MITSUBISHI

PROGRAMMABLE CONTROLLERS
MELSEC-F

FX2N

FX2N/FX2NC FUNCTION EXPANSION MEMORY

HARDWARE MANUAL

JY997D00401A

This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX2N/FX2NC Function Expansion Memory. It should be read and understood before attempting to install or use the unit. Further information can be found in the FX2N or FX2NC series PLC hardware manuals.

Guidelines for the safety of the user and protection of the FX2N/FX2NC Function Expansion Memory

• If in doubt at any stage during the installation of the FX2N/FX2NC Function Expansion Memory 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 FX2N/FX2NC Function Expansion Memory 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.

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

Note's on the symbology used in this manual

At various times through out this manual certain symbols will be used to highlight points of information which are intended to ensure the user's personal safety and protect the integrity of the equipment. Whenever any of the following symbols are encountered, its associated note must be read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

Hardware warnings

1) Indicates that the identified danger WILL cause physical and property damage.

2) Indicates that the identified danger could POSSIBLY cause physical and property damage.

Associated Manuals

	Manual name	Manual number	Description
⊙	FX1S/FX1N/FX2N/FX2NC Programming Manual II	JY992D88101 (sent separately)	Explains the instructions in the FX1S/FX1N/FX2N/FX2NC Series PLC.
○	FX2N Hardware Manual	JY992D66301 (included with product)	Describes the contents related to the hardware such as specification, wiring and mounting of the FX2N Series PLC.
○	FX2NC Hardware Manual	JY992D76401 (included with product)	Describes the contents related to the hardware such as specification, wiring and mounting of the FX2NC Series PLC.

⊙: Indispensable manual
○: Either manual is necessary

1. Product Outline

1.1 Features

FX2N-ROM-E1 and FX2NC-ROM-CE1 are optional memories for the FX2N or FX2NC Series PLC to add external ROM instruction.
In the products, system programs to add external ROM instruction, EXTR (FNC 180), and the EEPROM memory which can be used as a PLC program area are built in.

1.2 Programming Tools Applicable for EXTR (FNC 180) Instruction

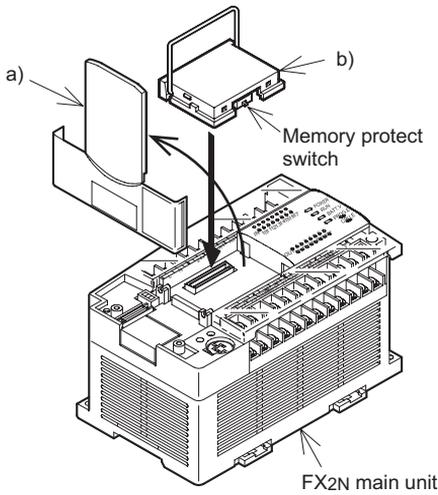| Model name	Version
GX Developer	SW7 or later
FX-PCS/WIN-E	3.10 or later
FX-10P-E	4.10 or later
FX-20P-E (FX-20P-MFXD-E)	5.10 or later

2. Specifications

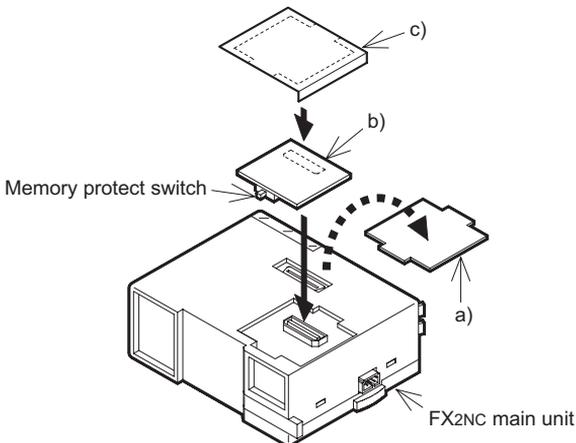| Model name		FX2N-ROM-E1 function expansion memory cassette	FX2NC-ROM-CE1 function expansion memory board
Applicable PLC		FX2N PLC version 3.00 or later (Serial number 15**** or later)	FX2NC PLC version 3.00 or later (Serial number 15**** or later)
		If installed in PLC earlier than version 3.00, only 16k-step user program memory and clock function can be used.	
Built-in functions	System memory	Equipped with functions K10 to K13 of the EXTR (FNC 180) instruction • K10: Inverter operation monitoring • K11: Inverter operation control • K12: Read of inverter parameter • K13: Write of inverter parameter	
	User program memory	• Memory capacity: 16k steps (can be set to 2k, 4k or 8k steps also) • Memory type: EEPROM • Allowable number of write: Approx. 10k times (memory protect switch provided)	
	Clock function	Not provided (clock is built in PLC)	• Year 1980 to 2079 • Year display in 2 or 4 digits • Monthly difference of ± 45 sec. (at 25°C)

3. Installation and Operation

⚠ • Don't attach/remove the memory cassette or memory board before turning off the power. Attaching/removing it while the power is on may damage its contents or element.

• Don't touch the memory cassette or memory board before discharging static from the body of the user. When transporting, make sure to wrap it in a static-free sheet to prevent damaging its contents or element.

3.1 Installation of FX2N-ROM-E1

1) Turn off the power of the PLC and remove the cover "a)".
2) Install FX2N-ROM-E1 "b)" to the port on the main unit.
3) Put back the cover "a)".

3.2 Installation of FX2NC-ROM-CE1

1) Turn off the power of the PLC and remove the cover "a)".
2) Install FX2NC-ROM-CE1 "b)" to the port on the main unit.
3) Place cover "c)", included in the memory board product box, onto the PLC.

3.3 Operation

- The program error may flash when used for the first time because the EEPROM (user program memory) is not initialized. In the personal computer or FX-20P (off-line mode), transfer and write a program in that status. In the FX-10P or FX-20P (online mode), execute all NOP write to erase the contents.
- After writing a program, make sure to verify.
- Set the memory protect switch to OFF before writing a program. During normal operation, it is recommended to set it to ON to prevent erroneous write.
- When installed in the FX2N or FX2NC Series PLC version 3.00 or later, the EXTR (FNC 180) instruction and the 16k-step EEPROM and clock function can be used.
  If installed in the FX2N or FX2NC Series PLC earlier than version 3.00, only the 16k-step EEPROM and clock function can be used.

4. Inverter Communication Function

⚡ • When handling the PLC or inverter, follow the notices indicated in each manual which is included with the main unit in order to avoid electric shock, fire, a damage or an accident.

⚠ • Make sure to perform class D grounding of the ground terminal of communication equipment for the PLC together with that of the PLC main unit. Ground the shield of a shielded cable at one point on the PLC. Do not, however, ground at the same point as high voltage line. If grounding is imperfect, effects of noise or surge induction takes place, and it may cause a communication error or erroneous operation.

• The signal cables must not be laid near or bundled with the main circuit lines, high voltage power cables or load carrying wires. Otherwise effects of noise or surge induction are likely to take place, and it may cause a communication error or erroneous operation.
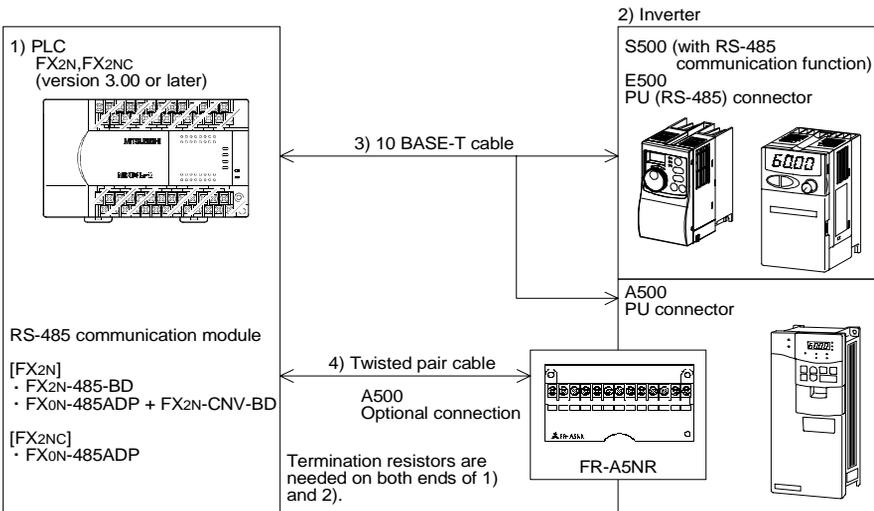 Keep a safe distance of more than 100mm (3.94") from these wires.

4.1 Outline of Functions and System Configuration

When using K10 to K13 of the EXTR (FNC 180) instruction, operation monitoring, control value write or parameter monitoring and change in the A500/E500/S500 (with RS-485 communication function) Series MITSUBISHI TRANSISTORIZED INVERTER can be performed.
The details of programming and setting can be found in the Programming Manual II, JY992D88101.
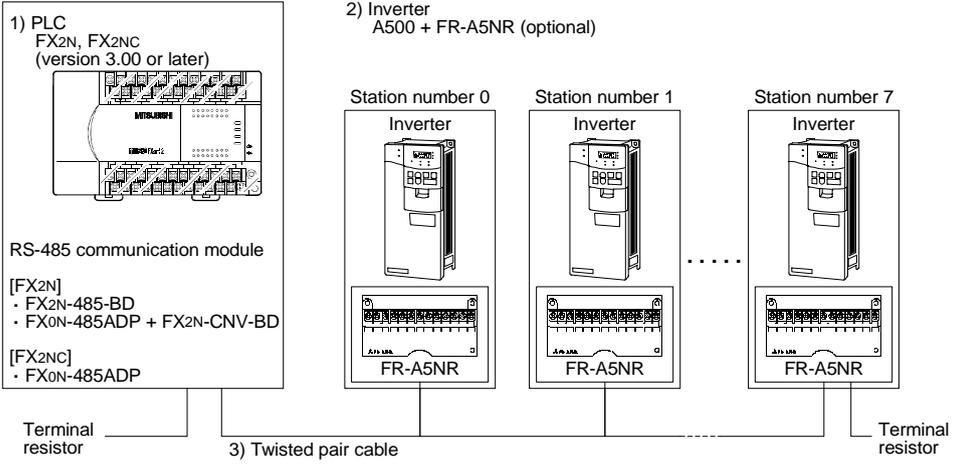
- **Total extension distance**

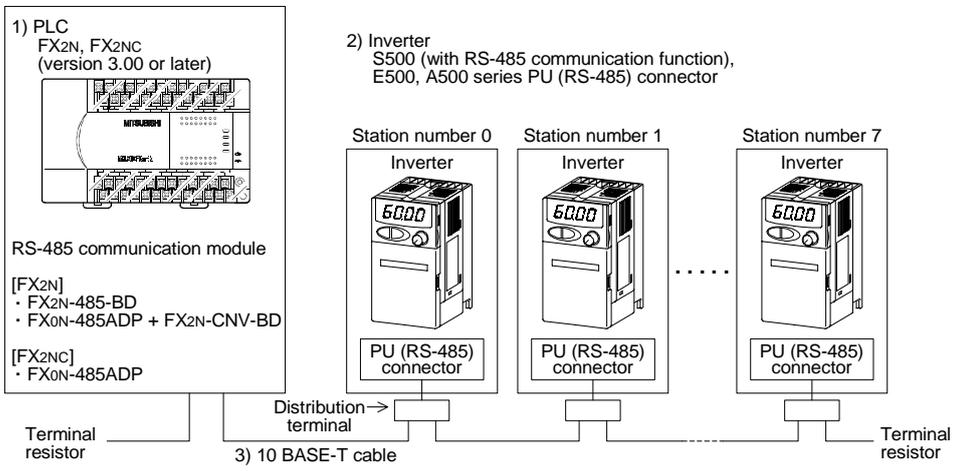| PLC	Using interface	Extension distance
FX2N	FX2N-485-BD	Maximum 50m (164')
	FX2N-CNV-BD + FX0N-485ADP	Maximum 500m (1640')
FX2NC	FX0N-485ADP	

- **Connecting with one inverter**

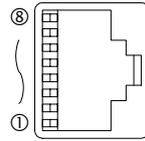- **Connecting with two or more inverters (Maximum 8 inverters)**

1) PLC
   FX2N, FX2NC
   (version 3.00 or later)

RS-485 communication module

[FX2N]
・ FX2N-485-BD
・ FX0N-485ADP + FX2N-CNV-BD

[FX2NC]
・ FX0N-485ADP

Terminal resistor

3) 10 BASE-T cable

Distribution→ terminal

2) Inverter
   S500 (with RS-485 communication function),
   E500, A500 series PU (RS-485) connector

Station number 0   Station number 1   Station number 7
Inverter   Inverter   Inverter

PU (RS-485) connector   PU (RS-485) connector   PU (RS-485) connector

Terminal resistor

1) PLC
   FX2N, FX2NC
   (version 3.00 or later)

RS-485 communication module

[FX2N]
・ FX2N-485-BD
・ FX0N-485ADP + FX2N-CNV-BD

[FX2NC]
・ FX0N-485ADP

Terminal resistor

3) Twisted pair cable

2) Inverter
   A500 + FR-A5NR (optional)

Station number 0   Station number 1   Station number 7
Inverter   Inverter   Inverter

FR-A5NR   FR-A5NR   FR-A5NR

Terminal resistor

4.2 Wiring

Wiring for PU (RS-485) Connector

- **Pin layout of PU (RS-485) connector**

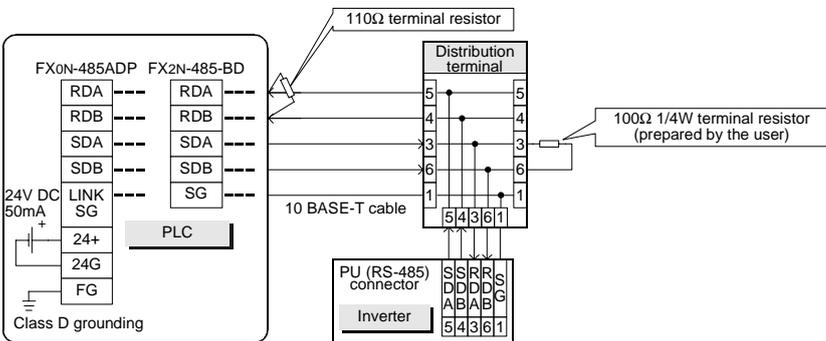| Pin number	Signal name	Note
1	SG	
2	P5S	Not to be used
3	RDA	
4	SDB	
5	SDA	
6	RDB	
7	SG	
8	P5S	Not to be used

Viewing from front face of inverter (receptacle side)
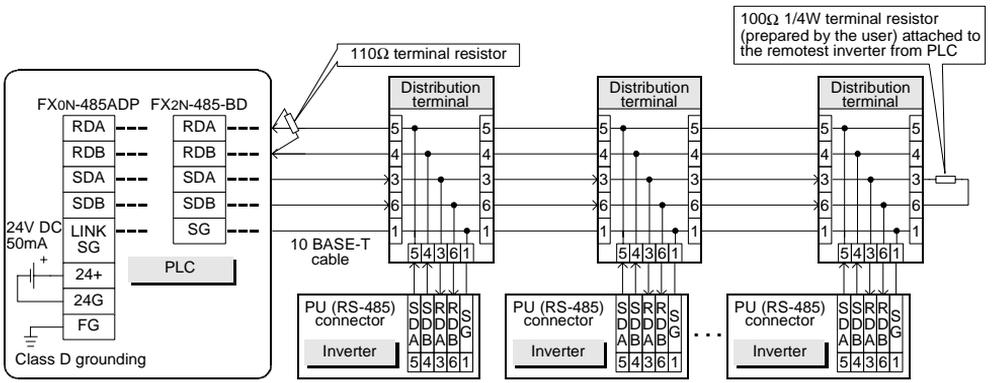
⑧

①

Modular jack

⚠ **Caution:**

The pin number 2 and 8 are for the power supply for an operation panel or parameter unit. DO NOT use when connecting two or more inverters.

- **Connecting with one inverter**

110Ω terminal resistor

Distribution terminal

FX0N-485ADP FX2N-485-BD

RDA	RDA
RDB	RDB
SDA	SDA
SDB	SDB
LINK SG	SG

24V DC 50mA

24+
24G
FG

Class D grounding

PLC

10 BASE-T cable

100Ω 1/4W terminal resistor (prepared by the user)

5 4 3 6 1

PU (RS-485) connector

Inverter

SDA SDB RDA RDB SG
5   4   3   6   1

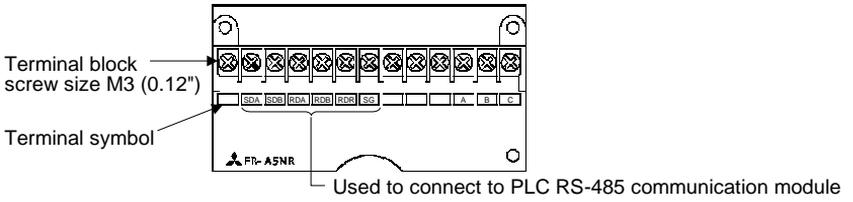- **Connecting with two or more inverters (Maximum 8 inverters)**

- **Applicable equipment**

    Use the connectors and cables for LAN (10 BASE-T) available on the market.
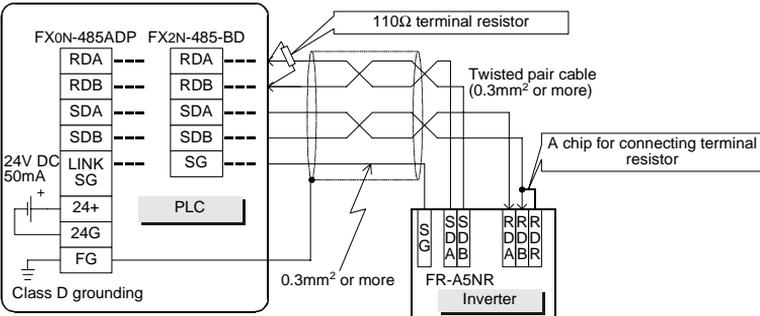
    - Connector: RJ45 connector
    - Cable: Cable conforming to EIA568 (such as 10 BASE-T cable)
    - Terminal resistor: On the PLC side, 110Ω
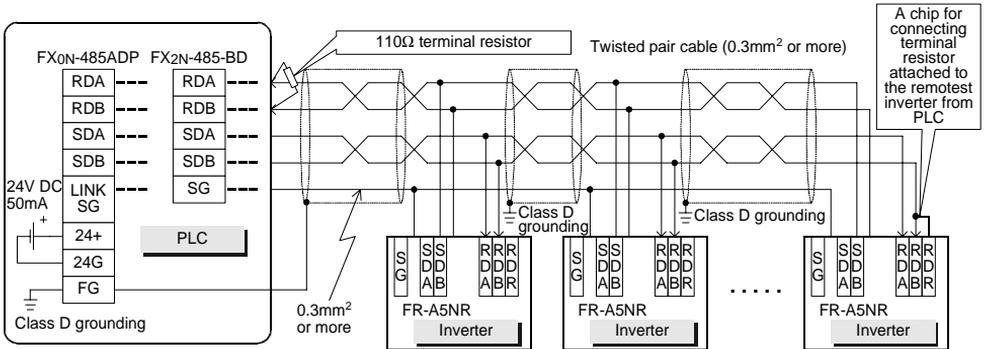   On the inverter side, 100Ω and 1/4W prepared by the user

Wiring for FR-A5NR

- **Terminal layout**

Terminal block screw size M3 (0.12")

Terminal symbol

Used to connect to PLC RS-485 communication module

- **Connecting with one inverter**

- **Connecting with two or more inverters (Maximum 8 inverters)**

- **Applicable equipment**

    - Cable: Use the twisted pair cables (0.3mm² or more, 3 pairs)
    - Terminal resistor : On the PLC side, 110Ω
        On the inverter side, a chip for connecting terminal resistor only to the remotest FR-A5NR from the PLC (between RDB and RDR)

MITSUBISHI ELECTRIC CORPORATION

Manual number : JY997D00401

Manual revision : A

Date   : JULY 2001

MITSUBISHI

PROGRAMMABLE CONTROLLERS
MELSEC-F

FX₂N

FX₂N/FX₂NC FUNCTION EXPANSION MEMORY

HARDWARE MANUAL

JY997D00401A

Changes for the Better

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Guidelines for the safety of the user and protection of the FX₂N/FX₂NC Function Expansion Memory

- If in doubt at any stage during the installation of the FX₂N/FX₂NC Function Expansion Memory 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 FX₂N/FX₂NC Function Expansion Memory 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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Hardware warnings

1) Indicates that the identified danger WILL cause physical and property damage.

2) Indicates that the identified danger could POSSIBLY cause physical and property damage.

Associated Manuals

Manual name	Manual number	Description
⊙ FX₁S/FX₁N/FX₂N/FX₂NC Programming Manual II	JY992D88101 (sent separately)	Explains the instructions in the FX₁S/FX₁N/FX₂N/FX₂NC Series PLC.
○ FX₂N Hardware Manual	JY992D66301 (included with product)	Describes the contents related to the hardware such as specification, wiring and mounting of the FX₂N Series PLC.
○ FX₂NC Hardware Manual	JY992D76401 (included with product)	Describes the contents related to the hardware such as specification, wiring and mounting of the FX₂NC Series PLC.

⊙: Indispensable manual
○: Either manual is necessary

1. Product Outline

1.1 Features

FX₂N-ROM-E1 and FX₂NC-ROM-CE1 are optional memories for the FX₂N or FX₂NC Series PLC to add external ROM instruction.
In the products, system programs to add external ROM instruction, EXTR (FNC 180), and the EEPROM memory which can be used as a PLC program area are built in.

1.2 Programming Tools Applicable for EXTR (FNC 180) Instruction

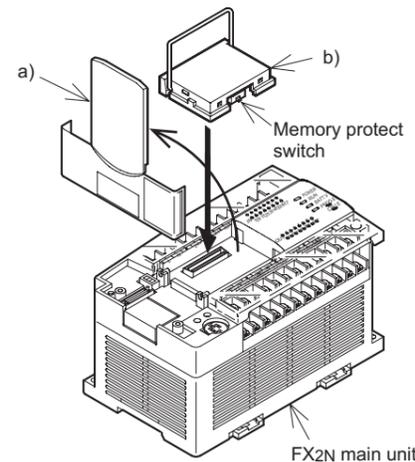| Model name	Version
GX Developer	SW7 or later
FX-PCS/WIN-E	3.10 or later
FX-10P-E	4.10 or later
FX-20P-E (FX-20P-MFXD-E)	5.10 or later

2. Specifications

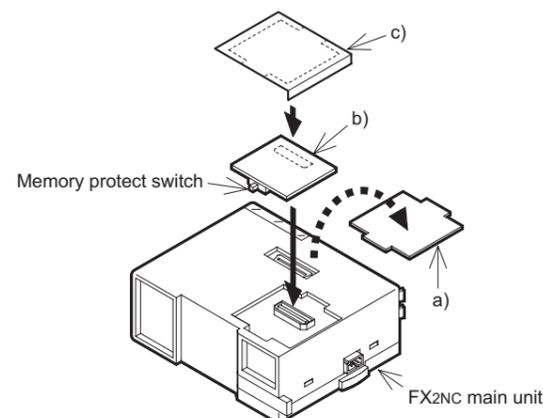| Model name		FX₂N-ROM-E1 function expansion memory cassette	FX₂NC-ROM-CE1 function expansion memory board
Applicable PLC		FX₂N PLC version 3.00 or later (Serial number 15**** or later)	FX₂NC PLC version 3.00 or later (Serial number 15**** or later)
		If installed in PLC earlier than version 3.00, only 16k-step user program memory and clock function can be used.	
Built-in functions	System memory	Equipped with functions K10 to K13 of the EXTR (FNC 180) instruction • K10: Inverter operation monitoring • K11: Inverter operation control • K12: Read of inverter parameter • K13: Write of inverter parameter	
	User program memory	• Memory capacity: 16k steps (can be set to 2k, 4k or 8k steps also) • Memory type: EEPROM • Allowable number of write: Approx. 10k times (memory protect switch provided)	
	Clock function	Not provided (clock is built in PLC)	• Year 1980 to 2079 • Year display in 2 or 4 digits • Monthly difference of ±45 sec. (at 25°C)

3. Installation and Operation

- Don't attach/remove the memory cassette or memory board before turning off the power. Attaching/removing it while the power is on may damage its contents or element.
- Don't touch the memory cassette or memory board before discharging static from the body of the user. When transporting, make sure to wrap it in a static-free sheet to prevent damaging its contents or element.

3.1 Installation of FX₂N-ROM-E1

Memory protect switch

FX₂N main unit

1) Turn off the power of the PLC and remove the cover "a)".
2) Install FX₂N-ROM-E1 "b)" to the port on the main unit.
3) Put back the cover "a)".

3.2 Installation of FX₂NC-ROM-CE1

Memory protect switch

FX₂NC main unit

1) Turn off the power of the PLC and remove the cover "a)".
2) Install FX₂NC-ROM-CE1 "b)" to the port on the main unit.
3) Place cover "c)", included in the memory board product box, onto the PLC.

3.3 Operation

- The program error may flash when used for the first time because the EEPROM (user program memory) is not initialized. In the personal computer or FX-20P (off-line mode), transfer and write a program in that status. In the FX-10P or FX-20P (online mode), execute all NOP write to erase the contents.
- After writing a program, make sure to verify.
- Set the memory protect switch to OFF before writing a program. During normal operation, it is recommended to set it to ON to prevent erroneous write.
- When installed in the FX₂N or FX₂NC Series PLC version 3.00 or later, the EXTR (FNC 180) instruction and the 16k-step EEPROM and clock function can be used.
  If installed in the FX₂N or FX₂NC Series PLC earlier than version 3.00, only the 16k-step EEPROM and clock function can be used.

4. Inverter Communication Function

- When handling the PLC or inverter, follow the notices indicated in each manual which is included with the main unit in order to avoid electric shock, fire, a damage or an accident.

- Make sure to perform class D grounding of the ground terminal of communication equipment for the PLC together with that of the PLC main unit. Ground the shield of a shielded cable at one point on the PLC. Do not, however, ground at the same point as high voltage line. If grounding is imperfect, effects of noise or surge induction takes place, and it may cause a communication error or erroneous operation.

- The signal cables must not be laid near or bundled with the main circuit lines, high voltage power cables or load carrying wires. Otherwise effects of noise or surge induction are likely to take place, and it may cause a communication error or erroneous operation.
  Keep a safe distance of more than 100mm (3.94") from these wires.
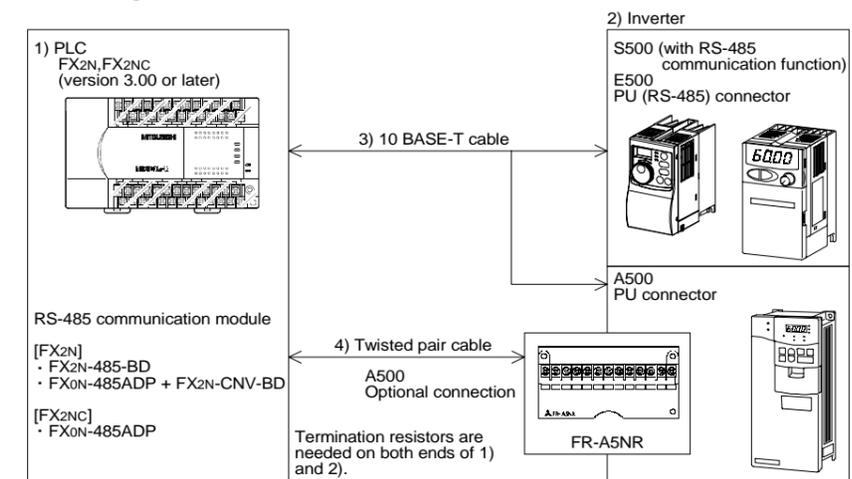
4.1 Outline of Functions and System Configuration

When using K10 to K13 of the EXTR (FNC 180) instruction, operation monitoring, control value write or parameter monitoring and change in the A500/E500/S500 (with RS-485 communication function) Series MITSUBISHI TRANSISTORIZED INVERTER can be performed.
The details of programming and setting can be found in the Programming Manual II, JY992D88101.
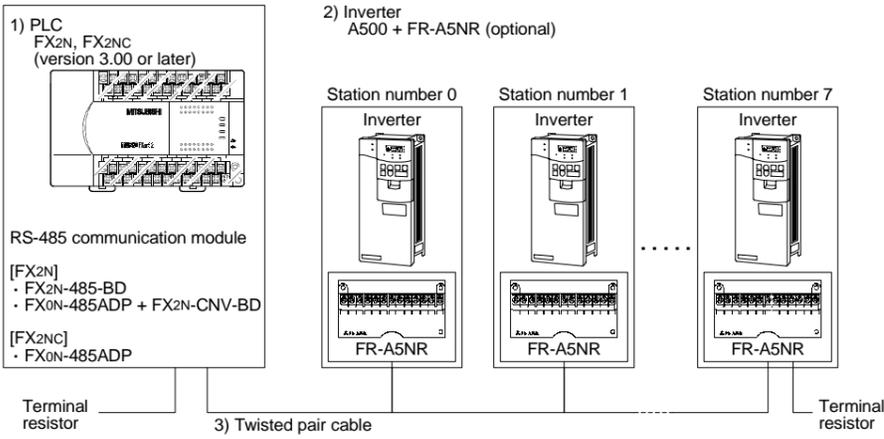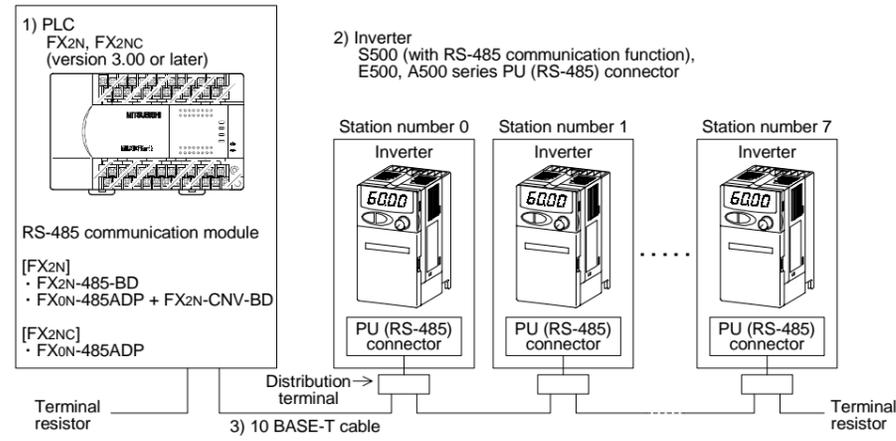
- **Total extension distance**

PLC	Using interface	Extension distance
FX₂N	FX₂N-485-BD	Maximum 50m (164')
	FX₂N-CNV-BD + FX₀N-485ADP	Maximum 500m (1640')
FX₂NC	FX₀N-485ADP	

- **Connecting with one inverter**

- **Connecting with two or more inverters (Maximum 8 inverters)**

1) PLC
FX2N, FX2NC
(version 3.00 or later)

RS-485 communication module

[FX2N]
· FX2N-485-BD
· FX0N-485ADP + FX2N-CNV-BD

[FX2NC]
· FX0N-485ADP

2) Inverter
S500 (with RS-485 communication function),
E500, A500 series PU (RS-485) connector

Station number 0 / Station number 1 / Station number 7

Terminal resistor

Distribution terminal

3) 10 BASE-T cable

Terminal resistor

1) PLC
FX2N, FX2NC
(version 3.00 or later)

RS-485 communication module

[FX2N]
· FX2N-485-BD
· FX0N-485ADP + FX2N-CNV-BD

[FX2NC]
· FX0N-485ADP

2) Inverter
A500 + FR-A5NR (optional)

Station number 0 / Station number 1 / Station number 7

Terminal resistor

3) Twisted pair cable

Terminal resistor

4.2 Wiring

Wiring for PU (RS-485) Connector

- **Pin layout of PU (RS-485) connector**

Pin number	Signal name	Note
1	SG	
2	P5S	Not to be used
3	RDA	
4	SDB	
5	SDA	
6	RDB	
7	SG	
8	P5S	Not to be used

Viewing from front face of inverter (receptacle side)
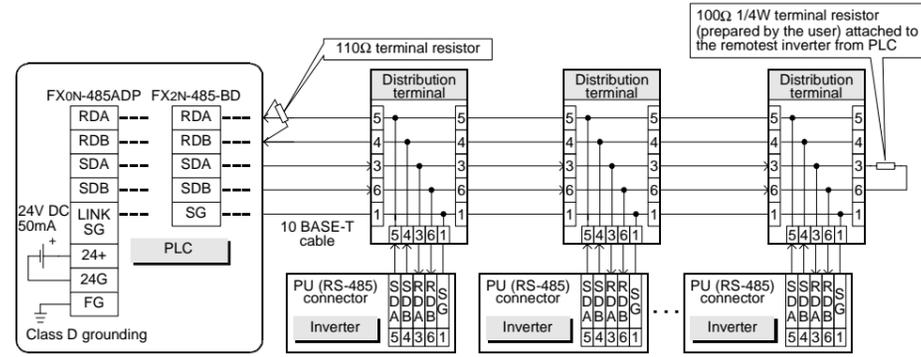
Modular jack

⚠ **Caution:**

The pin number 2 and 8 are for the power supply for an operation panel or parameter unit. DO NOT use when connecting two or more inverters.

- **Connecting with one inverter**

- **Connecting with two or more inverters (Maximum 8 inverters)**
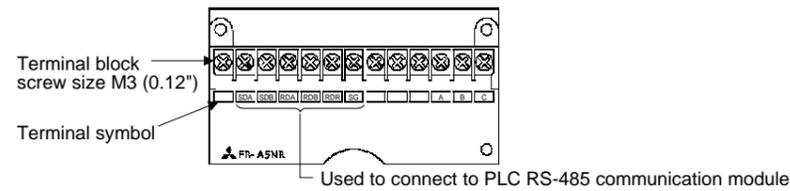

- **Applicable equipment**

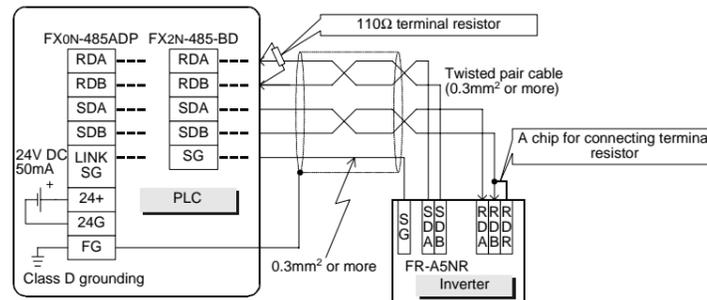 Use the connectors and cables for LAN (10 BASE-T) available on the market.

  - Connector: RJ45 connector
  - Cable: Cable conforming to EIA568 (such as 10 BASE-T cable)
  - Terminal resistor: On the PLC side, 110Ω
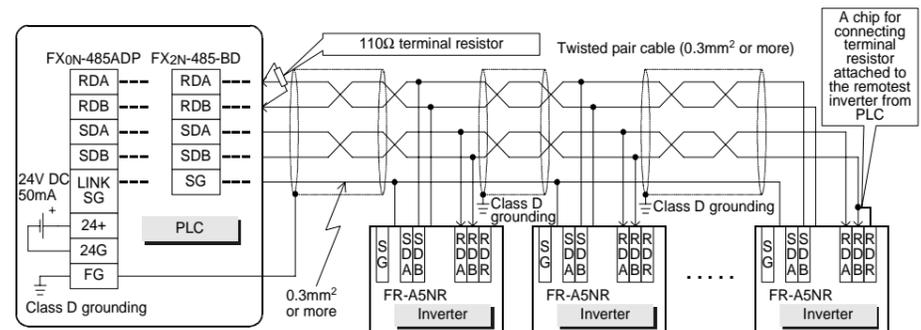   On the inverter side, 100Ω and 1/4W prepared by the user

Wiring for FR-A5NR

- **Terminal layout**

Terminal block screw size M3 (0.12")

Terminal symbol

Used to connect to PLC RS-485 communication module

- **Connecting with one inverter**

- **Connecting with two or more inverters (Maximum 8 inverters)**

- **Applicable equipment**

  - Cable: Use the twisted pair cables (0.3mm^2 or more, 3 pairs)
  - Terminal resistor : On the PLC side, 110Ω
    On the inverter side, a chip for connecting terminal resistor only to the remotest FR-A5NR from the PLC (between RDB and RDR)