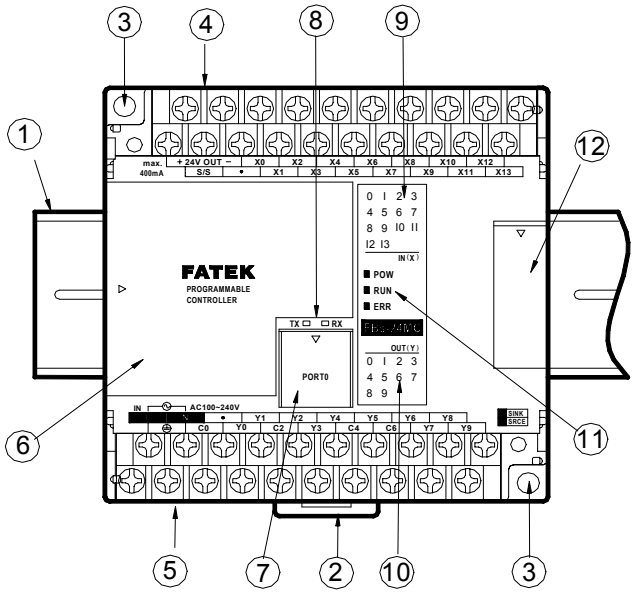
Chapter 1 Introduction of FATEK FBs Series PLC

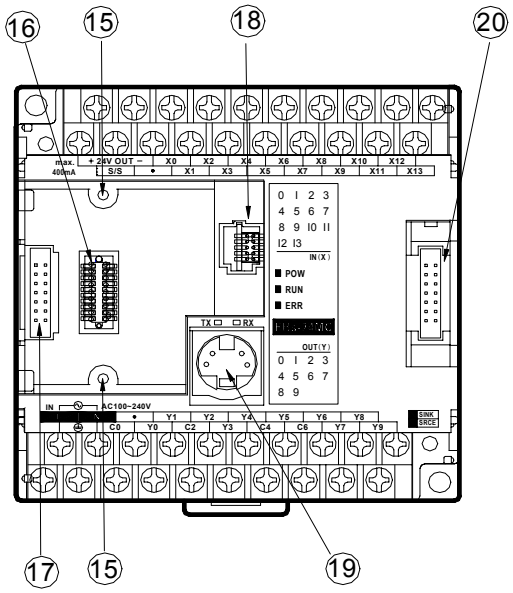
The FATEK FBS Series PLC is a new generation of micro PLC equipped with excellent functions comparable to medium or large PLC, with up to five communication ports. The maximum I/O numbers are 256 points for Digital Input (DI) and Digital Output (DO), 64 words for Numeric Input (NI) and Numeric Output (NO). The Main Units of FBs are available in three types: MA (Economy Type), MC (High-Performance Type), and MN(High-Speed NC Type). With the combination of I/O point ranges from 10 to 60, a total of 17 models are available. Fourteen DI/DO and eleven NI/NO models are available for Expansion Units/Modules. With interface options in RS232, RS485, USB and Ethernet, the communication peripherals are available with 13 boards and modules. The various models are described in the following:

1.1 Appearance of Main Unit

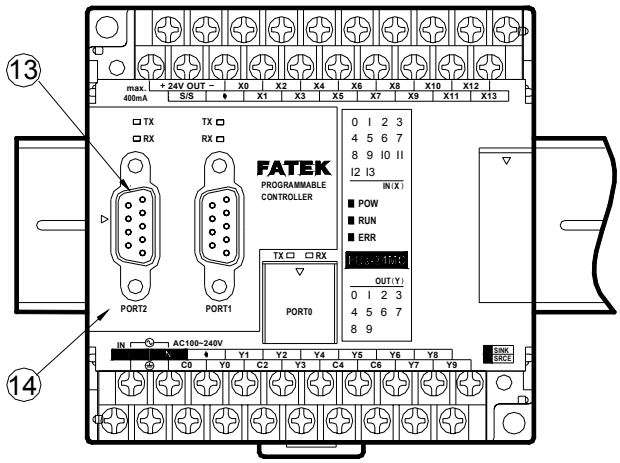
All the Main Units of FBs-PLC have the same physical structure. The only difference is the case width. There are four different case sizes, which are 60mm, 90mm, 130mm, and 175mm. The figure below will use the Main Unit case of the FBs-24MC as an example for illustration:



(Front view without Communication Board)



(Front view with cover plate removed)



(Front view with CB-22 Board installed)

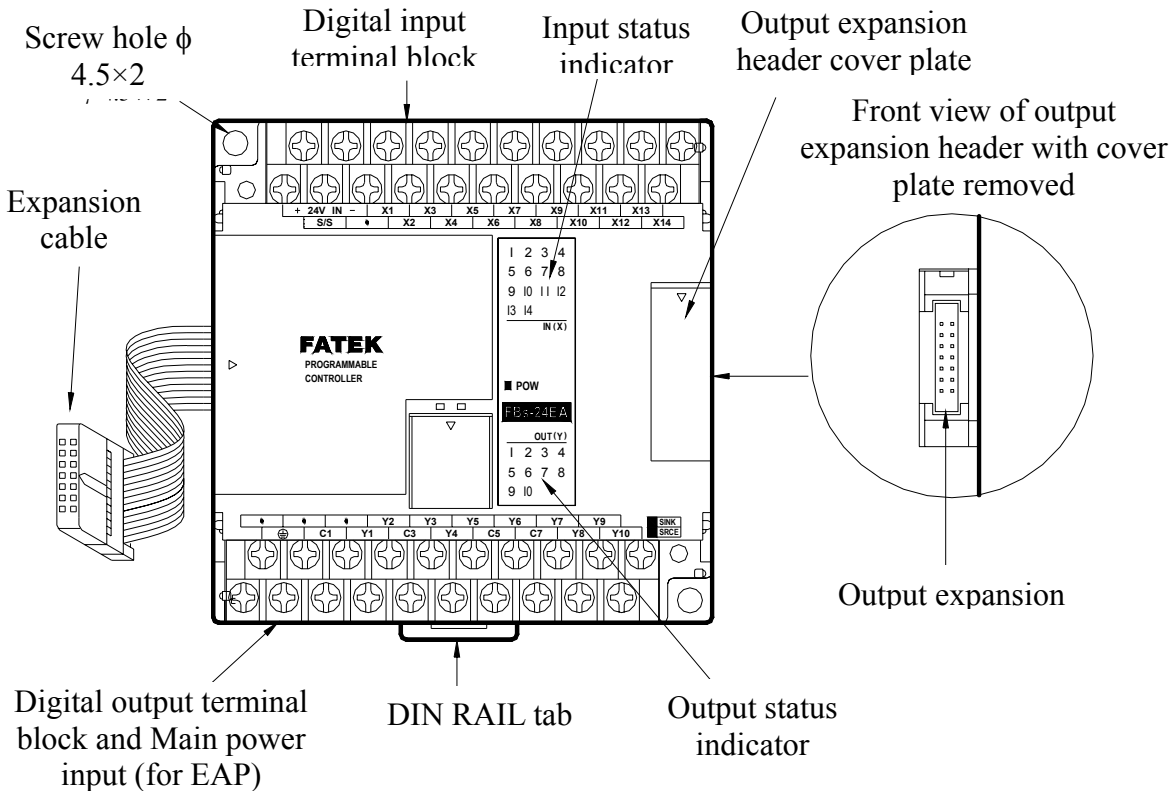
① 35mm-width DIN RAIL
② DIN RAIL tab
③ Hole for screw fixation ($\phi 4.5 \times 2$)
④ Terminals of 24VDC power input and digital input (Pitch 7.62mm)
⑤ Terminals of main power input and digital output (Pitch 7.62mm)
⑥ Standard cover plate (without communication board)
⑦ Cover plate of built-in communication port (Port 0)

⑧ Indicators for transmit (TX) and receive (RX) status of built-in communication port (Port0).
⑨ Indicator for Digital Input (Xn).
⑩ Indicator for Digital Output (Yn).
⑪ Indicator for system status (POW, RUN, ERR).
⑫ I/O output expansion header cover [units of 20 points or beyond only], with esthetic purpose and capable of securing expansion cable.
⑬ FBs-CB22 Communication Board (CB).
⑭ FBs-CB22 CB cover plate (each CB has its own specific cover plate)
⑮ Screw holes of communication board.
⑯ Connector for communication board (for CB2, CB22, CB5, CB55, and CB25)
⑰ Connector for Communication Module (CM) (only available in MC/MN model, for CM22, CM25, CM55, CM25E, and CM55E connection).
⑱ Connector for Memory Pack.
⑲ Connector for built-in communication port (Port 0) (With USB and RS232 optional, shown in the figure is for RS232)
⑳ I/O output expansion header (only available in units with 20 points or beyond), for connecting with cables from expansion units/modules.

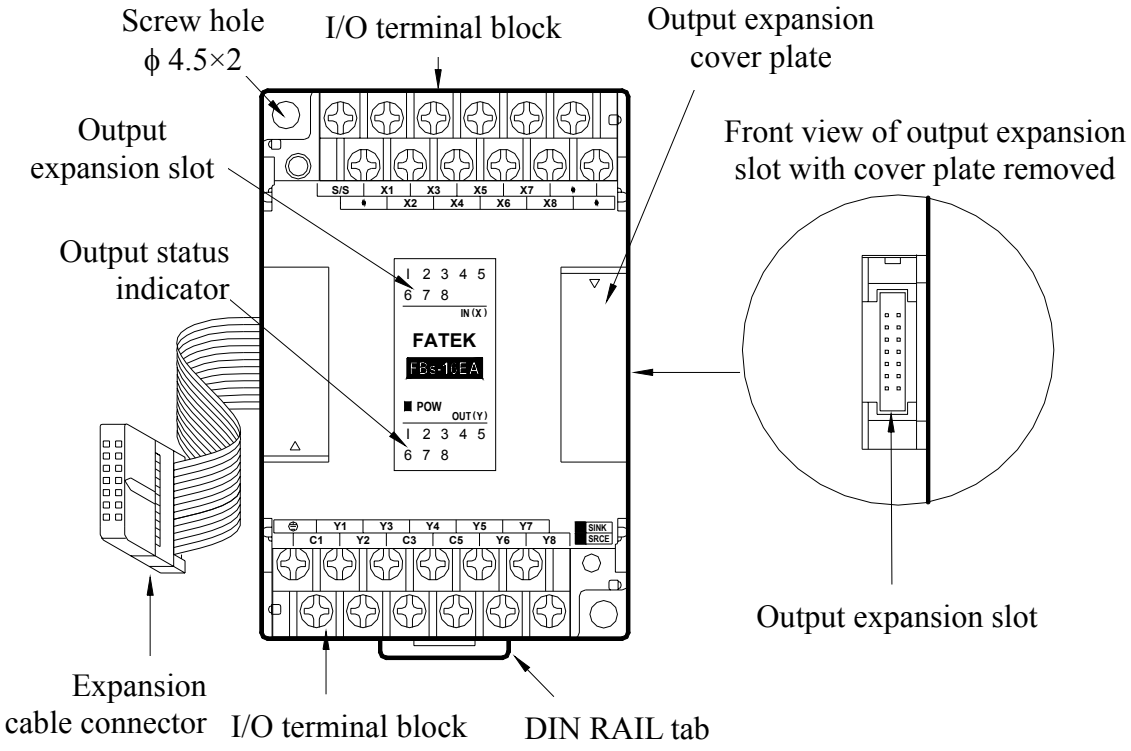
1.2 Appearance of Expansion Unit/Module

There are three types of cases for expansion units/modules. One type uses the same case as main unit that of the 90mm, 130mm, and 175mm, while the other two have thinner 40mm and 60mm cases, which are for expansion modules. All expansion cables (left) of expansion units/modules are flat ribbon cables (6cm long), which were soldered directly on the PCB, and the expansion header (right) is a 14Pin Header, with this to connect the right adjacent expansion units/modules. In the following, each of the three types of expansion units/modules is described as an example:

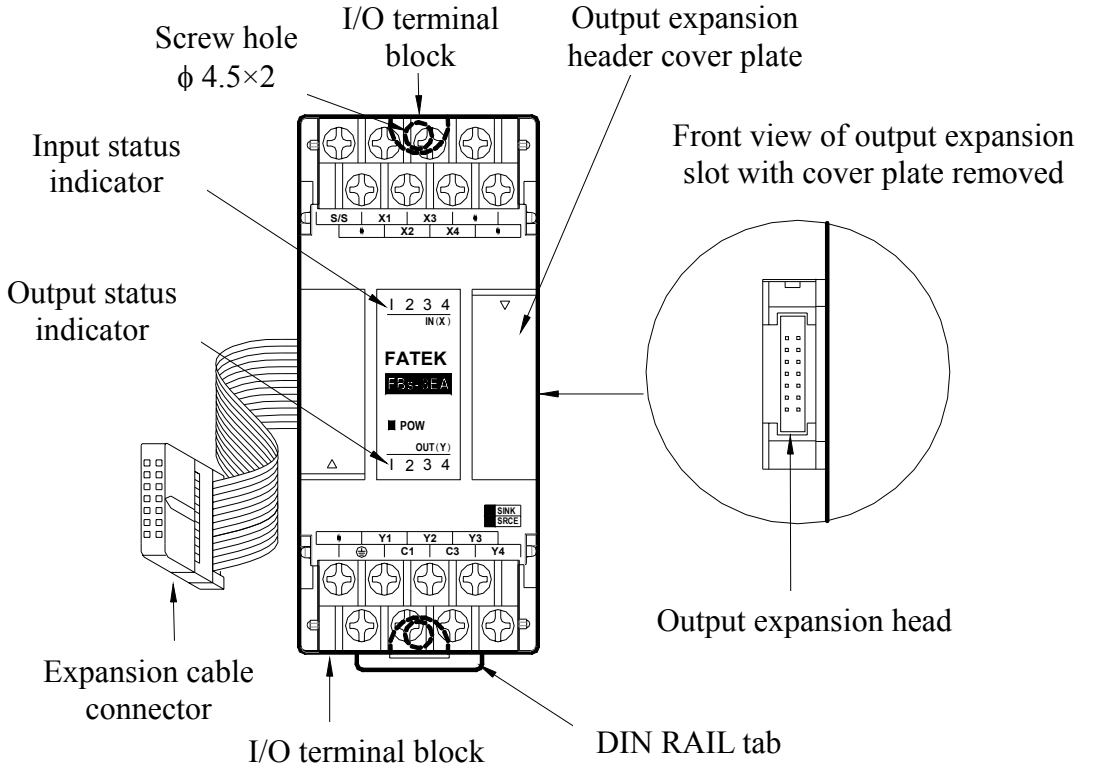
- Expansion unit/module with 90mm, 130mm, or 175mm width case: [-24EA(P), -40EA(P), -60EA(P), -TC16, -RTD16]



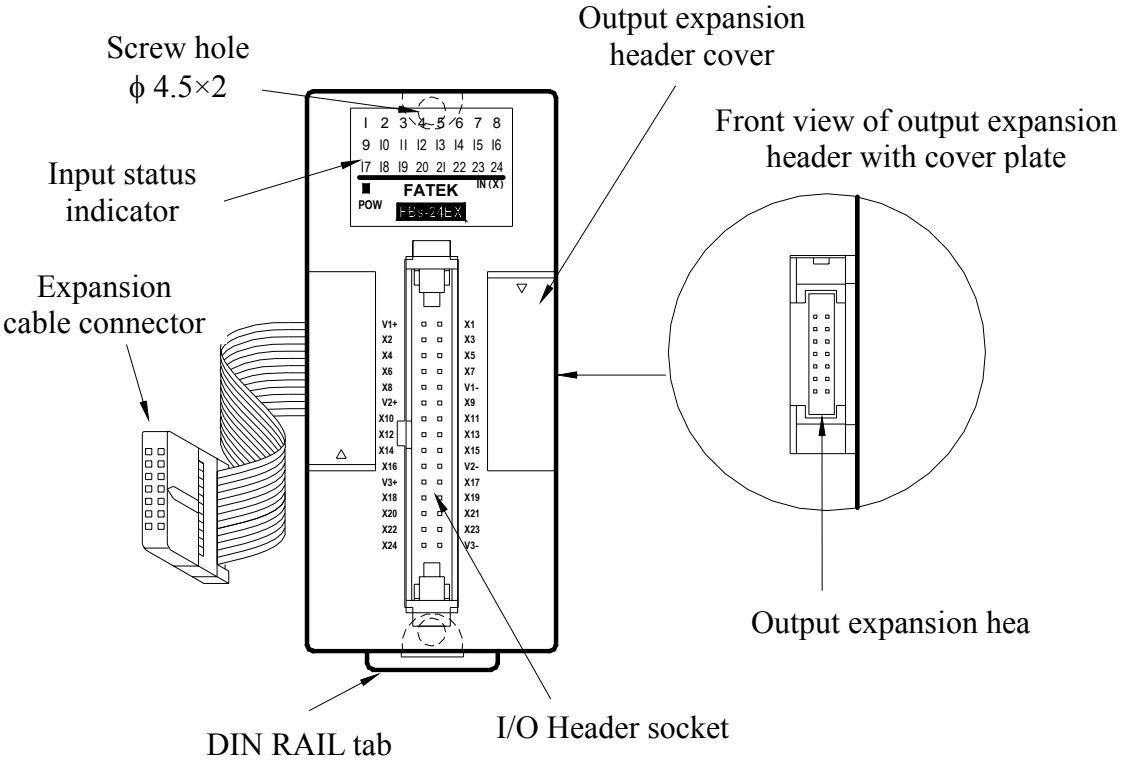
- Expansion unit/module with 60mm width case: (-16EA, -16EY, -20EX)



- Expansion module with 40mm width case: (-8EA, -8EY, -8EX, -6AD, -2DA, -4DA, -4A2D, -7SG△, -TC6, -RTD6, -CM5H)

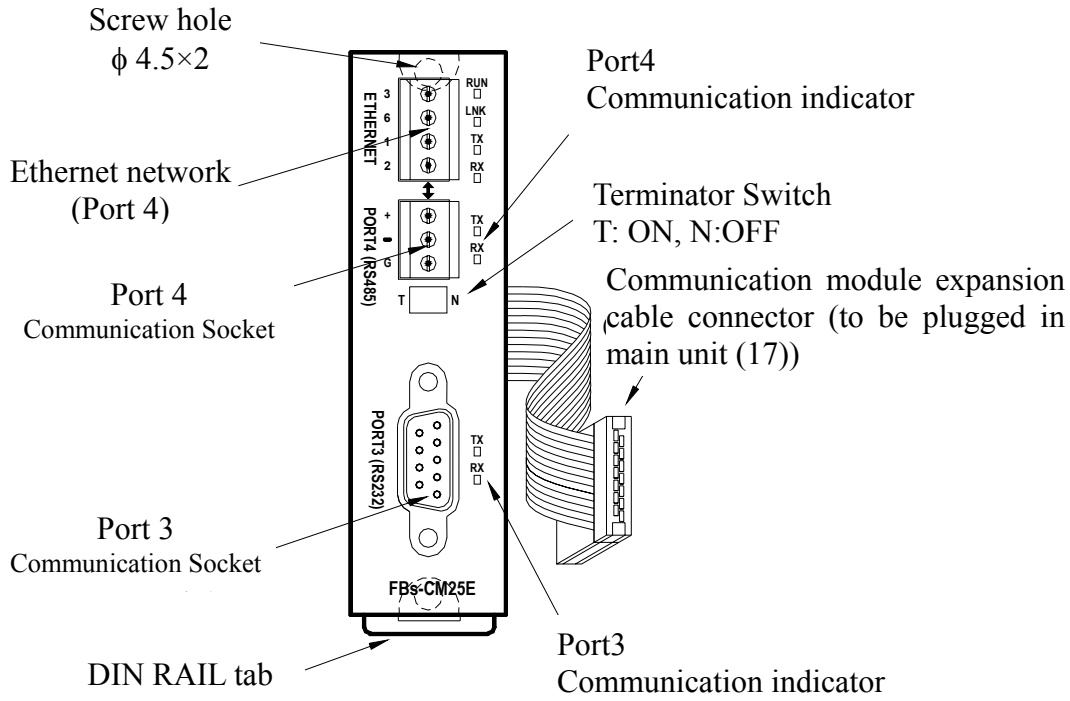


- Expansion module with 40mm width case: (-24EX, -24EYT, -32DGI)



1.3 Appearance of Communication Expansion Module

The Communication Module (CM) of FBS-PLC has a 25mm-width case, which can be used in the following seven modules: -CM22, -CM25, -CM55, -CM25E, -CM55E, -CM25C, -CM5R.



1.4 List of FBs-PLC Models

Item Name	Model Number	Specifications
NC Control Main Unit	FBs-20MN□◇Δ–◎	2 PTs 750KHz 5VDC differential input, 10 PTs 24VDC digital input (20KHz), 2 PTs 750KHz 5VDC differential output, 6 PTs (R/T/S) digital output (Model "T" 6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
	FBs-32MN□◇Δ–◎	4 PTs 750KHz 5VDC digital differential input, 16 PTs 24VDC digital input (20KHz for 12 PTs), 4 PTs 750KHz 5VDCdigital differential output, 8 PTs (R/T/S) digital output (Model "T" 4 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
	FBs-44MN□◇Δ–◎	8 PTs 750KHz 5VDC digital differential input, 20 PTs 24VDC digital input (20KHz for 8 PTs), 8 PTs 750KHz 5VDCdigital differential output, 8 PTs (R/T/S) digital output (Model "T" 4 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
Advanced Main Unit	FBs-10MC□◇Δ–◎	6 PTs 24VDC digital input (2 PTs 100KHz＋4 PTs 20KHz), 4 PTs (R/T/S) digital output (Model "T" 2 PTs 100KHz＋2 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, I/O is not expandable
	FBs-14MC□◇Δ–◎	8 PTs 24VDC digital input (2 PTs 100KHz＋6 PTs 20KHz), 6 PTs (R/T/S) digital output (Model "T" 2 PTs 100KHz＋4 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, I/O is not expandable
	FBs-20MC□◇Δ–◎	12 PTs 24VDC digital input (2 PTs 100KHz＋10 PTs 20KHz), 8 PTs (R/T/S) digital output (Model "T" 2 PTs 100KHz＋6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC

Item Name		Model Number	Specifications
		FBs-24MC□◇Δ–◎	14 PTs 24VDC digital input (2 PTs 100KHz＋12 PTs 20KHz), 10 PTs (R/T/S) digital output (Model “T” 2 PTs 100KHz＋6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
		FBs-32MC□◇Δ–◎	20 PTs 24VDC digital input (2 PTs 100KHz＋14 PTs 20KHz), 12 PTs (R/T/S) digital output (Model “T” 2 PTs 100KHz＋6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
		FBs-40MC□◇Δ–◎	24 PTs 24VDC digital input (2 PTs 100KHz＋14 PTs 20KHz), 16 PTs (R/T/S) digital output (Model “T” 2 PTs 100KHz＋6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
		FBs-60MC□◇Δ–◎	36 PTs 24VDC digital input (2 PTs 100KHz＋14 PTs 20KHz), 24 PTs (R/T/S) digital output (Model “T” 2 PTs 100KHz＋6 PTs 20KHz output), 1 RS232 or USB port (expandable up to 5), built-in RTC, detachable terminal block
Basic Main Unit		FBs-10MA□◇Δ–◎	6 PTs 24VDC digital input (up to 10KHz in 4 PTs), 4 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3), I/O is not expandable
		FBs-14MA□◇Δ–◎	8 PTs 24VDC digital input (up to 10KHz in 4 PTs), 6 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3), I/O is not expandable
		FBs-20MA□◇Δ–◎	12 PTs 24VDC digital input (up to 10KHz in 4 PTs), 8 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3)
		FBs-24MA□◇Δ–◎	14 PTs 24VDC digital input (up to 10KHz in 4 PTs), 10 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3)
		FBs-32MA□◇Δ–◎	20 PTs 24VDC digital input (up to 10KHz in 4 PTs), 12 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3)
		FBs-40MA□◇Δ–◎	24 PTs 24VDC digital input (up to 10KHz in 4 PTs), 16 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3)
		FBs-60MA□◇Δ–◎	36 PTs 24VDC digital input (up to 10KHz in 4 PTs), 24 PTs (R/T/S) digital output (Model “T” has 4 PTs 10KHz output), one RS232 or USB port (can be expanded up to 3)
Expansion Power		FBs-EPOW-◎	Power supply for expansion module, with single 5VDC and dual 24VDC voltage output and up to 20VA capacity
Digital I/O Module	**Digital Expansion Unit**	FBs-24EAP□◇–◎	14 PTs 24VDC digital input, 10 PTs (R/T/S) digital output, built-in power supply
		FBs-40EAP□◇–◎	24 PTs 24VDC digital input, 16 PTs (R/T/S) digital output, built-in power supply
		FBs-60EAP□◇–◎	36 PTs 24VDC digital input, 24 PTs (R/T/S) digital output, built-in power supply
	Digital Expansion Unit	FBs-8EA□◇	4 PTs 24VDC digital input, 4 PTs (R/T/S) digital output
		FBs-8EX	8 PTs 24VDC digital input
		FBs-8EY□◇	8 PTs (R/T/S) digital output
		FBs-16EA□◇	8 PTs 24VDC digital input, 8 PTs (R/T/S) digital output
		FBs-16EY□◇	16 PTs (R/T/S) digital output
		FBs-20EX	20 PTs 24VDC digital input
		FBs-24EA□◇	14 PTs 24VDC digital input, 10 PTs (R/T/S) digital input
		FBs-40EA□◇	24 PTs 24VDC digital input, 16 PTs (R/T/S) digital output
		FBs-60EA□◇	36 PTs 24VDCdigital input, 24 PTs (R/T/S) digital output
	High-Density Digital Expansion Module	FBs-24EX	24 PTs high-density 24VDC digital input, 30-Pin Header connector
		FBS-24EYT	24 PTs high-density transistor Sink type digital output (0.1A max.), 30-Pin Header connector

Item Name		Model Number	Specifications
Numeric I/O Module	**Numeric I/O Expansion Module**	FBs-7SG1	1 set (8 digits) 7 segment LED display (or 64 PTs independent LED) output display module, 16-PinHeader connector
		FBs-7SG2	2 set (16 digits) 7 segment LED display (or 128 PTs independent LED) output display module, 16-PinHeader connector
		FBs-32DGI	8 set 4 digits (total 32 digits) Thumbwheel switch (or 128 PTs independent switch) multiplex input module, 30-Pin Header connector
	Analog Expansion Module	FBs-6AD	6 channel, 14 bits analog input module (-10V~0V~+10V or -20mA~0mA~+20mA)
		FBs-2DA	2 channel, 14 bits digital output module (-10V~0V~+10V or -20mA~0mA~+20mA)
		FBs-4DA	4 channel, 14 bits digital output module (-10V~0V~+10V or -20mA~0mA~+20mA)
		FBs-4A2D	4 channel, 14 bits analog input＋2 channel, 14 bits digital output combo analog module (-10V~0V~+10V or -20mA~0mA~+20mA)
	Tempera-ture Input Module	FBs-TC6	6 channel thermocouple temperature input module with 0.1℃ resolution
		FBs-RTD6	6 channel RTD temperature input module with 0.1℃ resolution
		FBs-TC16	16 channel thermocouple temperature input module with 0.1℃ resolution
		FBs-RTD16	16 channel RTD temperature input module with 0.1℃ resolution
Communication Expansion Module		FBs-CM22	2 port RS232 (Port3＋Port4) communication module
		FBs-CM55	2 port RS485 (Port3＋Port4) communication module
		FBs-CM25	1 port RS232 (Port3)＋1 port RS485 (Port4) communication module
		FBs-CM25E	1 port RS232 (Port3)＋1 port RS485 (Port4)＋Ethernet network interface communication module
		FBs-CM55E	1 port RS485 (Port3)＋1 port RS485 (Port4)＋Ethernet network interface communication interface
		FBs-CM25C	General purpose RS232 ◄► RS485 Converter with optical isolation
		FBs-CM5R	General purpose RS485 Repeater with optical isolation
		FBs-CM5H	General purpose 4-port RS485 HUB with optical isolation
Communication Expansion Board		FBs-CB2	1 port RS232 (Port2) communication board
		FBs-CB22	2 port RS232 (Port1＋Port2) communication board
		FBs-CB5	1 port RS485 (Port2) communication board
		FBs-CB55	2 port RS485 (Port1＋Port2) communication board
		FBs-CB25	1 port RS232 (Port1)＋1 port RS485 (Port2) communication board
Communication Cable		FBs-232P0-9F-150	FBs-Main unit Port0 RS232 to 9Pin female D-Sub communication cable, 150cm long
		FBs-232P0-9M-400	FBs-Main unit Port0 RS232 to 9Pin male D-Sub communication cable, 400cm long
		FBs-USBP0-180	FBs-Min unit Port0 USB communication cable (standard USB A ◄► B)
Memory Pack		FBs-PACK	FBs-PLC Program memory pack with 20Kword program, 20Kword register, and write protection switch
Programming Device		FP-07C	Hand held programmer for FBs-PLC
		WinProladder	WinProladder Programming software for Windows
Others		FATEK Comm. Server	FATEK DDE communication server
		FBS-XTNR	Extension cable adapter
		HD30-22AWG-200	Include 22AWG I/O cable for 30Pin Header connector, 200cm long (for FBs-24EX, -24EYT, and -32DGI)

Item Name	Model Number	Specifications
7 Segment LED Display Board	DB.56 (DB.56LEDR)	0.56″ ×8 7 segment display board (with red LED installed)
	DB.8 (DB.8LEDR)	0.8″ ×8 7 segment display board (with red LED installed)
	DB2.3 (DB2.3LEDR)	2.3″ ×8 7 segment display board (with red LED installed)
	DB4.0 (DB4.0LEDR)	4.0″ ×4 7 segment display board (with red LED installed)
Simple People-Machine Interface	FB-DAP-B(R)	16×2 LCD character display, 20key keyboard, 24VDC power supply, RS-485 communication interface (suffixed R means wireless read card module included)
	FB-DAP-C(R)	16×2 LCD character display, 20key keyboard, 5VDC power supply, RS232 communication interface (suffixed R means wireless read card module included)
Wireless Card	CARD-1	Read-only wireless card (for FB-DAP-BR/CR)
	CARD-2	Read/Write wireless card(for FB-DAP-BR/CR)
Education and Training Kit	FBs-TBOX	46cm × 32cm × 16cm suitcase, containing FBs-24MCT main unit, FBs-CM25E communication module (RS232＋RS485＋Ethernet network), 14 simulated input switches, 10 external relay isolation output, Doctor terminal outlet I/O, peripherals such as stepping motor, encoder, 7 segment display, 10 ϕ LED indicator, thumbwheel switch, and 16key keyboard.

1. □: hollow－relay output，T－transistor output，S－TRIAC output
2. ◇: hollow－Sink（NPN），J－Source（PNP）
3. Δ: hollow－built-in RS232 port，U－built-in USB port
4. ◎: hollow－100~240VAC power supply， D－24VDC power supply
5. Specifications are subject to changes without further notice.

1.5 Specifications of Main Unit

"*" Default Settings

Item				Specification	Note
Execution Speed				0.33uS ／ per Sequence Command	
Space of Control Program				20K Words	
Program Memory				FLASH ROM or SRAM＋Lithium battery for Back-up	
Sequence Command				36	
Application Command				300 (113 types)	Include Derived Commands
Flow Chart (SFC) Command				4	
Single Point《BIT Status》	X	Output Contact(DI)		X0～X255 (256)	Corresponding to External Digital Input Point
	Y	Output Relay(DO)		Y0～Y255 (256)	Corresponding to External Digital Output Point
	TR	Temporary Relay		TR0～TR39 (40)	
	M	Internal Relay	Non-retentive	M0～M799 (800)*	Can be configured as retentive type
				M1400～M1911 (512)	
			Retentive	M800～M1399 (600)*	Can be configured as non-retentive type
		Special Relay		M1912～M2001 (90)	

	S	Step Relay		Non-retentive	S0～S499 (500)*	S20~S499 can be configured as retentive type
				Retentive	S500～S999 (500)*	Can be configured as non-retentive type
	T	Timer "Time Up" Status Contact			T0～T255 (256)	
	C	Counter "Count Up" Status Contact			C0～C255 (256)	
Register《WORD Data》	TMR	Current Time Value Register	0.01S Time base		T0～T49 (50)*	T0 ~ T255 Numbers for each time base can be flexibly adjusted.
			0.1S Time base		T50～T199 (150)*	
			1STime base		T200～T255 (56)*	
	CTR	Current Counter Value Register	16 Bits	Retentive	C0～C139 (140)*	Can be configured as non-retentive type
				Non-retentive	C140～C199 (60)*	Can be configured as retentive type
			32 Bits	Retentive	C200～C239 (40)*	Can be configured as non-retentive type
				Non-retentive	C240～C255 (16)*	Can be configured as retentive type
	HR DR	Data Register		Retentive	R0～R2999 (3000)*	Can be configured as non-retentive type
					D0～D3999 (4000)	
				Non-retentive	R3000～R3839 (840)*	Can be configured as retentive type
	HR ROR			Retentive	R5000～R8071 (3072)*	When not configured as ROR, it can serve as normal register (for read/Write)
				Read-only Register	R5000 ～ R8071 can be configured as ROR, default setting is (0)*	ROR is stored in special ROR area and not consume program space
				File Register	F0～F8191 (8192)*	Must save/retrieved via special commands
	IR	Input register			R3840～R3903 (64)	Corresponding to external numeric input
	OR	Output Register			R3904～R3967 (64)	Corresponding to external numeric output
	SR	Special System Register			R3968～R4167 (197) R4000	Except R4152～4154
	〈Special Register〉	0.1mSHigh Speed Timer register			R4152～R4154 (3)	
		High Speed Counter Register	Hardware(4 sets)		DR4096～DR4110 (4×4)	
			Software (4 sets)		DR4112～DR4126 (4×4)	
		Real Time Calendar Register			R4128 (sec) / R4128 (min) / R4130 (hour) / R4131 (day) / R4132 (month) / R4133 (year) / R4134 (week)	Not available in MA model
	XR	Index Register			V、Z (2), P0～P9 (10)	
Interrupt Control		External Interrupt Control			32 (16 point input positive/negative ends)	
		Internal Interrupt Control			8 (1, 2 3, 4, 5, 10, 50, 100mS)	
0.1mS High Speed Timer (HST)					1 (16bits), 4 (32bits, derived from HHSC)	
High Speed Counter	Hardware High Speed Counter (HHSC) /32PTs			Channels	Up to 4	• Total number of HHSC and SHSC is 8. • HHSC can change into High Speed Timer with 32 bits/0.1mS Time base.
				Counting mode	8 (U/D, U/D×2, K/R K/R×2, A/B, A/B×2, A/B×3 A/B×4)	
				Counting frequency	Up to 100KHz (single-end input) or 750KHz (differential input)	
	Software High Speed Counter (SHSC) /32PTs			Channels	Up to 4	
				Counting mode	3 (U/D、K/R、A/B)	

		Counting frequency	Maximum sum up to 10KHz	
Communication Interface	Port0 (RS232 or USB)		Communication Speed 4.8Kbps ～ 921.6Kbps (9.6Kbps)*	
	Port1～Port4 (RS232, RS485 or Ethernet)		Communication Speed 4.8Kbps ～ 921.6Kbps (9.6Kbps)*	Port1～4 talk FATEK or Modbus RTU Master/Slave Communication Protocol
	Maximum Connections		254	
NC Positioning Output (PSO)	Number of Axes		Up to 4	
	Output Frequency		Up to 100KHz (single-end output), 750KHz (differential output)	
	Output Pulse Mode		3 (U/D、K/R、A/B)	
	Positioning Language		Special Positioning Programming Language	
PWM Output	Number of Points		Up to 4	
	Output Frequency		72Hz ～ 18.432KHz (with 0.1% resolution) 720Hz～184.32KHz (with 1% resolution)	
Captured input			All input points on Main unit can be configured as Captured Input (up to 36 points).	
Setting of Digital Filter		X0～X15	Time Constant 0.1mS～1.5mS adjustable by step of 0.1ms	Chosen by frequency at high frequencies
			Time Constant 1mS～15mS adjustable by step of 1mS	Chosen by Time constant at low frequencies
		X16～X35	Time Constant 1mS～15mS	

1.6 Environmental Specifications

Item			Specification	Note
Operating Ambient Temperature	Enclosure Space	Minimum	5°C	Permanent Installation
		Maximum	40°C	
	Open Space	Minimum	5°C	
		Maximum	55°C	
Storage Temperature			-25°C～+70°C	
Relative Humidity (non-condensing, RH-2)			5%～95%	
Pollution Level			Degree II	
Corrosion Resistance			By IEC-68 Standard	
Altitude			≦2000m	
Vibration	Fixated by DIN RAIL		0.5G, for 2 hours each along the 3 axes	
	Secured by screws		2G, for 2 hours each along the 3 axes	
Shock			10G, 3 times each along the 3 axes	
Noise Suppression			1500Vp-p, width 1us	
Withstand Voltage			1500VAC, 1 minute	L, N to any terminal

⚠ Warning

The listed environmental specifications are for FBs-PLC under normal operation. Any operation in environment not conform to above conditions should be consulted with FATEK.