

# MITSUBISHI

PROGRAMMABLE CONTROLLER

# MELSEC-A

User's Manual

## Data link module type A1SJ71AP21/R21 (Hardware)

### 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.



The United States	Mitsubishi Electronics America, Inc. (Industrial Automation Division) 800 Biermann Court, MI Prospect IL 60066 Phone: (708)298 9223
Canada	Mitsubishi Electric Sales Canada, Inc. (Industrial Automation Division) 4299 14th Avenue, Markham Ontario L3R 0J2 Phone: (416)475 7728
United Kingdom	Mitsubishi Electric UK Ltd. (Industrial Sales Division) Travellers Lane, Hatfield, Herts AL10 9XB Phone: (0707)276100
Germany	Mitsubishi Electric Europe GmbH (Industrial Automation Division) Gothaer Strasse 8 Postfach 1548 D 4030 Ratingen 1 Phone: (02102)4860
Taiwan	Seteyo Enterprise Co. Ltd. (106) 11th Fl., Chung Ling Bldg., 363 Sec 2 Fu Hsing S. Rd., Taipei Taiwan R.O.C. Phone: (02)732-0161
Hongkong (& China)	Ryoden International Ltd. (Industrial & Electrical Controls Division) 10/F Manulife Tower, 169 Electric Rd. North Point, Hong Kong Phone: 8878870
Singapore (& Malaysia)	MELCO Sales Singapore Pte. Ltd. (Industrial Division) 307 Alexandra Rd. #05 01/02 Mitsubishi Electric Bldg. Singapore 0315 Phone: 4732308
Thailand	F.A. Tech Co. Ltd. 1138/33 34 Rama 3 Rd., Yannawa, Bangkok 10120 Phone: (02)295 2861-4
Australia	Mitsubishi Electric Australia Pty Ltd. (Industrial Controls Division) 348 Victoria Rd., Rydalmere N.S.W. 2116 Phone: (02)684 7200
Republic of South Africa	M.S.A. Manufacturing (Pty) Ltd. (Factory Automation Division) P.O. Box 39733, Bramley, Johannesburg 2018 Phone: (011)444-8080

**MITSUBISHI ELECTRIC CORPORATION**  
HEAD OFFICE: MITSUBISHI DENKI BLDG. MARUNOUCHI TOKYO 100 JAPAN TEL: 31032 CABLE: MELCO TOKYO  
NAHOYA WORKS: 1-14, YADA-MINAMI 6, HIRASAKI-CHO, NAHOYA, JAPAN

## 1. GENERAL DESCRIPTION

### 1 GENERAL DESCRIPTION

This manual describes the specifications, parts identification and self diagnosis function of the A1SJ71AP21(-S3)/R21 data link module (hereinafter called the "A1SJ71AP21(-S3)/R21") to be used for the MELSECNET data link system.

(1) An A1SJ71AP21(-S3)/R21 can be used as a master station or a local station.

(2) An A1SJ71AP21 is connected using fiber optic cable to the MELSECNET data link system.

-An A1SJ71AP21-S3 is connected using fiber optic cable for GI to the MELSECNET data link system.

-An A1SJ71AR21 is connected using coaxial cable to the MELSECNET data link system.

(3) An A1SJ71AP21/R21 is compatible to the MELSECNET mode, MELSECNET composite mode, and MELSECNET II mode.

(4) Refer to the manual mentioned below for details of the MELSECNET data link system.

MELSECNET, MELSECNET/B Data link system  
Reference manual (IB-66350)

(5) Applicable CPUs: AnSCPU

(6) Only one A1SJ71AP21/R21 module can be installed per PC CPU module.

## 2. SPECIFICATIONS

### 2 SPECIFICATIONS

#### 2.1 General Specifications

Item	Specifications				
Operating ambient temperature	0 to 55°C (See the important notice described below.)				
Storage ambient temperature	-20 to 75°C				
Operating ambient humidity	10 to 90% RH, non condensing				
Storage ambient humidity	10 to 90% RH, non condensing				
Vibration resistance	Conforms to <sup>2</sup> JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count 10 times *1 (1 octave /minute)
		10 to 55 Hz	—	0.075 mm (0.003 inch)	
		55 to 150 Hz	9.8 m/s <sup>2</sup> (1g)	—	
Shock resistance	Conforms to <sup>2</sup> JIS C 0912 (98 m/s <sup>2</sup> (10g) x 3 times in 3 directions)				
Noise durability	By noise simulator of 1500 Vpp noise voltage, 1 μs noise width and 25 to 80 Hz noise frequency				
Dielectric withstand voltage	1500 VAC for 1 minute across AC external terminals and ground 500 VAC for 1 minute across DC external terminals and ground				
Insulation resistance	5 MΩ or larger by 500 VDC insulation resistance tester across AC external terminals and ground				
Grounding	Class 3 grounding; Ground to the panel if proper grounding is not available				
Operating ambience	Free of corrosive gases. Dust should be minimal.				
Cooling method	Self cooling				

When exported from Japan, this manual does not require application to the Ministry of International Trade and Industry for service transaction permission.

IB (NA) 66480-A (9404) R00 Printed in Japan

Specifications subject to change without notice

**REMARKS**

- (1) One octave marked \*1 indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10 to 20 Hz, from 20 to 40 Hz, or 20 to 10 Hz are referred to as one octave.
- (2) \*2JIS: Japanese Industrial Standard

**IMPORTANT**

Restriction for UL Standard approved products  
 In order to be recognized as UL listed products, the following restrictions apply;  
 (1) Operating ambient temperature is limited from 0 to 50°C  
 (2) A class 2 power supply recognized by the UL Standard must be used

Item	Optical Data Link		Coaxial Data Link
	A1SJ71AP21	A1SJ71AP21-S3	A1SJ71AR21
Transmission loss	Maximum 12 dB/km	Maximum 3 dB/km	_____
Sending level	-17 to -11 dB/km (peak value)	-17 to -10 dBm (peak value)	_____
Receiving level	-32 to -11 dB/km (peak value)	-29 to -10 dBm (peak value)	_____
Number of occupied I/O points	32 points		

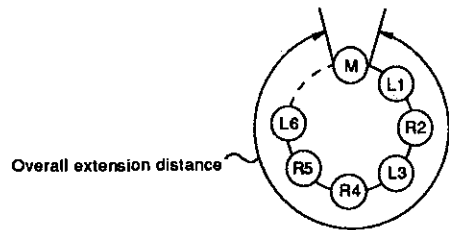
**2.2 Performance Specifications**

Table 2.2 Performance Specifications

Item	Optical Data Link		Coaxial Data Link
	A1SJ71AP21	A1SJ71AP21-S3	A1SJ71AR21
Maximum link points at one station	Input (X)	Number of the points is differs depends on the I/O points of PC CPU model	
	Output (Y)		
	MELSECNET mode	$\frac{B \text{ (points)} + Y \text{ (points)}}{8} + 2 \times W \text{ (points)} \leq 1024 \text{ bytes}$	
	MELSECNET II (composite) mode	$\frac{B \text{ (points)} + Y \text{ (points)}}{8} + 2 \times W \text{ (points)} \leq 1024 \text{ bytes}$ (Link parameter first half) $\frac{B \text{ (points)}}{8} + 2 \times W \text{ (points)} \leq 1024 \text{ bytes}$ (Link parameter second half)	
Maximum link points per system	MELSECNET mode	B	1024 points (128 bytes)
		W	1024 points (2048 bytes)
	MELSECNET II (composite) mode	B	4096 points (512 bytes)
		W	4096 points (8192 bytes)

**REMARKS**

- \*1 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 fiber optic cables and coaxial cables, the overall loop distance is a maximum of 10 km (32810 ft).



- \*2 For coaxial cables used in MELSECNET data link, the following cables are recommended:  
 RG-59B/U (MIL spec), RG-6A/U (MIL spec)

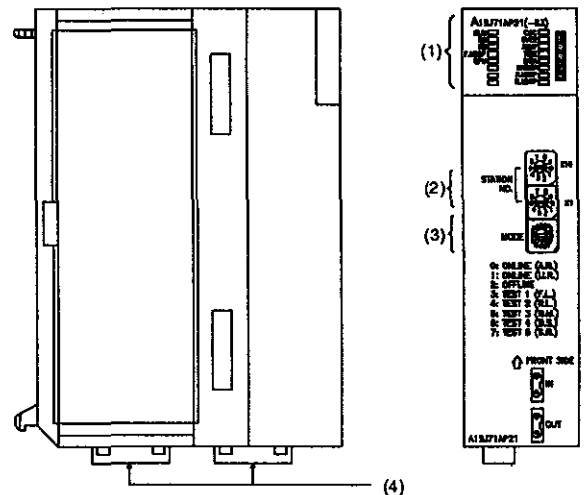
**3. HANDLING MELSEC-A**

**3 HANDLING**

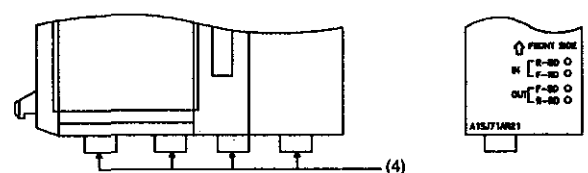
**3.1 Part Identification**

This section gives names and description of parts of the A1SJ71AP21(-S3)/R21

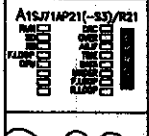
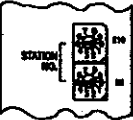
**(1) A1SJ71AP21(-S3)**

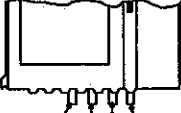
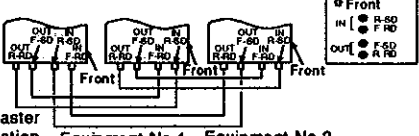


**(2) A1SJ71AR21**



Item	Optical Data Link		Coaxial Data Link
	A1SJ71AP21	A1SJ71AP21-S3	A1SJ71AR21
Current consumption (5 VDC)	330 mA		630 mA
Weight kg (lb)	0.3 (0.66)		0.33 (0.73)
Allowable instantaneous power failure time	20 ms or less		
Communication speed	1.25 MBPS		
Communication method	Half duplex, bit serial method		
Synchronous method	Frame synchronous method		
Transmission path	Duplex loop		
Overall loop distance *1	Maximum 10 km (32810 ft)		Maximum 10 km (32810 ft) (500 m (1640 ft) between stations)
	(1 km (3281 ft) between stations)	(2 km (65620 ft) between stations)	
Number of connected stations	Maximum of 65 stations (1 master station, 64 local stations)		
Modulation method	CMI method		
Transmission format	Conforms to HDLC (Frame format)		
Error control method	CRC (generating polynomial $X^{16} + X^{12} + X^5 + 1$ ) and retry after time-out		
RAS function	Loopback function on error detection or cable breakage, diagnostic functions such as link check		
Connector	Two-core optical connector plug (CA9003)	Single core optical connector plug (CA91035) Two-core optical connector plug (CA90035)	BCN type connector plug
Cable	SI-200/250	GI 50/125	3C-2V, 5C-2V, or equivalent *2

No.	Name and Appearance	Description																												
(1)	Operation and error indication LEDs 	<table border="1"> <thead> <tr> <th>LED</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>RUN</td> <td>Lit when data link is normal.</td> </tr> <tr> <td>SD</td> <td>Lit during data sending.</td> </tr> <tr> <td>RD</td> <td>Lit during data receiving.</td> </tr> <tr> <td>F LOOP</td> <td>Lit when data receiving line is a forward loop OFF when reverse.</td> </tr> <tr> <td>CPU</td> <td>Lit during communication with PC CPU.</td> </tr> <tr> <td>CRC</td> <td>Lit at code check error time.</td> </tr> <tr> <td>OVER</td> <td>Lit at data entry delay error time.</td> </tr> <tr> <td>AB IF</td> <td>Lit when all data are 1 or receiving data length is too short</td> </tr> <tr> <td>TIME</td> <td>Lit at time-out error</td> </tr> <tr> <td>DATA</td> <td>Lit receiving data error</td> </tr> <tr> <td>UNDER</td> <td>Lit at sending data error</td> </tr> <tr> <td>F.LOOP</td> <td>Lit at forward loop receiving error.</td> </tr> <tr> <td>R.LOOP</td> <td>Lit at reverse loop receiving error.</td> </tr> </tbody> </table>	LED	Description	RUN	Lit when data link is normal.	SD	Lit during data sending.	RD	Lit during data receiving.	F LOOP	Lit when data receiving line is a forward loop OFF when reverse.	CPU	Lit during communication with PC CPU.	CRC	Lit at code check error time.	OVER	Lit at data entry delay error time.	AB IF	Lit when all data are 1 or receiving data length is too short	TIME	Lit at time-out error	DATA	Lit receiving data error	UNDER	Lit at sending data error	F.LOOP	Lit at forward loop receiving error.	R.LOOP	Lit at reverse loop receiving error.
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(2)	Station number setting switches 	<ul style="list-style-type: none"> <li>Station number is set from 00 to 64               <ul style="list-style-type: none"> <li>Master station 00</li> <li>Local station 01 to 64</li> </ul> </li> <li>The upper digit is set using the "X10" switch</li> <li>The lower digit is set using the "X1" switch</li> <li>The factory setting is "00"</li> </ul>																												

No.	Name and Appearance	Description
(4)	-A1SJ71AR21 Connector 	<ul style="list-style-type: none"> <li>Coaxial cable connector</li> <li>Connect the cable as shown below</li> </ul>
		 <p>Master station    Equipment No 1    Equipment No 2</p> <p>IN-receiving : Connect to OUT-receiving of preceding station            IN-receiving : Connect to OUT-sending of preceding station            OUT-sending : Connect to IN-receiving of succeeding station            OUT-receiving : Connect to IN-sending of succeeding station</p>

### 3.2 Settings

(1) The following three items should be set for an A1SJ71AP21(-S3)/R21

(a) Station number

(b) Mode

Select online, offline, or self-diagnosis test modes

(c) Link parameter

The link parameter needs to be set at the master CPU module

No link parameter is necessary at any local station

\* For details, refer to the MELCECNET, MELSECNET/B Data Link Reference Manual.

## 4. SELF-DIAGNOSIS

### 4. SELF-DIAGNOSIS

(1) In self-diagnosis, an A1SJ71AP21(-S3)/R21 hardware, fiber optic cables and coaxial cables can be tested. A test mode is selected by the mode switch

Switch Position	Mode Designation	Description
3	Forward loop test mode	The forward loop of fiber optic or coaxial cables of the entire data link system is tested
4	Reverse loop test mode	The reverse loop of fiber optic or coaxial cables of the entire data link system is tested
5	Station to-station test mode (master station)	Cables between two stations are tested A younger station number should be designated as a master station (mode 5), and the other station should be designated as a slave station (mode 6)
6	Station-to-station test mode (slave station)	
7	Self-loopback test mode	Transmission and receiving circuits of a station is tested

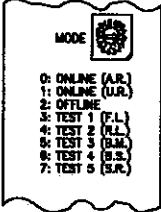

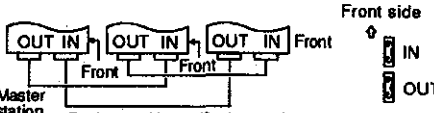
(2) For tests other than the self-loopback test, see the MELSECNET, MELSECNET/B Data Link System Reference Manual

#### 4.1 Self-Loopback Test

(1) Self-loopback test

(a) The self-loopback test is intended to check hardware of the transmission and receiving circuits (forward and reverse loops) of a link module basis

(b) A distinction between normal and faulty conditions is made depending on whether data sent from a transmitter can be received within the specified time by a receiver. The test is performed for the both loops

No.	Name and Appearance	Description																														
(3)	Mode select switch 	By switching mode, the following function are available <table border="1"> <thead> <tr> <th>Setting Number</th> <th>Name</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Online</td> <td>Automatic return mode (Recommended to use with this mode)</td> </tr> <tr> <td>1</td> <td>Online</td> <td>No automatic return mode</td> </tr> <tr> <td>2</td> <td>Offline</td> <td>Disconnect from a master station</td> </tr> <tr> <td>3</td> <td>Test mode 1</td> <td>Forward loop test</td> </tr> <tr> <td>4</td> <td>Test mode 2</td> <td>Reverse loop test</td> </tr> <tr> <td>5</td> <td>Test mode 3</td> <td>Station-to-station test (master station)</td> </tr> <tr> <td>6</td> <td>Test mode 4</td> <td>Station-to-station test (slave station)</td> </tr> <tr> <td>7</td> <td>Test mode 5</td> <td>Self-loopback test</td> </tr> <tr> <td>8 to F</td> <td></td> <td>Not usable</td> </tr> </tbody> </table> <p>(The factory setting is "0")</p>	Setting Number	Name	Description	0	Online	Automatic return mode (Recommended to use with this mode)	1	Online	No automatic return mode	2	Offline	Disconnect from a master station	3	Test mode 1	Forward loop test	4	Test mode 2	Reverse loop test	5	Test mode 3	Station-to-station test (master station)	6	Test mode 4	Station-to-station test (slave station)	7	Test mode 5	Self-loopback test	8 to F		Not usable
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5 DIMENSIONS

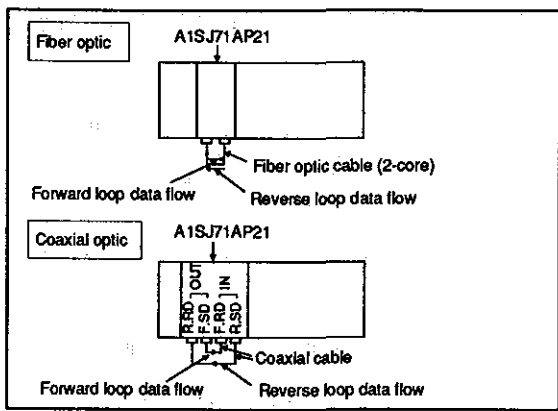
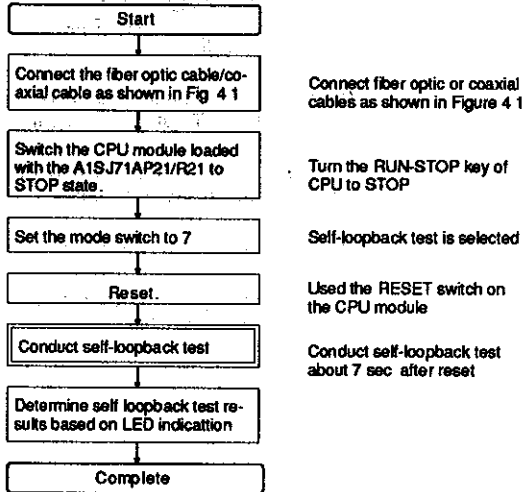


Fig 4 1 Self-Loopback Test

(2) Testing method

The self-loopback test procedure is given below



(3) Judgment on test results

The test results are indicated by the LEDs on the A1SJ71AP21/R21 front surface

(a)When the results are normal:

The CRC, OVER, AB IF, TIME, DATA and UNDER LEDs successively turn on and off

(b)When the results are abnormal:

The LED indicating the error in question lights and the test is discontinued

1)When the F LOOP, R LOOP and TIME LEDs are lit

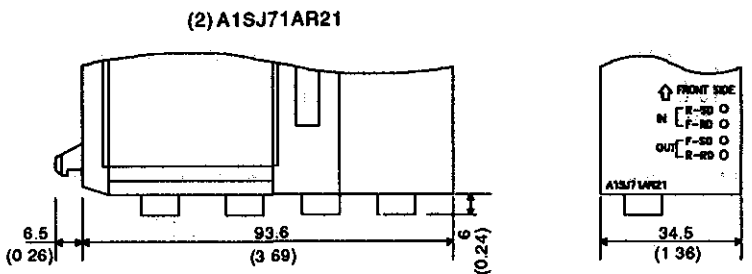
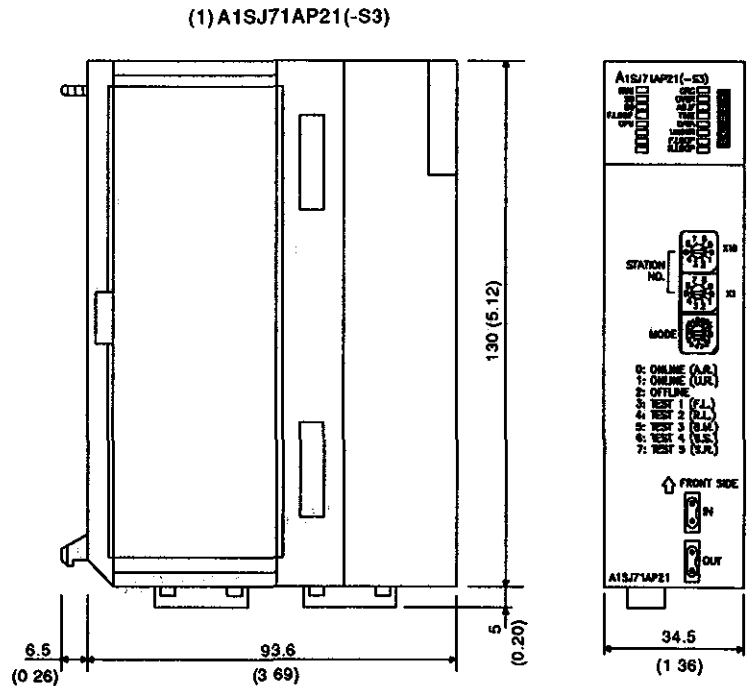
- i)The forward loop cable is broken
- ii)The forward loop send side and receive side are not connected
- iii)The forward loop send side is connected with the reverse loop send side and the reverse loop receive side is connected with the forward loop receive side

2)When the F LOOP, R LOOP and DATA LEDs are lit:

- i)The reverse loop cable is broken
- ii)The reverse loop send side and receive side are not connected

3)When the ERROR LEDs other than those mentioned in items 1) and 2) are lit:

- i)The hardware is faulty
- ii)The cable was disconnected during testing
- iii)The cable was broken during testing



Unit mm (inch)

REVISIONS

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Apr. 1994	

IMPORTANT

- (1) Design the configuration of a system to provide an external protective or safety interlocking circuit for the CPs
- (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 human body and work bench
  - (b) Do not touch the conductive areas of the printed circuit board and its electrical parts with and 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.