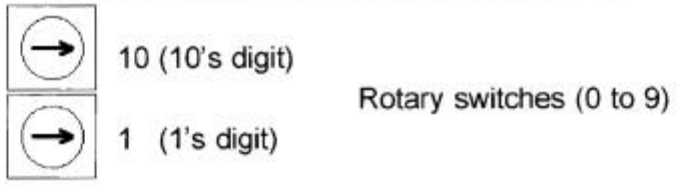
- RAS information LEDs:
  Displays various RAS information depending on the Monitor mode switch.
  See Section 9.3 for display details.

- Transmission terminals:
  Used to connect the transmission cable. A short-bar for termination connection is attached as accessory. See Section 6 for cable connection.

- Monitor mode switch:
  Used to select the information displayed on the RAS information LEDs. This switch is not valid for RS. See Section 9.3 for display details.

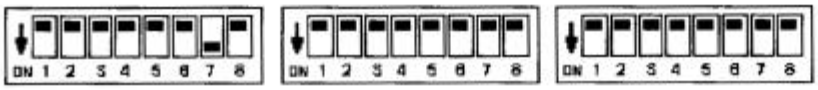


- Station number setting switches:
  The function of these switches is different between MS and RS.
  MS ···· Used to select the information displayed on the RAS information LEDs.
  See Section 9.3 for display details.
  RS ···· Used to set the Station number. Setting range is 0 to 31. The setting status of these switches is recognized at power on.



· Operation mode setting switches:
3 DIP switches are provided to select the transmission modes. The setting status of these switches is recognized at power on. Refer to Section 7 for details.

DIP0 DIP1 DIP2



DIP0

No.	OFF	ON
1	High speed mode (750k)	Long distance mode (250k)
2	Reserve (set to OFF)	——
3	Reserve (set to OFF)	——
4*	Non-re-configuration	Automatic re-configuration
5*	Non-read-back check	Read-back check
6*	1 station / scan	All stations / scan
7	——	Reserve (set to ON)
8	Reserve (set to OFF)	——

Notes (1) Factory settings are OFF except No.7.
(2) * marked switches are not used in the RS (set to OFF).
(3) No.6 is valid when No.5 is set to ON.

DIP1

No.	OFF	ON
1*	Normal mode	Test mode
2	Reserve (set to OFF)	——
3*	Data send block disable	Data send block enable
4	Reserve (set to OFF)	——
5*	Scan data hold in error	Scan data reset in error
6	Reserve (set to OFF)	——
7	Reserve (set to OFF)	——
8	Reserve (set to OFF)	——

Notes (1) Factory settings are all OFF.
(2) * marked switches are not used in the RS (set to OFF).
(3) When data send block is used in the MS, set No.3 to ON, and set the size by DIP2. Refer to Section 2.1.

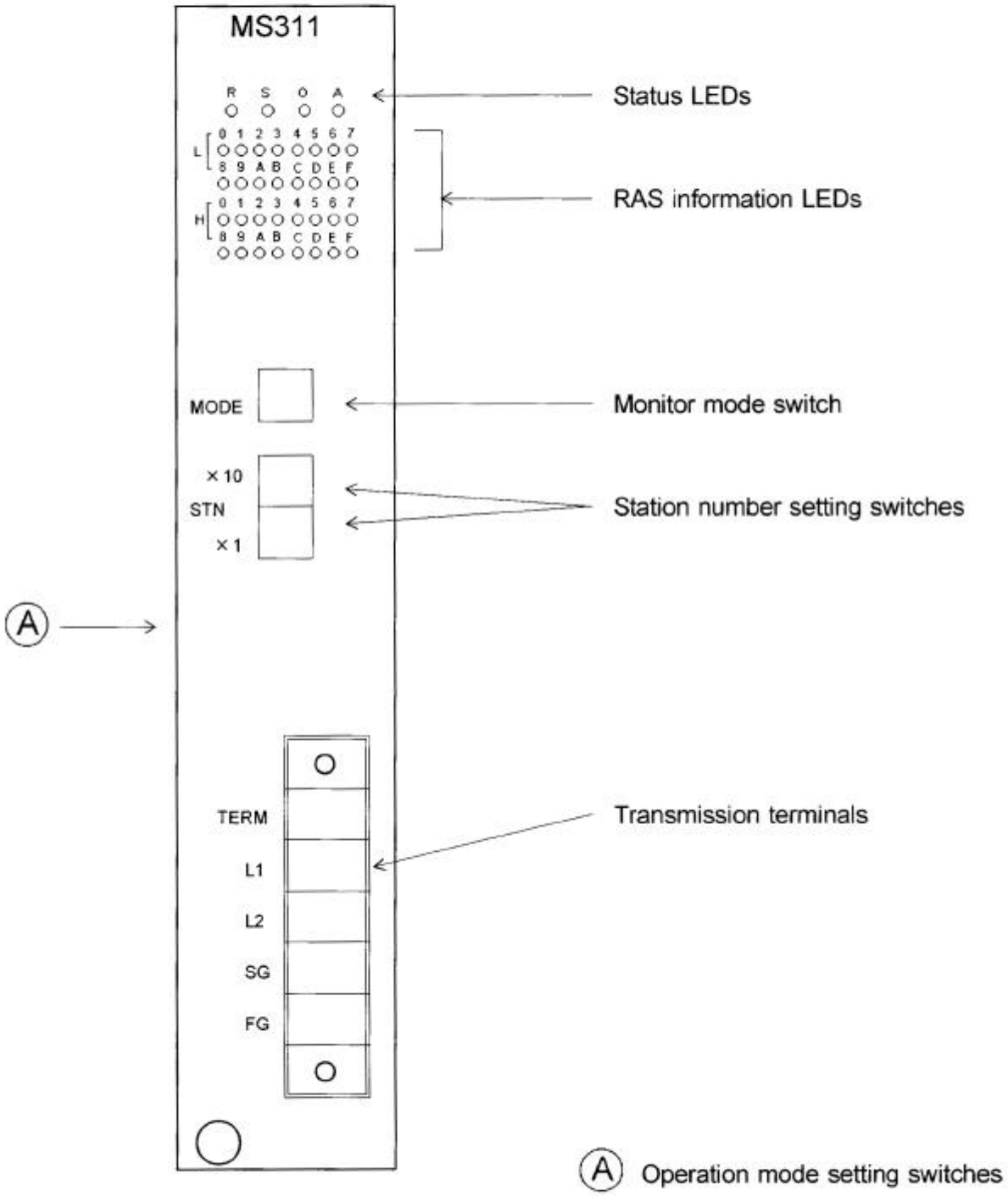
DIP2

No.	OFF	ON
1	Data send block size setting (OFF = 0)	
2	No.8 — No.1	
3	00000000 = 0 word	
4	00000001 = 1 word	
5	00000010 = 2 words	
6	⋮ ⋮	
7	00100000 = 32 words	
8		

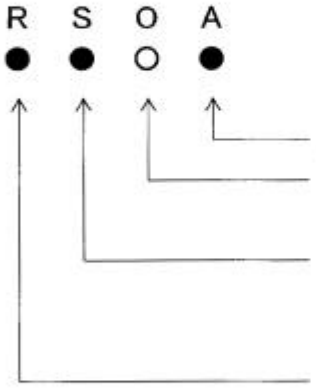
Notes (1) Factory settings are all OFF (size = 0).
(2) Set the size of data send block in binary. (No.8 = MSB, No.1 = LSB)
(3) Settings for more than 32 words are not allowed.
(4) In case of MS, DIP2 is valid when No.3 of DIP1 is set to ON.
(5) Refer to Section 2.1.

3.2 Station for T3

External feature of the MS311 (MS for T3) is shown below. Externally, the RS311 (RS for T3) is same as the MS311.



- Status LEDs:
  Indicates the station operation status.



A (Access):	Flickers when T3 accesses the station.
O (Option):	Not lit when normal.
	Blinks when error has occurred.
S (Scan):	Lit during scan transmission.
	Not lit when scan transmission has stopped.
	Blinks when error has occurred.
R (Run):	Lit when the station is normal.
	Not lit or blinks when error has occurred.

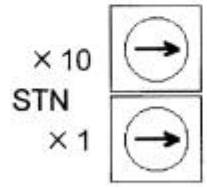
- RAS information LEDs:
  Displays various RAS information depending on the Monitor mode switch.
  See Section 9.3 for display details.

- Transmission terminals:
  Used to connect the transmission cable. A short-bar for termination connection is attached as accessory. See Section 6 for cable connection.

- Monitor mode switch:
  Used to select the information displayed on the RAS information LEDs. This switch is not valid for RS. See Section 9.3 for display details.

Rotary switch (0 to F)

- Station number setting switches:
  The function of these switches is different between MS and RS.
  MS ···· Used to select the information displayed on the RAS information LEDs.
  See Section 9.3 for display details.
  RS ···· Used to set the Station number. Setting range is 0 to 31. The setting status of these switches is recognized at power on.



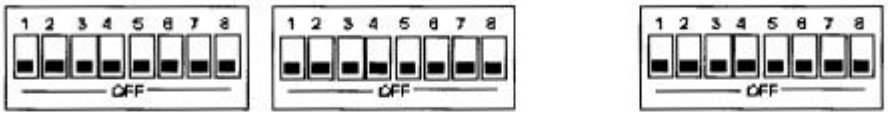
10's digit

1's digit

Rotary switches (0 to 9)

· Operation mode setting switches:
3 DIP switches are provided to select the transmission modes. The setting status of these switches is recognized at power on. Refer to Section 7 for details.

DSW0 DSW1 DSW2



DSW0

No.	OFF	ON
1	High speed mode (750k)	Long distance mode (250k)
2	Reserve (set to OFF)	———
3	Reserve (set to OFF)	———
4*	Non-re-configuration	Automatic re-configuration
5*	Non-read-back check	Read-back check
6*	1 station / scan	All stations / scan
7	Non-synchronization	Synchronization
8	Reserve (set to OFF)	———

Notes (1) Factory settings are all OFF.
(2) * marked switches are not used in the RS (set to OFF).
(3) No.6 is valid when No.5 is set to ON.

DSW1

No.	OFF	ON
1*	Normal mode	Test mode
2	Reserve (set to OFF)	———
3*	Data send block disable	Data send block enable
4	Reserve (set to OFF)	———
5*	Scan data hold in error	Scan data reset in error
6	Reserve (set to OFF)	———
7	Reserve (set to OFF)	———
8	Reserve (set to OFF)	———

Notes (1) Factory settings are all OFF.
(2) * marked switches are not used in the RS (set to OFF).
(3) When data send block is used in the MS, set No.3 to ON, and set the size by DSW2. Refer to Section 2.1.

DSW2

No.	OFF	ON
1	Data send block size setting (OFF = 0)	
2	No.8 — No.1	
3	00000000 = 0 word	
4	00000001 = 1 word	
5	00000010 = 2 words	
6	⋮ ⋮	
7	00100000 = 32 words	
8		

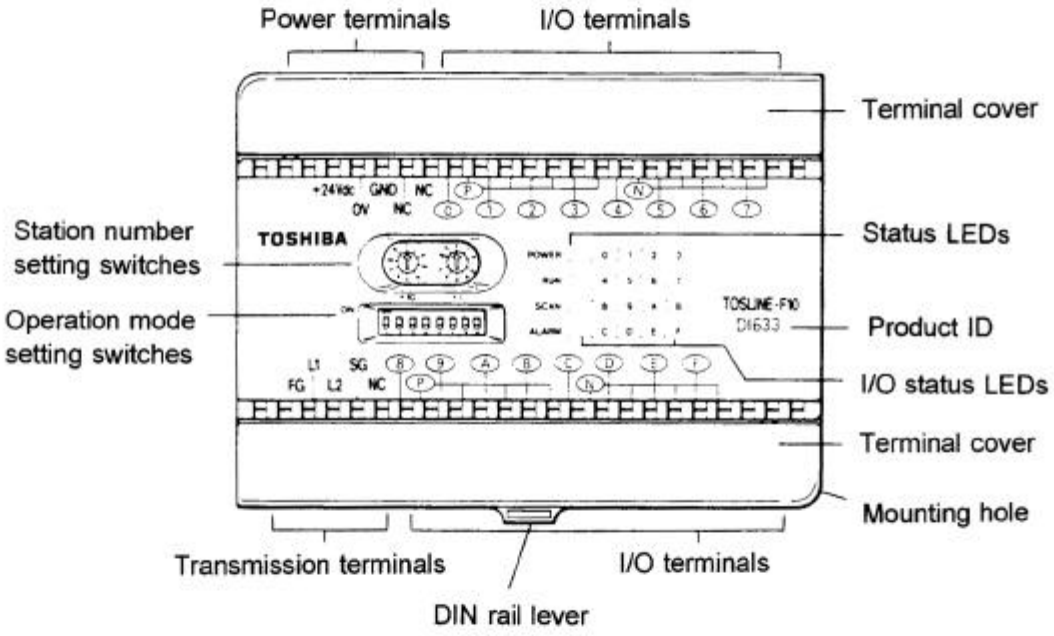
Notes (1) Factory settings are all OFF (size = 0).
(2) Set the size of data send block in binary. (No.8 = MSB, No.1 = LSB)
(3) Settings for more than 32 words are not allowed.
(4) In case of MS, DSW2 is valid when No.3 of DSW1 is set to ON.
(5) Refer to Section 2.1.

3.3 Remote I/O station

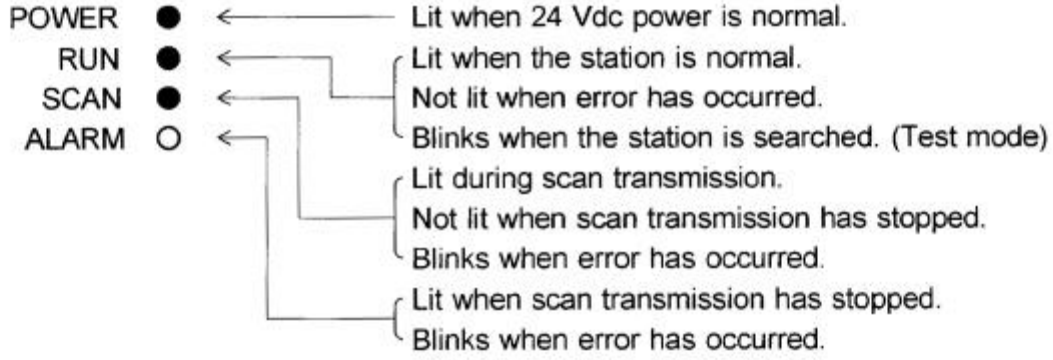
The following types of RIOs are available. Each of them has 16 points of external input or output. The RIO is suitable for small points distributed I/O system.

Type	Part number	Description
DI633	FDI633*K	16 points 24 Vdc input, 24 Vdc power
RO663	FRO663*K	16 points relay output, 24 Vdc power
DO633	FDO633*K	16 points 24 Vdc output, 24 Vdc power

The external fearure of the RIO is shown below. (Example of DI633)



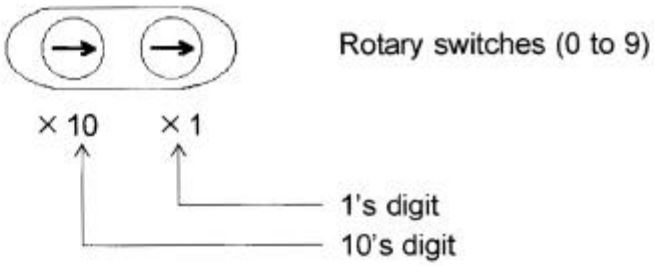
- Status LEDs:
  Indicates the station operation status.



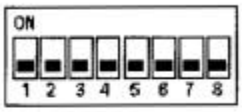
- I/O status LEDs:
  Indicates the external input/output status. Lit when the signal of the point is ON.

- Transmission terminals:
  Used to connect the transmission cable. See Section 6 for cable connection.

- Station number setting switches:
  Used to set the Station number. Setting range is 0 to 31. The setting status of these switches is recognized at power on.



- Operation mode setting switches:
  A DIP switch is provided to select the transmission modes and termination connection. The setting status of this switch is recognized at power on (except No.8). Refer to Sections 6.2 and 7 for details.



No.	OFF	ON
1	High speed mode (750k)	Long distance mode (250k)
2	Scan data reset in error	Scan data hold in error
3	Reserve (set to OFF)	———
4		
5		
6		
7		
8	Non-termination	Termination connection

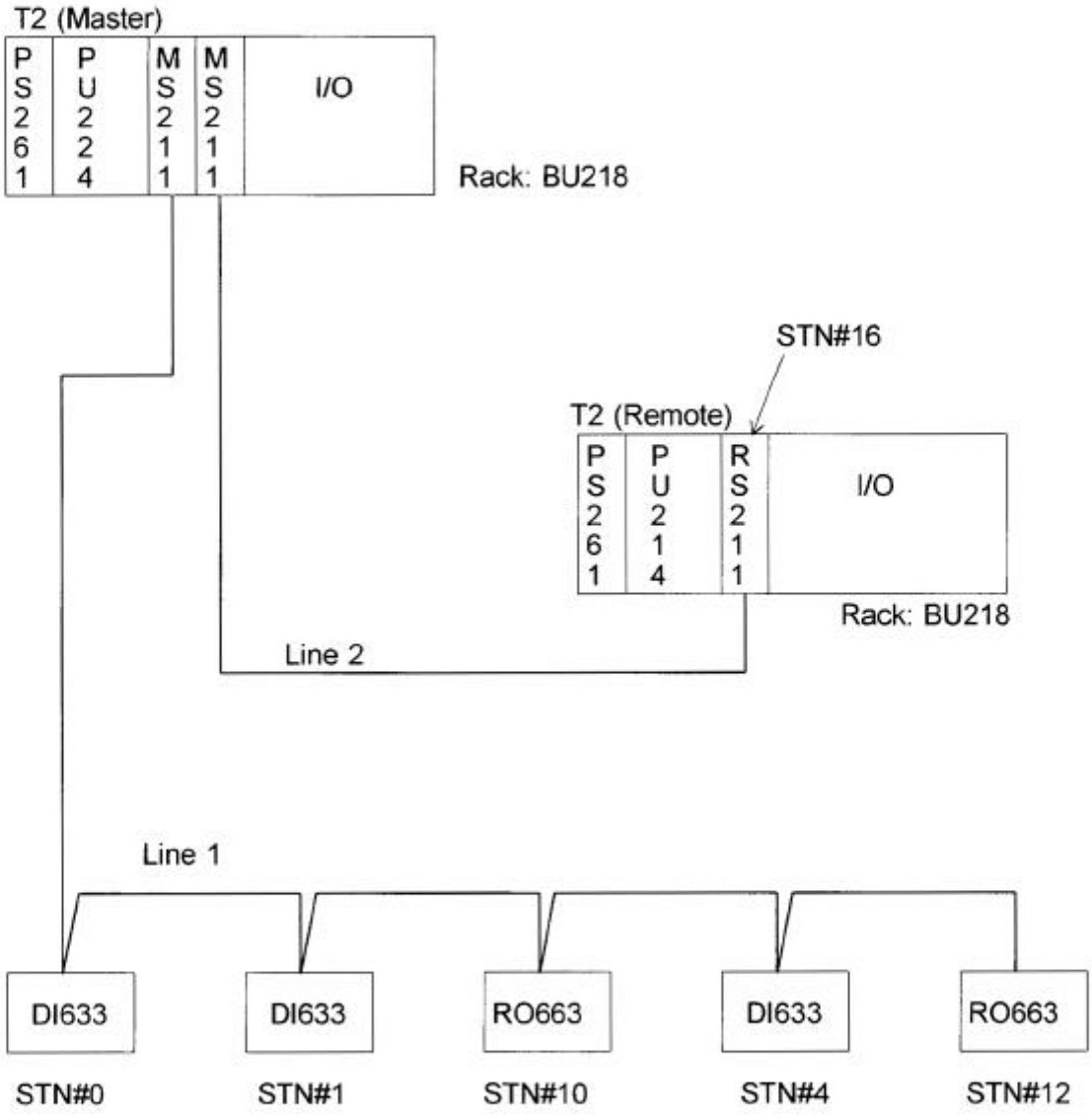
Notes (1) Factory settings are all OFF.
(2) When the RIO is a terminal station, set the No.8 of the DIP switch to ON to connect built-in termination resistor.

4. Sample Operation

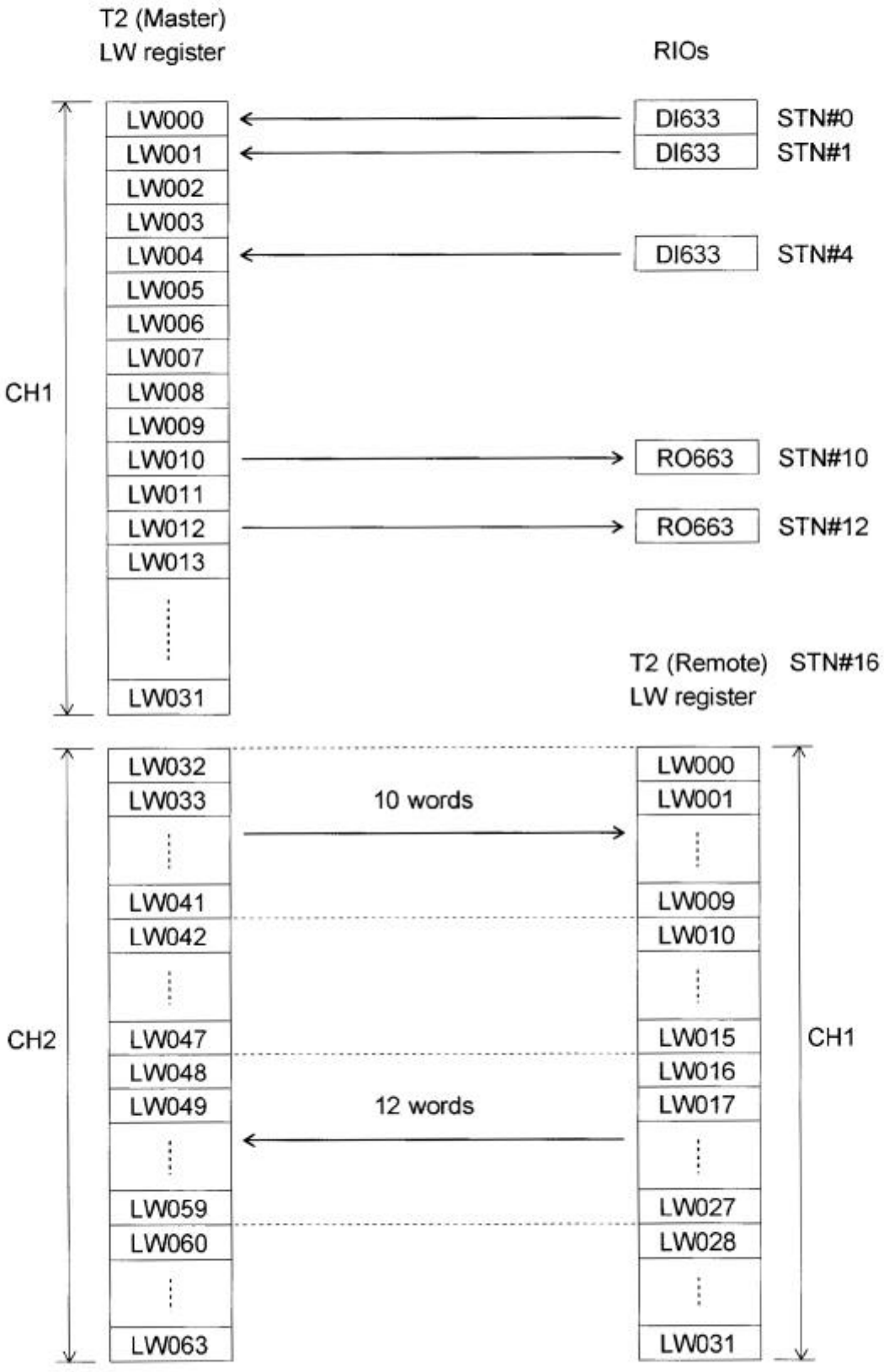
This section explains the starting-up procedure of F10 with simple example.

4.1 Sample system

Let us consider the system in the following diagram as an example.



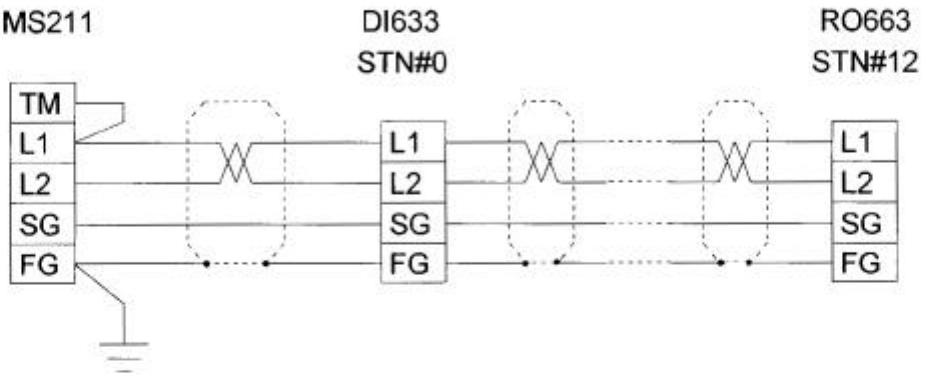
Data link configuration (Register assignment) is as follows.



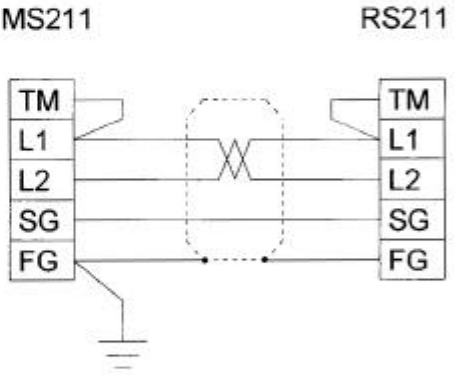
4.2 Cable connection

(1) Transmission cable connection and termination

Line 1



Line 2



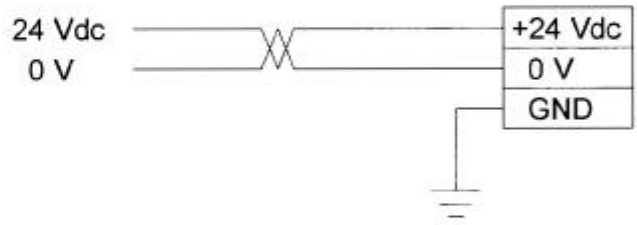
- Connect L1 to L1, L2 to L2, and SG to SG between stations.
- Use shielded twisted-pair cables. L1 and L2 should be paired. Cable shield should be connected to FG.
- Set termination at both end stations (terminal stations). Only 2 terminal stations are allowed on the line.
  MS/RS ·· Short TM (TERM) and L1
  RIO ····· Set No.8 of the DIP switch to ON. (See Section 4.3)
- Connect FG with a grounding point at one station. Normally at MS.

NOTE See Section 6 for cable connection details.

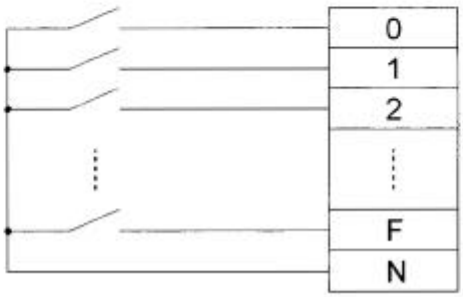
▽▲▽

(2) Power and I/O wiring for RIOs

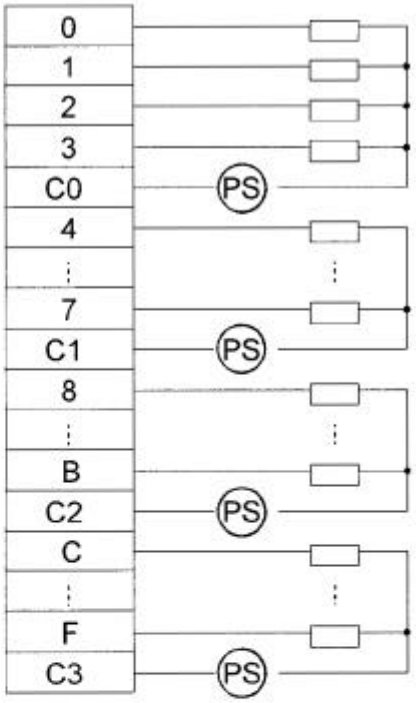
24 Vdc power



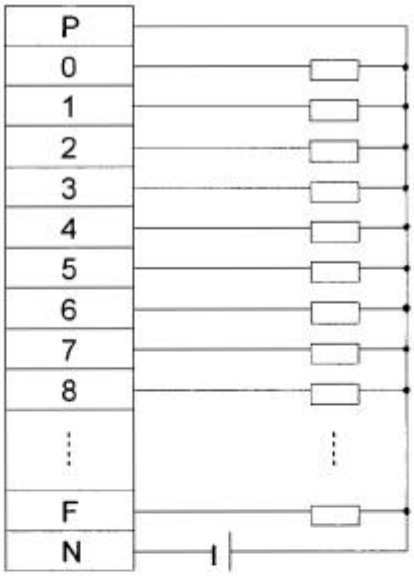
Input wiring (DI633)



Output wiring (RO663)



Output wiring (DO633)



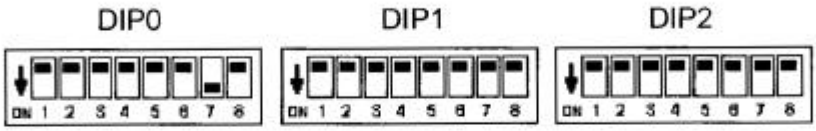
NOTE See Section 5.2.3 for I/O specifications and wiring details for RIOs.
▽▲▽

4.3 Switch settings

(1) Line 1 MS211

- Monitor mode switch and Station number setting switches:
  These switches are not related to the data link operation. (Any setting)

- Operation mode setting switches:

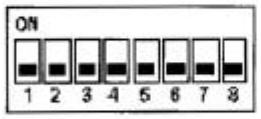


No.7 of DIP0 is ON and others are OFF. (Factory setting)

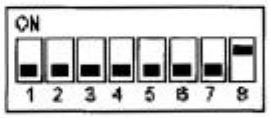
(2) Line 1 RIOs

- Station number setting switches:
  Set the Staion number.

- Operation mode setting switch:



Set all OFF for STN#0, STN#1, STN#10 and STN#4.

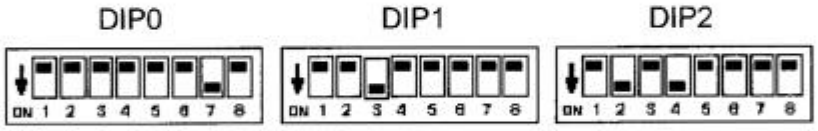


Set No.8 to ON and others OFF for STN#12. (Termination)

(3) Line 2 MS211

- Monitor mode switch and Station number setting switches:
  These switches are not related to the data link operation. (Any setting)

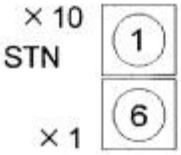
- Operation mode setting switches:



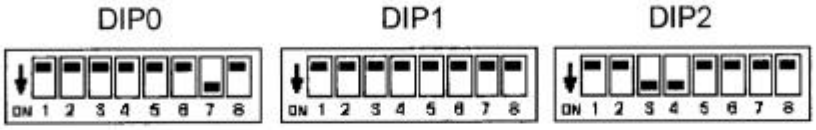
Set No.3 of DIP1 to ON. (Data send block enable)
Set No.2 and No.4 of DIP2 to ON. (Data send block size = 10 words)
10 (decimal) = 00001010 (binary)

(4) Line 2 RS211

- Station number setting switches:
  Set the Staion number. (STN#16)



- Operation mode setting switches:

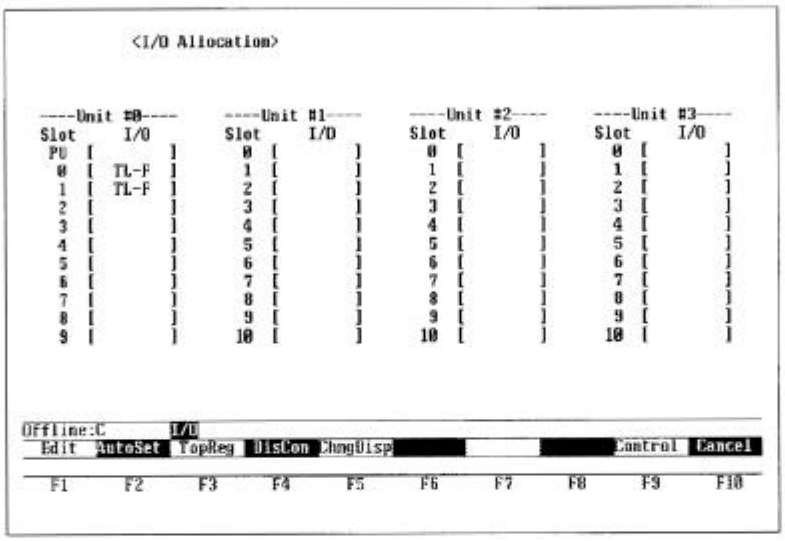


Set No.3 and No.4 of DIP2 to ON. (Data send block size = 12 words)
12 (decimal) = 00001100 (binary)

4.4 Settings on PLC

(1) Master T2

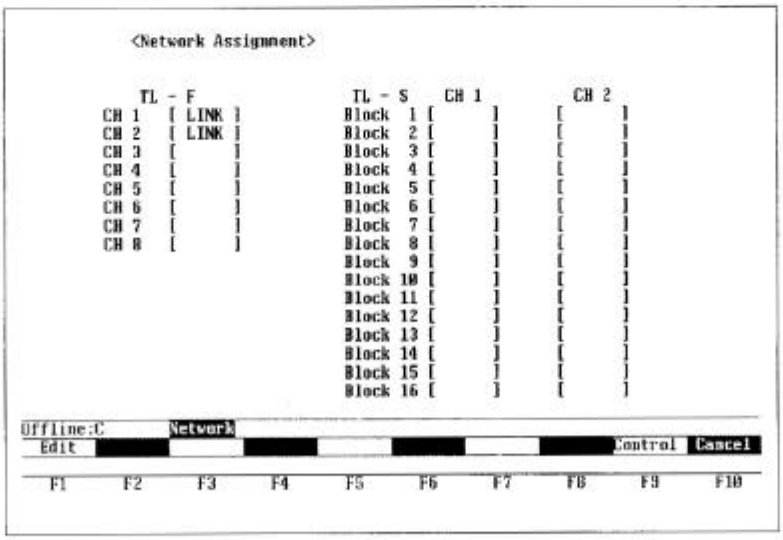
- I/O allocation
  Allocate the MS211s as TL-F by the automatic I/O allocation or by the manual I/O allocation.



T-PDS screen example (I/O allocation)

Slot 0 MS211 is recognized as CH1, and slot 1 MS211 is recognized as CH2.

- Network assignment
  Set LINK both for CH1 and CH2 on the network assignment.

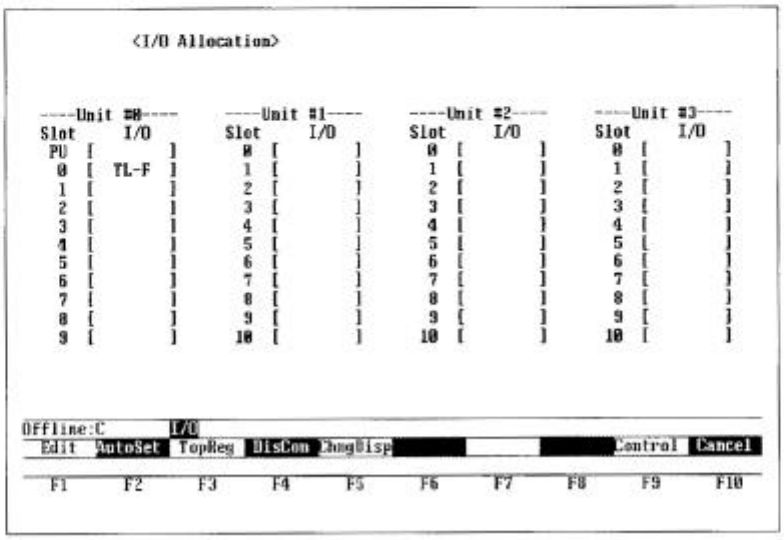


T-PDS screen example (Network assignment)

LW000 to LW031 are assigned to the CH1 MS211, and LW032 to LW063 are assigned to the CH2 MS211.

(2) Remote T2

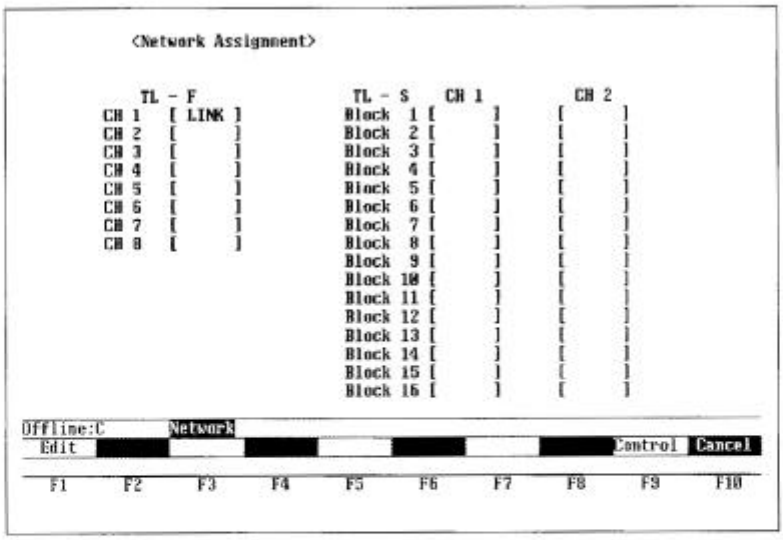
- I/O allocation
  Allocate the RS211 as TL-F by the automatic I/O allocation or by the manual I/O allocation.



T-PDS screen example (I/O allocation)

The RS211 is recognized as CH1.

- Network assignment
  Set LINK for CH1 on the network assignment.



T-PDS screen example (Network assignment)

LW000 to LW031 are assigned to the RS211.

NOTE ▽▲▽ For key operations of the T-series programmer (T-PDS), refer to the T-PDS Operation Manual.

4.5 Sample program

(1) Master T2

On the master T2, input data from the RIOs are read into LW registers as follows.

STN#0 DI633 ⟶ LW000 (L0000 - L000F)
STN#1 DI633 ⟶ LW001 (L0010 - L001F)
STN#4 DI633 ⟶ LW004 (L0040 - L004F)

And the data of LW registers are sent to the RIOs as output signals as follows.

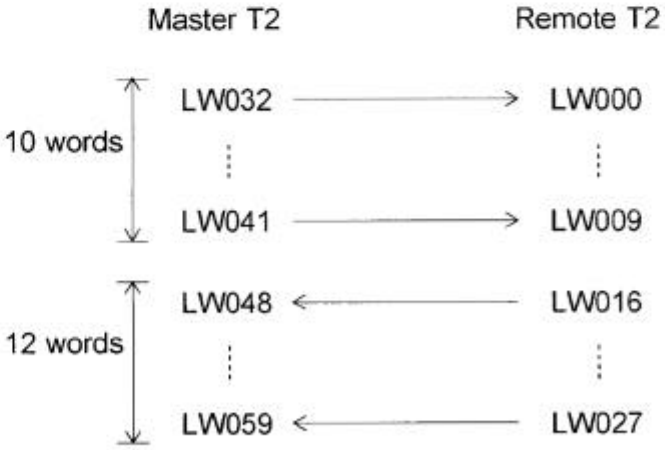
LW010 (L0100 - L010F) ⟶ STN#10 RO663
LW012 (L0120 - L012F) ⟶ STN#12 RO663

Therefore, as similar as local input/output (X/Y), the remote input/output can be used in a program by using L devices.

(For example)

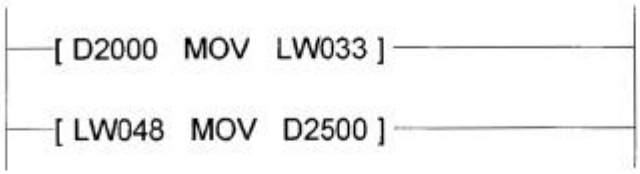
When both the input 5 of STN#0 DI633 and the input 9 of STN#4 DI633 are ON, turns the output 0 of STN#12 RO663 to ON.

Also, 10 words data starting with LW032 are sent to LW000 and after of the remote T2. And 12 words data starting with LW016 of the remote T2 are read into LW048 and after, as follows.



To send data from the master T2 to the remote T2, simply write the data onto the LW register assigned to data sending. And the data sent from the remote T2 are stored on the LW registers assigned to data receiving.

(For example)

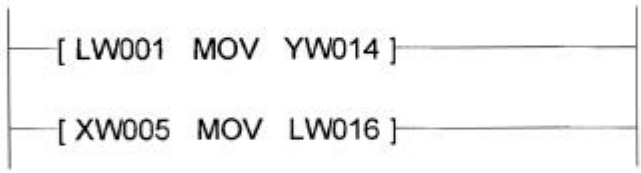


The data of D2000 is written into LW033, then it will be sent to LW001 of the remote T2.
The data of LW016 of the remote T2 is received and stored into LW048, and it is copied to D2500.

(2) Remote T2

As for the data linkage, data handling method on the remote T2 is the same as that on the master T2. The register correspondence information is very important to create the program.

(For example)



The data sent from the master T2 (LW033) is received in LW001, and it is written into YW014
The input data of XW005 is written into LW016, then it will be sent to the master T2 (LW048).

4.6 Starting the operation

Now, the necessary preparations are completed.
Before starting the operation, turn off power to the T2s and RIOs. Because the Station number setting switches and the operation mode switches are read at power on.

Next, turn on power. Note that the power on sequence must be remote T2 and RIOs first, and followed by master T2. Otherwise MS211 cannot recognize remote stations. If the automatic re-configuration mode is selected, the power on sequence can be random. Refer to Sections 2.3 and 7.2.

Then turn the T2s to RUN mode. The F10 operation will be started.

5. Specifications

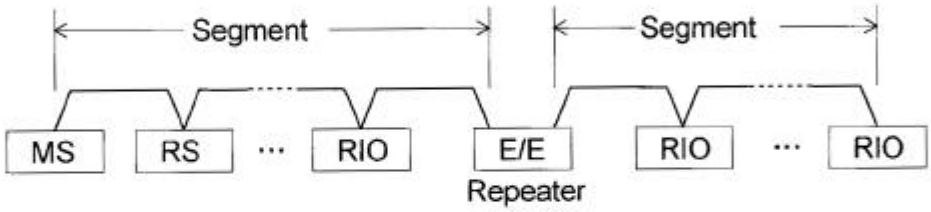
5.1 System specifications

Transmission specifications

Item		Specifications	
		High speed mode	Long distance mode
Topology		Bus (terminated at both ends)	
Transmission cable		Shielded twisted-pair cable (2 pairs or more) 1.2 mm ϕ , 0.75 mm^2, 0.5 mm^2 for RS485	
Transmission distance (no repeater)	1.2 mm ϕ	Max. 500 m (total)	Max. 1000 m (total)
	0.75 mm^2	Max. 300 m (total)	Max. 600 m (total)
	0.5 mm^2	Max. 200 m (total)	Max. 400 m (total)
Number of stations		Max. 32 remote stations (Station number 0 to 31)	
Transmission speed		750 kbps	250kbps
Transmission method		Asynchronous transmission	
Modulation mothod		Baseband, NRZ, Positive logic	
Access method		Polling/sellecting method	
Interface standard		Conforms to EIA RS485	
Scan transmission cap.		Max. 512 points (32 words)	
Scan cycle		7 ms/32 words	12 ms/32 words
Communication service		Scan transmission	
Error checking		CRC check	

Notes 1) For the transmission cable specification, refer to Section 6.5.

2) When the repeater(s) is used, transmission distance can be extended. However the segment length is limited by the value on the above table.



3) Same cable should be used in a segment.

5.2 Station specifications

5.2.1 Stations for T2

Item		MS211	RS211
Station type		Master station	Remote PLC station
Max. number on T2		8 stations (MS211 and RS211 total)	
I/O allocation type		TL-F	TL-F
Scan transmission register		32 words (LW000 - LW255)	32 words (LW000 - LW255)
Station control/status register		2 words (SW078 - SW093)	2 words (SW078 - SW093)
Scan error map		2 words (SW094 - SW109)	2 words (SW094 - SW109)
Optional functions	Automatic re-configuration	Yes (selectable)	—
	Read-back check	Yes (selectable)	—
	Scan data synchronize	No (fixed in synchronize)	No (fixed in synchronize)
	Data hold/ reset in error	Yes (selectable)	No (fixed in hold)
LED indication	Status LEDs	Station status (R, S, O, A)	Station status (R, S, O, A)
	RAS LEDs (selectable)	Staion connections	—
		Data send blocks	Data send block
		I/O status of selected RIO	—
		DIP switches setting status	—
		Scan error map	—
Transmission cable connection		5-pin terminal block (removable), M3.5	5-pin terminal block (removable), M3.5
Current consumption		600 mA (5 Vdc)	600 mA (5 Vdc)
Environmental conditions		Conforms to T2 spcifications	
Size		Same as T2 I/O module (1-slot size)	

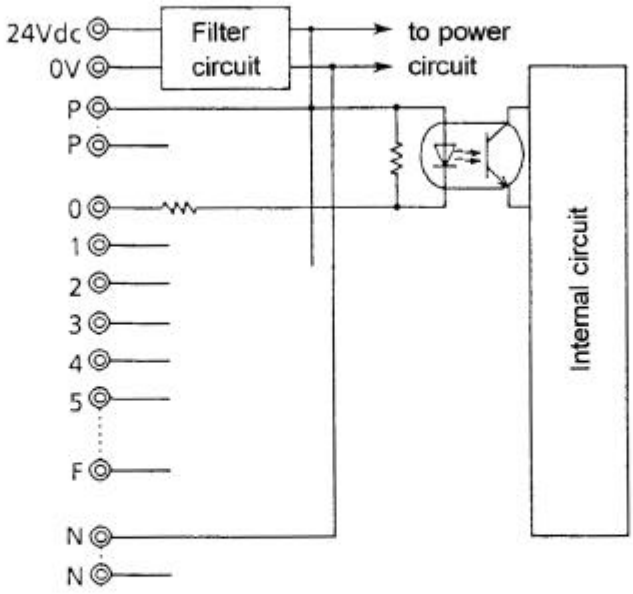
5.2.1 Stations for T3

Item		MS311	RS311
Station type		Master station	Remote PLC station
Max. number on T3		8 stations (MS311 and RS311 total)	
I/O allocation type		TL-F	TL-F
Scan transmission register		32 words (LW000 - LW255)	32 words (LW000 - LW255)
Station control/status register		2 words (SW078 - SW093)	2 words (SW078 - SW093)
Scan error map		2 words (SW094 - SW109)	2 words (SW094 - SW109)
Optional functions	Automatic re-configuration	Yes (selectable)	—
	Read-back check	Yes (selectable)	—
	Scan data synchronize	Yes (selectable)	Yes (selectable)
	Data hold/ reset in error	Yes (selectable)	No (fixed in hold)
LED indication	Status LEDs	Station status (R, S, O, A)	Station status (R, S, O, A)
	RAS LEDs (selectable)	Staion connections	—
		Data send blocks	Data send block
		I/O status of selected RIO	—
		DIP switches setting status	—
		Scan error map	—
Transmission cable connection		5-pin terminal block (removable), M3.5	5-pin terminal block (removable), M3.5
Current consumption		600 mA (5 Vdc)	600 mA (5 Vdc)
Environmental conditions		Conforms to T3 spcifications	
Size		Same as T3 I/O module (1-slot size)	

5.2.3 Remote I/O stations

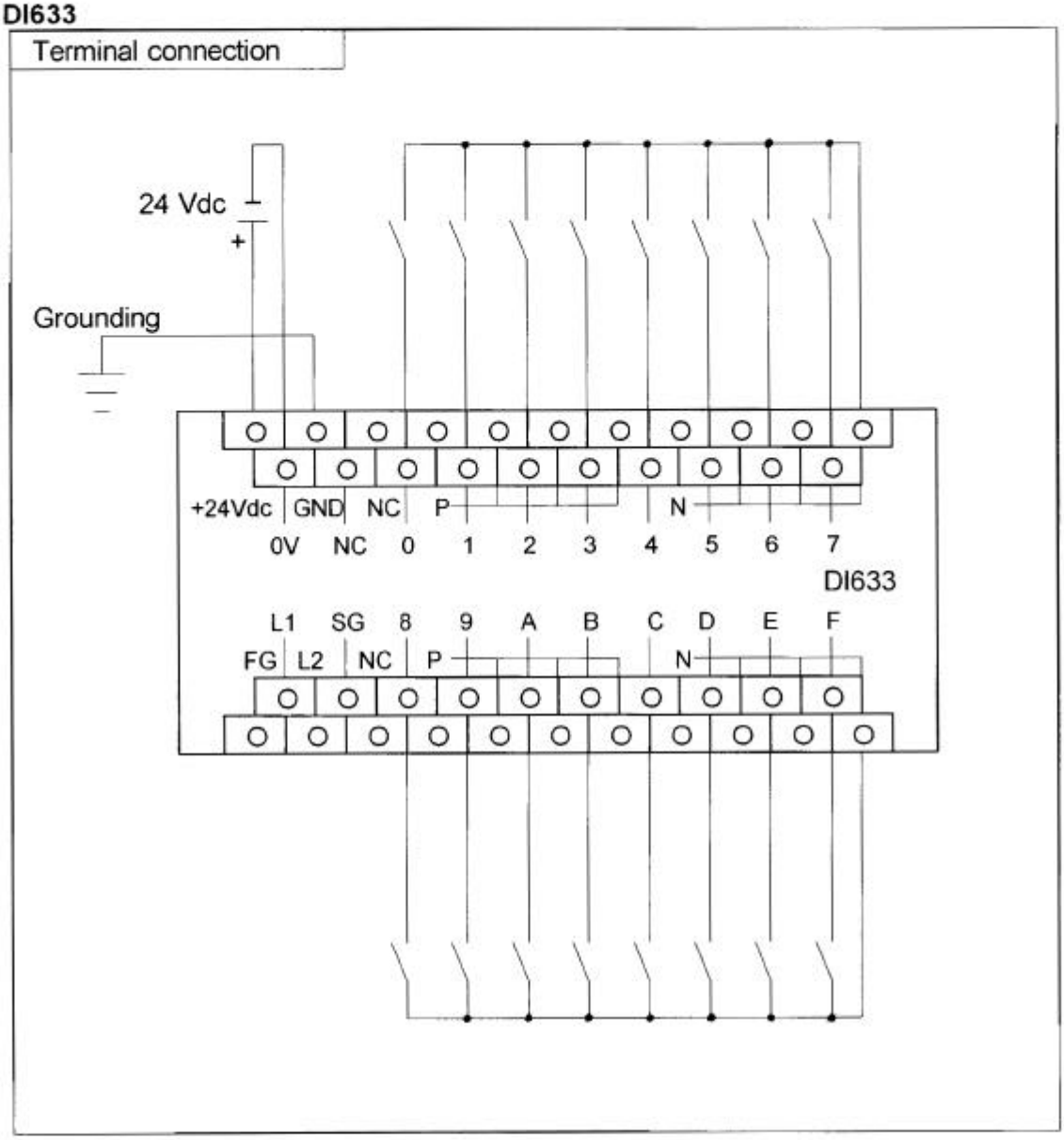
DI633

Item	DI633
Station type	Fixed I/O type remote I/O station
I/O type	DC input
Scan transmission data	1 word
Power supply voltage	24 Vdc
Voltage tolerance	20.4 to 26.4 Vdc
Current consumption	250 mA (including input current - at all points ON)
Input type	Dry contact input (current sourcing)
No. of input points	16 points (16 points per common)
Insulation method	Photo-coupler
Input voltage	Same as power voltage (supplied from the station)
Input current	10 mA (at 24 Vdc)
Minimum ON voltage	Contact close (9.6 V between P and input terminals)
Maximum OFF voltage	Contact open (3.5 V between P and input terminals)
ON delay time	10 ms or less
OFF delay time	15 ms or less
Input status display	LED display for all points, lit at ON, internal logic side
External connection	21-pin removable terminal block × 2, M3.5
Withstand voltage	1500 Vac, 1 minute
Environmental condition	Conforms to T2/T3 specifications
Weight	440 g
Internal circuit	



DI633

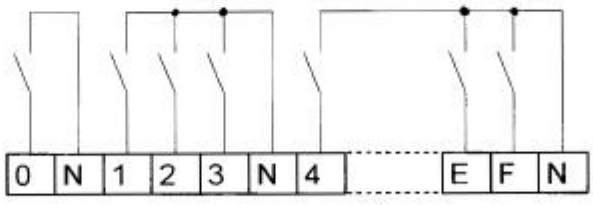
Terminal connection



NOTE ▽▲▽

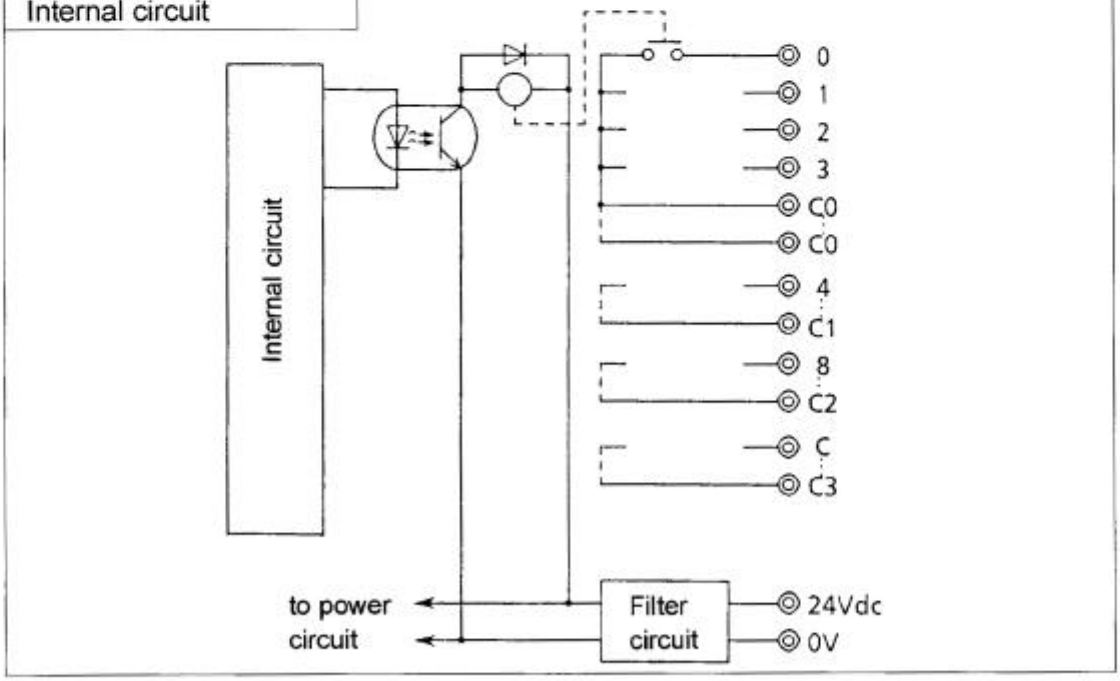
(1) N terminals are connecteed each other inside the station. Depending on the input wiring system, the following connection is also available.

(2) P terminals can be used to supply 24 Vdc to proximity switches, etc. P terminals are connected each other inside the station.



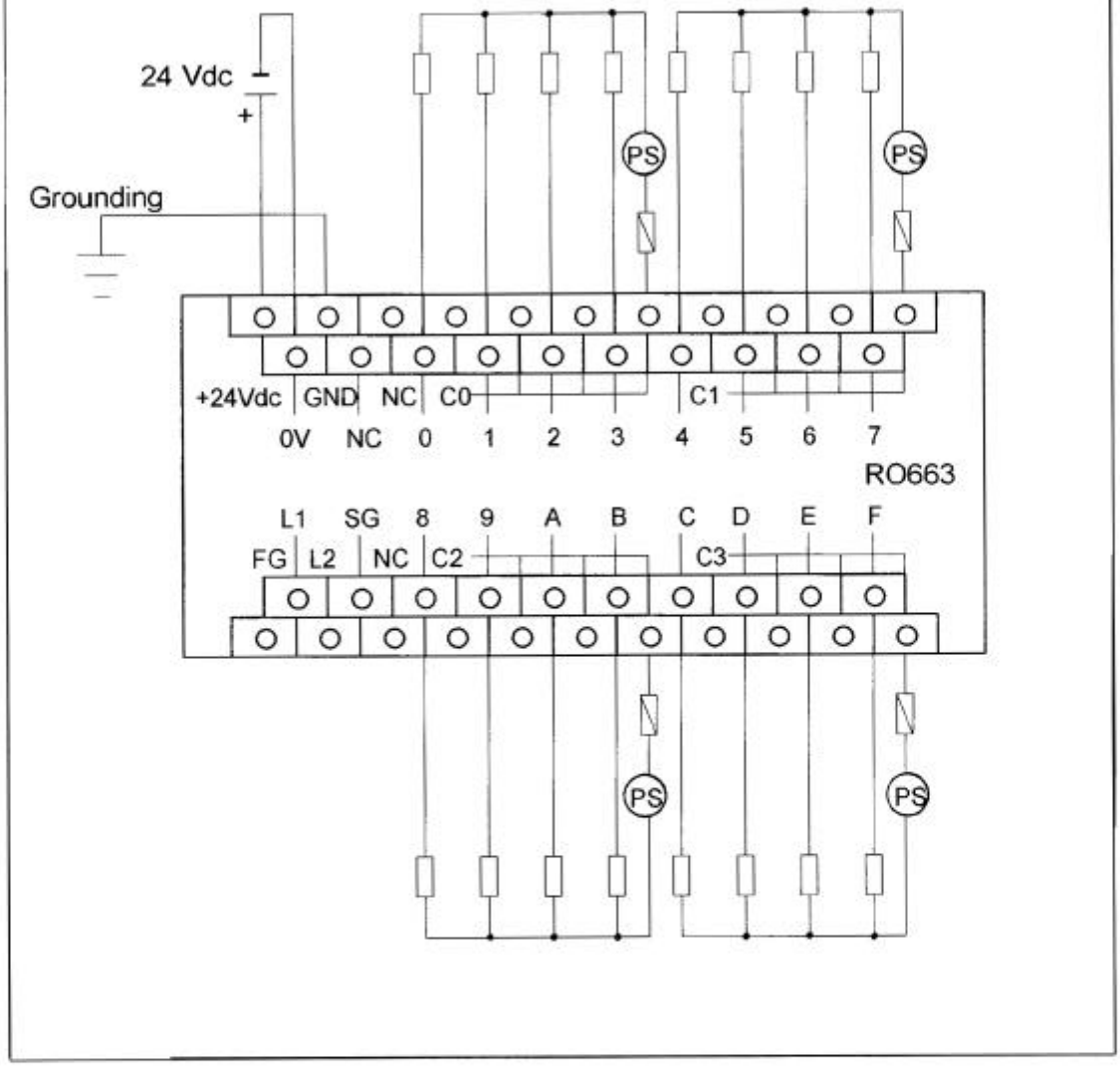
RO663

Item	RO663
Station type	Fixed I/O type remote I/O station
I/O type	Electromechanical relay output
Scan transmission data	1 word
Power supply voltage	24 Vdc
Voltage tolerance	20.4 to 26.4 Vdc
Current consumption	200 mA (at all points ON)
Output type	NO-contact
No. of output points	16 points (4 points per common × 4)
Insulation method	Photo-coupler and relay
Rated load voltage	240 Vac/24 Vdc
Range of load voltage	Up to 264 Vac/125 Vdc
Maximum load current	2 A/point (resistive load), 4 A/common
Contact ON resistance	50 mΩ or less (initial value)
Leakage current at OFF	None
Minimum load current	5 Vdc, 10 mA (50 mW or more)
ON delay time	10 ms or less
OFF delay time	10 ms or less
Output status display	LED display for all points, lit at ON, internal logic side
External connection	21-pin removable terminal block × 2, M3.5
Built-in fuse	None
Withstand voltage	1500 Vac, 1 minute
Environmental condition	Conforms to T2/T3 specifications
Weight	500 g
Internal circuit	



RO663

Terminal connection



NOTE ▽▲▽

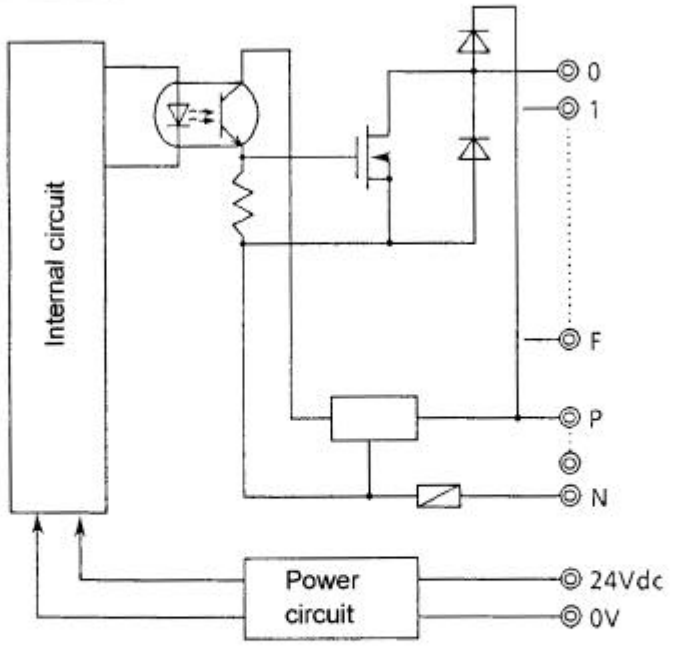
(1) The electrical life of the relay is 100 thousand times or more. (At rated voltage, current)

(2) The mechanical life of the relay is 20 million times or more.

(3) This station does not have protective fuse inside. Install a 4 A fuse per common externally for short-circuit proof.

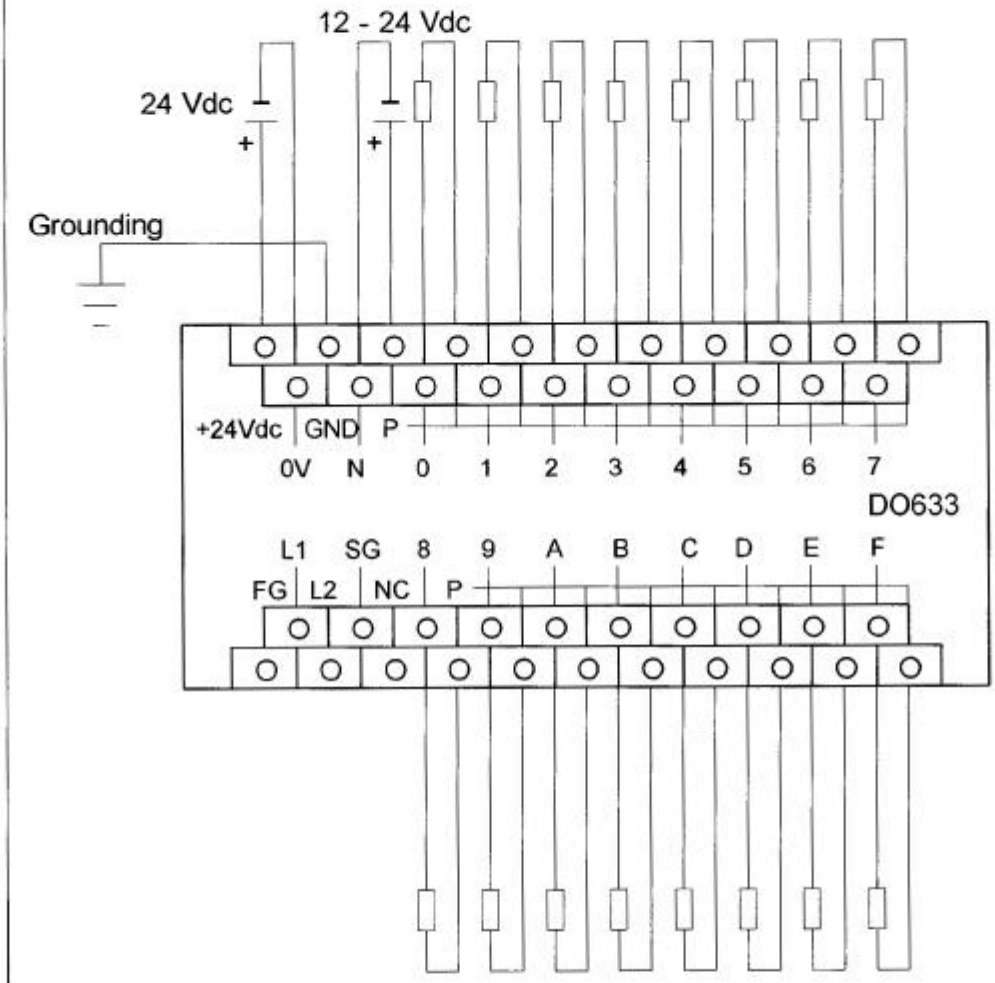
DO633

Item	DO633
Station type	Fixed I/O type remote I/O station
I/O type	Transistor output
Scan transmission data	1 word
Power supply voltage	24 Vdc
Voltage tolerance	20.4 to 26.4 Vdc
Current consumption	200 mA (at all points ON)
Output type	Current sinking
No. of output points	16 points (16 points per common)
Insulation method	Photo-coupler
Rated load voltage	12 to 24 Vdc
Range of load voltage	9.6 to 26.4 Vdc
Maximum load current	1 A/point, 2 A/4 points (transistor array), 4 A/16 points
ON resistance	1.5 Ω or less
Leakage current at OFF	0.1 mA or less
ON delay time	1 ms or less
OFF delay time	1 ms or less
Output status display	LED display for all points, lit at ON, internal logic side
External connection	21-pin removable terminal block × 2, M3.5
Built-in fuse	5 A
Withstand voltage	1500 Vac, 1 minute
Environmental condition	Conforms to T2/T3 specifications
Weight	500 g
Internal circuit	

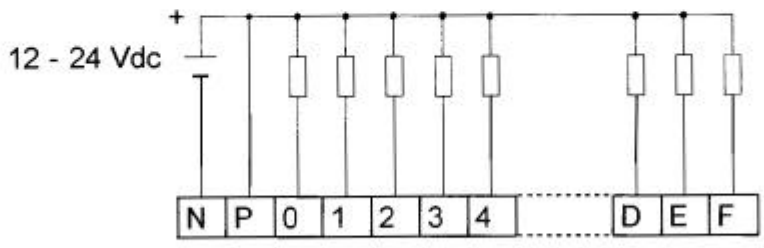


DO633

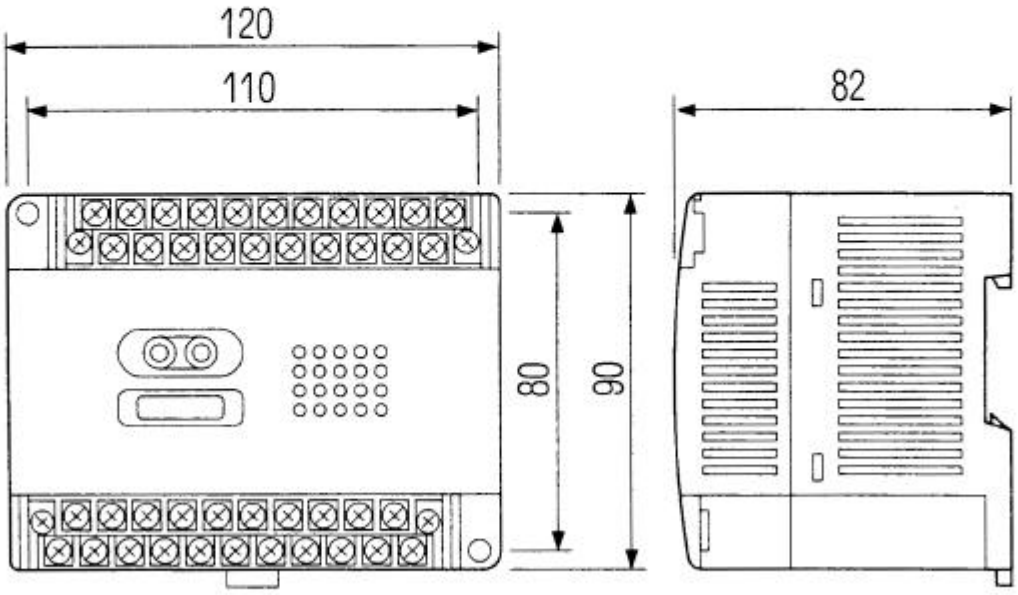
Terminal connection



NOTE ▽▲▽ The output terminals have been arranged to eliminate the external terminals for wire branching. Depending on the load power system, the following connection is also available.



External dimensions of DI633, RO663 and DO633



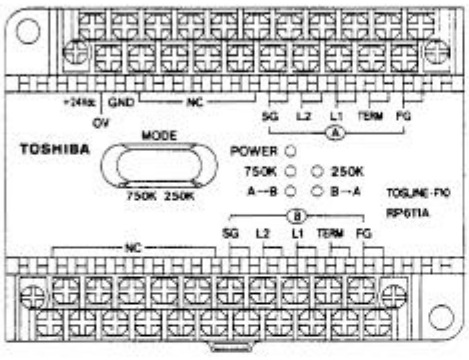
[mm]

5.3 Repeater specifications

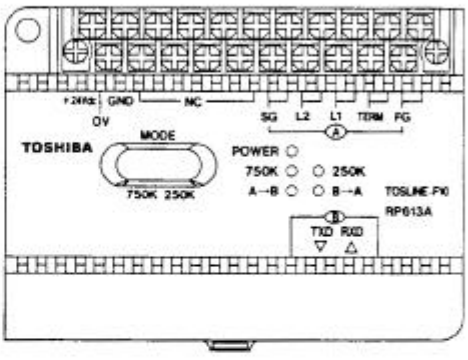
Item		RP611A	RP613A
Type		Electric/electric	Elecrtic/optic
Max. number on the line		2	2 (used in a pair)
Transmission line isolation		Photo-coupler	Optical fiber
Transmission speed		750 kbps (High speed mode) / 250 kbps (Long distance mode) } Selectable	
Transmission cable	Electric	Conforms to F10 system specification	
	Optic	—	H-PCF 200/230 μm
Cable connection	Electric	Removable terminal block, M3.5	
	Optic	—	F08 type connector (JIS C5977)
Transmission distance	Electric	Conforms to F10 system specification	
	Optic	—	Max. 1000 m (between RP613As)
Power supply voltage		24 Vdc	
Voltage tolerance		20.4 to 26.4 Vdc	
Power interruption		Continuous operation within 1 ms	
Power consumption		8 W or less	
Withstand voltage		500 Vac, 1 minute	
Environmental condition		Conforms to T2/T3 specifications	
Weight		500 g	

External features

RP611A



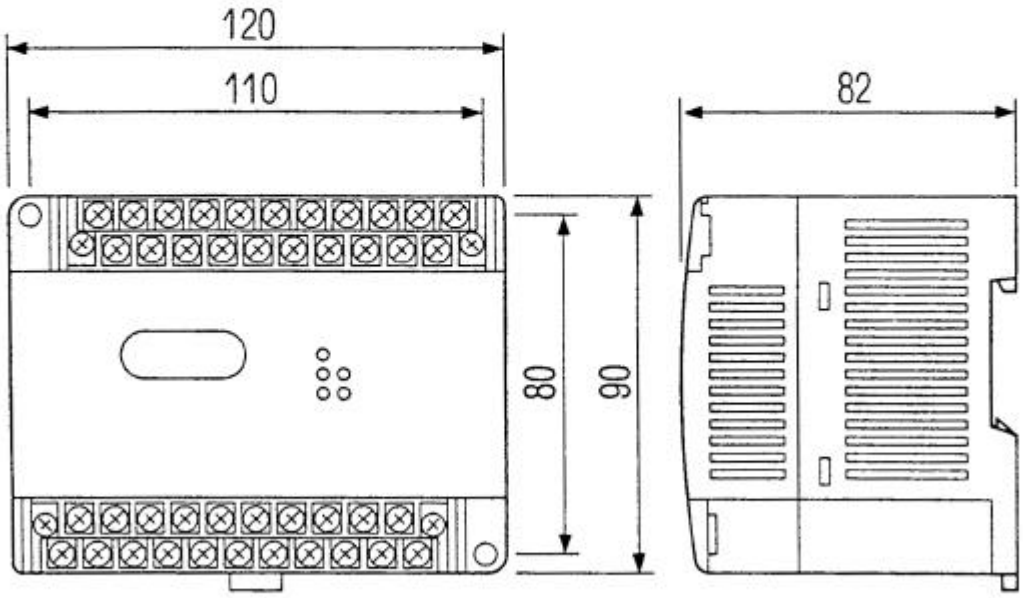
RP613A



NOTE Refer to Secttion 6 for cable connections and cable specifications.

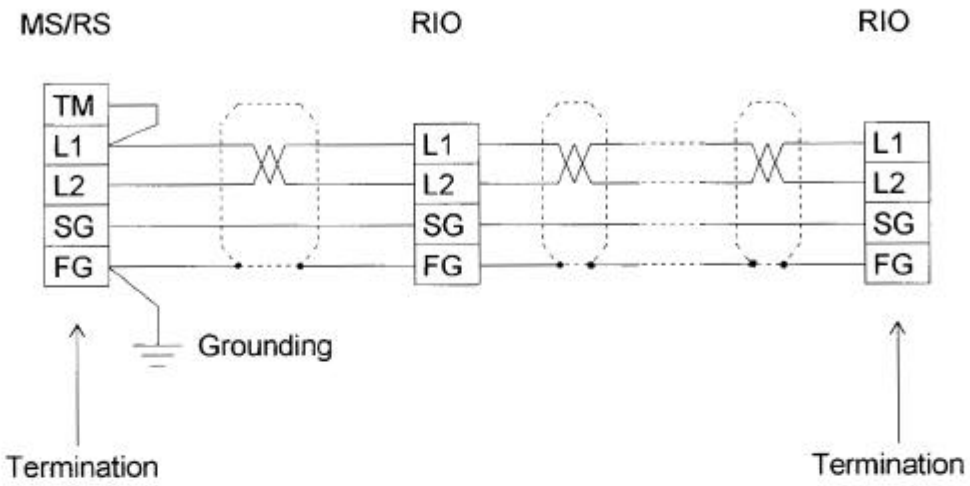
▽▲▽

External dimensions of the repeater



[mm]

6. Cable Connection



6.1 Transmission cable connection

- Three terminals are provided for transmission, L1 (Line 1), L2 (Line 2), and SG (Signal ground).
- Connect L1 to L1, L2 to L2, and SG to SG, every stations.
- The topology is bus connection (party line). The line must be terminated at both ends. Only 2 terminal stations are allowed.
- Use shielded twisted-pair cable. L1 and L2 should be paired. (SG connection should be other pair)
- The maximum cable length is dependent on the transmission mode and the cable size. Refer to Section 6.5 Cable specifications.

NOTE ▽▲▽ (1) Separate the transmission cable from high power lines and equipment as far as possible. The table below shows a guideline for the distance between the cable and high power line when they run in parallel.

Power line	Minimum distance (mm)			
Voltage Current	> 100 A	100 - 50 A	50 -10 A	10 A >=
more than 440 V	2000	2000	2000	2000
440 V or less	2000	600	600	600
220 V or less	2000	600	600	500
110 V or less	2000	600	500	300
60 V or less	2000	500	300	150

(2) Cable branching or relaying by terminals, or usage of different type cables on a line are not allowed.

6.2 Termination

- At both termanal stations, the termination setting is necessary. To set termination;

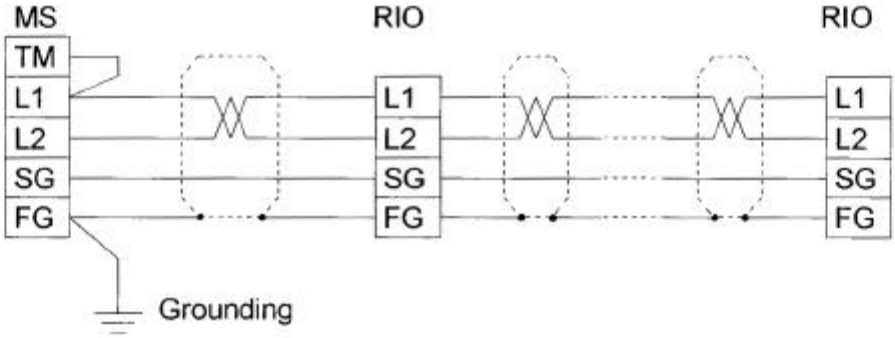
  MS/RS ···· Short TM (TERM) and L1 terminals.
  RIO ····· Set the switch No.8 of the DIP switch to ON at the RIO.

- At other stations, the termination must not be set. Otherwise F10 data transmission cannot be performed correctly.

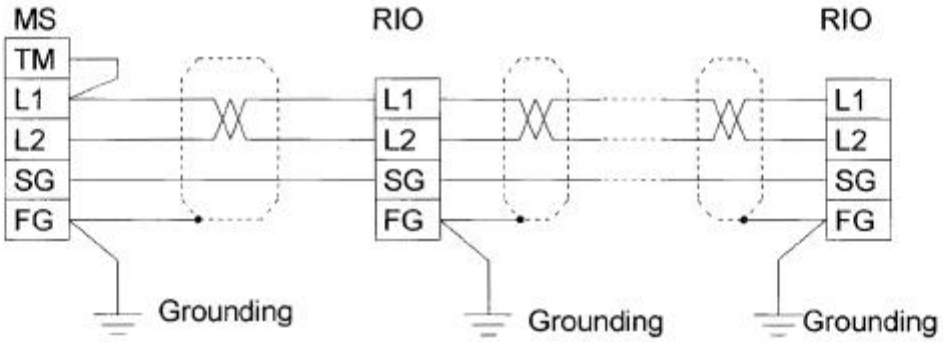
6.3 Grounding

- The cable shield should be connected to a stable grounding point (less than 100 Ω to earth) by 2 mm^2 wire in shortest distance.
- The follwing two methods for grounding are available. Select either method case by case.

a) Grounding at single station
Connect the cable shield with FG terminals of every stations. And at one station (normally at MS), connect the FG to ground.



b) Grounding at each station
Connect the cable shield with FG terminal of each one side station. And connect the FG to ground at each station.

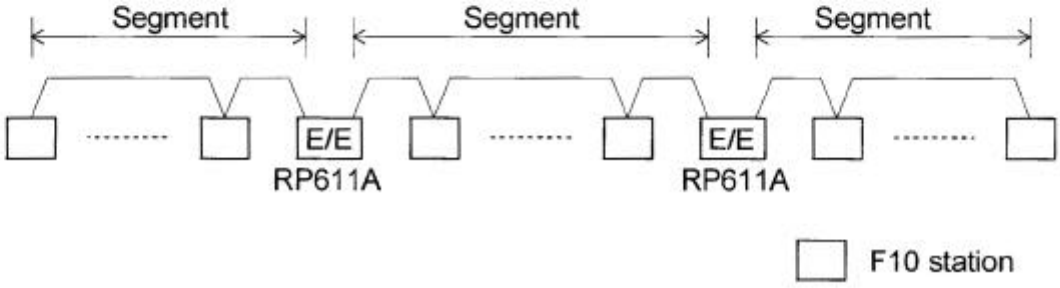


6.4 Using the repeater

By using the repeater, the F10 transmission line can be extended. Up to 2 repeaters (RP611As or RP613As) can be used on a line.

NOTE ▽▲▽
(1) Set the transmission speed (750 kbps or 250 kbps) of the repeater(s) to meet the system setting. Otherwise data transmission cannot be performed correctly.
(2) Even if the repeater(s) is used, the number of stations connectable on a line is not changed. (max. 32 remote stations)

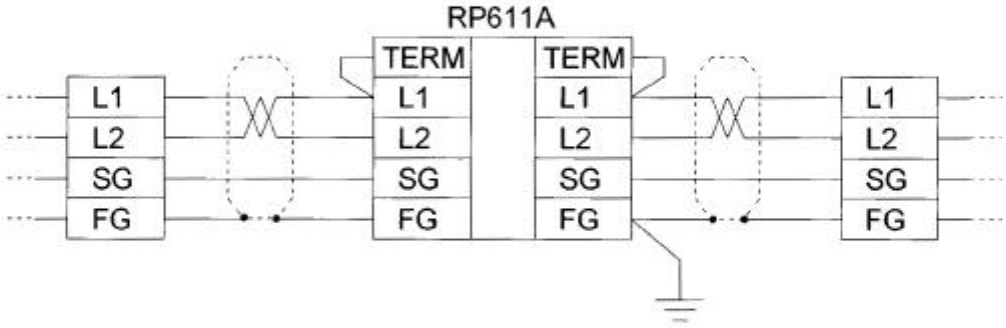
(1) RP611A (Electric/elecrtic type)



・ Transmission distance

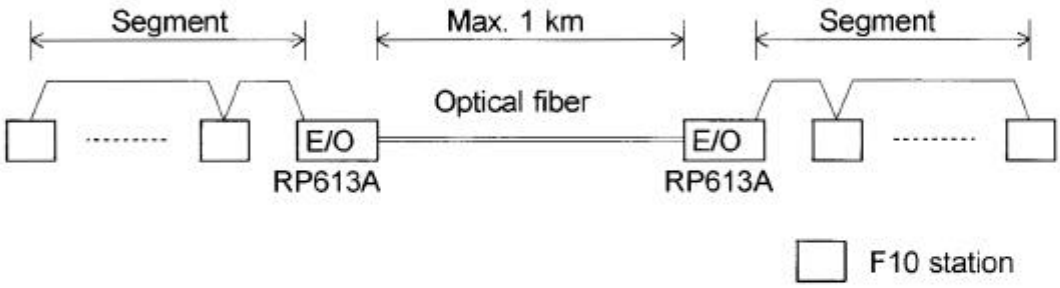
Maximum distance		Cable size		
		1.2 mm ϕ	0.75 mm^2	0.5 mm^2
High speed mode (750 k)	Segment	500 m	300 m	200 m
	Total	1500 m	900 m	600 m
Long distance mode (250 k)	Segment	1000 m	600 m	400 m
	Total	3000 m	1800 m	1200 m

・ Cable connections



When the RP611A is a terminal, short TERM and L1 on the RP611A.

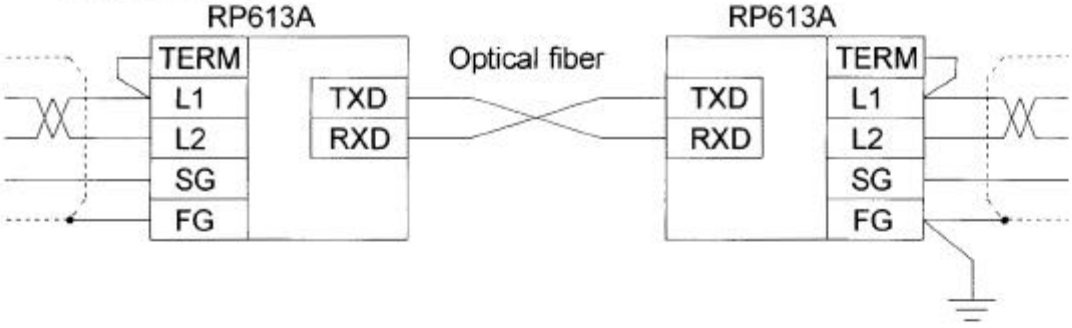
(2) RP613A (Electric/optic type)



・ Transmission distance

Maximum distance		Cable size		
		1.2 mm ϕ	0.75 mm^2	0.5 mm^2
High speed mode (750 k)	Segment	500 m	300 m	200 m
	Total	2000 m	1600 m	1400 m
Long distance mode (250 k)	Segment	1000 m	600 m	400 m
	Total	3000 m	2200 m	1800 m

・ Cable connections



The RP613As must be used in a pair.
When the RP613A is a terminal, short TERM and L1 on the RP613A.

6.5 Cable specifications

The following cable or equivalent should be used for the F10 transmission line.

Manufacturer		Showa Electric Wire & Cable		
Cable type		CPEV-CU	KMPEV-SB	KMPEV-SB
Conductor size		1.2 mm ϕ (solid)	0.75 mm^2 (7 × 0.35 mm)	0.5 mm^2 (7 × 0.29 mm)
Shields		Cupper tape	Cupper braid	Cupper braid
Number of pairs		2	2	2
Jacket		Polyethylene insulated Polyvinyl chloride sheath		
Conductor resistance (Ω/km, at 20°C)		16.5 or less	28.5 or less	42.0 or less
Insulation resistance (MΩ-km)		10000 or more	10000 or more	10000 or more
Withstand voltage (Vac/1 minute)		1000	1000	1000
Allowable distance	High speed mode	Max. 500 m	Max. 300 m	Max. 200 m
	Long distance mode	Max. 1000 m	Max. 600 m	Max. 400 m

When the electric/optic type repeaters (RP613A) are used, the following optical fiber cable with optical connectors should be used.

Manufacturer	Berg Electronics
Cable type	DL2-A12HP (part number:) — for inside panel DL2-B12HP (part number:) — for outside panel
Optical fiber cable	H-PCF (Hard polymer cladding fiber), SI (Step index) type 200/230 μm (core/cladding dia.)
Optical connector	F08 type (DL type) connector (JIS C5977)
Allowable distance	Max. 1000 m

Optical fiber characteristics

Material	Hard polymer cladding, Sillica glass core, Step index
Core diameter	200 ±5 μm
Cladding diameter	230 +0/ -10 μm
Numerical Aperture	0.37
Attenuation	7 dB/km or less
Bandwidth	17 MHz·km or more

7. Transmission Mode Details

7.1 High speed mode and Long distance mode

Function:

The F10 transmission speed can be selected either 750 kbps or 250 kbps.
The 750 kbps mode is called High speed mode, and the 250 kbps mode is called Long distance mode.
In the Long distance mode, although the F10 scan cycle is slower, the allowable transmission distance becomes longer. The table below shows the scan cycle and the allowable maximum distance of the F10 transmission line (bus connection segment).

Mode		High speed mode	Long distance mode
Transmission speed		750 kbps	250 kbps
Scan cycle		7 ms/32 words	12 ms/32 words
Max. distance by cable size	1.2 mm ϕ	500 m	1000 m
	0.75 mm^2	300 m	600 m
	0.5 mm^2	200 m	300 m

Setting:

These modes are selected by the operation mode setting switch (DIP switch) on each station and the MODE switch on the repeater.

High speed mode: (Factory setting)

MS/RS for T2	DIP0 - No.1	→	OFF
MS/RS for T3	DSW0 - No.1	→	OFF
RIO	DIP - No.1	→	OFF
Repeater	MODE switch	→	750K

Long distance mode:

MS/RS for T2	DIP0 - No.1	→	ON
MS/RS for T3	DSW0 - No.1	→	ON
RIO	DIP - No.1	→	ON
Repeater	MODE switch	→	250K

NOTE Every stations and repeaters on a F10 system must be set to the same mode.
▽▲▽

7.2 Automatic re-configuration mode

Function:

In the standard mode, the MS checks existing stations on the F10 system only at the timing of power to the MS comes on. Therefore, if power to a remote station (RS or RIO) comes on after the MS power on, the remote station will not be recognized by the MS and cannot join in the F10 system.
To enable random power on to the stations, the automatic re-configuration mode is provided.
In the automatic re-configuration mode, the MS checks the existence of a station every scan (for 1 adderss per scan). Therefore the scan cycle becomes longer. (see Note below)

Setting:

This mode is selected by the operation mode setting switch (DIP switch) on the MS.

Standard mode: (Factory setting)

MS for T2	DIP0 - No.4	→	OFF
MS for T3	DSW0 - No.4	→	OFF

Automatic re-configuration mode:

MS for T2	DIP0 - No.4	→	ON
MS for T3	DSW0 - No.4	→	ON

NOTE ▽▲▽ In the automatic re-configuration mode, the MS send the command that requests response for the transmission adderss. The address is shifted from 0 to 31 each scan. (1 address per 1 scan)
The scan cycle is extended by the following values.

- If a station corresponding to the address exists ..... 1.4 ms
- If a station corresponding to the address does not exist ..... 19.5 ms

When the application system requires quick respnse, the automatic re-configuration mode is not recommended. For the scan cycle, refer to Appendix A.1.

7.3 Read-back check mode

Function:

In the standard mode, it cannot be monitored whether an output type RIO has received the data correctly or not.
If the read-back check mode is selectd, the MS reads back the data from the output type RIO and reflects the result on the scan error map. The check mode can be selected either 1 station check per scan or all output stations check per scan.
In the read-back check mode, the scan cycle becomes longer. (see Note below)
The read-back check is not valid for the RS.

Setting:

This mode is selected by the operation mode setting switch (DIP switch) on the MS.

Standard mode: (Factory setting)

MS for T2	DIP0 - No.5	→	OFF
MS for T3	DSW0 - No.5	→	OFF

Read-back check mode (1 station per scan):

MS for T2	DIP0 - No.5	→	ON
	DIP0 - No.6	→	OFF
MS for T3	DSW0 - No.5	→	ON
	DSW0 - No.6	→	OFF

Read-back check mode (All stations per scan):

MS for T2	DIP0 - No.5	→	ON
	DIP0 - No.6	→	ON
MS for T3	DSW0 - No.5	→	ON
	DSW0 - No.6	→	ON

NOTE ▽▲▽ The read-back check processing needs 1.4 ms per one station if read-back data is normal, and 19.5 ms per one station if no response is received.
When the application system requires quick respnse, the read-back check mode is not recommended.
For the scan error map, refer to Section 9.1, and for the scan cycle, refer to Appendix A.1.

7.4 Scan data synchronization mode

Function:

The synchronization of 32 words of scan data is guaranteed in this mode. This function is available for data linkage between MS and RS when both the MS and the RS are set to this mode. (Even in the standard mode, 1 word data is guaranteed.)
This mode selection is available for the MS/RS for T3. The MS/RS for T2 is fixed in the scan data synchronization mode.

Setting:

This mode is selected by the operation mode setting switch (DIP switch) on the MS/RS for T3.

Standard mode: (Factory setting)

MS/RS for T3	DSW0 - No.7	→	OFF

Scan data synchronization mode:

MS/RS for T3	DSW0 - No.7	→	ON

NOTE ▽▲▽
(1) When the scan data synchronization mode is selected, the transmission delay from PLC to PLC becomes longer. For the response time, refer to Appendix A.1.
(2) In the scan data synchronization mode, all 0 data are sent from MS/RS to other stations at first scan transmission cycle, and all 0 data are returned to T2/T3 during first scan transmission cycle. Therefore, it is recommended to use the user-defined status flag (normally ON) which indicates the start of data linkage.

7.5 Scan data hold/reset selection in error

Function:

In the case of time-out error is detected in an output type RIO, the output status of the RIO can be selected either hold or reset (all OFF) by switch setting.
This selection is valid for output type RIO and MS.
In case of MS, when the hold mode is selected, the scan data (receive data) will remain unchanged if time-out error is detected for the address. On the other hand, when the reset mode is selected, the scan data (receive data) will be reset to 0 if time-out error is detected. Of course, in either mode, the time-out error can be monitored in the PLC application program by referring to the scan error map.
(RS is fixed in the hold mode)

Setting:

These modes are selected by the operation mode setting switch (DIP switch) on the station.

Hold mode:

MS for T2	DIP1 - No.5	→	OFF	(Factory setting)
MS for T3	DSW1 - No.5	→	OFF	(Factory setting)
RIO	DIP - No.2	→	ON	

Reset mode:

MS for T2	DIP1 - No.5	→	ON	
MS for T3	DSW1 - No.5	→	ON	
RIO	DIP - No.2	→	OFF	(Factory setting)

8. F10 Control by PLC

8.1 Command register and status register

Two SW registers of the T2/T3 are assigned to the MS/RS. These are called command register and status register. By using these registers, the T2/T3's application program can control the F10 transmission.
The table below shows the register assignment.

MS/RS	Command register	Status register
CH1	SW078	SW079
CH2	SW080	SW081
CH3	SW082	SW083
CH4	SW084	SW085
CH5	SW086	SW087
CH6	SW088	SW089
CH7	SW090	SW091
CH8	SW092	SW093

(1) Command register
The bit assignment is shown below. Bits 0 to 7 reflect the operation status and bits 8 to F work for commands from the T2/T3.

Bit	Name	0	1
0 *	Transmission status	Not executing	Executing
1	Output inhibition status	Normal	Output inhibited
2	Re-configuration status	Normal	Under re-configuration
3	Reserved	Always 0	—
4	Scan error flag	Normal	Scan error occurring
5	Reserved	Always 0	—
⋮			
7			
8 *	Transmission stop request	Normal	Transmission stop
9	Output inhibition request	Normal	Output inhibition
A	Reserved	Set to 0	—
⋮			
F			

NOTE In case of RS, only the * marked bits have the function.
▽▲▽

(2) Status register

The bit assignment is shown below. This register reflects the operation status.

Bit	Name	0	1
0 *	Transmission status	Not executing	Executing
1	Scan transmission status	Not executing	Executing
2	Reserved	Always 0	—
⋮			
4			
5	MS mode	Normal	Test mode
6 *	Station type	MS	RS
7	Reserved	Always 0	—
⋮			
F			

NOTE In case of RS, only the * marked bits have the function.

▽▲▽

8.2 Functions

By controlling the command register from the T2/T3's application program, the following functions are available.

- Transmission stop request
- Output inhibition request

Also, the F10 operation status can be monitored by using the status register (and a part of the command register).

In this section, the following expression is used for explanation.

CMD<8> ····· Bit 8 of the command register
STS<0> ····· Bit 0 of the status register

(1) Commands

- Transmission stop request
  When CMD<8> is set to ON, the MS/RS's transmission will be stopped. Then CMD<8> is reset to OFF, the transmission will be started.

- Output inhibition request
  When CMD<9> is set to ON, output signals of the output type RIOs are reset to OFF (or holded if the data hold mode is selected). Also, receive data of RSs are holded.

(2) Status flags

- Transmission status (CMD<0> and STS<0>)
  These flags are ON while the transmission is executing.

- Output inhibition status (CMD<1>)
  When the output inhibition request has been accepted, this flag comes ON.

- Re-configuration status (CMD<2>)
  In the automatic re-configuration mode, this flag is ON while the F10 is under re-configuration operation.

- Scan error flag (CMD<4>)
  This flag comes ON when some error has occurred in the scan transmission. (OR condition of the scan error map)

- Scan transmission status (STS<1>)
  This flag is ON while the scan transmission is executing normally.

- MS mode (STS<5>)
  When the MS is in the test mode (see Section 9.4), this flag is ON. In the normal mode, this flag is OFF.

- Station type (STS<6>)
  This flag represents the type of station allocated. This flag is OFF for MS, and ON for RS.

9. RAS Function

9.1 Scan error map

The scan error map indicates the F10's scan data updating status for each address. This information is reflected in the SW registers of T2/T3, and can be referred in the T2/T3's application program.
In the standard mode, the scan error map is effective only for receive data. However, if the read-back check mode is used, the check status for send data is also reflected in the map. (MS only)
Refer to Section 7.3 for the read-back check mode.

NOTE ▽▲▽ In the read-back check mode, the data send block for RS is indicated as error on the scan error map. Because the data sending for RS is broadcast.

	F	E	D	·····	2	1	0	
SW094	LW015	LW014	LW013		LW002	LW001	LW000	CH1
SW095	LW031	LW030	LW029		LW018	LW017	LW016	
SW096	LW047	LW046	LW045		LW034	LW033	LW032	CH2
SW097	LW063	LW062	LW061		LW050	LW049	LW048	
⋮								
SW108	LW239	LW238	LW237		LW226	LW225	LW224	CH8
SW109	LW255	LW254	LW253		LW242	LW241	LW240	

In case of MS:

LWn = 1: The scan data assigned to LWn is not being updated by an error.
= 0: The scan data assigned to LWn is being updated normally or LWn is not assigned to scan data.

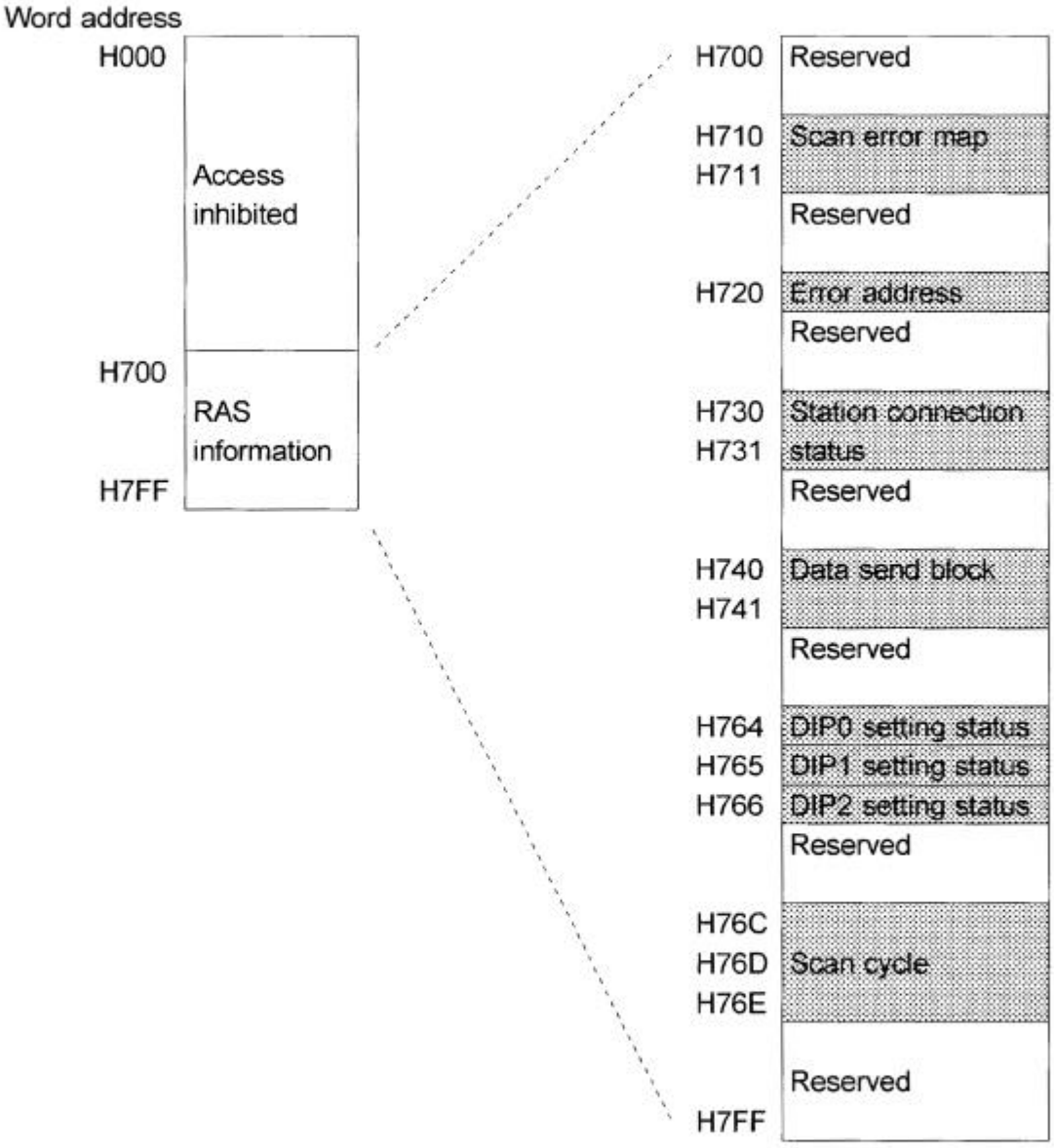
In case of RS:

LWn = 1: The scan data assigned to LWn is not being updated by an error or LWn is not assigned to scan data.
= 0: The scan data assigned to LWn is being updated normally.

NOTE ▽▲▽ When the scan transmission recovers from error (CRC error, time-out. etc.) the scan error map is reset to OFF (0) automatically.

9.2 Internal memory

The MS/RS has the internal memory which stores RAS information.
This memory contents can be read from the T2/T3's application program by READ instruction (FUN237).
The overall map of the internal memory is shown below.



NOTE ▽▲▽ You should not write any data into this memory. Also, you should not read data from the addresses H000 to H6FF.

9.2.1 Internal memory contents

(1) Scan error map (H710, H711)

The scan error map indicates the F10's scan data updating status for each address. In the standard mode, the scan error map is effective only for receive data. However, if the read-back check mode is used, the check status for send data is also reflected in the map. (MS only)
Refer to Section 9.1.

	F	E	D	C	----------	3	2	1	0
H710	15	14	13	12		3	2	1	0
H711	31	30	29	28		19	18	17	16

0 - 31: Transmission address
= 1: The scan data is not being updated by an error.
= 0: The scan data is being updated normally or not assigned.

(2) Error address (H720)

The latest address of scan error has occurred is stored.

	F	----------	5	4	3	2	1	0
H720	*		*	Address				

Address: Latest error address (0 - 31)
* : Not used

(3) Station connection status (H730, H731)

This information indicates the existing stations corresponding to the transmission address.

	F	E	D	C	----------	3	2	1	0
H730	15	14	13	12		3	2	1	0
H731	31	30	29	28		19	18	17	16

0 - 31: Transmission address
= 1: The station corresponding to the address is existing.
= 0: The station corresponding to the address is not existing.

(4) Data send block (H740, H741)
This information indicates the data send block of the station. If the station is MS, the addresses corresponding to the output type RIOs and the data sending addersses for RSs are indicated.

	F	E	D	C	----------	3	2	1	0
H740	15	14	13	12		3	2	1	0
H741	31	30	29	28		19	18	17	16

0 - 31: Transmission address
= 1: Data sending
= 0: Data receiving or not assigned

(5) DIP switches setting status (H764, H765, H766)
This information indicates the setting status of the DIP switches (Operation mode setting switches).

	F	-------	8	7	6	5	4	3	2	1	0
H764	*		*	DIP0 setting status							
H765	*		*	DIP1 setting status							
H766	*		*	DIP2 setting status							

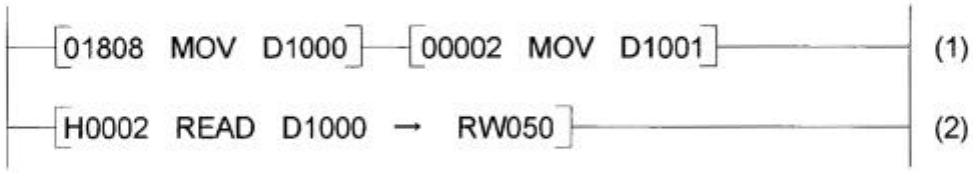
Bits 0 - 7 correspond to switch No.1 - No.8
= 1: The switch is ON.
= 0: The switch is OFF.
Bits 8 - F are not used.

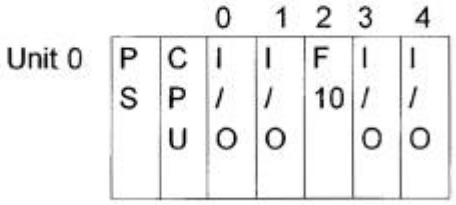
(6) Scan cycle (H76C, H76D, H76E)
The F10's scan cycle is stored as minimum, current, and maximum data. The data unit is [× 1.3 ms]. For example, if the data is 9, the scan cycle is 9 × 1.3 = 11.7 ms.

	F ---------- 0
H76C	Minimum
H76D	Current
H76E	Maximum

9.2.2 Reading the internal memory

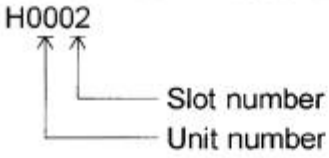
The internal memory contents can be read by the READ instruction (FUN237).
The sample program is shown below. For detailes of T-series instruction set, refer to the separate manual.



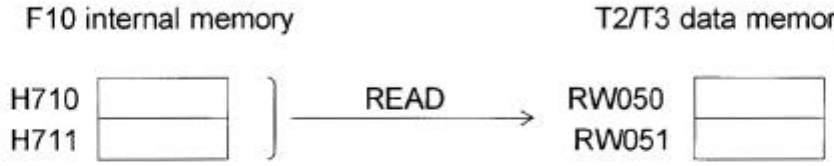


(1) Sets the starting address of reading-out (1808 = H710) into D1000.
Sets the size (words) of reading-out data (2 words) into D1001.

(2) Reads the internal memory data according to the parameters of D1000 and D1001, from the module mounted on Unit 0 - Slot 2, and stores them into RW050 and after.



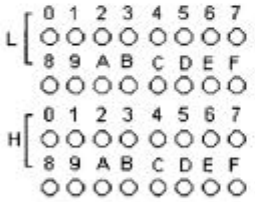
By executing this program, the internal memory contents (H710 and H711) of the F10 station mounted on Unit 0 - Slot 2 are read and stored into RW050 and RW051.



9.3 Monitoring by LEDs

RAS information LEDs (32) are provided on the MS and RS. The following information can be displayed on the LEDs by selecting the monitor mode switch (rotary switch).

NOTE In case of RS, the display information is fixed as "data send block".
▽▲▽



← RAS information LEDs

- Station connection status (Monitor mode switch = 0)
- Data send block (Monitor mode switch = 1 or RS)
- I/O signal status (Monitor mode switch = 2)
- DIP switches setting status (Monitor mode switch = 3)
- Scan error map (Monitor mode switch = 5)

(1) Station connection status (Monitor mode switch = 0)
This information indicates the existing stations corresponding to the transmission address.

	0	1	2	3	----------	C	D	E	F
L	0	1	2	3		12	13	14	15
H	16	17	18	19		28	29	30	31

0 - 31: Transmission address
- Lit: The station corresponding to the address is existing.
- Not lit: The station corresponding to the address is not existing.

(2) Data send block (Monitor mode switch = 1 or RS)
This information indicates the data send block of the station.

	0	1	2	3	----------	C	D	E	F
L	0	1	2	3		12	13	14	15
H	16	17	18	19		28	29	30	31

0 - 31: Transmission address
- Lit: Data sending
- Not lit: Data receiving or not assigned

(3) I/O signal status (Monitor mode switch = 2)
The I/O signal status of selected address is displayed. The station number setting switches on the MS is used to select the address.

	0	1	2	3	----------	C	D	E	F
L	I/O signal status of address N								
H	I/O signal status of address N+1								

Address N: Setting number of the station number setting switches
- Lit: Signal ON
- Not lit: Signal OFF

(4) DIP switches setting status (Monitor mode switch = 3)
This information indicates the setting status of the DIP switches (Operation mode setting switches).

	0	1	2	3	4	5	6	7	8	----	F
L	DIP0 setting status								Not lit		
H	DIP1 setting status								Not lit		

LEDs 0 - 7 correspond to switch No.1 - No.8
- Lit: Switch ON
- Not lit: Switch OFF

LEDs 8 - F are not used.

(5) Scan error map (Monitor mode switch = 5)
This information indicates the F10's scan data updating status for each address.

	0	1	2	3	----------	C	D	E	F
L	0	1	2	3		12	13	14	15
H	16	17	18	19		28	29	30	31

0 - 31: Transmission address
- Lit: The scan data is not being updated by an error.
- Not lit: The scan data is being updated normally or not assigned.

9.4 Test mode

The MS supports the test mode. The test mode is effective for system checking.
In the test mode, the following two functions are available.

- Search function
- Station connection monitor

To set the MS to the test mode, set DIP1 - No.1 (operation mode setting switch) to ON.

(1) Search function
Set the monitor mode switch (rotary swich) on the MS to 0.
The remote station (RIO or RS) which is selected by the MS's station number setting switches is searched. And the RUN LED on the searched remote station will blink.
By using this function, allocation of each remote station can be checked.

(2) Station connection monitor
Set the monitor mode switch (rotary swich) on the MS to 1.
The existing stations corresponding to the transmission address are displayed on the RAS information LEDs.

	0	1	2	3	----------	C	D	E	F
L	0	1	2	3		12	13	14	15
H	16	17	18	19		28	29	30	31

0 - 31: Transmission address
- Lit: The station corresponding to the address is existing.
- Not lit: The station corresponding to the address is not existing.

NOTE In the test mode, the scan transmission is not executed.
▽▲▽

A.1 Response time

The response time of the F10 system can be defined as follows.

> The time elapsed between a change of input signal state at the input type RIO and the corresponding change in the output signal state at the output type RIO.

The PLC's scan and the F10's scan are not synchronized. Therefore, the maximum response time can be calculated by the following formula.

- Non-synchronization mode
  TRT = TFID + TFSC + 2·TPSC + TFSC + TFOD
- Synchronization mode (TFSC > TPSC)
  TRT = TFID + 2·TFSC + 2·TPSC + 3·TFSC + TFOD
- Synchronization mode (TFSC < TPSC)
  TRT = TFID + TFSC + 4·TPSC + 2·TFSC + TFOD

Here;

TRT:	Response time
TPSC:	PLC scan time
TFSC:	F10 scan cycle
TFID:	RIO Input delay
TFOD:	RIO output delay

On the other hand, the F10 scan cycle (TFSC) can be estimated as follows.

- High speed mode
  TFSC = (0.6 + 0.20·N) + α + β·M [ms]
- Long distance mode
  TFSC = (0.6 + 0.35·N) + α + β·M [ms]

Here;

N: Number of total transmission words

α : 0 when non-re-configuration mode
1.4 (high speed mode)
2.0 (long distance mode) } when re-configuration mode (normal case)
19.5 when re-configuration mode (in case of response time-out)

β : 0 when non-read-back mode
1.4 (high speed mode)
2.0 (long distance mode) } when read-back mode (normal case)
19.5 when read-back mode (in case of response time-out)

M: 1 for 1 station read-back per scan
Number of MS's sending words for all stations read-back per scan

A.2 LED indication

(1) MS/RS status LEDs

On the MS/RS, 4 status LEDs are provided. They are R (run), S (scan), O (option) and A (access).

The A (access) flickers when PLC (T2/T3) accesses the MS/RS. And other 3 LEDs indicate the station status as follows.

R	S	O	Status	Possible cause
Lit	Lit	Not lit	Normal state	–
Lit	Not lit	Not lit	Scan transmission is not being executed.	• PLC is in HALT or ERROR mode. • Transmission has been stopped by command. • Scan transmission error has occurred.
Blink	Not lit	Not lit	Searched in test mode	• RS only
Blink	Not lit	Blink	Station mode setting error state	• Reserve switchs on the DIP switches have been set to ON. (They must be OFF) • Station number illegal (RS)
Not lit	Blink simultaneous	Blink		
Not lit	Blink alternate	Blink	Watchdog timer error has occurred.	• External noise • Station internal failure
Not lit	Not lit	Not lit	Error state	• Station hardware failure • 5 Vdc power is not being supplied.

(2) RIO status LEDs

On the RIO, 4 status LEDs are provided. They are Power, Run, Scan and Alarm. The Power LED is lit when power to the RIO is normal. And other 3 LEDs indicate the station status as follows.

Run	Scan	Alarm	Status	Possible cause
Lit	Lit	Not lit	Normal state	—
Lit	Not lit	Lit	Scan transmission is not being executed.	• MS's PLC is in HALT or ERROR mode. • Scan transmission error has occurred. • This RIO has not been recognized by MS.
Blink	Not lit	Not lit	Searched in test mode	—
Not lit	Blink	Blink	Station mode setting error state	• Reserve switchs on the DIP switches have been set to ON. (They must be OFF) • Station number is illegal.
Not lit	Not lit	Blink	Power voltage drop	• Power voltage drop
Not lit	Not lit	Not lit	Error state	• Station hardware failure

TOSHIBA

TOSHIBA CORPORATION
Industrial Equipment Department
1-1, Shibaura 1-chome, Minato-ku
Tokyo 105-8001, JAPAN
Tel: 03-3457-4900 Fax: 03-5444-9268