DS4-2156

CC-Link

Remote Space Optical Transfer Unit

SOT-CP1601/1603 series

Compatible with CC-Link Ver. 1.10

Operation Manual

Read this manual before use.

● Thoroughly read this manual and understand its contents before using, inspecting or servicing this unit.

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DS42107A.jtd 2000.09.05

Introduction

- Thank you for choosing our SOT-CP1601/1603 series remote space optical transfer unit.
- Fully understand the contents of this manual before starting the installation or maintenance work.
- If you have any question or need further information regarding this manual, consult the nearest sales office or the Sales Engineering Section, Electronics Division, Kagiya Factory at 0568-88-1181.
- Keep this manual with care.

Outline

- These series provide remote space optical transfer units compatible with the Mitsubishi Electric's PLC `CC-Link Ver. 1.10' (hereinafter, referred to as C remote SOTs).
- The C remote SOT is a remote I/O unit where a single station can be occupied by a system.
- Up to 64 C remote SOTs can be connected with a single master unit.
- It is a parallel optical transfer unit with 16 input bits and 16 output bits.
- The SOT-CP1601 series cannot communicate with the SOT-4102H3 and SOT-V1601R series.
- The SOT-CP1603 series cannot communicate with the SOT-4302H3 and SOT-V1603R series.

  The names of systems, product, companies, etc. shown in this manual are trademarks of relevant companies.

- The models compatible with the CC-Link, Ver. 1.10 marked with the logo shown to the right. 

are
- The C remote SOT is marked with the logo on the nameplate at the rear of the main body.

Contents

1. Precautionary Notes

1-1.Power supply

Use a regulated voltage (24 VDC) power supply that meets the specifications for this unit.

1-2.Resetting time

The unit does not function for about a minute after power-up as the internal resetting circuit is activated during this period.

1-3.Operation mode selection (in M/S mode)

The parallel optical transfer unit should be in the master mode when the other one is in the slave mode or vice versa. The unit has been factory-set to the master mode. To change the operation mode to slave, turn the mode select switch (SW1) at the top of the main body on.

1-4.Caution in installation

Use this unit indoor. Do not use it where:

① there may be dust, suspended particles or water or oil splashes that will damp optical signals,
② an evaporated solvent or corrosive gas exists,
③ a light containing much infrared rays such as sunlight or incandescent light (disturbing light) directly enters the projector/receiver,
④ the unit may be exposed to a temperature, humidity, vibration or impact that exceeds the rating,
⑤ the SOT's optical passage may be interrupted by a person or another obstacle, or
⑥ a device that will generate a strong magnetic field (e.g. electromagnetic contactor or motor) or a source of radio frequencies (e.g. inverter) is used.

1-5.Extention of the cable

The data link and power cables should be separately extended.

① Power cable specifications
0.3 mm^3 or more. The cable should be as short as possible and must not exceed 50 m. Install a regulated voltage power supply within 50 m. The extension should be adjusted in consideration of voltage drop. A shielded power cable is recommended.

② Data link cable
Specified by the baud rate, etc. See section 5 `Electric Connection.'

Use a data link cable dedicated for CC-Link. For detail, see the User's Manual for CC-Link Master/Local Units.

1-6.The following instructions should be observed in routing the data link and power cables to protect them from noises and surges.

① They should be separately wired and must not be laid near or bundled together with the main circuit or any line with a high voltage or load (should be at least 100 mm away from them).
② The same applies to cable relays.

1-7.Communication settings

This unit requires several items to be set with switches, including the station No. and baud rate. See 4-2 `Switch settings.'

1-8.Terminal resistors

A terminal resistor provided with the master/slave unit should be installed at each end of the data link cable.

1-9.16th input/output bits

The 16th input (IN) bit has been factory-set to CTL and the 16th output (OUT) bit to RCV. When using the 16th input/output bits for control inputs/outputs, set mode select switch SW3 to ON.

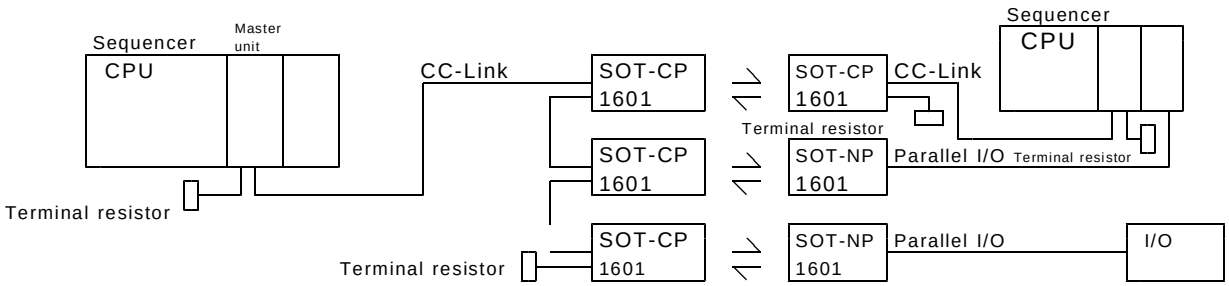
2. Construction

2-1.Model

SOT－CP 16 01

- Optical axis direction
  - H: Head-on
  - S: Side-on
- Transfer distance
  - 01: 1 m
  - 03: 3 m
- Number of input/output bits
  - 16: 16 bits each
- Series model

2-2.Example of wiring

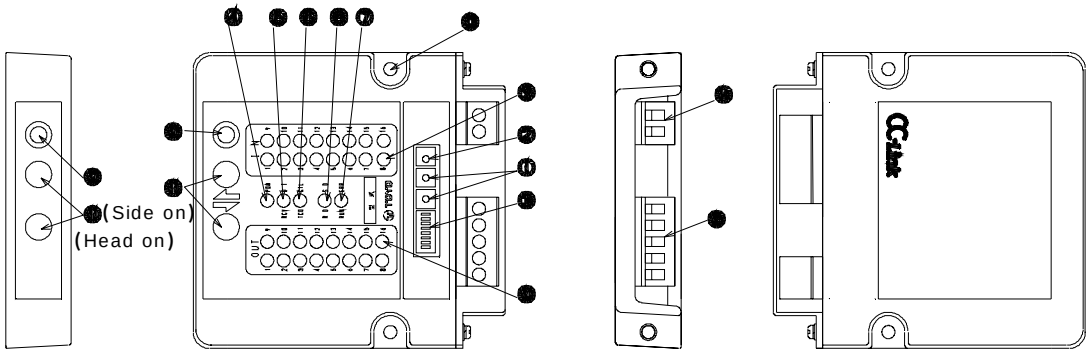


2-3.Applicable master/local units

The C remote SOT can be connected with the following master/local units.

- A1SJ61BT11: Master/local unit for AnS/A2US series
- AJ61BT11: Master/local unit for A series
- A1SJ61QBT11: Master/local unit for Q2AS series
- AJ61QBT11: Master/local unit for QnA series
- QJ61BT11: Master/local unit for Q series

3. Component Names and Functions



①Station No. select switches (x2)
Used to select the remote station No. of the unit between 1 and 64.

②Baud rate select switch
Used to select the baud rate of the CC-Link between 0 and 4.

③Mode select switches
Used to select the M/S mode, X mode, etc.

④POW (power lamp)
Lights (red) when the main body is normally supplied with power.

⑤DT/RCV (normal data lamp/stabilized reception lamp)
DT lights (red) when data transfer between the other SOT is possible. RCV lights (green) when the reception level of your SOT is stabilized.

⑥CTL/TCD (transfer stop input lamp/transmission stop input lamp)
CTL lights (red) when the optical transfer stops. TCD lights (green) when the optical transmission stops.

⑦RUN/ERR (data link execution lamp/communication error lamp)
RUN lights (green) when data is normally exchanged with the master station. ERR lights (red) when a CC-Link communication error occurs and blinks when the position(s) of the ①station No. select switches or ②baud rate select switch is (are) changed with the power supply on.

⑧SD/RD (data transmission lamp/data reception lamp)
SD lights (green) when data is being transmitted through the CC-Link. RD lights (red) when data is being received through the CC-Link.

⑨IN (data input lamps)
Indicate bit by bit the status of the data transferred to the other transfer unit (RY).

⑩OUT (data output lamps)
Indicate bit by bit the status of the data transferred from the other transfer unit (RX).

⑪Projector/receiver
Units are offered in two types: head-on and side-on.
The head-on type has projector/receiver elements on the head.
The side-on type has projector/receiver elements beside the nameplate.

⑫Light intensity control knob
Used to adjust the light intensity and, consequently, transfer distance when you do not want to send the light beyond the specified transmission distance.
Remove the cover and adjust the knob. (The cover is fixed with screws.)

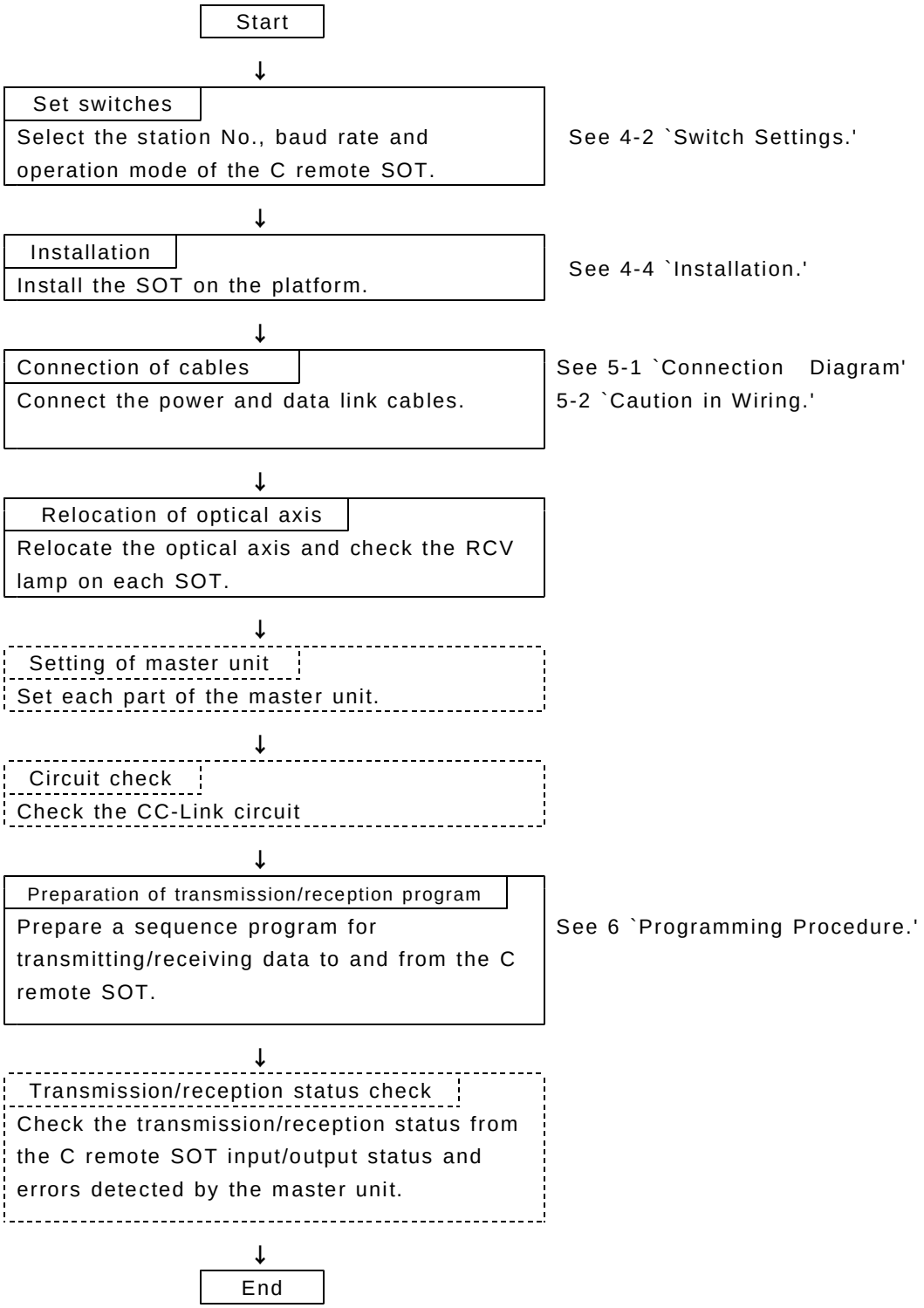
⑬Mounting holes
Holes used to fix the main body (2 holes, 5 mm dia.).

⑭Power connector (MSTB 2.5/2-ST-5.08, Phoenix Contact)
A connector terminal block for connecting the power supply.

⑮Signal connector (MSTB 2.5/5-ST-5.08, Phoenix Contact)
A connector terminal block for transferring signals through the CC-Link.

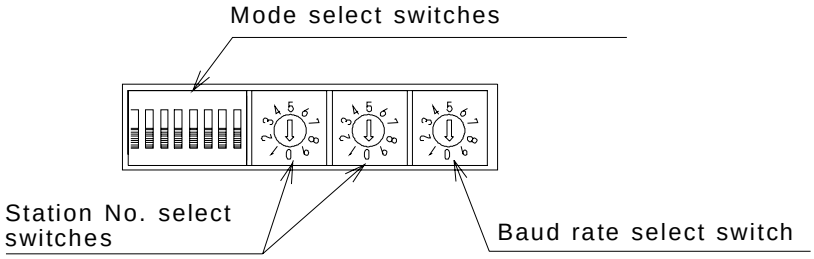
4. Settings and Procedure

4-1.Procedure



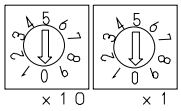
For the steps enclosed by dot lines, see the User's Manual for Master/Local Unit.

4-2.Switch settings



4-2-1.Setting the station No. select switches

①Station No. select switches

	Description
	X10 switch: Used to specify the first digit of the station No. X1 switch: Used to specify the second digit of the station No. Select a station No. between 01 and 64.

②The station No. should be `01' when there is no previous station or `previous station No. + number of stations occupied by the unit to which the previous station belongs.' (If the station No. of the previous station is `01' and the unit occupies two stations, for example, the station No. of your station should be `03.')

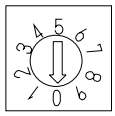
③The switches have been factory-set to `00.'

④Take care not to skip or duplicate any station No.

⑤Precautionary instructions to be followed in making a connection with the CC-link are shown in the User's Manual for CC-Link Master/Local Unit.

4-2-2.Setting the baud rate select switch

①Baud rate select switch

	No.	Description
	0	156 kbps
	1	625 kbps
	2	2.5 Mbps
	3	5 Mbps
	4	10 Mbps
	5-9	Setting error (cannot be used)

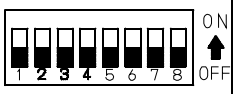
②This setting must be consistent with that of the master station.
If not, communication with the master station is impossible.

③The switch has been factory-set to `0.'

④Precautionary instructions to be followed in making a connection with the CC-link are shown in the User's Manual for CC-Link Master/Local Unit

4-2-3.Mode select switch

①Description

	Description
	Raise the lever to turn on. SW1: M/S (master or slave) SW5: Normally off SW2: Mode (M/S or X) SW6: Normally off SW3: 16th bit status SW7: Normally off SW4: TRE SW8: Normally off

②M/S select switch (SW1)

SW1	
OFF	Master (transmission preceded)
ON	Slave (reception preceded)

When data is communicated bi-directionally between two transfer units, the one should be designated as master and the other as slave.

The switch has been factory-set to `master.'

③Mode select switch (SW2)

SW2	
OFF	M/S mode
ON	X mode

M/S mode: Bi-directional communication

X mode: Bi-directional/uni-directional communication

Description of each mode is given in 4-3 `Description of Operation Modes.'

The switch has been factory-set to `M/S mode.'

④16th bit status switch (SW3)

SW3	Input	Output
OFF	CTL/TCD ※	RCV
ON	IN16	OUT16

※Switched between CTL (M/S mode) and TCD (X mode) according to the position of mode select switch (SW2).

The switch has been factory-set to OFF.

⑤TRE switch (SW4)

SW4	
OFF	Output cleared in case of count-up
ON	Output retained in case of count-up

Count-up: Elapse of a given time after the completion of refresh data reception through the CC-Link and before the completion of next refresh data reception.

This time is determined by the baud rate (fixed).

Count-up time by the baud rate

Baud rate	Count-up time (ms)
10M	104.8
5M	104.8
2.5M	209.7
625K	833.8
156K	1677.6

The switch has been factory-set to `retain the output in case of count-up.'

4-2-4.After setting the switches

Attach the nameplate provided to prevent changes to the switch settings.

(The rear of the nameplate is adhesive. Remove a plastic sheet from the rear and attach.)

4-3.Description of Modes

4-3-1.M/S mode

Set the mode select switch (SW2) to OFF to select the M/S mode.

① Designate your unit as master or slave.
When data is communicated bi-directionally between two transfer units, the one should be designated as master and the other as slave. Set the M/S select switch (SW1) to ON to designate your unit as slave.

② Turn the power supply on. The power lamp (POW) lights.

③ When the other transfer unit is out of the operational range (not synchronized), the master repeats transmission and reception at regular intervals. The slave waits a signal transmitted from the master.

④ When the other transfer unit is within the operational range (synchronized):
a. A signal is transmitted from the master to the slave.
b. The slave detects the end of the signal transmitted from the master and transmits a signal in response to it.
c. After transmitting a signal, the master receives the signal transmitted from the slave, detects the end of that signal, and transmits another signal. The master and slave detect the end of each signal transmitted from the other and alternately repeats the transmission and reception.

⑤ When the units are synchronized, the normal data lamp (DT) lights.
If the received data is determined normal, the relevant data output turns on.

⑥ If the reception level drops below 120% of the on-level of the DT output due to a stain on the projector/receiver or an optical axis shift, the stabilized reception lamp (RCV) and the RCV output turn off.

⑦ With the 16th bit status switch (SW3) set to OFF, the remove input `RY1F' on the C remote SOT is used for transfer stop input (CTL).

⑧ With the transfer stop input (CTL) on, the transfer stop lamp (CTL) lights and, as the transmission and reception are forcedly prohibited, the DT/RCV lamp and all data outputs turn off.

4-3-2.X mode

① Select the X mode
Set the mode select switch (SW2) to ON to select the M/S mode.
In the X mode, the M/S select switch is ineffective.

② Turn the power supply on. The power lamp (POW) lights.

③ With the 16th bit status switch (SW3) set to OFF, the remove input `RY1F' on the C remote SOT is used for transfer stop input (TCD).

④ Select the transmission stop function.
When data is communicated uni-directionally between two transfer units, the transmission stop input (TCD) should be used. With the TCD input on, the transmission stops and only the reception remains possible.

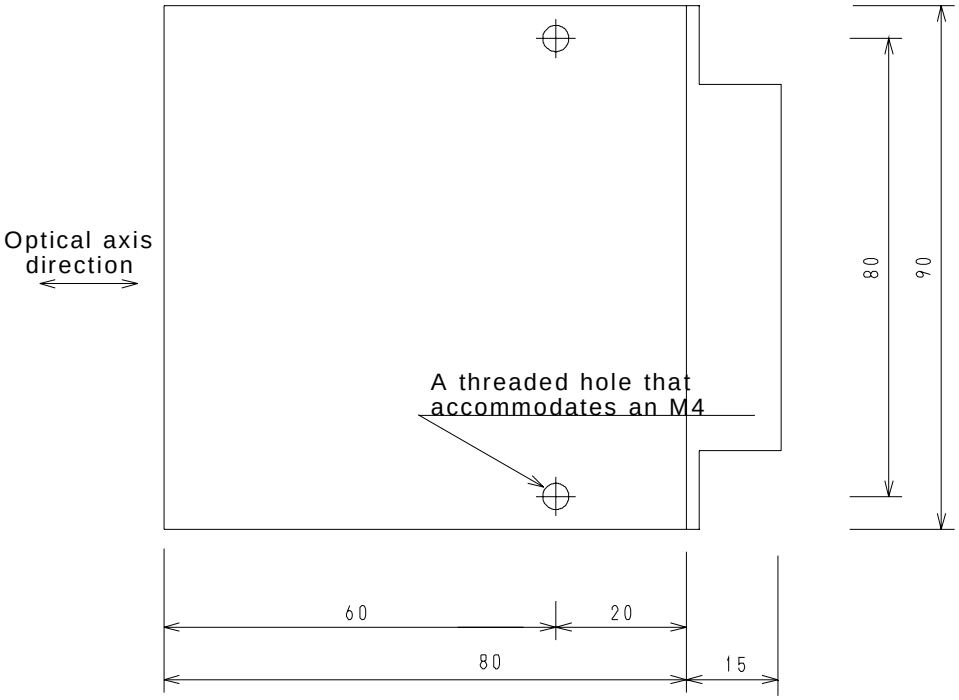
⑤ When the other transfer unit is out of the operational range (not synchronized), the transfer unit with the TCD input off repeats transmission and reception at regular intervals. The one with the TCD input on waits a signal transmitted from the other.

⑥ When the other transfer unit is within the operational range (synchronized):
a. The transfer unit with the TCD input off repeats transmission and reception at regular intervals.
b. If the one with the TCD input on normally receives an optical signal from the other, it turns the DT and relevant data output on.
c. If the TCD input turns off at this time, data can be bi-directionally communicated as in the M/S mode.

4-4.Installation

4-4-1.Drilling mounting holes

M4 screws are recommended for mounting.



※Note 1: Tighten the C remote SOT mounting screws to a torque not higher than 8 kgf-cm.

4-4-2. Place for installation

Install the unit indoor.

To prevent malfunction and disorder, do not use it where:

①there may be dust, suspended particles or water or oil splashes that will damp optical signals,

②an evaporated solvent or corrosive gas exists,
Note: The main body is made of a resin and must not be cleaned with paint thinner or another solvent.

③a light containing much infrared rays such as sunlight or incandescent light (disturbing light) directly enters the projector/receiver,

④the unit may be exposed to a temperature, humidity, vibration or impact that exceeds the rating,

⑤the SOT's optical passage may be interrupted by a person or another obstacle,

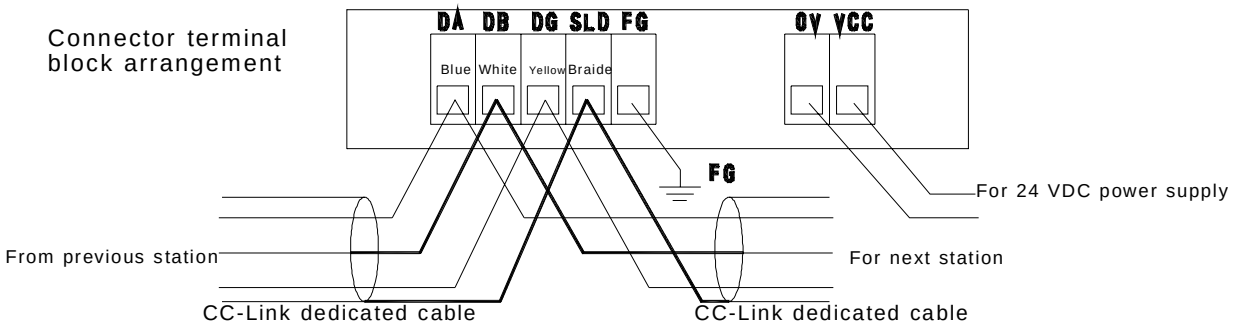
⑥a reflecting surface may draw near the front of the receiver (to cause optional intereference), or

⑦a device that will generate a strong magnetic field (e.g. electromagnetic contactor or motor)or a source of radio frequencies (e.g. inverter) is used.

5. Electric Connection

5-1.Connection diagram

5-1-1.Connection of the C remote SOT



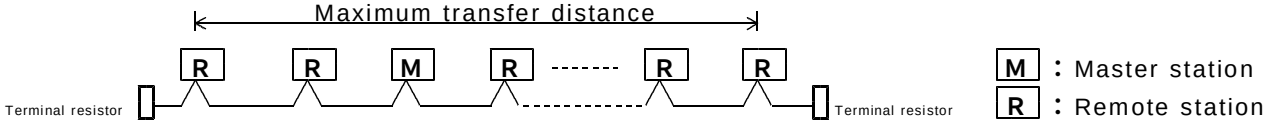
Each cable should be stripped to 7 mm.

5-1-2.Mutual connection of link data cables (for CC-Link, Ver. 1.10)

The station-to-station distance and total extension distance are determined by the baud rate setting and the construction of units used.

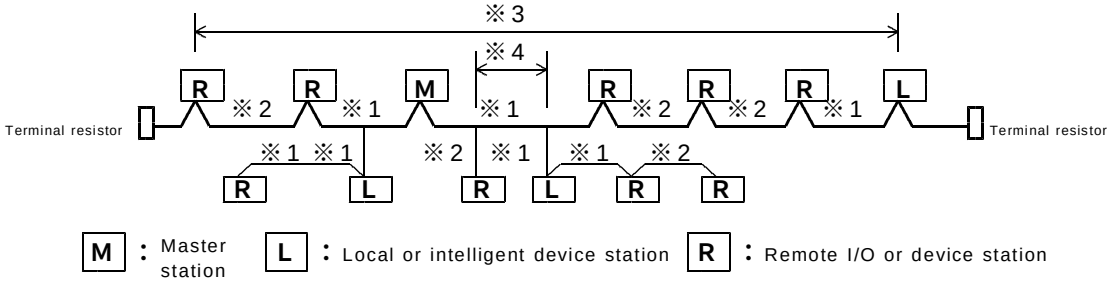
① Maximum transfer distance

Baud rate	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
Station-to-station cable length	20 cm or more				
Maximum transfer distance	1200m	900m	400m	160m	100m



② For T branch connection

Baud rate		156kbps	625kbps	2.5M/5M/10Mbps unacceptable
Station-to-station cable length	Between master/local station or intelligent device station and previous/subsequent station ※1	1 m or more		For the system only consisting of remote I/O and remote device stations
		2 m or more		For the system including local and intelligent device stations
	Between remote I/O station and remote device station ※2	30cm or more		
Maximum number of units connected per branch		6		
Maximum trunk length ※3		500m	100m	Excluding cables between terminal resistors and branches
T branch interval ※4		Not limited		
Maximum branch length		8m		Cable length per branch
Total branch length		200m	50m	Total length of branches
Terminal resistor		110Ω 1/2W ×2		Connected between DA and DB at trunk ends
T branch terminal block/connector		Terminal block: A commercial one Connector: FA sensor connector		Trunk cables should be stripped to a shorter length.



Note: All units and cables on the system should be compatible with the CC-Link, Ver. 1.10.

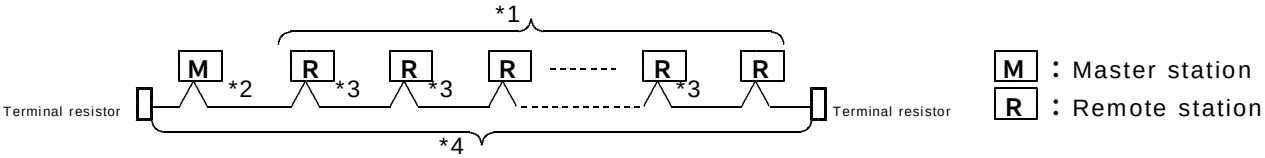
5-1-3.Mutual connection of link data cables (when units older than the CC-Link, Ver. 1.10 are used)

The station-to-station distance and total extension distance are determined by the baud rate setting and the construction of units used.

(The following table applies when FAN-SB and FANC-SBH are used.)

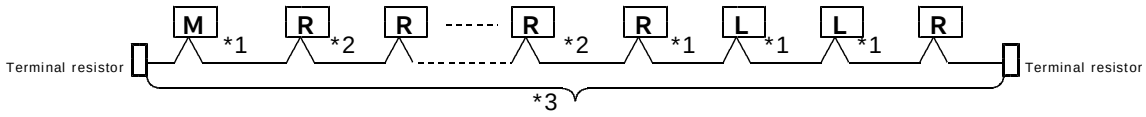
①For the system only consisting of remote I/O and remote device stations

Baud rate	Total number of remote stations *1	Cable length at each end of master station *2	Minimum cable length between remote stations *3	Total cable extension*4	
				FANC-SB	FANC-SBH
156 Kbps	64 or less	1.0 m or more	0.3 m or more	1200 m or less	1200 m or less
625 Kbps				600 m or less	900 m or less
2.5 Mbps				200 m or less	400 m or less
5 Mbps				110 m or less	160 m or less
			0.6 m or more	150 m or less	
10 Mbps			0.3 m or more	50 m or less	20 m or less
			0.4 m or more		30 m or less
			0.6 m or more	80 m or less	
			0.7 m or more		100 m or less
			1.0 m or more	100 m or less	
	48 or less		0.3 m or more	50 m or less	80 m or less
			0.4 m or more		100 m or less
	32 or less		0.3 m or more		



②For the system including local and intelligent device stations

Baud rate	Cable length at each end of master, local and intelligent device stations *1	Minimum cable length between remote I/O and remote device stations *2	Total cable extension *3	
			FANC-SB	FANC-SBH
156 Kbps	2.0 m or more	0.3 m or more	1200 m or less	1200 m or less
625 Kbps			600 m or less	600 m or less
2.5 Mbps			200 m or less	200 m or less
5 Mbps			110 m or less	110 m or less
		0.6 m or more	150 m or less	150 m or less
10 Mbps		0.3 m or more	50 m or less	
		0.6 m or more	80 m or less	
		0.7 m or more		50 m or less
		1.0 m or more	100 m or less	80 m or less



M : Master station L : Local or intelligent device station R : Remote I/O or device station

Install the terminal resistor provided with the master/local unit at each end of the data link cable. The terminal resistor type depends on the cable.

Install 110 Ω for FANC-SB or FANC-SBZ or 130 Ω for FANC-SBH.

For detail, see the User's Manual for CC-Link System Master/Local Unit.

5-1-4.Maximum number of units connected

The C remote SOT is a remote I/O station and occupies a single station. Up to 64 SOTs maybe connected.

When other units are to be connected, the following conditions should be met.

① { (1 × a) + (2 × b) + (3 × c) + (4 × d) } ≦ 64

a: Number of units that occupy a single station each

b: Number of units that occupy two stations each

c: Number of units that occupy three stations each

d: Number of units that occupy four stations each

② { (16 × A) + (54 × B) + (88 × C) } ≦ 2304

A: Number of remote I/O stations

B: Number of remote device stations

C: Number of local, standby master and intelligent device stations

5-2.Caution in wiring

(1)The data link cable should be connected with a CC-Link dedicated cable.

(2)The shielded (braided) cable to be connected to the connector terminal block should be stripped to as small a length as possible.

(3)Install the terminal resistor provided with the master/local unit at each end of the data link cable.

(4)Using a noise filter, EMI filter and/or ferrite core with the power cable may be effective to suppress the noise at the power supply.

(5)Power cable extension

The power cable extension should be as short as possible and must not exceed 50 m. Use a cable with 0.3 mm^2 or thicker conductor.

(Install a regulated voltage power supply within 50 m. The extension should be adjusted in consideration ofvoltage drop. A shielded power cable is recommended.

(6)The following instructions should be observed in routing the data link cables to protect them from noises and surges.

①The data link and power cables must not be laid near or bundled together with the main circuit or any line with a high voltage or load (should be at least 100 mm away from them).

②The data link and power cables to the C remote SOT should also be separated.

(7)No conductor should protrude from the cables connected to the connector terminal block. Braided wires should be insulated using tubes or such to prevent the contact with other wires.

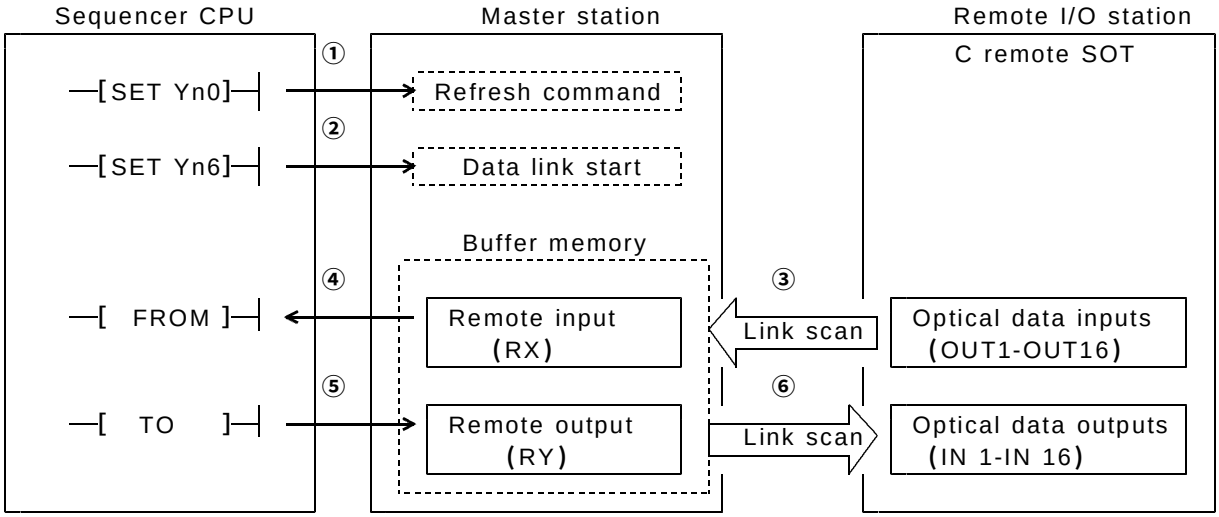
(8)Cables should be secured so that conductors will not be cut due to vibration.

6. Programming Procedure

6-1.Outline of data exchange

6-1-1Data exchange flow

The data exchange flow between the C remote SOT and the master station is outlined below.



①The refresh command (Yn0) turns on.

②The request for data link start (Yn6 or Yn8) turns on.

③The link is scanned to store the optical data inputs (OUT) from the C remote SOT in the remote input (RX) area of the master station.

④Data is uploaded from the remote input (RX) area of the master station according to the FROM command.

⑤Data is downloaded from the remote output (RY) area of the master station according to the TO command.

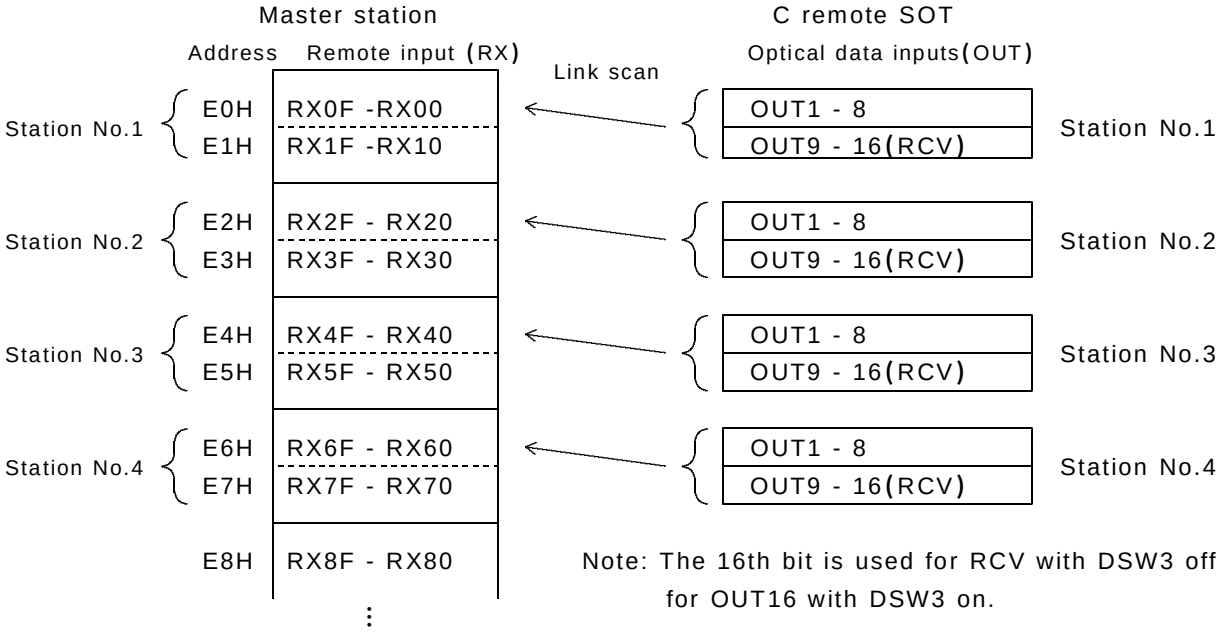
⑥The link is scanned to send data in the remote output (RY) area of the master station to the optical data outputs (IN) of the C remote SOT.

6-1-2.Processing of remote input/output signals of the C remote SOT

Remote input/output signals of the C remote SOT are processed via the remote input (RX) and remote output (RY) areas of the master station.
Remote inputs/outputs of the master station are assigned to addresses E0H to 15FH (RX)and 160H to 1DFH (RY) in the buffer memory.
For detail of the buffer memory, see 6-3 `Buffer memory of master station.'

①Remote input (RX) area

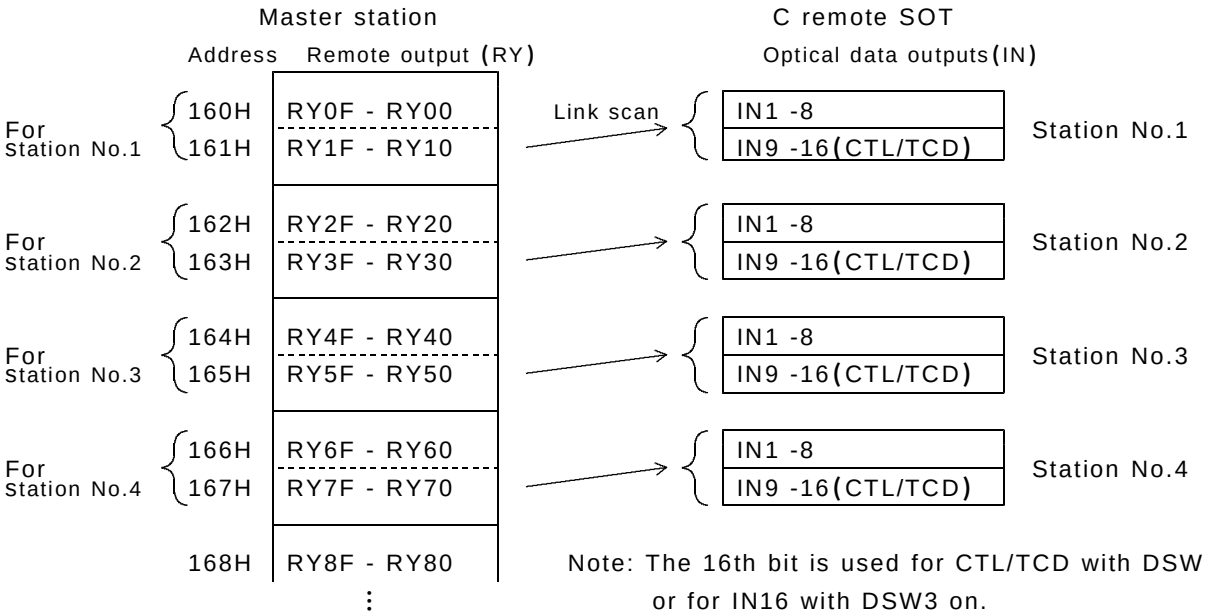
Optical data inputs of the C remote SOT are always stored in the remote input area of the master station through link scanning.



Note: The 16th bit is used for RCV with DSW3 off or for OUT16 with DSW3 on.

②Remote output (RY) area

Data in the remote output area of the master station is always sent to optical data outputs of the C remote SOT through link scanning.



Note: The 16th bit is used for CTL/TCD with DSW3 off or for IN16 with DSW3 on.

6-2.Master station input/output signals

The master station input/output signals to and from the CPU unit are listed below. For detail of the input/output signals, see the User's Manual for CC-Link System Master/Local Unit.

`n' in the device No. column represents the starting I/O No. of the master station, which is determined by the number of units installed in front of the master station.

If the starting I/O No. of the master station is X/Y20, for example:

X(n+0)-X(n+1F)=X20-X3F

Y(n+0)-Y(n+1F)=Y20-Y3F

I/O Signal List

Device No.	Signal name	Device No.	Signal name
Xn0	Unit failure	Yn0	Refresh command
Xn1	Your station data-linked	Yn1	(Not used)
Xn2	Parameters set	Yn2	
Xn3	Other station data-linked	Yn3	
Xn4	Request for unit reset accepted	Yn4	Request for unit reset
Xn5	(Not used)	Yn5	(Not used)
Xn6	Data linking per buffer memory parameters normally started	Yn6	Request for data linking per buffer memory parameters
Xn7	Data linking per buffer memory parameters abnormally started	Yn7	(Not used)
Xn8	Data linking per E^2PROM parameters normally started	Yn8	Request for data linking per E^2PROM parameters
Xn9	Data linking per E^2PROM parameters abnormally started	Yn9	(Not used)
XnA	Parameters normally registered in E^2PROM	YnA	Request for registration of parameters in E^2PROM
XnB	Parameters abnormally registered in E^2PROM	YnB	(Not used)
XnC	(Not used)	YnC	
XnD		YnD	
XnE		YnE	
XnF	Unit ready	Y(n+F)	
X(n+1)0	(Not used)	Y(n+1)0	
X(n+1)1		Y(n+1)1	
X(n+1)2		Y(n+1)2	
X(n+1)3		Y(n+1)3	
X(n+1)4		Y(n+1)4	
X(n+1)5		Y(n+1)5	
X(n+1)6		Y(n+1)6	
X(n+1)7		Y(n+1)7	
X(n+1)8		Y(n+1)8	
X(n+1)9		Y(n+1)9	
X(n+1)A		Y(n+1)A	
X(n+1)B		Y(n+1)B	
X(n+1)C		Y(n+1)C	
X(n+1)D		Y(n+1)D	
X(n+1)E		Y(n+1)E	
X(n+1)F		Y(n+1)F	

6-3.Master station buffer memory

6-3-1.Master station buffer memory

The master station buffer memory is used for data exchange between a remote unit and the CPU unit.

Assignment of buffer memory addresses is shown below.

For detail of the buffer memory, see the User's Manual for CC-Link System Master/Local Unit.

Master Station Buffer Memory Addresses

Address (hexadecimal)	Item	Description	Read/write ※3
0H - 5FH	Parameter information area	Stores the information (parameters) required for data linking.	Read/ write enabled
60H - DFH	(Not used) ※1	———	———
E0H -15FH	Remote input (RX)	Stores the status of inputs from remote/local stations.	Read only
160H -1DFH	Remote output (RY)	Stores the status of outputs to remote/local stations.	Write only
1E0H -2DFH	Remote register (RWw)	Stores the data transmitted to remote/local stations.	Write only
2E0H -3DFH	Remote register (RWr)	Stores the data received from remote/local stations.	Read only
3E0H -5DFH	(Not used) ※1	———	———
5E0H -5FFH	Link relay(SB)	Stores the data link status.	Read/ write enabled ※2
600H -7FFH	Link register(SW)	Stores the data link status.	
800H -9FFH	(Not used) ※1	———	———
A00H -FFFH	Random access buffer	Used for dedicated instructions such as RIRD and RIWT.	Read/ write enabled

※1: Do not write any data in the areas not used. Doing so may lead to an error.

※2: Writing is not enabled for some devices.

※3: Do not write in the read-only areas from the sequencer CPU.

6-3-2. Setting the parameter information area

Specify the conditions for data linking in the parameter information area of the master station.

① Number of stations connected (address 01H, defaulted 64)

Specify the number of remote/local stations connected with the master station (including reserved ones).

Specify a number between 1 and 64.

This is not the number of occupied stations.

② Maximum number of retries (address 02H, defaulted 3)

Specify the maximum number of retries to be made for a remote or local station in case of data linking error.

Specify a number between between 1 and 7.

If data linking is not normally performed after the specified number of retries, the remote or local station is considered as `data link failed station.'

③ Number of automatically reset stations (address 03H, defaulted 1)

Specify the number of remote/local stations that can be reset during a single link scan.

Specify a number between 1 and 10.

④ Operation status in case of CPU breakdown (address 06H, defaulted 0)

Choose to cease the data linking (set to 0) or continue (set to 1) when the CPU unit of the master station `stops due to an error.'

⑤ Reserved stations (addresses 10H to 13H, defaulted 0)

Any of the remote/local stations specified as connected but not actually connected may be considered as data link failed. To prevent this, set the relevant bit(s) to 0.

If any of the remote/local stations actually connected is specified as reserved, it will never be data-linked.

Set on the bits corresponding to the station Nos. of reserved stations.

For the unit occupying two or more remote/local stations, set on the bit corresponding to the station No. specified by the station No. select switches.

1 to 64 in the following table represent station Nos.

Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
10H	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
11H	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
12H	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
13H	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

⑥ Error invalid station (addresses 14H to 17H, defaulted 0)

Local/remote stations specified as error invalid are not considered as 'data link failed' by the master and remote stations if they cannot be data-linked due to power failure or for another reason. Note that no error can be detected at error invalid stations. If they are also specified as reserved, they are considered as not connected.

Set on the bits corresponding to the station Nos. of the stations to be error-invalid. For the unit occupying two or more remote/local stations, set on the bit corresponding to the station No. specified by the station No. select switches.

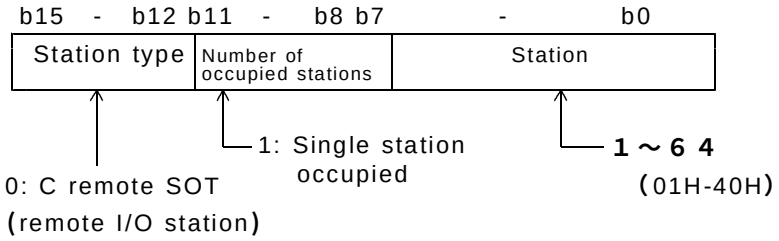
1 to 64 in the following table represent station Nos.

Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
14H	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
15H	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
16H	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
17H	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49

⑦ Station information (addresses 20H to 5FH)

Specify the type of each of the remote/local stations connected or specified as reserved.

Data structure



Buffer memory addresses are assigned to units as shown below.

Unit	Address	Unit	Address	Unit	Address	Unit	Address
1 st	20H	17 th	30H	33 rd	40H	49 th	50H
2 nd	21H	18 th	31H	34 th	41H	50 th	51H
3 rd	22H	19 th	32H	35 th	42H	51 st	52H
4 th	23H	20 th	33H	36 th	43H	52 nd	53H
5 th	24H	21 st	34H	37 th	44H	53 rd	54H
6 th	25H	22 nd	35H	38 th	45H	54 th	55H
7 th	26H	23 rd	36H	39 th	46H	55 th	56H
8 th	27H	24 th	37H	40 th	47H	56 th	57H
9 th	28H	25 th	38H	41 st	48H	57 th	58H
10 th	29H	26 th	39H	42 nd	49H	58 th	59H
11 th	2AH	27 th	3AH	43 rd	4AH	59 th	5AH
12 th	2BH	28 th	3BH	44 th	4BH	60 th	5BH
13 th	2CH	29 th	3CH	45 th	4CH	61 st	5CH
14 th	2DH	30 th	3DH	46 th	4DH	62 nd	5DH
15 th	2EH	31 st	3EH	47 th	4EH	63 rd	5EH
16 th	2FH	32 nd	3FH	48 th	4FH	64 th	5FH

6-3-3.Inputs/outputs of C remote SOT

Optical data inputs of the C remote SOT are always stored in the remote input (RX) area in the buffer memory of the master station through link scanning.
Data in the remote output (RY) area in the buffer memory of the master station is always sent to optical data outputs of the C remote SOT through link scanning.

Remote Inputs/Outputs

Signal direction: C remote SOT →Master unit			Signal direction: Master unit →C remote SOT		
Device No.	Description		Device No.	Description	
RX00	Optical data inputs	OUT 1	RY0O-RX0F	Not used	
RX01	〃	OUT 2	RY10	Optical data outputs	IN 1
RX02	〃	OUT 3	RY11	〃	IN 2
RX03	〃	OUT 4	RY12	〃	IN 3
RX04	〃	OUT 5	RY13	〃	IN 4
RX05	〃	OUT 6	RY14	〃	IN 5
RX06	〃	OUT 7	RY15	〃	IN 6
RX07	〃	OUT 8	RY16	〃	IN 7
RX08	〃	OUT 9	RY17	〃	IN 8
RX09	〃	OUT10	RY18	〃	IN 9
RX0A	〃	OUT11	RY19	〃	IN10
RX0B	〃	OUT12	RY1A	〃	IN11
RX0C	〃	OUT13	RY1B	〃	IN12
RX0D	〃	OUT14	RY1C	〃	IN13
RX0E	〃	OUT15	RY1D	〃	IN14
RX0F SW3 OFF	**R C V**		RX1E	〃	IN15
RX0F SW3 ON	〃	OUT16	RY1F SW3 OFF	**C T L ／ T C D**	
RX1O-RX1F	Not used		RY1F SW3 0N	Optical data outputs	IN16

①OUT1 to 16 (RX00 to RX0F)
Outputs the data sent from the normal SOT.

②RVC (RX0F)
Set to '1' during stabilized reception.
With SW3 on, RX0F is switched to OUT16 and cannot be used.

③IN1 to 16 (RY10 to RY1F)
Inputs the data to be transmitted to the normal SOT.

④CTL/TCD (RY1F)
The transmission and reception are ceased with SW2 off and RY1F on (CTL).
The transmission is ceased with SW2 on and RY1F on (TCD).
With SW3 on, RY1F is switched to IN16 and cannot be used.

6-3-4.Remote input (RX) area

Remote inputs of the C remote SOT are stored in the remote input area in the buffer memory of the master station at the relevant addresses.

The correspondence between the station No. of the C remote SOT and the applicable buffer memory address is shown below.

Master Station Buffer Memory Addresses (C Remote SOT → Master Station (RX))

Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address
1	E0H-E1H	14	FAH-FBH	27	114H-115H	40	12EH-12FH	53	148H-149H
2	E2H-E3H	15	FCH-FDH	28	116H-117H	41	130H-131H	54	14AH-14BH
3	E4H-E5H	16	FEH-FFH	29	118H-119H	42	132H-133H	55	14CH-14DH
4	E6H-E7H	17	100H-101H	30	11AH-11BH	43	134H-135H	56	14EH-14FH
5	E8H-E9H	18	102H-103H	31	11CH-11DH	44	136H-137H	57	150H-151H
6	EA0-EBH	19	104H-105H	32	11EH-11FH	45	138H-139H	58	152H-153H
7	ECH-EDH	20	106H-107H	33	120H-121H	46	13AH-13BH	59	154H-155H
8	EEH-EFH	21	108H-109H	34	122H-123H	47	13CH-13DH	60	156H-157H
9	F0H-F1H	22	10AH-10BH	35	124H-125H	48	13EH-13FH	61	158H-159H
10	F2H-F3H	23	10CH-10DH	36	126H-127H	49	140H-141H	62	15AH-15BH
11	F4H-F5H	24	10EH-10FH	37	128H-129H	50	142H-143H	63	15CH-15DH
12	F6H-F7H	25	110H-111H	38	12AH-12BH	51	144H-145H	64	15EH-15FH
13	F8H-F9H	26	112H-113H	39	12CH-12DH	52	146H-147H	–	–

6-3-5.Remote output (RY) area

Remote outputs to the C remote SOT are stored in the remote output area in the buffer memory of the master station at the relevant addresses.

The correspondence between the station No. of the C remote SOT and the applicable buffer memory address is shown below.

Master Station Buffer Memory Addresses (Master Station (RY) →C Remote SOT)

Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address	Station No.	Buffer memory address
1	160H-161H	14	17AH-17BH	27	194H-195H	40	1AEH-1AFH	53	1C8H-1C9H
2	162H-163H	15	17CH-17DH	28	196H-197H	41	1B0H-1B1H	54	1CAH-1CBH
3	164H-165H	16	17EH-17FH	29	198H-199H	42	1B2H-1B3H	55	1CCH-1CDH
4	166H-167H	17	180H-181H	30	19AH-19BH	43	1B4H-1B5H	56	1CEH-1CFH
5	168H-169H	18	182H-183H	31	19CH-19DH	44	1B6H-1B7H	57	1D0H-1D1H
6	16A0-16BH	19	184H-185H	32	19EH-19FH	45	1B8H-1B9H	58	1D2H-1D3H
7	16CH-16DH	20	186H-187H	33	1A0H-1A1H	46	1BAH-1BBH	59	1D4H-1D5H
8	16EH-16FH	21	188H-189H	34	1A2H-1A3H	47	1BCH-1BDH	60	1D6H-1D7H
9	160H-171H	22	18AH-18BH	35	1A4H-1A5H	48	1BEH-1BFH	61	1D8H-1D9H
10	172H-173H	23	18CH-18DH	36	1A6H-1A7H	49	1C0H-1C1H	62	1DAH-1DBH
11	174H-175H	24	18EH-18FH	37	1A8H-1A9H	50	1C2H-1C3H	63	1DCH-1DDH
12	176H-177H	25	190H-191H	38	1AAH-1ABH	51	1C4H1C5H	64	1DEH-1DFH
13	178H-179H	26	192H-193H	39	1ACH-1ADH	52	1C6H-1C7H	–	–

6-4.Data processing time

The data processing time by the C remote SOT is calculated as follows.

6-4-1.Time required for transmitting data

Maximum processing time = MS + LS x 2 + optical transfer time x 2

6-4-2.Time required for uploading received data

Maximum processing time = MS x 2 + LS x 2

MS: Scan time by sequence program of master station

LS: Link scan time

Optical transfer time: Time required for optical transfer from C remote SOT to normal SOT

M/S mode : 20ms MAX

X mode : 30ms MAX

The link scan time for the CC-Link is calculated as follows.

LS = BT{29.4 + (NI×4.8) + (NW×9.6) + (N×32.4) + (ni×4.8) + (nw×9.6)} + ST

*2 + {number of communication failed stations x 48 x BT x number of retries}

*2 : This term is required when one or more communication failed stations exist.

BT: A constant (baud rate)

NI: The largest station No. of a, b and c (including all occupied stations)

NW: The latest station No. of b and c (including all occupied stations)

} A multiple of 8

N: Number of connected stations

ni: a + b + c

nw: b + c

ST: A constant (the largest of ①,②and ③)

① 800 + (a×15)

② 900 + (b×50)

③ If c ≦ 26, 1200 + (c x 100)

If c > 26, 3700 + {(c - 26) x 25}

a: The total number of occupied remote I/O stations

b: The total number of occupied remote device stations

c: The total number of occupied intelligent device stations (including local ones)

6-5.Programming

Prepare a PC program using the following example.
This section gives a description assuming the ACPU, AJ61bT11 and C remote SOT set as follows for your reference.

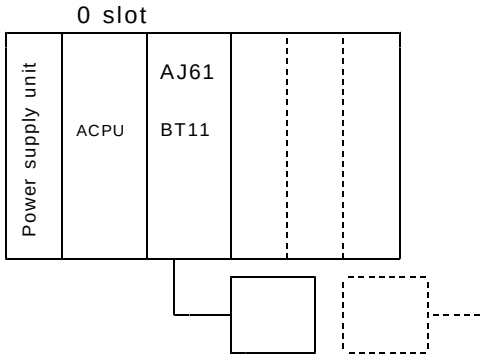
Example of system construction

①AJ61BT11 is installed in 0 slot.

②Station No. of C remote SOT is 1.

③Only a single C remote SOT is connected.

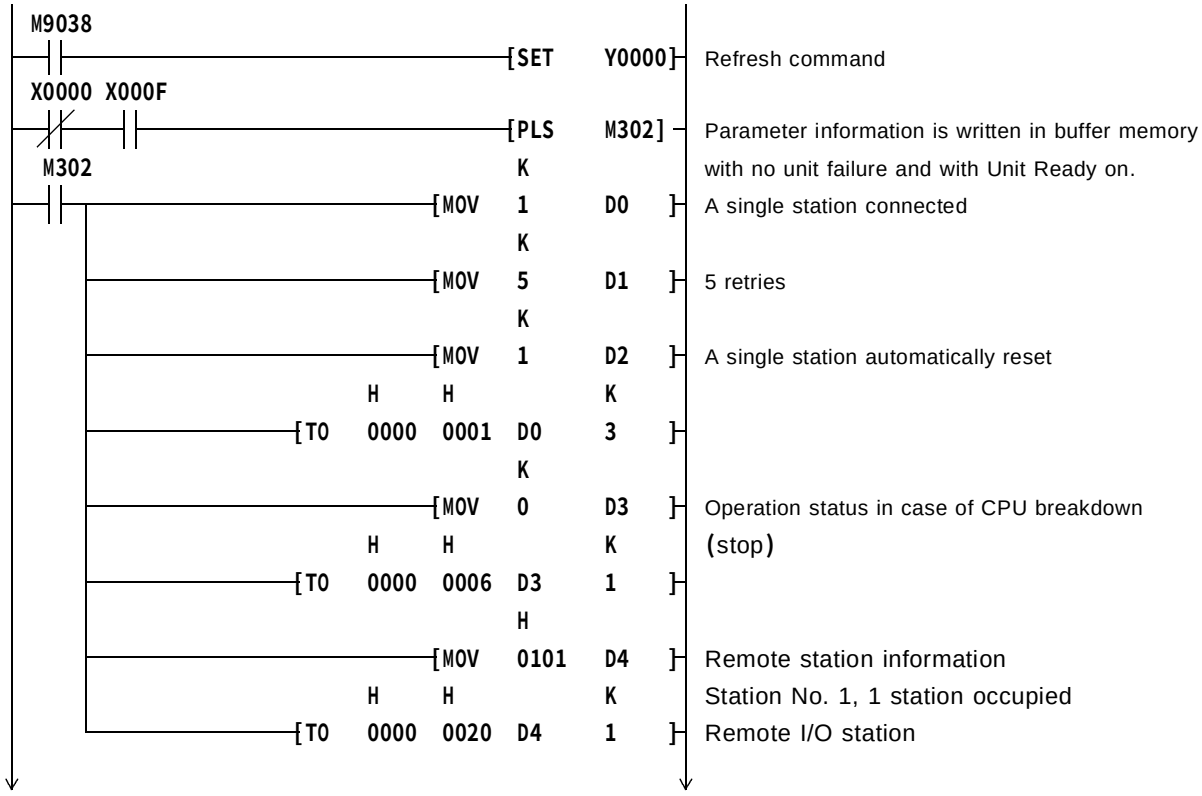
④Transmitted data is stored at B0010 to B001F and received data at B0000 to B000F.

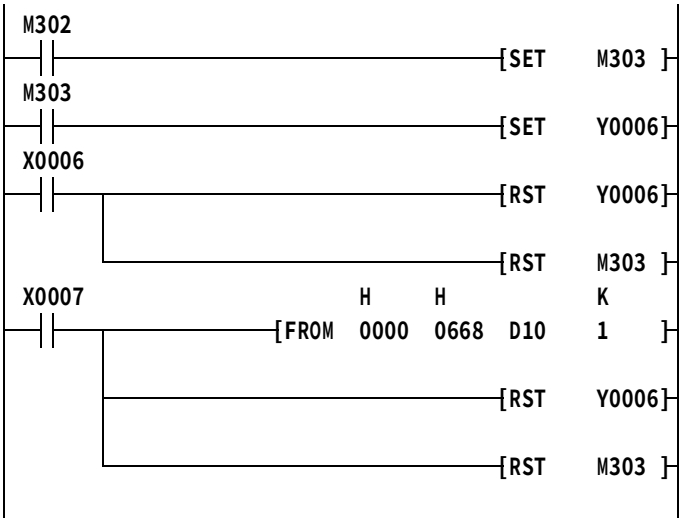


6-5-1.Parameters setting program

An example program for setting parameters is shown below.

①Data linking per buffer memory parameters (in debugging)



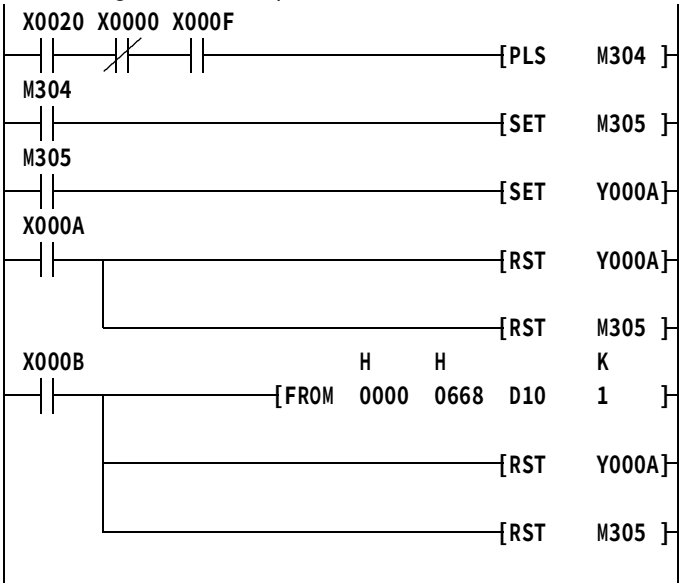


Request for start of data linking per buffer memory parameters turns on with no unit failure and with Unit Ready on.

Request for start of data linking turns off when data linking is normally started.

Parameter information of your station is called out and request for start of data linking turns off when data linking is abnormally started.

② Registration of parameters in E²PROM



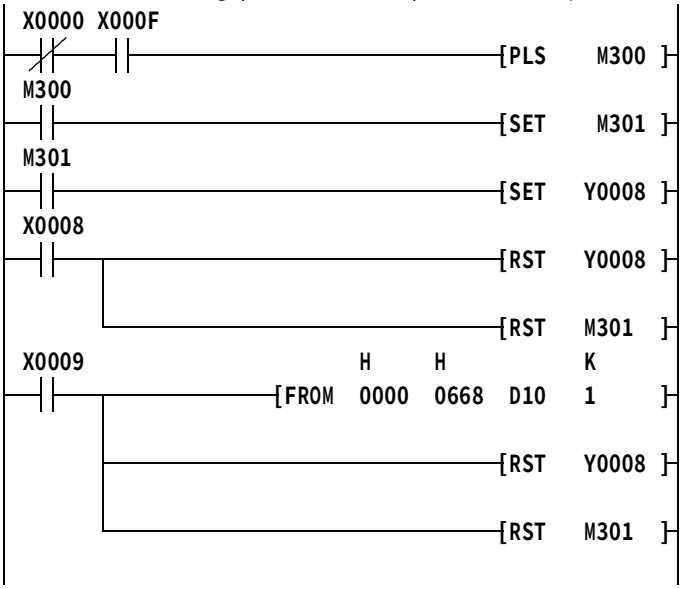
Parameters are registered in E2PROM per registration command (Y20).

Request for registration of parameters turns on with no unit failure and with Unit Ready on.

Request for registration of parameters turns off when parameters are normally registered in E2PROM.

Parameter information of your station is called out and request for registration of parameters turns off when parameters are abnormally registered in E2PROM.

③ Data linking per E²PROM parameters (in running)

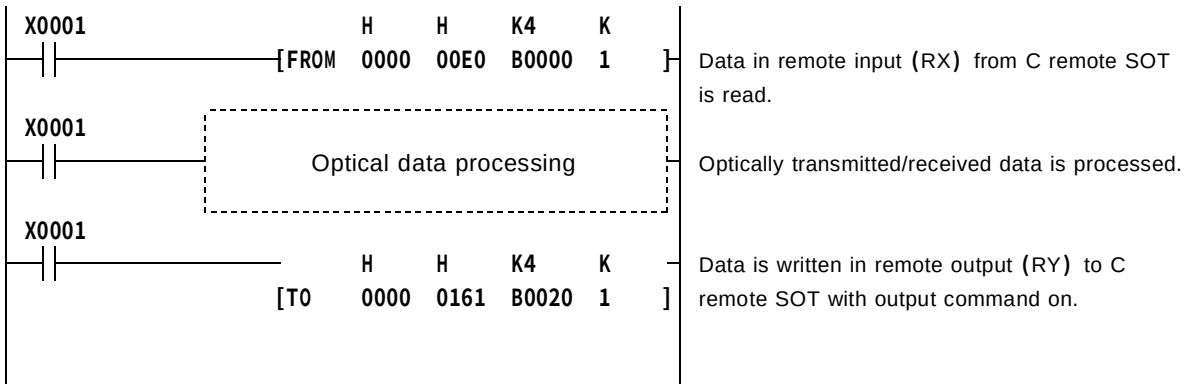


Request for start of data linking per E2PROM parameters turns on with no unit failure and with Unit Ready on.

Request for start of data linking turns off when data linking is normally started.

Parameter information of your station is called out and request for start of data linking turns off when data linking is abnormally started.

6-5-2.Transmission/reception process



6-5-3.Caution in preparing a program

① For communication with remote/local stations connected with the master station, the refresh command (Yn0) and request for start of data linking (Yn6 or Yn8) should have been on before any instruction can be executed.

② When debugging, write necessary information in the parameter information area of the master station buffer memory and turn on the request for start of data linking per buffer memory parameters (Yn6). When running, register parameters in the E^2PROM and turn on the request for start of data linking per E^2PROM parameters (Yn8).

7. Troubleshooting

7-1.In case a problem occurs

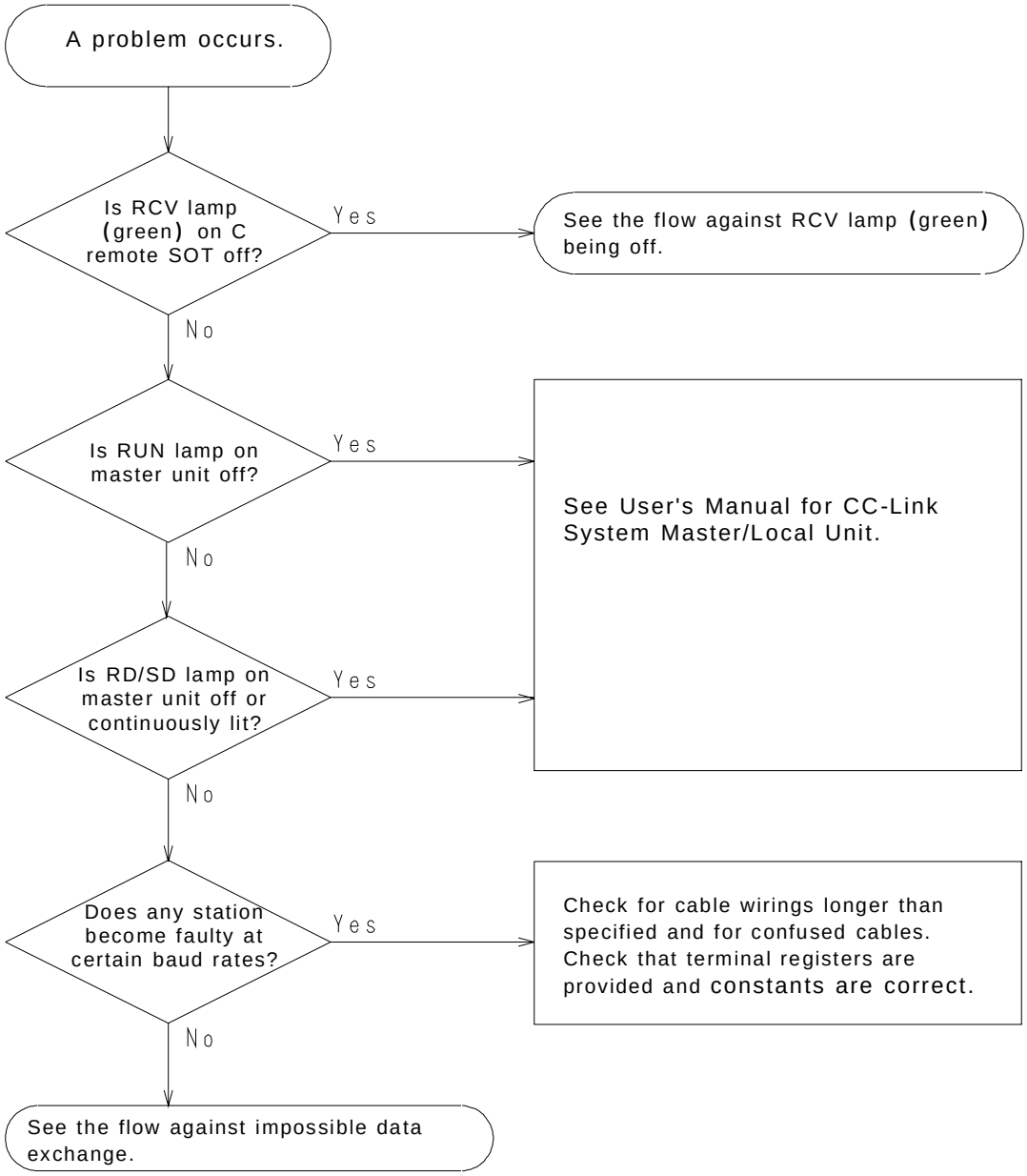
The check items and corrective action against each problem are listed below.

Symptom	Check item	Check method
Entire system cannot be data-linked.	Cable connections	Check cables with eyes or circuit tester. Check circuit status (SW0090).
	Terminal registers	Connect terminal registers to units at both ends. Check that terminal resistors are compatible with cables.
	Error at master station CPU	Check error code on sequencer CPU and take corrective action.
	Parameter settings	Check contents of parameters.
	Request for start of data linking	Check that request for start of data linking (Yn6 or Yn8) has been on.
	Error at master station	Check parameter status of your station (SW0068), switch status (SW006A), mounting status (SW0069) and blinking of ERR LED on master station.
	Synchronized mode	If scan time exceeds the maximum limit in synchronized mode, switch to non-synchronized mode or reduce baud rate.
Data cannot be exchanged with remote station.	Data linked?	Check LEDs on remote station and master station's communication status with other stations.
	Station reserved?	Check contents of parameters.
	Station No. consistent with parameters?	Check contents of parameters and remote station No.
	Station No. duplicated?	Check remote station No.
	Correct address?	Check that address corresponding to station No. is used.
Faulty station cannot be detected.	Error invalid station? Station No. duplicated?	Check contents of parameters. Check remote station No.
Remote station does not start up.	Parameter settings consistent with unit settings?	Check contents of parameters and remote station No.
	Station No. duplicated?	Check remote station No.
Some stations become faulty at certain baud rates.	Check faulty stations' communication status with other stations (SW0080 to 83).	Check switch settings of faulty stations.
	Restored to normal condition at lower baud rate?	Check that cables are correctly grounded. Check cable wirings (for confusion and poor connection). Check that terminal resistors are compatible with cables.
Optical transmission is impossible.	Correct address?	Check that address corresponding to station No. is used.
	Optical transmission stopped?	Check that CTL/TCD is off.
Optical reception is impossible.	Correct address?	Check that address corresponding to station No. is used.
	Other station powered?	Check that POW lamp on other station is lit.
	Any data transmitted from other station?	Check that CTL/TCD on other station is off.
	Optical axis correctly located?	Check that optical transfer status lamp (RCV) is lit.
	Optical reception stopped?	Check that CTL is off.

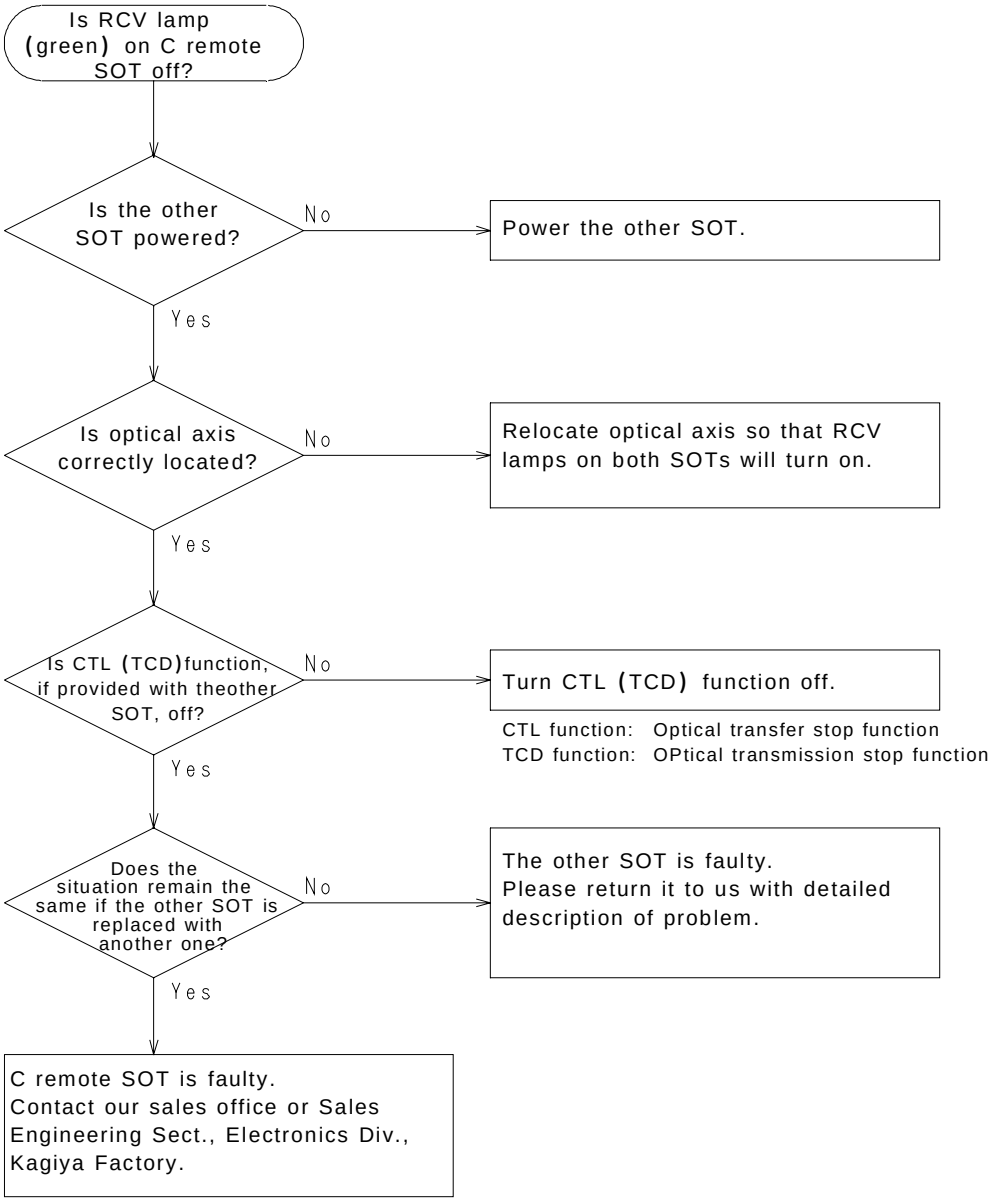
7-2.Troubleshooting

Simple troubleshooting procedures against problems in communication with C remote SOTs are shown below. For problems related with CPU units and master/slave units, see the relevant user's manual.

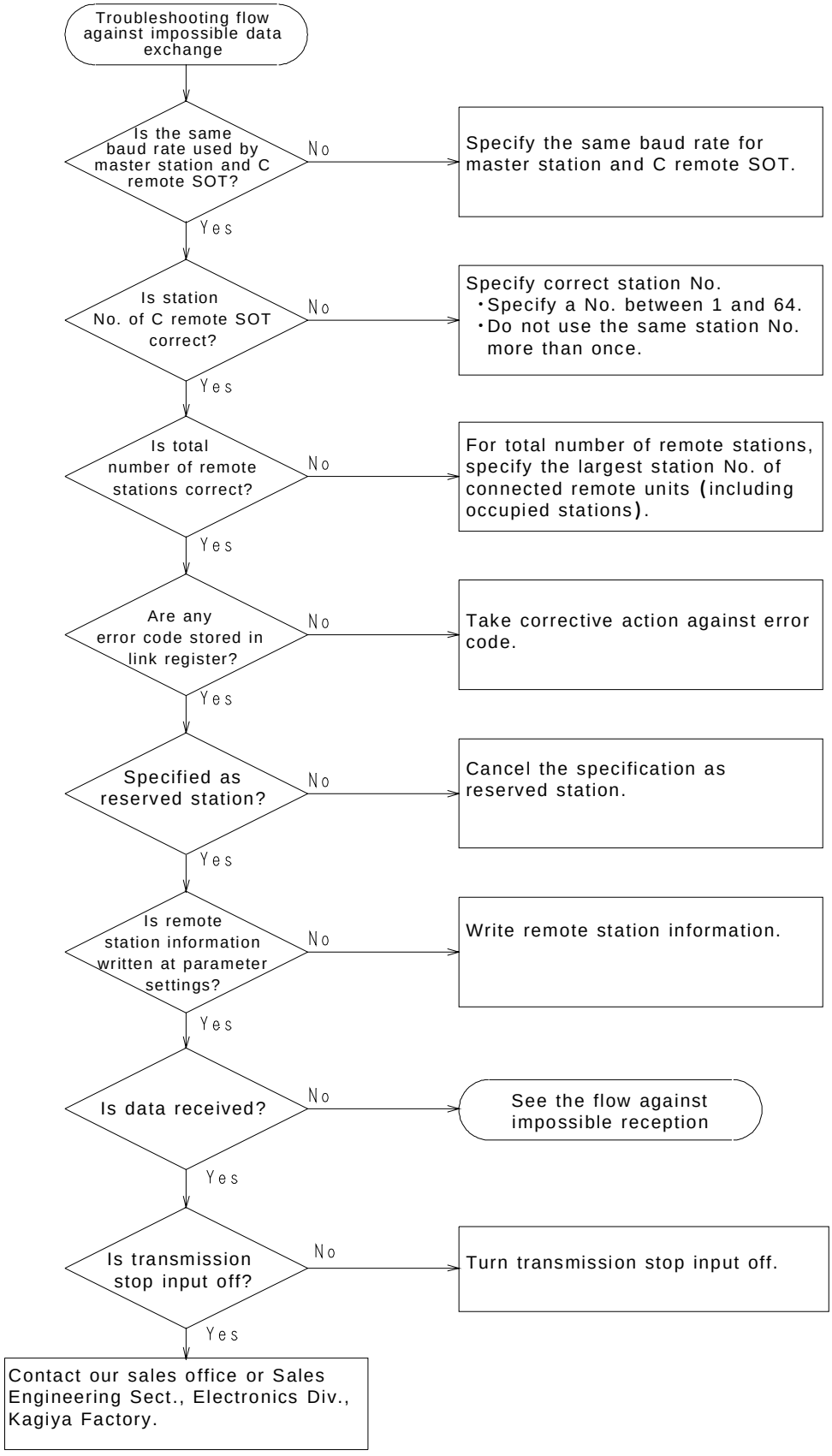
7-2-1.Troubleshooting flow



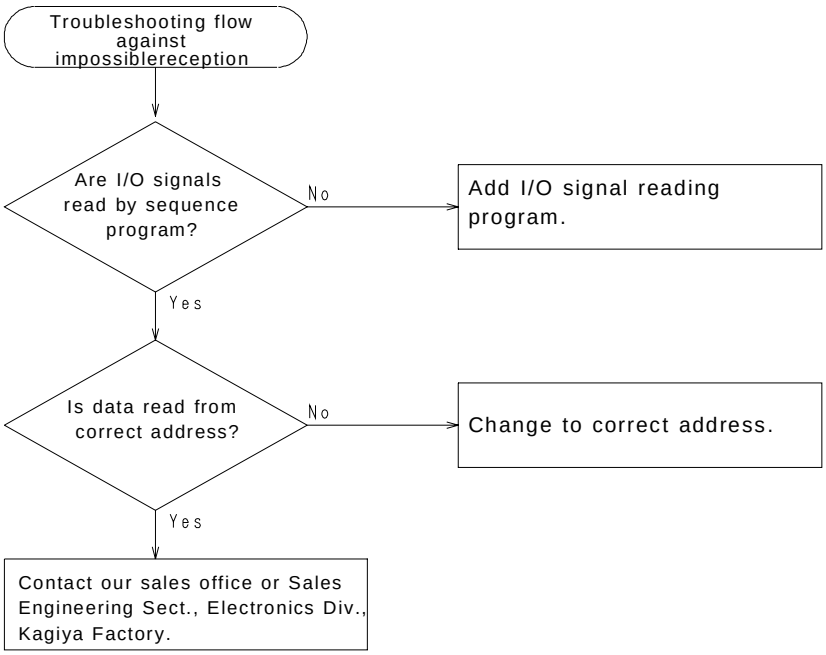
7-2-2.If the RCV lamp (Green) is off



7-2-3.If data cannot be exchanged



7-2-4.In case of impossible reception



8. Maintenance and Inspection

The SOT-CP 1601 series products should be serviced according to the following schedule. The check frequency is only shown for your reference and should be changed in consideration of the conditions of use and environmental conditions.

Caution: When servicing, take adequate safety measures so that no equipment around the unit will not accidentally move.

Check item	Description	Check frequency
Clean optical axis surface.	Wipe out transmitter/receptor opening surface with soft cloth. Do not use any solvent such as paint thinner and alcohol.	Every 3 months
Clean nameplate.	Wipe out nameplate with soft cloth so that it reads clearly. Do not use any solvent such as paint thinner and alcohol. If nameplate is peeled off or becomes illegible, replace with a new one (supplied at your cost).	
Check communication range.	Determine the range where RCV lamp on main body lights to check for optical axis shift.	
Check for loose screws.	Check each part of main body for loose screws.	
Check cables.	Check cables and connectors for damage.	

9. Specifications

9-1.CC-Link specifications

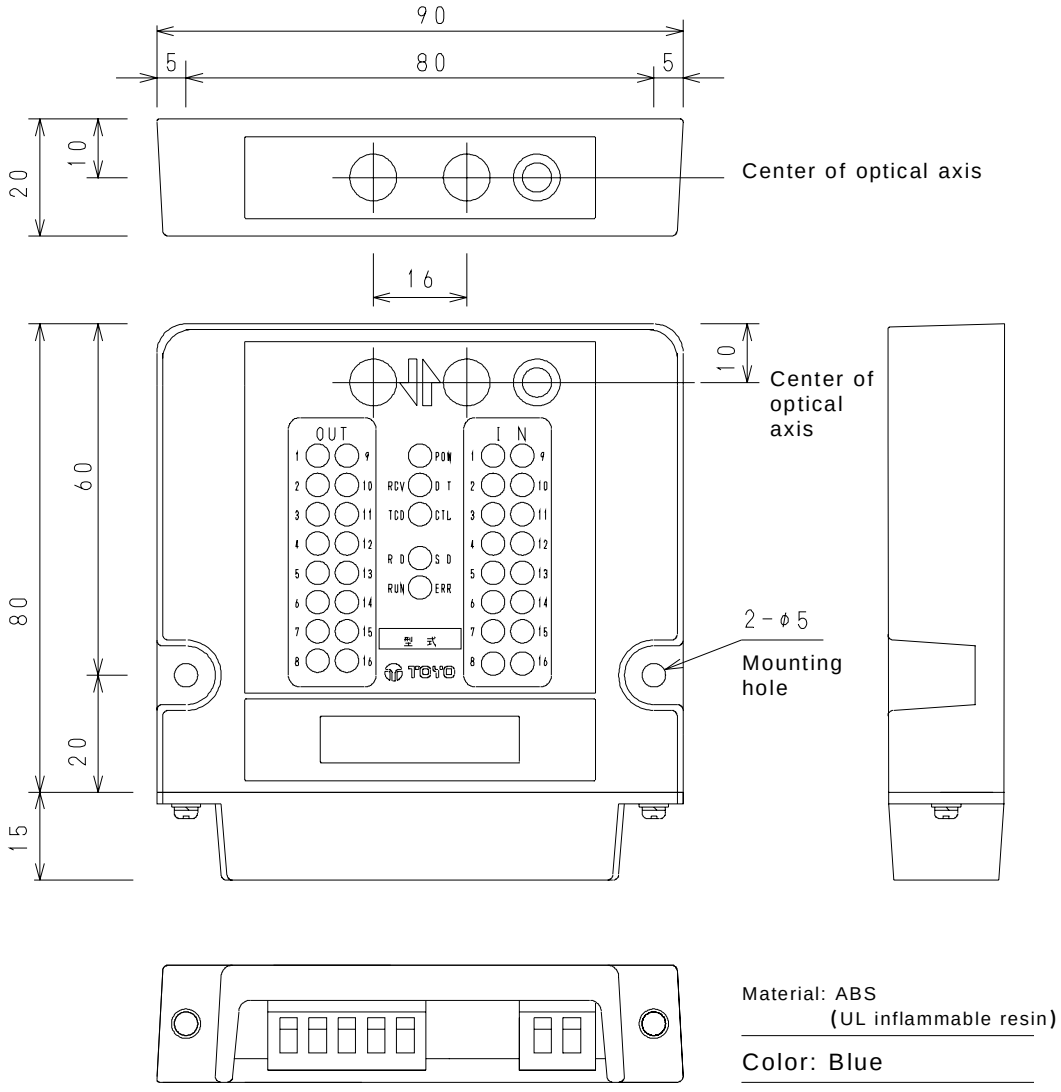
Item	Specification
Applicable sequencer	MELSEC A/QnA/Q series, Mitsubishi Electric
Applicable master unit	AJ61BT11,A1SJ61BT1,AJ61QBT11,A1SJ61QBT11,QJ61BT11
Communication method	**C**ontrol & **C**ommunication **L**ink (CC-Link)
No. of occupied stations	1
Transfer route	Bus
Transfer format	HDLC
Link connecting means	Connector terminal block (MSTB 2.5/5-ST-5.08, Phoenix Contact)
Connecting cable	CC-Link dedicated cable
Maximum transfer distance	1200 to 100 m (depending on baud rate)
Baud rate	10 M, 5 M, 2.5 M, 625 K or 156 Kpbs

9-2.Optical transfer specifications

Item	Specification			
Model	SOT-CP1601H	SOT-CP1601S	SOT-CP1603H	SOT-CP1603S
Optical axis direction	Head-on	Side-on	Head-on	Side-on
Rated voltage	DC24V			
Operating voltage	DC 18-30 V			
Current consumption	150mA MAX			
Transfer distance	0 to 1 m (with light intensity control knob set to MAX)		0 to 3 m (with light intensity control knob set to MAX)	
Emitting direction	30 degrees or more (at 1 m distance)		5 degrees or more (at 3 m distance)	
Transfer method	Semi-dual bi-directional or uni-directional			
Detection method	Continuous monitoring of bit status changes			
Transfer time	20 ms max. (in M/S mode) or 30 ms max. (in X mode)			
Projector element	Near infrared light emitting diode			
Receiver element	Photo-transistor			
No. of transfer bits	15 (16) input bits and 15 (16) output bits (16th bits may be switched to control input/output)			
No. of control inputs	1 (CTL/TCD) (with DSW3 off)			
No. of control outputs	1 (RCV) (with DSW3 off)			
Switches	①Station No. select switches (2 rotary switches) ②Baud rate select switch (a rotary switch) ③Mode select switches (dip switches)			
Indicator lamps	POW lamp: Lights (red) with power supply on. CTL/TCD lamp: Lights (red) with CTL input on. Lights (green) with TCD input on. D T/RCV lamp: Lights (red) when data is normally received. Lights (green) during stabilized reception. IN lamp: Lights (red) with relevant optical output data on. OUT lamp: Lights (green) with relevant optical input data on. RUN lamp: Lights (green) during normal data exchange with master unit. ERR lamp: Lights (red) with data error received and turns off during normal communication. SD lamp: Lights (red) during linked data transmission. RD lamp: Lights (red) during linked data reception.			

Item	Specification
Operating ambient temperature	-20 to 50 deg C (no condensation allowed during operation)
Operating ambient humidity	40 to 85%RH (no condensation allowed)
Operating ambient illuminance	4,000 Lx or less (no disturbing rays should directly enter receiver)
Vibration resistance	10 to 55Hz, 1.5mm dual amplitude 2 hours each in X, Y and Z directions
Impact resistance	500 m/s² (approx. 50G), 2 hours each in X, Y and Z directions
Protection class	IP40
Power supply connection	Connector terminal block (MSTB 2.5/2-ST-5.08, Phoenix Contact)
Physical dimensions	90㎜(W)×80㎜(D)×20㎜(H) (for detail, see the schematic in section 10)

10. Schematic



11. Settings and Procedure

11-1.Guarantee period

An year after delivery to the specified location

11-2.Scope of Guarantee

If any part of the product is found to have a fault attributable to us during the guarantee period as defined above, it will be replaced or repaired at our cost.
This does not apply when:
①the product has been incorrectly handled or used by the user,
②the fault was caused for a reason not related with the product,
③the product has been altered or repaired by the third party, or
④the fault was caused by a natural disaster or another accident unavoidable by us.

We only guarantee the product itself and take no responsibility for any secondary damage resulting from the use of the product.

12. Revision History

Date	Content of change	Responsibility
Aug. 2000	First issue	Development
Sep. 2000	Q series added, revision 'A'	Development