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PROGRAMMABLE CONTROLLERS
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Industrial automation

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FX

FX-485ADP COMMUNICATION ADAPTER
FX_{0N}-485ADP COMMUNICATION ADAPTER

USER'S GUIDE

JY992D53201C

This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX and FX_{0N}, 485 communication adapters. It should be read and understood before attempting to install or use these units.

Further information can be found in the FX PROGRAMMING MANUAL, FX and FX₀/FX_{0N} series hardware manuals.

When the FX_{0N}-485ADP is used with the FX_{2N} series programmable controller, please see the FX_{2N}-485-BD USER'S GUIDE for operation.

1 INTRODUCTION

The adapter for FX-485ADP RS485 or the adapter for FX_{0N}-485ADP RS485 (both called 485ADP hereinafter) is designed to link the data between PC and computer by using 485PC-IF.

(1) Data exchange by request from computer

Specified data can be exchanged by sending a request command from the computer to the PC. Except for few functions (global function, on-demand function), the program for data link is not needed at the PC side.

- Batch read / write of all devices (word unit, bit unit) of PC is possible. By reading out the content of each device of the PC, the operating state can be monitored, or the data can be acquired and analyzed. Besides, by writing data into each device, production control and production direction can be effected.
- Remote run / stop of PC is possible. A stopped PC can be started and stopped again from the computer, and therefore the PCs are remote controlled.
- A batch instruction can be issued to all PCs. When one computer and plural PCs are connected, a specific device (special auxiliary relay M8126) can be turned on or off from the computer to all PCs on the circuit. This function is called **the global function**. This special auxiliary relay M8126 is an exclusive device for global function.

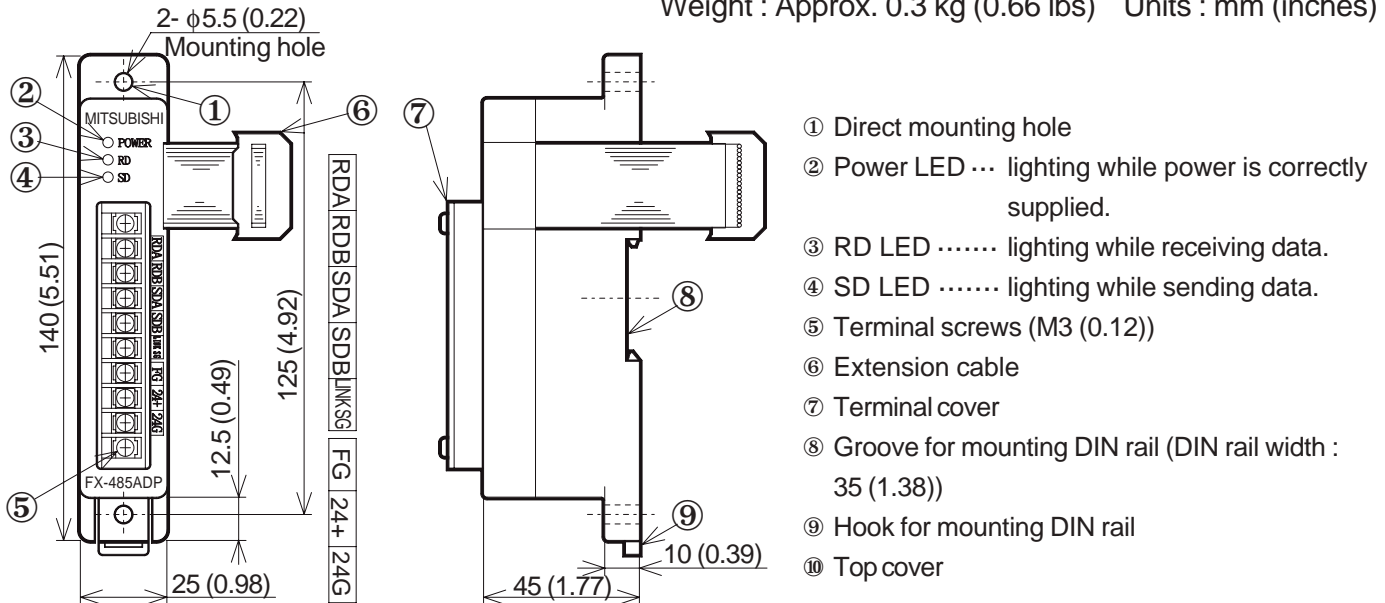
(2) Data exchange by request from PC

If transmission of emergency data from the PC to the computer is necessary, the PC issues a send request to interrupt in the computer. This function is called **on-demand function**, and is enabled only when the system is composed of one computer and one PC.

1.1 External dimensions

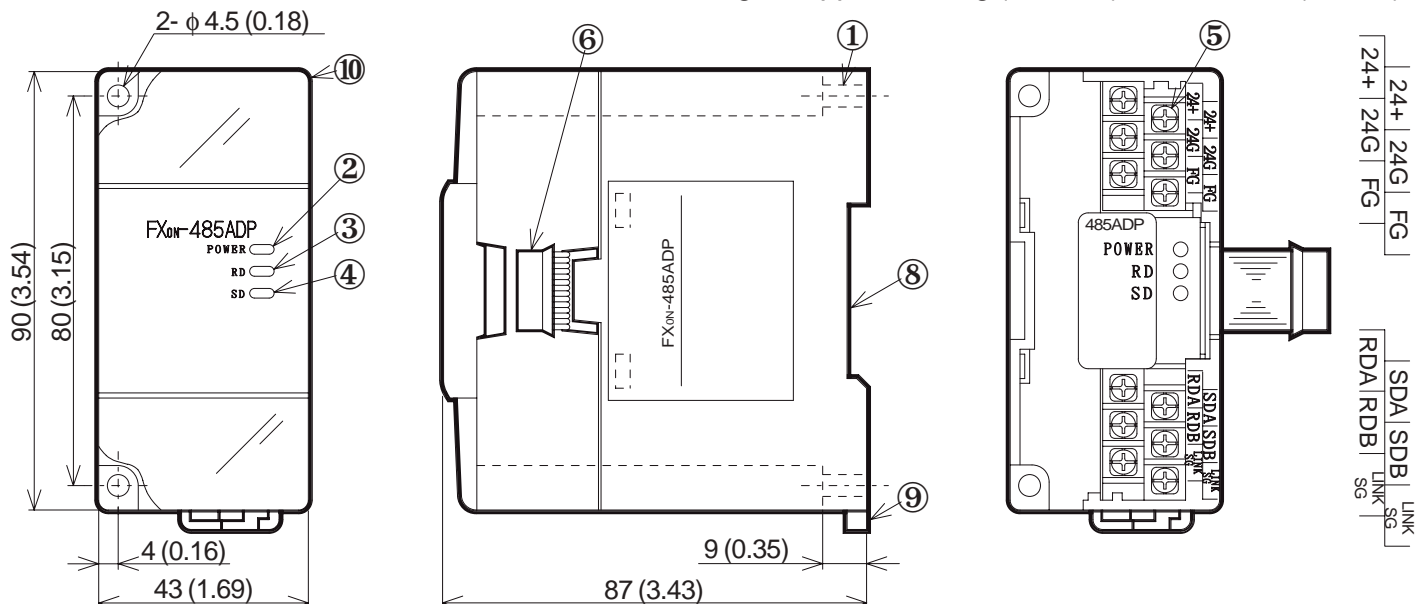
<FX-485ADP>

Weight : Approx. 0.3 kg (0.66 lbs) Units : mm (inches)



<FX_{0N}-485ADP>

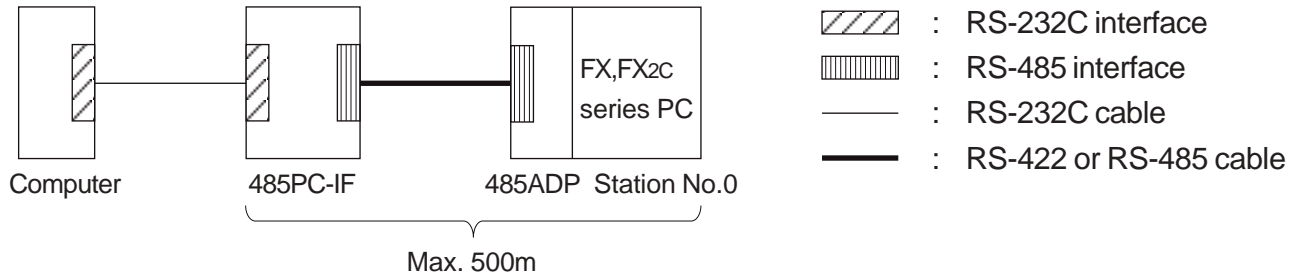
Weight : Approx. 0.3 kg (0.66 lbs) Units : mm (inches)



1.2 System configuration

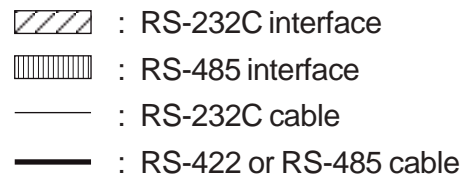
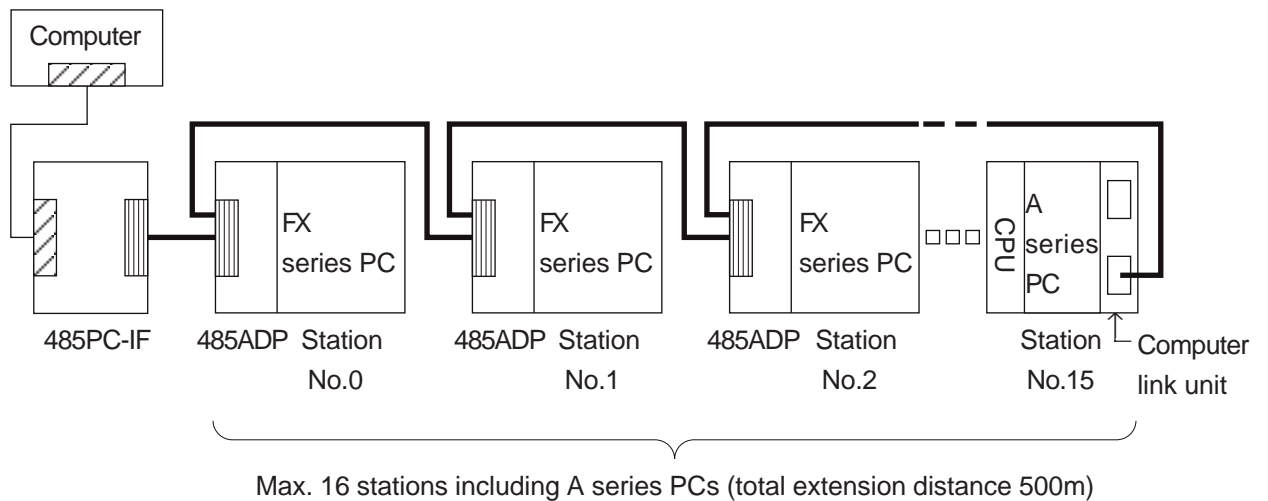
The system configuration of computer and PC is either 1 : 1 or 1 : n, and for communication with the computer, the RS-485 or RS-422 is used.

(1) Computer and PC by 1 : 1 configuration



(2) Computer and PC by 1 : n configuration

In this case, the number of link stations is 16 PCs at maximum for one computer, including the FX series PCs and A series PCs. Such system of data exchange with plural PCs with one computer is called the multi-drop link system.



1.3 Applicable PCs

For setting up the system, the 485ADP can be connected to the following PCs.

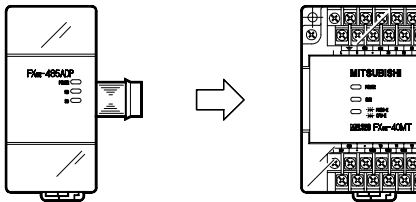
	PC series	PC version	Remarks
FX0N-485ADP	FX0N	Ver. 1.20 or later	Exclusive protocol format 1 and format 4 are supported.
FX-485ADP	FX, FX2C	Ver. 3.30 or later	Exclusive protocol format 1 and format 4 are supported.

As for exclusive protocol formats (1, 4), see the 485PC-IF manual.

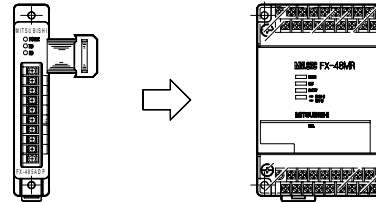
1.4 Connection with PC

For connection with the PC, connect the serial port provided at the left side facing the PC basic unit and the extension cable of the 485ADP. It must be noted however that only one special adapter (FX-8AV, FX-232ADP, etc.) such as 485ADP can be connected to the PC.

In the case of FX0N-485ADP



In the case of FX-485ADP



2

WIRING

The connecting method with the 485PC-IF is available in two-pair wiring and one-pair wiring, which may be used as follows. As for connection of the 485PC-IF and computer, see the 485PC-IF manual.

- Two-pair wiring is required when :

- ① The RS-422 device is incorporated in the system configuration.
- ② A high speed response is required (message waiting time* is desired to be less than 70 ms).
- ③ The on-demand function is used (however, the system configuration must be 1 : 1).
- ④ Adding to a system already using two-pair wiring.

* See the 485PC-IF manual.

- One-pair wiring is required when :

- ① Adding to a system already using one-pair wiring.
- ② The system configuration is standardized to RS-485 devices, and two-pair wiring is not needed.

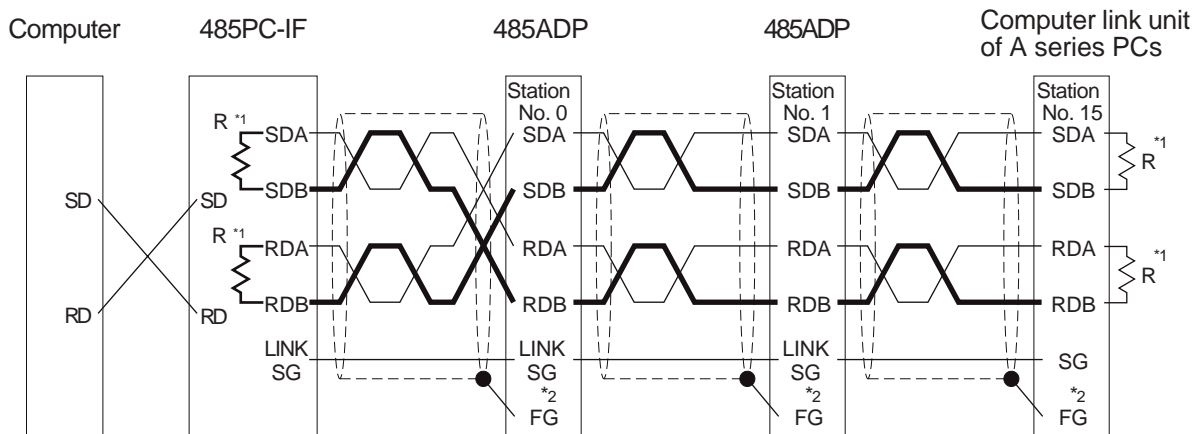
2.1 Examples of two-pair wiring (for RS-422 circuit)

(1) When connecting one computer and one PC

485PC-IF		Cable connection and signal direction	485PC		Application
Signal name			Signal name		
SDA	R*1		R*1	RDA	Reception data
SDB			R*1	RDB	Reception data
RDA	R*1		R*1	SDA	Transmission data
RDB			R*1	SDB	Transmission data
LINK SG			LINK SG	Signal ground	
Grounding resistance of 100 Ω or less			FG *2	Frame ground	
			24V *3	Power supply terminal	
			24G *3	Power supply terminal	

(2) Computer and PCs in 1 : n connection (n has a maximum value of 16).

The terminal layout shown is diagrammatic only. As for 485ADP, see chapter 1, and as for 485PC-IF, and computer link unit for A series PC, see the individual manuals.



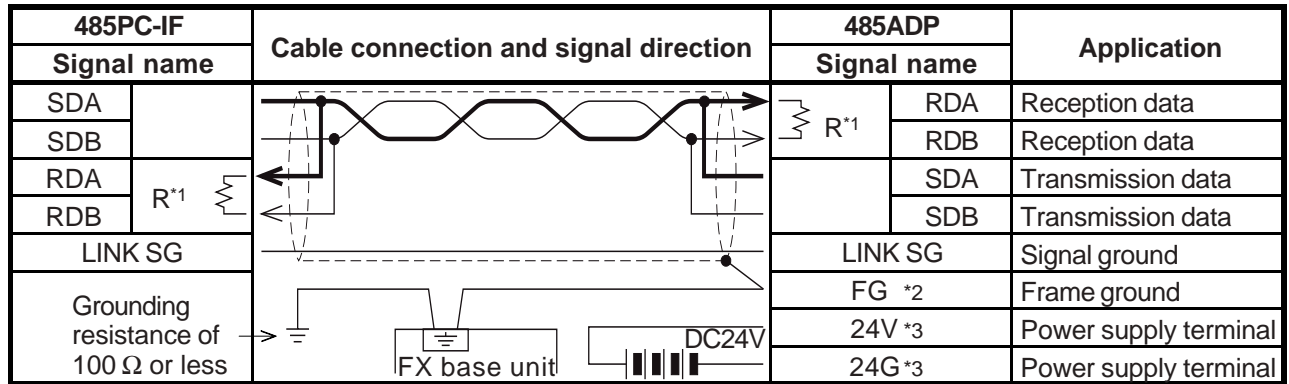
*1 R is the terminating resistance. Connect the terminating resistance (330 Ω) between terminals **SDA** and **SDB**, and terminals **RDA** and **RDB**. For details see section 2.3.

*2 Connect terminal **FG** to earth terminal of the PC main body grounded with resistance of 100 Ω or less. However, as for the computer link unit of the A series PC, see the manual of the computer link unit.

*3 The 24V DC power requirement can be taken from the service power supply of the PC.

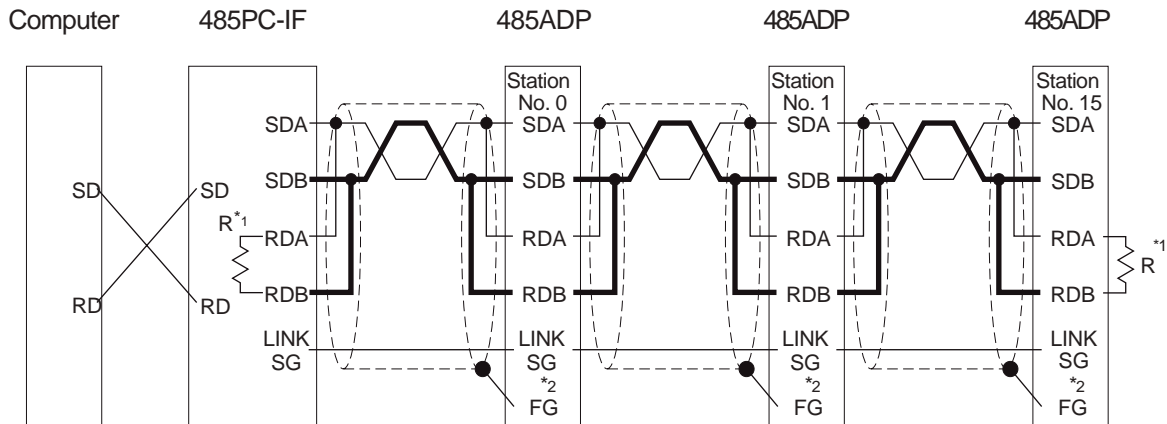
2.2 Examples of one-pair wiring (for RS-485 circuit)

(1) When connecting one computer and one PC



(2) Computer and PCs in 1 : n connection (n has a maximum value of 16).

The terminal layout shown is diagrammatic only. As for 485ADP, see chapter 1, and as for 485PC-IF, and computer link unit for A series PC, see the individual manuals.



*1 R is the terminating resistance. Connect the terminating resistance (110 Ω) between terminals **RDA** and **RDB**. For details see section 2.3.

*2 Connect terminal **FG** to earth terminal of the PC main body grounded with resistance of 100 Ω or less. However, as for the computer link unit of the A series PC, see the manual of the computer link unit.

*3 The 24V DC power requirement can be taken from the service power supply of the PC.

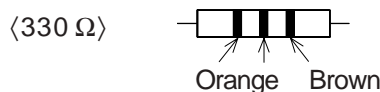
2.3 Terminating resistances

The terminating resistances are resistances connected between terminals SDA and SDB, and between terminals RDA and RDB at both end stations of the circuit (or the interface when an interface such as 485PC-IF is used at both end stations), when connecting with the RS-485 or RS-422 circuit. For connection examples, see section 2.1 and 2.2.

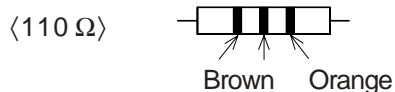
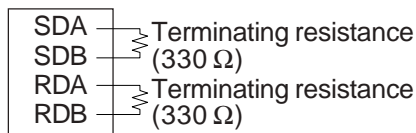
Classification of terminating resistances

In this product, two sets of terminal end resistances ($330\ \Omega \times 2$, $110\ \Omega \times 1$) are packaged, and the terminating resistances to be connected differ as shown below depending on the circuit being used.

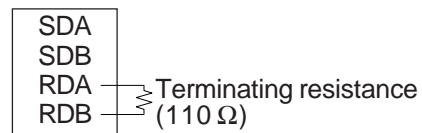
- When communicating with the RS-422 circuit, connect the resistances of “ $330\ \Omega\ 1/4W$ ” as the terminating resistances.
- When communicating with the RS-485 circuit, connect the resistances of “ $110\ \Omega\ 1/2W$ ” as the terminating resistances.



Two-pair wiring



One-pair wiring



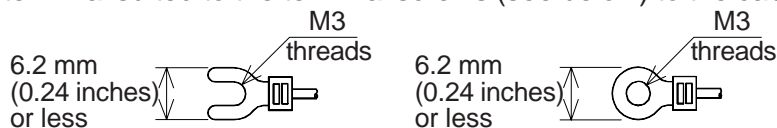
2.4 Cautions for wiring

As one of the conditions for exhibiting the function of the 485ADP sufficiently and building up a reliable system, external wiring resistant to noise is essential. Cautions for external wiring are given below.

(1) In this system, the data is read or written (turned on or off by force) while the PC is operating. Accordingly, if abnormal data is written into the PC due to effect of noise, the PC may malfunction, leading to machine trouble or accident, and therefore the following cautions should be strictly observed.

- Never lay near or bundle together with the main circuit, high voltage line or load line. Or effects of noise or surge induction may be serious. Keep at least a safe distance of over 100 mm from these lines.
- Ground the shield wire or shield of shield cable at one point at the PC side. Never ground commonly with high voltage line.

(2) Terminals screws of terminal block for RS-485 are M3 threaded. Therefore, connect wiring by fitting a crimped terminal suited to the terminal screws (see below) to the cable.



(3) Tightening torque of terminals is 0.5 to 0.8 N·m (5 to 8 kgf·cm). Screw terminals must be secure enough to prevent a loose connection from causing a malfunction.

Environmental specifications

Operating ambient temperature	0 to 55°C, storage temperature -20 to 70°C	
Humidity no condensation	35 to 85% RH (No condensation)	
Vibration resistance	Conforming to JIS C 0911. 10 to 55 Hz, 0.5 mm (max. 2G), 2 hr each in 3 axes; however, 0.5G when mounting DIN rail.	
Shock resistance	Conforming to JIS C 0912. 10G, 3 times each in 3 axes	
Noise immunity	Noise voltage 1000V p-p, noise width 1μsec, period 30 to 100 Hz, by noise simulator.	
Dielectric withstand voltage	500V AC, 1 min	Between all terminals in batch and FG terminal
Insulation resistance	500V DC, 5 MΩ by Megger	
Ground	Grounding resistance of 100 Ω or less (class 3)	
Operating ambience	Free from corrosive gases, minimal dust.	

Power source specification and type of isolation

Supply voltage	5V DC (supplied from PC), 24V DC ±10%
Current consumption	External power supply : 24V DC, max. 50 mA Internal power supply from PC : 5V DC, max. 30 mA
Type of isolation	Power source is isolated by transformer ; PC and communication signal lines are isolated by photo coupler .

Performance specification

- Transmission specification * For detail of Special D8120, D8121, and D8129, see the 485PC-IF manual.

Item		Specifications
Interface		Conforming to RS-422 / 485.
Communication method		Exclusive protocol, half-duplex communication system
Synchronization method		Start-stop synchronous system
Transfer speed (bps)		300,600,1200,2400,4800,9600,19200
Data format	Start bit	1
	Data bit	7 or 8
	Vertical parity bit	1 or none
	Stop bit	1 or 2
Error detection	Parity check	Odd / even / none
	Sum check	Yes / no
Transfer control procedure		Protocol format 1 or format 4
Access cycle		One request is processed at the time of END processing of sequence program. Therefore, access cycle is one scan time.
Circuit configuration (computer : PC)		1 : 1 or 1 : n (n = 0 to 15, max. 16 stations)
Transfer distance	RS-485, RS-422	Total extension within 500 m
	RS-232C	Within 15 m
Station numbers		0 to 15 (set by Special D8121)
Time-out judging time (Special D8129)	FX _{0N}	1 to 255 (10 to 2,550 ms) ; however, setting of "0" hrenders 100 ms.
	FX, FX _{2C}	1 to 3,276 (10 to 32,760 ms) ; however, setting of "0" hrenders 100 ms.

4.1 Computer commands

Command		Function	Objective device symbol	Number of processing points done by one communication	
Symbol	ASCII code			FX _{0N}	FX, FX _{2C}
BR	42H,52H	To read out on/off state of bit device in batch in the unit of 1 point.	X,Y,M,S,T,C	54 points	256 points
WR	57H,52H	To read out on/off state of bit device in batch in the unit of 16 points.	X,Y,M,S	13 words, 208 points	32 words, 512 points
		To read out numerical data stored in word device in batch in the unit of 1 point.	T,C,D	13 points	64 points
BW	42H,57H	To write on/off state into bit device in batch in the unit of 1 point.	X,Y,M,S,T,C	46 points	160 points
WW	57H,57H	To write on/off state into bit device in batch in the unit of 16 points.	X,Y,M,S	10 words, 160 points	10 words, 160 points
		To write numerical data into word device in batch in the unit of 1 bit.	T,C,D	11 points	64 points
BT	42H,54H	To specify bit device at random in the unit of 1 point, and set/reset by force.	X,Y,M,S,T,C	10 points	20 points

WT	42H,54H	To specify bit device at random in the unit of 16 points, and set/reset by force.	X,Y,M,S	6 words, 96 points	10 words, 160 points
		To specify word device at random in the unit of 1 point, and write data by force.	T,C*, D	6 points	10 points
RR	52H,52H	To remote-run the PC.	————	————	————
RS	52H,53H	To remote-stop the PC.	————	————	————
PC	52H,43H	To read out the type name of PC.	————	————	————
GW	47H,57H	To turn on/off global signal (special auxiliary relay M8126 in FX series) to all PCs connected to computer link.	Special auxiliary relay M8126	1 points	1 points
TT	54H,54H	To transmit the data received from computer directly back to the computer.	————	25 characters	254 characters

* Counter except for high speed counter, 32-bit counter (C200 to C255).

4.2 PC commands

The command to be effected from the PC is the on-demand command only. This command can be used only when the system configuration is 1:1. In this on-demand command, the content of the data register specified at the PC side is transmitted to the computer side from the PC side. The maximum number of points of the data register that can be transmitted as follows.

PC series	Max. number of points
FX _{0N}	13 words
FX, FX _{2C}	64 words

4.3 Device range

Device		Device number range (characters)		Decimal/Octal expression
		FX _{0N} series PC	FX, FX _{2C} series PC	
Bit device	Input relay (X)	X0000 ~ X0177	X0000 ~ X0337	Octal
	Output relay (Y)	Y0000 ~ Y0177	Y0000 ~ Y0337	
	Auxiliary relay (M)	M0000 ~ M0511	M0000 ~ M1535	
	State (S)	S0000 ~ S0127	S0000 ~ S0999	
	Special auxiliary relay (M)	M0000 ~ M8254	M8000 ~ M8255	
	Timer contact (T)	TS000 ~ TS063	TS000 ~ TS255	
	Counter contact (C)	CS000 ~ CS031 CS235 ~ CS254	CS000 ~ CS255	
Word device	Timer present value (T)	TN000 ~ TN063	TN000 ~ TN255	Decimal
	Counter present value (C)	CN000 ~ CN031 CN235 ~ CN254	CN000 ~ CN255	
	Data register (D)	D0000 ~ D0255	D0000 ~ D0999	
	File register (D)	D1000 ~ D2499	D1000 ~ D1999	
	RAM file register (D)	————	D6000 ~ D7999	
	Special data register (D)	D8000 ~ D8255	D8000 ~ D8255	

As for timer and counter, it must be noted that the character symbols differ as follows between the bit device and word device.

	Bit device (contact)	Word device (present value)
Timer	TS	TN
Counter	CS	CN

In case of trouble, check the following points, and remedy according to the troubleshooting guide in the 485PC-IF manual.

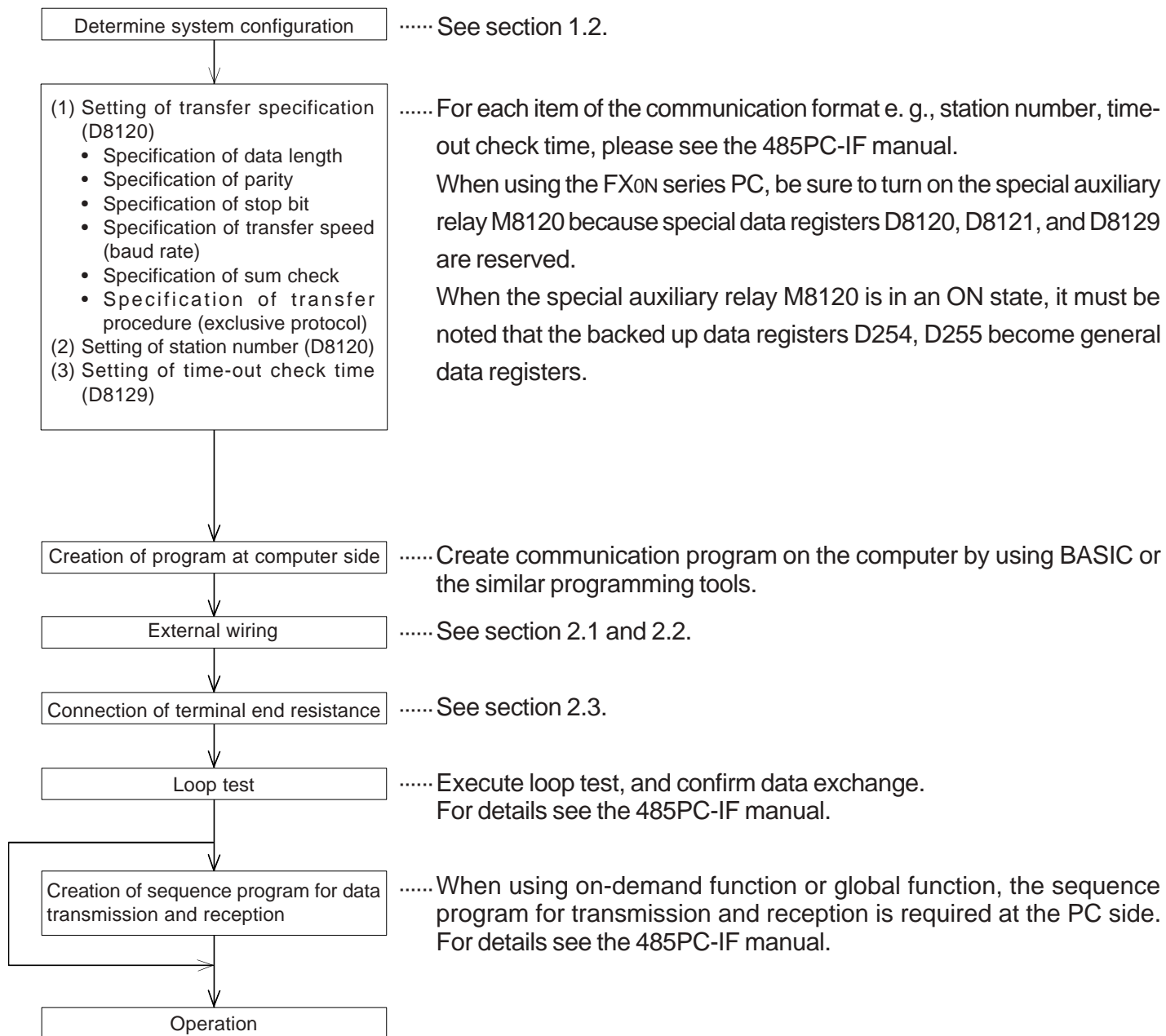
(1) Power LED

Lit : The extension cable is normally connected to the PC.

Otherwise : The extension cable is not connected correctly, or external 24 V DC power supply is not functioning correctly. Check and connect correctly.

(2) As for SD LED, RD LED, check and remedy according to the troubleshooting guide in the 485PC-IF manual.

Prior to start of operation, follow the procedure below. As for detail of procedure, see the 485PC-IF manual.



Guidelines for the safety of the user and protection of the FX-485ADP, FX₀N-485ADP communication adapter

- This manual has been written to be used by trained and competent personnel. This is defined by the European directives for machinery, low voltage and EMC.
- If in doubt at any stage during the installation of the FX-485ADP, FX₀N-485ADP always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use of the FX-485ADP, FX₀N-485ADP please consult the nearest Mitsubishi Electric distributor.
- 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.

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