

Chapter 12 FBs-PLC Communication

The main unit of FBs-PLC has maximum 5 communication ports with the interface of USB/RS-232/RS-485/Ethernet; the built-in Port 0 with optional USB/RS-232 interface, which supports FATEK communication protocol; Port 1~4 with RS-232/RS-485 interface can be expanded through the installation of communication board (Port 1 & 2) and communication module (Port 3 & 4), they can support FATEK/Modbus-RTU master or slave or User-defined ladder program controlled communication protocols. Through the Ethernet communication module, the FBs PLC can be connected with the Ethernet network for intranet or internet supervisory application. The details as below:

12.1 Functions and Applications of FBs-PLC Communication Ports

FBs-PLC not only has four different hardware interfaces but also has four types of software interfaces. The table below shows the types of software interfaces that the FBs-PLC communication ports can be defined:

Type Available Software Interface	Communication Port			Note
	Port 0	Port 1	Port 2 ~ 4	
Standard Interface	○	○	○	Controlled by the CPU via the "Standard Communication Driver of FATEK"
Modbus RTU Interface		○	○	Controlled by the CPU via the "Standard Communication Driver of Modbus RTU"
Modem Interface		○		Controlled by the CPU via the "MODEM Interface Driver" and "Standard Communication Driver of FATEK"
Ladder Program Control Interface		○	○	The user controls the communication port via ladder diagram program

- **Standard Interface:** This type of interface can be set in Port 0 ~ Port 4 (Port 0 supports this type only) and is called "Standard Interface" due to the fact that the port is controlled by the FB-PLC Standard Communication Driver (applying "FB-PLC Communication Protocol"). It is necessary to conform to "FB-PLC Communication Protocol" before connection with "Standard Interface" can be made for communication.
This is the system default.
- **Modbus RTU Interface:** This type of interface can be set in Port 1 ~ 4 as the slave of Modbus communication protocol, which applies the "Standard Modbus Communication Protocol".
- **Modem interface:** This type of interface can only be selected in Port 1 that is controlled by the FBs-PLC built-in "MODEM Interface Driver" for receiving phone calls or dialing. After connecting, control will be passed to "Standard Communication Driver" or "Ladder Controlled Communication Instruction).
- **Ladder Program Control Interface:** This type of interface can be selected in Port 1 ~ 4. The port under this type of interface is controlled by the handy instructions of ladder program (such as FUN94, FUN 150 and FUN151). Thus, the user may control these communication ports for various communication applications via the ladder program.

The following sections will describe the functions and applications of the five FBs-PLC communication ports in each of the four different types of software interface.

12.1.1 Communication Port 0 : USB or RS-232 Serial Interface

Function Specification

- Communication Parameters:
 - Baud Rate : 9600 bps (Default; 19200/38400/57600/115200 bps also allowed)
 - Data Length : 7-bit (Fixed)
 - Parity : Even (Fixed)
 - Stop Bit : 1-bit (Fixed)

Basic Application

The Port 0 has the hardware interface of USB/RS232 and the software interface of “Standard Interface”.

Derived Application

- ① For connection with peripherals having USB/RS-232 interface, such as WinProladder, PC, MMI, SCADA,....
- ② By adding RS-232↔RS-485 convertor for long distance or multi-drop application through RS-485 interface:
For connection with peripherals having RS-485 interface, such as PC, MMI, SCADA,....
By this way, it may be connected to the FB-PLC CPU Link Network.

12.1.2 Communication Port 1 : RS-232/RS-485 Serial Interface

Function Specification

- The signal specification meets the EIA RS-232C/RS-485 standard and the communication parameters are adjustable, the maximum communication speed can reach 921.6K bps. The default communication parameters are as bellow:
Baud Rate : 9600 bps ; Data Length : 7-bit ; Parity : Even ; Stop Bit : 1-bit

Basic Application

The following four types of software interfaces can be selected

- ① Standard Interface : Applying FATEK communication protocol
For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,
- ② Modbus RTU Interface : Applying Modbus RTU communication protocol
For connection with peripherals having RS-232/RS-485 interface, such as PC, MMI, SCADA,
- ③ Modem Interface :
It will provide the remote diagnostics and trouble debugging or remote data collection or alarm and fault report via the Modem interface.
- ④ Ladder Program Control Interface :
The user can control Port 1 through ladder diagram program to take over the control, it can be connected with the printer, acts as the master of FATEK-CPU-Link/Modbus-RTU communication network, or communicates with the intelligent peripherals.

Derived Application

- ① For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,...; or it may be connected to the FATEK CPU Link network or Modbus RTU network through RS-485 interface.
- ② For "Ladder Diagram Control Interface", the applications described as below:
 - By FUN151 of MD0 instruction, it can act as the master of FATEK CPU Link Network.
 - By FUN151 of MD1 instruction, it can act as the sender and connect with the intelligent peripherals, such as other PLC, servo driver, temperature controller, inverter....
 - By FUN151 of MD2 instruction, it can act as the receiver and connect with intelligent peripherals, such as magnetic card reader, barcode reader and electronic weighing scale....
 - By FUN150 instruction, it can act as the master of Modbus RTU Network.
 - By FUN94 instruction, it can be connected with the printer having RS-232 hardware interface for report printing.

12.1.3 Communication Port 2 : RS-232/RS-485 Serial Interface

Function Specification

- The signal specification meets the EIA RS-232C/RS-485 standard and the communication parameters are adjustable, the maximum communication speed can reach 921.6K bps. This port with the ability for real-time distributed control. The default communication parameters are as below:
Baud Rate : 9600 bps ; Data Length : 7-bit ; Parity : Even ; Stop Bit : 1-bit

Basic Application

The following three types of software interfaces can be selected

- ① Standard Interface : Applying FATEK communication protocol
For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,
- ② Modbus RTU Interface : Applying Modbus RTU communication protocol
For connection with peripherals having RS-232/RS-485 interface, such as PC, MMI, SCADA,
Modem Interface :
- ③ Ladder Program Control Interface :
The user can control Port 2 through ladder diagram program to take over the control, it can act as the master of the FATEK High Speed CPU Link, the master of FATEK-CPU-Link/Modbus-RTU network, or communicates with the intelligent peripherals.

Derived Application

- ① For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,...; or it may be connected to the FATEK CPU Link network or Modbus RTU network through RS-485 interface.
- ② For "Ladder Diagram Control Interface", the applications described as below:
 - By FUN151 of MD0 instruction, it can act as the master of FATEK CPU Link Network.
 - By FUN151 of MD3 instruction, it can act as the master of FATEK High Speed CPU Link Network.
 - By FUN151 of MD1 instruction, it can act as the sender and connect with the intelligent peripherals, such as other PLC, servo driver, temperature controller, inverter....
 - By FUN151 of MD2 instruction, it can act as the receiver and connect with intelligent peripherals, such as magnetic card reader, barcode reader and electronic weighing scale....
 - By FUN150 instruction, it can act as the master of Modbus RTU Network.

12.1.4 Communication Port 3 : RS-232/RS-485 Serial Interface

Function Specification

- The signal specification meets the EIA RS-232C/RS-485 standard and the communication parameters are adjustable, the maximum communication speed can reach 921.6K bps. The default communication parameters are as bellow:
Baud Rate : 9600 bps ; Data Length : 7-bit ; Parity : Even ; Stop Bit : 1-bit

Basic Application

The following three types of software interfaces can be selected

- ① Standard Interface : Appling FATEK communication protocol

For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,

- ② Modbus RTU Interface : Appling Modbus RTU communication protocol

For connection with peripherals having RS-232/RS-485 interface, such as PC, MMI, SCADA,

Modem Interface :

- ③ Ladder Program Control Interface :

The user can control Port 3 through ladder diagram program to take over the control, it can act as the master of the FATEK-CPU-Link/Modbus-RTU network, or communicates with the intelligent peripherals.

Derived Application

- ① For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,...; or it may be connected to the FATEK CPU Link network or Modbus RTU network through RS-485 interface.
- ② For "Ladder Diagram Control Interface", the applications described as bellow:
- By FUN151 of MD0 instruction, it can act as the master of FATEK CPU Link Network.
 - By FUN151 of MD1 instruction, it can act as the sender and connect with the intelligent peripherals, such as other PLC, servo driver, temperature controller, invertor....
 - By FUN151 of MD2 instruction, it can act as the receiver and connect with intelligent peripherals, such as magnetic card reader, barcode reader and electronic weighing scale....
 - By FUN150 instruction, it can act as the master of Modbus RTU Network.

12.1.5 Communication Port 4 : RS-232/RS-485 Serial Interface

Function Specification

- The signal specification meets the EIA RS-232C/RS-485 standard and the communication parameters are adjustable, the maximum communication speed can reach 921.6K bps. The default communication parameters are as bellow:
Baud Rate : 9600 bps ; Data Length : 7-bit ; Parity : Even ; Stop Bit : 1-bit

Basic Application

The following three types of software interfaces can be selected

① Standard Interface : Appling FATEK communication protocol

For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,

② Modbus RTU Interface : Appling Modbus RTU communication protocol

For connection with peripherals having RS-232/RS-485 interface, such as PC, MMI, SCADA,

Modem Interface :

③ Ladder Program Control Interface :

The user can control Port 4 through ladder diagram program to take over the control, it can act as the master of the FATEK-CPU-Link/Modbus-RTU communication network, or communicates with the intelligent peripherals.

Derived Application

- ① For connection with peripherals having RS-232/RS-485 interface, such as WinProladder, PC, MMI, SCADA,...; or it may be connected to the FATEK CPU Link network or Modbus RTU network through RS-485 interface.
- ② For "Ladder Diagram Control Interface", the applications described as bellow:
 - By FUN151 of MD0 instruction, it can act as the master of FATEK CPU Link network.
 - By FUN151 of MD1 instruction, it can act as the sender and connect with the intelligent peripherals, such as other PLC, servo driver, temperature controller, invertor....
 - By FUN151 of MD2 instruction, it can act as the receiver and connect with intelligent peripherals, such as magnetic card reader, barcode reader and electronic weighing scale....
 - By FUN150 instruction, it can act as the master of Modbus RTU network.

12.2 Description and Application of Modem Interface

This type of interface can only be selected in Port 1 by setting the High Byte value of R4149 to be AAH. Although CPU still manages the communication transactions of Port 1 by "Standard Communication Driver", it has to go through Modem, for dialing or receiving. Prior to the initiation of communication, port control is managed by "Modem Interface Driver" and PLC cannot be accessed. Once the connection between the Modems are successful, port control is turned over to "Standard Communication Driver" and Port 1 enters into "Standard Interface". This section will describe the operation of Modem connection for active dialing and passive receiving.

Under Modem interface, according to the setting of phone number registers (R4140 ~ R4145), select to dial to a distant Modem or receive a call from a distant Modem through RS-232C interface of Port1. Once successful connection, data can be sent or received through phone line. Below is a description of the two modes.

* * * High Byte of R4149 = AAH, setting Port 1 as the Modem interface

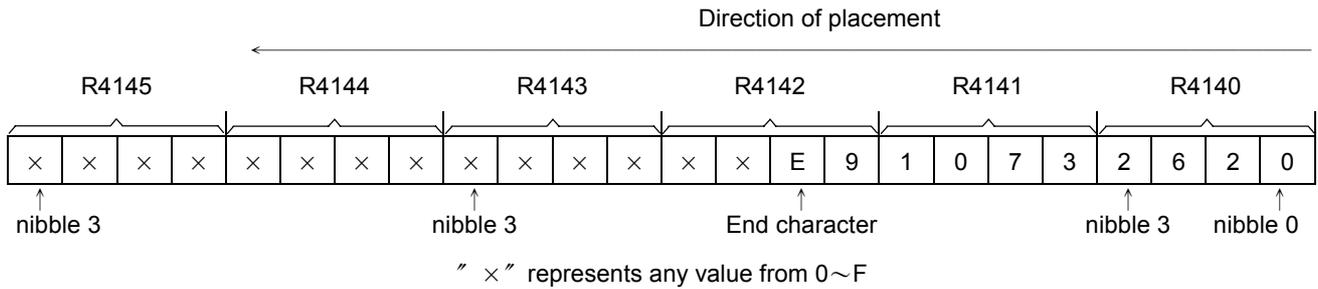
A. Passive receiving mode

When there are no "valid phone number" stored in the phone number registers (see below), the main unit enters passive receiving mode automatically, where Modem is set in receiving mode and waits for the calling of a distant Modem. When the connection between the Modems are successful, PLC exits the receiving mode and enters the connection mode. At this time, the distant Modem can access or control the connected main unit. Beware that the main unit will check the content of phone number registers while power up or Modem is OFF→ON. Thus any change to R4140~R4145 (such as addition or deletion of phone numbers) will be activated only after the main unit or Modem is turned off and then turned on again.

B. Active dialing mode

When there is "valid phone number" stored in the phone number registers, the main unit will automatically enter the active dialing mode the instant both the main unit and modem are turned on (OFF→ON), and the phone number storing in R4140 ~ R4145 is dialed from Port 1 through Modem to attempt connection with the distant Modem. Once the connection is successful, it enters the connection mode. At this time, distant Modem can access or control the connected main unit. If the connection fails, the main unit will undergo dialing the second time, and the third time if the dialing fails again. If all three attempts fail (takes about 3 minutes), the main unit will exit dialing mode automatically and enter passive receiving mode, waiting for the call of distant Modem.

The phone number storing in phone number registers will be considered as valid only when the number is stored according to the format described below. First the phone number must be expressed by hexadecimal digit where only 0 ~ 9 and "A", "B", "C", "E" are significant. "A" represents dialing delay which applies to dial extension or international call (one "A" represents 2-second delay). "B" represents "#" character (for calling pager), and "C" represents "*" character. Valid digits 0~9 represent phone number and "E" represents the end of said phone number. Each register has 4 hexadecimal digits, thus R4140 ~ R4145 have in total 24 hexadecimal digits. After deducting the end character "E", R4140 ~ R4145 can store a phone number with 23 digits at maximum. Phone number is placed in the sequence from nibble 0 of R4140 to nibble 3 of R4145. For instance, the valid storage of a phone number 02-6237019 goes as follows:



As shown above, R4140 stores 2620H, R4141 stores 1073H, R4142 stores XE9H, and R4143~R4145 can have any value. Please note that the last digit of the phone number must be immediately followed by end character "E." Any figure after "E" which can be 0 ~ F will be ignored. There can only be 0 ~ C before "E" and the presence of any other figure will render the phone number invalid.

If the phone number with extension e.g. 02-28082192 ext 100, as described above, R4140 stores 2A20H, R4141 stores 2808H, R4142 stores A291H, R4143 stores AAAAH, R4144 stores 001AH, R4145 stores 000EH; where the characters "A" are the delay for dialing.

In practical application, the phone call in relation to the provision of technical service will be paid by the service provider. If that's the case, there cannot be any valid phone number stored in the phone number registers of customer's PLC main unit. It means that the PLC of the customer's will go into receiving mode once it's turned on and wait for the call from service provider. If the phone call is to be paid by the customer, the phone number of technical service provider will first be stored in customer's PLC main unit. When the customer turns on Modem and PLC, the PLC main unit will dial to the service provider automatically. In light that the phone number of service provider might change, we provide a phone number write-in and dial-back function in WinProladder package software. When the service provider changes phone number, the PLC of customer's still stores the old phone number and can't make connection to the Modem of service provider. At this time, PLC will dial and redial three times and switches into receiving mode in 3 minutes after the redials fail. At this time, service provider will dial to the customer, download its new phone number in customer's PLC main unit phone number registers and give the dial-back command. Upon receiving the dial-back command, the PLC of customer's will enter dialing mode and call service provider at the new number just downloaded. Although such process requires service provider to call customer first, the cost is minimal since the time of write-in and dial-back of the new number takes little time.

When WINProladder executes the command of "phone number write-in and dial-back", it will retrieve the old number in customer's PLC main unit for your reference (just in case you need the write back the old number) before executing the command. It will disconnect the call after the command is completed.