MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

type : A1NCPUP21/R21, A2NCPUP21/R21
A3NCPUP21/R21
[DATA LINK]

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.

CONTENTS

1. INTRODUCTION

This manual gives the specifications and handling procedures for the data link version of the MELSEC-A series high speed Programmable Controllers, the A1NCPUP21, A2NCPUP21, A3NCPUP21 and A1NCPUR21, A2NCPUR21, A3NCPUR21.

1.1 How to Use This Manual

This manual is divided up into sections as follows:

Section 2: Applicability of the A□NCPUP21/R21 in the MELSECNET Network.

Section 3: A□NCPUP21/R21 General and performance specifications. Cable specifications Communication processing times.

Section 4: Nomenclature, switch settings, preparing the hardware.

Appendix: External views and dimensions

The following manuals mayalso be required:
Data Link System User's Manual
A1NCPU, A2NCPU, A3NCPU User's Manual.
Building block type I/O module User's Manual.

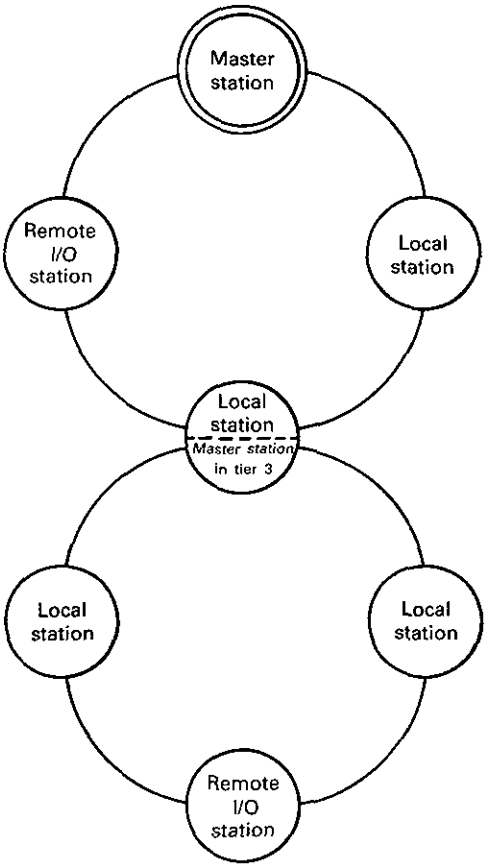
Link refresh of the A NCPUP21/R21 may be processed in either of the two timings:

(1) Interrupts sequence program execution.

(2) Executed when a link refresh request is given during sequence program execution, after the END instruction, or after the EI instruction with M9053 on.

The A□NCPUP21/R21 is designed for use in Mitsubishi Electric's MELSECNET data link system.

2. SYSTEM CONFIGURATION



(1) The A□NCPUP21/R21 may be used as the master or any local station (shaded above) in the MELSECNET network.
(2) Current consumption:

	A1NCPUP21/R21	A2NCPUP21/R21	A3NCPUP21/R21
Current consumption (5V DC)	1.23/1.63A	1.38/1.78A	1.55/1.95A

The current capacity must be noted when the power supply module cannot be used in the main base unit.

3. CPU MODULE

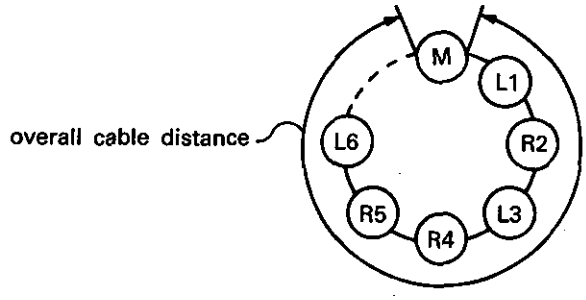
3.1 Performance Specifications

		Optical data link		
		A1NCPUP21	A2NCPUP21	A3NCPUP21
Maximum number of I/O points		256	512	2048
Maximum number of link points per station	Input (X)	256 (32 bytes)	512 (64 bytes)	2048 (256 bytes)
	Output (Y)	256 (32 bytes)	512 (64 bytes)	2048 (256 bytes)
Maximum number of link points in one system	Link relay (B)	1024 (128 bytes)		
	Link register (W)	1024 (2048 bytes)		
Maximum number of link points in one station		$\frac{Y(\text{points}) + B(\text{points})}{8} + 2 \times W \text{ (points)} \leq 1024$ bytes		
Current consumption (5V DC)		1.23A	1.38A	1.55A
Allowable instantaneous power failure time		Less than 20ms		
Communication speed (MBPS)		1.25		
Communication method		Half duplex, bit serial method		
Synchronous method		Frame synchronous method		
Transmission path		Duplex loop		
Overall loop distance (km/mile)		Maximum 10/6.21 (1/0.621 between stations)		
Number of stations connected		Maximum 65 stations per loop (1 master station, 64 local/remote I/O stations)		
Modulation method		CMI method		
Transmission format		Conforms to HLDC (frame format)		
Error control method		CRC (generating polynominal $X^{16} + X^{12} + X^5 + 1$) and retry after time-out		
RAS function		Loopback function on error detection or cable breakage, diagnostic functions such as link check		
Connector		2-core optical connector plug (CA9003)		
Cable		S1-200/250		
Weight :kg (lb)		1.75 (3.85)	0.92 (2.02)	0.95 (2.09)

Table3.1 Optical Data Link Module

REMARKS

The overall loop distance refers to the distance from the master station sending port to the master station receiving port via slave stations.
For both the optical fiber cables and coaxial cables, the overall loop distance is a maximum of 10km/6.21mile.

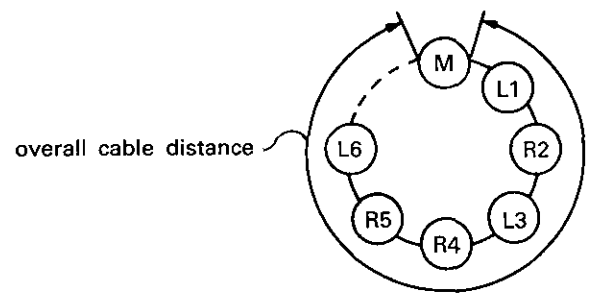


		Coaxial data link		
		A1NCPUR21	A2NCPUR21	A3NCPUR21
Maximum number of I/O points		256	512	2048
Maximum number of link points per station	Input (X)	256 (32 bytes)	512 (64 bytes)	2048 (256 bytes)
	Output (Y)	256 (32 bytes)	512 (64 bytes)	2048 (256 bytes)
Maximum number of link points in one system	Link relay (B)	1024 (128 bytes)		
	Link register (W)	1024 (2048 bytes)		
Maximum number of link points in one station		$\frac{Y(\text{points}) + B(\text{points})}{8} + 2 \times W \text{ (points)} \leqq 1024$ bytes		
Current consumption (5V DC)		1.63A	1.78A	1.95A
Allowable instantaneous power failure time		Less than 20ms		
Communication speed (MBPS)		1.25		
Communication method		Half duplex, bit serial method		
Synchronous method		Frame synchronous method		
Transmission path		Duplex loop		
Overall loop distance (km/mile)		Maximum 10/6.21 (0.5/0.31 between stations)		
Number of stations connected		Maximum 65 stations per loop (1 master station, 64 local/remote I/O stations)		
Modulation method		*CMI method*		
Transmission format		Conforms to HLDC (frame format)		
Error control method		CRC (generating polynominal $X^{16} + X^{12} + X^5 + 1$) and retry after time-out		
RAS function		Loopback function on error detection or cable breakage, diagnostic functions such as link check		
Connector		*BNC-P-5, BNC-P-3-Ni (DDK) or equivalent*		
Cable		3C-2V, 5C-2V or equivalent		
Weight :kg (lb)		1.75 (3.85)	0.92 (2.02)	0.95 (2.09)

Table3.2 Coaxial Data Link Module

REMARKS

The overall loop distance refers to the distance from the master station sending port to the master station receiving port via slave stations.
For both the optical fiber cables and coaxial cables, the overall loop distance is a maximum of 10km.



3.2 Link Refresh and Processing Times

3.2.1 Link refresh

(1) Link refresh methods are as follows:

System	Link Refresh Method
Master station	1) If scan time > link scan, Executed after the END instruction.
	2) If scan time < link scan, (a) Interrupts sequence program execution. (b) Executed after the END instruction.
Local station	3) Interrupts sequence program execution.
	4) Executed after the END instruction.

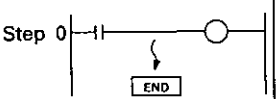
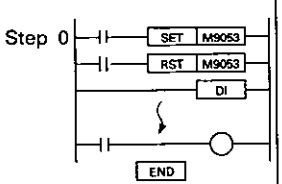
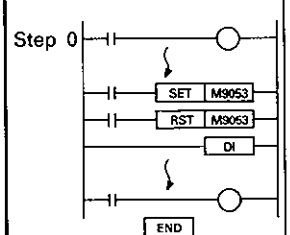
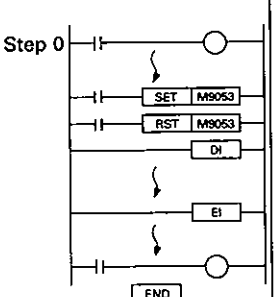
(2) The link refresh interrupt timing of the above link refresh methods 2)-(a), (b), 3), 4) depends on the combination of special relay M9053 ON/OFF and DI / EI (Disable Interrupt/ Enable Interrupt) instruction execution as indicated below.

Special Relay M9053	Control Mode	DI/EI Instruction	Link Refresh Disable, Enable
ON	Link interrupt (link refresh) control	No DI / EI instructions	Enabled (executed in accordance with Para. (1))
		DI instruction executed	Disabled from DI to END. (i.e. enabled from END to DI.)
		DI / EI instructions executed	Disabled from DI to EI. (i.e. enabled from EI to END and DI.)
OFF	Sequence control (using an interrupt pointer)	No DI / EI instructions	Link refresh is executed in accordance with Para. (1) independently of disable/ enable. (The DI / EI instructions serve to disable/enable an interrupt program.)
N9053 not used		DI instruction executed	
		DI / EI instructions executed	

POINT

(1) Every processing is initiated with "link interrupt enabled" and "sequence program interrupt disabled."
(2) When executing any interrupt program by using an interrupt pointer in the sequence program, switch on M9053 and execute the EI instruction to enable the interrupt program to be executed. For further details, see the ACPU Programming Manual.
(3) For data communication (link scan) timing, see the Data Link System User's Manual.

(3) Link refresh interrupt timings

Special Relay M9053 / Sequence Program	M9053 ON		M9053 OFF	
	Link interrupt	Interrupt program	Link interrupt	Interrupt program
(a) DI / EI instructions not used 	Enable	Disable	Enable	Disable
(b) DI instruction used 	Enable Disable Enable	Disable	Enable	Disable
	Enable Disable Enable	Disable	Enable	Disable
(c) DI / EI instructions used 	Enable Disable Enable	Disable	Enable	Enable *1 Disable Enable *1: Only disable for 1 scan.

3.2.2 Processing times

(1) Link refresh processing time

a) A□NCPUP21/R21 configured as the master station

$$\text{Link refresh} = 0.8 + \frac{B + X_0 + Y_0}{2048} \times 1.0 + \frac{W}{1024} \times 4.1 \text{ [msec]}$$

b) A□NCPUP21/R21 configured as a local station

$$\text{Link refresh} = 0.4 + \frac{B + X_1 + Y_1}{2048} \times 1.0 + \frac{W}{1024} \times 4.1 \text{ [msec]}$$

c) Tier 3 master station link refresh time (i.e. AJ71P22/R22) when A□NCPUP21/R21 is used as corresponding tier 2 local station.

$$\text{Link refresh} = 0.8 + \frac{B + X_2 + Y_2}{2048} \times 1.2 + \frac{W}{1024} \times 6.4 \text{ [msec]}$$

(2) Link scan time

$$\text{Link scan time} = K + K_R \times (\text{number of all remote I/O stations}) + K_L \times (\text{number of all local stations}) + \frac{B + X_0 + Y_0 + (W \times 16)}{1000} \text{ [msec]}$$

Total number of slave stations	1 to 8	9 to 16	17 to 24	25 to 32	33 to 40	41 to 48	49 to 56	57 to 64
K	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
K_R	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6
K_L	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3

B: Total number of link relays (B) used for all stations
W: Total number of link registers (W) used for all stations
X_0: Total number of link inputs (X) assigned to the master station
Y_0: Total number of link outputs (Y) assigned to the master station
X_1: Total number of link inputs (X) used in the corresponding station
Y_1: Total number of link outputs (Y) used in the corresponding station
X_2: Total number of link inputs (X) assigned to the tier 3 master station
Y_2: Total number of link outputs (Y) assigned to the tier 3 master station

3.3 Handling

The following information should be used in conjunction with the A□NCPU User's manual.

3.3.1 Handling instructions

(1) Do not subject the module to impact loads.

(2) Do not remove printed circuit boards from the housing. There are no user-serviceable parts on the board.

(3) Ensure that no conductive debris can enter the module, if it does, make sure that it is removed. Guard particularly against the entry of wire offcuts.

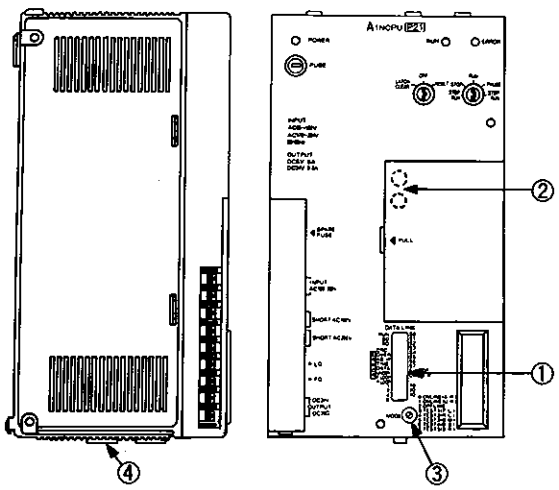
(4) Tighten module mounting and terminal screws, as specified below.

Screw	Tightening Torque Range kg·cm (lbs·inch)
I/O module terminal screws (M3 screw)	5 to 8 (28 to 44.8)
I/O module terminal block installation screws (M4 screw)	8 to 14 (44.8 to 78.4)
Power supply terminal screws (M4 screw)	10 to 14 (56 to 78.4)
Extension cable connector mounting screw	3.7 to 4.9 (20.7 to 27.4)

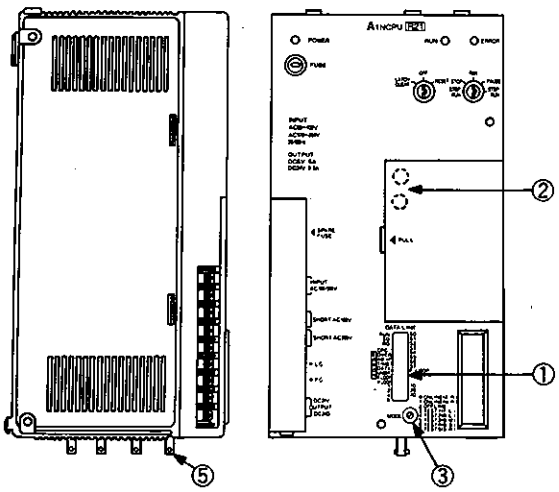
(5) Do not touch the fiber optic core or the tip of the connector. If these are touched, clean them with a soft cloth. Dirt will cause excessive transmission losses.

3.3.2 Nomenclature

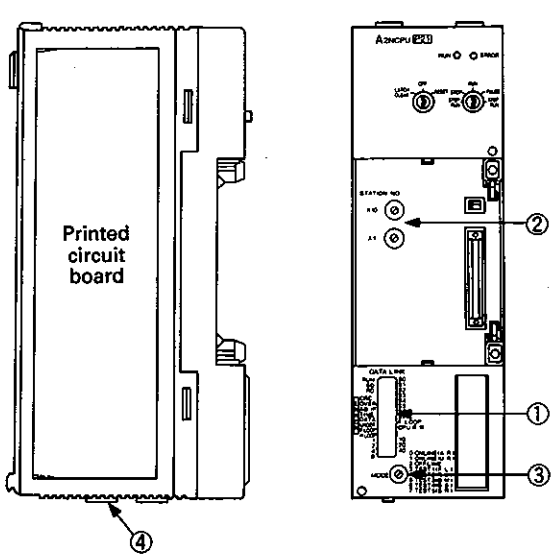
Refer also to the A□NCPU User's Manual.



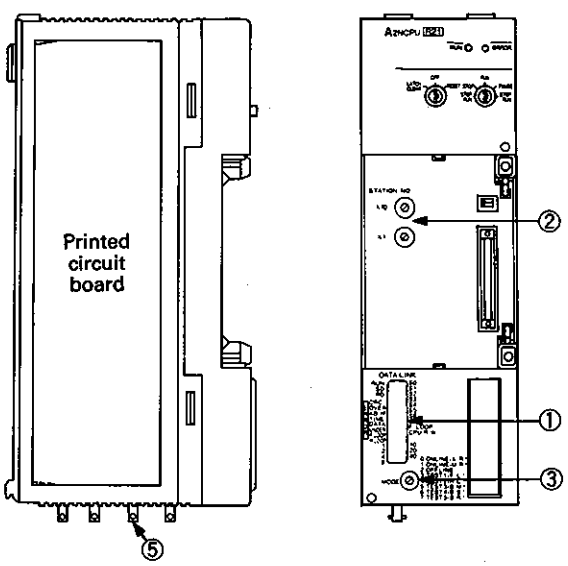
A1NCPUP21



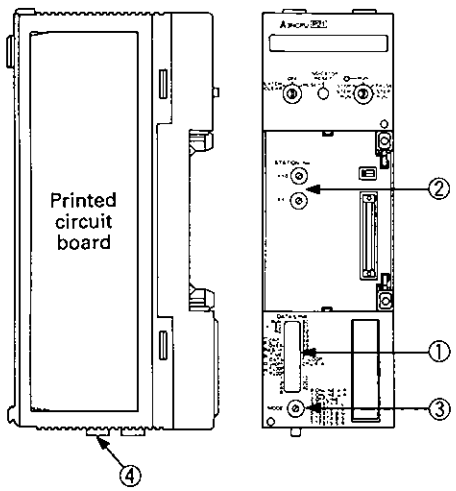
A1NCPUR21



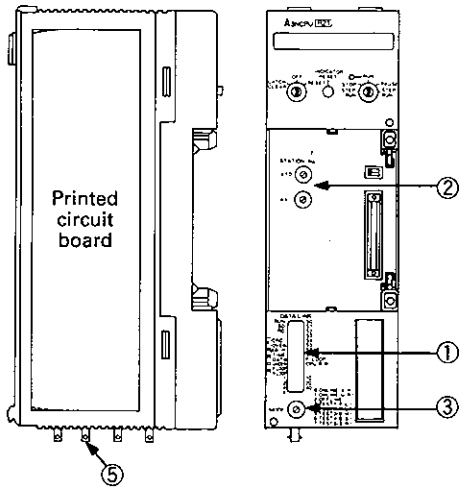
A2NCPUP21



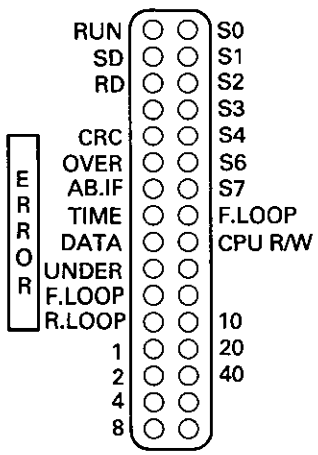
A2NCPUR21



A3NCPUP21



A3NCPUR21

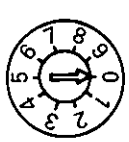
① 

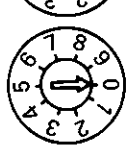
Operation, error indicator LEDs

LED	Description	LED	Description
RUN	Lit when data link is normal run.	S0	For factory tests only (Flickers during normal data link.)
SD	Lit during data sending.	S1	
RD	Lit during data receiving.	S2	
	Not used (Always off)	S3	
CRC	Lit at CRC error time	S4	
OVER	Lit at data entry delay error time.	S5	
		S6	
AB.IF	Lit when all data is 1.	S7	
TIME	Lit at time-out error	F.LOOP	Lit when receiving data via the forward loop
DATA	Lit to indicate a received data error.		
UNDER	Lit at sending data error time.	CPU R/W	Lit during communication with programmable controller CPU.
F. LOOP	Lit at forward loop receiving error		Not used (Always off)
R. LOOP	Lit at reverse loop receiving error		Not used (always off)
1	Indicates the least significant digit of the station number in BCD.	10	Indicates the most significant digit of the station number in BCD.
2		20	
4		40	
8			Not used (Always off)

For details on "CRC" to "R.LOOP", refer to the Data link unit User's Manual.

② STATION NO.

X10 

X1 

Station number setting switches

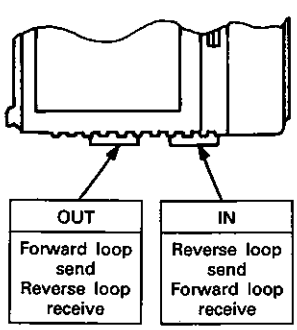
Set the least significant digit of the station number on the switch marked X1 and the most significant digit on that marked X10 (in the range 01 to 64). The master station should be set to station number "0 0".

③ MODE

Mode select switch

Setting Number	Name	Description	Ref. Section
0	Online	Automatic return set during normal operation.	3.3.5
1	Online	Automatic return not set during normal operation	
2	Offline	Disconnected from data link	
3	Test mode 1	Forward loop test	3.3.6
4	Test mode 2	Reverse loop test	
5	Test mode 3	Station-to-station test (station number n)	
6	Test mode 4	Station-to-station test (station number n+1)	
7	Test mode 5	Loopback self-check	
8	—	Not used	—
9	—	Not used	—
A	—	Not used	—
B	—	Not used	—
C to F	—	Not used	—

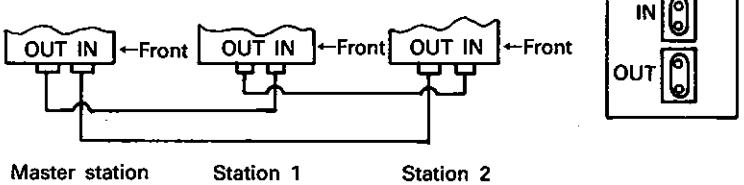
④



For A3HCPUP21

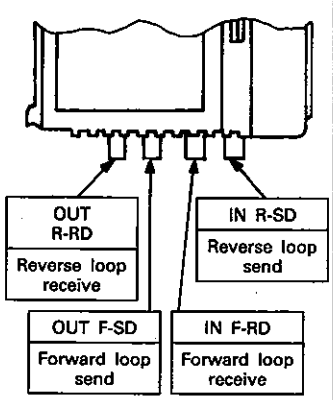
Optical fiber cable

Connect the cable as shown below.



Connect IN to preceding station OUT, and OUT to next station IN

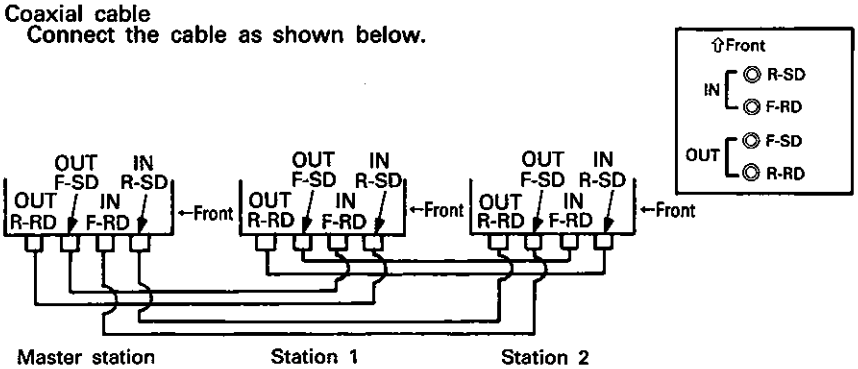
⑤



For A3HCPUR21

Coaxial cable

Connect the cable as shown below.



Connect: IN R-SD to preceding station OUT R-RD.
IN F-RD to preceding station OUT F-SD.
OUT F-SD to next station IN F-RD.
OUT R-RD to next station IN R-SD.

3.3.3 Link module hardware and software settings

The A□NCPUP21/R21 may be used as an independent PC or may be incorporated into the MELSECNET data link network. The following hardware and software settings should be made in each case.

To set the A□NCPUP21/R21 as a data link module:
(1) Station number
(2) Mode
(3) Link parameters.

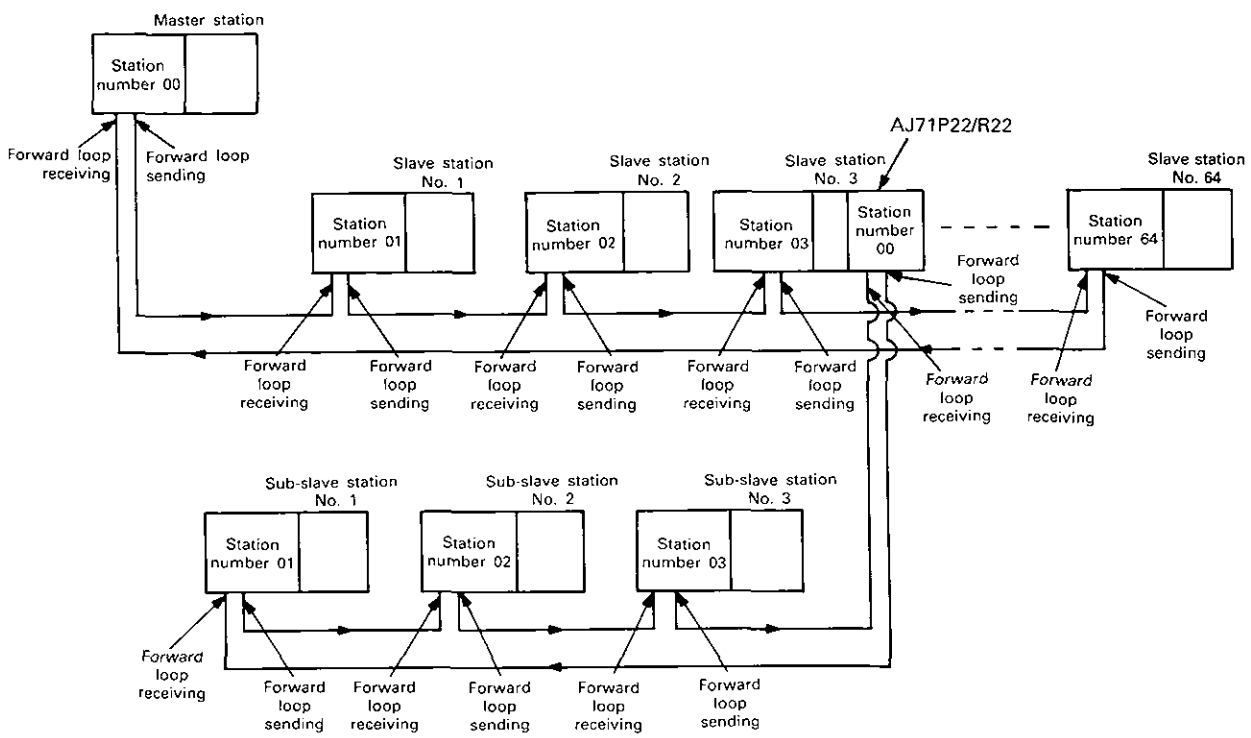
To set the A□NCPUP21/R21 as an independent PC set the mode select switch to mode 2, offline.

If the link module is used without setting as above, the sequence program is executed but the message "LINK PARAMETER ERROR" is displayed.

POINT

The A□NCPUP21/R21 used independently may be checked in test mode (see Section 3.3.6).
If the link module is used without connecting an optical fiber cable or a coaxial cable, the status of the diagnostic LEDs should be ignored.

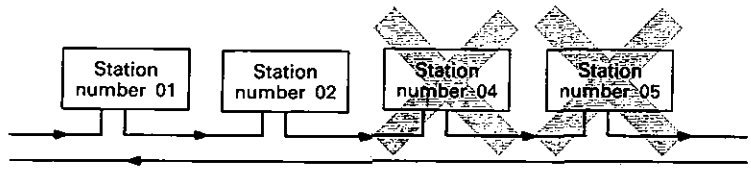
3.3.4 Station number setting (STATION NO. switch)



(1) The first slave station in the forward loop is station No. 1.

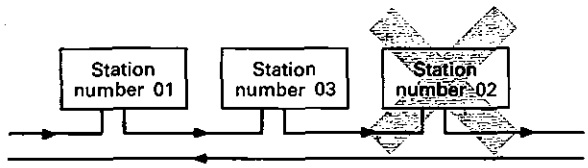
(2) The next slave station in the forward loop after station No. 1 is station No. 2, etc.

(3) Omitting station numbers as shown below is not allowed as this will reduce the effectiveness of the loopback function.

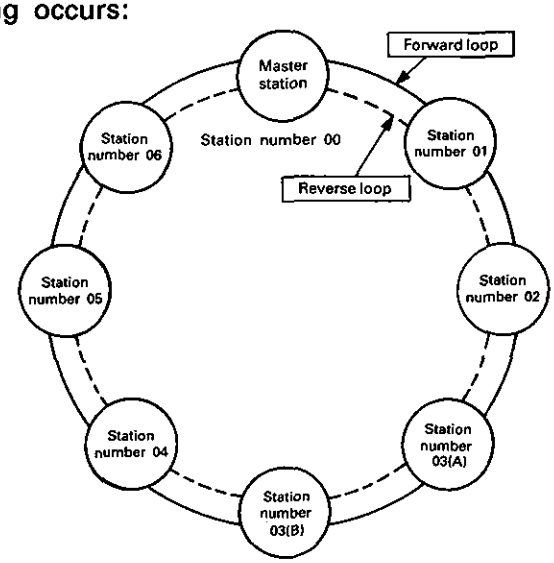


If station 4 is disconnected from the network, loopback cannot be effected at station 3 (which does not exist) and so has to be effected at station 2.
This process takes twice as long as it would if station 3 had existed.
If the loopback switching time becomes too long, the watch dog timer(WDT) in the link module may time out and stop the data link for the whole system.

(4) Setting a higher number before a lower number as shown below is not allowed since it will invalidate the loopback function.



(5) A station number must not be repeated within the same loop. If the same station number is used more than once, the following occurs:



In the above example, there are two station No. 3s. Data sent by the master will be received by both stations, however only data sent by the station No. 3. nearest to the master stations receive port will be read by the master. (i.e. data from station No. 3(B) when the forward loop is active and that from 3(A) when the reverse loop is active.)

3.3.5 Mode select switch (online/offline setting)

The mode select switch is used to set the online or offline status (0 to 2) of a particular station and to self test the loops (3 to 7). After setting the mode select switch, it is necessary to reset the CPU to erase the previous setting. If the CPU is not reset, the previous setting is retained.
This section describes the online and offline settings. For self test settings, refer to section 3.3.6.

(1) Online, automatic return function active. Setting "0"

- Setting "0" should be used if the A□NCPUP21/R21 is being incorporated in a data link system and the automatic return function is required during normal operation.

  If the local station is disconnected from the link due to a fault, that station automatically returns to the link after it is restored to normal operating status.

(2) Online, automatic return function inactive. Setting "1"

- Setting "1" should be used if the A□NCPUP21/R21 is being incorporated in a data link system and the automatic return function is not required during normal operation.

  When the local station is disconnected from the link due to a fault, that station does not automatically return to the link system even if normal operating status is restored.
  To resume data link operation, reset the CPU.

(3) Offline, independent PC operation, Data link capability inactive. Setting "2"

- Any local station set to offline mode will be removed from the network. Communication between the remaining on line stations will be maintained.

  Setting the master station to offline mode will disable the data link. Each local station and the master station itself will run their own sequence programs independently. All remote I/O station outputs switch off.

  Setting any local station to offline mode removes that station from the network. Its sequence program then runs independently of the network.

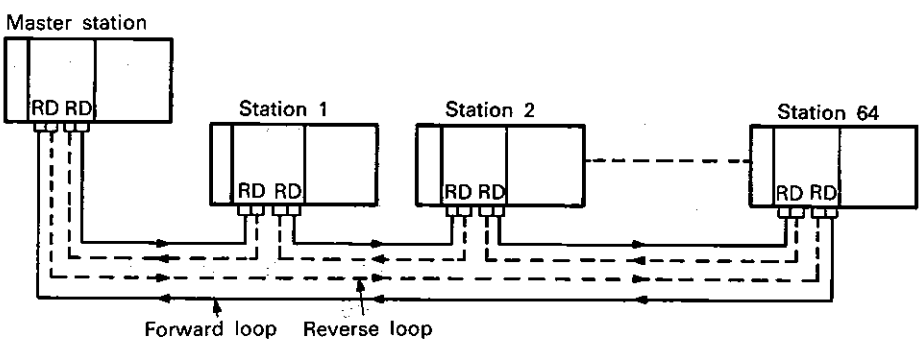
  After changing the mode setting switch from offline to online, reset the PC CPU.

3.3.6 Mode select switch (setting of test mode)

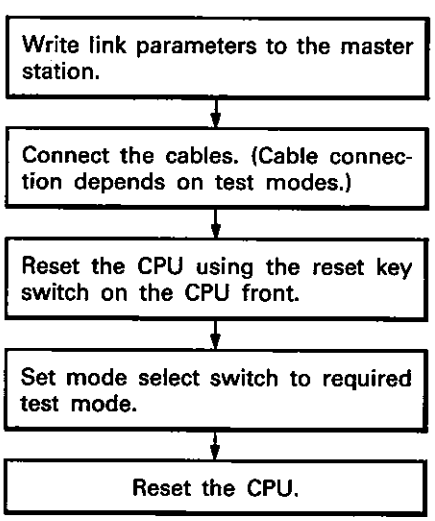
This section describes the test modes used to check the link module hardware and cabling in a data link network.
The following test modes are available on the mode select switch setting.

Switch Setting	Name	Description	Page
3	Forward loop test	Checks the optical fiber cables or coaxial cables in the data link system forward loop.	3-14
4	Reverse loop test	Checks the optical fiber cables or coaxial cables in the data link system reverse loop.	3-15
5	Station-to-station test (main station)	Checks the lines between two stations. Set the lower station number to main station and the higher to subordinate station.	3-17
6	Station-to-station test (subordinate station)		
7	Self-loopback test	Checks the sending/receiving circuits of transmission system on a single link unit basis.	3-18

The forward loop test and reverse loop test are used to check the lines shown below.



The procedure for performing any of the test operations is as follows:



POINT

In test mode, the sequence program may either be present or absent.

3.4 Tests

3.4.1 Forward loop test

Forward loop test (Mode select switch position = 3)

Checks the network forward loop continuity.
To activate the test, the master station (only) must be set to mode 3.

1) Test status

- Connect the cables for a normal network.
- Write the link parameters to the master station.
- Set the master station to STOP.
- Set the master station to mode 3 and reset the PC CPU.
- Set slave stations to online (0) position. Slave stations may be in RUN or STOP mode.
  All slave stations must be online (mode 0).
  They may be in either RUN or STOP mode.

POINT

1. **If a slave station has been set to offline status, the test will be executed with that station omitted from the system.**

2. **Link parameters must be present in the master station before the forward loop test can be conducted.**

2) Test Diagnosis
Errors may be found in either of two ways.

(a) Link monitoring on the GPP/PHP/HGP.

(b) From the LEDs on the front face of the module.
Determine the test result from the six LEDs, "CRC", "OVER", "AB.IF", "TIME", "DATA", and "UNDER", on the front of the link module.

- For a continuous, active forward loop, the six LEDs will flicker one after the other, in order, starting at the top.
- Errors will be indicated as follows:

LED Status	Cause	Corrective Action
"TIME", "DATA", and "UNDER" flicker simultaneously.	Loopback has occurred due to cable break or a slave station error.	The station number at which loopback has occurred may be read from special register D9204, D9205, D9206. Check and correct.
No LED indication.	The total number of slave stations has not been set in the master station link parameters.	Set the link parameter and re-test.

POINT

Any error in the forward loop continuity will cause the network either to switch to reverse loop or to loopback. Restoring the forward loop to normal status during loopback will cause the network to switch back to forward loop.

3.4.2 Reverse loop test

Reverse loop test (Mode select switch position = 4)

Checks the network reverse loop continuity as well as carrying out an operational check of the switchover facility from forward to reverse loop.
To activate the test, the master station (only) must be set to mode 4.

1) Test status

- Connect the cables for a normal network.
- Write the link parameters to the master station.
- Set the master station to STOP.
- Set the master station to mode 4 and reset the PC CPU.
- All slave stations must be online (mode 0). They may be in either RUN or STOP mode.

POINT

1. **If a slave station has been set to offline status, the test will be executed with that station omitted from the system.**

2. **Link parameters must be present in the master station before the reverse loop test can be conducted.**

2) Test diagnosis
Errors may be found in either of two ways.
(a) Link monitoring on the GPP/PHP/HGP.

(b) From the LEDs on the front cover of the unit.
Determine the test result from the six LEDs, "CRC", "OVER", "AB.IF", "TIME", "DATA", and "UNDER", on the front of the link module.

- For a continuous active reverse loop, the six LEDs will flicker one after the other, in order, starting at the top.
- Errors will be indicated as follows:

LED Status	Cause	Corrective Action
"TIME", "DATA", and "UNDER" flicker simultaneously.	Loopback has occurred due to cable break or a slave station error.	The station number at which loopback has occurred may be read from special data register D9204, D9205, D9206. Check and correct.
No LED indication.	The total number of slave stations has not been set in the master station link parameters.	Set the link parameter and re-test.

POINT

Any error in the reverse loop continuity will cause the network either to switch to forward loop or to loop back.

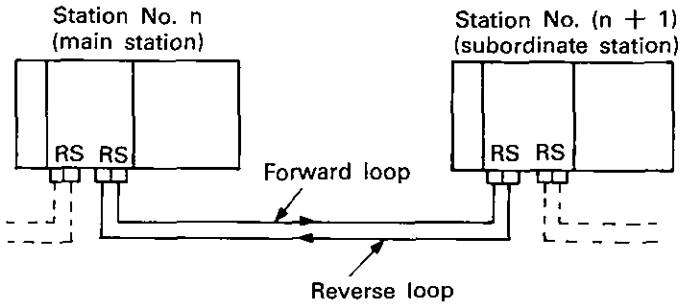
Restoring the forward loop continuity during loopback will cause the network to switch back to forward loop communication.

If the network has switched from reverse loop to forward or from reverse to loopback during the test, the master station must be reset to repeat the test.

3.4.3 Station-to-station test

Station-to-station test (Mode select switch position = 5, 6)

This mode is used to check the link between two stations. This checks that data sent in the forward loop from the main station is returned in the reverse loop within a certain period of time.



1) Test status

- Connect the cables for a normal network.
- Set the two stations being tested to STOP. (For a remote I/O station, set the master station "RUN" key switch to STOP.)
- Set the station with the lower station number to mode 5 (BM) and that with the higher station number to mode 6 (BS).
  Reset the higher station number (mode 6) then the lower station number CPUs.

2) Test diagnosis.

Determine the test result from the LEDs on the front of the link module.

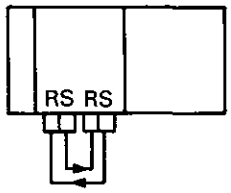
- For normal status, the six LEDs, "CRC", "OVER", "AB.IF", "TIME", "DATA", and "UNDER", will flicker in order, starting at the top.

- Any error is indicated by one or more of the LEDs switching on and staying on. The meaning of each LED is given at the end of this section.

3.4.4 Self-loopback test

Self-loopback test mode

Used to check the transmission and receiving circuits of the relevant link unit. Data is sent from the sending side of the forward loop to the receiving side of the forward loop and must be received within a pre-defined period of time.
The same check is made for the reverse loop.



1) Test status

- Connect a cable from the forward loop send port to the forward loop receive port and from the reverse loop send port to the reverse loop receive port.
- Set the station to STOP.
- Set the mode select switch to "7" and reset.

2) Test result

Determine the test result from the LEDs on the front of the link unit.

- For normal status, the six LEDs, "CRC", "OVER", "AB.IF", "TIME", "DATA", and "UNDER", flicker in order, starting at the top.

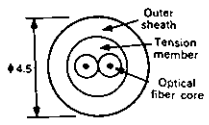
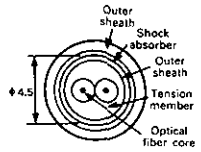
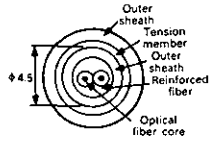
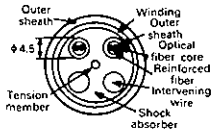
- Any error is indicated by one or more of the LEDs switching on and staying on. The meaning of each LED is given at the end of this section.

4. OPTICAL/COAXIAL CABLES

4.1 Performances, Specifications

4.1.1 Optical fiber cable specifications

The following section describes the types of optical cable available for the MELSECNET system.
Please contact your local Mitsubishi representative for details on local availability.

Item		Standard Cable for Indoor Use	Reinforced Cable for Indoor Use	Standard Cable for Outdoor Use	Reinforced Cable for Outdoor Use
Construction					
Cable diameter		4.5mm (0.177inches)	8.5mm (0.335inches)	8.5mm (0.335inches)	15mm (0.591inches)
Minimum Allowable bend radius		45mm (1.77inches)	85mm (3.35inches)	85mm (3.35inches)	140mm (5.51inches)
	Without outer sheath (φ4.5mm)	45mm (1.77inches)	45mm (1.77inches)	45mm (1.77inches)	45mm (1.77inches)
	When cable is extended	90mm (3.54inches) or more	170mm (6.69inches) or more	170mm (6.69inches) or more	280mm (11.02inches) or more
Allowable tensile load	Cable	20kg (44.10lb)	20kg (44.10lb)	40kg (88.20lb)	60kg (132.28lb)
	4.5mm dia.	20kg (44.10lb)	20kg (44.10lb)	20kg (44.10lb)	20kg (44.10lb)
	Connector	3kg (6.61lb)			
Ambient temperature		−10 to 70°C		−20 to 60°C	
Transmission loss		Maximum 12dB/km			
Transmission band		Minimum 5MHzkm			
Core diameter		200 μm (7.9thou') (SI type multi-component glass fiber)			
Clad diameter		200 μm (7.9thou') (SI type multi-component glass fiber)			
Number of cores		2 cores			2 cores × (1 to 4) pieces
Weight		15kg/km (0.03lb/Yard)	65kg/km (0.13lb/Yard)	50kg/km (0.10lb/Yard)	135kg/km (0.27lb/Yard)
Applicable connector		2-core optical connector plug (CA9003)			
Purchase order type		A-2P-□M-A	A-2P-□M-B	A-2P-□M-C	A-2P-□M-□D

(1) Enter the cable length required in □.

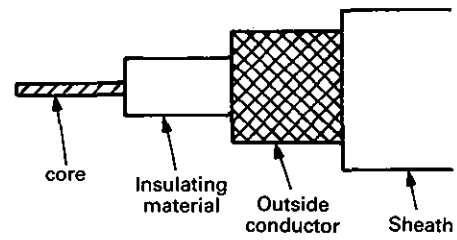
- A-2P-□M-A
- A-2P-□M-B
- A-2P-□M-C
- A-2P-□M-□D

→ Specify length. (Unit: m)
Example: 20m
A-2P-20M-A

Specify the number of 2-core cables.
Example: Two 2-core cables of 20m length.
A-2P-30M-2D

4.1.2 Coaxial cable specifications

This section gives the specifications of coaxial cables used for the coaxial data link.
The coaxial cables used are high-frequency coaxial cables "3C-2V" and "5C-2V" (conforming to *JIS C 3501).

Item	3C-2V	5C-2V
Construction		
Cable diameter	5.4mm (0.21inch)	7.4mm (0.29inch)
Allowable bending radius	22mm (0.87inch) or more	30mm (1.18inch) or more
Internal conductive material diameter	0.5mm (0.02inch) (Annealed copper wire)	0.8mm (0.03inch) (Annealed copper wire)
Insulating material diameter	3.1mm (0.12inch) (Polyethylene)	4.9mm (0.19inch) (Polyethylene)
External conductive material diameter	3.8mm (0.15inch) (Single annealed copper wire mesh)	5.6mm (0.22inch) (Single annealed copper wire mesh)
Used jack type	227161-4 (Made by Nippon A.M.P)	
Applicable connector plug	Connector plug for 3C-2V	Connector plug for 5C-2V

*Note: *JIS Japanese Industrial Standard*

4.2 Handling

4.2.1 Handling instructions for optical/coaxial cables

Handle cables, particularly optical fiber cables, with care.

(1) Do not bend the cable to less than specified minimum bending radius.

(2) Do not crush the cable.

(3) Do not twist the cable.

(4) Do not pull the cable by the connector.

(5) Do not tension the cable.

4.2.2 Connection of optical fiber cables

The connectors are located under the data link module as shown below.

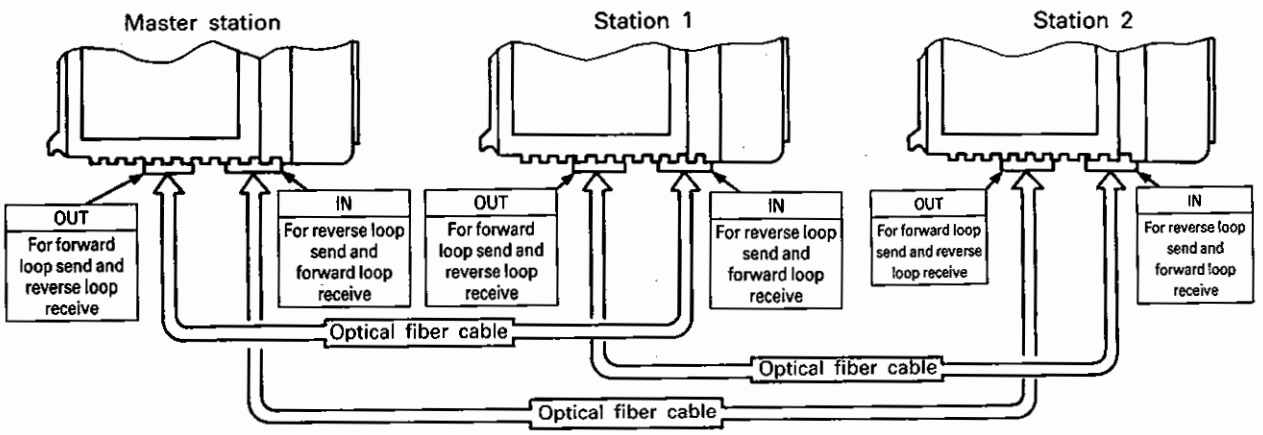


Fig. 4.1 Connection Diagram

Connect the IN connector to the OUT connector of the preceding station.
Connect the OUT connector to the IN connector of the next station.
Connect and disconnect the optical fiber cables as follows:

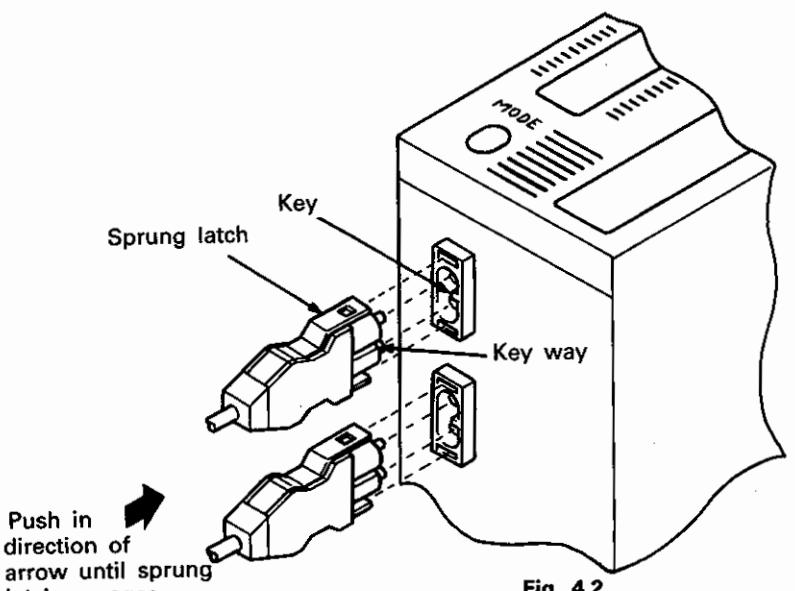


Fig. 4.2

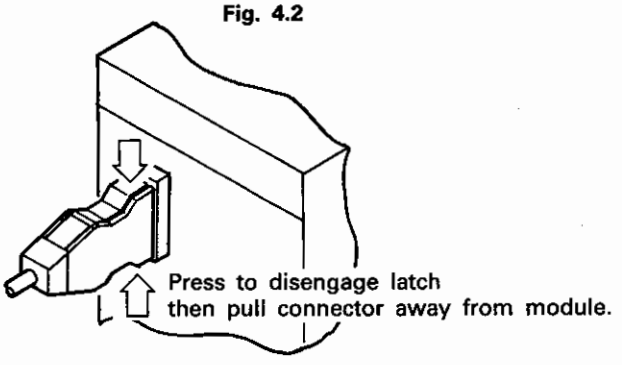
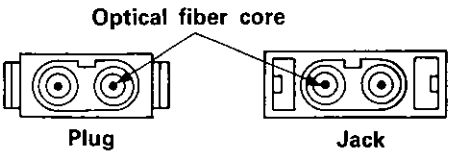


Fig. 4.3

POINT

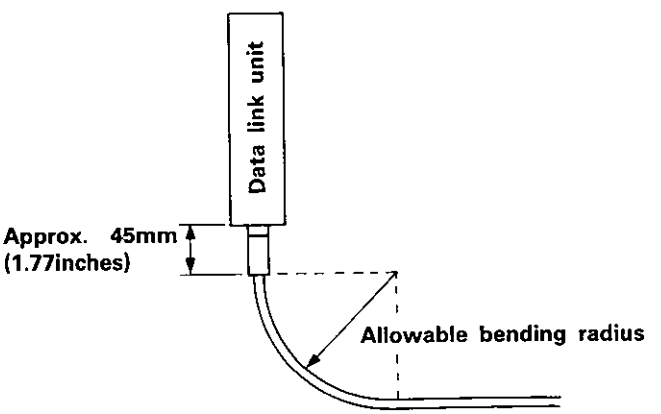
(1) Do not touch the optical fiber cores in the plug or the jack and protect from dirt and dust. Always fit the protective cap to the plugs and sockets when not in use.



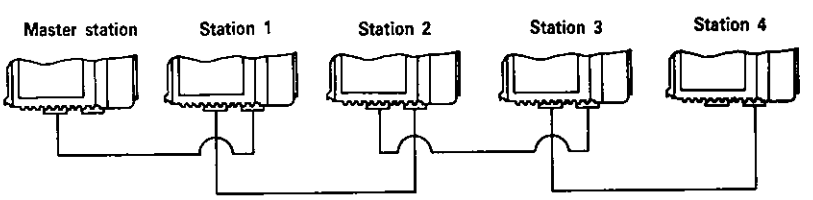
(2) Minimum bending radii are shown below.

Standard type for indoor cabling : 45mm (1.77inches) or more
Reinforced type for indoor cabling : 85mm (3.35inches) or more
Standard type for outdoor cabling : 85mm (3.35inches) or more
Reinforced type for ortdoor cabling : 140mm (5.51inches) or more

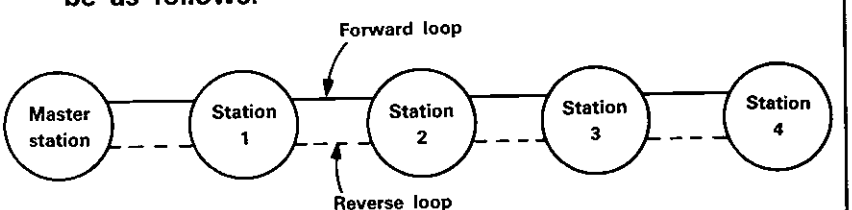
For details, refer to Section 4.1.2 on page 4-2.



(3) The following network configuration will result if the loop is not completed.
This is illustrated below.



If the final connection between the master station and station number 4 is omitted, the network topology will be as follows.



In this example, the network continuously loops back at station 4. Providing no faults occur at any other station, the network will function normally. However, if any station is disconnected from the network, all subsequent station number will also be disconnected. As an example, if the power supply to station 2 fails, stations 3 and 4 will also be disconnected from the network.

4.2.3 Connection of coaxial cables

The connectors are located under the data link module as shown below.

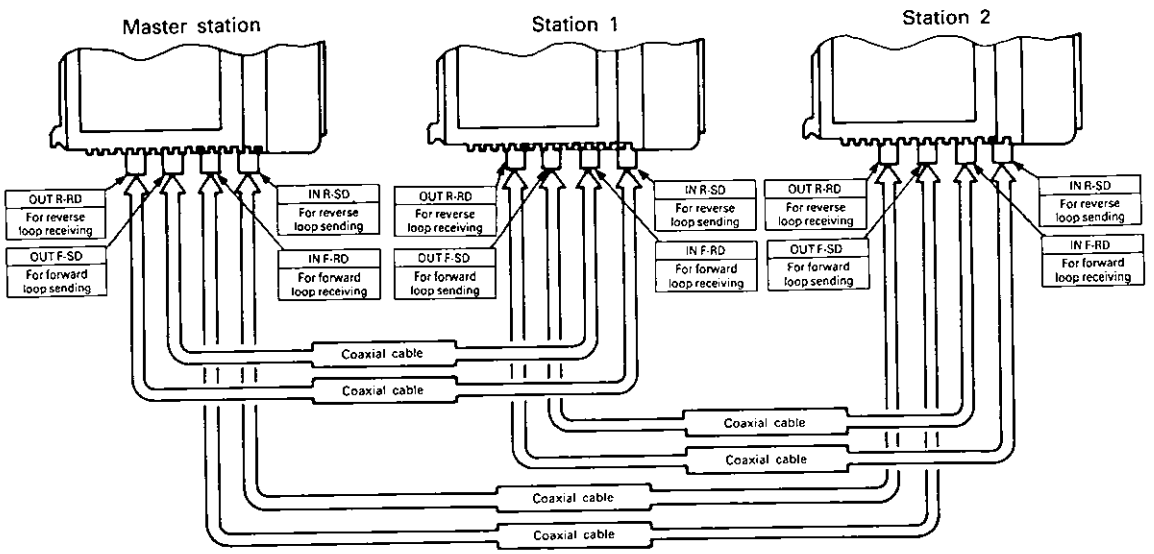


Fig. 4.4 Connection Diagram

Connect the IN R-SD port to the OUT R-RD port of the preceding station.
Connect the IN F-RD port to the OUT F-SD port of the preceding station.
Connect the OUT F-SD port to the IN F-RD port of the next station.
Connect the OUT R-RD port to the IN R-SD port of the next station.

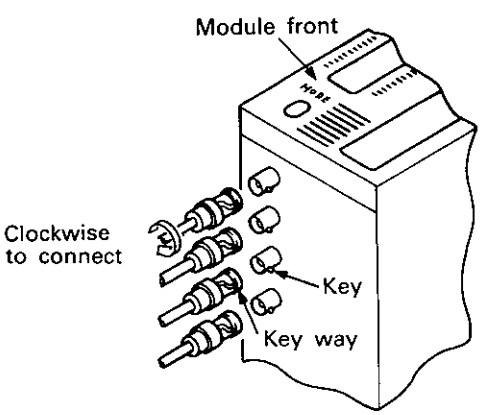


Fig. 4.5 Connection

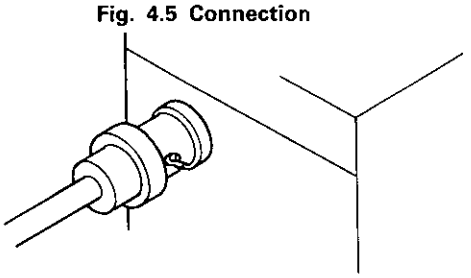


Fig. 4.6 Coaxial Connector Installed

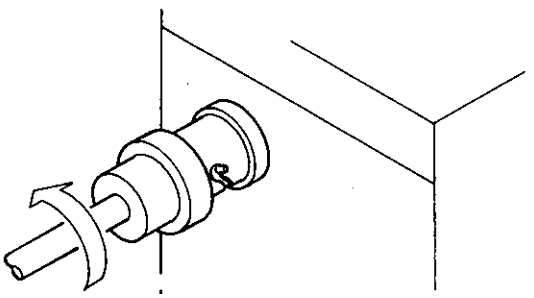


Fig. 4.7 To Disconnect, Twist

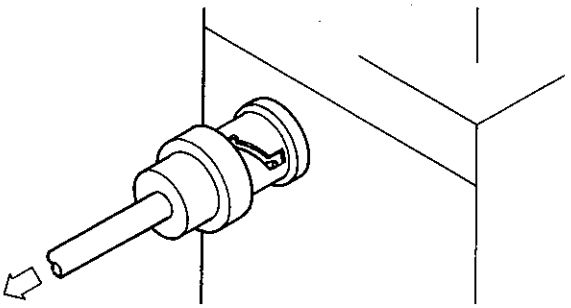
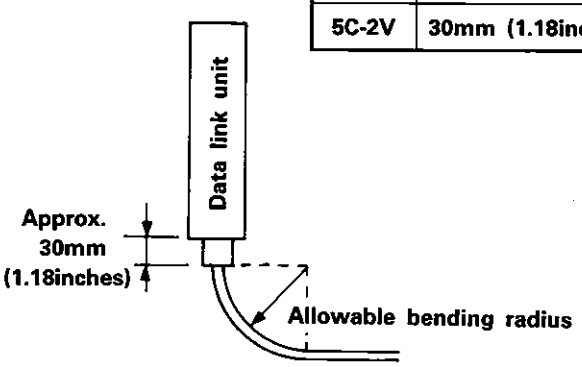


Fig. 4.8 ··· and Pull.

POINT

(1) Minimum bending radii are shown below.

Cable	Allowable Bending Radius
3C-2V	23mm (0.91inches) or more
5C-2V	30mm (1.18inches) or more



(2) Ensure that both forward and reverse loops are correctly installed and that the connection between the final station and the master station is correctly installed.

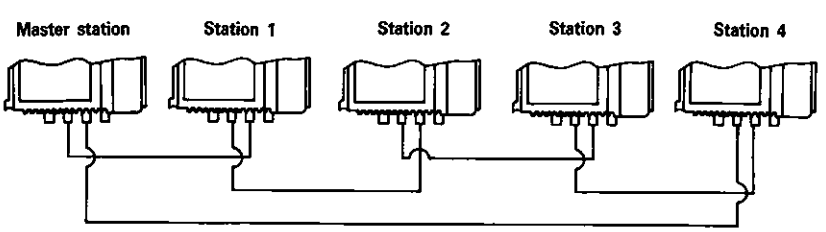


Fig. 4.9 Cabling for forward loop only

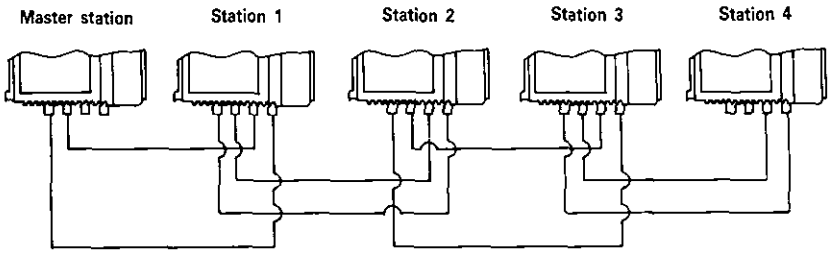
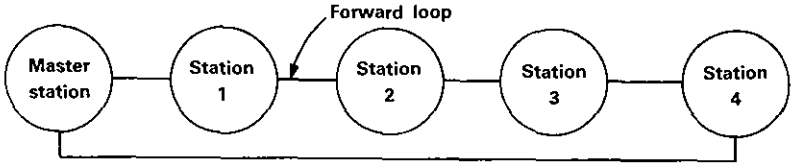


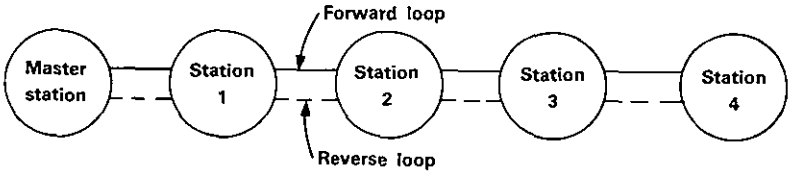
Fig. 4.10 Final Connection between Master Station and Last Station omitted

The two examples above will give the following network topologies.

Reference Fig. 4.9



Reference Fig. 4.10

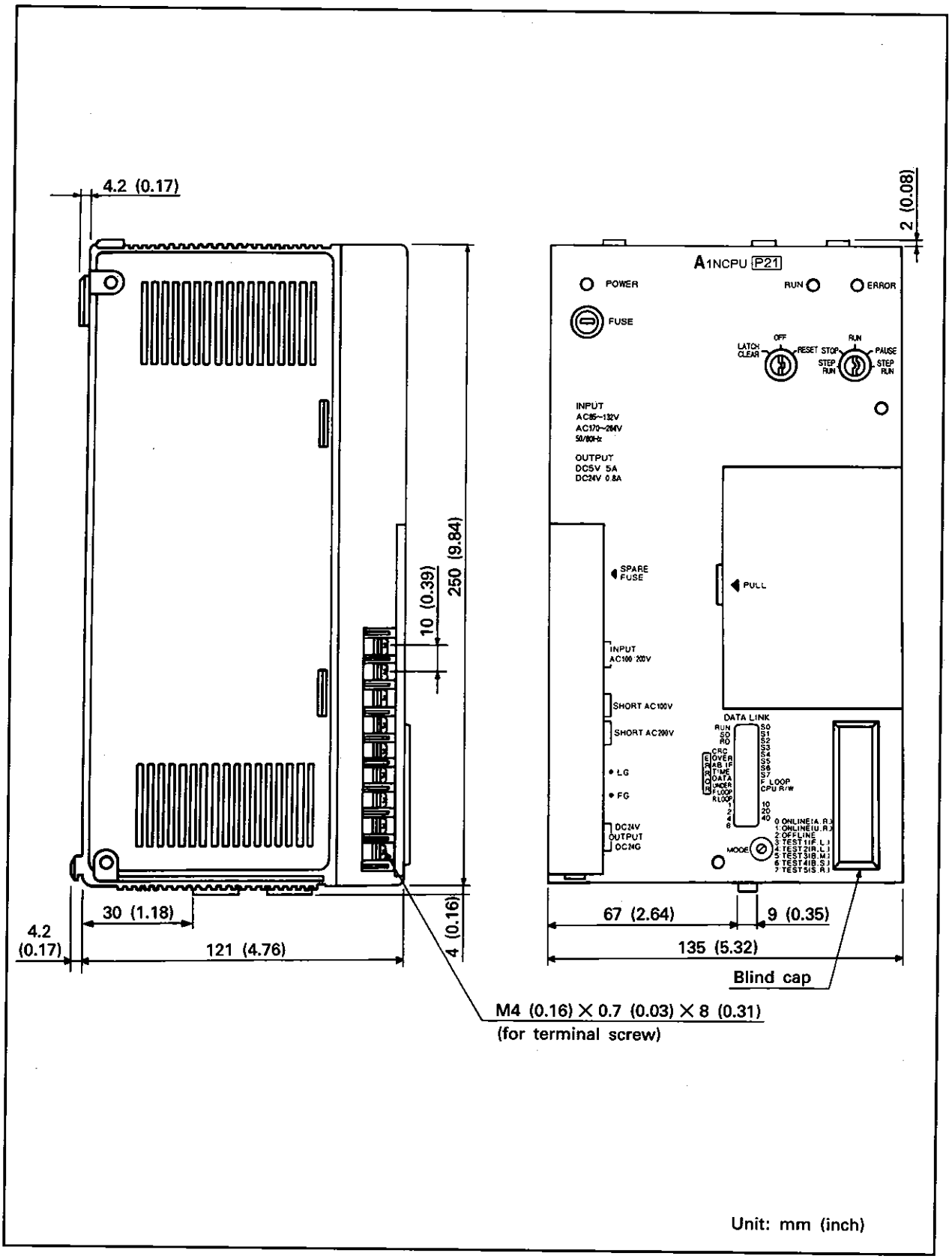


In figure 4.9, only the forward loop is connected. Providing no faults occur on the network, it will function normally. However any fault at any station will disable the complete system.

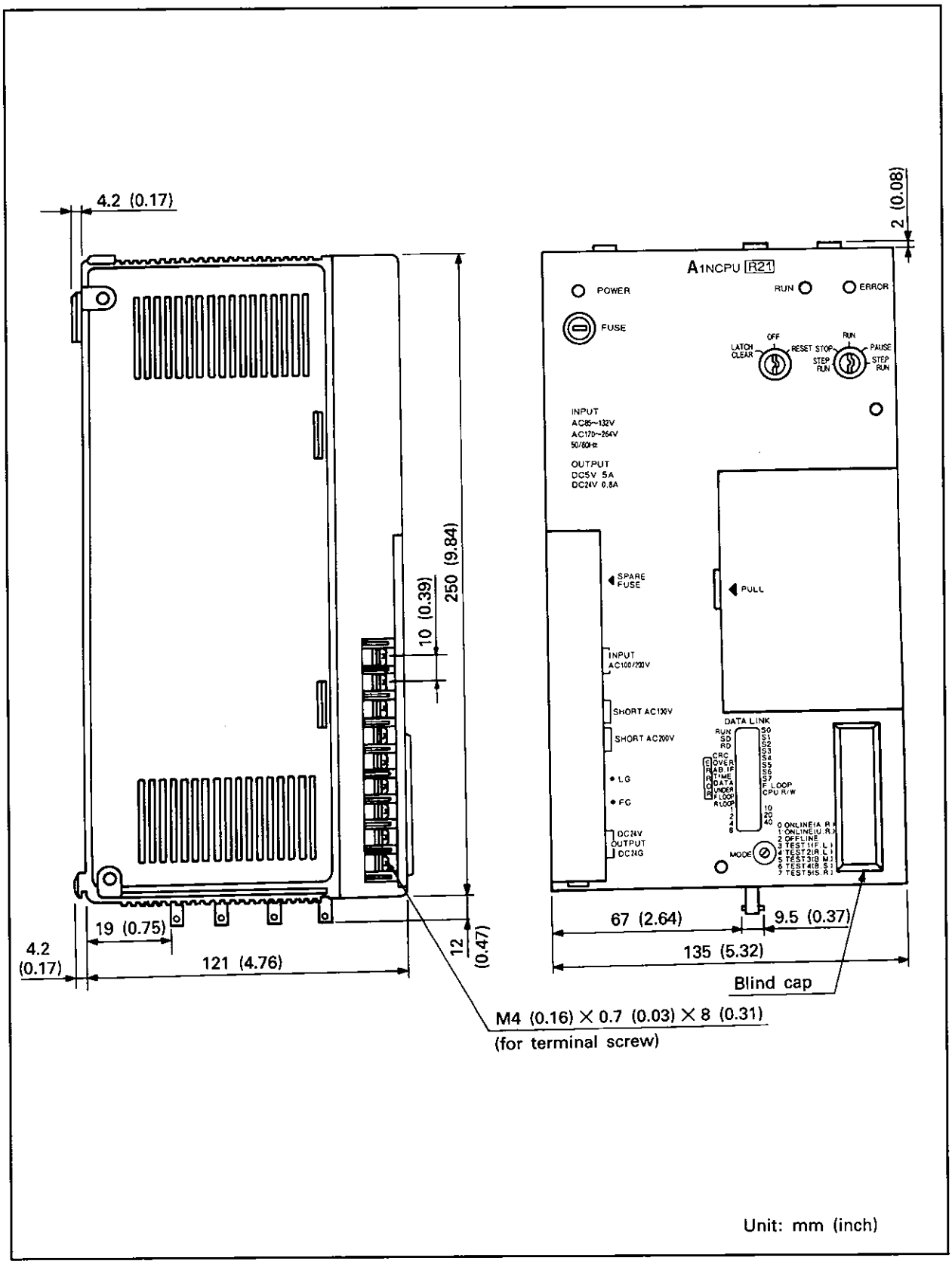
In figure 4-10 the network continuously loops back at station 4. Providing no faults occur at any other station, the network will function normally. However, if any station is disconnected from the network, all subsequent station numbers will also be disconnected. As an example, if the power supply to station 2 fails, stations 3 and 4 will also be disconnected from the network.

APPENDIX

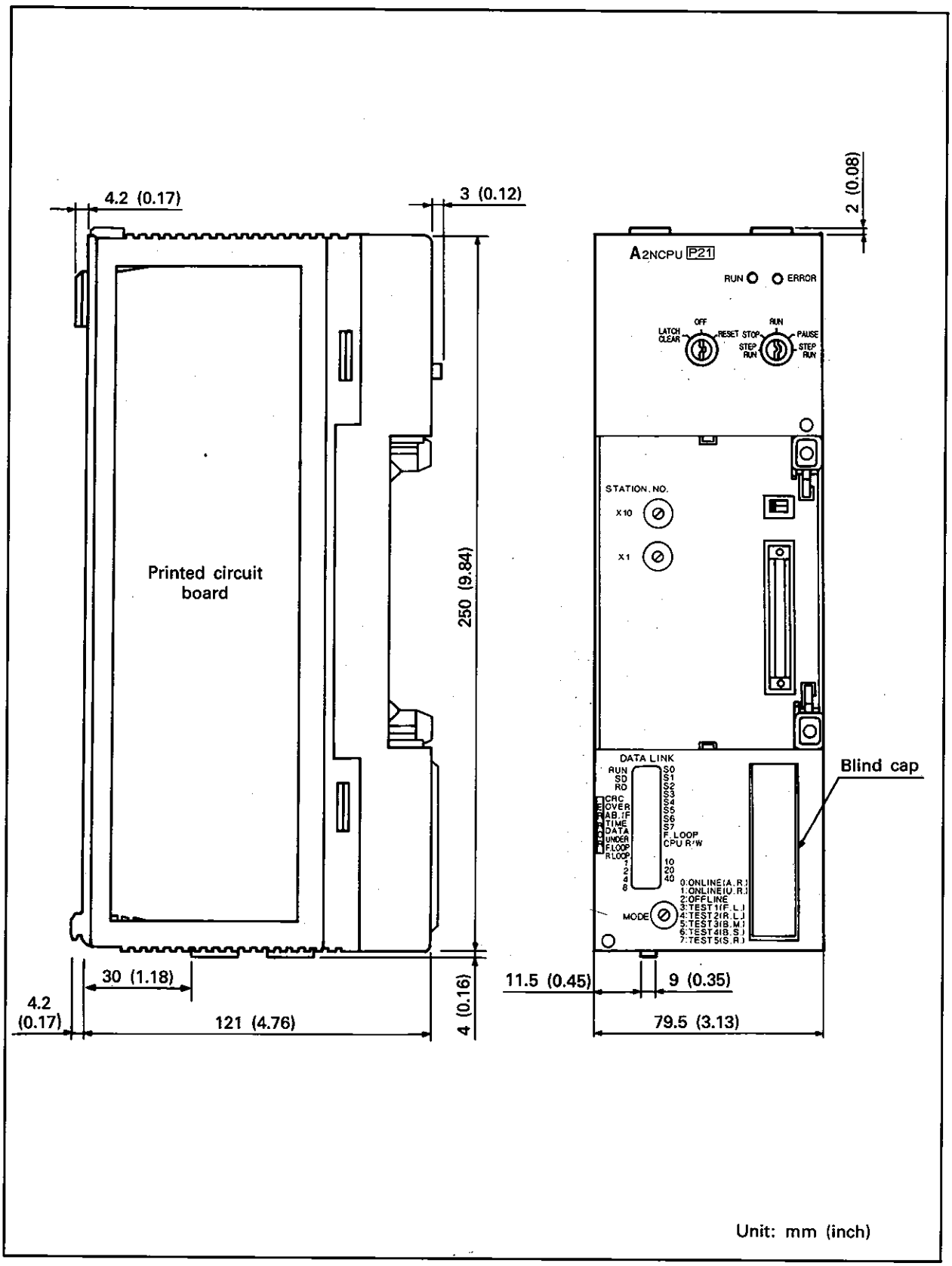
(1) A1NCPUP21 optical data link module



(2) A1NCPUR21 coaxial data link module



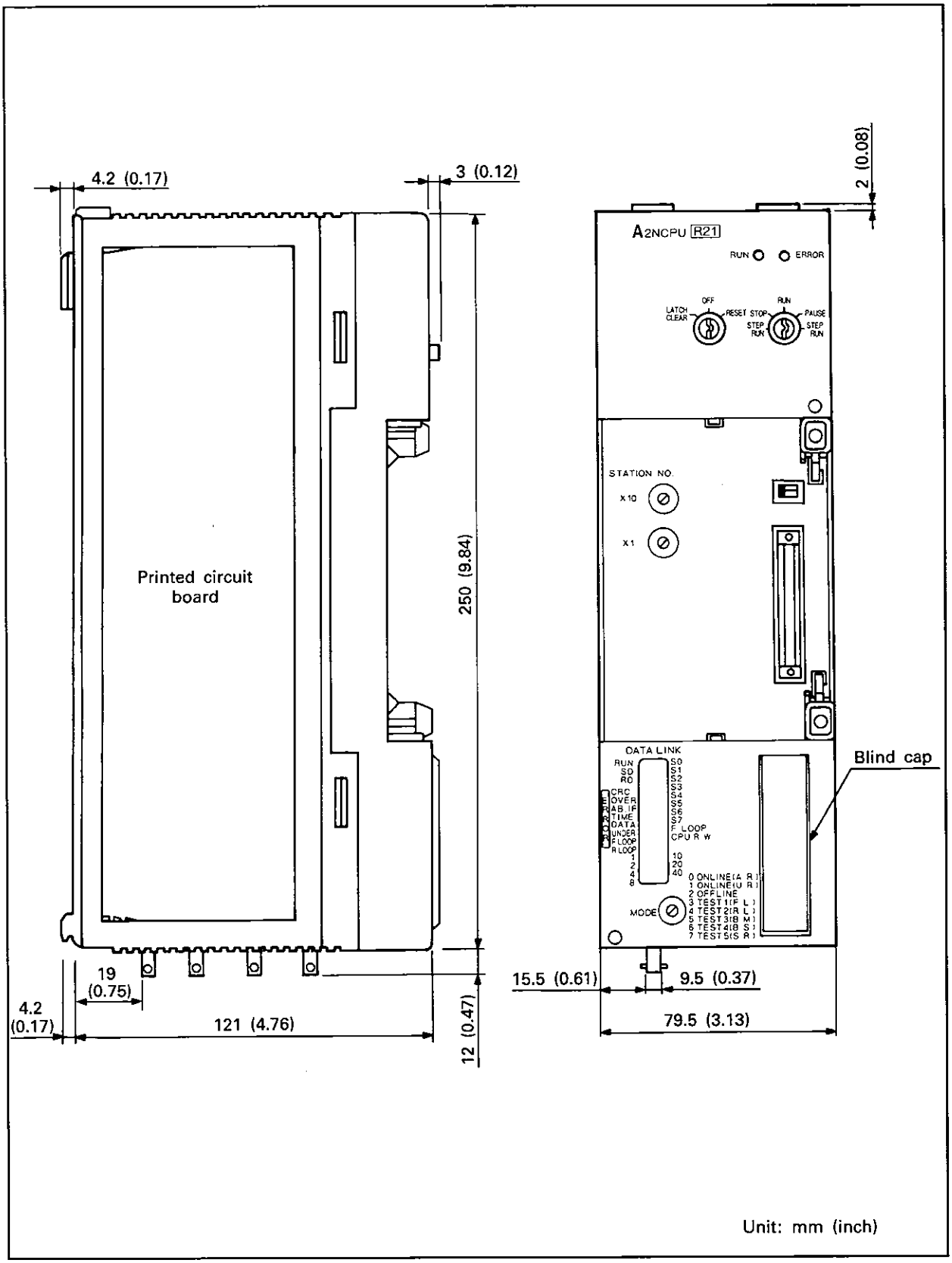
(3) A2NCPUP21 optical data link module



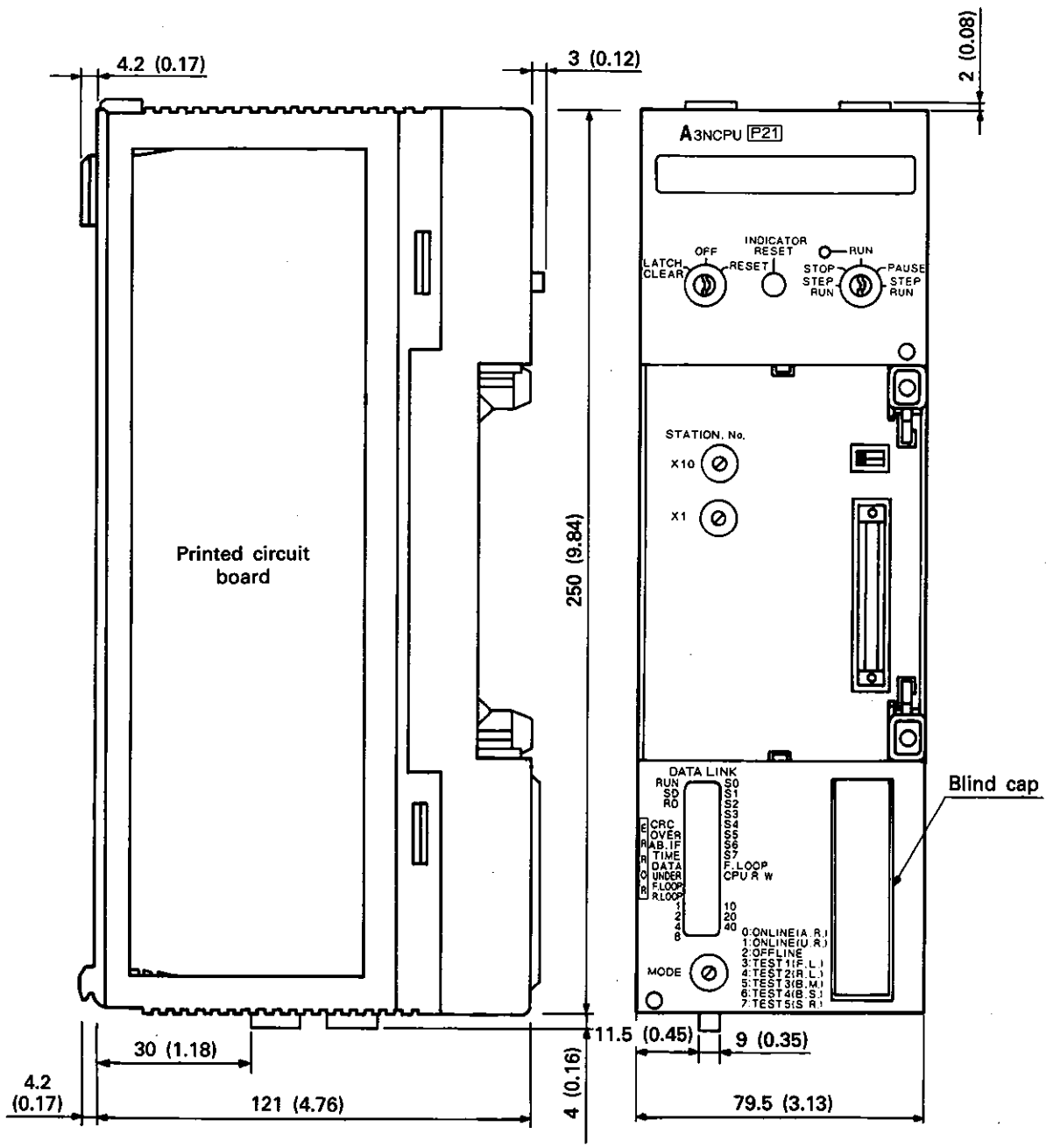
APP

IB (NA) 66158-A

(4) A2NCPUR21 coaxial data link module

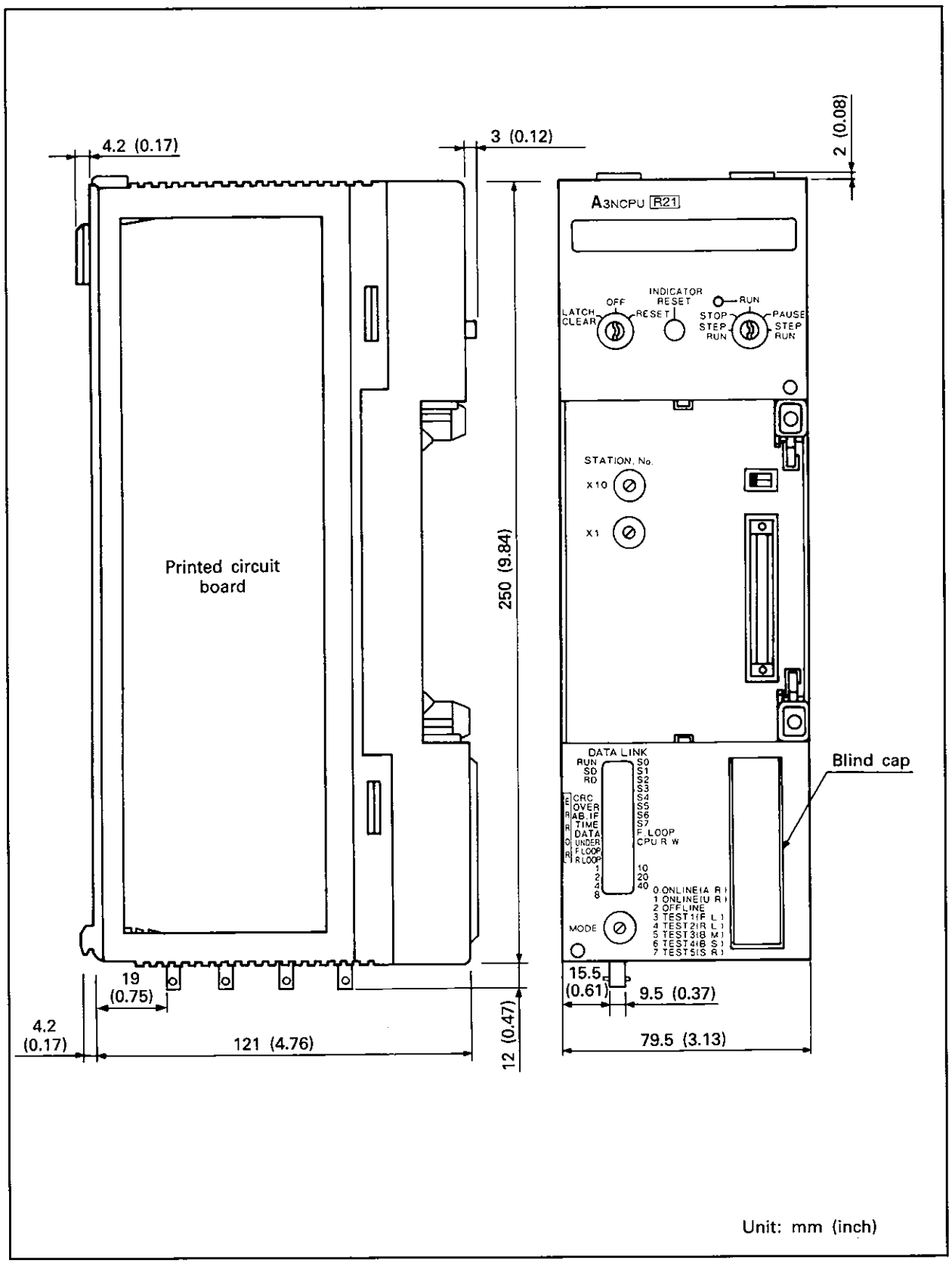


(5) A3NCPUP21 optical data link module



APP

(6) A3NCPUR21 coaxial data link module



IMPORTANT

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.

(1) Ground human body and work bench.

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

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

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