

HITACHI PROGRAMMABLE CONTROLLER

HIDIC EH-150

Counter Module EH-CU

APPLICATION MANUAL

NJI-321(x)

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WARNING

To ensure that the equipment described by this manual. As well as all equipment connected to and used with it, operate satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. Since codes can vary geographically and can change with time, it is the user's responsibility to determine which standard and codes apply, and to comply with them.

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INSTALL EMERGENCY POWER STOP SWITCH WHICH OPERATES INDEPENDENTLY OF THE PROGRAMMABLE CONTROLLER TO PROTECT THE EQUIPMENT AND OR PERSONNEL IN CASE OF THE CONTROLLER MALFUNCTION.

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Production Operations Division,
Hitachi, Ltd.
46-1, Ooaza-Tomioka Nakajo-machi
Kitakanbara-gun, Niigata-ken
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Safety Precautions

Read this manual and related documents thoroughly before installing, operating, performing preventive maintenance or performing inspection, and be sure to use the unit correctly. Use this product after acquiring adequate knowledge of the unit, all safety information, and all cautionary information. Also, make sure this manual enters the possession of the chief person in charge of safety maintenance.


Safety caution items are classified as "Danger" and "Caution" in this document.



: Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible death or severe injury.




: Cases where if handled incorrectly a dangerous circumstance may be created, resulting in possible minor to medium injury to the body, or only mechanical damage.

However, depending on the circumstances, items marked with  CAUTION may result in major accidents.


In any case, they both contain important information, so please follow them closely.

Icons for prohibited items and required items are shown below:



: Indicates prohibited items (items that may not be performed). For example, when open flames are prohibited,  is shown.



: Indicates required items (items that must be performed). For example, when grounding must be performed,  is shown.

1. About installation

CAUTION

- Use this product in an environment as described in the catalogue and this document.
If this product is used in an environment subject to high temperature, high humidity, excessive dust, corrosive gases, vibration or shock, it may result in electric shock, fire or malfunction.
- Perform installation according to this manual.
If installation is not performed adequately, it may result in dropping, malfunction or an operational error in the unit.
- Do not allow foreign objects such as wire chips to enter the unit.
They may become the cause of fire, malfunction or failure.

2. About wiring

REQUIRED

- Always perform grounding (FE terminal).
If grounding is not performed, there is a risk of electric shocks and malfunctions.

CAUTION

- Connect power supply that meets rating.
If a power supply that does not meet rating is connected, fire may be caused.
- The wiring operation should be performed by a qualified personnel.
If wiring is performed incorrectly, it may result in fire, damage, or electric shock.

3. Precautions when using the unit

DANGER

- Do not touch the terminals while the power is on.
There is risk of electric shock.
- Structure the emergency stop circuit, interlock circuit, etc. outside the programmable controller (hereinafter referred to as PC).
Damage to the equipment or accidents may occur due to failure of the PC.
However, do not interlock the unit to external load via relay drive power supply of the relay output module.

CAUTION

- When performing program change, forced output, RUN, STOP, etc., while the unit is running, be sure to verify safety.
Damage to the equipment or accidents may occur due to operation error.
- Supply power according to the power-up order.
Damage to the equipment or accidents may occur due to malfunctions.

4. About preventive maintenance

DANGER

- Do not connect the \oplus , \ominus of the battery in reverse. Also, do not charge, disassemble, heat, place in fire, or short circuit the battery.
There is a risk of explosion or fire.

PROHIBITED

- Do not disassemble or modify the unit.
These actions may result in fire, malfunction, or malfunction.

CAUTION

- Turn off the power supply before removing or attaching module/unit.
Electric shock, malfunction or failure may result.

Chapter 1 Introduction

We appreciate that you have selected the EH-150 Counter Module of the Hitachi programmable logic controller. This application manual describes how to properly operate the EH-150 Counter Module. Carefully read the manual to familiarize yourself with the procedures respectively of installation , operation, and maintenance and check.

Reference documents

(1) EH-150 APPLICATION MANUAL ----- NJI-281*(X)

*The last character of the manual number may be modified when the product is revised.
Notes. The contents of this manual may be modified without previous notice.

1.1 Before Use

When you purchased the EH-series Counter Module , please check the following matters:

- (1) If model name and specifications are correct.
- (2) If there is no shipping damage on product (If any, consult the dealer of the counter module.)
- (3) If following parts are in a carton box.

Table 1.1 List of Counter Module Parts

NO.	Contents	Quantity
1	EH-series Counter Module	1
2	Notes to use	1

Cautions

- Please use EH-CPU308/316 or CPU104/208 ROM.02 or later. In case of CPU 104/208 ROM Rev.02 or later, **the external output of double words (DYrus5 to 6) is not available. Please use WY rus 5 to 7)**
- The description in this manual may be changed without notice.

1.2 Outline

1.2.1 Outline

1. EH-150 Counter Module (EH-CU) is a special function module that is installed on the basic base or expansion base of EH-150 series.
2. EH-CU can count high speed pulse that digital input module cannot count.
3. EH-CU can output according to the data set by user program.

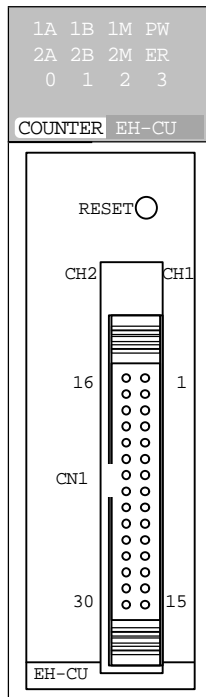
1.2.2 Characteristics

1. EH-CU is 1 slot module size, with 2 channels 32 bit counter.
2. EH-CU can count 4 mode pulse types which are 2 phase input mode, single phase (CW/ CCW signal) mode, 2 phase input mode (4 time multiplied) and single phase (Clock and direction signal) mode. These modes are selectable by mode setting switches.
3. High speed. (Maximum frequency is 100kHz (25kHz at 4 time multiplied mode))
4. EH-CU has 2 kinds input interfaces are for differential output (line driver), are for open collector output (12-24 V DC), so can be connected to the 2 type pulse encoder.
5. EH-CU has ring counter mode and can count pulses during CPU stopping.
6. High speed response (less than 1ms) output, is prepared. The comparison output is open collector type, so EH-CU can be connected to the external device directly.
7. In normal counting mode EH-CU can be set to the preset value from the current value by marker input.

1.3 Notes to use

- (1) There are some limitations of comparison output and marker input. In detail refer 5.2 “Normal counter and Ring counter”.**
- (2) When install or uninstall this module and wiring, turn off power source.**
- (3) External cables of EH-CU should be laid out fully apart from the other power and signal cables. In detail refer 6.2 “Wiring”.**

2.2 Module nameplate and Signals



No.	CH 2	No.	CH 1	Signal	
16	Vin A	1	Vin A	Phase A	Connect 12-24 V DC (In case of open collector output)
17	A (+)	2	A (+)		Connect (+) signal (In case of differential output)
18	A (-)	3	A (-)		Connect signal (In case of open collector output) Connect (-) signal (In case of differential output)
19	Vin B	4	Vin B	Phase B	Connect 12-24 V DC (In case of open collector output)
20	B (+)	5	B (+)		Connect (+) signal (In case of differential output)
21	B (-)	6	B (-)		Connect signal (In case of open collector output) Connect (-) signal (In case of differential output)
22	Vin M	7	Vin M	Marker	Connect 12-24 V DC (In case of open collector output)
23	M (+)	8	M (+)		Connect (+) signal (In case of differential output)
24	M (-)	9	M (-)		Connect signal (In case of open collector output) Connect (-) signal (In case of differential output)
25	N.C.	10	N.C.		Don't connect
26		11			
27		12			
28	Y2	13	Y0	Output	Comparison output (open collector)
29	Y3	14	Y1		Comparison output (open collector)
30	Com2	15	Com1		Comparison output common

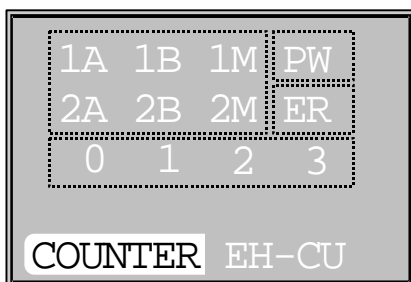
Note: The pin number defined of EH-CU is different from the number of the connector itself.

2.3 LED display

LED	Description
PW	When the EH-CU module is normal, this LED will light up. When the parameters are not set, this LED will flash. When serious error, this LED will be OFF.
ER	When hardware error, this LED will light up. When the power is ON, this LED lights briefly however, it is normal.
1A, 1B, 1M, 2A, 2B, 2M	When the corresponding input is ON, these LED will light up.
0, 1, 2, 3	When the corresponding output is ON, these LED will light up.

Note: Marker LED's 1M and 2M light when input is "ON" regardless of logical reverse switch.

For details about definition of "ON", please refer to Chapter 4.



Chapter 3 Specifications

Table 3.1 General Specifications

Item	Specification		
Power source	Supplied from Power Supply Module		
Operating ambient temperature	0 to 55 °C	Storage ambient temperature	-10 to 75 °C
Operating ambient humidity	20 to 90 %RH (no condensation)	Storage ambient humidity	10 to 90 %RH (no condensation)
Vibration resistance	In accordance with JIS C 0911		
Noise resistance	○Noise voltage 1500 Vpp Noise pulse width 100 ns, 1 μs by using noise simulator. ○Based on NEMA ICS 3-304 (with the exception of input module) ○Static noise : 3000 V at metal exposed area		
Dielectric withstand voltage	250 V DC between External signal terminal and case ground (FG) terminal		
Consumption current	5 V DC 200 mA		
Usage environment	No corrosive gasses, no excessive dirt		
Structure	Attaches to an open wall		
Cooling	Natural air cooling		

Table 3.2 Performance Specifications

Item	Specifications	
Count range	32 bit (0 to 4 294 967 295)	
Countable pulse frequency	100 kHz (25 kHz at 4 time multiple)	
Count mode	Selectable by Dip switches, setting of CH1 and 2 is common. 2 phases, single phase (CW/CCW,CK/U/D) and 2 phases 4 time multiple	
Count channel number	2 channels	
Differential input current	4 mA or more	
Open collector input voltage	12 to 24 V DC	
	ON voltage	10 V DC or more
	OFF voltage	4 V DC or less
Isolation system	Photo-coupler isolation	
Number of pulse input points 3points,2ch.	A: A, CW, CK	Phase difference (A-B) + 45 to +125 at normal rotation - 45 to - 125 at reverse rotation
	B: B, CCW, U/D	
	M: Marker (Z)	
Count pulse width	ON : 4 μs, OFF : 4 μs or more	
Marker pulse width	10 μs or more (ON edge)	
External connector	One 30 pin connector for 2 channels	
External wiring	Paired common shielded wire	

Table 3.3 Output Specifications

Item	Specification	
Output voltage	12/24 V DC (maximum 30 V DC)	
Load current	Maximum 20 mA/ point	
Output mode	Transistor (open collector)	
Minimum load current	1 mA	
Output delay time	ON to OFF	1 ms or less
	OFF to ON	1 ms or less
ON-time voltage decrease	Maximum 1.5 V	
External output points	4 points (selectable each channel)	
	Up and down counter	Current value = (latch) comparison value 1 or Current value > (rebel) comparison value 1
	Ring counter	Current value = (latch) comparison value 2
Leak current	Maximum 0.5 mA	
Polarity	Minus (-) side in module (common) . Common is (-).	
External power supply voltage	current	12/24 V DC (Maximum 30 V DC)
		60 mA or more when EH-CU is connected with open collector output device. (It doesn't include the output current.)
Isolation system	Photo-coupler isolation	

Table 3.4 Count method

↑ or ↓ is the counting timing.

Count method			Selectable by Dip switches	Dip switches
2 phase Mode 1	Up = A & B↑	Phase A Phase B		SW1:OFF SW2:OFF
	Down = A & B↓	Phase A Phase B		
single phase Mode 2 (CW/CCW)	Up = A↓ & B A = CW, B = CCW	Phase A Phase B		SW1:ON SW2:OFF
	Down = A & B↓ A = CW, B = CCW	Phase A Phase B		
single phase Mode 3 (CK/U/D)	Up = B & A↓ A = CK, B = Up/Down	Phase A Phase B		SW1:OFF SW2:ON
	Down = B̄ & A↓ A = CK, B = Up/ Down	Phase A Phase B		
2 phase (4 time multiple) Mode 4	Up = A & B↑ + Ā & B↓ + B̄ & A↑ + B & A↓	Phase A Phase B		SW1:ON SW2:ON
	Down = A & B↓ + Ā & B↑ + B & A↑ + B̄ & A↓	Phase A Phase B		

*1 High is input "OFF", Low is input "ON".

Chapter 4 Interface

4.1 Input Interface

<Structure of input interface>

The input interface of EH-CU has both interfaces for differential output and for open collector output. Figure 4.1 shows the structure of the interface circuit. (Only one signal is shown)

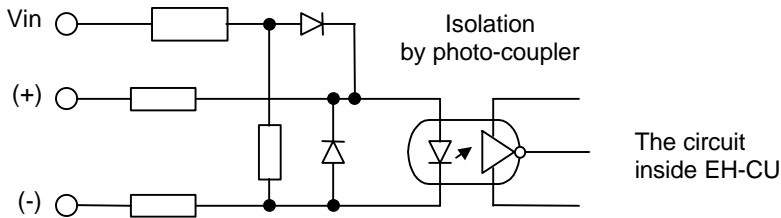


Figure 4.1 The structure of input interface

4.1.1 Example: Connection with differential input

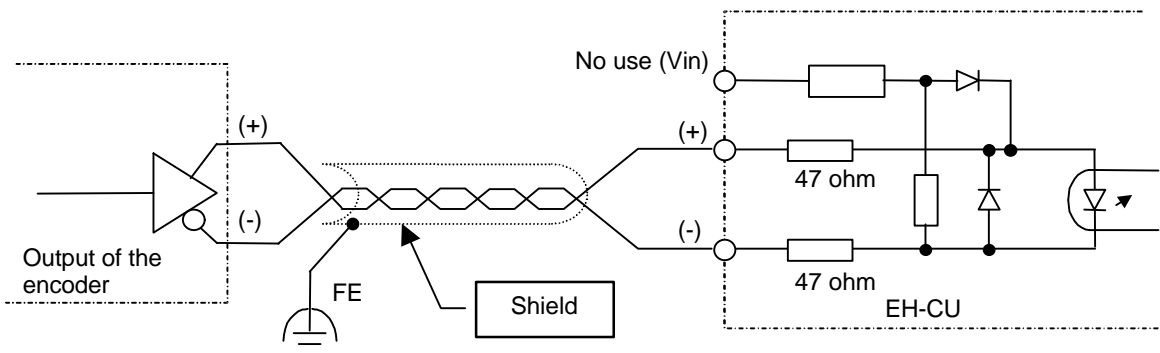
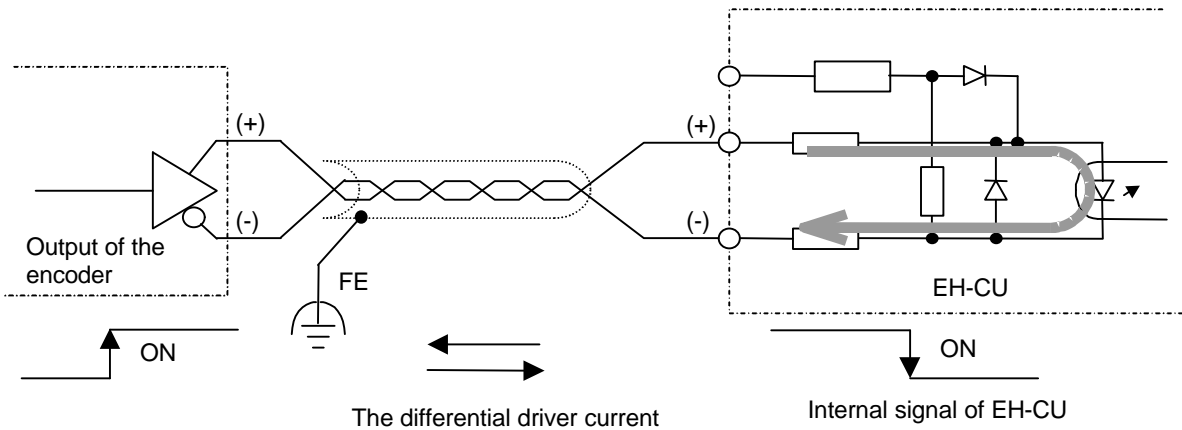


Figure 4.2 The interface with differential input

<Definition of input "ON">

When the differential driver current of the encoder passes the photo-coupler, input signal turns "ON" like under figure.



4.1.2 Example: Connection with open collector output

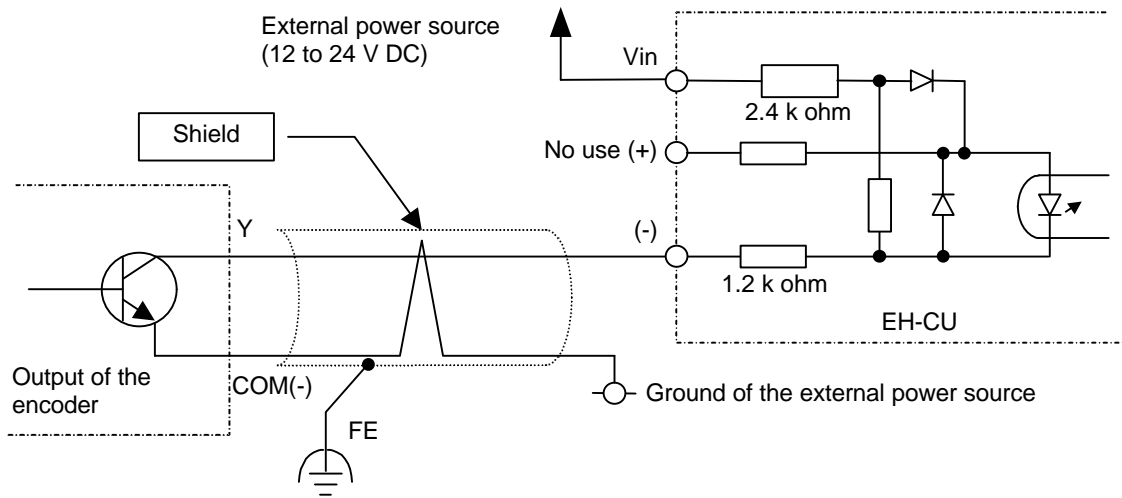
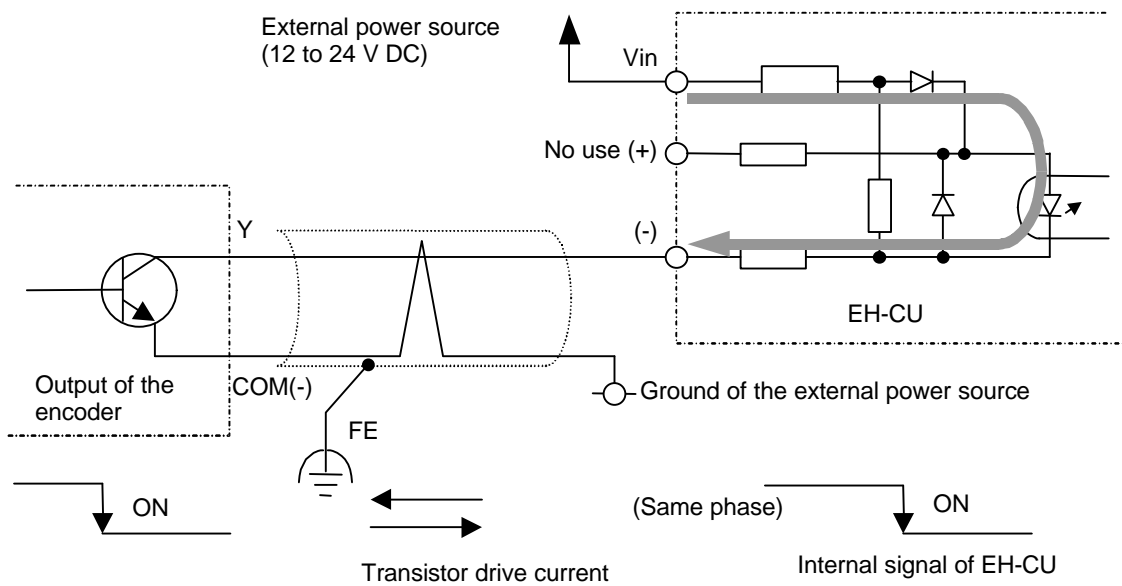


Figure 4.3 The interface with open collector output

<Definition of input "ON">

When the transistor current of the encoder run the photo-coupler, input signal is "ON" like under figure.



4.2 Output Interface

<Structure of input interface>

EH-CU has output interfaces of open collector type. Figure 4.4 shows a structure of the circuit.

When the output transistor is "ON", it sinks the current from the external load.

Please connect an additional fuse rated about 0.5A to each COM terminal outside, for protection of internal wiring.

4.2.1 Example: Connection with external device

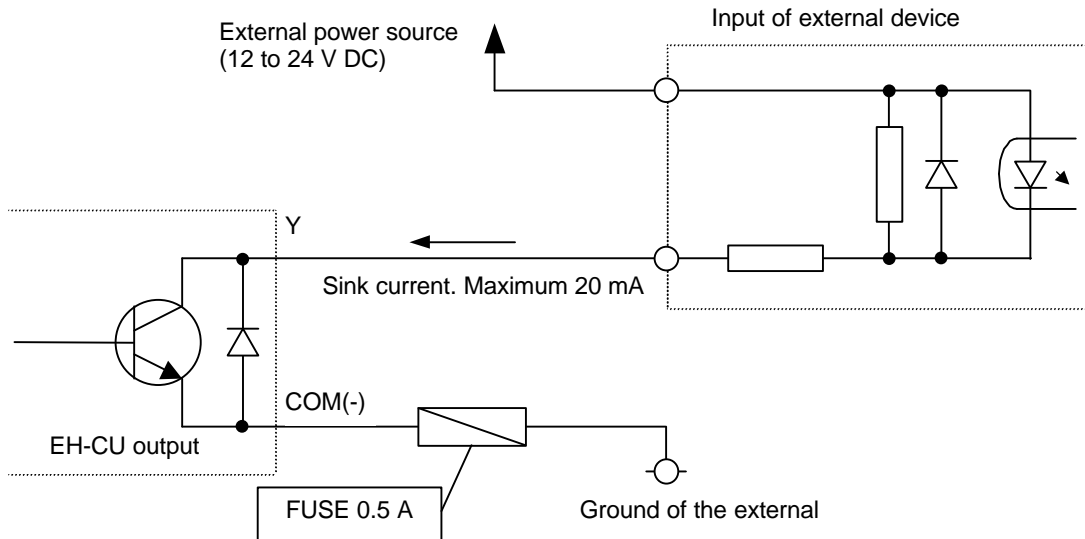


Figure 4.4 The interface of transistor

4.3 How to connect

Use the below connector below or equal one between EH-CU and the target device.

1.Connector model for EH-CU side

HIF3BA-30PA-2.54DS 30pin (male connector) made by HIROSE or equal one.

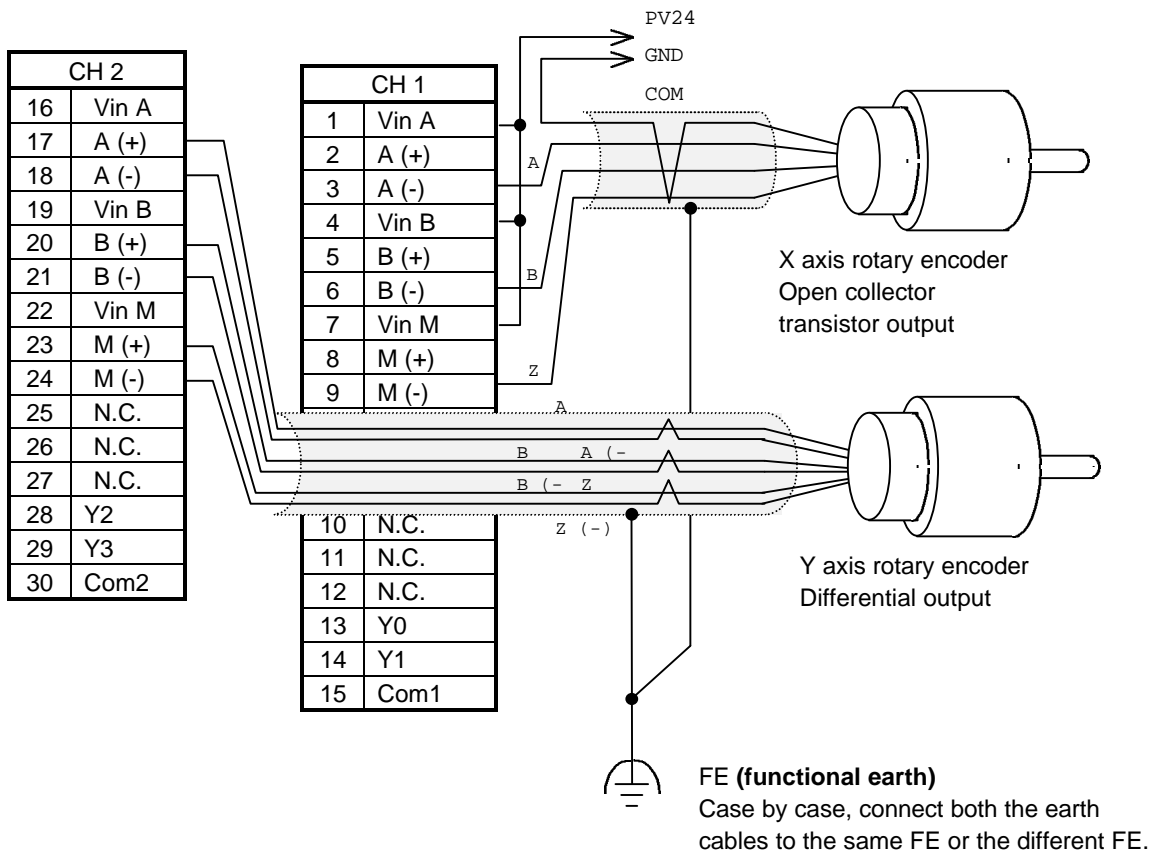
2.Connector model for the device side. Free wires and pin-socket of solderless type.

Connector case	HIF3BA-30D-2.54C	Connector case for 30 pins	Made by HIROSE
Connector pin (applicable tool)	HIF3-2226SCC (HIF3-TB2226HC)	Partial plated terminal For AWG#22-26 wire *1	Made by HIROSE
Connector case cover	HIF3-30CV		Made by HIROSE

*1 AWG22-26 wire is $\phi 0.64-0.40\text{mm}$

Refer Chapter 6.3 "Wiring" about the notes of wiring.

Example: connection to a rotary encoder



Refer Chapter 6.3 "Wiring" about the notes of wiring.

Chapter 5 Setting

5.1 Setting dip switches

Set dip switches by an equipment which is sharp at the end carefully, and don't touch the electric parts except for dip switch.

1	<p>Counter mode</p> <p>SW1,2</p>	<p>SW1,2 : Counter mode setting. This setting mode is common in both channels. SW1:SW2 OFF:OFF 2 phase counter (Maximum 100kHz) O N:OFF Single phase counter (CW, CCW) OFF:O N Single phase counter (CK, U/D) O N:O N 2 phase 4 time multiple counter (Maximum 25kHz)</p>
2	<p>Marker polarity</p> <p>SW3,4</p>	<p>SW3,4 : Marker polarity setting Refer Chapter 4 "Interface" about the definition of input "ON". SW3 is for CH1 and SW4 is for CH2. OFF: Input "ON" is the marker input. O N: Input "OFF" is the marker input.</p>
3	<p>CPU stop count</p> <p>SW5,6</p>	<p>SW5,6 : Counter enable during CPU stop. SW5 is for CH1 and SW6 is for CH2. OFF: Counter disable during CPU stop. O N: Counter enable during CPU stop.</p>
4	<p>Ring counter mode</p> <p>SW7,8</p>	<p>SW7,8 : Ring counter mode Ring counter: Upper limit value is Setting value1, lower limit value is Preset value, do not use Marker input. Normal counter: Upper limit value is "HFFFFFFF", lower limit value is "0", when marker inputs, the current value change to Preset value. SW7 is for CH1 and SW8 is for CH2. OFF: Normal counter O N: Ring counter</p>
5	<p>Reserve</p> <p>SW9,10</p>	<p>SW9 and SW10 are reserved. Keep "OFF".</p>

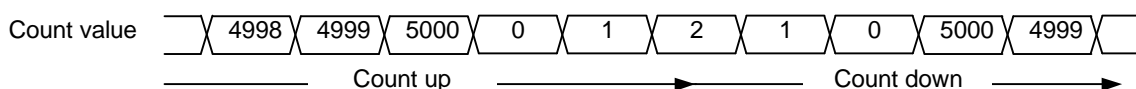
The other functions can be set by software commands. Refer to Chapter 7 about the detail of software commands.

5.2 Counter specifications and setting items

	Item	Normal counter	Ring counter
Specification	Lower limit value	0	Preset value*1
	Upper limit value	HFFFFFFF	Setting value*1
	Over flow flag	This flag will be "1" when the current value change HFFFFFFF to 0.	Always 0
	Under flow flag	This flag will be "1" when the current value change 0 to HFFFFFFF.	Always 0
	Over flow flag clear	When this bit is "1", the over flow flag will be cleared.	No function
	Under flow flag clear	When this bit is "1", the under flow flag will be cleared.	No function
	Count enable	When the count enable bit is "1", the counter will be enable.	When the count enable bit is "1", the counter will be enable.
	Count disable	When the count enable bit is "1", the counter will be disable.	When the count enable bit is "1", the counter will be disable.
Comparison detection	Comparison (=, latch output)	In case of counting up, when the current value becomes the Setting value1 + 1, this bit will be set. *2 In case of counting down, when the current value becomes the Setting value1 - 1, this bit will be set. *2	In case of counting up, when the current value becomes the Setting value2 + 1, this bit will be set. *2 In case of counting down, when the current value becomes the Setting value2 - 1, this bit will be set. *2
	Comparison (>, level output)	In case of counting up, when the current value becomes the Setting value1 + 1, this bit will be set. *2 In case of counting down, when the current value becomes the Setting value1 - 1, this bit will be reset. *2	No function
	Comparison (=, latch output) clear	When it is set "1", comparison bit (=, latch output) is set "0".	When it is set "1", comparison bit (=, latch output) is set "0".
	Output enable or disable	It makes the external output enable or disable.	It makes the external output enable or disable.
Marker	Marker input	Current value will change to the preset value. *3	No function
	Marker enable or disable	Marker input enable or disable	No function
	Marker logic	Marker logic positive or negative.	No function
Setting value	Current value	The current value of EH-CU*4	The current value of EH-CU *5
	Preset value	When marker input is "ON", current value will be the preset value. *4	Lower limit value *5
	Setting value1	Comparison value*4	Upper limit value*5
	Setting value2	No function	Comparison value *5

*1 In case of Ring counter, the count value includes upper limit value.

Example) In case of upper limit value is "5000", lower limit value is "0".

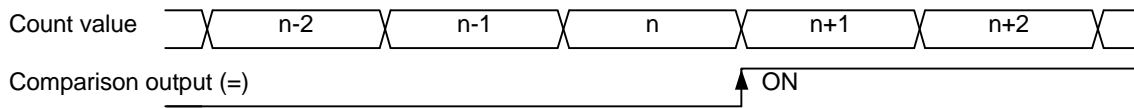


*2 Specification of the comparison output

In case of latch detection

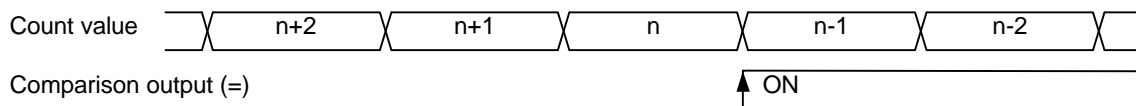
In case of counting up, the comparison output is "ON" when the current value changes "n" to "n+1".

(n = Setting value1)



In case of counting down, the comparison output is "ON" when the current value changes "n" to "n-1".

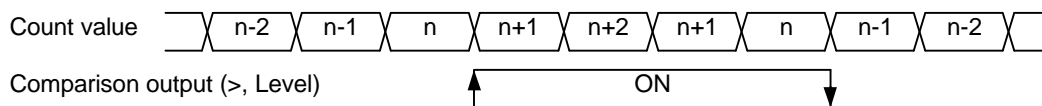
(n = Setting value1 or Setting value2)



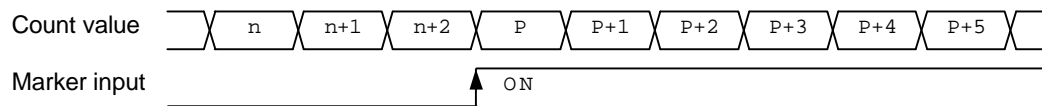
In case of level detection.

The comparison output is "ON" when the current value changes "n" to "n+1" or "n-1".

(n = Setting value1)



*3 Specification of the marker input.(P= Preset value)



The marker operation is done at "ON" edge of the marker input. So even during the marker "ON", the counter is countable.

***4 In case of Normal counter mode, Current value, Preset value and Setting value1 are able to be written during counting.**

***5 In case of Ring counter mode, Current value is able to be written during counting, but the Current value should be within the value from lower limit to upper limit.**

Preset value and Setting value1, 2 are able to be written during stopping count. If there is a mismatch of big/small relation between Preset value and Setting value1, Setting error occurs and PW LED lamp flashes.

Chapter 6 Installation and Wiring

6.1 Installation of Module

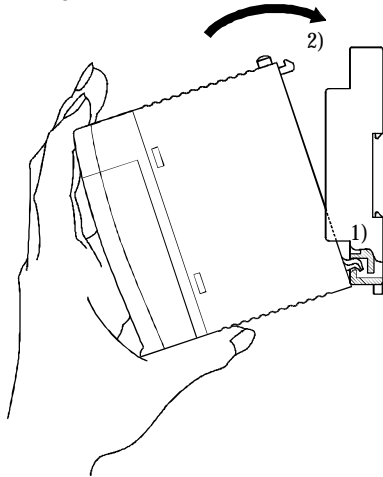
EH-150 can be installed in both the basic and expansion base unit.

Install and uninstall the module after turn off the base unit power source.

Set dip switch before installing the module according to Chapter 5.1 "Setting dip-switches".

6.2 Loading the Module

(1) Installing



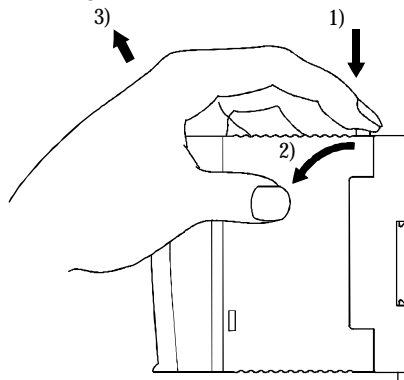
- 1) Hook the claw at the lower section of the module to the hole in the base.
- 2) Press in the upper side of the module until it clicks.

Note 1: After loading the module, check to make sure it does not come out.

Note 2: Load the power module at the leftmost side of the base unit.

Note 3: Load the CPU module and I/O controller to the right neighbor of the power module.

(2) Removing



- 1) Push in the lock button.
- 2) With the lock button pushed in, pull the top of the module toward the front.
- 3) Raise it toward the top and pull it out.

Note: For the power module, pull it out while pushing down the two lock buttons.

6.3 Wiring

Take much care of separation from the other wires. Because EH-CU that can count high frequency pulse that is maximum 100kHz is very sensitive to short width pulses, so in the case that the noise from the other wires come across to EH-CU, EH-CU may not count correctly.

In case of high frequency, EH-CU may not count correctly by the wiring method, the length of wire, the cable impedance or short of pulse drive power.

So we recommend the differential input.

<Notes of wiring>

1) Length of wire

Wire within 10m from EH-CU to the pulse output device like encoder.

2) Separation to the power lines.

Use the cable with shields for wiring to the pulse output device like encoder. In this case connect a drain wire to the shield net both sides, because it can be connected to the functional earth not only on the device side but also PLC side.

Separate the duct within the signal wires of EH-CU from other wires. (Another input/ output wires and power source wires)

3) Add a ferrite core

Insert a ferrite core with the input/output shielded wires, and wind the shielded wires by one turn around the ferrite core.

4) Regarding failsafe

Construct an interlock circuit outside the PLC.

When PLC supply is turned on or off, the lag time and difference in startup time between the PLC unit power and the external power (particularly DC power supply) for the PLC I/O module signals, may temporarily cause the I/O not to operate normally.

5) Install a lightning arrestor

To prevent damage to equipment from being struck by lightning, it is recommended that a lightning arrestor is to be set up for each PLC power supply.

Chapter 7 Programming

7.1 I/O Assignment

EH-CU uses 8 words that are 5 word input(WX) and 3 word output(WY).
Set "FUN 0" as I/O assignment.

7.2 Input and Output register

The input and output registers of EH-CU are defined the under table.

Table 7.1 Function of the input and output registers

Register NO.	Direction	Function
WX r u s 0	EH-CPU←EH-CU (EH-CU writes , CPU reads)	Status Register The information of EH-CU status is set. According to the commands set in Control Register, the status of each bit changes.
WX r u s 1 WX r u s 2	EH-CPU←EH-CU (EH-CU writes , CPU reads)	CH1 Status word (lower word)*1 CH1 Status word (upper word)*1 When XHS is "0", Current value of CH1 is set. When XHS is "1", preset value and Setting value1 and 2 of CH1 are set. According to the commands set in Control Register, the data of the words changes.
WX r u s 3 WX r u s 4	EH-CPU←EH-CU (EH-CU writes , CPU reads)	CH2 Status word (lower word)*1 CH2 Status word (upper word)*1 When XHS is "0", Current value of CH2 is set. When XHS is "1", preset value or Setting value1 and 2 of CH2 are set. According to the commands set in Control Register, the data of the words changes.
WY r u s 5	EH-CPU→EH-CU (CPU writes , EH-CU reads)	Control Register Set the commands to control EH-CU and set the handshake bit for communication between EH-CU and CPU. Set valid data to Control words (WYrus6, 7) before setting the commands or the handshake bit.
WY r u s 6 WY r u s 7	EH-CPU→EH-CU (CPU writes , EH-CU reads)	Control word (lower word) Control word (upper word) Set the necessary data of the command in WY rus 5.

Note: r : Remote master number. (In the case of the module installed CPU unit, r = 0)
u : unit or Remote slave station number.
s : slot number on the base unit.
0 to 7: word number of the module.

*1 When CPU reads Status words (WX r u s 1 to 4), CPU can read the unit per word (16 bits) data correctly, but CPU can not read two words (32 bits) at the same time. In order to read the current value (32 bits), CPU should set "Current value latch command" to Control Register and latch the count data before read the count data.
During handshake operation, the count value is fixed but the pulse counting is continued.

7.3 Detail of Registers

7.3.1 W X r u s 0 Status Register

The status of EH-CU is set Status Register.

	W X r u s 0															
Bit	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
Definition	XHS	-	CH2	CH1	OF2	UF2	OF1	UF1	EQ2	OE2	ME2	CE2	EQ1	OE1	ME1	CE1

Bit	Definition	Contents
X15	XHS	X-Handshake flag: The response flag from EH-CU for the commands from CPU. When it change from "0" to "1", the value of Status words is valid. In detail refer chapter 7. 3. 3. (Notes) When XHS is "1", the value of X0 – X11 are all "0".
X14	-	No definition. Always "0"
X13	CH1	CH1 valid flag: When it is "1", the value (flags, data, commands) for CH1, is valid.
X12	CH2	CH2 valid flag: When it is "1", the value (flags, data, commands) for CH2, is valid.
X11	OF2	CH2 Overflow flag: It is set "1" when CH2 counter is overflow. It keeps the status until receiving the clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X10	UF2	CH2 underflow flag: It is set "1" when CH2 counter is underflow. It keeps the status until receiving the clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X09	OF1	Overflow CH1 flag: It is set "1" when CH1 counter is overflow. It keeps the status until receiving the clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X08	UF1	CH1 underflow flag: It is set "1" when CH1 counter is underflow. It keeps the status until receiving the clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X07	EQ2	CH2 equal flag: It is set "1" when the CH2's count value exceed Comparison value. It keeps the status until receiving the Comparison clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X06	OE2	CH2 output enabled flag: It is set "1" when the CH2's comparison output is enabled. The initial value is "0". In case of setting count disable during CPU stopping, it keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X05	ME2	CH2 Maker enabled flag: It is set "1" when CH2's Maker enabled. The initial value is "0". It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X04	CE2	CH2 counter enable flag: It is set "1" when CH2's counter enabled. The initial value is "0". It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X03	EQ1	CH1 equal flag: It is set "1" when the CH1's count value exceed Comparison value. It keeps the status until receiving the Comparison clear command. It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X02	OE1	CH1 output enabled flag: It is set "1" when the CH1's comparison output is enabled. The initial value is "0". In case of setting count disable during CPU stopping, it keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X01	ME1	CH1 Maker enabled flag: It is set "1" when CH1's Maker enabled. The initial value is "0". It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".
X00	CE1	CH1 counter enabled flag: It is set "1" when CH1's counter enabled. The initial value is "0". It keeps the value when CPU status changes "RUN" to "STOP" or "STOP" to "RUN".

7.3.2 WYrus5 Control Register

Set EH-CU's functions to Control Register.

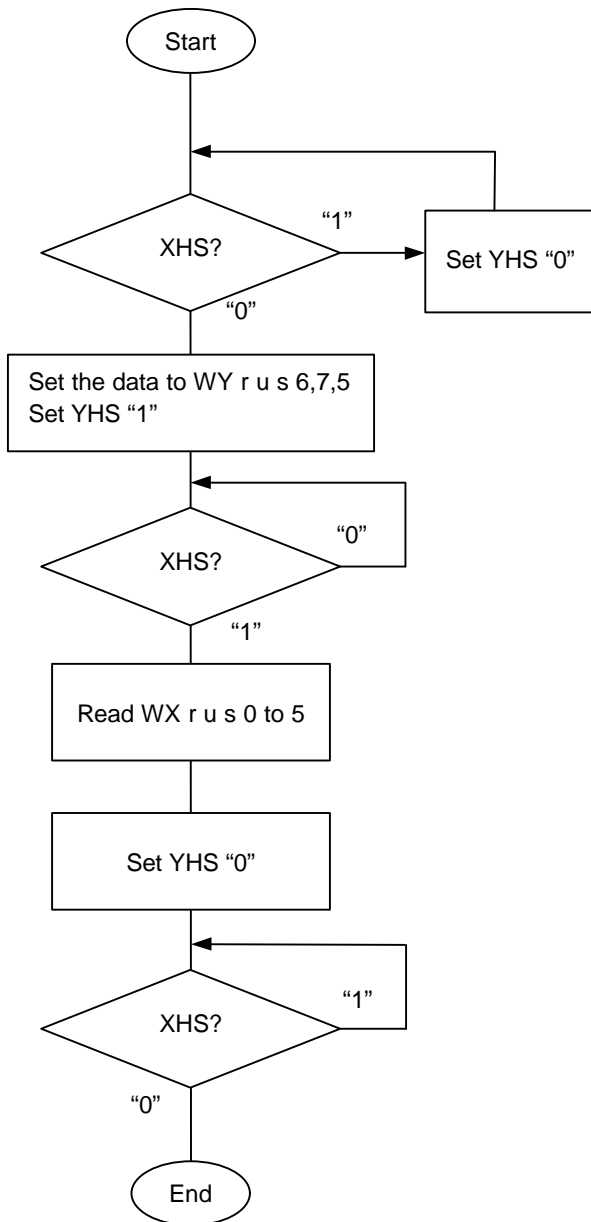
		WYrus5															
Bit		Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
Definition		YHS	CMD	CH2	CH1	CM3	CM2	CM1	CM0	EC2	OE2	ME2	CE2	EC1	OE1	ME1	CE1

Bit	Definition	Contents
Y95	YHS	Y-Handshake flag : When this bit changes from "0" to "1", the command from CPU to EH-CU is set. In detail, refer to chapter 7. 3. 3.
Y94	CMD	Command Mode bit: It is the command mode. In flag setting mode, please set "0". In data setting mode, please set "1".
Y93	CH1	Selecting CH1 for commands Set "1" when the command is for CH1.
Y92	CH2	Selecting CH2 for commands Set "1" when the command is for CH2.
Y91	CM3	Command bit3-0 :It is commands for EH-CU. In case of CM3-0 is "H0", the command is the global command that is the operation command for the control flag. In case of CM3-0 is "H1" to "HF", the command is the data command that is the operation command to set flags and data.
Y90	CM2	
Y89	CM1	
Y88	CM0	
Y87	EC2	Equal flag clear bit of CH2 : It is enabled to set in case of global command. When this bit is "1", the equal flag of CH2 is cleared. The initial value is "0".
Y86	OE2	Output enable bit of CH2 : It is enabled to set in case of global command. When this bit is "1", the comparison output of CH2 is enable. The initial value is "0".
Y85	ME2	Marker enable bit of CH2 : It is enabled to set in case of global command. When this bit is "1", the marker input of CH2 is enable(*1). The initial value is "0".
Y84	CE2	Counter enable bit of CH2 : It is enabled to set in case of global command. When this bit is "1", the counter input is enable. The initial value is "0"
Y83	EC1	Equal flag clear bit of CH1 : It is enabled to set in case of global command. When this bit is "1", the equal flag of CH2 is cleared. The initial value is "0".
Y82	OE1	Output enable bit of CH1 : It is enabled to set in case of global command. When this bit is "1", the comparison output of CH2 is enable. The initial value is "0".
Y81	ME1	Marker enable bit of CH1 : It is enabled to set in case of global command. When this bit is "1", the marker input of CH2 is enable(*1). The initial value is "0".
Y80	CE1	Counter enable bit of CH1 : It is enabled to set in case of global command. When this bit is "1", the counter input is enable. The initial value is "0"

*1 Marker polarity setting is mentioned in chapter 5.1 Setting dip switches.

7.3.3 Communication Specification Between EH-CPU and EH-CU

Set data from EH-CPU to EH-CU according to the procedure under.



Procedure of User program

1. See XHS status "1" or "0". If XHS is "1", set YHS "0" and wait XHS become "0".

2. If XHS is "0", set the necessary data to WYrus6 and WYrus7, and set the command to WYrus5 before setting "1" to YHS.

3. After EH-CU receives the command, EH-CU responds to set "1" to XHS.

4. After EH-CPU reads the necessary data, set "0" to YHS.

7.4 Control Command

7.4.1 Command List

CMD is bit14 of Control Register, CM3-0 are bit11-08 of Control Register.

	CMD bit	Both channel	CM3-0 bits	Contents
	Bit14	Bit13-12	Bit11-08	
Global	-	-	H0	Global command. It controls the flags of EH-CU.
Setting command	0	disable(0)	H1	Read the latched current value.
	0	enable *1	H2	Write Setting value 1. *3
	0	enable *1	H3	Write Setting value 2. *3
	0	enable *1	H6	Read Setting value 1.
	0	enable *1	H7	Read Setting value 2.
	0	enable	HD	Read Preset value.
	0	enable *1	HE	Write Preset value. *3
	0	enable *1	HF	Write Current value
Flag command	1	enable	H1	Specify comparison output (Cannot set in counting) *2
	1	enable	H2	Clear Overflow flag
	1	enable	H3	Clear Underflow flag
	1	enable	H4	Read each flag

*1 When both channels (bit12,13 are "1","1") are enable, the same data is set to CH1 and CH2.

*2 Comparison output cannot be specified when count enable is valid (CE1 or CE2 is "1")

*3 In case of Ring counter, the current value 1 or 2 or Preset value cannot be set when count enable is valid (CE1 or CE2 is "1")

7.5 Command Specification

7.5.1 Global Command

		Global command				CM3-0 = H0				Function		Control flag of EH-CU						
command/Data	Setting	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		WYrus6	No setting data(ignored)															
		WYrus7	No setting data(ignored)															
		There is no data to set WYrus6,7.																
		Set the flags to set lower 8 bits of WYrus5																
		Refer 7.3.2 "Control Register" about the definition of each flag																
Data	Response	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		WXrus1-4	There is no response data. Previous data is kept.															
		Only XHS bit is set "1" to WXrus0. When XHS bit is "0", the other bits that are from X00 to X11 are set according to refer chapter "7.3.1 WX rus0 Status Register".																

7.5.2 Setting Command

Setting command CMD = 0					CM3-0 = H1				Function		Read the latched current value						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	0	0	0	0	0	1	*	*	*	*	*	*	*	*
	WYrus6	No setting data (ignored)															
	WYrus7	No setting data (ignored)															
There is no data to set to WY rus 6 and 7.																	
Both the latched current values of CH1 and CH2 are set at the same time.																	
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1	Lower word (16 bits) of CH1's latched current value															
	WXrus2	Upper word (16 bits) of CH1's latched current value															
	WXrus3	Lower word (16 bits) of CH2's latched current value															
	WXrus4	Upper word (16 bits) of CH2's latched current value															
When XHS bit of WXrus0 is set, the response data is valid.																	

Setting command CMD = 0					CM3-0 = H2				Function		Write Setting value1						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	CH2	CH1	0	0	1	0	*	*	*	*	*	*	*	*
	WYrus6	Lower word (16bits) of Setting value1															
	WYrus7	Upper word (16bits) of Setting value1															
Set Setting value1 to WYrus6 or 7.																	
Set "1" to CH1 or CH2 bit to write Setting value1.																	
If both channel valid flags (CH1 and CH2) are set, the same setting value are set to both channels.																	
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There is no response data. The previous value is kept.															
CH1 or CH2 flag is set applicable to the channel set by the setting command.																	
When XHS bit of WXrus0 is set "1", it is complete to write Setting value 1.																	

Setting command CMD = 0					CM3-0 = H3				Function		Write Setting value2						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	CH2	CH1	0	0	1	1	*	*	*	*	*	*	*	*
	WYrus6	Lower word (16bits) of Setting value2															
	WYrus7	Upper word (16bits) of Setting value2															
Set Setting value1 to WYrus6 or 7.																	
Set "1" to CH1 or CH2 bit to write Setting value2.																	
If both channel valid flags (CH1 and CH2) are set, the same setting value are set to both channels.																	
In case of Ring counter, Setting value2 cannot be written.																	
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There is no response data. The previous value is kept.															
CH1 or CH2 flag is set applicable to the channel set by the setting command.																	
When XHS bit of WXrus0 is set, it is complete to write Setting value 2.																	

Note Bit value "*" means "Don't care".

Setting command CMD = 0					CM3-0 = H6				Function		Read Setting value1						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	CH2	CH1	0	1	1	0	*	*	*	*	*	*	*	*
	WYrus6	No setting data (ignored)															
	WYrus7	No setting data (ignored)															
	There is no data to set to WYrus 6 and 7.																
	Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to read Setting value1.																
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1	Lower word (16 bits) of CH1's Setting value1															
	WXrus2	Upper word (16 bits) of CH1's Setting value1															
	WXrus3	Lower word (16 bits) of CH2's Setting value1															
	WXrus4	Upper word (16 bits) of CH2's Setting value1															
	CH1 or CH2 flag is set applicable to the channel set by the setting command																
	When XHS bit of WXrus0 is set "1", the response data is valid.																
	The status data of the invalid channel is kept the previous value.																

Setting command CMD = 0					CM3-0 = H7				Function		Read Setting value2						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	CH2	CH1	0	1	1	1	*	*	*	*	*	*	*	*
	WYrus6	No setting data (ignored)															
	WYrus7	No setting data (ignored)															
	There is no data to set to WYrus 6 and 7.																
	Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to read Setting value2.																
	In case of Normal counter, the reading value is "0".																
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1	Lower word (16 bits) of CH1's Setting value2															
	WXrus2	Upper word (16 bits) of CH1's Setting value2															
	WXrus3	Lower word (16 bits) of CH2's Setting value2															
	WXrus4	Upper word (16 bits) of CH2's Setting value2															
	CH1 or CH2 flag is set applicable to the channel set by the setting command.																
	When XHS bit of WXrus0 is set "1", the response data is valid.																
	The status data of the invalid channel is kept the previous value.																

Setting command CMD = 0					CM3-0 = HD				Function		Read Preset value						
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	0	CH2	CH1	1	1	0	1	*	*	*	*	*	*	*	*
	WYrus6	No setting data (ignored)															
	WYrus7	No setting data (ignored)															
	There is no data to set to WYrus 6 and 7.																
	Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to read Preset value.																
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1	Lower word (16 bits) of CH1's Preset value															
	WXrus2	Upper word (16 bits) of CH1's Preset value															
	WXrus3	Lower word (16 bits) of CH2's Preset value															
	WXrus4	Upper word (16 bits) of CH2's Preset value															
	CH1 or CH2 flag is set applicable to the channel set by the setting command.																
	When XHS bit of WXrus0 is set "1", the response data is valid.																
	The status data of the invalid channel is kept the previous value.																

Setting command CMD = 0					CM3-0 = HE				Function		Write Preset value						
command/Data	Setting	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		WYrus5	YHS	0	CH2	CH1	1	1	1	0	*	*	*	*	*	*	*
	WYrus6	Lower word (16bits) of Preset value															
	WYrus7	Upper word (16bits) of Preset value															
	Set Preset value to WYrus6 or 7. Set "1" to CH1 or CH2 bit to write Preset value. If both channel valid flags (CH1 and CH2) are set, the same Preset value are set to both channels.																
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There are no response data. The previous value is kept.															
	CH1 or CH2 flag is set applicable to the channel set by the setting command. When XHS bit of WXrus0 is set "1", it is complete to write Preset value.																

Setting command CMD = 0					CM3-0 = HF				Function		Write Current value						
command/Data	Setting	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		WYrus5	YHS	0	CH2	CH1	1	1	1	1	*	*	*	*	*	*	*
	WYrus6	Lower word (16bits) of Current value															
	WYrus7	Upper word (16bits) of Current value															
	Set Current value to WYrus6 or 7. Set "1" to CH1 or CH2 bit to write Current value. If both channel valid flags (CH1 and CH2) are set, the same Current value are set to both channels.																
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There is no response data. The previous value is kept.															
	CH1 or CH2 flag is set applicable to the channel set by the setting command. When XHS bit of WXrus0 is set "1", it is complete to write Current value.																

7.5.3 Flag Command

Flag command CMD = 1				CM3-0 = H1				Function		Specify comparison output							
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	1	CH2	CH1	0	0	0	1	*	*	*	*	*	*	*	*
	WYrus6	Disable bit access															
		>	=	>	=	>	=	>	=	>	=	>	=	>	=	>	=
CH2		CH1		CH2		CH1		CH2		CH1		CH2		CH1			
Specify "Y3" output				Specify "Y2" output				Specify "Y1" output				Specify "Y0" output					
WYrus7	No setting data (ignored)																
Specify each comparison output defined by Wyrus6. Set "1" to the applicable bit to each comparison output terminal ("Y0", "Y1", "Y2" or "Y3") and comparison specification. (">" or "=")																	
Specify only one setting output to the same output terminal.																	
It is able to set the same setting to the other output terminal. It isn't necessary to set the value for WYrus7 (Example) In case of defining Y3-0 that are set for CH1's comparison output "=", WYrus6 = H1111 (Example) In case of defining Y3 that is set for CH2's comparison output ">", Y2 that is set for CH2's comparison output "=", Y1 that is set for CH1's comparison output ">", Y0 that is set for CH2's comparison output "=".																	
WYrus6 = H8421																	
Note: To enable the real output, it is necessary not only to specify by this command but also to set output enable bit by global command. This command is disabled during counting. When changing the output specification, the comparison output is cleared.																	
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There is no response data. The previous value is kept.															
CH1 or CH2 flag is set applicable to the channel set by the setting command.																	
When XHS bit of WXrus0 is set "1", it is complete to specify comparison output.																	

Flag command CMD = 1				CM3-0 = H2				Function		Clear Overflow flag							
Setting command/Data	WYrus5	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		YHS	1	CH2	CH1	0	0	1	0	*	*	*	*	*	*	*	*
	WYrus6	No setting data (ignored)															
WYrus7	No setting data (ignored)																
There is no data to set to WYrus 6 and 7.																	
Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to clear Overflow.																	
If both channel valid flags (CH1 and CH2) are set, both channel flag are cleared.																	
Response Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
		XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
	WXrus1-4	There are no response data. The previous value is kept.															
CH1 or CH2 flag is set applicable to the channel set by the setting command.																	
When XHS bit of WXrus0 is set "1", it is complete to clear Overflow flag.																	

		Flag command CMD = 1				CM3-0 = H3				Function		Clear Under flow flag					
command/Data	Setting	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		WYrus5	YHS	1	CH2	CH1	0	0	1	1	*	*	*	*	*	*	*
WYrus6	No setting data (ignored)																
WYrus7	No setting data (ignored)																
Response		<p>There is no data to set to WYrus 6 and 7.</p> <p>Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to clear Underflow.</p> <p>If both channel valid flags (CH1 and CH2) are set, both channel flag are cleared.</p>															
Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
	WXrus1-4	XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	0	0	0	0
Response		<p>There is no response data.</p> <p>The previous value is kept.</p> <p>CH1 or CH2 flag is set applicable to the channel set by the setting command.</p> <p>When XHS bit of WXrus0 is set "1", it is complete to clear Underflow flag.</p>															

		Flag command CMD = 1				CM3-0 = H4				Function		Read each flag					
command/Data	Setting	Y95	Y94	Y93	Y92	Y91	Y90	Y89	Y88	Y87	Y86	Y85	Y84	Y83	Y82	Y81	Y80
		WYrus5	YHS	1	CH2	CH1	0	1	0	0	*	*	*	*	*	*	*
WYrus6	No setting data (ignored)																
WYrus7	No setting data (ignored)																
Response		<p>There is no data to set to WYrus 6 and 7.</p> <p>Set "1" to the CH bit that is applicable to the channel "CH1" or "CH2" to read each flag.</p>															
Data	WXrus0	X15	X14	X13	X12	X11	X10	X09	X08	X07	X06	X05	X04	X03	X02	X01	X00
	WXrus1	XHS	0	CH2	CH1	0	0	0	0	0	0	0	0	Y3	Y2	Y1	Y
Data	WXrus1	X31	X30	X29	X28	X27	X26	X25	X24	X23	X22	X21	X20	X19	X18	X17	X16
	WXrus2	0	0	0	0	0	U/D	OF1	UF1	0	0	0	EQ1	EC1	OE1	ME1	CE1
Data	WXrus2	X47	X46	X45	X44	X43	X42	X41	X40	X39	X38	X37	X36	X35	X34	X33	X32
	WXrus3	0	0	>	=	0	0	>	=	0	0	>	=	0	0	>	=
Response		Specify "Y3" output				Specify "Y2" output				Specify "Y1" output				Specify "Y0" output			
Data	WXrus3	X63	X62	X61	X60	X59	X58	X57	X56	X55	X54	X53	X52	X51	X50	X49	X48
	WXrus4	0	0	0	0	0	U/D	OF2	UF2	0	0	0	EQ2	EC2	OE2	ME2	CE2
Data	WXrus4	X79	X78	X77	X76	X75	X74	X73	X72	X71	X70	X69	X68	X67	X66	X65	X64
	WXrus4	>	=	0	0	>	=	0	0	>	=	0	0	>	=	0	0
Response		Specify "Y3" output				Specify "Y2" output				Specify "Y1" output				Specify "Y0" output			
Response		<p>When XHS bit of WXrus0 is set "1", CH1 or CH2 flag is set applicable to the channel set by the setting command and Y3-0 flag are set the status of the comparison outputs in WXrus0.</p> <p>The status of the each channel flags are set in WXrus1 and WXrus3. When U/D equals "1", it is counting up. When U/D equals "0", it is counting down. WXrus1 is CH1's status and WXrus2 is CH2's status.</p> <p>The specified information of the output "Y3-0" are set in WXrus2 and WXrus4. WXrus3 is CH1's status and WXrus4 is CH2's status.</p>															

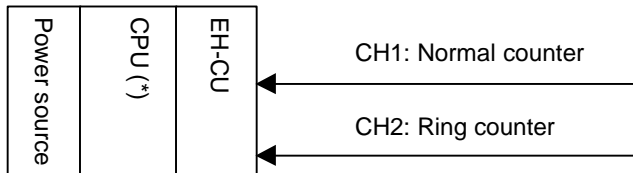
7.6 User Program

This program doesn't include the interlock circuit for the machinery safety, because it is the example for using EH-CU.

Before using EH-CU actually, program to consider about the machinery safety sufficiently.

7.6.1 Module construction about the next example of setting the counter

Below figure is the module construction about the next example of setting counter.



EH-CU is installed on slot "0".

(*) Please use EH-CPU308 or 316.

In case of CPU is CPU104/208, use CPU whose revision is ROM Rev.02 or new.

(The external output of double words (DYrus5 to 6) is disable. Use WY)

7.6.2 Example of setting the counter

Table 7.2 Setting specifications

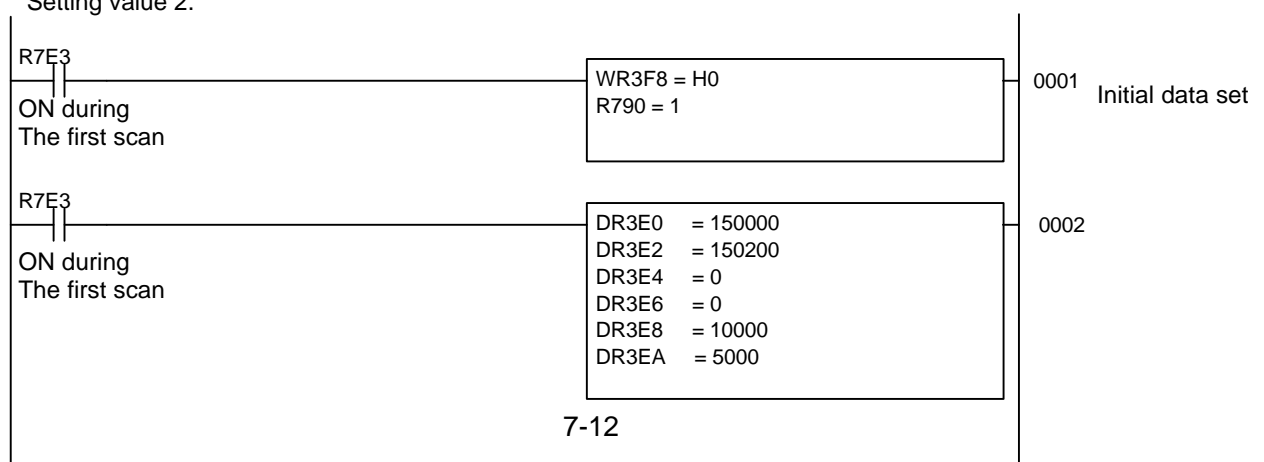
Item	CH1	CH2	Remark
Count enable during stopping	Enable	Disable	Dip-switch "5" is "ON"
Counter mode	Normal counter	Ring counter	Dip-switch "8" is "ON"
Marker enable or disable	Enable	-----	
Marker logic	Negative "ON" edged detection.	-----	Dip-switch "3" is "OFF"
Lower limit	0	Preset value	
Upper limit	HFFFFFFF	Setting value1	
Preset value	150000	0 (Lower limit)	
Setting value1	150200 (Comparison value)	10000 (Upper limit)	
Setting value2	-----	5000(Comparison value)	
Comparison output	Y0 is set as "=".	Y2 is set as "=".	
	Y1 is set as ">".		

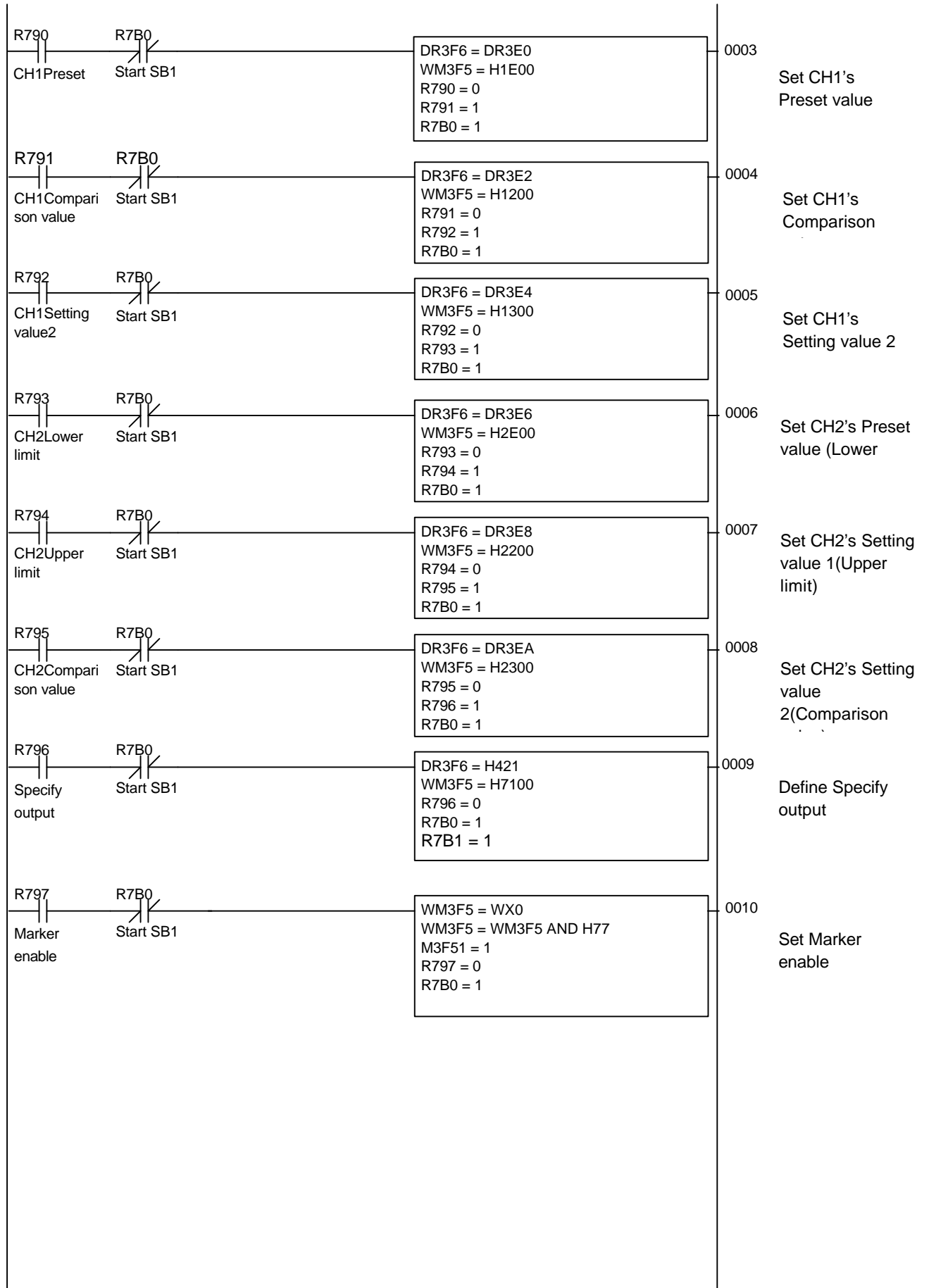
Table 7.3 Used internal outputs

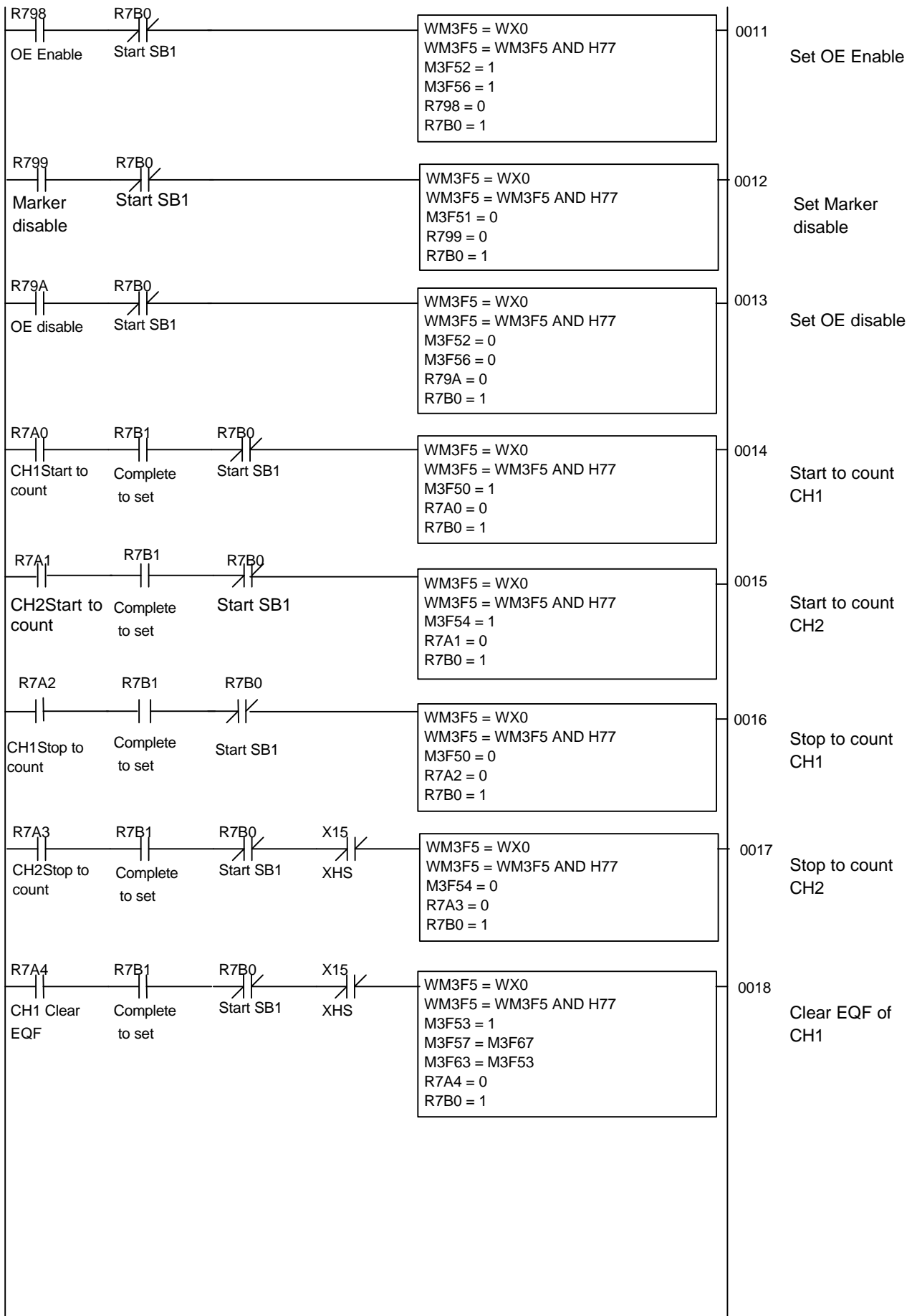
Area	Contents	Remark	Area	Contents	Remark
WR03F0	Working area for WXrus0		R799	Marker disable setting flag	CH1 only
WR03F1	Working area for WXrus1		R79A	OE disable setting flag	Same time for CH1
WR03F2	Working area for WXrus2		R79F	Flag of reading setting flags	and CH2
WR03F3	Working area for WXrus3		R7A0	CH1's flag starting to count	
WR03F4	Working area for WXrus4		R7A1	CH2's flag starting to count	
WR03F5	Working area for WYrus5		R7A2	CH1's flag stopping to count	
WR03F6	Working area for WYrus6		R7A3	CH2's flag stopping to count	
WR03F7	Working area for WYrus7		R7A4	Clear CH1's comparison flag as "="	
WR03F8	Transference of SB1's state		R7A5	Clear CH2's comparison flag as "="	
DR3E0	Preset value of CH1		R7A6	Reset the CH1's Clear flag	
DR3E2	Setting value1 of CH1		R7A7	Reset the CH2's Clear flag	
DR3E4	Setting value2 of CH1		R7A8	Clear the over flow	CH1 only
DR3E6	Preset value of CH2		R7A9	Clear the under flow	
DR3E8	Setting value1 of CH2		R7AA	Read Preset value	
DR3EA	Setting value2 of CH2		R7AB	Read Setting value1	
DR3EC	CH1's writing value		R7AC	Read Setting value2	
DR3EE	CH2's writing value		R7AD	Read the latched current value	Same time for CH1 and ch2
R790	CH1Preset	Setting flag	R7AE	Writing Current value	
R791	CH1Comparison value	Setting flag	R7AF	Reading Setting flag	
R792	CH1Setting value2	Setting flag	R7B0	The flag of starting SB1	
R793	CH2Lower limit	Setting flag	R7B1	Complete flag to Setting the counter	
R794	CH2Upper limit	Setting flag	WM3F0	Working area of WX0	
R795	CH2Comparison value	Setting flag	DM3F1	Working area of writing CH1's Current value.	
R796	Specify output	Setting flag	DM3F3	Working area of writing CH2's Current value.	
R797	Marker enable setting flag	CH1 only	WM3F5	Working area of WY5	
R798	OE enable setting flag	Same time for CH1 and CH2	WM3F6	Before status data of WM3F5	

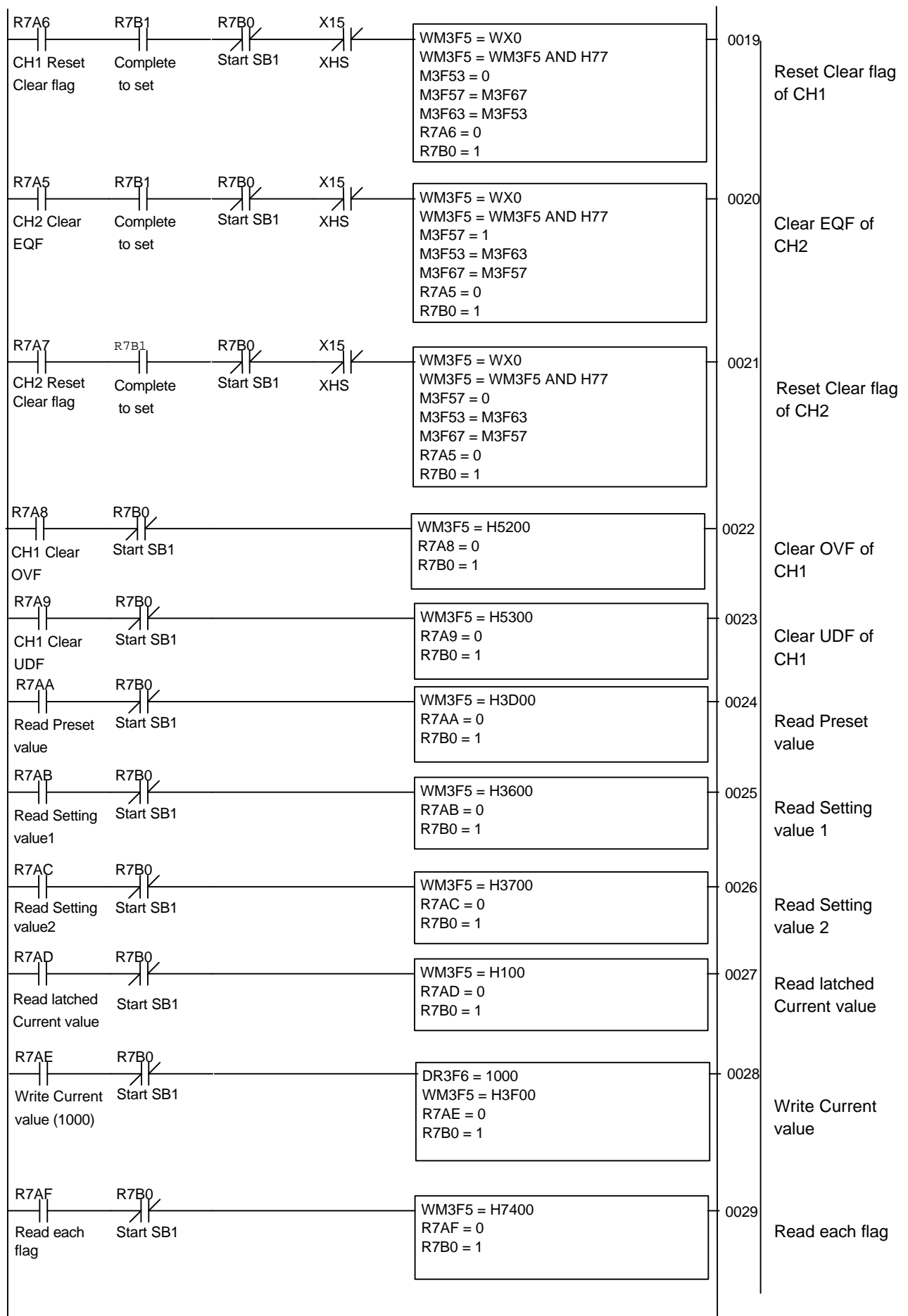
<Program example>

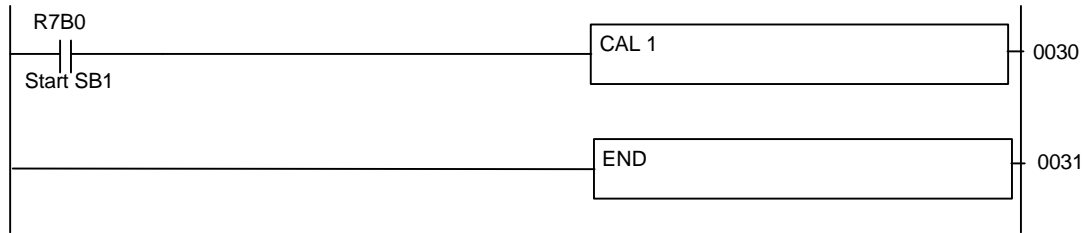
This program set the Preset value, Setting value 1, Setting value 2 and Specify comparison output automatically after the CPU runs. By setting each flag, it does setting enable or disable of Marker or Comparison output, to start or stop to count, to clear comparison flag, to read Preset value, Setting value 1 or Setting value 2.



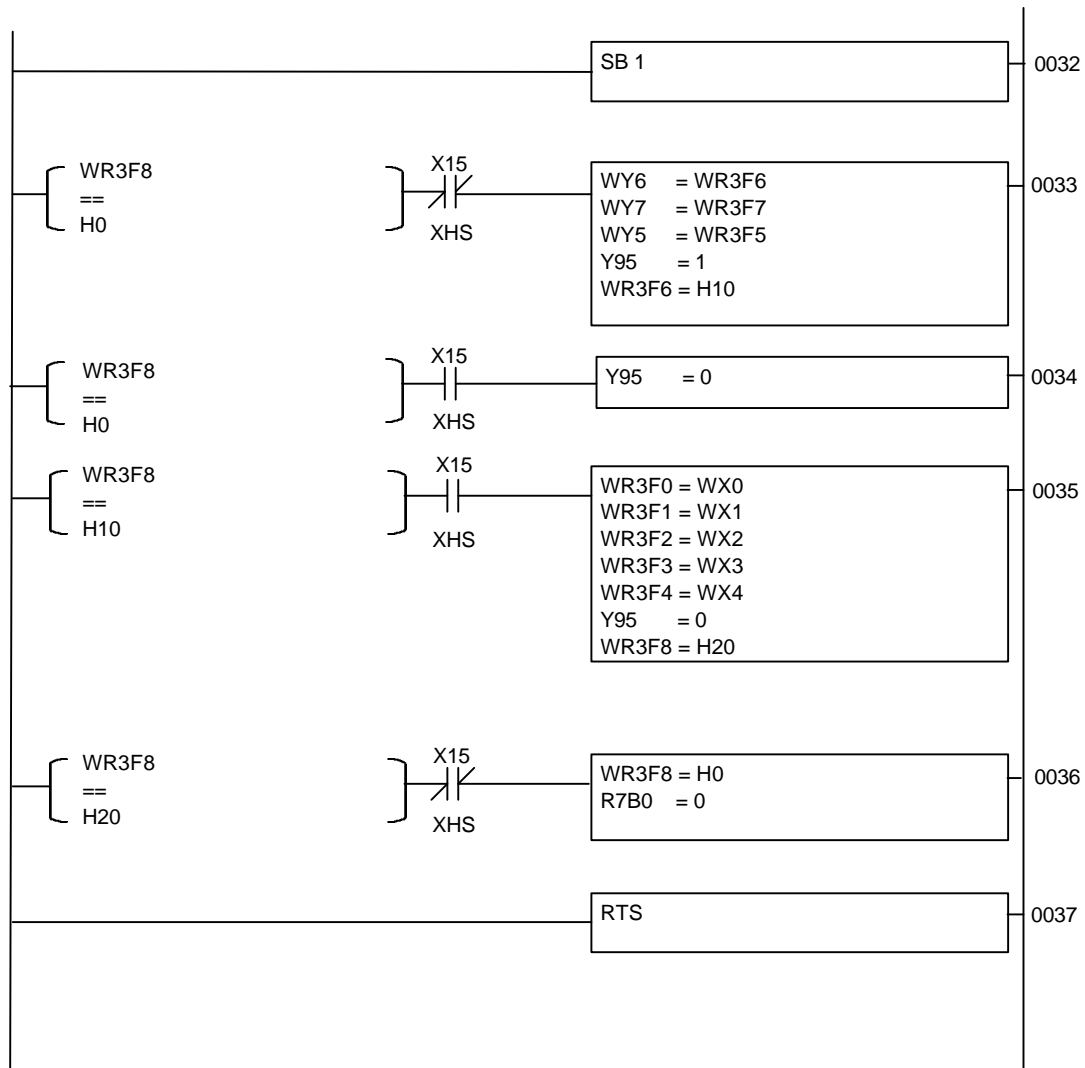








The below diagram is the sequence of handshake communication between EH-CPU and EH-CU.



Chapter 8 Daily and Periodic Inspection

In order to use the EH-CU functions in the most desirable condition and maintain the system to operate normally, it is essential to conduct daily and periodic inspections.

8.1 Daily inspection

Verify the following items while the system is running.

Table 8.1 Items for daily inspection

Item	LED display	Inspection method	Normal status	Main cause of error
Power module display	PW	Visual check	Lit	When unlit: Power supply error Hardware error of EH-CU, etc. When flashing: Wrong setting value.
	ER	Visual check	Unlit	When lit: Hardware error of EH-CU, etc.
	Other LED	Visual check	Lit or unlit	When lit: Input or output is "ON". *1 When unlit: Input or output is "OFF". *1

*1 About the definition, refer to the Chapter 4 "Interface".

8.2 Periodic inspection

Turn off the power for the external I/O ladder and check the following items once every six months.

Table 8.2 Items for periodic inspection

Part	Item	Check criteria	Remarks
Programming device to CPU	Check operation of programming device	All switches and display lamps work normally.	
Power supply	Check for voltage fluctuations	85 to 264 V AC (when EH-PSA) 21.6 to 26.4VDC(when EH-PSD)	Tester
Installation and connecting areas	(1) All modules are securely fixed (2) All connectors fit snugly (3) All screws are tight (4) All cables are normal	No defects	Tighten Check insertion Tighten Visual check
Ambient environment	(1) Temperature (2) Humidity (3) Other	0 to 55 °C 20 to 90 % RH (no condensation) No dust, foreign matter, vibration	Visual check
Spare parts	Check number of parts, storage condition	No defects	Visual check
Program	Check program contents	Compare the contents of the latest program saved and CPU contents, and make sure they are the same	Check both master and backup.

Chapter 9 Troubleshooting

If it occurs any troubles on EH-CU, please investigate below items.

< Notes of investigation >

- (1) **Check CPU type. Do not use EH-104/208 ROM.00 and 01.**
- (2) Before exchanging modules, turn off the power source certainly.
- (3) In case of re-sending the troubled module, please inform us the error phenomenon in detail as possible
- (4) The necessary tools in troubleshooting
 - 1) Plus screwdriver and minus screwdriver.
 - 2) Digital multifunction tester.

9.1 When EH-CU does not count pulses.

1. In case of Differential inputs (For details, refer Chapter 4)
 - (1) Check the connection between EH-CU and the pulse output devices.
Is the polarity of signals or the power source right?
 - (2) Check the voltage between the input terminals (Vin) of EH-CU.
Is the input voltage normal voltage (approximately from 1 V to 3 V)?
Is the pulse input to EH-CU?
2. In case of Open collector inputs (For detail, refer Chapter 4)
 - (1) Check the connection between EH-CU and the pulse output device.
Is the polarity of signals or the power source right?
 - (2) Check the voltage between the input terminals (Vin) of EH-CU.
Is Vin terminal connected to the external voltage (from 12 to 24 VDC)?
Is Vin terminal voltage normal?
Is the common terminal of the pulse output device connected to the ground of the external power source?
 - (3) Check the setting of counter mode. (For details, refer Chapter 3)
 - (4) Check the count enable bit.
 - (5) Check LED (1A/1B/1M or 2A/2B/2M) is flashing. (Is the pulse input?)

9.2 When the comparison output does not become "ON".

When the comparison output does not "ON" in spite of completing the right condition.
Check the below items.

- (1) Check the voltage of the external power source.
- (2) Check the connection between EH-CU and the external load.
- (3) Check the setting data. (For details, refer to Chapter 7)
- (4) Check the setting of "OE". (For details, refer to Chapter 7)
- (5) Check the load current.
Is the load current less than 20 mA?

Appendix 1 Before using high function module

A1.1 For using the EH-CU

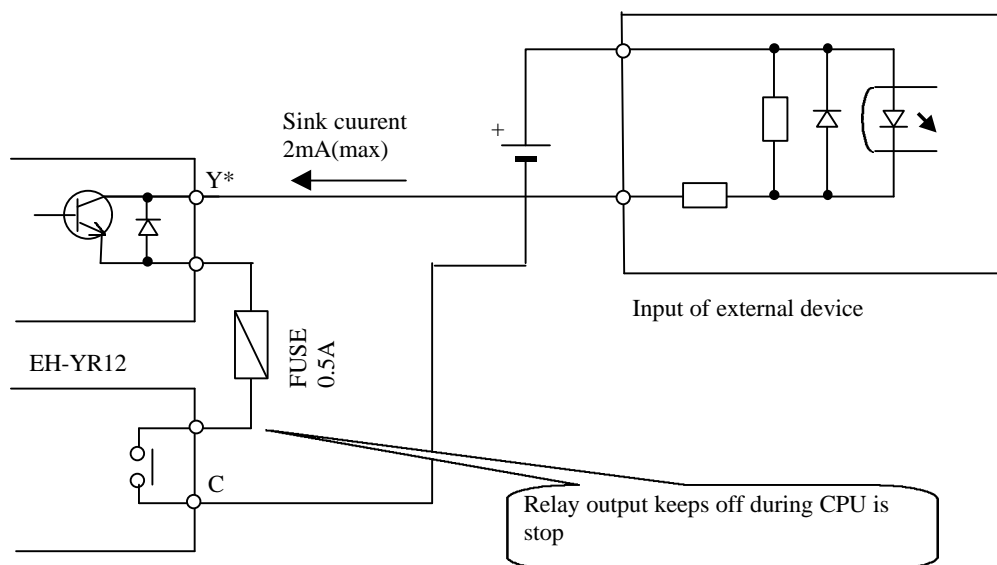
The partial operation is different on the case of using on the side of EH-CPU and the case of using on the side of EH-IOCP.

When using EH-CU, always take care of the following attention item.

! REQUIRED

When using EH-CU with EH-IOCP, the EH-CU continues to count during CPU stop. (fixed in "counter enable during CPU stop" mode)
In case of using the "counter disable during CPU stop" mode,
Insert a relay, which is controlled by other digital output, between comparison output of EH-CU and the external input device.
Otherwise, the comparison output becomes ON after CPU stops.
When CPU is RUN again, initialize the current value.

The example wiring when controlling the relay which was inserted among the external input device and the comparison output of EH-CU is shown.



Allocates optional one point of EH-YR12 for the external input device.

Make a circuit at the head of the ladder program to become OFF in STOP or become ON in RUN for PLC(the Profibus-DP master).

The ladder program for EH-150 CPU is shown in the following.

