Safety Notes

Please Read Before Use

This manual should be read and understood before attempting to install, operate, maintain or overhaul a PLC. The user should be completely familiar with all associated documentation, safety practices, guidelines and necessary device knowledge before move on accordingly.

Two symbols are used to highlight the safety notes mentioned in this manual: DANGER and CAUTION. They are listed below with brief descriptions.

DANGER	Indicates that misoperation could cause severe consequence like death or major injury.
CAUTION	Indicates that misoperation could cause physical or property damage.

In addition, the CAUTION warnings also indicate that severe consequences are possible under certain conditions. Please make sure all operations are carried out in accordance with these guidelines to avoid such consequences.

Please keep this manual properly for reference whenever necessary and distribute it to the end users.

Safety Notes

Please Read Before Use

1. Design Guidelines

⚠ DANGER	Page Ref.
• Please set up an external safety circuit for the PLC, so that if the external power fails or the PLC breaks down, the system can still operate with safety.	
• Any misoperation or mis-output could possibly cause accident.	
• External protective circuits should be designed for a PLC to avoid mechanical damage. E.g. Emergency Stop, Forward/Reverse Inter-Lock or Upper/Lower Limit Positioning.	
• A PLC CPU detects abnormal states through self-examine functions such as Watch Dog Timer (WDT) and will then switch off all its outputs. Anyway, it is not able to detect the state of the input/output control circuits and thus may not be able to control the output when error occurs. So in order to protect the mechanical equipment, some external safety circuits and agencies should be designed.	12 41
• A PLC may not be able to control the ON/OFF state when error occurs to its output relay and transistor, etc. So for crucial output signals which could cause major accident, some external safety circuit and agencies should be designed, to make sure the mechanical devices operate with safety.	

2. Installation Guidelines

⚠ CAUTION	Page Ref.
• The product should be used under certain conditions as stated in "1-6 General Specifications" of this manual. • The product should NOT be used under the following conditions: (1) Excessive or conductive dust, corrosive or flam. gas, or oily smoke. (2) Excessive heat, moisture or rain, condensation, regular impact shocks or excessive vibration. The above-mentioned conditions may cause electric shock, fire or misoperation and damage the product. • Take special care not to allow debris to fall inside the unit during installation e.g. making screw holes, cut wires etc, for it may cause fire, product damage or mis-reaction. • Once the installation is complete, remove the protective paper band on the PLC to prevent fire, product damage or mis-reaction caused by the overheating. • Install the connection cables and expansion modules properly, and make sure they are fixed, for loose contact may cause mis-reaction. • DO NOT install the product on the basement, top or along the vertical direction of a switchboard, to avoid overheating. • Ensure that there is a space larger than 50 mm around the installed PLC and it is kept as far as possible from high-voltage cables, high-voltage equipment and power equipment.	29

3. Wiring Guidelines

DANGER	Page Ref.
• Cut all the external power during installation or wiring, to avoid electric shock or product damage. • Close the terminal cover before switch on the power supply after installation or wiring, to avoid electric shock.	31

CAUTION	Page Ref.
• When wiring AC supplies, it must be connected to the correct input terminal, for if it is connected to DC (Direct Current) input/output terminal or DC power terminal, the PLC will be damaged.	31
• DO NOT connect the 24V OUT ⊞ terminal of a PLC main unit to the 24V OUT ⊞ terminal of an extension unit, or to the ⊞ terminal of an external power supply, for it may damage the PLC.	35
• DO NOT do any external wiring for the empty terminals ⊡ of a PLC, for it may damage the product.	
• Connect the grounding terminal of the main unit using the class 3 grounding standard, but DO NOT ground it with major power systems. (Refer to 1-6)	41

4. Operation and Maintenance Guidelines

DANGER	Page Ref.
• DO NOT contact the terminal when the power supply switched on, to avoid electric shock or product mis-reaction. • Switch off the power supply before clean or tighten the terminal, to avoid electric shock. • Carry program-change-in-operation (force output, RUN, STOP, etc) ONLY after carefully read and understand this manual and safety is ensured, for misoperation may cause equipment damage or accident.	53

CAUTION	Page Ref.
• Switch off the power supply before assemble or overhaul the selected optional units, to avoid damage to the expansion or main units. • Switch off the power supply before assemble or overhaul the connection cable, to avoid damage or misoperation. • DO NOT assemble or overhaul the product cage, or alter it by yourself, for it may cause product damage, mis-reaction or fire. • Contact the nearest distributor or Vigor Electric Corp directly for any product repairing matters.	53

5. Recycling Guidelines

⚠ CAUTION	Page Ref.
• Dispose the product as industrial waste when it is to be discarded as worthless.	58

TOC

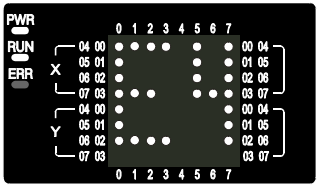
About the Manual

When purchasing VH series PLC main unit, a copy of this hardware manual will be attached. For programming tutorial or instruction tables, please refer to the “Programming Manual for M, VB and VH Series PLC”.

Manual Name	Content
Hardware Manual for VH Series PLC (This manual)	• Introduction to the VH series PLC • Specification and guidelines for the operation environment, wiring and installation of the VH series PLC • Specification and instructions for the installation and operation of the selected optional units. • Instructions for the operation, maintenance and fault repair of the PLC.
Programming Manual for M, VB and VH Series PLC	• Introduction to the various components of the M, VB and VH series PLC. • Introduction to the basic and applied instructions. • Programming guidelines.

About the Trademark

Great, Reliable Performance at a Budget Price



◇ Error Code Display Function

- The machine maintenance work is made easier by this practical powerful function.

◇ Complete Product Model Collections, Cost-Saving Customized Module Assembling

- 8 models of main unit to be chosen from: 10/14/20/24/28/32/40/60 points.
- Many I/O extension module models to provide complete extension ability: 4X/4Y～16X/16Y, etc.

◇ Complete and Powerful Communication Ability

- Built-in RS-232 interface can connect with PC or HMI (Human Machine Interface).
- Can extend to a local area monitor network.

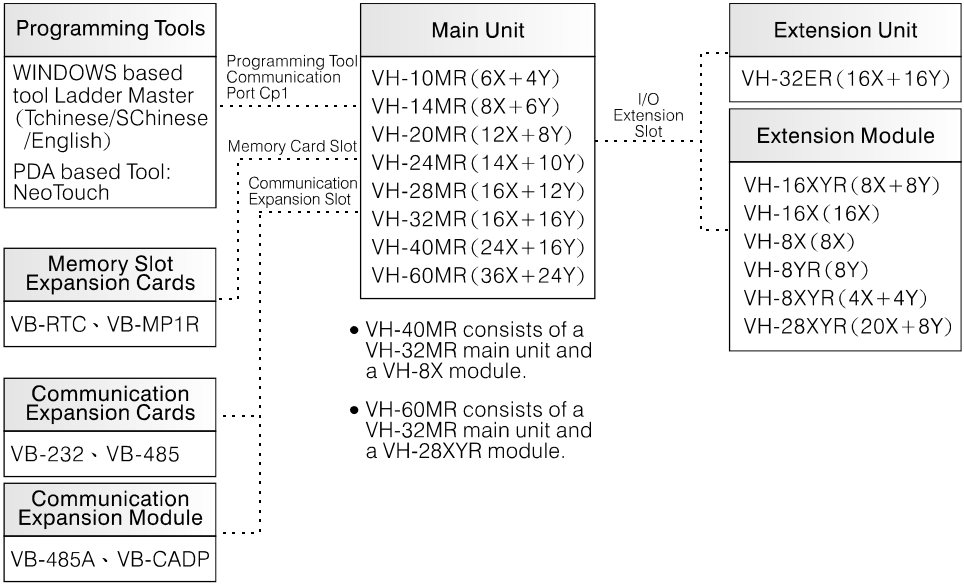
◇ Small & Compact Design to Save Install Space

◇ Complete and Powerful System Functions

- No-battery program storage device:Flash ROM.
- Download program with component and program comments to make the maintenance work easier.
- Complete collection of instructions, including compare point instruction, makes the PLC programming work easier.
- Password Lock function on the PLC program, fully protect the intelligent property.
- The RTC (Real Time Clock) expansion card can set timer and run periodical automated control.
- Wide range voltage design (AC85V～264V) of the power input.

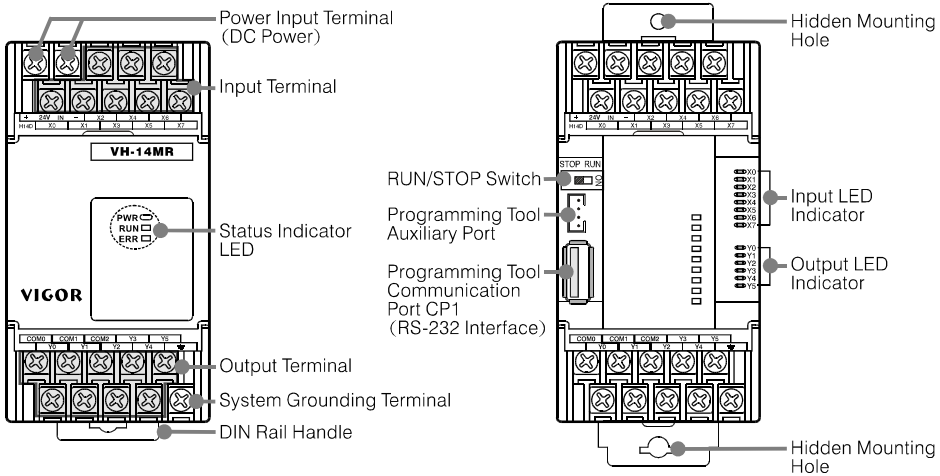
1. VH Series PLC Introductions

1-1 System Configuration



1-2 Component Names

VH-10/14MR

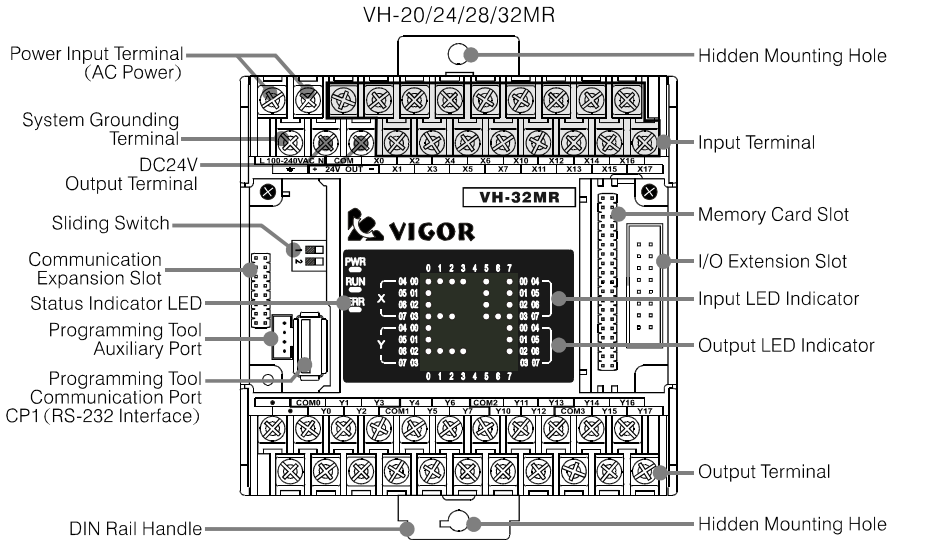


DO NOT connect any PC USB interface to the programming tool communication port for the comm. Interface is RS-232 although it is an USB A-type connector.

CAUTION Use the MWPC-200 cable to connect the programming tool communication port to PC RS-232 interface. Use VBUSB-200 cable instead if the PC has no RS-232 interface.

The VH-10/14 MR main unit has no comm. expansion/memory card/IO extension slots.

1. VH Series PLC Introductions

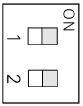


CAUTION DO NOT connect any PC USB interface to the programming tool communication port for the comm. Interface is RS-232 although it is an USB A-type connector. Use the MWPC-200 cable to connect the programming tool communication port to PC RS-232 interface. Use VBUSB-200 cable instead if the PC has no RS-232 interface.

• Status Indicator LED

LED	Action	Status
PWR (GREEN)	ON	Power in Supply
	OFF	Power Cut
RUN (GREEN)	ON	RUN
	OFF	STOP
ERR (RED)	ON	System Error (Stop Running)
	FLICKERING	Abnormal State (Stop Running)
	OFF	Normal State

• Sliding Switch

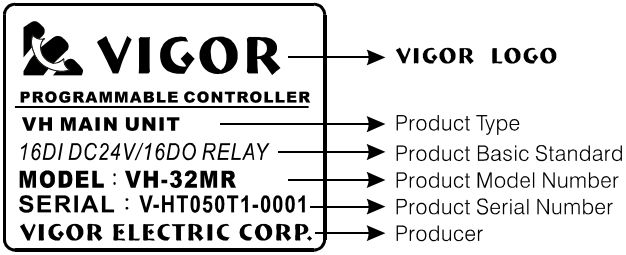


Switch Number	Function	OFF	ON
1	RUN/STOP Switch	STOP	RUN
2	I/O Display Range Switch	X0~X37 Y0~Y37	X40~X77 Y40~Y77

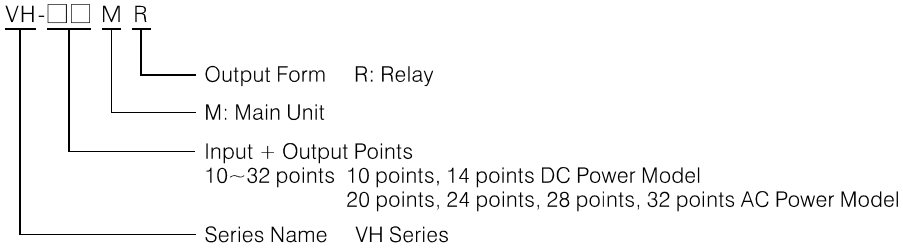
• The Programming Tool Auxiliary Port is used to connect to HMI or SCADA (Supervisor Control and Data Acquisition) System. This auxiliary port is parallel linked with the Programming Tool Communication Port, so they cannot be used at the same time.

1-3 Model Numbering

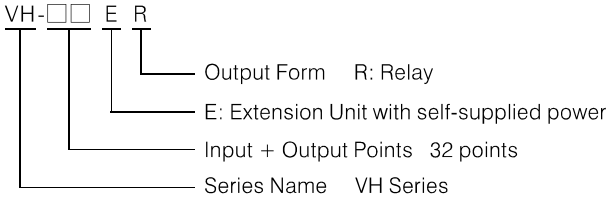
• Model Numbering Tag (Pasted on the right side of a PLC)



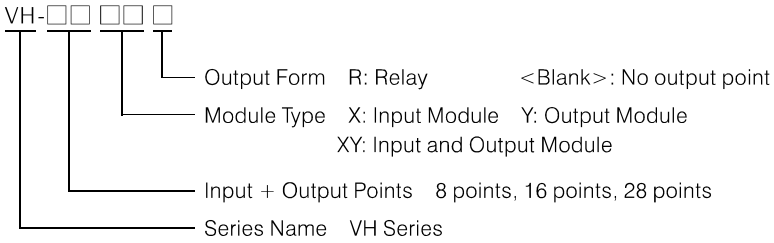
• Main Unit Model Numbering



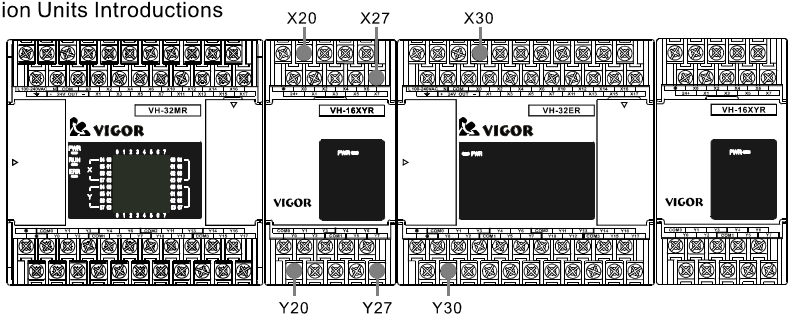
- Extension Unit Model Numbering



- Extension Module Model Numbering



1-4 Extension Units Introductions



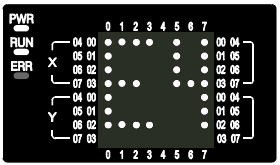
- VH-10MR and VH-14MR do not have the I/O Extension function
- VH Series Main Unit always occupies the I/O address X0~X17/Y0~Y17, and thus the first Expansion Unit /Module will use the I/O address from X20/Y20 onwards.
- VH-8XY Extension Module occupies 8 input points and 8 output points.
- VH-28XYR Extension Module occupies 24 input points and 8 output points.
- Maximum output/input points: 128 points X0~X77 /Y0~Y77
- VH-40MR consists of a VH-32MR Main Unit and a VH-8X Module, occupies I/O addresses X0~X27/Y0~Y17.
- VH-60MR consists of a VH-32MR Main Unit and a VH-28XYR Module, occupies I/O addresses X0~X47/Y0~Y27.
- VH series Main Unit and Extension Unit have self-supply power units, but the Extension Module does not. So the Extension Module needs to get power from a Main Unit or Expansion Unit.
- 2 Conditions must be met when the Main Unit or Extension Unit connect to other modules:
  (1) The number of modules connected after the Main Unit or Extension Unit should be <= 6.
  (2) The total number of ON relays in the Main Unit or Extension Unit and the Extension Modules connected after them should be <= 32.

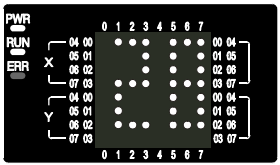
1-5 Error Code Display Function Introductions

The Multi-Functional Display on the Main Unit panel has an Error Code Display function besides the I/O Display function. It can display 109 error codes from 01～99 and E0～E9. This function is very practical and it makes the device maintenance work much easier than before.

The D9080 special register controlled Multi-Functional Display of VH Series PLC has the following functions:

Value of D9080	MFD Function
0	Displays Input/Output status of PLC
1～99	Displays 01～99 numbers
100～109	Displays E0～E9 Error Code

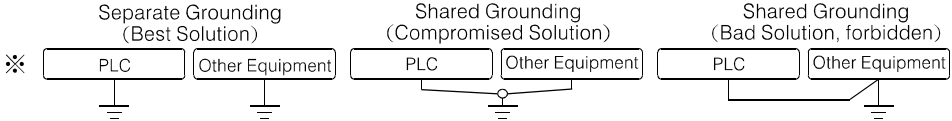




Design Guidelines ⚠ DANGER

- Please set up an external safety circuit for the PLC, so that if the external power fails or the PLC breaks down, the system can still operate with safety.
- Any misoperation or mis-output could possibly cause accident.
- External protective circuits should be designed for a PLC to avoid mechanical damage. E.g. Emergency Stop, Forward/Reverse Inter-Lock or Upper/Lower Limit Positioning.
- A PLC CPU detects abnormal states through self-examine functions such as Watch Dog Timer (WDT) and will then switch off all its outputs. Anyway, it is not able to detect the state of the input/output control circuits and thus may not be able to control the output when error occurs. So in order to protect the mechanical equipment, some external safety circuits and agencies should be designed.
- A PLC may not be able to control the ON/OFF state when error occurs to its output relay and transistor, etc. So for crucial output signals which could cause major accident, some external safety circuit and agencies should be designed, to make sure the mechanical devices operate with safety.

Item	Specifications
Work Ambient Temperature	0~55°C / 32~131°F
Storage Ambient Temperature	–20~70°C /–4~158°F
Work Ambient Humidity	10~90% RH, (at 25°C / 77°F, no condensation)
Storage Ambient Humidity	10~90% RH, (at 25°C / 77°F, no condensation)
Vibration Tolerance	10~55 Hz with amplitude of 0.075 mm / 0.30 inch and acceleration along X, Y and Z axes each for 80 min (8 min/Cycle × 10 times = 80 min) at 55 ~ 150 Hz with 1G.
Shock Tolerance	10 G along X, Y and Z axes each for three times
Noise Immunity	Noise Simulator 1500 Vp-p, 1μS Pulse Width and 25~60Hz Frequency
Dielectric Strength	1500VAC 1 min between AC terminal and rack panel or 500VAC 1 min between DC terminal and rack panel
Insulation Resistance	5 MΩ or above at DC 500V between AC terminal and rack panel
Grounding	Class-3 Grounding (DO NOT ground with major power supply equipment.) ※
Environmental Condition	Keep away from corrosive gas or excessive dust.



1-7 Performance Specification

Item			Specifications
Operation Control Method			Cyclic Operation by Stored Program
Programming Language			Electric Ladder Diagram + SFC
I/O Control Method			Batch Processing
Operation Processing Rate	Basic Instruction		0.375~12.56 μs
	Applied Instruction		Several μs ~ Several hundreds of μs
Number of Instructions	Basic Instruction		27 (including LDP, LDF, ANDP, ANDF, ORP, ORF, INV)
	Stepladder Instructions		2
	Applied Instructions		73
Memory Capacity	Program Capacity		Built-in 4 K Steps Flash ROM
	Component Comment Capacity		2730 comments (16 characters or 8 double-byte characters for each)
	Program Comment Capacity		20,000 characters or 10,000 double-byte characters
Max. Input / Output Points			128 points: X0 ~ X77, Y0 ~ Y77
Internal Relay	Auxiliary Relay (M)	General	384 points: M0 ~ M383
		Latched	128 points: M384 ~ M511
		Special	256 points: M9000 ~ M9255
	State Relay (S)	Initial	10 points: S0 ~ S9 (Latched)
		Latched	118 points: S10 ~ S127
Timer (T)		100mS	63 pts when M9028 OFF: T0 ~ T62 (Timer range: 0.1 ~ 3276.7 sec.)
		10mS	31 pts when M9028 ON: T32 ~ T62 (Timer range: 0.01 ~ 327.67 sec.)
		1mS	1 point: T63 (Timer range: 0.001 ~ 32.767 sec.)
Counter (C)	16-bit Up	General	16 points: C0 ~ C15
		Latched	16 points: C16 ~ C31

Item			Specifications
High Speed Counter (C)	32-bit Up/Down, Latched	1-phase Counter	11 points: C235 ~ C245 (Signal Frequency: 10 kHz Max.)
		2-phase Counter	5 points: C246 ~ C250 (Signal Frequency: 10 kHz Max.)
		A/B Phase Counter	4 points: C251 ~ C254 (Signal Frequency: 5 kHz Max.)
Data Register (D)		General	128 points: D0 ~ D127
		Latched	128 points: D128 ~ D255
		Special	256 points: D9000 ~ D9255
		Index	16 points: V0 ~ V7, Z0 ~ Z7
Pointer		Call Pointer (P)	64 points: P0 ~ P63
		Interrupt Pointer (I)	15 points: 6 points for external interrupt, 3 points for timer interrupt, and 6 points for counter interrupt
		Nest Pointer (N)	8 points: N0 ~ N7
Constants Range	Decimal (K)	16 Bits	–32768 ~ 32767
		32 Bits	–2147483648 ~ 2147483647
	Hexadecimal (H)	16 Bits	0H ~ FFFFH
		32 Bits	0H ~ FFFFFFFFH
Pulse Output			1 point, Max. 7 kHz
Programming Device Link Interface CP1			RS-232C, can connect to PC, HMI or MODEM directly.
Communication Link Interface CP2 (Optional)			RS-232C or RS-422 / RS-485, can connect to PC or HMI
Communication Link Interface CP3 (Optional)			RS-485, can connect to PC or HMI
Real Time Clock (Optional)			Displays year, month, day, hour, min., sec. and week
Error Code Display Function			Displays 109 error codes (01~99 and E0~E9)

1-8 Instruction Tables

Basic Instruction Table

Inst.	Function	Devices
LD	Initial logical operation A contact	X、Y、M、S、T、C
LDI	Initial logical operation B contact	X、Y、M、S、T、C
AND	Serial link of NO contacts	X、Y、M、S、T、C
ANI	Serial link of NC contacts	X、Y、M、S、T、C
OR	Parallel link of NO contacts	X、Y、M、S、T、C
ORI	Parallel link of NC contacts	X、Y、M、S、T、C
ANB	Serial link of multi. parallel circuits	—
ORB	Paral. link of multi. contact circuits	—
OUT	Final logical op. type coil drive	Y、M、S、T、C
SET	Sets component permanently ON	Y、M、S
RST	Resets comp. permanently OFF	Y、M、S、T、C、D
PLS	Rising edge pulse	Y、M
PLF	Falling/trailing edge pulse	Y、M

Inst.	Function	Devices
MC	Start of a master control block	N0～N7
MCR	End of a master control block	N0～N7
MPS	Stores current internal opr. Result	—
MRD	Reads current internal opr. Result	—
MPP	Pops currently stored result	—
NOP	No operation or null step	—
END	Force current prog. scan to end	—
LDP	Init. logical opr. rising edge pulse	X、Y、M、S、T、C
LDF	Init. logical opr. fall. edge pulse	X、Y、M、S、T、C
ANDP	Serial link of rising edge pulse	X、Y、M、S、T、C
ANDF	Serial link of falling edge pulse	X、Y、M、S、T、C
ORP	Paral. link of rising edge pulse	X、Y、M、S、T、C
ORF	Paral. link of falling edge pulse	X、Y、M、S、T、C
INV	Invert current internal opr. result	—

Stepladder Instruction Table

Instruction	Function	Devices
STL	Initiation of Stepladder	S
RET	End of Stepladder	—

Extension Unit Model Numbering

Type	FNC NO.	Title*			Function
		D		P	
Program Flow	00		CJ	P	Conditional Jump
	01		CALL	P	CALL subroutine
	02		SRET		Subroutine RETurn
	03		IRET		Interrupt RETurn
	04		EI		Enable Interrupt
	05		DI		Disable Interrupt
	06		FEND		First END
	07		WDT	P	Watch Dog Timer refresh
	08		FOR		Start of a FOR-NEXT loop
	09		NEXT		End of a FOR-NEXT loop
Compare and Move	10	D	CMP	P	CoMPare
	11	D	ZCP	P	Zone ComPare
	12	D	MOV	P	Move
	13		SMOV	P	Shift MOVe
	14	D	CML	P	CoMpLiment
	15		BMOV	P	Block MOVe n → n
	16	D	FMOV	P	Fill MOVe 1 → n
	17	D	XCH	P	EXCHange
	18	D	BCD	P	Converts BIN → BCD
	19	D	BIN	P	Converts BCD → BIN

Type	FNC NO.	Title*			Function
		D		P	
Arithmetic and Logical Operations	20	D	ADD	P	ADDition
	21	D	SUB	P	SUBtraction
	22	D	MUL	P	MULtiplication
	23	D	DIV	P	DIVision
	24	D	INC	P	INCrement
	25	D	DEC	P	DECrement
	26	D	WAND	P	Logic Word AND
	27	D	WOR	P	Logic Word OR
	28	D	WXOR	P	Logic Word eXclusive OR
Rotary and Shift	30	D	ROR	P	ROtation Right
	31	D	ROL	P	ROtation Left
	32	D	RCR	P	Rotation Right with Carry
	33	D	RCL	P	Rotation Left with Carry
	34		SFTR	P	Bit ShiFT Right
	35		SFTL	P	Bit ShiFT Left
	38		SFWR	P	ShiFt register WRite (FIFO)
	39		SFRD	P	ShiFt register ReaD (FIFO)

Type	FNC NO.	Title*			Function
		D		P	
Processing	40		ZRST	P	Zone ReSeT
	41		DECO	P	DECOde
	42		ENCO	P	ENCOde
High-speed Processing	50		REF	P	REFresh I/O
	53	D	HSCS		High Speed Counter Set
	54	D	HSCR		High Speed Counter Reset
	56		SPD		SPeed Detection
	57	D	PLSY		PuLSe Y output
	58		PWM		Pulse Width Modulation
Handy Instruction	62	D	ABSD		ABSolute Drum sequencer
	63		INCD		INCremental Drum sequencer
	66		ALT	P	ALTernate state
	67		RAMP		RAMP variable value
	73		SEGD	P	Seven SEGment Decoder
Others	167		TWR	P	Time WRites to RTC
	176		TFT		Timer (10 ms)
	177		TFH		Timer (100 ms)
	178		TFK		Timer (1 sec.)

Type	FNC NO.	Title*			Function
		D		P	
In-line Comparisons	224	D	LD=		LoaD when (S1) = (S2)
	225	D	LD>		LoaD when (S1) > (S2)
	226	D	LD<		LoaD when (S1) < (S2)
	228	D	LD<>		LoaD when (S1) ≠ (S2)
	229	D	LD<=		LoaD when (S1) ≤ (S2)
	230	D	LD>=		LoaD when (S1) ≥ (S2)
	232	D	AND=		AND when (S1) = (S2)
	233	D	AND>		AND when (S1) > (S2)
	234	D	AND<		AND when (S1) < (S2)
	236	D	AND<>		AND when (S1) ≠ (S2)
	237	D	AND<=		AND when (S1) ≤ (S2)
	238	D	AND>=		AND when (S1) ≥ (S2)
	240	D	OR=		OR when (S1) = (S2)
	241	D	OR>		OR when (S1) > (S2)
	242	D	OR<		OR when (S1) < (S2)
	244	D	OR<>		OR when (S1) ≠ (S2)
	245	D	OR<=		OR when (S1) ≤ (S2)
	246	D	OR>=		OR when (S1) ≥ (S2)

1-9 Special Components and Error Messages

In the tables below, the symbol "■" represents that the component cannot be driven by instructions and no data can be written into it. And for any component that is not listed below, it is reserved for system use, and cannot be driven by instructions and no data can be written into either.

Coil No.	Function
PLC Operation Status.	
■ M9000	Always-ON A Contact during RUN period
■ M9001	Always-OFF A Contact during RUN period
■ M9002	Initial Pulse A Contact, ON for a scan time
■ M9003	Initial Pulse B Contact, OFF for a scan time
■ M9004	Error occurs
Clock Pulse	
■ M9011	10ms cycles pulse. ON 5ms/OFF 5ms
■ M9012	100ms cycles pulse. ON 50ms/OFF 50ms
■ M9013	1sec. cycles pulse. ON 0.5Sec/OFF 0.5Sec
■ M9014	1min. cycles pulse. ON 30Sec/OFF 30Sec
System Status	
■ M9005	ON when battery of the RTC is low
■ M9018	ON when RTC installed in the Main Unit
M9028	OFF T32~T62 become 100ms counter
	ON T32~T62 become 10ms counter
M9031	Clear the Non-Latched area memory
M9032	Clear the Latched area memory
M9033	Not clear data memory when RUN → STOP.

Coil No.	Function
System Status	
M9034	All the outputs are disabled
M9039	Constant Scan Time set by D9039
Flag	
■ M9020	Zero Flag. Result of ADD or SUB is "0"
■ M9021	Borrow Flag. Borrow occurred to ADD or SUB
M9022	Carry Flag. Carry occurred to ADD or SUB
■ M9029	Execution complete flag for some instructions
Assigned Operation Mode of Applied Instructions	
M9024	Assign BMOV moving directions
M9025	Assign external HSC reset mode
M9026	Assign RAMP hold mode
M9168	Assign SMOV operation mode
Stepladder Instruction Flags	
M9040	Step Ladder move prevented
■ M9046	STL step is working
M9047	STL monitoring is enabled

Coil No.	Function
Interrupt Prevented	
M9050	Input interrupt I00□ is prevented.
M9051	Input interrupt I10□ is prevented.
M9052	Input interrupt I20□ is prevented.
M9053	Input interrupt I30□ is prevented.
M9054	Input interrupt I40□ is prevented.
M9055	Input interrupt I50□ is prevented.
M9056	Input interrupt I6□□ is prevented.
M9057	Input interrupt I7□□ is prevented.
M9058	Input interrupt I8□□ is prevented.
M9059	HSCounter interrupt I010~I060 disallow
Error Message	
■M9019	Real Time Clock setting error.
■M9066	Program CHECK SUM error.
■M9067	Operation error. PLC will keep running.
M9068	IOperation error latch.
Control and Monitor High Speed Counter Count. Direction	
■M9235 ~ ■M9245	When M92□□="OFF", C2□□ is up counter When M92□□="ON", C2□□ is down counter
■M9246 ~ ■M9254	When C2□□ is up counter, M92□□=OFF When C2□□ is down counter, M92□□=ON

Table for Special Registers

Coil No.	Function
PLC Operation Status	
D9000	Time Setting of Watch Dog Timer.(unit: 1ms)
■D9004	Error coil ID shows the source of the error.
■D9010	Current operation scan time (unit: 1ms)
■D9011	Min. scan time (unit: 1ms)
■D9012	Max. scan time (unit: 1ms)
System Status	
■D9001	Displays the PLC model and version. (※1)
■D9002	Capacity size of Memory. 2 for 2000 steps.
■D9003	Type of Memory. (※2)
D9020	X0~X7 input response time setting: 0~15ms.
D9039	Constant Scan Time setting.
Real Time Clock Data	
D9013	Second value. (0~59)
D9014	Minute value. (0~59)
D9015	Hour value. (0~23)
D9016	Day value. (1~31)
D9017	Month value. (1~12)
D9018	Year value: 2000~YYYY (4 digits)
D9019	Weekday value: 0 (Sun.) ~ 6 (Sat.)

Coil No.	Function		
Step Ladder Instructions			
■ D9040	1st active STL step	When M9047 ON, the step point ID which are in action is stored in D9040~D9047. Where the smallest one is stored in D9040, the second smallest one is stored in D9041 and so forth.	
■ D9041	2nd active STL step		
■ D9042	3rd active STL step		
■ D9043	4th active STL step		
■ D9044	5th active STL step		
■ D9045	6th active STL step		
■ D9046	7th active STL step		
■ D9047	8th active STL step		
Error Message			
■ D9067	Error code identifying Operation error.		
D9068	Latched the step address number of opr. Error		
■ D9069	Step address number of Operation error.		
Multi-Functional Error Code Display			
D9080	Control Display	0	Displays the I/O Status
		1~99	Displays 1~99
		100~109	Displays E0~E9
High Speed Process Instruction			
■ D9136	Lower 16 bits	Total number of output pulses using PLSY instruction.	
■ D9137	Higher 16 bits		
■ D9140	Lower 16 bits	Total number of output pulses using PLSY instruction.	
■ D9141	Higher 16 bits		

Coil No.	Function
Index Register V, Z	
D9180	Z0 Index Register
D9181	V0 Index Register
D9182	Z1 Index Register
D9183	V1 Index Register
D9184	Z2 Index Register
D9185	V2 Index Register
D9186	Z3 Index Register
D9187	V3 Index Register
D9188	Z4 Index Register
D9189	V4 Index Register
D9190	Z5 Index Register
D9191	V5 Index Register
D9192	Z6 Index Register
D9193	V6 Index Register
D9194	Z7 Index Register
D9195	V7 Index Register

※1 2 1 1 0 0
- Version: V1.00
- Model: VH Series

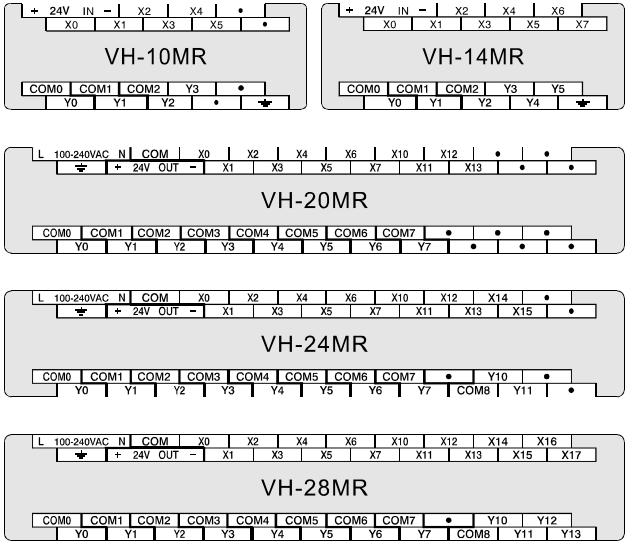
※2 00H indicates a built-in Flash Memory of PLC.
01H indicates an expanded VB-MP1R Memory Card.

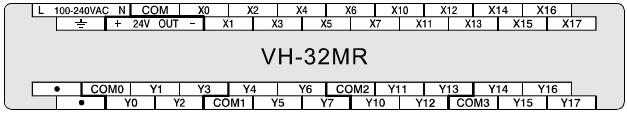
Error Message Specifications

Operation Error Code（the value of D9067）

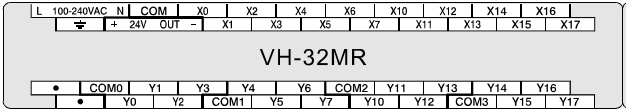
Error Code	Detail
0	No Error
6702	More than 5 layers of Call instruction have been nested together.
6703	More than 2 layers of Interrupt Insert have been nested together.
6704	More than 5 layers FOR / NEXT have been nested together.
6705	Incompatible device assigned as operand of applied instruction.
6706	Allowable range of applied instruction operand exceeded.

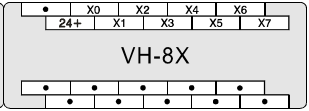
1-10 Terminal Layouts



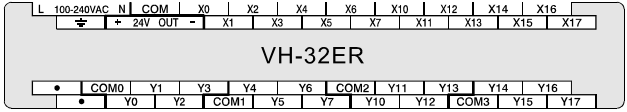


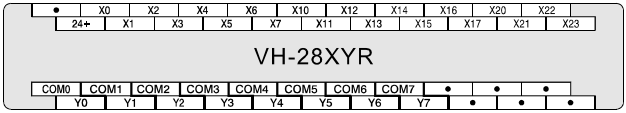
VH-40MR

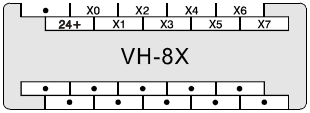


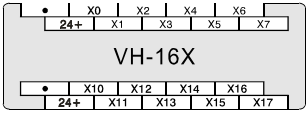


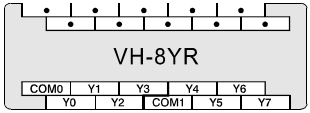
VH-60MR

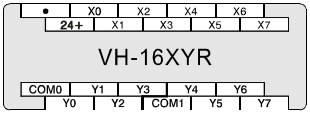


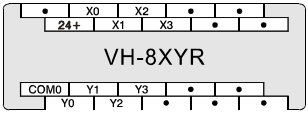

X0 X2 X4 X6 X10 X12 X14 X16 X20 X22
24+ X1 X3 X5 X7 X11 X13 X15 X17 X21 X23
VH-28XYR
COM0 COM1 COM2 COM3 COM4 COM5 COM6 COM7
Y0 Y1 Y2 Y3 Y4 Y5 Y6 Y7

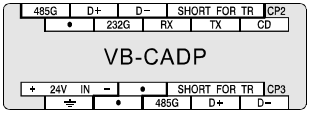

X0 X2 X4 X6
24+ X1 X3 X5 X7
VH-8X

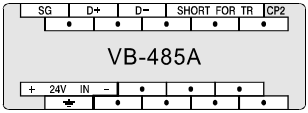

X0 X2 X4 X6
24+ X1 X3 X5 X7
X10 X12 X14 X16
24+ X11 X13 X15 X17
VH-16X

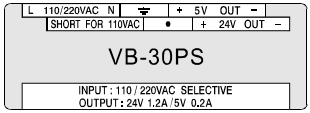

COM0 Y1 Y3 Y4 Y6
Y0 Y2 COM1 Y5 Y7
VH-8YR


X0 X2 X4 X6
24+ X1 X3 X5 X7
VH-16XYR
COM0 Y1 Y3 Y4 Y6
Y0 Y2 COM1 Y5 Y7


X0 X2
24+ X1 X3
VH-8XYR
COM0 Y1 Y3
Y0 Y2


485G D+ D− SHORT FOR TR CP2
232G RX TX CD
VB-CADP
+ 24V IN − SHORT FOR TR CP3
485G D+ D−


SG D+ D− SHORT FOR TR CP2
+ 24V IN −
VB-485A


L 110/220VAC N + 5V OUT −
SHORT FOR 110VAC + 24V OUT −
VB-30PS
INPUT : 110 / 220VAC SELECTIVE
OUTPUT : 24V 1.2A / 5V 0.2A

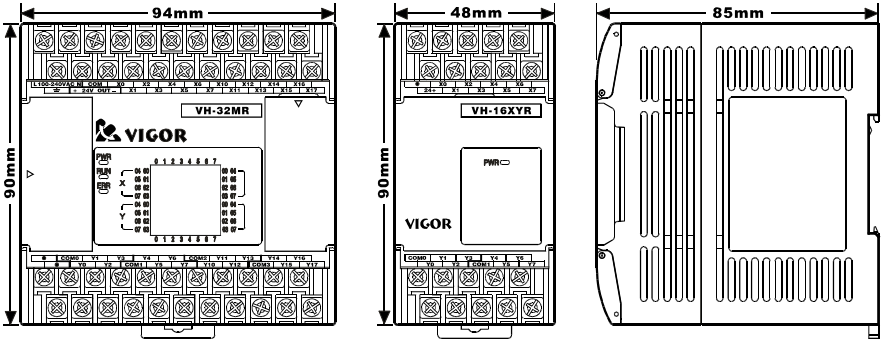
1-11 Product List

Item	Model	Main Specification
Main Unit	VH-10MR	DC 24V Power, 6 points DC24V Input, 4 points Relay Output
	VH-14MR	DC 24V Power, 8 points DC24V Input, 6 points Relay Output
	VH-20MR	AC Power, 12 points DC24V Input, 8 points Relay Output, provide DC24V Output 420mA
	VH-24MR	AC Power, 14 points DC24V Input, 10 points Relay Output, provide DC24V Output 420mA
	VH-28MR	AC Power, 16 points DC24V Input, 12 points Relay Output, provide DC24V Output 420mA
	VH-32MR	AC Power, 16 points DC24V Input, 16 points Relay Output, provide DC24V Output 420mA
	VH-40MR	AC Power, 24 points DC24V Input, 16 points Relay Output, provide DC24V Output 420mA
	VH-60MR	AC Power, 36 points DC24V Input, 24 points Relay Output, provide DC24V Output 420mA
Extension Unit	VH-32ER	AC Power, 16 points DC24V Input, 16 points Relay Output, provide DC24V Output 420mA
Extension Module	VH-28XYR	20 points DC24V Input, 8 points Relay Output
	VH-16XYR	8 points DC24V Input, 8 points Relay Output
	VH-16X	16 points DC24V Input
	VH-8XYR	4 points DC24V Input, 4 points Relay Output
	VH-8X	8 points DC24V Input
	VH-8YR	8 points Relay Output
Communication Module	VB-485A	RS-485 Communication Module; Photocoupler Isolated; Max. Distance: 1000M/3280'
	VB-CADP	One Isolated RS-232 / RS-485 Port and one Isolated RS-485 Port; Max. Distance: 1000M/3280'
Connection Cables	VB-232	RS-232C Communication Expansion Card
	VB-485	RS-422 / RS-485 Communication Expansion Card; non-Isolated; Max. Distance: 50M/164'
Power Supplier	VB-MP1R	Flash ROM Program Memory Card (4K Steps for the VH series PLC); including the RTC (Real Time Clock) function
	VB-RTC	RTC (Real Time Clock) Expansion Card

Item	Model	Main Specification
Connection Cables	MWPC-200	Cable between a PLC (CP1 A-type USB) and Computer (9-pin female connector); Length: 200cm/6'7"
	MWMD-200	Cable between a PLC (CP1 A-type USB) and MODEM (9-pin male connector) with a length of 200cm/6'7"
	MWPC25-200	Cable between a PLC (CP1 A-type USB) and Computer (25-pin female connector); Length: 200cm/6'7"
	VBPC09-200	Cable between a PLC (CP1 JST 4P) and Computer (9-pin female connector); Length: 200cm/6'7"
	VBMD09-200	Cable between a PLC (Cp1 JST 4P) and MODEM (9-pin male connector); Length: 200cm/6'7"
	VBPC25-200	Cable between a PLC (CP1 JST 4P) and Computer (25-pin female connector); Length: 200cm/6'7"
	VBFDHMI-200	Cable between a PLC (CP1 JST 4P) and Fuji, Digital HMI (25-pin male D-SUB); Length: 200cm/6'7"
	VHEC-050	VH Series PLC Expansion Extended cable; Length: 50cm/19.7"
Power Supplier	VB-30PS	30W power supply; power input: AC 110V or AC 220V; outputs: DC 24V 1.2A and DC 5V 0.2A

※The VH-10/14MR Main Units do not have communication expansion slot, memory card slot and the I/O extension slot.

1-12 Dimensions



Main Unit/Extension Unit Main Unit/Extension Module

Model	Weight (kg)
VH-10MR	0.31
VH-14MR	0.32
VH-20MR	0.56
VH-24MR	0.57
VH-28MR	0.57

Model	Weight (kg)
VH-32MR	0.57
VH-40MR	0.77
VH-60MR	0.91
VH-32ER	0.54
VH-16XYR	0.29

Model	Weight (kg)
VH-16X	0.26
VH-8XYR	0.26
VH-8X	0.29
VH-8YR	0.27
VH-28XYR	0.34

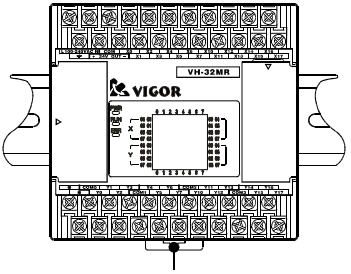
Installation Safety Guidelines ⚠ CAUTION

- The product should be used under certain conditions as stated in “1-6 General Specifications” of this manual.
- The product should NOT be used under the following conditions:
  (1) Excessive or conductive dust, corrosive or flam. gas, or oily smoke.
  (2) Excessive heat, moisture or rain, condensation, regular impact shocks or excessive vibration. The above-mentioned conditions may cause electric shock, fire or misoperation and damage the product.
- Take special care not to allow debris to fall inside the unit during installation e.g. making screw holes, cut wires etc, for it may cause fire, product damage or mis-reaction.
- Once the installation is complete, remove the protective paper band on the PLC to prevent fire, product damage or mis-reaction caused by the overheating.
- Install the connection cables and expansion modules properly, and make sure they are fixed, for loose contact may cause mis-reaction.
- DO NOT install the product on the basement, top or along the vertical direction of a switchboard, to avoid overheating.
- Ensure that there is a space larger than 50 mm around the installed PLC and it is kept as far as possible from high-voltage cables, high-voltage equipment and power equipment.

2. Installation Work

2-1 Installation Guides

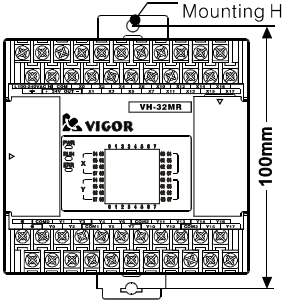
- DIN Rail Installation



DIN Rail Handling Hook

Install the product on the 35mm DIN rail handle. Pull down the handle when un-install to take the product off.

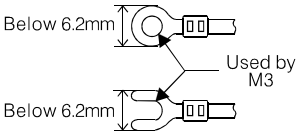
- Direct Installation



Pull out the 2 hidden mounting hole s(100mm between) from the top and bottom of the product, and install with screws.

2-2 Wiring Guidelines

- DO NOT pass PLC's Input Signal and Output signal through the same cable.
- DO NOT tie the Input Signal cable/Output Signal Cable together with other power cables.
- Limit the cable length to be within 20 meters for safety reasons.
- Use O or Y type terminal when wiring as specified on the right hand side diagram.
- Tighten the screw properly to avoid misoperation. The proper strength used to turn the terminal screw is 5~8kg-cm.



Wiring Safety Guidelines — DANGER

- Cut all the external power during installation or wiring, to avoid electric shock or product damage.
- Close the terminal cover before switch on the power supply after installation or wiring, to avoid electric shock.

Wiring Safety Guidelines — CAUTION

- When wiring AC supplies, it must be connected to correct input terminal, for if it is connected to DC (Direct Current) input/output terminal or DC power terminal, the PLC will be damaged.
- DO NOT connect the 24 V OUT ⊞ terminal of a PLC main unit to the 24 V OUT ⊞ terminal of an extension unit, or to the ⊞ terminal of an external power supply, for it may damage the PLC.
- DO NOT do any external wiring for the empty terminals of a PLC, for it may damage the product.
- Connect the grounding terminal of the main unit using the class 3 grounding standard, but DO NOT ground it with major power systems. (Refer to 1-6)

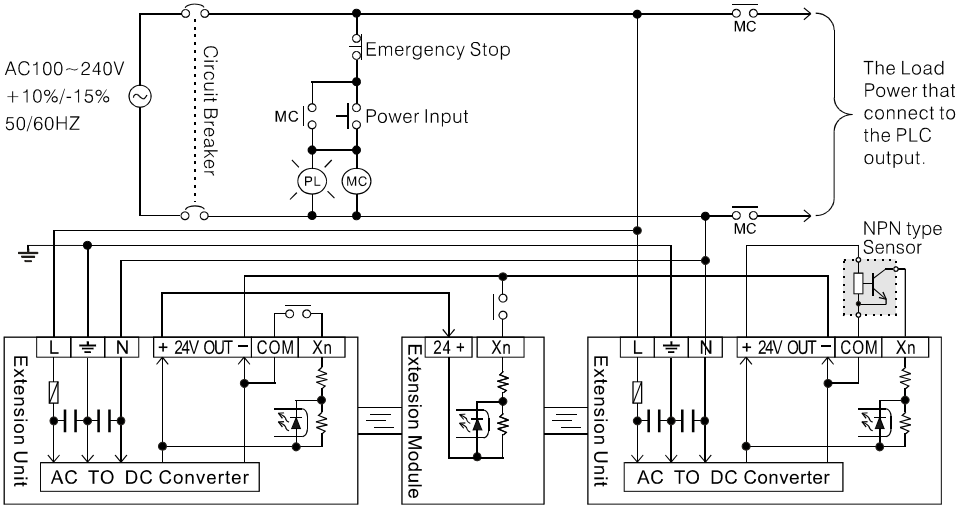
3. Power Specifications and External Wiring

3-1 Power Specifications

Power Specifications (Including All VH Series Main Units and Extension Units)

Item	AC Power	DC Power
Input Voltage	AC100～240V +10% / -15%	DC24V +20% / -15%
Input Frequency	50/60Hz	—
Max. allowable momentary power failure period	Within 10 ms.	Within 1 ms.
Power Fuse	250V 2A	250V 0.5A
Power Consumption	30 VA	5W
Power Unit Output Current	DC5V 400mA	—
	DC12V 530mA	—
	DC24V ±15% 420mA; output from terminal	—

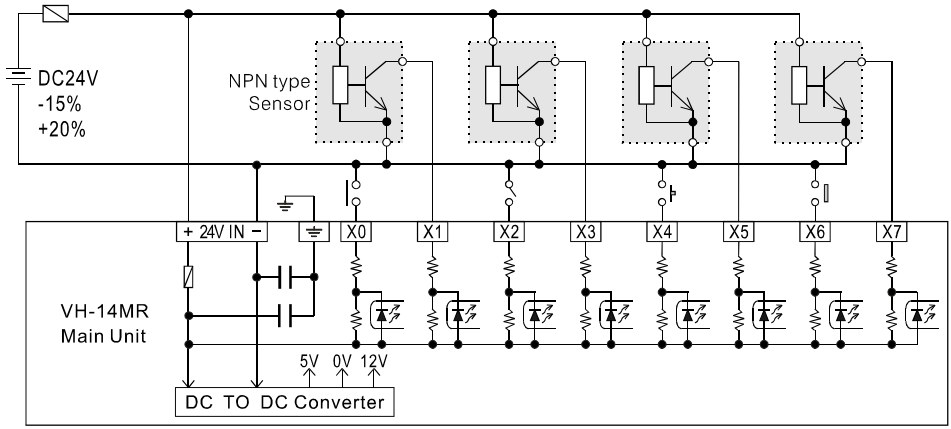
3-2 AC Power Wiring Example



CAUTION

- 24V OUT can be used as sensor power but DO NOT send external power to it.
- DO NOT do external wiring for any empty terminal or use it as a relay terminal.
- DO NOT connect the positive terminal of the Main Unit and Extension Unit together, but please connect their negative terminals together.

3-3 DC Power Wiring Example



- Connect the 24V IN terminal of the Main Unit with Direct Current power of DC 24V 15%/+20%.
- Try to use Constant Voltage Power Supply if possible. Make sure a Wave Filter Capacitor is used if need to use a full-wave Rectifying Power Supply
- DO NOT do external wiring for any empty terminal or use it as a relay terminal.

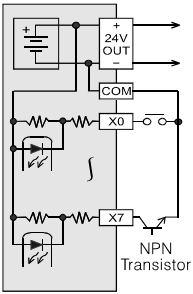
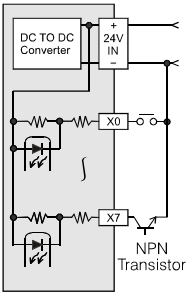
Wiring Safety Guidelines

⚠ **CAUTION**

- When wiring AC supplies, it must be connected to correct input terminal, for if it is connected to DC (Direct Current) input/output terminal or DC power terminal, the PLC will be damaged.
- DO NOT connect the 24 V OUT ⊞ terminal of a PLC main unit to the 24 V OUT ⊞ terminal of an extension unit, or to the ⊞ terminal of an external power supply, for it may damage the PLC.
- DO NOT do any external wiring for the empty terminals of a PLC, for it may damage the product.
- Connect the grounding terminal of the main unit using the class 3 grounding standard, but DO NOT ground it with major power systems. (Refer to 1-6)

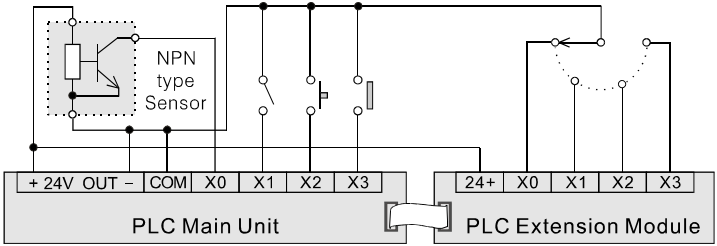
4. Input Specifications and External Wiring

4-1 Input Point Specifications

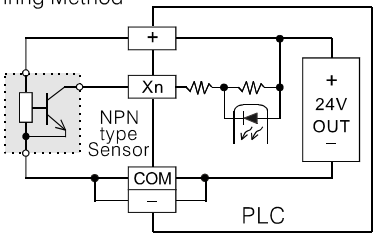
Item	Specification
Input Activating Voltage	DC24V ± 15%
Input Signal Circuit	7 mA / DC 24V
Input ON Circuit	Above 3.5 mA
Input OFF Circuit	Below 1.7 mA
Input Resistance	3.3 KΩ approximately
Input Response Time	10 ms approximately, X0~X7 can be set to be 0~15 ms by changing the value of D9020.
Input Signal Type	Dry Contact or NPN open collector transistor
Isolation Mode	Photocoupler Isolation
Circuit Diagram	AC Power Model  DC Power Model 

4-2 Input Point Wiring Introduction

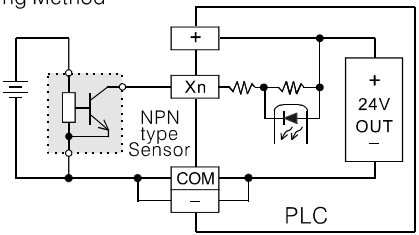
- Input Point Wiring Example



- "Sensor Power Provided by PLC" Wiring Method



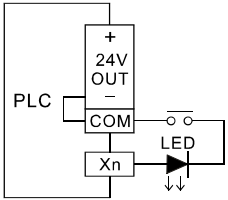
- "Sensor Power Provided by External Source" Wiring Method



4-3 Input Wiring Notes

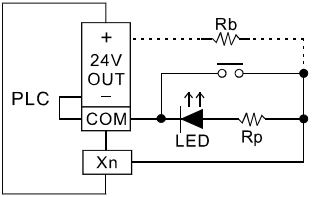
- The input point current of this product is 7mA/DC24V. So please choose a mini switch as input device, which suits such micro-current. Loose contact problem may occur if macro-current switch is used.

- Keep the voltage drop below 4V approximately if serial diode string is used in the input circuit, as shown in the right hand side diagram.



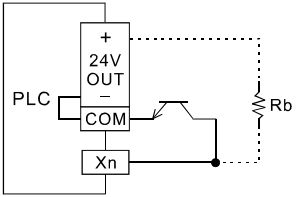
- Make sure the Parallel Resistor has more than 15KΩ Rp if used in the input circuit, as shown in the diagram below. And if the resistor Rp is less than 15KΩ, please install a pull up resistor Rb.

$$Rb \leqq \frac{4Rp}{15 - Rp} (K\Omega)$$



- Install a pull up resistor Rb if the OFF current leakage of the 2-wire-close-contact switch used is more than 1.5mA, as shown in the diagram below.

$$Rb \leqq \frac{6}{I\,(\text{OFF Current Leakage}) - 1.5} (K\Omega)$$



4-4 About the X0~X7 Input Points

There are 8 input points (X0~X7) in the VH Series Main Unit. These 8 points have high speed input function such as High Speed Counter, External Interrupt Insertion and Speed Detection, etc. When X0~X7 are not used as high speed inputs, they can still be used as common input points.

The corresponding relations of X0~X7 input terminals and their high speed applications are listed below:

Input	1-Phase Counter											2-Phases Counter					A/B-Phase Counter				External Interrupt Insertion	Speed Detect
	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245	C246	C247	C248	C249	C250	C251	C252	C253	C254		
X0	U/D						U/D			U/D		U	U		U		A	A		A	I00□	○
X1		U/D					R			R		D	D		D		B	B		B	I10□	○
X2			U/D					U/D			U/D		R		R			R		R	I20□	○
X3				U/D				R			R			U		U			A		I30□	○
X4					U/D				U/D					D		D			B		I40□	○
X5						U/D			R					R		R			R		I50□	○
X6										S					S					S		
X7											S					S						

U: Up Counter Input; D: Down Counter input; A: A-Phase Counter Input; B: B-Phase Counter Input
U/D: Up / Down Count Input; R: Reset Counter Input; S: Start-up Counter Input

- X0~X7 cannot be repeatly used. Each point can only choose 1 function from table above to execute.
- All high speed input function can complete the counting by interrupt insertion, and the total frequency of the interrupt inserting should not be more than 20KHz.

Calculation Method of the Total Interrupt Insertion Frequency

(Total of 1-Phrase Counter Frequency) + (Total of 2-Phrases Counter Frequency) +
(Total of A/B-Phrase Counter Frequency x 2) + Input Pulse Frequency of Speed Detection (SPD) Instruction = Total Frequency of Interrupt Insertion *This value should not be more than 20KHz.

Design Safety Guidelines

DANGER

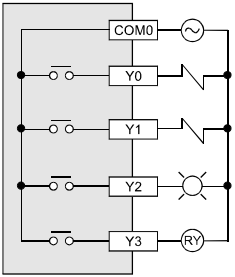
- External protective circuits should be designed for a PLC to avoid mechanical damage. E.g. Emergency Stop, Forward/Reverse Inter-Lock or Upper/Lower Limit Positioning.
- A PLC may not be able to control the ON/OFF state when error occurs to its output relay and transistor, etc. So for crucial output signals which could cause major accident, some external safety circuit and agencies should be designed, to make sure the mechanical devices operate with safety.

Wiring Safety Guidelines

CAUTION

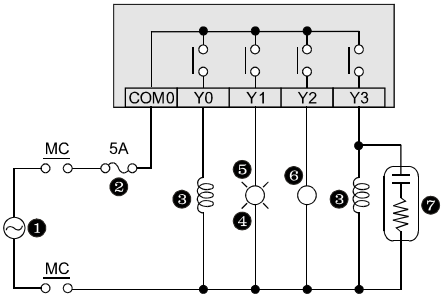
- When wiring AC supplies, it must be connected to correct input terminal, for if it is connected to DC (Direct Current) input/output terminal or DC power terminal, the PLC will be damaged.
- DO NOT connect the 24 V OUT ⊞ terminal of a PLC main unit to the 24 V OUT ⊞ terminal of an extension unit, or to the ⊞ terminal of an external power supply, for it may damage the PLC.
- DO NOT do any external wiring for the empty terminals ⊡ of a PLC, for it may damage the product.
- Connect the grounding terminal of the main unit using the class 3 grounding standard, but DO NOT ground it with major power systems. (Refer to 1-6)

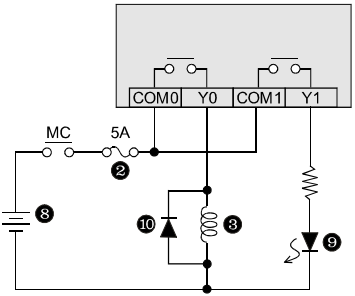
5-1 Output Point Specifications

Item		Specification
Output Type		Relay Output
Switched Voltages		≤ AC 250V / DC 30V
Rated Current	Resistive Load	2 A /point, 8 A /4 points COM
	Inductive Load	80VA
	Lamp Load	100W
Open Circuit Leakage		—
Output Response Time		10 ms approximately
Isolation Method		Mechanic Isolation
Circuit Diagram		

5-2 Output Wiring Introduction

• Relay Output Wiring Diagram



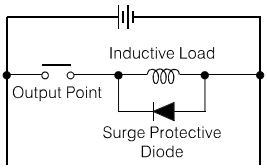


❶ AC Power Supply
❷ Fuse (※)
❸ Inductive Load
❹ Incandescent Light Bulb
❺ Neon Bulb
❻ Contactor
❼ Spark Killer
❽ DC Power
❾ Light Emitting Diode LED
❿ Surge Protective Diode

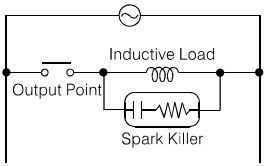
※ No fuse installed within the PLC's internal output circuit. Please install external fuse to avoid board circuit damage caused by short circuit of the load.
Install 2~3A fuse for single point COM circuit.
Install 5~10A fuse for 4 points COM circuit.

5-3 Output Wiring Notes

- Please add parallel connected Surge Protective Diode to the 2 ends of the DC Inductive Load, as shown in the right hand side diagram, otherwise the pointer life time will be reduced significantly. When choose the Surge Protective Diode, note that the reverse voltage (VR) must be more than 5~10 times of the forward voltage (FR), and the forward current (IF) must be greater than the load current.

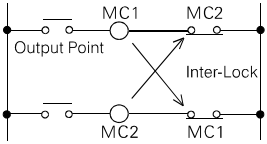


- Please add parallel connected Spark Killer to the 2 ends of the AC Inductive Load, as shown in the right hand side diagram, to reduce noise. A Spark Killer is made by serial connected resistor and capacitor (0.1μF+120Ω), and can be purchased from the producer.



- IT IS DANGEROUS to close the contactors used as the forward(FP)/reverse(RP) control at the same time. For such a load, an external inter-lock circuit should be set up as well as the inter-lock that controlled by the program within the PLC, as demonstrated in the right hand side diagram.

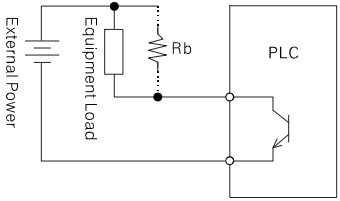
⚠ **DANGER**



5-4 About the Y0 Output Point

The Y0 output point of VH series PLC has high speed output functions like pulse output, Pulse Width Modulation, etc. Y0 can be used as general output point when it is not used for high speed output.

- Use transistor output form for the output when Y0 used as high speed output point.
- The output point assigned by PLSY and PWM should not overlap with each other.
- The pulse frequency sent by Y0 of VH series PLC using PLSY instruction can be 7KHz at most.
- Since the PLSY and PWM instructions output need to have high speed reaction, please connect a parallel Rb resistor as demonstrated in the right hand side diagram and make the total load current to be 100 mA approximately, for the PLC output wave shape will be twisted by the longer OFF time of the transistor under light load. Calculate the power needed by the Rb resistor carefully, to avoid Rb resistor damage caused by overheats.



External Power	50mA Rb of the Load Current	100mA Rb of the Load Current
5V	100Ω 1W	50Ω 2W
12V	240Ω 2W	120Ω 3W
24V	480Ω 3W	240Ω 5W

6-1 Models of Optional Modules

The optional modules of VH series PLC are listed in the table below:

Slot	Model	Function
Communication Expansion Slot	VB-232	RS-232 Communication Expansion Card, extend the second communication port (CP2)
	VB-485	RS-422/RS-485 Communication Expansion Card, extend the second communication port (CP2)
Memory Card Expansion Slot	VB-RTC	● Install the RTC (Real Time Clock) Expansion Card for PLC, to do automatic Date and Time control. ● Displays Year, Month, Day, Hour, Minute, Second and Week. ● Battery life is 5 years approximately @ 25°C. ● The special register M9005 will turn ON when the battery is running out of power.
	VB-MP1R	● A memory card used by the VH and VB series PLC, to record program, component comments, program comments and data registers. ● Flash ROM Memory that can be written for more than 10,000 times. ● The program downloading/uploading function makes the program copy and device maintenance work easier. ● Built-in RTC (Real Time Clock) function, battery life is 5 years approximately @ 25°C. ● The special register M9005 will turn ON when the battery is running out of power.

※ The VH-10/14 MR Main Unit does not have communication expansion or memory card expansion slot.

6-2 Communication Expansion Board

- VB-232 and VB-485 are the expansion cards for VH series PLC's second communication port (CP2).
- The second communication port of VH series PLC can execute Computer Link communication functions.
- Please install the communication expansion board when the power supply is OFF.

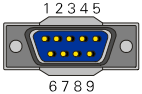
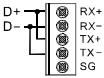
Install VB-232

① Switch off the PLC power
② Open the left side cover of the PLC Main Unit.
③ Take off the black screw in the upper left corner inside the left cover.
④ Install the base plug of VB-232 into the communication expansion slot.
⑤ Install the black screw in the upper left corner inside the left cover.
⑥ Lock the M3 self-tapping screw of the VB-232 into the mounting hole in the upper left corner inside the left cover

Install VB-485

① Switch off the PLC power
② Open the left side cover of the PLC Main Unit.
③ Take off the left side ⊏ shape plastic piece.
④ Take off the black screw in the upper left corner inside the left cover.
⑤ Install the base plug of VB-485 into the communication expansion slot.
⑥ Install the black screw in the upper left corner inside the left cover.
⑦ Lock the M3 self-tapping screw of the VB-485 into the mounting hole in the upper eft corner inside the left cover

- There is a white-color JST4P outlet for both VB-232 and VB-485. It has the same functions as the white-color JST4P outlet on the main unit, since installing the communication expansion card will block the white-color JST4P outlet on the main unit.

Item	VB-232	VB-485
Communication Interface	RS-232C	RS-422/RS-485
Isolation Method	No Isolation	
LED Indicator	RXD、TXD	
Max. Communication Distance	15 Meters	50 Meters
Power Supply	DC5V 10mA (from PLC power supply)	DC5V 60mA (from PLC Power Supply)
Communication Protocol	Computer Link - The shared communication protocol of M, VB and VH series PLC	
Communication Method	Half-duplex	
Communication Speed	4800/9600/19200/38400 bps	
Communication Parameters	Data length: 7 bits (ASCII) Parity: EVEN Stop Bit: 1 bit	
Number of Connected Station	1	256 Max. (Install amplification device if more than 32 stations)
Data Transfer Range	Includes all the X, Y, M, S, T, C, D	
Wiring Method	 2 : RXD 3 : TXD 5 : SG D-Sub Connector 9Pin Male Connector	PCB Style Terminal Block  Remarks: 1. RS-485 Wiring Method  2. SW1 is the terminal resistance switch. (Terminal resistance 120Ω)
Parameter Configuration	For CP2 relevant parameter configuration settings please use the "System CPU Expansion Card's Communication Port Setting" function of the programming software Ladder Master.	

6-3 Memory Card Slot Expansion Card

- Install the Memory Card Slot Expansion Card
  - ① Switch off the PLC power
  - ② Open the right side cover of the PLC Main Unit.
  - ③ Confirm the expansion card position, make sure the battery on the card is at the right hand side.
  - ④ Plug the card into the slot in the cover with a proper strength; be careful not to damage the main unit circuit.
  - ⑤ Make sure the connector of the expansion card binds with the slot connector tightly, to finish the installation.

- Un-install Memory Card Slot Expansion Card

  Switch off the PLC power when un-install the expansion card. Use the small "_" shape screw driver or the IC clip to clip the auxiliary nick hole and take out the expansion card.

- About the reading and configuration of the RTC (Real Time Clock) time.

Reading the RTC Time

The PLC program will automatically read the RTC time after the RTC installed to the Main Unit, and store it in D9013~D9019 for user reference.

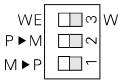
Configure the RTC Time

The user can configure the RTC time in 2 ways:

1. Use the "System-RTC Settings" function in Ladder Master to configure.
2. Use instruction (FNC167 TWR) to set the RTC time. This method can be used with supplementary devices like the HMI to change the RTC time.

6-4 Use the VB-MP1R

- There are 3 switches on the VB-MP1R expansion card and their functions are described below:



WE/WP Write Protect SwitchWE: Write allowed/WP: Write forbidden

P ► M Program Upload SwitchPLC program upload to MP1R enabled when it slides to the left.

M ► P Program Download SwitchMP1R program download to PLC enabled when it slides to the left.

- Operation flow of uploading/downloading program using VB-MP1R

① Put the switch on the VB-MP1R to the right position as listed in the table below:

Function	WE/WP	P►M	M►P
Upload Program	WE(Left)	ON(Left)	OFF(Right)
Download Program	WP(Right)	OFF(Right)	ON(Left)

② Switch off the PLC power and install the VB-MP1R in the correct direction.

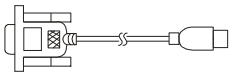
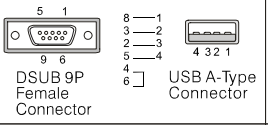
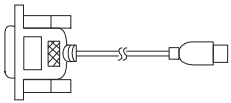
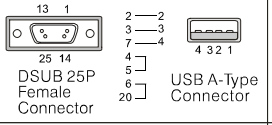
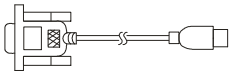
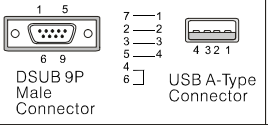
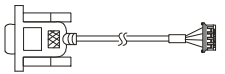
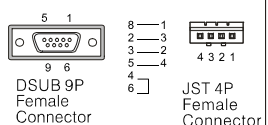
③ Switch on the power and start uploading/downloading programs. First the ERR LED indicator on the PLC Main Unit will flicker for 3 times then go off. During the whole process of the uploading /downloading, the ERR LED will be on all the time, and it will not take more than 1 e of the program). If anything goes wrong during the function execution process, the ERR LED will be flickering all the time.

④ Switch off the power and take out the VB-MP1R expansion card.

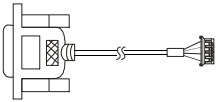
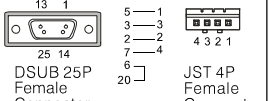
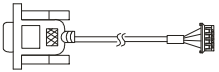
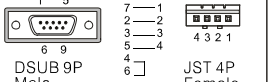
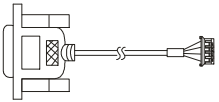
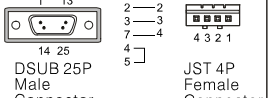
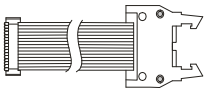
NOTICE

- Always put the WE/WP switch to WP when the VB-MP1R is not used for program uploading.
- Error occurs when executing uploading/downloading for the following reasons:
  ① Password has been set for the source program
  ② WE/WP switch is at WP when uploading.
  ③ P ▶ M and M ▶ P switches are both at the ON (Left) side.
  ④ Improper installation of the VB-MP1R expansion card.
  ⑤ VB-MP1R or the PLC is malfunctioning.
- The program in the VB-MP1R will be executed first when the PLC is installed with a VB-MP1R card. And at this time, when a programming tool (e.g. Ladder Master) doing uploading/downloading, it acts for the memory in VB-MP1R as well.

6-5 Connection Cables

Model	Picture	Connection Illustrations	Application
MWPC-200 (Length: 200cm/6'7")			● PC↔VB, VH or M Series PLC
MWPC25-200 (Length: 200cm/6'7")			● PC↔VB, VH or M Series PLC ● Hitech HMI↔VB, VH or M Series PLC
MWMD-200 (Length: 200cm/6'7")			● MODEM↔VB, VH or M Series PLC ● EASY VIEW HMI↔VB, VH or M Series PLC
VBPC09-200 (Length: 200cm/6'7")			● PC ↔VB or VH Series PLC

6. Optional Modules

Model	Picture	Connection Illustrations	Application
VBPC25-200 (Length: 200cm/6'7")		 DSUB 25P Female Connector JST 4P Female Connector	• PC↔VB or VH Series PLC • Hitech HMI↔VB or VH Series PLC
VBMD09-200 (Length: 200cm/6'7")		 DSUB 9P Male Connector JST 4P Female Connector	• MODEM↔VB or VH Series PLC • EASY VIEW HMI↔VB or VH Series PLC
VBFDHMI-200 (Length: 200cm/6'7")		 DSUB 25P Male Connector JST 4P Female Connector	• FUJI HMI↔VB or VH Series PLC • DIGITAL HMI↔VB or VH Series PLC
VHEC-050 (Length: 50cm/19.7")		—	• Extended cable for a VH Series PLC Extension Unit/Module. (Keep away from interference during wiring job for the data transferred in this extended cable is unprotected and easy to get interferred.)

Operation and Maintenance Safety Notes ⚠ DANGER

- DO NOT contact the terminal when the power supply switched on, to avoid electric shock or product mis-reaction.
- Switch off the power supply before clean or tighten the terminal, to avoid electric shock.
- Carry program-change-in-operation (force output, RUN, STOP, etc) ONLY after carefully read and understand this manual and safety is ensured, for misoperation may cause equipment damage or accident.

Operation and Maintenance Safety Notes ⚠ CAUTION

- Switch off the power supply before assemble or overhaul the selected optional units, to avoid damage to the expansion or main units.
- Switch off the power supply before assemble or overhaul the connection cable, to avoid damage or misoperation.
- DO NOT assemble or overhaul the product cage, or alter it by yourself, for it may cause product damage, mis-reaction or fire.
- Contact the nearest distributor or Vigor Electric Corp directly for any product repairing matters.

7. Operation Rehearsal, Maintenance and Error Checking

7-1 Operation Rehearsal

- Perform the pre-rehearsal examination with the power supply switched OFF.

  Incorrect power terminal connection, short circuit of DC input and power supply wirings or short circuit of output wirings will cause severe damage to the PLC. So DO check the power and input /output wirings before switch on the power, to make sure everything correct.

- Perform the program examination when the power supply ON and PLC STOP.

  Upload the program within the PLC using programming tool and make sure it is correct. The user can also use the "compile program" function of the programming tool to make sure the circuit and grammar are correct.

- RUN/STOP Switch of the PLC

  There is a RUN/STOP switch on the PLC. When the PLC power goes from OFFON, the PLC will enter RUN/STOP mode according to the setting of the RUN/STOP switch. And then the RUN/STOP status can be controlled by the RUN/STOP switch and the programming tool.

- Perform the operation rehearsal test when the power is ON and PLC is RUN.

  The CPU will execute self-examine function once the PLC power goes from OFFON.
  If there is no exception, the PLC enters operation mode. (RUN LED is ON.)
  If there is program error (grammar or circuit error), the ERR LED will flicker, and PLC stop running.
  If there WDT triggered, the ERR LED will flicker, and PLC stop running.
  Force ON/OFF action can be performed on many components during the program operation.

7-2 Determine Exceptional Behavior through the LED Indicator

When problem occurs during PLC operation, check the power supply voltage, the terminal screw and connection cable (may be loose), and the I/O component (may be faulty). Then check the PLC LED indicator. These indicators help to analyze the error is caused by PLC or external components.

- PWR Power Indicator LED (Green)
  When power supplied, the PWR indicator LED on main unit panel will be ON. If it is not, check the power circuit wiring and make sure correct voltage is used. Else, may send PLC back for repairing.
- RUN Operation Indicator LED (Green)
  When the PLC operates well, the RUN indicator LED on the Main Unit panel will be ON. If the PLC is at STOP status or any error occurs, the RUN LED will be OFF.
- ERR Error Indicator LED (Red)
  When error occurs to the PLC, the error indicator LED ERR on main unit panel will be ON or flickering.

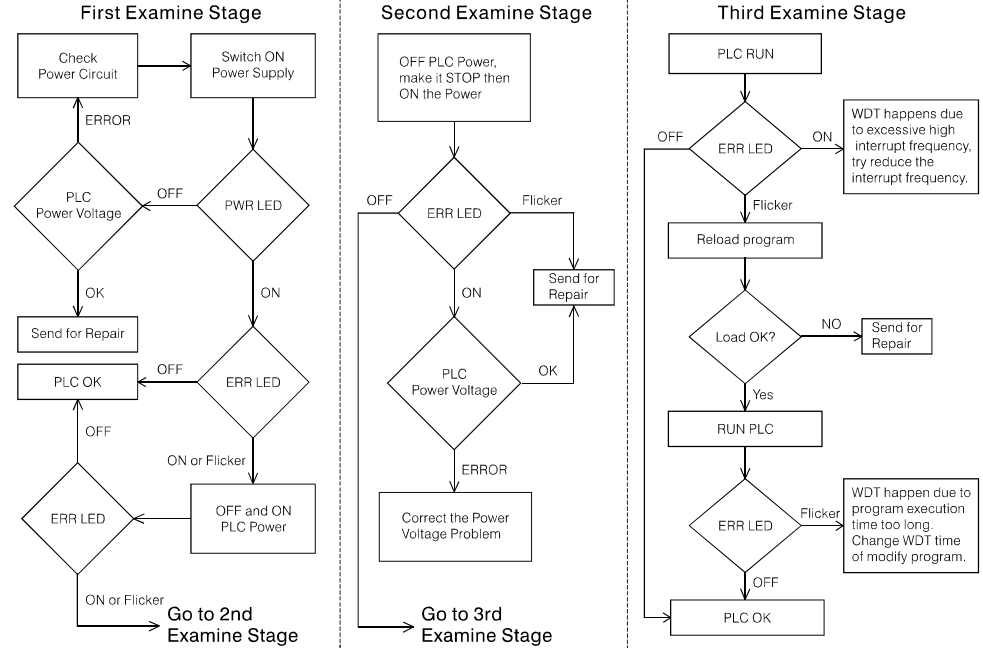
<ERR LED Flicker>
ERR LED flickers when program changed by improper use, broken circuit, exceptional interruption, and invasion by conductive materials, PLC will STOP and all outputs turn OFF. When this happens, please double-check the program, and whether there is powerful interruption source or conductive materials invasion.

<ERR LED ON>
ERR LED turns ON when the CPU out of control and WDT occurs caused by PLC circuit broken or exceptional external interruption, PLC will STOP and all outputs turn OFF. When this happens, please switch off the PLC power supply and switch it on again. If this recovers the PLC normal operation, please double-check whether there is powerful interruption source and whether the PLC grounding is fine. If the ERR LED is still ON, the PLC may be faulty, consider sending it back for overhauling.

- INPUT X Input Status Indicator LED (Upper half of the Display)
  (1) If the input status indicator LED is not as expectation, please make sure the external input switch status is fine.
  (2) Loose switch contact may be caused by over-strong input switch current or invasion of oily dirt.
  (3) When parallel LED circuit included in the input switch, the input signal of the PLC may be ON even when the switch is OFF.
  (4) The sensitivity of photoelectric switches might be affected by dirt-stuck, and cause it failed to switch to ON mode.
  (5) The PLC may not be able to judge the input status accurately if the input switch ON/OFF time is shorter than the PLC scanning time.
  (6) The PLC input circuit may not be able to work well when the DC24V power supply used by it is excessively used or has short circuit.
  (7) The input circuit might be damaged if the voltage put on it exceeds the appointed limit.

- OUTPUT Y Output Status Indicator LED (Lower half of the Display)
  (1) If the load doesn't work as the output indicator LED status, please check whether the external load function is fine.
  (2) Melting or short circuit of the PLC output point may be caused by overload, short circuit load or surge current of the capacitor load.
  (3) Relay point loose contact may be caused by the excessively frequent action of the PLC output point.

- Refer to the Error Examination Flow Chart on the next page for advance examinations.


First Examine Stage
Check Power Circuit
Switch ON Power Supply
ERROR
PLC Power Voltage
OFF
PWR LED
OK
ON
Send for Repair
PLC OK
OFF
ERR LED
OFF
ON or Flicker
ERR LED
OFF and ON PLC Power
ON or Flicker
Go to 2nd Examine Stage
Second Examine Stage
OFF PLC Power, make it STOP then ON the Power
OFF
ERR LED
Flicker
Send for Repair
ON
PLC Power Voltage
OK
ERROR
Correct the Power Voltage Problem
Go to 3rd Examine Stage
Third Examine Stage
PLC RUN
OFF
ERR LED
ON
WDT happens due to excessive high interrupt frequency, try reduce the interrupt frequency.
Flicker
Reload program
Load OK?
NO
Send for Repair
Yes
RUN PLC
ERR LED
Flicker
WDT happen due to program execution time too long. Change WDT time of modify program.
OFF
PLC OK

Recycling Safety Notes ⚠ CAUTION
• Dispose the product as industrial waste when it is to be discarded as worthless.

- The product does not include short-life consumptive parts, so there is usually no need to change parts.
- If the output relay works frequently, or is used to drive big capacity load, please perform constant check on it.
- Perform the following general checks constantly:
  (1) Does other heat source or direct sunlight cause the internal temperature of PLC raise abnormally?
  (2) Is there dust or conductive dust invasion into the PLC?
  (3) Do any of the connection cables or connection terminals, etc, become loose?