

FC9Y-B969



MICROSmart
penetra

FC5A SERIES

Expansion RS232C Communication Module FC5A-SIF2

User's Manual



IDEC CORPORATION

SAFETY PRECAUTIONS

- Read this user's manual to make sure of correct operation before starting installation, wiring, operation, maintenance, and inspection of the FC5A series MicroSmart expansion RS232C communication module.
- All MicroSmart modules are manufactured under IDEC's rigorous quality control system, but users must add a backup or failsafe provision to the control system using the MicroSmart in applications where heavy damage or personal injury may be caused in case the MicroSmart should fail.
- In this user's manual, safety precautions are categorized in order of importance to Warning and Caution:



Warning

Warning notices are used to emphasize that improper operation may cause severe personal injury or death.

- Turn off the power to the MicroSmart before starting installation, removal, wiring, maintenance, and inspection of the MicroSmart. Failure to turn power off may cause electrical shocks or fire hazard.
- Special expertise is required to install, wire, program, and operate the MicroSmart. People without such expertise must not use the MicroSmart.
- Install the MicroSmart according to the instructions described in this user's manual. Improper installation will result in falling, failure, or malfunction of the MicroSmart.



Caution

Caution notices are used where inattention might cause personal injury or damage to equipment.

- The MicroSmart is designed for installation in a cabinet. Do not install the MicroSmart outside a cabinet.
- Install the MicroSmart in environments described in this user's manual. If the MicroSmart is used in places where the MicroSmart is subjected to high-temperature, high-humidity, condensation, corrosive gases, excessive vibrations, and excessive shocks, then electrical shocks, fire hazard, or malfunction will result.
- The environment for using the MicroSmart is "Pollution degree 2." Use the MicroSmart in environments of pollution degree 2 (according to IEC 60664-1).
- Prevent the MicroSmart from falling while moving or transporting the MicroSmart, otherwise damage or malfunction of the MicroSmart will result.
- Prevent metal fragments and pieces of wire from dropping inside the MicroSmart housing. Put a cover on the MicroSmart modules during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage, or malfunction.
- Make sure of safety before starting and stopping the MicroSmart or when operating the MicroSmart to force outputs on or off. Incorrect operation on the MicroSmart may cause machine damage or accidents.
- Do not connect the ground wire directly to the MicroSmart. Connect a protective ground to the cabinet containing the MicroSmart using an M4 or larger screw. This is required when equipment containing the MicroSmart is destined for Europe.
- Do not disassemble, repair, or modify the MicroSmart modules.
- When disposing of the MicroSmart, do so as an industrial waste.

About This Manual

This user's manual primarily describes entire functions, installation, programming, and troubleshooting procedures of the FC5A series MicroSmart expansion RS232C communication module.

CHAPTER 1: GENERAL INFORMATION

General information about the expansion RS232C communication module, applicable CPU module system program version, and WindLDR version.

CHAPTER 2: MODULE SPECIFICATIONS

Specifications of the expansion RS232C communication module.

CHAPTER 3: INSTALLATION AND WIRING

Methods and precautions for installing and wiring the expansion RS232C communication module.

CHAPTER 4: EXPANSION RS232C COMMUNICATION

General information about programming and setting up various communication systems for the expansion RS232C communication module.

CHAPTER 5: TROUBLESHOOTING

Procedures to determine the cause of trouble and actions to be taken when any trouble occurs while operating the expansion RS232C communication module.

INDEX

Alphabetical listing of key words.

MicroSmart Modules

Category		Modules
CPU modules	All-in-one type	FC5A-C10R2, FC5A-C16R2, FC5A-C24R2 FC5A-C10R2C, FC5A-C16R2C, FC5A-C24R2C
	Slim type	FC5A-D16RK1, FC5A-D16RS1 FC5A-D32K3, FC5A-D32S3
Expansion modules	Expansion I/O modules	Input modules, output modules, mixed I/O modules
	Function modules	Analog I/O modules, AS-Interface master module
	Expansion RS232C communication module	FC5A-SIF2
Option modules		HMI module, RS232C communication adapter, RS485 communication adapter, memory cartridge, clock cartridge
Communication modules		HMI base module, RS232C communication module, RS485 communication module
Expansion interface modules		Expansion interface module, expansion interface master module, expansion interface slave module

IMPORTANT INFORMATION

Under no circumstances shall IDEC Corporation be held liable or responsible for indirect or consequential damages resulting from the use of or the application of IDEC PLC components, individually or in combination with other equipment.

All persons using these components must be willing to accept responsibility for choosing the correct component to suit their application and for choosing an application appropriate for the component, individually or in combination with other equipment.

All diagrams and examples in this manual are for illustrative purposes only. In no way does including these diagrams and examples in this manual constitute a guarantee as to their suitability for any specific application. To test and approve all programs, prior to installation, is the responsibility of the end user.

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1: GENERAL INFORMATION

Introduction

This chapter describes general information and specifications of the FC5A series MicroSmart expansion RS232C communication module.

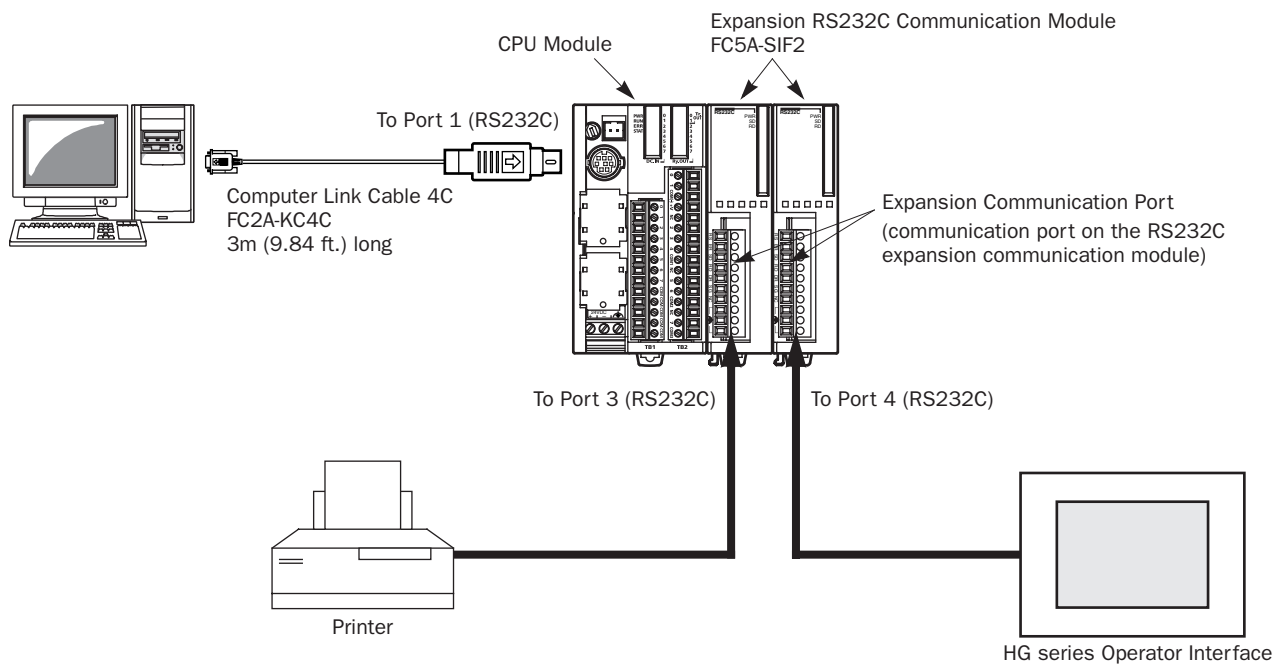
About the Expansion Communication Module

The FC5A-SIF2 expansion RS232C communication module is an expansion module used for the FC5A series micro programmable controller.

The expansion RS232C communication module is mounted on the right of all-in-one 24-I/O type or slim type CPU modules. All-in-one 24-I/O type CPU modules can be used with a maximum of three expansion RS232C communication modules to expand up to five communication ports. Slim type CPU modules can be used with a maximum of five expansion RS232C communication modules to expand up to seven communication ports.

For example, the expansion RS232C communication module can be used in the following system. When the CPU module is connected to a PC and also mounted with expansion RS232C communication modules, the PC can be used to monitor the CPU operation while the CPU module communicates with multiple RS232C devices, such as printers, operator interfaces, and measuring instruments.

System Setup Example



Features

The expansion RS232C communication module has two communication functions. For details about these communication functions, see the FC5A MicroSmart user's manual (FC9Y-B927).

Maintenance Communication (Computer Link)	With a computer is connected to the MicroSmart CPU module, operating status and I/O status can be monitored on the computer, and data in the CPU can be monitored or updated from the computer. User programs cannot be uploaded and downloaded.
User Communication	CPU modules can be linked to remote RS232C devices such as computers, printers, and barcode readers through expansion RS232C communication modules, using the user communication function.

1: GENERAL INFORMATION

Applicable CPU Modules and WindLDR Version

The expansion RS232C communication module can be used with the FC5A MicroSmart CPU modules and WindLDR as listed below.

CPU Modules	All-in-one Type:	FC5A-C24R2, FC5A-C24R2C
	Slim Type:	FC5A-D16RK1, FC5A-D16RS1, FC5A-D32K3, FC5A-D32S3
	System Program Version:	110 or later
WindLDR	Version 5.1 or higher	

Note 1: All-in-one 10- and 16-I/O type CPU modules cannot use the expansion RS232C communication module.

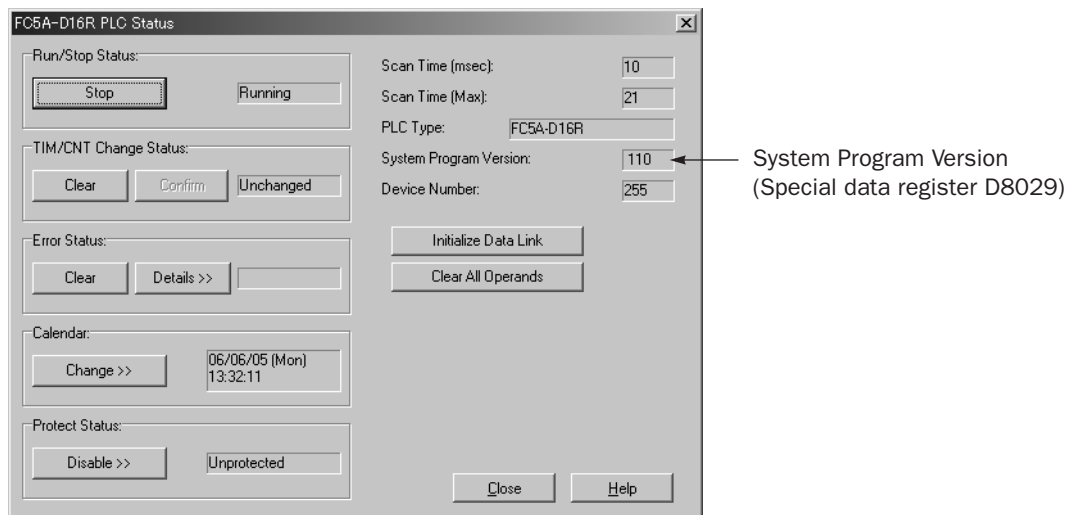
Note 2: The all-in-one 24-I/O type CPU module cannot use the expansion RS232C communication module in combination with function modules listed below. When using the expansion RS232C communication module and these function modules, use the slim type CPU module.

Function Module	Type No.
Analog I/O Module	FC4A-L03A1, FC4A-L03AP1, FC4A-J2A1, FC4A-J4CN1, FC4A-J8C1, FC4A-J8AT1, FC4A-K1A1, FC4A-K2C1
AS-Interface Master Module	FC4A-AS62M

Confirming System Program Version

CPU module system program version 110 or higher is required to use the expansion RS232C communication module. The system program version can be confirmed using WindLDR.

1. Connect a PC to communication port 1 or 2 on the MicroSmart CPU module using the computer link cable 4C (FC2A-KC4C).
2. From the WindLDR menu bar, select **Online** > **Monitor**. The monitor mode is enabled.
3. From the WindLDR menu bar, select **Online** > **PLC Status**. The PLC Status dialog box appears and shows the system program version.



Updating System Program Version

When the CPU module system program version is lower than 110, you can download the latest system program using WindLDR ver. 5.1 or higher.

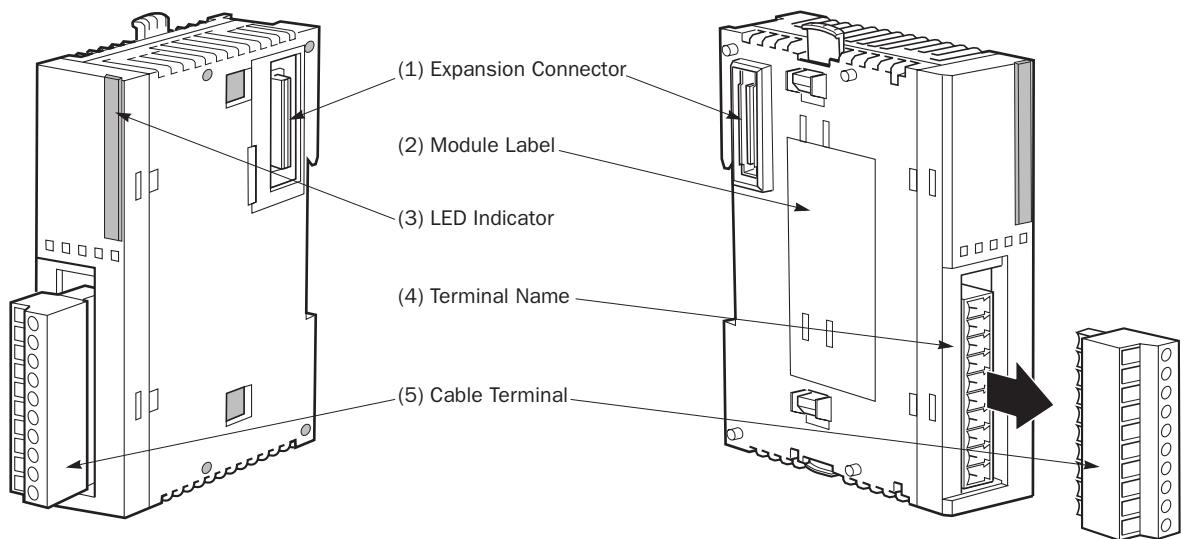
1. From the WindLDR menu bar, select **Tool** > **System Update**. The System Update screen appears.
2. Follow the instructions as shown on the screen.

2: MODULE SPECIFICATIONS

Introduction

This chapter describes parts names, functions, specifications, and dimensions of the expansion RS232C communication module.

Parts Description



- (1) Expansion Connector** Connects to the CPU and other I/O modules.
(All-in-one 10- and 16-I/O type CPU modules cannot be connected.)
- (2) Module Label** Indicates the expansion RS232C communication module Type No. and specifications.
- (3) LED Indicators**

PWR	<input type="checkbox"/>
SD	<input type="checkbox"/>
RD	<input type="checkbox"/>

 - PWR: Turns on when this module is powered up.
 - SD: Turns on when this module is sending data.
 - RD: Turns on when this module is receiving data.
- (4) Terminal Name** Indicates terminal names.
- (5) Cable Terminal** Screw terminals for wiring.

2: MODULE SPECIFICATIONS

Expansion RS232C Communication Module Specifications

General Specifications

Type No.	FC5A-SIF2	
Quantity of Channels	1	
Synchronization	Start-stop synchronization	
Electrical Characteristics	EIA RS232C compliant	
Terminal Arrangement	See page 3-6.	
Operating Temperature	0 to 55°C	
Relative Humidity	10 to 95% (no condensation)	
Recommended Cable Specifications	Shielded multi-core cable:	24AWG x 6
	Dielectric strength:	2000 V/min
	Insulation resistance:	100 MΩ/km
Maximum Cable Length	3m	
Connector on Mother Board	MC1.5/10-G-3.81BK (Phoenix Contact) Applicable terminal block: FC4A-PMT10P	
Connector Insertion/Removal Durability	100 times minimum	
Isolation from Internal Circuit	Transformer isolated	
Effect of Improper Input Connection	Incorrect Wiring	Malfunction may be caused.
	Improper Voltage	If any input exceeding the rated value is applied, permanent damage may be caused.
Dielectric Strength	Between communication terminals and internal circuit: 500V AC, 1 minute	
Quantity of Applicable Expansion RS232C Communication Modules	All-in-one type CPU module:	3 maximum
	Slim type CPU module:	5 maximum
Internal Current Draw	85 mA (5V DC) 0 mA (24V DC)	
Weight	100g	

Communication Specifications

Communication Parameters	Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400
	Data Bits	7 or 8
	Parity	Odd, even, none
	Stop Bits	1 or 2
Protocol	Maintenance Communication	Possible (User program download and upload are impossible.)
	User Communication	Possible
	Data Link	—
	Modbus Communication	—
	Modem Communication	—

Data Communication Processing Time

The CPU module processes data communication with expansion RS232C communication modules in every scan. One expansion RS232C communication module requires a communication processing time shown in the table below. Therefore, when an expansion RS232C communication module sends or receives communication, the scan time extends accordingly.

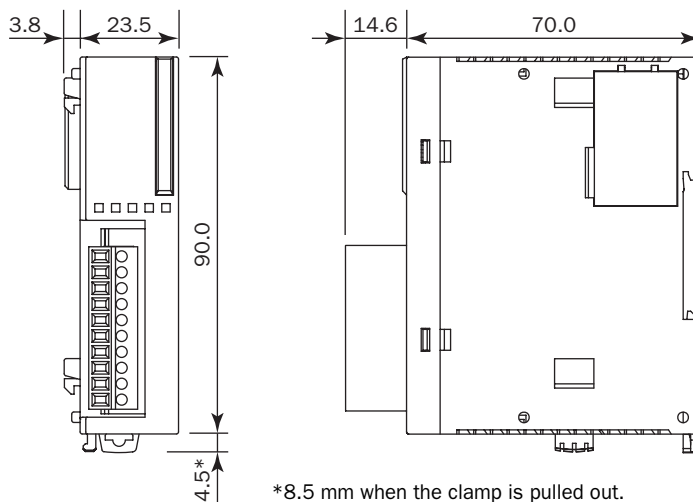
CPU Module	Maximum Delay in One Scan
All-in-one Type CPU Module	Approx. 4 ms
Slim Type CPU Module	Approx. 4 ms

Note: The above values are the maximum delay of scan time when one expansion RS232C communication module performs communication. When multiple expansion RS232C communication modules perform communication at the same time, the delay is multiplied by the quantity of the expansion RS232C communication modules.

2: MODULE SPECIFICATIONS

Dimensions

All MicroSmart modules have the same profile for consistent mounting on a DIN rail.



*8.5 mm when the clamp is pulled out.

All dimensions in mm.

3: INSTALLATION AND WIRING

Introduction

This chapter describes precautions for installing the expansion RS232C communication module in connection with the internal current draw by other expansion modules.

For general methods and precautions for installation and wiring of the expansion RS232C communication module, see the FC5A MicroSmart user's manual (FC9Y-B927).



Warning

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.
- Explosion hazard — Substitution of components may impair suitability for Class I, Division 2.
- Explosion hazard — Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



Caution

- Make sure that the total internal current draw by all connected expansion modules does not exceed the allowable current draw of the CPU module. Otherwise the CPU and other modules do not operate correctly. The CPU module does not detect the excessive current draw.
- The expansion RS232C communication module cannot be mounted on the right of expansion interface modules (FC5A-EXM2, FC5A-EXM1M, and FC5A-EXM1S). Expansion interface modules can be mounted on the right of the expansion RS232C communication module.

Maximum Quantity of Applicable Expansion Modules

The all-in-one 24-I/O type CPU module can mount a maximum of three expansion RS232C communication modules. The slim type CPU module can mount a maximum of five expansion RS232C communication modules.

Including expansion RS232C communication modules and other expansion modules, the all-in-one type CPU module can mount a maximum of four expansion modules, and the slim type CPU module can mount a maximum of seven expansion modules, unless the total internal current draw by all connected expansion modules exceeds the allowable current draw of the CPU module. Make sure that the total internal current draw does not exceed the current capacity of the CPU module.

Allowable Total Internal Current Draw

CPU Module	Quantity of Expansion RS232C Communication Modules	Quantity of Expansion Modules	Total Internal Current Draw (5V DC)
All-in-one 24-I/O Type CPU Module	3 maximum (Note)	4 maximum	260 mA maximum
Slim Type CPU Module	5 maximum	7 maximum	455 mA maximum

Note: The all-in-one 24-I/O type CPU module cannot use the expansion RS232C communication module in combination with function modules listed below. When using the expansion RS232C communication module and these function modules, use the slim type CPU module.

Function Module	Type No.
Analog I/O Module	FC4A-L03A1, FC4A-L03AP1, FC4A-J2A1, FC4A-J4CN1, FC4A-J8C1, FC4A-J8AT1, FC4A-K1A1, FC4A-K2C1
AS-Interface Master Module	FC4A-AS62M

Internal Current Draw by Expansion Modules

Module	Type No.	Internal Current Draw (5V DC)	Module	Type No.	Internal Current Draw (5V DC)
Input Module	FC4A-N08B1	25 mA maximum	Mixed I/O Module	FC4A-M08BR1	25 mA maximum
	FC4A-N16B1	40 mA maximum		FC4A-M24BR2	65 mA maximum
	FC4A-N16B3	35 mA maximum	Analog I/O Module	FC4A-L03A1	50 mA maximum
	FC4A-N32B3	65 mA maximum		FC4A-L03AP1	50 mA maximum
	FC4A-N08A11	60 mA maximum		FC4A-J2A1	50 mA maximum
Relay Output Module	FC4A-R081	30 mA maximum	Analog Input Module	FC4A-J4CN1	50 mA maximum
	FC4A-R161	45 mA maximum		FC4A-J8C1	40 mA maximum
Transistor Output Module	FC4A-T08K1	10 mA maximum		FC4A-J8AT1	45 mA maximum
	FC4A-T08S1	10 mA maximum		Analog Output Module	FC4A-K1A1
	FC4A-T16K3	10 mA maximum	FC4A-K2C1		60 mA maximum
	FC4A-T16S3	10 mA maximum			
	FC4A-T32K3	20 mA maximum			
	FC4A-T32S3	20 mA maximum			
AS-Interface Master Module (Note)				FC4A-AS62M	80 mA maximum
Expansion RS232C Communication Module				FC5A-SIF2	85 mA maximum

Note: A maximum of two AS-Interface master modules can be mounted even if the total current draw is within the limits. Only one expansion interface module or expansion interface master module can be mounted to a CPU module, and is not included in the calculation of the total current draw by expansion modules.

Example: Installing five expansion RS232C communication modules to the slim type CPU module

Module	Type No.	Quantity	Internal Current Draw (5V DC)	Total Internal Current Draw
Expansion RS232C Communication Module	FC5A-SIF2	5	85 mA	425 mA
Maximum Applicable Expansion Modules (Slim CPU)		7	—	455 mA
Balance		2	—	30 mA

In the above example, two more expansion modules can be added, with a maximum total current draw of 30 mA. The following table shows an example of installing the maximum quantity of expansion modules.

Module	Type No.	Quantity	Internal Current Draw (5V DC)	Total Internal Current Draw
Expansion RS232C Communication Module	FC5A-SIF2	5	85 mA	425 mA
Transistor Output Module	FC4A-T08S1	1	10 mA	10 mA
	FC4A-T32K3	1	20 mA	20 mA
Total		7	—	455 mA

Example: Installing an expansion interface module and RS232C communication modules

When using an expansion interface module, the current draw by the expansion interface module is not included in the total of internal current draw the current capacity of the CPU module as shown in the example below.

Area	Module	Type No.	Quantity	Internal Current Draw (5V DC)	Total Internal Current Draw
Expansion	Expansion RS232C Communication Module	FC5A-SIF2	5	85 mA	425 mA
	Total		5	—	425 mA
Expansion Interface Module		FC5A-EXM2 or FC5A-EXM1M + FC5A-EXM1S			
Additional	Input Module	FC4A-N32B3	4	65 mA	260 mA
	Transistor Output Module	FC4A-T32K3	4	20 mA	80 mA
	Total		8	—	340 mA

In the additional area on the right of the expansion interface module (FC5A-EXM2, FC5A-EXM1M, and FC5A-EXM1S), a maximum of eight digital I/O modules can be mounted regardless of the internal current draw of the digital I/O modules.

Expansion RS232C communication modules cannot be mounted on the right of expansion interface module.

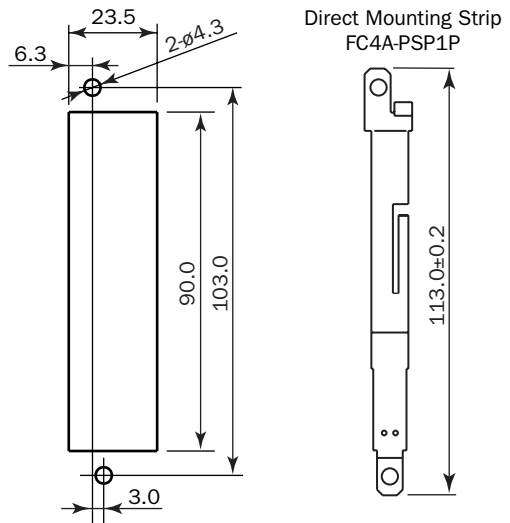
For details about the expansion interface modules, see the FC5A MicroSmart user's manual (FC9Y-B927).

3: INSTALLATION AND WIRING

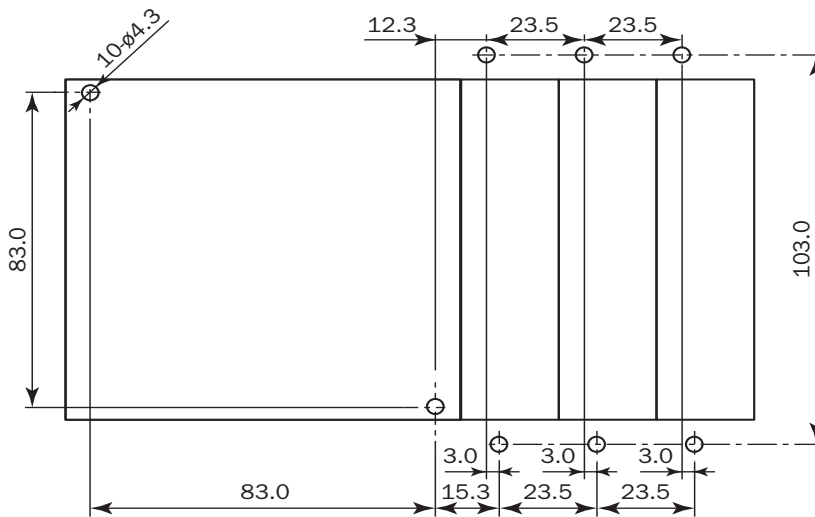
Mounting Hole Layout for Direct Mounting on Panel Surface Using Direct Mounting Strip

To mount the expansion RS232C communication module on a panel surface, use the direct mounting strip and two M4 screws (6 or 8 mm long).

For details about the direct mounting strip, see the FC5A MicroSmart user's manual (FC9Y-B927).



Example: Mounting hole layout for FC5A-C24R2 and three expansion RS232C communication modules



All dimensions in mm.

Terminal Connection



Caution

- Do not touch live terminals, otherwise electrical shocks may be caused.
- Do not touch terminals immediately after power has been turned off, otherwise electrical shocks may be caused.
- When using ferrules, insert a wire to the bottom of the ferrule and crimp the ferrule.
- When connecting a wire to the screw terminal block, use a ferrule. Otherwise the wire may slip off the screw terminal block.

Ferrules, Crimping Tool, and Screwdriver for Phoenix Terminal Blocks

The screw terminal block is wired using ferrules on the end of cable. Applicable ferrule for the Phoenix terminal block and crimping tool for the ferrule are listed below. The screwdriver is used for tightening the screw terminals on the expansion RS232C communication module. These ferrule, crimping tool, and screwdriver are made by Phoenix Contact and are available from Phoenix Contact.

Type numbers of the ferrule, crimping tool, and screwdriver listed below are the type numbers of Phoenix Contact. When ordering these products from Phoenix Contact, specify the Order No. and quantity listed below.

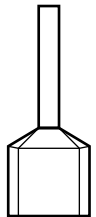
Ferrule Order No.

Quantity of Cables	Cable Size	Phoenix Type	Order No.	Pcs./Pkt.
For 1-cable connection	UL2464 AWG24	AI 0,25-8 YE	32 03 03 7	100

Crimping Tool and Screwdriver Order No.

Tool Name	Phoenix Type	Order No.	Pcs./Pkt.
Crimping Tool	CRIMPFOX ZA 3	12 01 88 2	1
Screwdriver	SZS 0,4 x 2,5	12 05 03 7	10

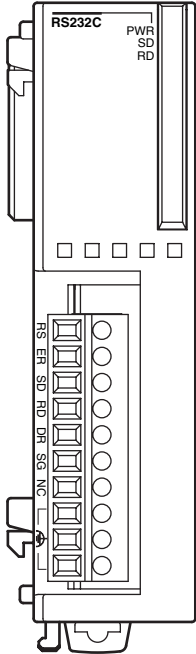
Screw Terminal Tightening Torque	0.22 to 0.25 N·m
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Terminal Arrangement and Wiring Diagram

Screw Terminal Type

Applicable Terminal Block: FC4A-PMT10P (supplied with the input module)



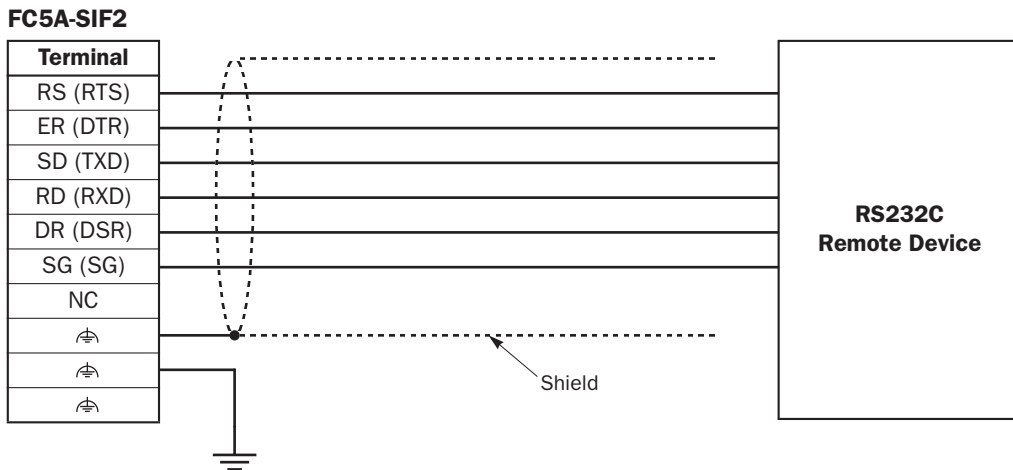
Terminal	I/O	Description
RS (RTS)	Output	Request to Send (constant voltage terminal)
ER (DTR)	Output	Data Terminal Ready
SD (TXD)	Output	Transmit Data
RD (RXD)	Input	Receive Data
DR (DSR)	Input	Data Set Ready
SG (SG)	—	Signal Ground
NC	—	—
⏏	—	Functional ground
⏏	—	Functional ground
⏏	—	Functional ground

Note: The ⏏ terminals can be used as junction terminals of functional ground.

Wiring Example

Caution

- Use a recommended cable or a similar shielded cable for wiring the expansion RS232C communication terminals. For the recommended cable, see page 2-2 and prepare the cable.
- When the expansion RS232C communication module may malfunction due to external noise, connect the shield of the cable to a proper ground.
- Before wiring, read the user’s manual for the remote device connected to the expansion RS232C communication module.



4: EXPANSION RS232C COMMUNICATION

Introduction

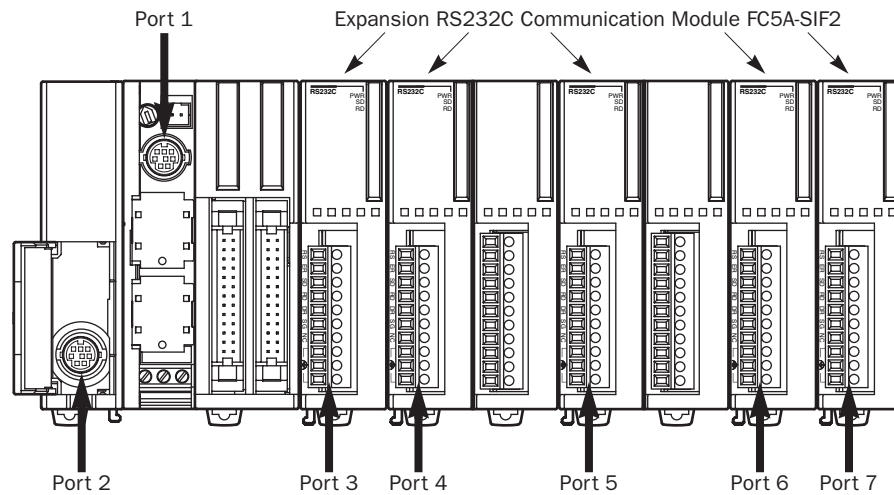
This chapter describes communication examples using the expansion RS232C communication module.

Allocating Communication Port Number

When expansion RS232C communication modules are mounted, port number starts with port 3 and ends with port 7 when a maximum of five expansion RS232C communication modules are mounted.

Example:

When five expansion RS232C communication modules and two I/O modules are mounted, the communication port numbers allocated as shown below.

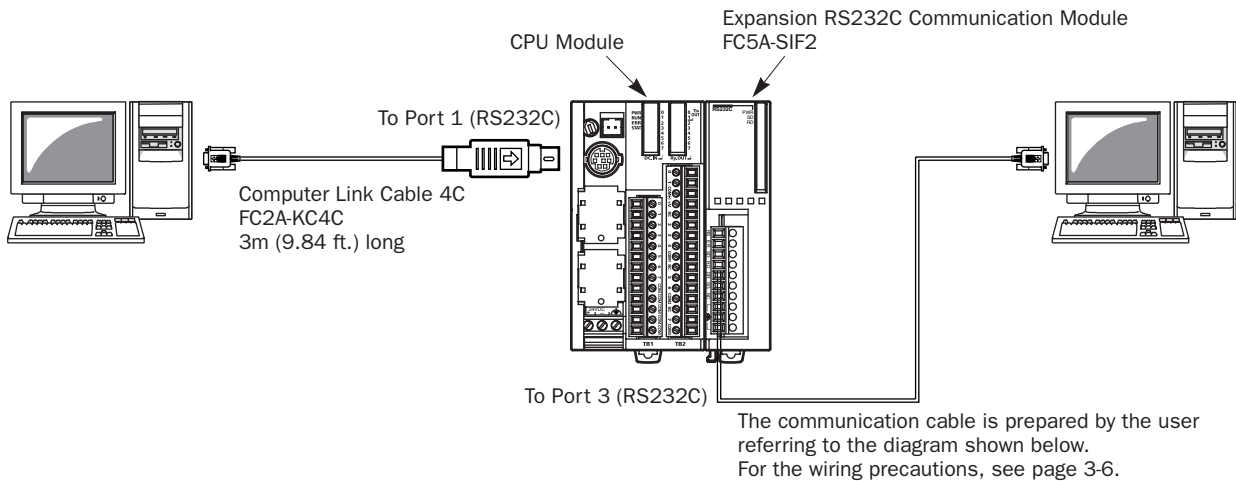


4: EXPANSION RS232C COMMUNICATION

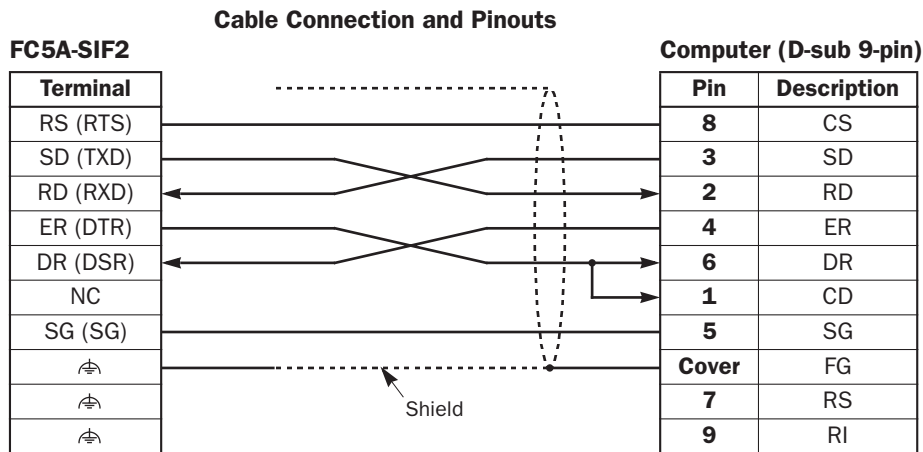
Computer Link Communication

The computer link communication can be used with WindLDR on a PC connected to the CPU module to perform maintenance operations, such as download/upload user programs, start/stop the PLC, monitor the PLC status, and read/write operand values. When the expansion RS232C communication module is mounted to the CPU module in a computer link system, the computer link communication functions can be performed, except for download/upload user programs. For details about the computer link communication, see the FC5A MicroSmart user's manual (FC9Y-B927).

System Setup Example



Note: User programs cannot be downloaded and uploaded through the expansion RS232C communication module.



Expansion RS232C Communication Module Communication Parameter Range

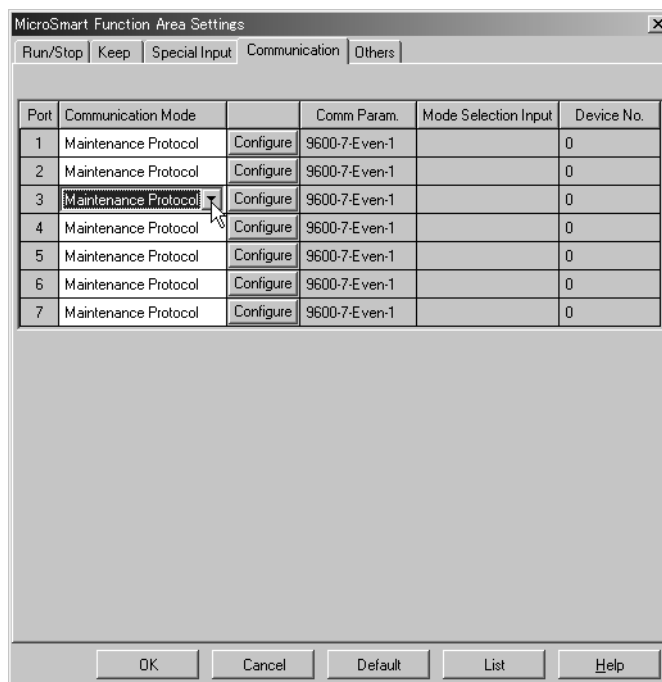
Parameter	Optional Range	Default
Communication Mode	Maintenance communication	
Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400	9600
Data Bits	7 or 8	7
Parity	Even, Odd, None	Even
Stop Bits	1 or 2	1
Receive Timeout (ms)	10 to 2550 (10-ms increments) (Receive timeout is disabled when 0 is selected.)	500
Device Number	0 to 31	0
Mode Selection Input	Any input number	Disabled

Computer Link Communication through the Expansion RS232C Communication Module

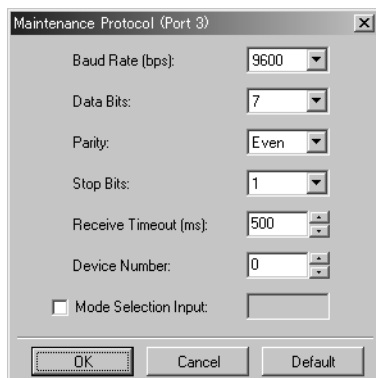
To perform the computer link communication using the expansion RS232C communication module, a user program has to be downloaded through port 1 or 2 in the 1:1 computer link system as shown on page 4-2, because user programs cannot be downloaded or uploaded through the expansion RS232C communication module. After downloading the user program to the CPU module, the operating statuses of the CPU module can be monitored using WindLDR on the PC connected to the expansion RS232C communication module.

The operating procedures for computer link communication are as follows:

1. Connect the PC to communication port 1 or 2 (RS232C) on the CPU module using the computer link cable 4C (FC2A-KC4C).
2. From the WindLDR menu bar, select **Configure > Function Area Settings**. The Function Area Setting dialog box appears.
3. Click the **Communication** tab, and select **Maintenance Protocol** in the Port 3 through Port 7 pull-down list.



4. The Communication Parameters dialog box appears. Change settings, if required.



Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400
Data Bits	7 or 8
Parity	Even, Odd, None
Stop Bits	1 or 2
Receive Timeout (ms)	10 to 2550 (10-ms increments) (Receive timeout is disabled when 0 is selected.)
Device Number	0 to 31
Mode Selection Input	Any input number

Note: When a mode selection input has been designated and the mode selection input is turned on, the selected communication parameters are enabled. When communication parameters are changed without designating a mode selection input, the changed communication parameters take effect immediately when the user program is downloaded.

5. Click the **OK** button to save changes.

4: EXPANSION RS232C COMMUNICATION

The Communication Parameters dialog box closes and the Communication page becomes active.

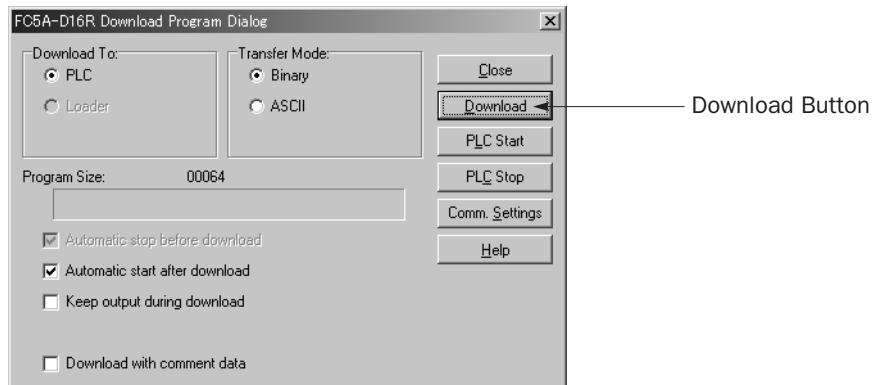
6. Click the **OK** button to save changes to the Function Area Settings.

The Function Area Settings dialog box closes and the ladder editing screen becomes active.

Next, download the user program through port 1 or 2 to the CPU module.

7. From the WindLDR menu bar, select **Online > Download Program**.

The Download Program Dialog appears,



8. Click the **Download** button.

The user program is downloaded to the CPU module.

Note: When downloading a user program, all values and selections in the Function Area Settings are also downloaded to the CPU module.

9. Connect the PC to communication port 3 through port 7 on the expansion RS232C communication module.

For terminal arrangement and wiring diagram, see page 3-6.

10. Start WindLDR on the PC connected to the expansion RS232C communication module.

11. From the WindLDR menu bar, select **Online > Monitor**.

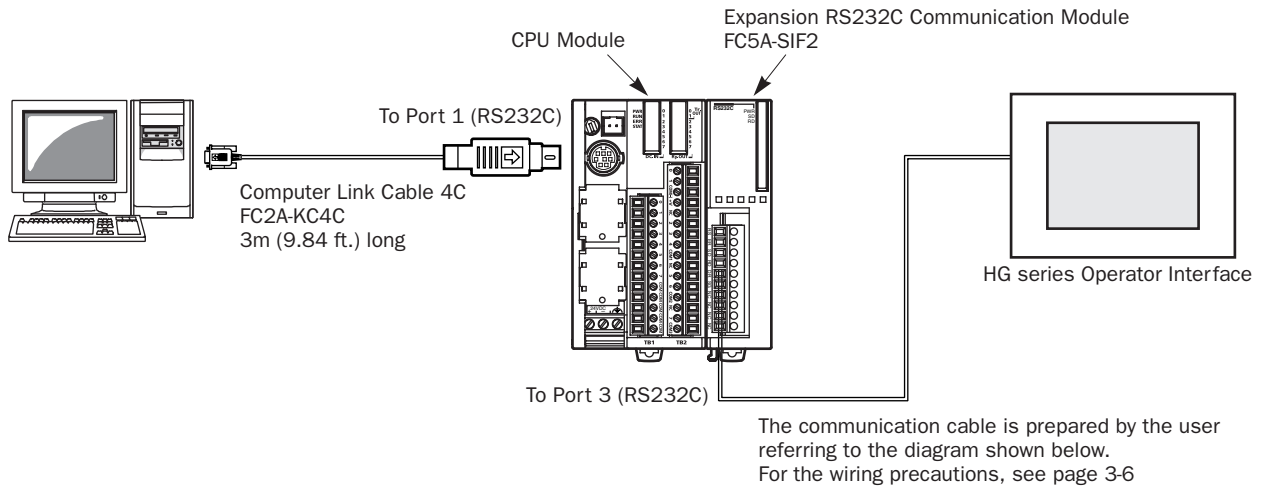
The monitor screen appears, and you can monitor the MicroSmart operating statuses and change operand values.

Operator Interface Communication

Using the expansion RS232C communication module, the MicroSmart can communicate with IDEC’s HG series operator interfaces. To connect the HG series operator interface to the expansion RS232C communication module, use a communication cable prepared by the user.

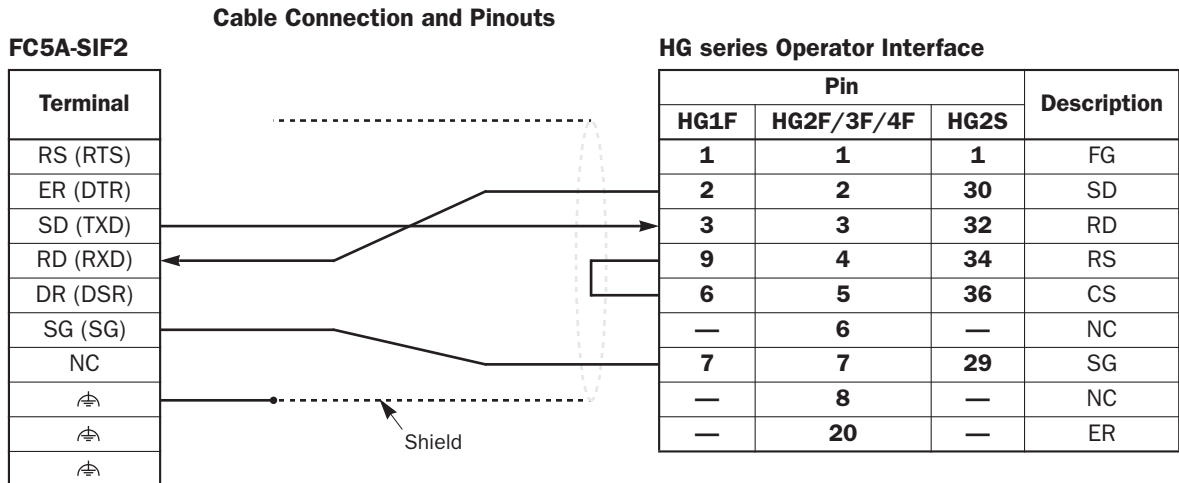
For details about the communication settings and specifications, see the HG series operator interface user’s manual.

System Setup Example



Note: User programs cannot be downloaded and uploaded through the expansion RS232C communication module.

Applicable Operator Interfaces	HG1F, HG2F, HG3F, HG4F, HG2S (HG series operator interfaces applicable to port 1 and port 2 can be used.)
---------------------------------------	--



Applicable Cable Connectors for HG series Operator Interface

Operator Interface	Connector on Cable
HG1F	D-sub 9-pin male connector
HG2F, HG3F, HG4F	D-sub 25-pin male connector
HG2S	D-sub 37-pin female connector

4: EXPANSION RS232C COMMUNICATION

Expansion RS232C Communication Module Communication Parameter Range

Parameter	Optional Range	Default
Communication Mode	Maintenance communication	
Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400	9600
Data Bits	7 or 8	7
Parity	Even, Odd, None	Even
Stop Bits	1 or 2	1
Receive Timeout (ms)	10 to 2550 (10-ms increments) (Receive timeout is disabled when 0 is selected.)	500
Device Number	0 to 31	0
Mode Selection Input	Any input number	Disabled

Operator Interface Communication through the Expansion RS232C Communication Module

To perform the operator interface communication using the expansion RS232C communication module, a user program has to be downloaded through port 1 or 2 in the 1:1 computer link system as shown on page 4-5, because user programs cannot be downloaded or uploaded through the expansion RS232C communication module. After downloading the user program to the CPU module, the CPU module can communicate with the operator interface through the expansion RS232C communication module.

The operating procedures for operator interface communication are as follows:

1. Change the Function Area Settings, if required, and download the user program through communication port 1 or 2 (RS232C) on the CPU module. See step 1 through step 8 shown on pages 4-3 and 4-4.
2. Connect the operator interface to communication port 3 through port 7 on the expansion RS232C communication module.

For terminal arrangement and wiring diagram, see page 3-6.

Now the CPU module can communicate with the operator interface using communication port 3 through port 7.

User Communication

The user communication function can be used for the MicroSmart to communicate with a PC, printer, and barcode reader through the expansion RS232C communication module. For details about the user communication function, see the FC5A MicroSmart user's manual (FC9Y-B927).

Expansion RS232C Communication Module Communication Parameter Range

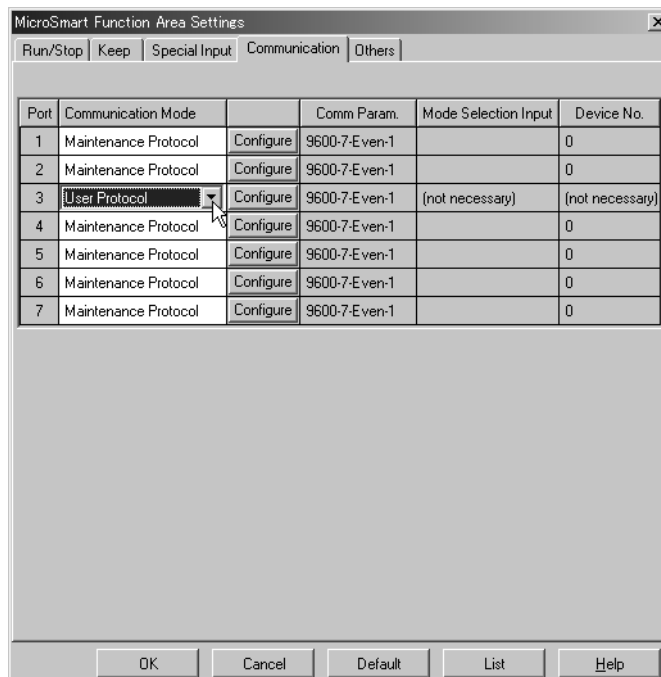
Parameter	Optional Range	Default
Communication Mode	User communication	
Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400	9600
Data Bits	7 or 8	7
Parity	Even, Odd, None	Even
Stop Bits	1 or 2	1
Receive Timeout (ms)	10 to 2540 (10-ms increments) (Receive timeout is disabled when 0 or 2550 is selected.)	500

User Communication through the Expansion RS232C Communication Module

This section describes an example of user communication through the expansion RS232C communication module to send data to a printer. After downloading the user program to the CPU module, the CPU module can communicate with the printer through the expansion RS232C communication module.

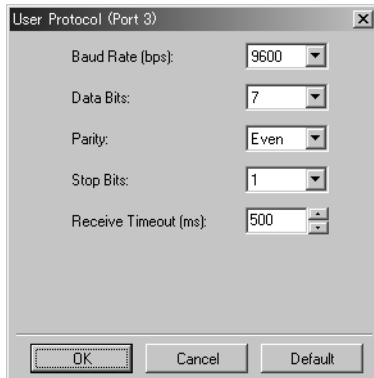
The operating procedures for user communication are as follows:

1. Change the Function Area Settings, if required, and download the user program through communication port 1 or 2 (RS232C) on the CPU module. See step 1 through step 8 shown on pages 4-3 and 4-4.
2. Connect the printer to communication port 3 through port 7 on the expansion RS232C communication module. For terminal arrangement and wiring diagram, see page 3-6.
3. From the WindLDR menu bar, select **Configure > Function Area Settings**. The Function Area Setting dialog box appears.
4. Click the **Communication** tab, and select **User Protocol** in the Port 3 through Port 7 pull-down list.



4: EXPANSION RS232C COMMUNICATION

5. The Communication Parameters dialog box appears. Change settings to meet the communication parameters of the remote device. See the user's manual for the remote device.



Baud Rate (bps)	1200, 2400, 4800, 9600, 19200, 38400
Data Bits	7 or 8
Parity	Even, Odd, None
Stop Bits	1 or 2
Receive Timeout (ms)	10 to 2540 (10-ms increments) (Receive timeout is disabled when 0 or 2550 is selected.)

6. Click the **OK** button to save changes.

The Communication Parameters dialog box closes and the Communication page becomes active.

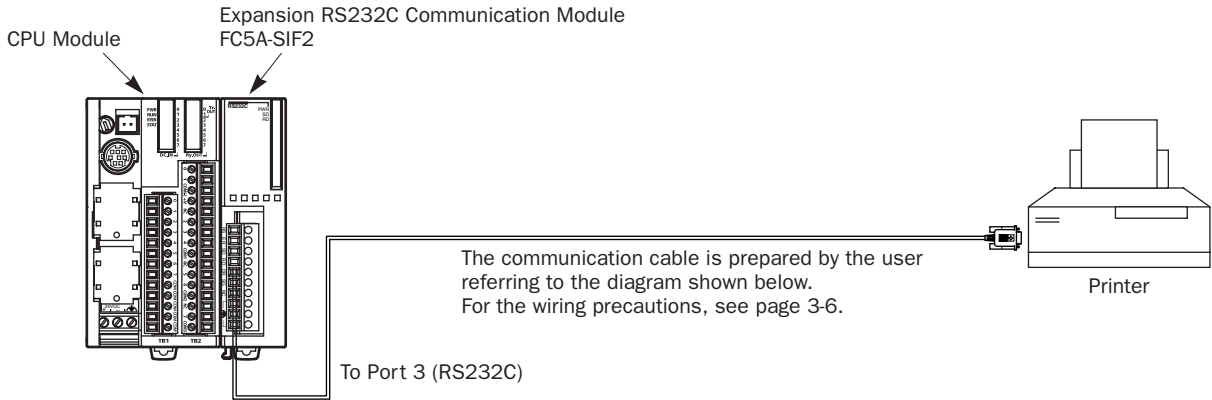
7. Click the **OK** button to save changes to the Function Area Settings.

The Function Area Settings dialog box closes and the ladder editing screen becomes active.

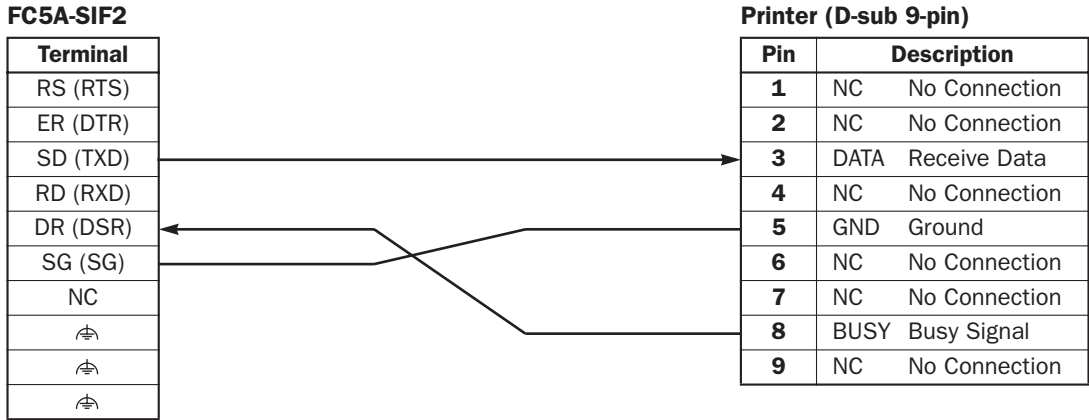
8. Download the user program through communication port 1 or 2 (RS232C) on the CPU module.

For the ladder program to control the printer, see page 4-10.

System Setup for Connecting a Printer



Cable Connection and Pinouts



The name of BUSY terminal differs depending on printers, such as DTR. The function of this terminal is to send a signal to local equipment whether the printer is ready to print data or not. Since the operation of this signal may differ depending on printers, confirm the operation before connecting the cable.

Caution • Do not connect any wiring to the NC (no connection) pins; otherwise, the MicroSmart and the printer may not work correctly and may be damaged.

Description of Operation

The data of counter C2 and data register D30 are printed every minute. A printout example is shown on the right.

Programming Special Data Register

Special data register D8105 is used to monitor the BUSY signal and to control the transmission of print data.

Special DR	Value	Description
D8105	24 (011)	While DSR is on (not busy), the CPU sends data. While DSR is off (busy), the CPU stops data transmission. If the off duration exceeds a limit (5 sec), a transmission busy timeout error will occur, and the remaining data is not sent. The transmit status data register stores an error code. For error codes, see the FC5A MicroSmart user's manual (FC9Y-B927).

Printout Example

```

--- PRINT TEST ---

11H 00M

CNT2...0050
D030...3854

--- PRINT TEST ---

11H 01M

CNT2...0110
D030...2124
    
```

The MicroSmart monitors the DSR signal to prevent the receive buffer of the printer from overflowing. The special data register number and value shown above are for port 3. For the DSR signal on other ports, see page 4-13.

4: EXPANSION RS232C COMMUNICATION

Setting Communication Parameters

Set the communication parameters to match those of the printer. See page 4-8. For details of the communication parameters of the printer, see the user's manual for the printer. An example is shown below:

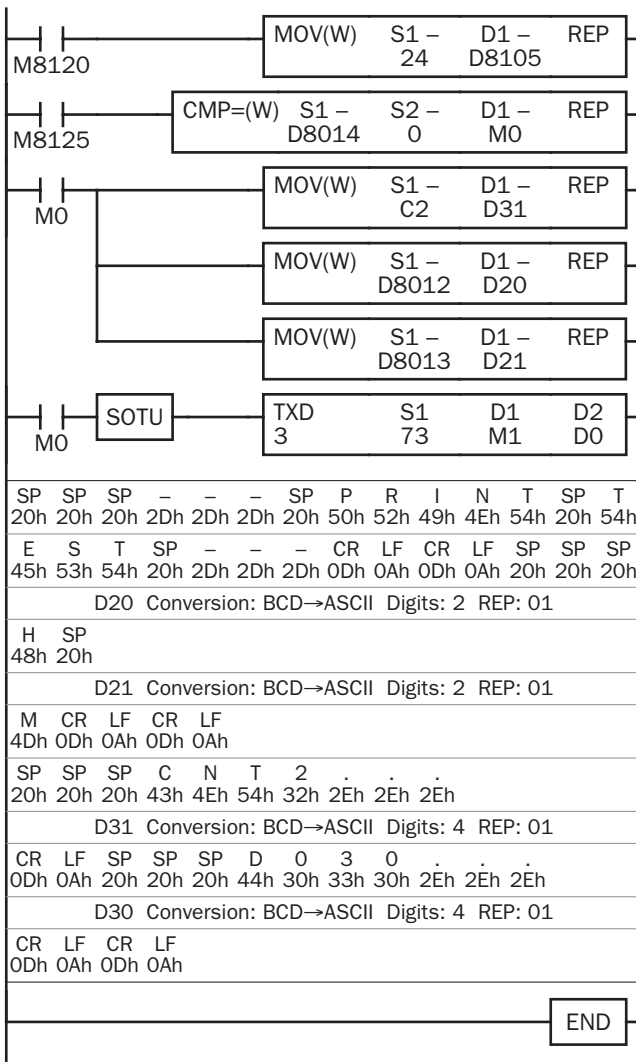
Communication Parameters:

Baud rate	9600 bps
Data bits	8
Parity	None
Stop bits	1

Note: The receive timeout value is used for the RXD instruction in the user communication mode. Since this example uses only the TXD instruction, the receive timeout value has no effect.

Ladder Diagram

The second data stored in special data register D8014 is compared with 0 using the CMP= (compare equal to) instruction. Each time the condition is met, the TXD3 instruction is executed to send the C2 and D30 data to the printer. A counting circuit for counter C2 is omitted from this sample program.



M8120 is the initialize pulse special internal relay.

24 → D8105 to enable the DSR option for busy control.

M8125 is the in-operation output special internal relay.

CMP=(W) compares the D8014 second data with 0.

When the D8014 data equals 0 second, M0 is turned on.

Counter C2 current value is moved to D31.

D8012 hour data is moved to D20.

D8013 minute data is moved to D21.

TXD3 is executed to send 73-byte data through the RS232C port 3 to the printer.

D20 hour data is converted from BCD to ASCII, and 2 digits are sent.

D21 minute data is converted from BCD to ASCII, and 2 digits are sent.

D31 counter C2 data is converted from BCD to ASCII, and 4 digits are sent.

D30 data is converted from BCD to ASCII, and 4 digits are sent.

Communication Mode Information and RS232C Line Control Signals

Special data registers are allocated for communication mode information of port 1 through port 7 and RS232C line control signals for port 2 through port 7.

While the MicroSmart is in the user communication mode, special data registers can be used to enable or disable DSR and DTR control signal options for port 2 through port 7. The DSR and DTR control signal options cannot be used for port 1.

The RTS signal line of port 2 through port 7 remains on.

In the maintenance communication mode, DSR has no effect and DTR remain on.

Special Data Registers for Communication Mode Information and RS232C Line Control Signals

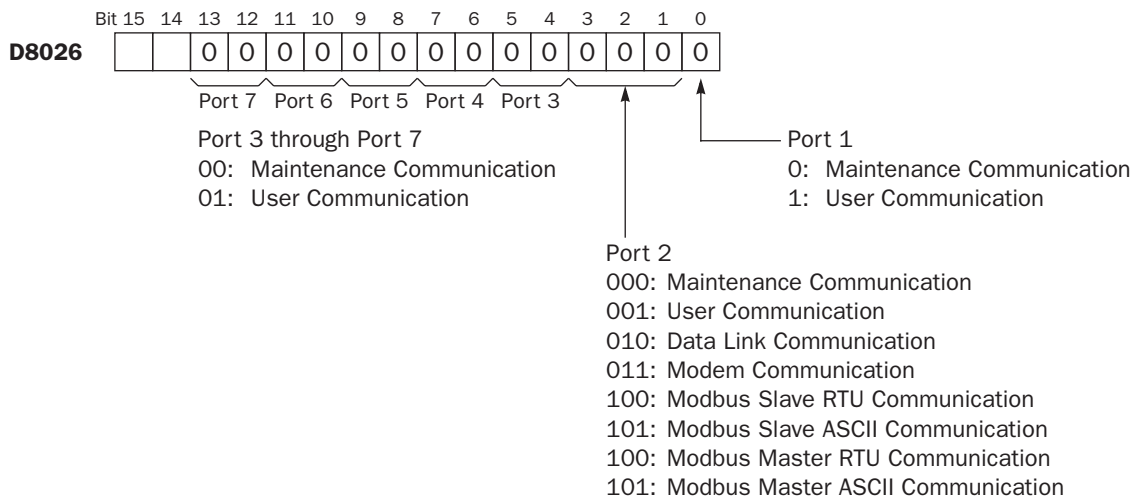
Special data register D8026 is allocated for communication mode information of port 1 through port 7.

Special data registers D8104 through D8106 and D8204 through D8206 are allocated for RS232C line control signals.

Communication Port	DR No.	Data Register Function	Data Register Value Updated	R/W
Port 1 to Port 7	D8026	Communication Mode Information	Every scan	R
Port 2 to Port 6	D8104	Control signal status	Every scan	R
	D8105	DSR input control signal option	When sending/receiving data	R/W
	D8106	DTR output control signal option	When sending/receiving data	R/W
Port 7 (Slim type CPU only)	D8204	Control signal status	Every scan	R
	D8205	DSR input control signal option	When sending/receiving data	R/W
	D8206	DTR output control signal option	When sending/receiving data	R/W

Communication Mode Information D8026 (Port 1 through Port 7)

Communication mode information of port 1 through port 7 is stored to D8026.

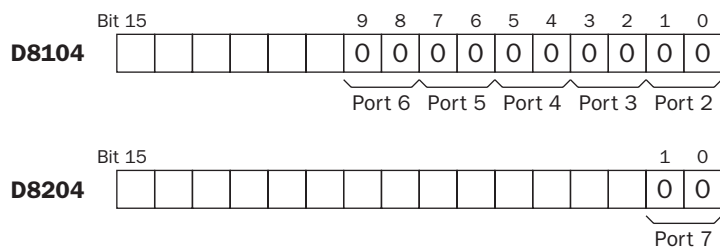


4: EXPANSION RS232C COMMUNICATION

Control Signal Status D8104 (Port 2 to Port 6) and D8204 (Port 7)

Special data registers D8104 and D8204 store a value to show that DSR and DTR are on or off at port 2 through port 7. The data of D8104 and D8204 are updated at every END processing.

The control status of each port is allocated as shown below:



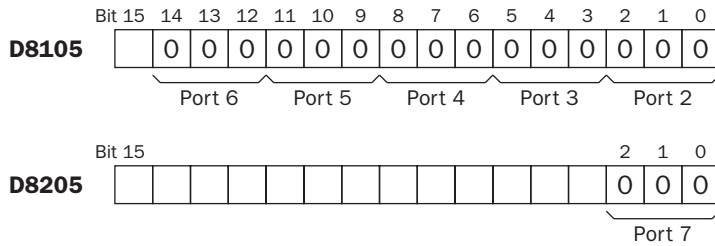
D8104/D8204 2-bit Binary Value	DTR	DSR	Description
00	OFF	OFF	Both DSR and DTR are off
01	OFF	ON	DSR is on
10	ON	OFF	DTR is on
11	ON	ON	Both DSR and DTR are on

DSR Input Control Signal Option D8105 (Port 2 to Port 6) and D8205 (Port 7)

Special data registers D8105 and D8205 are used to control data flow between the MicroSmart RS232C port 2 through port 7 and the remote terminal depending on the DSR (data set ready) signal sent from the remote terminal. The DSR signal is an input to the MicroSmart to determine the status of the remote terminal. The remote terminal informs the MicroSmart using DSR whether the remote terminal is ready for receiving data or is sending valid data.

The DSR control signal option can be used only for the user communication through the RS232C port 2 to port 7.

The control status of each port is allocated as shown below:



D8105/D8205 3-bit Binary Value	Description
000	DSR is not used for data flow control. When DSR control is not needed, set 0 to D8105/D8205.
001	When DSR is on, the MicroSmart can transmit and receive data.
010	When DSR is off, the MicroSmart can transmit and receive data.
011	When DSR is on, the MicroSmart can transmit data. This function is usually called "Busy Control" and is used for controlling transmission to a remote terminal with a slow processing speed, such as a printer. When the remote terminal is busy, data input to the remote terminal is restricted.
100	When DSR is off, the MicroSmart can transmit data.
≥ 101	Same as D8105/D8205 = 000. DSR is not used for data flow control.

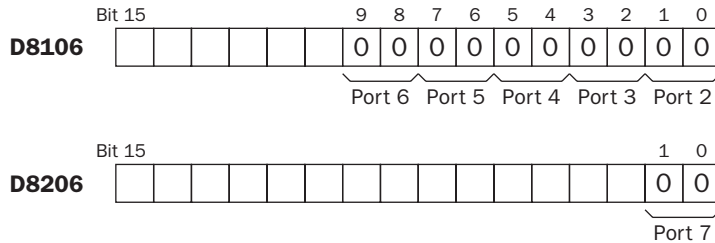
4: EXPANSION RS232C COMMUNICATION

DTR Output Control Signal Option D8106 (Port 2 to Port 6) and D8206 (Port 7)

Special data registers D8106 and D8206 are used to control the DTR (data terminal ready) signal to indicate the MicroSmart operating status or transmitting/receiving status.

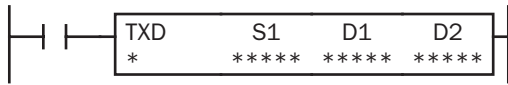
The DTR control signal option can be used only for the user communication through the RS232C port 2 to port 7.

The control status of each port is allocated as shown below:



D8106/D8206 2-bit Binary Value	Description
00	<p>While the MicroSmart is running, DTR is on whether the MicroSmart is transmitting or receiving data. While the MicroSmart is stopped, DTR remains off. Use this option to indicate the MicroSmart operating status.</p> <p>MicroSmart: Stopped Running Stopped</p> <p>DTR signal: ON (High) during Running; OFF (Low) during Stopped.</p>
01	<p>Whether the MicroSmart is running or stopped, DTR remains off.</p> <p>MicroSmart: Stopped Running Stopped</p> <p>DTR signal: Always OFF (Low).</p>
10	<p>While the MicroSmart can receive data, DTR is turned on. While the MicroSmart can not receive data, DTR remains off. Use this option when flow control of receive data is required.</p> <p>Receive: Impossible Possible Impossible</p> <p>DTR signal: ON (High) during Possible; OFF (Low) during Impossible.</p>
11	<p>Same as D8106/D8206 = 00.</p>

TXD (Transmit)



When input is on, data designated by S1 is converted into a specified format and transmitted from port 1 through port 7 to a remote terminal with an RS232C port.

TXD2 can be used to communicate with an RS485 remote terminal through port 2.

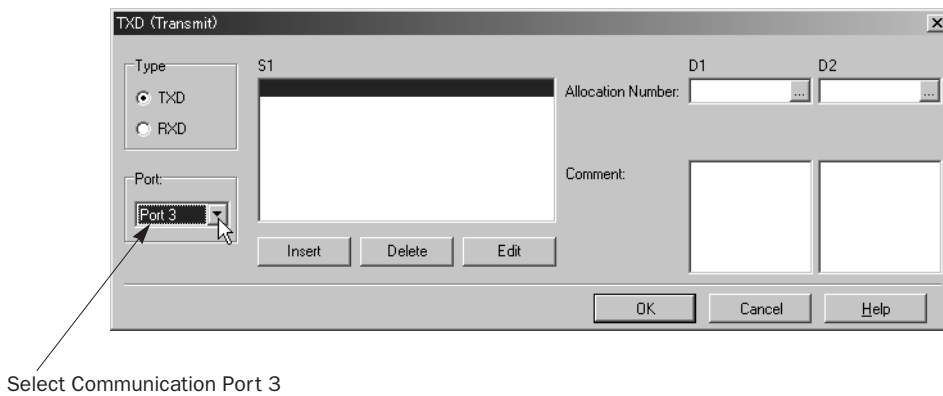
For details about the user communication, see the FC5A MicroSmart user's manual (FC9Y-B927).

Applicable CPU Modules

FC5A-C10R2/C	FC5A-C16R2/C	FC5A-C24R2/C	FC5A-D16RK1/RS1	FC5A-D32K3/S3
TXD1-TXD2	TXD1-TXD2	TXD1-TXD5	TXD1-TXD7	TXD1-TXD7

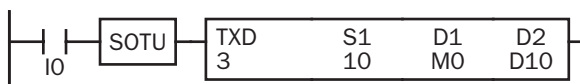
Example: Programming the TXD instruction for Port 3

When programming WindLDR for TXD3, select communication port 3 as shown below.



Example: Ladder Diagram for TXD3

A simple example of TXD3 program is shown below.



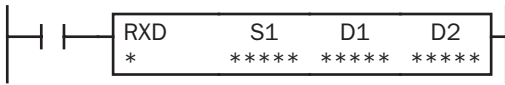
When I0 is turned on, TXD3 is executed to send 10-byte data through the RS232C port 3.

When data transmission is complete, M0 is turned on.

D10 stores the status of transmission and error code. The next data register stores the byte count of transmitted data.

4: EXPANSION RS232C COMMUNICATION

RXD (Receive)



When input is on, data from an RS232C remote terminal received by port 1 through port 7 is converted and stored in data registers according to the receive format designated by S1.

RXD2 can be used to communicate with an RS485 remote terminal through port 2.

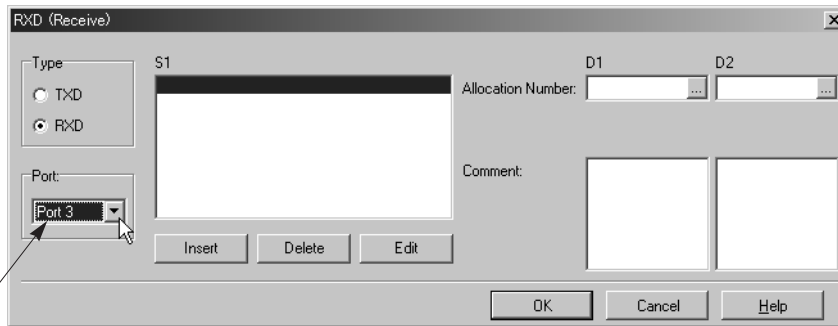
For details about the user communication, see the FC5A MicroSmart user's manual (FC9Y-B927).

Applicable CPU Modules

FC5A-C10R2/C	FC5A-C16R2/C	FC5A-C24R2/C	FC5A-D16RK1/RS1	FC5A-D32K3/S3
RXD1-RXD2	RXD1-RXD2	RXD1-RXD5	RXD1-RXD7	RXD1-RXD7

Example: Programming the RXD instruction for Port 3

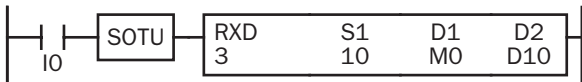
When programming WindLDR for RXD3, select communication port 3 as shown below.



Select Communication Port 3

Example: Ladder Diagram for RXD3

A simple example of RXD3 program is shown below.



When I0 is turned on, RXD3 is executed to be ready for receiving 10-byte data through the RS232C port 3.

When data receiving is complete, M0 is turned on.

D10 stores the receive data status and error code. The next data register stores the byte count of received data.

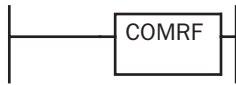
User Communication Receive Instruction Cancel Flag

Special internal relays for user communication receive instruction cancel flag are used to cancel all RXD instructions for each port. While the MicroSmart has completed receive format and is ready for receiving incoming data, turning on the user communication receive instruction cancel flag cancels all RXD instructions for each port. This function is useful to cancel receive instructions only, without stopping the MicroSmart.

To make the cancelled RXD instructions active, turn off the flag and turn on the input to the RXD instruction again.

Allocation Number	Description	CPU Stopped	Power OFF	Remarks
M8033	User Communication Receive Instruction Cancel Flag (Port 3)	Cleared	Cleared	
M8145	User Communication Receive Instruction Cancel Flag (Port 4)	Cleared	Cleared	
M8146	User Communication Receive Instruction Cancel Flag (Port 5)	Cleared	Cleared	
M8147	User Communication Receive Instruction Cancel Flag (Port 6)	Cleared	Cleared	Reserved in all-in-one CPU
M8170	User Communication Receive Instruction Cancel Flag (Port 7)	Cleared	Cleared	Slim CPU only

COMRF (Communication Refresh)



The COMRF instruction refreshes the send and receive data in the expansion RS232C communication buffers for port 3 through port 7 in real time.

The send data in the buffer are usually sent out in the END processing. The receive data in the buffer are usually sent to MicroSmart operands in the END processing. The COMRF can be used in any place in the ladder diagram where you want to execute the TXD instruction immediately or to update the received data in a period shorter than the scan time.

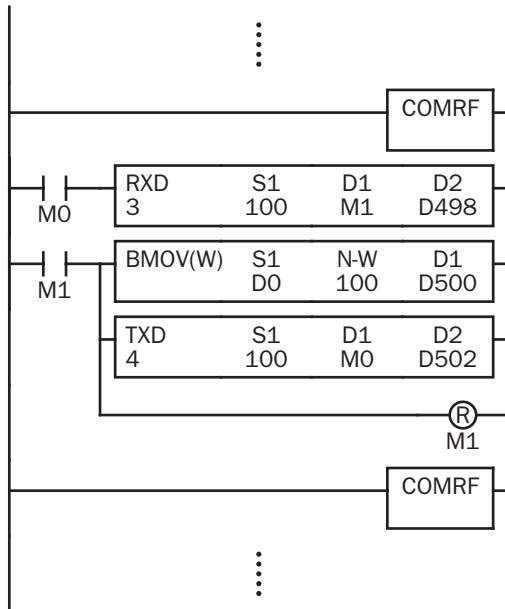
Note: The COMRF instruction cannot be used in interrupt programs. If used, a user program execution error will result, turning on special internal relay M8004 and the ERR LED on the CPU module.

Applicable CPU Modules

FC5A-C10R2/C	FC5A-C16R2/C	FC5A-C24R2/C	FC5A-D16RK1/RS1	FC5A-D32K3/S3
—	—	X	X	X

Example: COMRF

The following example demonstrates a program to execute COMRF instructions among other instructions.



Before executing the RXD instruction, COMRF refreshes send and receive data of the expansion RS232C communication ports.

After executing the TXD instruction, COMRF refreshes send and receive data of the expansion RS232C communication ports.

COMRF Execution Time

While the expansion RS232C communication module sends or receives communication, the CPU module requires the execution time to execute the COMRF instruction as shown in the table below.

CPU Module	All-in-one 24-I/O Type CPU Module	Slim Type CPU Module
COMRF Execution Time	Approx. 4 ms	Approx. 4 ms

Note: The above values are the COMRF execution time when one expansion RS232C communication module performs communication. When multiple expansion RS232C communication modules performs communication at the same time, the execution time is multiplied by the quantity of the expansion RS232C communication modules.

COMRF Quantity of Bytes

The following table shows the quantity of bytes which the COMRF instruction requires in the user program and applicability of the COMRF instruction in interrupt programs.

CPU Module	All-in-one 24-I/O Type CPU Module	Slim Type CPU Module
COMRF Quantity of Bytes	2 bytes	4 bytes
COMRF in Interrupt Programs	—	—

5: TROUBLESHOOTING

Introduction

This chapter describes the procedures to determine the cause of trouble and actions to be taken when any trouble occurs while operating the expansion RS232C communication module. When a trouble occurred, check the points and take the actions described below. If the trouble cannot be solved, call IDEC for assistance.

The PWR (power) LED does not go on.

Check	Action	Page
Is power supplied to the CPU module?	Supply power to the CPU module.	Note 1
Is the power voltage correct?	Supply the rated power voltage. All-in-one type: 100-240V AC or 24V DC Slim type: 24V DC	Note 1

The expansion RS232C communication module cannot communicate with WindLDR.

Check	Action	Page
Is the communication cable connected correctly?	Connect the communication cable correctly.	3-6, 4-2
Is the PWR LED on the CPU module on?	See "The PWR (power) LED does not go on."	5-1
Are the communication settings for WindLDR and expansion communication port the same?	Set the same communication parameters for WindLDR and expansion communication port.	4-3
Is the CPU module system program version applicable to the expansion RS232C communication module?	Upgrade the CPU module system program version to 110 or higher.	1-2

The expansion RS232C communication module cannot communicate with an operator interface.

Check	Action	Page
Is the communication cable connected correctly?	Connect the communication cable correctly.	3-6, 4-5
Is the PWR LED on the CPU module on?	See "The PWR (power) LED does not go on."	5-1
Are the communication settings for the operator interface and expansion communication port the same?	Set the same communication parameters for the operator interface and expansion communication port.	4-6
Is the CPU module system program version applicable to the expansion RS232C communication module?	Upgrade the CPU module system program version to 110 or higher.	1-2

Communication response is slow.

Check	Action	Page
Is the communication baud rate set to a proper value?	Set the communication baud rate to a required value.	4-2, 4-6, 4-7
Is the COMRF instruction used in the user program?	Use the COMRF instruction in the user program.	4-17

Data is not transmitted at all in the user communication.

Check	Action	Page
Is the communication cable connected correctly?	Make sure of correct wiring.	3-6, 4-9
Are the communication settings for the remote terminal and expansion RS232C communication port the same?	Set the same communication parameters for expansion RS232C communication port as the remote terminal.	4-8
Is the CPU module system program version applicable to the expansion RS232C communication module?	Upgrade the CPU module system program version to 110 or higher.	1-2
Is the correct port number designated in the TXD instruction?	Designate a correct port number in the TXD instruction.	4-15

5: TROUBLESHOOTING

Check	Action	Page
Is the start input for the TXD instruction on?	Turn on the start input for the TXD instruction.	4-15
Is the PWR LED on the CPU module on?	See “The PWR (power) LED does not go on.”	5-1

Data is not transmitted correctly in the user communication.

Check	Action	Page
Are the communication settings for the external device and expansion communication port the same?	Set the same communication parameters for expansion communication port as the external device.	4-8
Is the same data register designated as destination operand D2 (transmit status) repeatedly?	Change the duplicate operand to another data register.	Note 2
Are inputs to more than 5 TXD instructions on simultaneously?	Correct the program to make sure that inputs to more than 5 TXD instructions do not go on simultaneously.	Note 2
Is duration of the busy signal at the remote terminal less than 5 sec?	Make sure that the busy signal at the remote terminal does not exceed 5 sec.	Note 2
Did you make sure of source 1 operand of the TXD instruction?	Make sure that the transmit data designated as source 1 operand is correct.	Note 2

Data is not received at all in the user communication.

Check	Action	Page
Is the communication cable connected correctly?	Make sure of correct wiring.	3-6, 4-9
Are the communication settings for the remote terminal and expansion RS232C communication port the same?	Set the same communication parameters for expansion RS232C communication port as the remote terminal.	4-8
Is the CPU module system program version applicable to the expansion RS232C communication module?	Upgrade the CPU module system program version to 110 or higher.	1-2
Is the correct port number designated in the RXD instruction?	Designate a correct port number in the RXD instruction.	4-16
Is the start input for the RXD instruction on?	Turn on the start input for the RXD instruction.	4-16
Is the PWR LED on the CPU module on?	See “The PWR (power) LED does not go on.”	5-1

Data is not received correctly in the user communication.

Check	Action	Page
Are the communication settings for the external device and expansion communication port the same?	Set the same communication parameters for expansion communication port as the external device.	4-8
Is the same data register designated as destination operand D2 (receive status) repeatedly?	Change the duplicate operand to another data register.	Note 2
Is a start delimiter specified in the RXD instruction? Are inputs to more than 5 RXD instructions on simultaneously?	Correct the program to make sure that inputs to more than 5 RXD instructions do not go on simultaneously.	Note 2
Did you check the format of incoming data?	Make sure that the receive format of the RXD instruction matches that of the incoming data.	Note 2
Is the receive timeout value set correctly using WindLDR?	Make sure that the receive timeout value is larger than character intervals of the incoming data.	Note 2
Did you make sure of source 1 operand of the RXD instruction?	Make sure that the receive data designated as the source 1 operand is correct.	Note 2

Note 1: See “Installation and Wiring” in the FC5A MicroSmart user’s manual (FC9Y-B927).

Note 2: See “User Communication Instructions” in the FC5A MicroSmart user’s manual (FC9Y-B927).

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