MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

type A6BSW-R

MITSUBISHI ELECTRIC

REVISIONS

*The manual number is given on the bottom left of the back cover.

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INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

IMPORTANT

(1) Design the configuration of a system to provide an external protective or safety inter locking circuit for the PCs.

(2) The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.

(a) Ground your body and the work bench.

(b) Do not touch the conductive areas of the printed circuit board and its electrical parts with non-grounded tools, etc.

CONTENTS

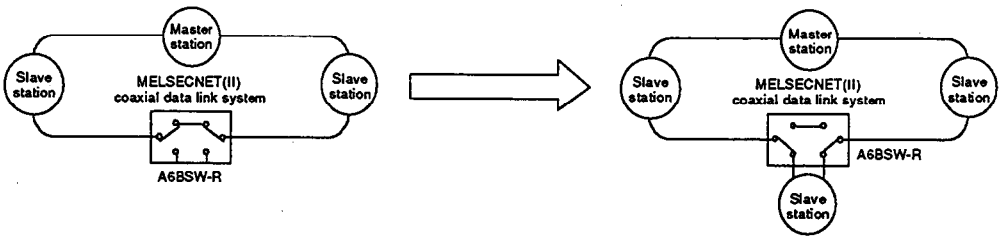
1. GENERAL DESCRIPTION

This user's manual gives the specifications, handling, etc. of the A6BSW-R coaxial tap (hereinafter referred to as A6BSW-R) which is used with the MELSEC-A series coaxial data link module. The A6BSW-R is a coaxial by-pass switch incorporating a switch relay which can switch the loop channels by turning ON/OFF an external power supply for bypass switching (hereinafter referred to as the external power supply) in the MELSECNET(II) coaxial data link system.

1.1 Features

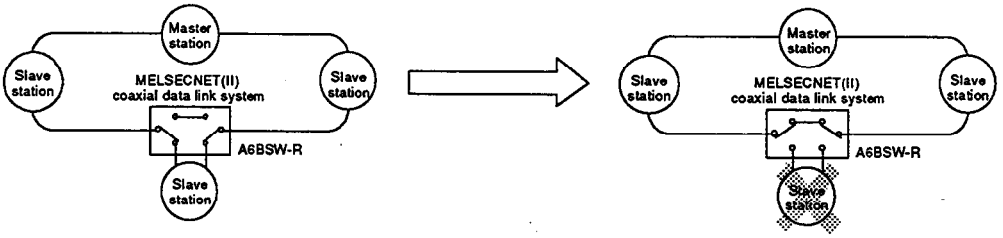
The A6BSW-R has the following features:

(1) Easy extension of slave stations.



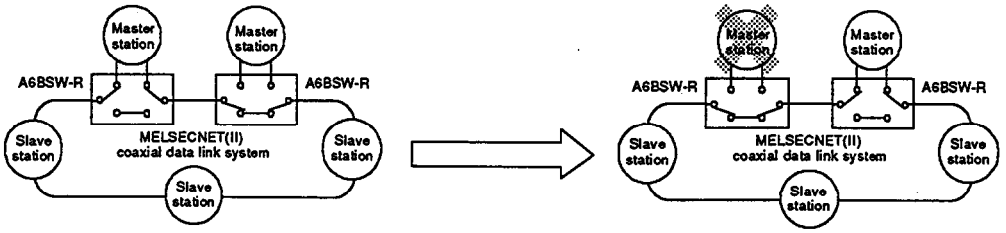
By installing the A6BSW-R units to the positions where future extension of slave stations is expected in a loop system, slave stations (local or remote I/O stations) can be easily installed later to the loop system without making additional extension wiring.

(2) Loop channels can be switched for bypass operation.



By connecting slave stations to the loop channels by using the A6BSW-R installed to each station, faulty slave stations are bypassed so that the entire loop system maintains data link. This feature maintains data link with normal stations which are previously left offline by the loop-back function when they are sandwiched by faulty stations.

(3) Can be used as the switch unit for redundant run of the master station.



By connecting two or more master stations using the A6BSW-R units in a data link system, a redundant run system in which one master station is set as the operating station and another master station is set as the backup station can be built. This system can minimize the time of data communication failure when the operating master station is down since the backup master station takes over the control of the data link system.

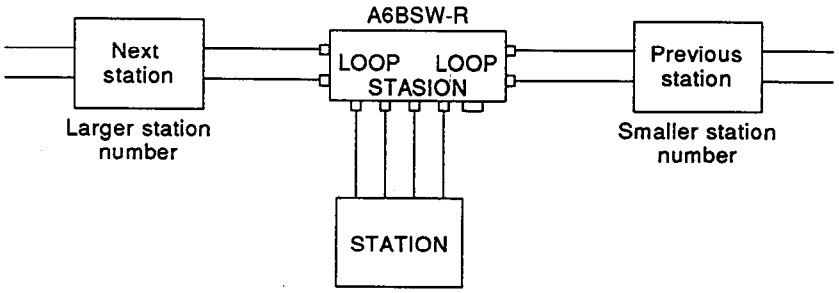
1.2 Products Contained in the Delivery Package

Make sure the following products are contained in the delivery package:

Product	Quantity
A6BSW-R coaxial tap unit	1
Power supply connector	1

POINT

In the following sections, the stations connected to the A6BSW-R are referred to as the previous station, next station, and STATION and are connected as shown below.



2. SYSTEM CONFIGURATION

This section gives a coaxial data link system configuration with the MELSEC-A series PC and A6BSW-R and the precautions to be observed when building a data link system.

2.1 Overall System Configuration

Fig. 2.1 shows the overall system configuration of a coaxial data link system in which the A6BSW-R units are used.

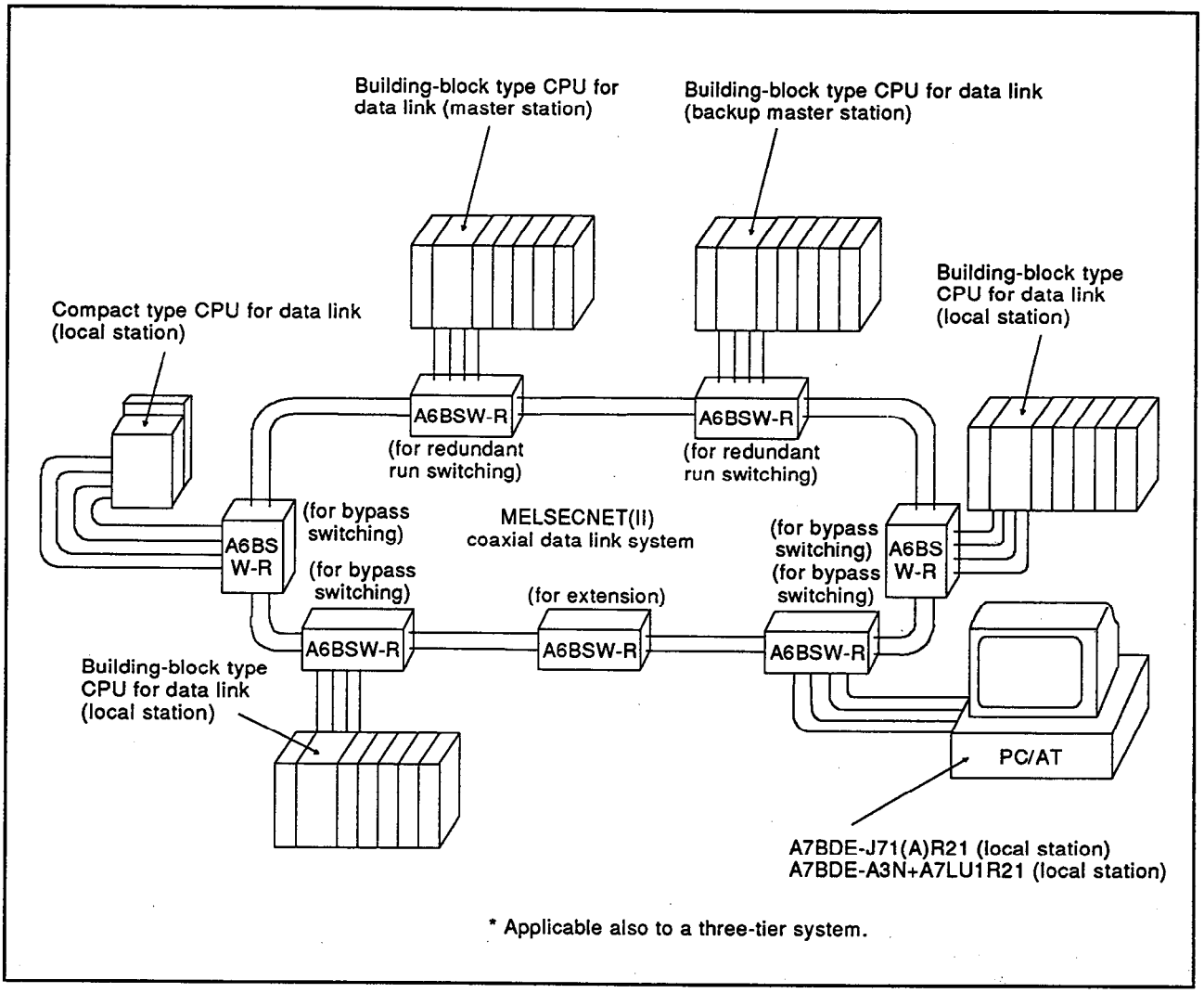


Fig. 2.1 Overall System Configuration

2.1.1 System configuration in which the A6BSW-R is used for extension or bypass switching

Fig. 2.2 shows a system configuration in which the A6BSW-R units are used for extension (of slave stations) or bypass switching (to set faulty stations offline).

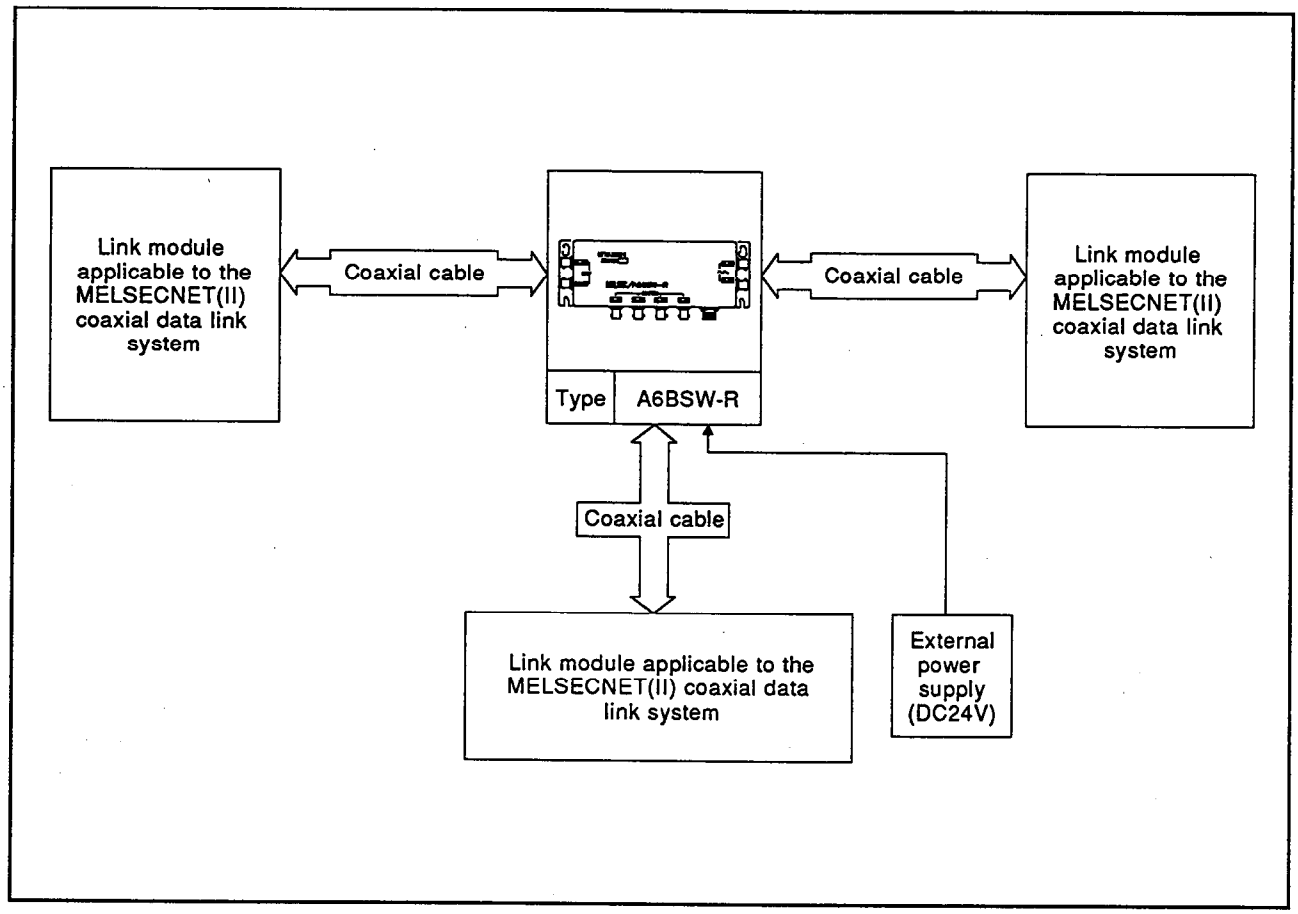


Fig. 2.2 System Configuration in which the A6BSW-R is Used for Extension or Bypass Switching

2.1.2 System configuration in which the A6BSW-R is used for redundant run

Fig. 2.3 shows a system configuration in which the A6BSW-R units are used for redundant run switching for the master stations.

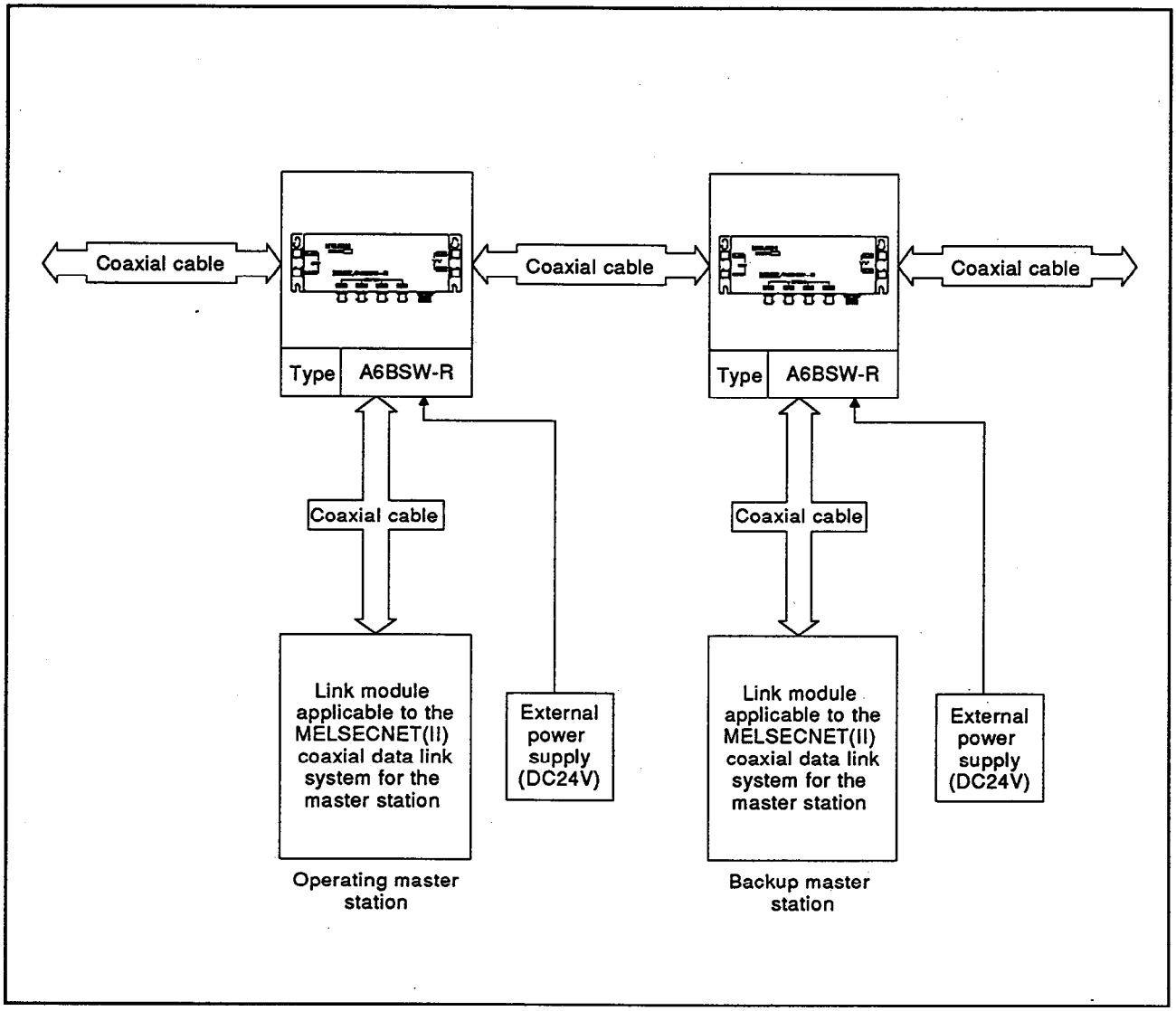


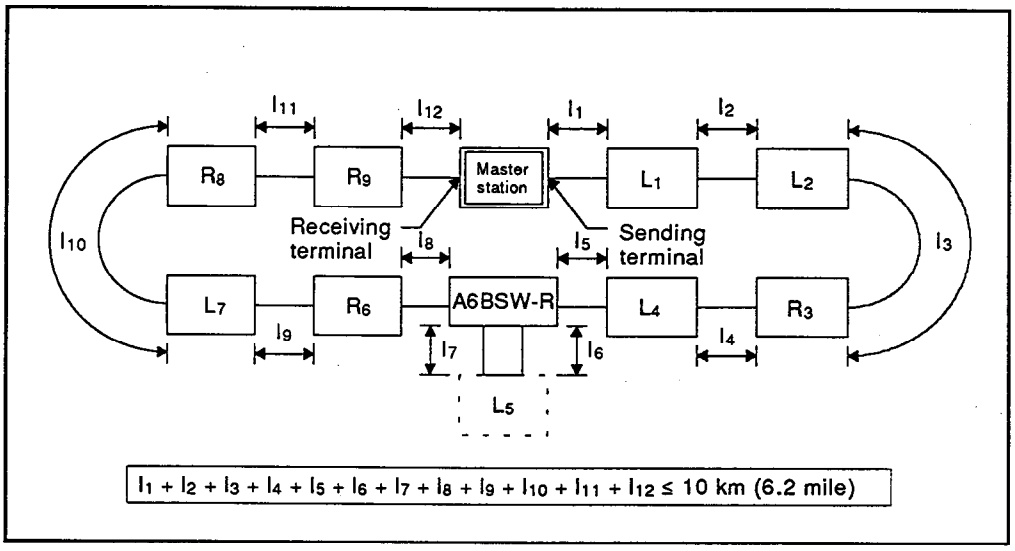
Fig. 2.3 System Configuration in which the A6BSW-R is Used for Redundant Run Switching

2.2 Precautions to be Observed When Building a Data Link System

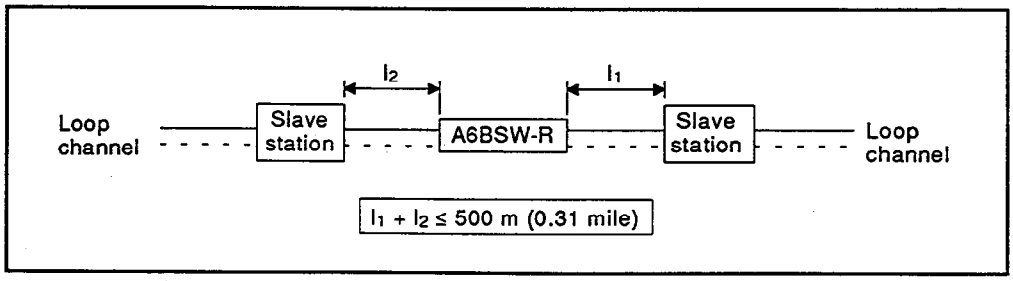
The following precautions should be observed when building a coaxial data link system in which the A6BSW-R units are used.

(1) The overall distance of the link cables in the MELSECNET(II) data link system which starts at the sending terminal of the master station, makes one turn via all slave stations, and ends at the receiving terminal of the master station (that is, the total length of cables between stations) is limited to 10 km (6.2 mile) or less. The station-to-station distance (cable length between stations) is limited to 500 m (0.31 mile) or less. The following points should be considered when building a system.

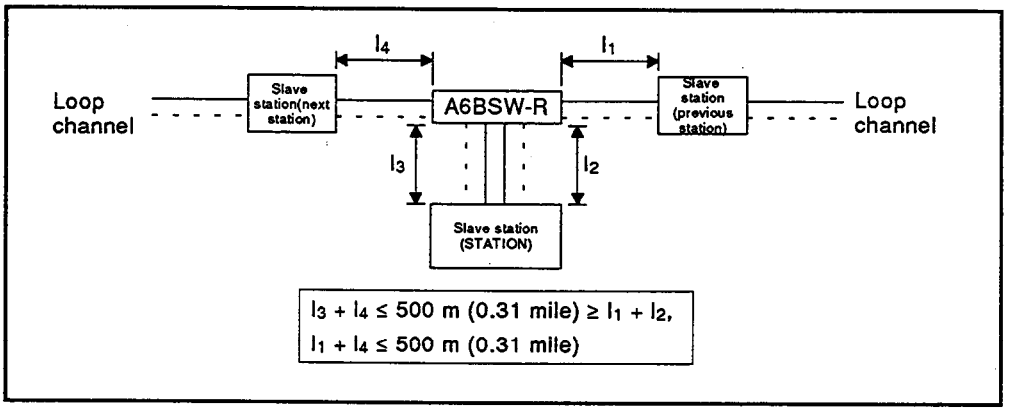
(a) The overall distance of the link cables for the forward and reverse loops respectively should not exceed 10 km (6.2 mile).



(b) The A6BSW-R does not have an amplification function such as a repeat function. Therefore, when an extension station is added by using an A6BSW-R, the station-to-station distance in which the A6BSW-R is added should still be up to 500 m (0.31 mile) for the forward and backward loops.

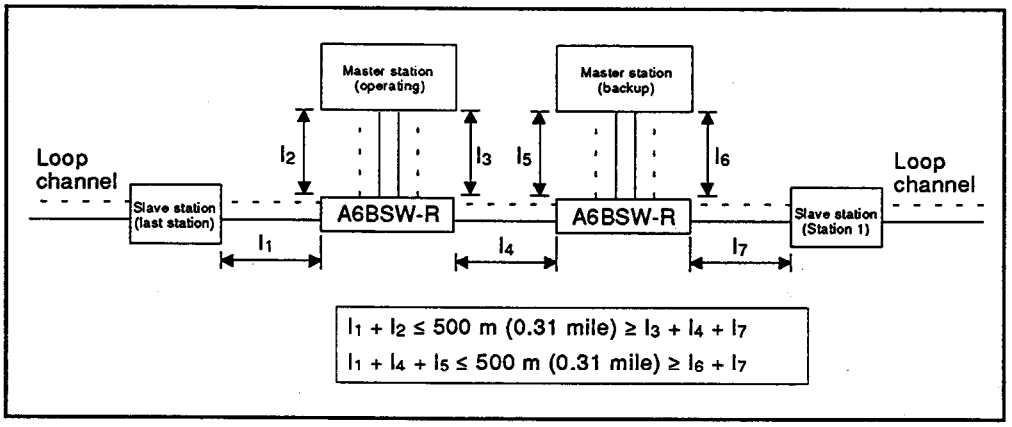


(c) When a slave station is connected to the A6BSW-R which has been connected to the loop channel for extension, or when a slave station is connected to the loop channel by using the A6BSW-R for bypass switching in case of a fault, the station-to-station distance between the slave station (STATION) and the previous station and between the slave station (STATION) and the next station should not exceed 500 m (0.31 mile) respectively for the forward and reverse loops.



However, when the slave station (STATION) is set offline by the A6BSW-R's bypass function, the distance between the previous station and the next station is the total of the distance (l1) between the previous station and the A6BSW-R and that (l4) between the A6BSW-R and the next station. The total distance should not exceed 500 m (0.31 mile) according to the limitation mentioned in (b) on previous page.

(d) When building a system for redundant run, the distance between the master station and station 1 and that between the master station and the last station should not exceed 500 m (0.31 mile) for the forward and reverse loops respectively.



3. SPECIFICATIONS

3.1 General Specifications

The general specifications of the A6BSW-R are as given below.

Table 3.1 General Specifications

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55 °C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">–20 to 75 °C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90% RH, no condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90% RH, no condensation</td></tr>
<tr><td rowspan="3">Vibration resistance</td><td rowspan="3">*1
Conforms to JIS C 0911</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 55 Hz</td><td>—</td><td>0.075 mm (0.003 inch)</td><td rowspan="2">10 times
*2
(1 octave/minute)</td></tr>
<tr><td>55 to 150 Hz</td><td>9.8 m/s^2 (1 g)</td><td>—</td></tr>
<tr><td>Shock resistance</td><td colspan="5">*1 Conforms to JIS C 0912 (98 m/s^2 (10 g) x 3 times in 3 directions)</td></tr>
<tr><td>Noise resistance</td><td colspan="5">By noise simulator at 1500 Vpp noise voltage, 1 μs noise width and 25 to 60 Hz noise frequency</td></tr>
<tr><td>Dielectric withstand voltage</td><td colspan="5">1500 VAC for 1 minute across AC external terminals and ground
500 VAC for 1 minute across DC external terminals and ground</td></tr>
<tr><td>Insulation resistance</td><td colspan="5">5 MΩ or larger by 500 VDC insulation resistance tester across AC external terminals and ground</td></tr>
<tr><td>Grounding</td><td colspan="5">Class 3 grounding; not necessary when grounding is impossible.</td></tr>
<tr><td>Operating ambience</td><td colspan="5">No corrosive gases or extreme dust.</td></tr>
<tr><td>Cooling method</td><td colspan="5">Self-cooling</td></tr>
</table>

REMARKS

*1: JIS : Japanese Industrial Standard

*2: One octave marked * indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10 Hz to 20 Hz, from 20 Hz to 40 Hz, from 40 Hz to 20 Hz, and 20 Hz to 10 Hz are referred to as one octave.

3.2 Performance Specifications

The performance specifications of the A6BSW-R are as given below.

Table 3.2 Performance Specifications

Item		Specifications
External power supply (for bypass switching)	Rated voltage	24 VDC
	Operating voltage range	20.4 to 26.4 VDC
Rated current consumption		25 mA
Bypass switching method		• Switching by turning ON/OFF the external power supply (when the SHORT terminals are shorted) • Switching by turning ON/OFF (short/open) the SHORT terminals (when the external power supply is always ON)
Max. number of switch units usable per loop		128 units*
Connectors	For the coaxial cable	BNC connector
	For the input power supply	Special connector
Applicable cables	Coaxial cable	3C-2 V/5C-2 V
	Input power supply cable	Finished outer diameter: ϕ5 to 6 mm, core wire: 0.5 mm^2 or smaller
Indicator		State of STATION which is connected or not connected is indicated by a LED lamp.
Outside dimensions mm (inch)		75 (H) x 204 (W) x 40 (D) (2.95 x 8.03 x 1.58)
Weight kg (lb)		0.8 (1.76)

*: Up to 128 A6BSW-R units can be connected among the stations in a loop. Note that the maximum number of slave stations usable in each tier is 64 per master station.

3.3 Block Diagram

The figure below shows a block diagram of the A6BSW-R.

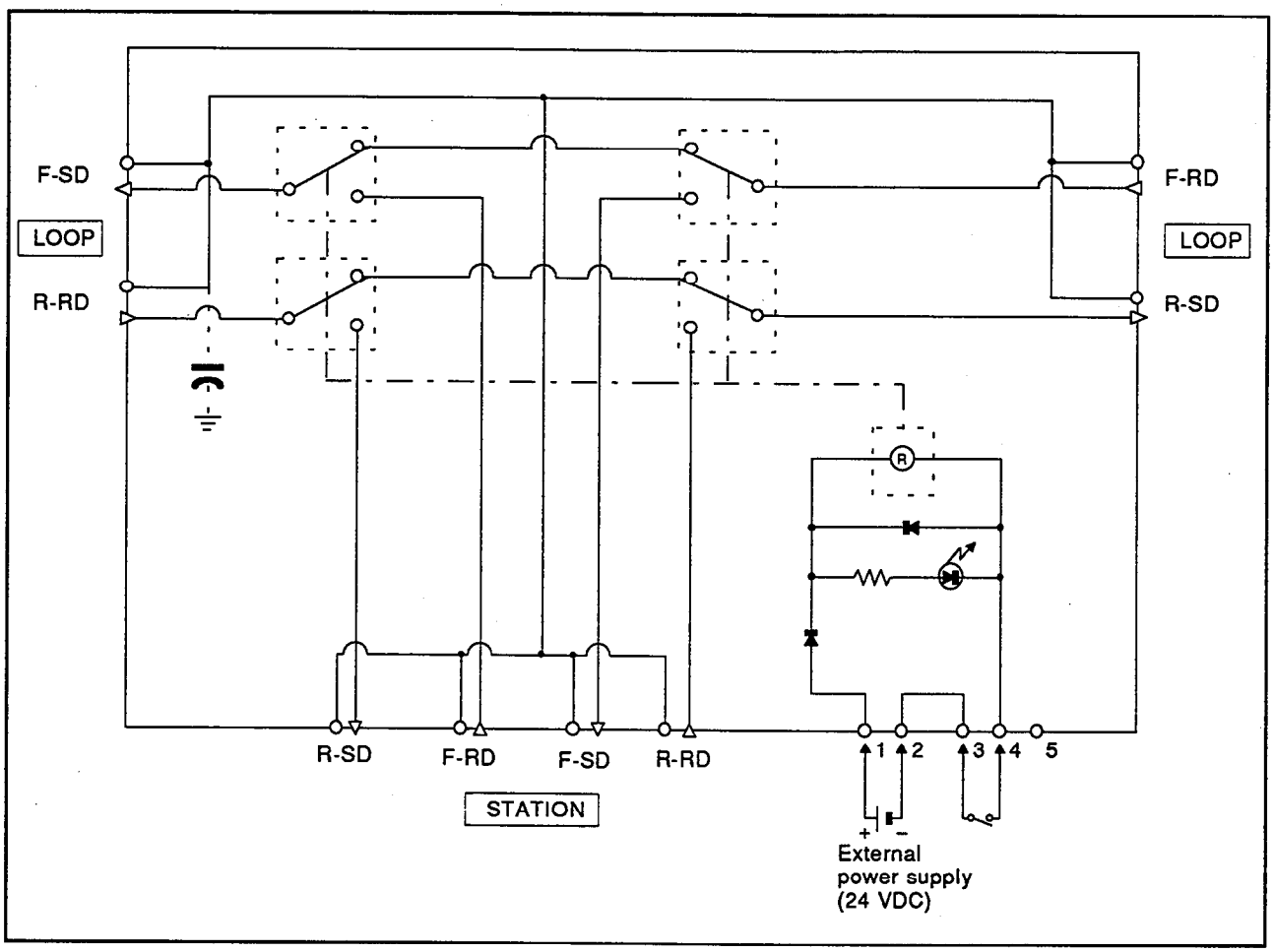


Fig. 3.1 Block Diagram

3.4 Functions

A coaxial data link system built with the A6BSW-R units has the following functions.

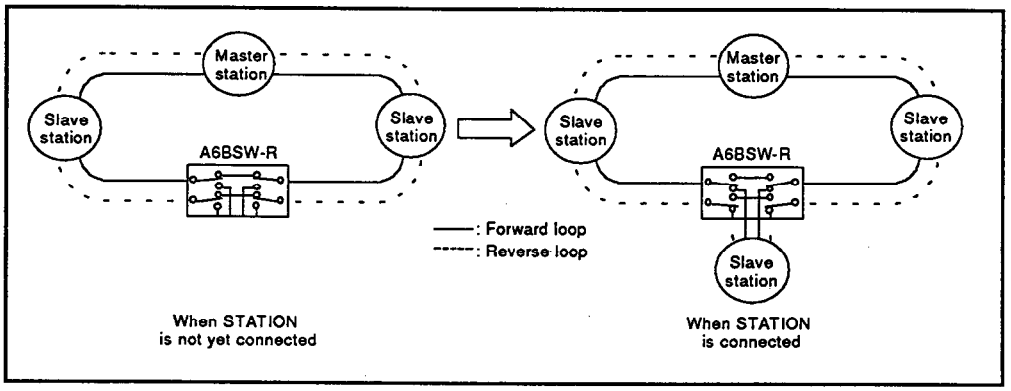
3.4.1 Extension function

When installing a slave station to an existing loop system, additional wiring for the slave station is usually required. However, by installing the A6BSW-R units to the positions where future extension of slave stations is expected in a loop system when first building the data link system, slave stations can be easily installed later to the loop system without making additional extension wiring.

(1) The extension function can be used by either of the following methods.

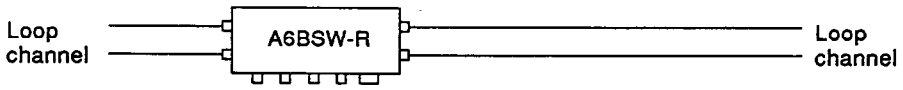
(a) Turning the external power supply (24 VDC) ON.

(b) Shorting the SHORT terminals.

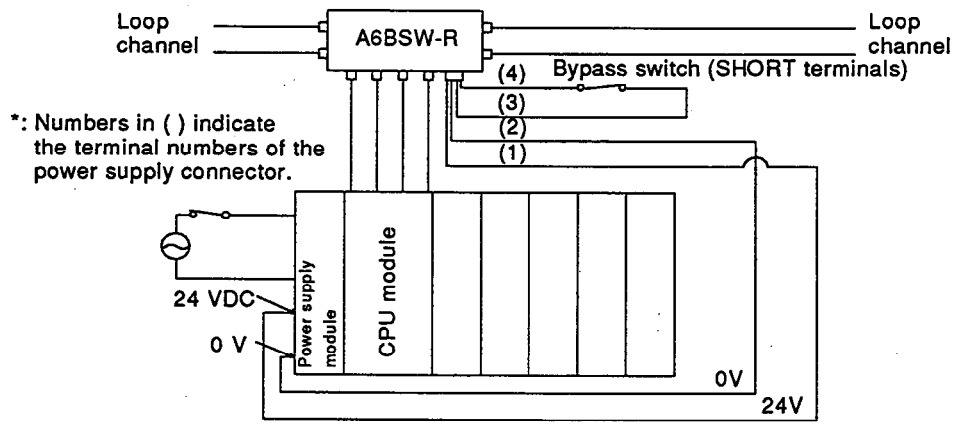


(2) Examples of use

(a) When STATION (slave) is not yet connected



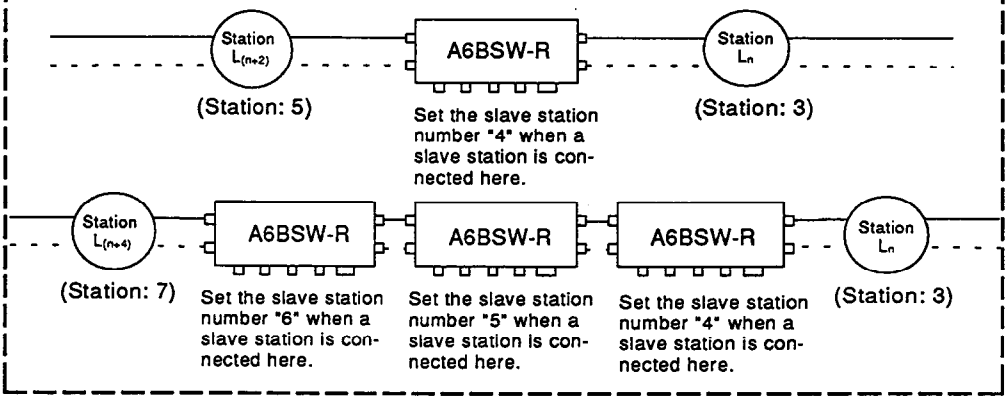
(b) When STATION (slave) is connected



(3) Precautions to be observed when using the extension function

(a) When setting the station numbers when the A6BSW-R units are installed to a loop channel, consider the slave station numbers to be added in future and give station numbers also to such A6BSW-R units. When adding a slave station in between consecutively-numbered stations, set again the station numbers beginning with the added station and the stations that follow.

Example



When additional slave stations are not yet connected, the master station treats such stations as non contact stations.

(b) When adding a slave station, set the mode select switch of the adding station to "0" (for automatic online return).

(c) Set the type of slave station (local or remote I/O) to be connected to the A6BSW-R with the link parameter at the master station. If the type of slave station actually connected to the A6BSW-R is different from that set with the link parameter, correct link parameter setting.

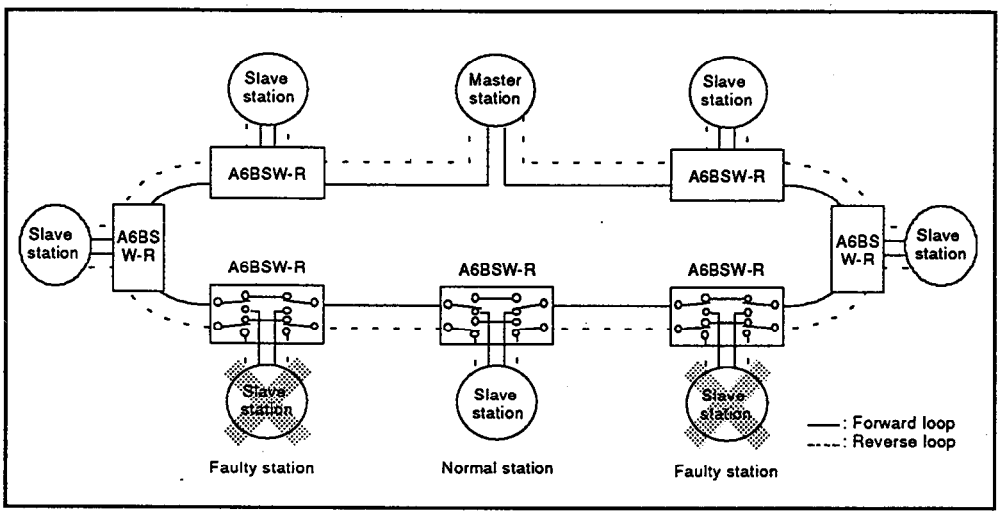
3.4.2 Bypass function

The MELSECNET(II) data link system has a loopback function using a duplex loop system for improved reliability. When two or more stations in the loop are down due to power failure, however, all stations connected between the faulty stations are set for non contact. The A6BSW-R sets only faulty stations for non contact and normal stations between faulty stations are not set for non contact and continue data link.

(1) The bypass function of the A6BSW-R can be used by either of the following methods.

(a) Turning the external power supply (24 VDC) OFF.

(b) Opening the SHORT terminals.



(2) Precaution to be observed when using the bypass function

(a) To enable the bypass function, set the mode select switch of the slave station connected to the A6BSW-R to "0" (for automatic online return). If it is not set for "automatic online return", data link cannot be restarted.

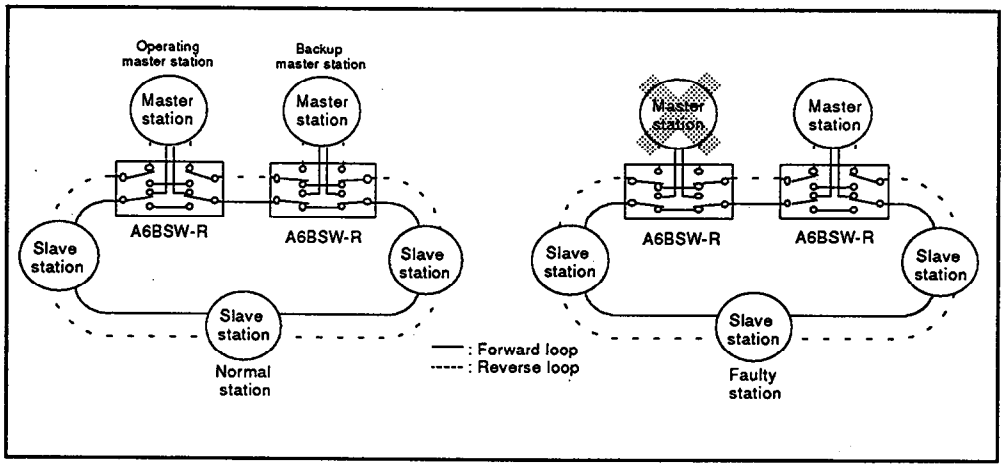
3.4.3 When the A6BSW-R is used as the redundant run switching unit

When the master station is down, the entire data link system goes down. A backup master station can be installed by using the A6BSW-R, so that the system down time is minimized.

(1) Switching to the redundant run is done by using the extension function and the bypass function.

(a) The bypass function sets the down master station offline.

(b) The extension function sets a backup master station online.



IMPORTANT

The redundant run system using the A6BSW-R is not perfectly backed up.
There is a minimum system down time when the operating master station is down until a backup master station takes over the control of the data link system.

(2) Precautions to be observed when using the A6BSW-R for switching to the redundant run

(a) Set the operating master station and the backup master station for "automatic online return". If they are not set for "automatic online return", data link cannot be restarted.

(b) When the backup master station takes over the control of the data link system, the CPU in the backup master station starts processing in the initial start condition, and the data link starts also in the initial state.

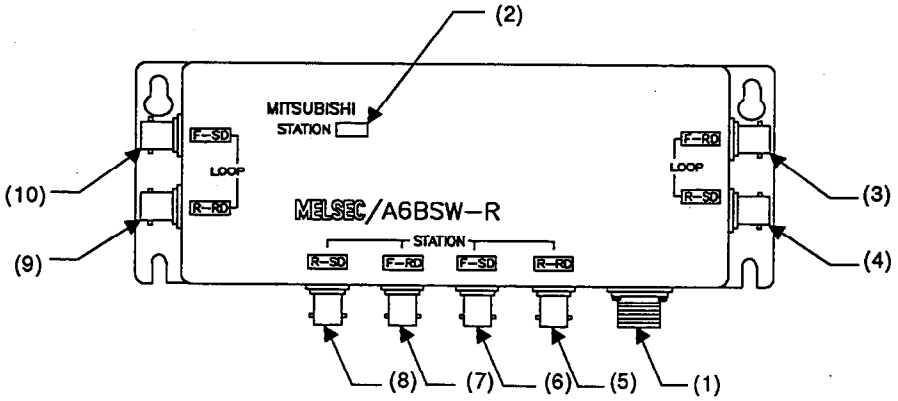
(c) The input and output signals of the devices connected to the input and output modules in the operating master station must be connected in parallel also to the backup master station. Make the connections using caution to prevent additional current.

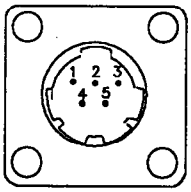
4. NAMES, DESCRIPTIONS AND HANDLING OF PARTS

The names, descriptions and handling of parts of the A6BSW-R are as given below.

4.1 Names and Descriptions of Parts

Names and descriptions of the parts of the A6BSW-R are as given below.



No.	Name and appearance	Description
(1)	External power supply connector 	Used to input an external power supply. <table><tr><th>Terminal No.</th><th>Terminal Name</th></tr><tr><td>1</td><td>24 VDC input terminal</td></tr><tr><td>2</td><td>24 GDC input terminal</td></tr><tr><td>3</td><td>SHORT terminal (-)</td></tr><tr><td>4</td><td>SHORT terminal (+)</td></tr><tr><td>5</td><td>Vacancy</td></tr></table>
(2)	STATION LED	Indicates the connected / not connected condition of the STATION. When the STATION is connected: Lit When the STATION is not connected (bypass function): Unlit
(3)	Previous station forward loop receive (F-RD) connector	Connects to the previous station forward loop send (F-SD) connector.
(4)	Previous station reverse loop send (R-SD) connector	Connects to the previous station reverse loop receive (R-RD) connector.
(5)	STATION reverse loop receive (R-RD) connector	Connects to the STATION reverse loop send (R-SD) connector.
(6)	STATION forward loop send (F-SD) connector	Connects to the STATION forward loop receive (F-RD) connector.
(7)	STATION forward loop receive (F-RD) connector	Connects to the STATION forward loop send (F-SD) connector.
(8)	STATION reverse loop send (R-SD) connector	Connects to the STATION reverse loop receive (R-RD) connector.
(9)	Next station reverse loop receive (R-RD) connector	Connects to the next station reverse loop send (R-SD) connector.
(10)	Next station forward loop send (F-SD) connector	Connects to the next station forward loop receive (F-RD) connector.

4.2 Handling

The handling instructions for the A6BSW-R are as mentioned below.

4.2.1 Handling Instructions

(1) Do not drop nor give mechanical shock to the A6BSW-R.

The case may become distorted and the boards inside the A6BSW-R may break.

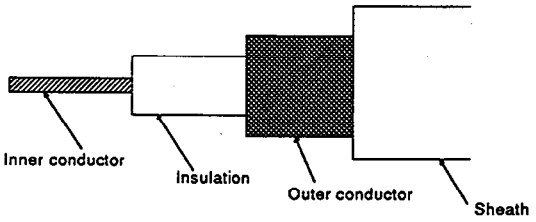
(2) Ensure that no conductive debris such as wire offcuts and drill cut chips can enter the electrical connection parts of the A6BSW-R. If debris enters, make sure that it is removed.

(3) Do not disassemble and remove the printed circuit boards from the case. There are no user-serviceable parts on the boards.

4.2.2 Coaxial cable specifications

The specifications of the coaxial cables used for the coaxial data link system are as given in Table 4.1.
Use high-frequency coaxial cables "3C-2V" or "5C-2V" (conforms to JIS C 3501).

Table 4.1 Coaxial Cable Specifications

Item	3C-2V	5C-2V
Structure		
Cable diameter	5.4 mm (0.21 in.)	7.4 mm (0.29 in.)
Allowable bending radius	22 mm (0.87 in.) or over	30 mm (1.18 in.) or over
Inner conductor diameter	0.5 mm (0.02 in.) (annealed copper wire)	0.8 mm (0.03 in.) (annealed copper wire)
Insulation diameter	3.1 mm (0.12 in.) (polyethylene)	4.9 mm (0.19 in.) (polyethylene)
Outer conductor diameter	3.8 mm (0.15 in.) (single-braided annealed copper wire)	5.6 mm (0.22 in.) (single-braided annealed copper wire)
Jack type	227161-4	
Applicable connector plug	Connector plug for 3C-2V (BNC-P-3-Ni is recommended)	Connector plug for 5C-2V (BNC-P-5 is recommended)

REMARK

Consult nearest Mitsubishi representative in regard to connector plug.

4.2.3 Fixing the coaxial cable connector

Fix a BNC (coaxial cable connector plug) connector with the coaxial cable as given below.

(1) Components and structure

The components and structure of the BNC connector and coaxial cable are as shown below.

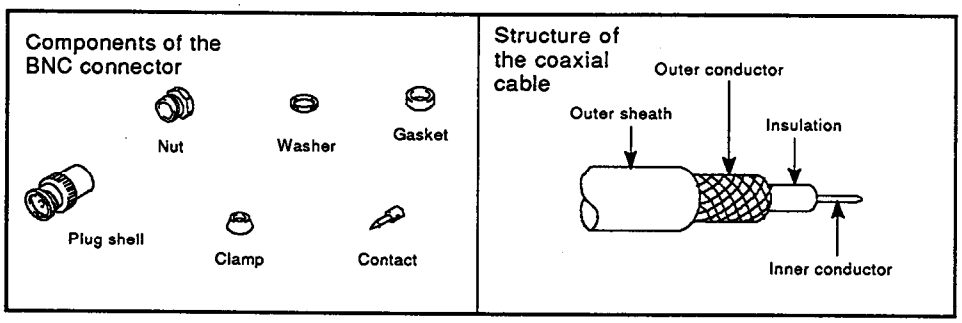


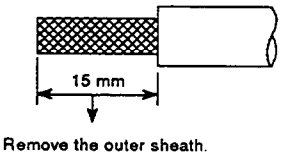
Fig. 4.1 Components and Structure of the BNC Connector and Coaxial Cable

(2) Fixing the BNC connector with the coaxial cable

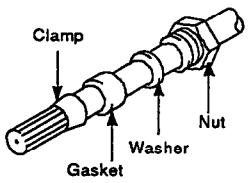
Fix the BNC connector as given below.

(a) Remove the outer sheath of the coaxial cable as shown to the right.

Use caution not to damage the outer conductor.

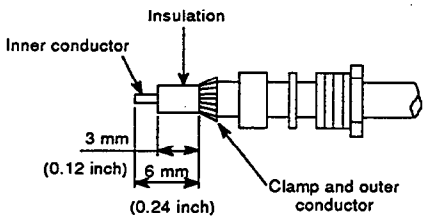


(b) Put a nut, a washer, a gasket, and a clamp on the cable and loosen the outer conductor.

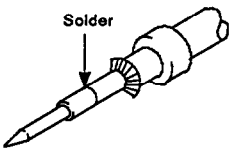


(c) Cut the outer conductor, insulation, and inner conductor as shown to the right.

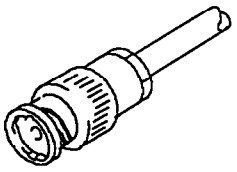
Cut the outer conductor so that it extends over the tapered part of the clamp.



(d) Solder the contact to the inner conductor.



(e) Insert the contact assembly (d) in the plug shell, and screw the nut on the plug shell.



POINT

(1) Observe the following precautions when soldering the contact to the inner conductor:
   (a) Solder should not be lumpy.
   (b) No clearance should be left between the contact and the insulation nor should they cut into each other.
   (c) Solder the contact quickly so that the insulation is not deformed.

4.2.4 Cable connection and unit installation

The method for connecting cables to the A6BSW-R's BNC connector jack and for installing the unit are as given below.

(1) General precautions

(a) Do not bend the coaxial cable to a radius smaller than the allowable bending radius.

Provide enough space around the A6BSW-R unit so that the coaxial cables are not bent to extremity (refer to (5)).

(b) Connect the coaxial cables to form a duplex loop system.

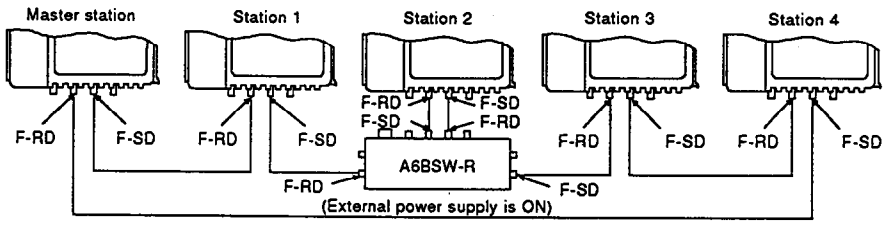
When only the forward or reverse loop is built or when the master station is not connected to the last station, data link is possible with all stations only when the data link system is in normal condition. However, when a fault occurs with a station, the following problems occur.

1) When only the forward or reverse loop is connected, data link with all stations becomes impossible.

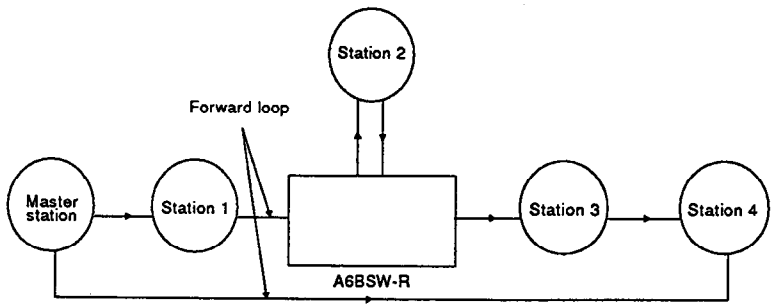
Example

When a station in the data link system shown below causes power failure, data link with all stations becomes impossible. The faulty station detection by the link monitor function also becomes impossible. When station 2 causes power failure, however, the A6BSW-R executes its bypass function and restarts data link with other stations.

When only the forward loop is connected:



Link data flow

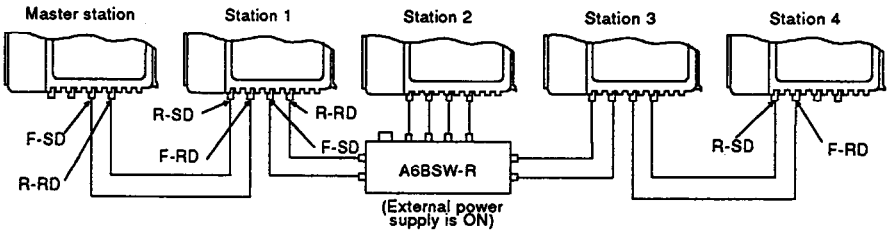


2) When master station's F-RD is not connected to the last station's F-SD, or when the master station's R-SD is not connected to the last station's R-RD, data link is performed always by the loopback operation. When a station in such data link system is down, data link beginning with the faulty station through the last station becomes impossible.

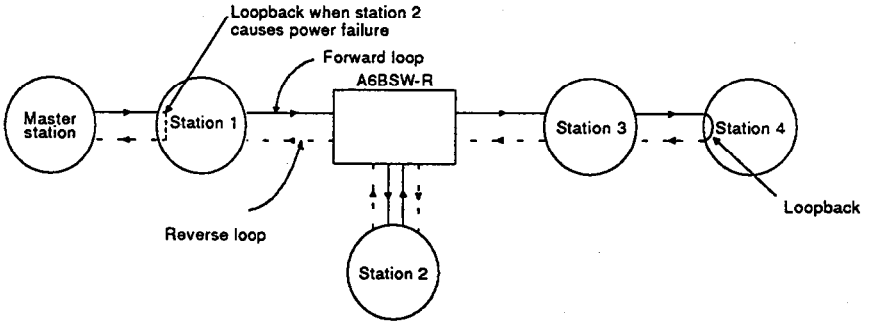
Example

When station 4 in the data link system shown below causes power failure, data link with stations 2, 3, and 4 becomes impossible. However, the A6BSW-R executes its bypass function and restarts data link with stations 3 and 4.

When master station's F-RD is not connected to the last station's F-SD, or when the master station's R-SD is not connected to the last station's R-RD:



Link data flow



(c) When connecting the coaxial cables, allow a clearance of at least 100 mm(3.94 inch) to high-tension or large-current circuit wires.

(2) Connection between the A6BSW-R and link modules

Connect one end of the coaxial cable to the link module's F-SD connector and the other end to the next station's F-RD connector. Connect the link module's R-RD connector to the next station's R-SD connector, as shown below. (Connect the last station's F-SD and R-RD connectors to the master station's F-RD and R-SD connectors respectively.)

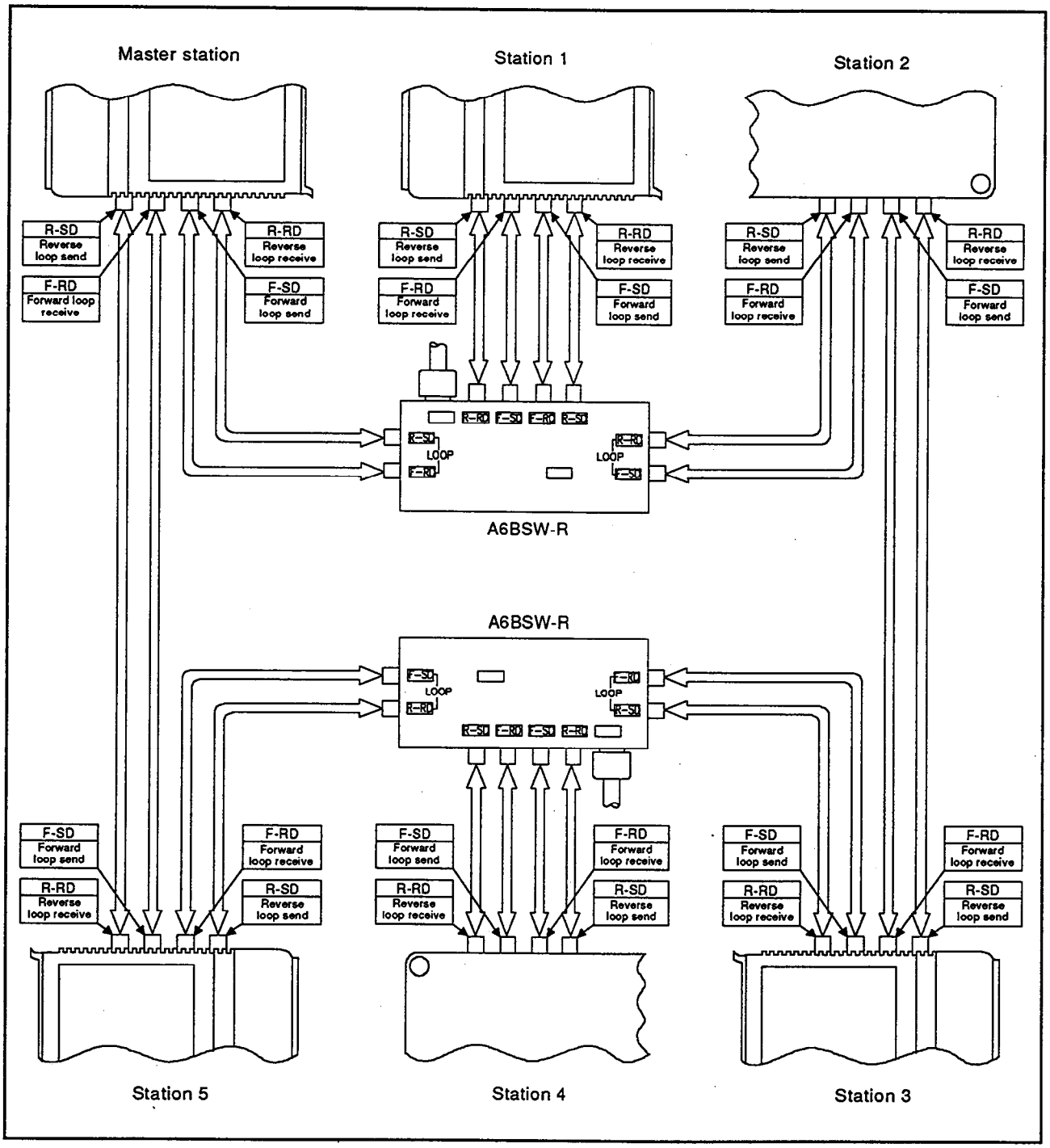
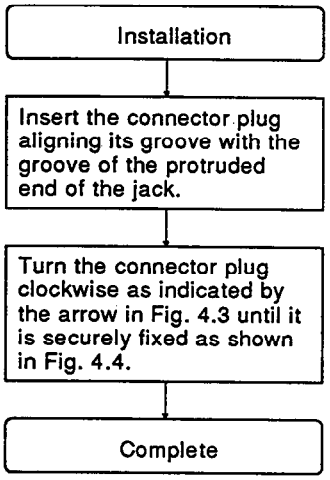


Fig. 4.2 Coaxial Cable Connections to the Link Modules

(3) Installing the coaxial cable

Follow the procedure mentioned below for installing coaxial cables.



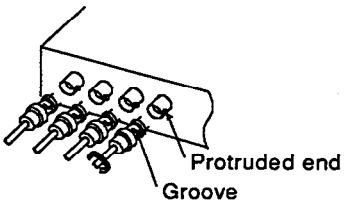


Fig. 4.3

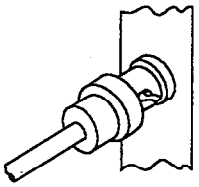
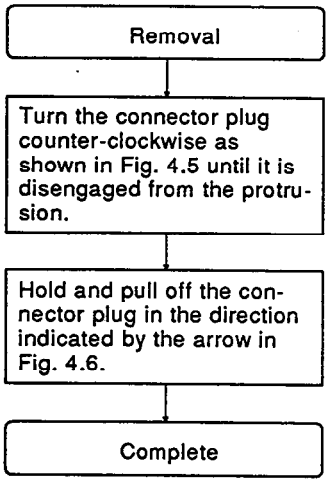


Fig. 4.4

(4) Removing the coaxial cable

Follow the procedure mentioned below for removing the coaxial cables.



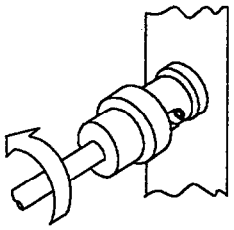


Fig. 4.5

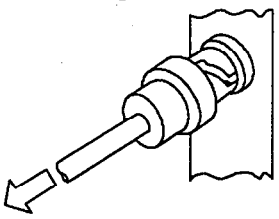
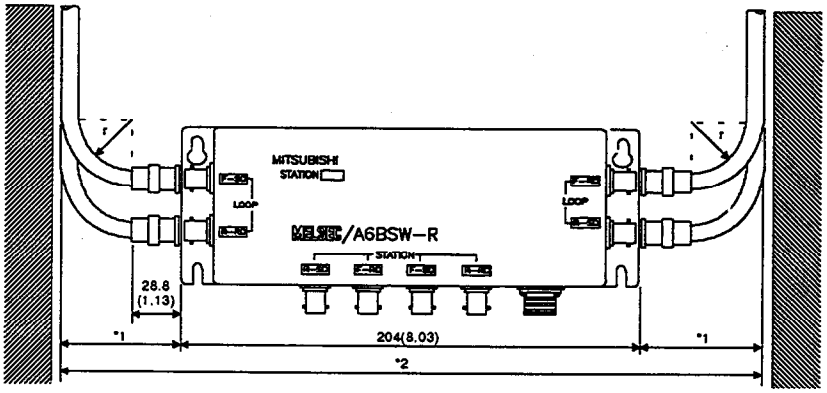


Fig. 4.6

(5) Installing the A6BSW-R unit

Provide clearances as mentioned below when installing the A6BSW-R unit to a panel.
([///] indicates a panel wall, conduit, component, etc.)

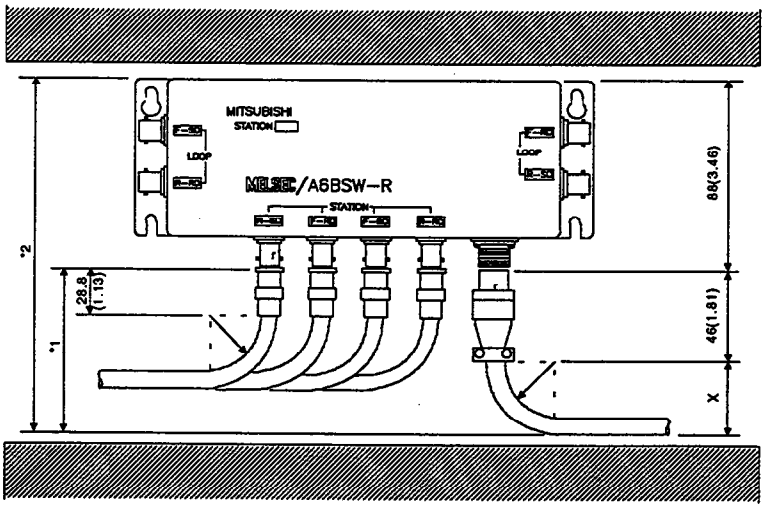
(a) When the cable connector plugs are positioned horizontally



*1 .....3C-2V ..... 56.2(2.21) or over
5C-2V ..... 66.2(2.61) or over
*2 .....3C-2V ..... 260.2(10.24) or over
5C-2V ..... 270.2(10.64) or over

Unit: mm (inch)

(b) When the cable connector plugs are positioned vertically



*1 .....3C-2V ..... 56.22(2.21) or over
5C-2V ..... 66.2(2.61) or over
*2 .....134 + x mm (5.22 + x inch) or over

[x: Sum of the minimum values of the diameter and allowable bending radius of the cable connected to the power supply connector.]

Unit: mm (inch)

4.3 Checking the A6BSW-R's Hardware

The following gives the troubleshooting procedures that are applicable when a station (previous, next, or STATION) connected to the A6BSW-R is down or the loop channel becomes faulty (loop error) as it is detected by the link monitor with the peripheral devices or by monitoring the special relay M or special register D which is executed when a fault occurs in a data link system in which the A6BSW-R is used.
Also refer to the MELSECNET(II) Data Link System Reference Manual for details of the procedures of the link monitor with peripheral devices, monitoring with special relay M and special register D, and specific tests.

(1) Troubleshooting procedures

Follow the procedures mentioned below for troubleshooting as described in this section.

(a) Find the condition of the problem which corresponds to the current condition of the problem with the data link system by referring to Table 4.2 Troubleshooting Tests for Specific System Configurations. Then, conduct troubleshooting tests 1) to 3) mentioned in the corresponding area in the table.

(b) Find the cause of the problem in Table 4.3 based on the test results, and take applicable corrective actions.
The test results given in Table 4.3 are described below.

1) Normal .....The "CRC", "OVER", "AB.IF", "TIME", "DATA" and "UNDER" ERROR LEDs of the link module flash in that order.

2) Forward loop error ..The "TIME" or "DATA" ERROR LED of the link module lights.

3) Reverse loop error ..The "R.LOOP" and any of the other ERROR LED of the link module light.

4) Hardware fault .....An ERROR LED other than those mentioned in 2) and 3) above lights.

POINT

When data link is not restored after conducting the corrective actions given in Table 4.3 or when no probable cause can be found, refer to the sections about the ERROR LEDs in the MELSECNET(II) Data Link System Reference Manual and conduct further troubleshooting.

(2) Troubleshooting tests for specific system configurations

The following gives the troubleshooting tests for specific system configurations.
(M: Master station, Ls: Station with smaller station number, L_L: Station with larger station number, □: A6BSW-R)

Table 4.2 Troubleshooting Tests for Specific System Configurations

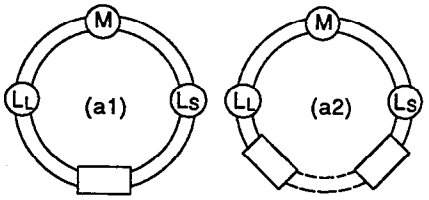
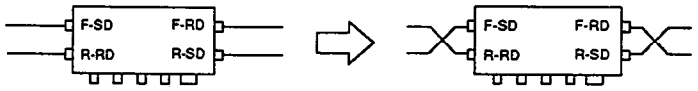
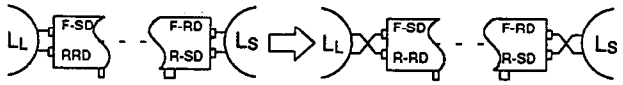
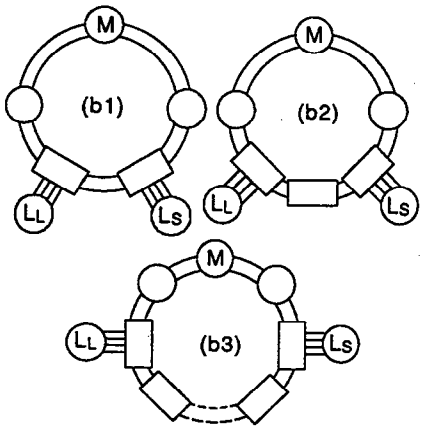
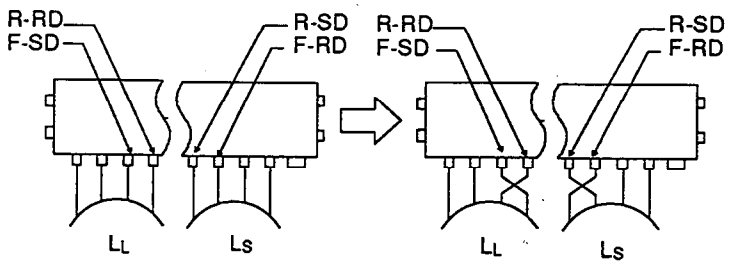
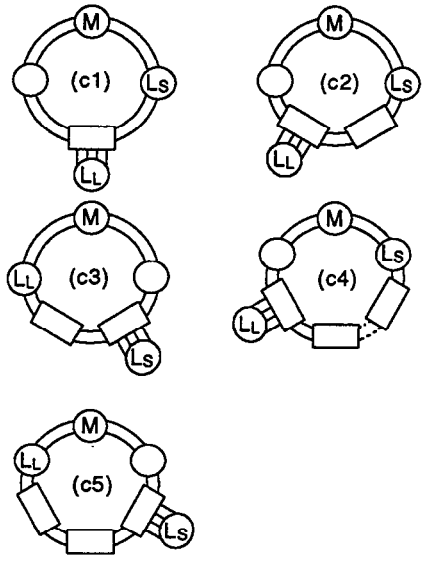
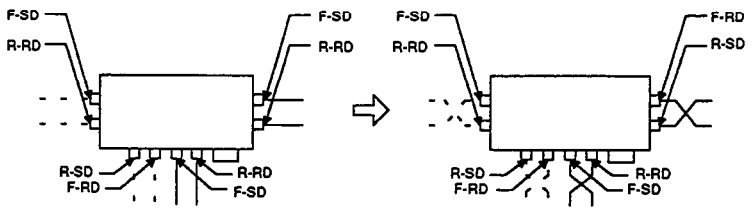
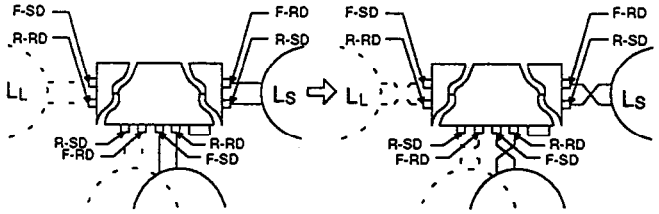
Problem Condition	Troubleshooting Tests
(a) An A6BSW-R exists between stations which caused a loop error. (Example) 	1) Conduct a station-to-station test between stations Ls and L_L with the link cable condition which caused a loop error. 2) Switch the cables connected to the A6BSW-R as shown below, and conduct a station-to-station test again between stations Ls and L_L. • When the number of A6BSW-R units between stations is one (a1)  • When the number of A6BSW-R units between stations is more than one (a2)  Switch the cables connected to the previous station connectors (F-RD and R-SD) of the A6BSW-R which is closest to Ls and the cables connected to the next station connectors (F-SD and R-RD) of the A6BSW-R which is closest to L_L. 3) Conduct a self-loopback test at Ls and L_L stations.
(b) A loop error occurs between stations connected to the loop by the A6BSW-R units. (Example) 	1) Conduct a station-to-station test between stations Ls and L_L with the link cable condition which caused a loop error. 2) Switch the cables connected to the A6BSW-R as shown below, and conduct a station-to-station test again between stations Ls and L_L.  Switch the cables connected to the STATION connectors (F-RD and R-SD) of the A6BSW-R to which Ls is connected and the cables connected to the STATION connectors (F-SD and R-RD) of the A6BSW-R to which L_L is connected. 3) Conduct a self-loopback test at Ls and L_L stations.

Table 4.2 Troubleshooting Tests for Specific System Configurations (Continued)

Problem Condition	Troubleshooting Tests
(c) A loop error occurs between a station in the loop and a station connected to the loop by the A6BSW-R. (Example)  	1) Conduct a station-to-station test between stations Ls and L_L with the link cable condition which caused a loop error. 2) Switch the cables connected to the A6BSW-R as shown below, and conduct a station-to-station test again between stations Ls and L_L. ----- : when Ls is connected to the loop by the A6BSW-R —— : when L_L is connected to the loop by the A6BSW-R • When the number of A6BSW-R units between stations is one (c1)  When L_L is connected to the loop by the A6BSW-R, switch the cables connected to the previous station connectors (F-RD and R-SD) of the A6BSW-R and the cables connected to the STATION connectors (F-SD and R-RD) of the A6BSW-R as indicated by the undotted lines in the figure above. When Ls is connected to the loop by the A6BSW-R, switch the cables connected to the next station connectors (F-SD and R-RD) of the A6BSW-R and the cables connected to the STATION connectors (F-RD and R-SD) of the A6BSW-R as indicated by the dotted lines in the figure above. • When the number of A6BSW-R units between stations is more than one (c2, c3, c4, c5)  When L_L is connected to the loop by the A6BSW-R, switch the cables connected to the previous station connectors (F-RD and R-SD) of the A6BSW-R which is closest to Ls and the cables connected to the STATION connectors (F-SD and R-RD) of the A6BSW-R which is connected to L_L as indicated by the undotted lines in the figure above. When Ls is connected to the loop by the A6BSW-R), switch the cables connected to the next station connectors (F-SD and R-RD) of the A6BSW-R which is closest to L_L and the cables connected to the STATION connectors (F-RD and R-SD) of the A6BSW-R which is connected to Ls as indicated by the dotted lines in the figure above. 3) Conduct a self-loopback test at Ls and L_L stations.

(3) Problem causes and corrective actions

Refer to the table below to find the cause of the problem and take corrective action according to the combination results of tests 1) to 3) given in Table 4.2.

Table 4.3 Problem Causes and Corrective Actions

Result of Test 1)	Result of Test 2)	Result of Test 3)		Applicable System (●: Applicable)										Cause	Corrective Action
		Station Ls	Station L_L	a1	a2	b1	b2	b3	c1	c2	c3	c4	c5		
Forward loop error	Forward loop error	Normal	Normal	●	●	●	●	●	●	●	●	●	●	The forward loop cable between Ls and A6BSW-R or A6BSW-R and L_L is broken.	Check conductivity of the forward loop cable. If it is abnormal, replace the cable.
					●	●	●	●		●	●	●	●	The forward and reverse loop cables between the A6BSW-R units are broken.	Check conductivity of the forward and reverse loop cables between the A6BSW-R units connected between faulty stations. If they are abnormal, replace the cables.
				●	●	●	●	●	●	●	●	●	●	The A6BSW-R's hardware is faulty.	Check conductivity of all A6BSW-R units connected between faulty stations. If a fault is found, replace the faulty A6BSW-R. (*1)
				●	●									The external power supply of A6BSW-R is ON (not for bypass).	Turn the external power supply OFF or open the SHORT terminals.
				●	●		●	●		●	●	●	●	Hardware of the slave station connected (extended) to the A6BSW-R which is connected between faulty stations is faulty or connecting cables are broken.	Check the condition of the extended slave stations and cables.
	Reverse loop error	Normal	Normal	●	●	●	●	●	●	●	●	●	●	Hardware of the forward loop circuit of the A6BSW-R is faulty.	Check conductivity of the forward loop circuit of all A6BSW-R units connected between faulty stations. If a fault is found, replace the faulty A6BSW-R. (*1)
					●	●	●	●		●	●	●	●	The forward loop cables between the A6BSW-R units are broken.	Check conductivity of the forward loop cables between the A6BSW-R units connected between faulty stations. If it is abnormal, replace the cables.

Table 4.3 Problem Causes and Corrective Actions (Continued)

Result of Test 1)	Result of Test 2)	Result of Test 3)		Applicable System (●: Applicable)										Cause	Corrective Action
		Station Ls	Station L_L	a1	a2	b1	b2	b3	c1	c2	c3	c4	c5		
Reverse loop error	Forward loop error	Normal	Normal	●	●	●	●	●	●	●	●	●	●	Hardware of the reverse loop circuit of the A6BSW-R is faulty.	Check conductivity of the reverse loop circuit of all A6BSW-R units connected between faulty stations. If a fault is found, replace faulty A6BSW-R. (*1)
					●	●	●	●		●	●	●	●	The reverse loop cables between the A6BSW-R units are broken.	Check conductivity of the reverse loop cables between the A6BSW-R units connected between faulty stations. If they are abnormal, replace the cables.
	Reverse loop error	Normal	Normal	●	●	●	●	●	●	●	●	●	●	The reverse loop cable between L_L and A6BSW-R or A6BSW-R and Ls is broken.	Check conductivity of the reverse loop cable between Ls and A6BSW-R and between L_L and A6BSW-R. If it is abnormal, replace the cable.
Hard-ware fault	Hard-ware fault	Hard-ware fault	Hard-ware fault	●	●	●	●	●	●	●	●	●	●	Hardware of the link data send and receive areas of Ls and L_L are faulty.	Replace the link modules in Ls and L_L.
			Normal	●	●	●	●	●	●	●	●	●	●	Hardware of the link data send and receive area of Ls is faulty.	Replace the link module in Ls.
		Normal	Hard-ware fault	●	●	●	●	●	●	●	●	●	●	Hardware of the link data send and receive area of L_L is faulty.	Replace the link module in L_L.
			Normal	●	●	●	●	●	●	●	●	●	●	Temporary malfunction due to noise, etc.	Remove noise sources which influence the loop channels.

POINTS

*1: Check conductivity of the A6BSW-R as given below.

(1) Conductivity check for the forward loop side

(a) Turn the external power supply OFF, and check conductivity between the previous station forward loop receive (F-RD) connector and the next station forward loop send (F-SD) connector.

- Normal when conductivity is established.
- Abnormal when conductivity is not established.

(b) Turn the external power supply ON, and check conductivity between the previous station forward loop receive (F-RD) connector and the STATION forward loop send (F-SD) connector and between the STATION forward loop receive (F-RD) connector and the next station forward loop send (F-SD) connector.

- Normal when conductivity between the connectors of each pair is established.
- Abnormal when conductivity between the connectors of each pair is not established.

(c) The forward loop is normal when both (a) and (b) are normal.

(2) Conductivity check for the reverse loop side

(a) Turn the external power supply OFF, and check conductivity between the next station reverse loop receive (R-RD) connector and the previous station reverse loop send (R-SD) connector.

- Normal when conductivity is established.
- Abnormal when conductivity is not established.

(b) Turn the external power supply ON, and check conductivity between the next station reverse loop receive (R-RD) connector and the STATION reverse loop send (R-SD) connector and between the STATION reverse loop receive (R-RD) connector and the previous station reverse loop send (R-SD) connector.

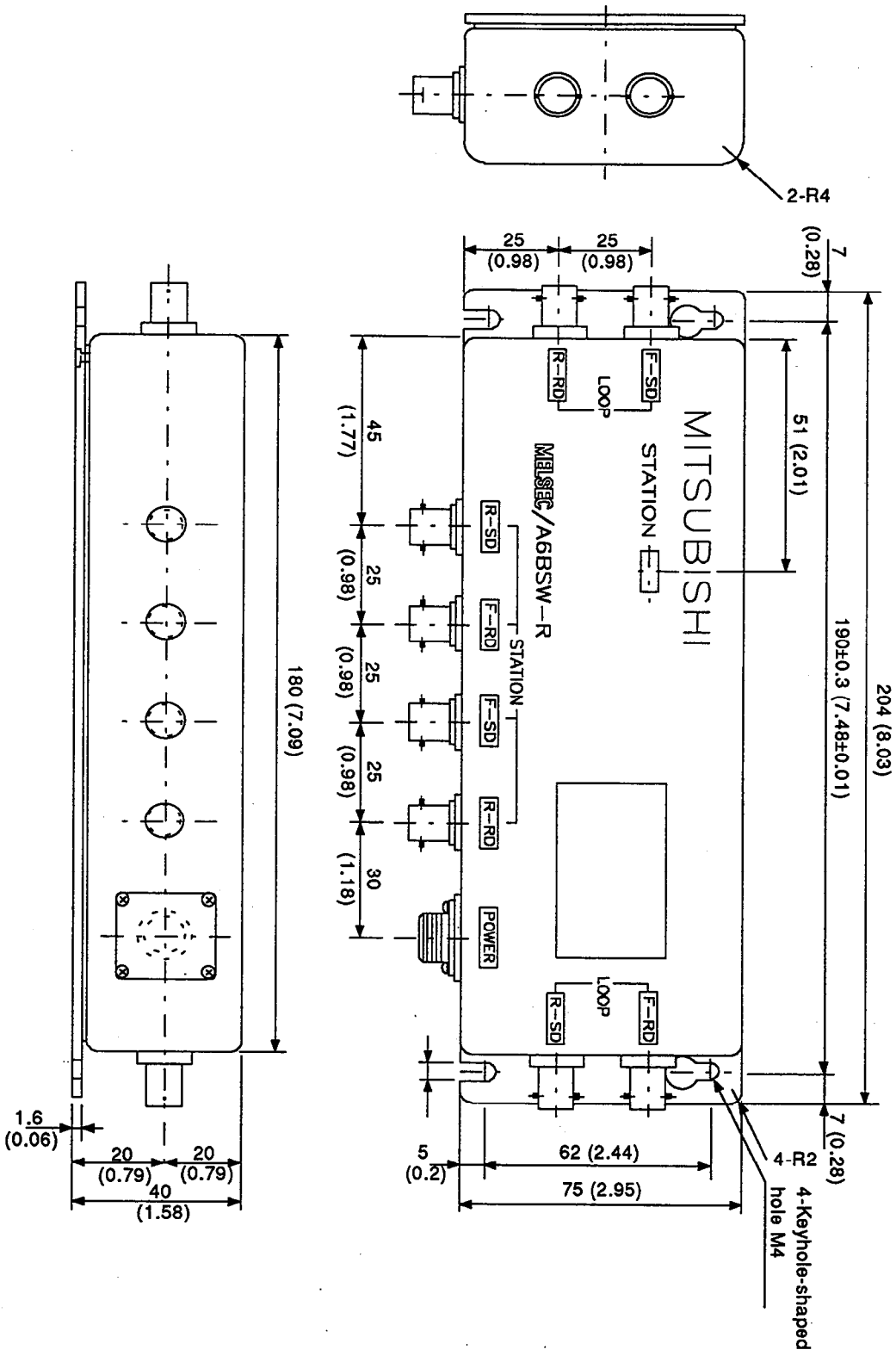
- Normal when conductivity between the connectors of each pair is established.
- Abnormal when conductivity between the connectors of each pair is not established.

(c) The reverse loop is normal when both (a) and (b) are normal.

(3) The A6BSW-R is normal when both (1) and (2) above are normal.

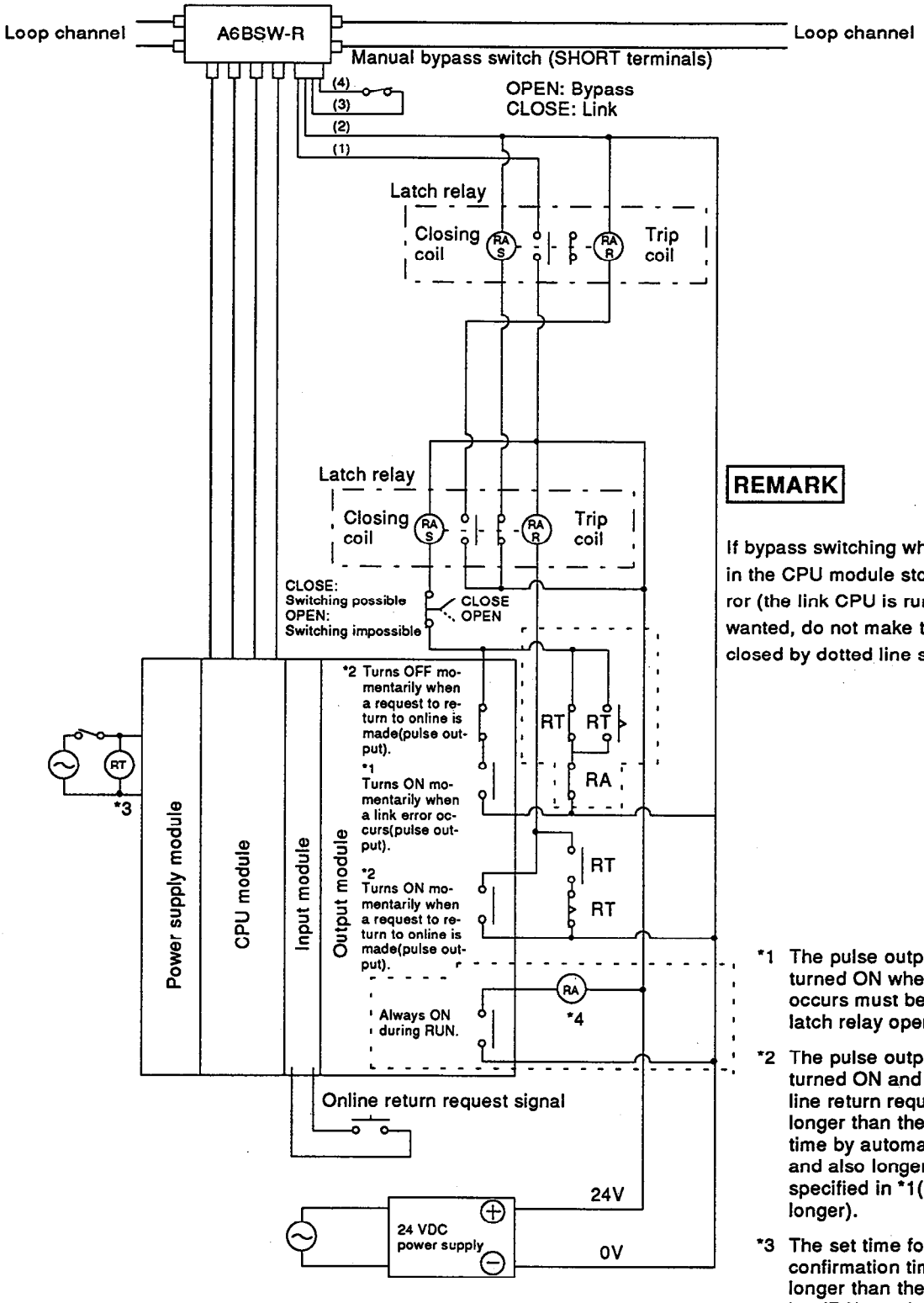
APPENDICES

APPENDIX 1 OUTSIDE DIMENSIONS



Unit: mm (inch)

APPENDIX 2 WHEN THE SIMPLIFIED AUTOMATIC BYPASS SWITCHING FUNCTION IS USED



REMARK

If bypass switching when the PC CPU in the CPU module stops due to an error (the link CPU is running) is not wanted, do not make the circuits enclosed by dotted line squares.

*1 The pulse output signal which is turned ON when a link error occurs must be longer than the latch relay operating time.

*2 The pulse output signal which is turned ON and OFF by the online return request must be longer than the data link restart time by automatic online return and also longer than the time specified in *1(2 to 3 seconds or longer).

*3 The set time for the power ON confirmation timer must be longer than the time that *4 relay (RA) needs to start operating(3 seconds or more).

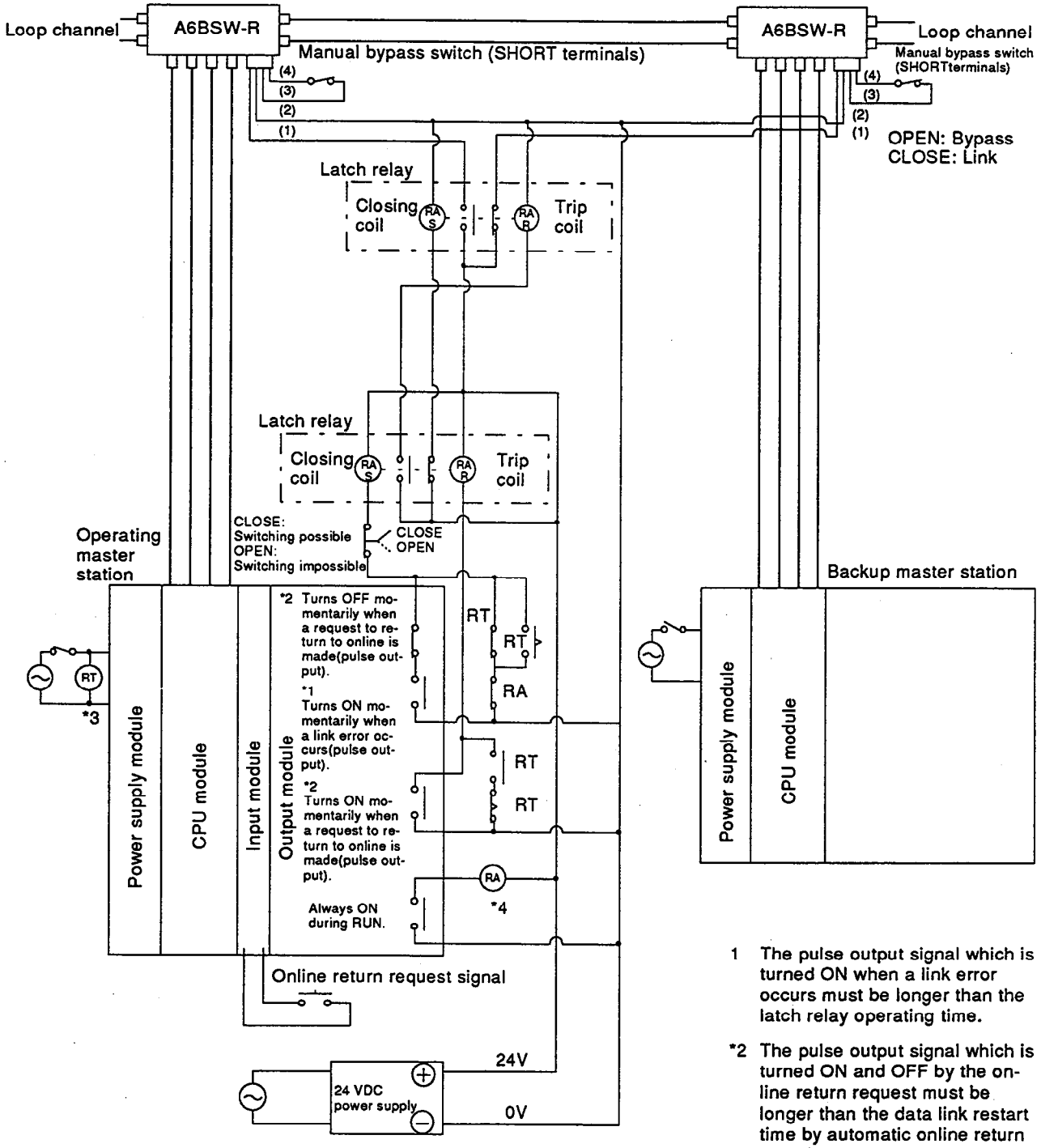
Precautions to be observed when using the bypass function

(a) The methods which are used for the bypass function mentioned in the examples of uses in the previous sections can set the STATION offline automatically when an error occurs. However, the offline station is not automatically returned to online.
To return the offline station to online, restore the STATION and turn ON the online return request signal. (The automatic online return mode must have been set.)

(b) When a link error occurs when the PC CPU is stopped or when the PC CPU is stopped due to an error, automatic switching is not performed and the STATION is set for non contact, and the previous station and the next station perform loopback.
When two stations in a link are set for non contact, all stations connected between the two non contact stations are also set for non contact.
To return the non contact stations connected between the two non contact stations contact, set the manual bypass switch (SHORT terminals) to operate the bypass function of the A6BSW-R connected to the non contact stations.

(c) To stop the CPU without operating the bypass function, set the switching enable/disable switch to the disable (OPEN) side, and then, turn the RUN keyswitch to the STOP position.

APPENDIX 3 WHEN THE SIMPLIFIED AUTOMATIC REDUNDANT RUN SWITCHING FUNCTION IS USED



1 The pulse output signal which is turned ON when a link error occurs must be longer than the latch relay operating time.

*2 The pulse output signal which is turned ON and OFF by the online return request must be longer than the data link restart time by automatic online return and also longer than the time specified in *1(2 to 3 seconds or longer).

*3 The set time for the power ON confirmation timer must be longer than the time that *4 relay (RA) needs to start operating(3 seconds or more).

Precautions to be observed when using the redundant run function

(a) The methods which are used for the redundant run function mentioned in the examples of uses in the previous sections can set the backup master station online automatically when an error occurs. However, the operating master station is not automatically returned to online. To return the operating master station to online, restore the operating master station and turn ON the online return request signal. (The automatic online return mode must have been set.)

(b) To stop the CPU without switching from the operating master station to the backup master station, set the switching enable/disable switch to the disable (OPEN) side, and then, turn the RUN keyswitch to the STOP position.

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