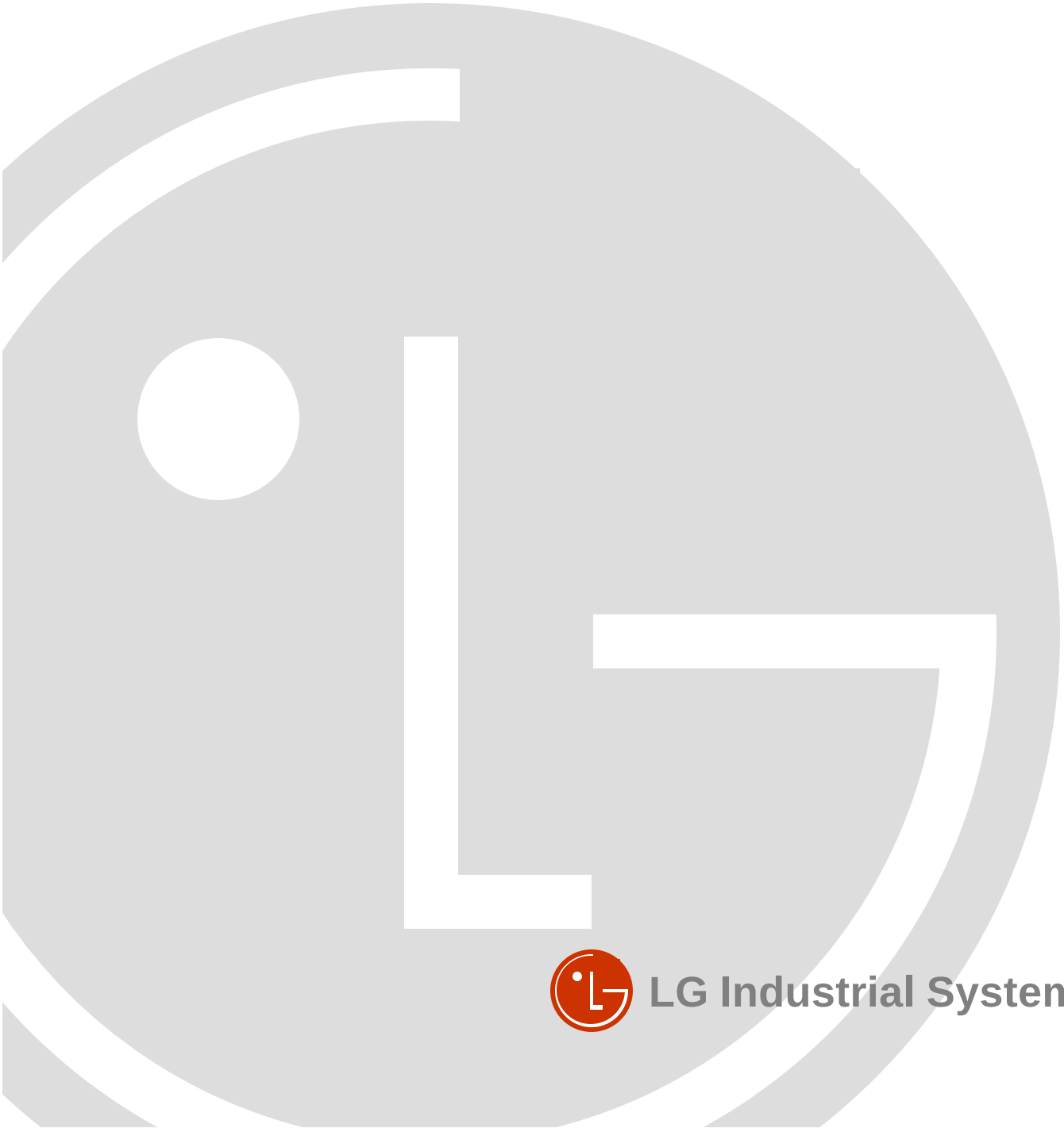
User's Manual

LG Programmable Logic Controller

GLOFA MASTER-K

G3F-HSCA
G4F-HSCA
G6F-HSCA



LG Industrial Systems

SAFETY PRECAUTIONS

Be sure to read carefully the safety precautions given in data sheet and user's manual before operating the module and follow them.

The precautions explained here only apply to the high-speed counting module.

For safety precautions on the PLC system, see the GLOFA PLC GM3/4/6 and MASTER-K200S/300S/1000S CPU User's Manuals.

A precaution is given with a hazard alert triangular symbol to call your attention, and precautions are represented as follows according to the degree of hazard.

! **WARNING**	If not provided with proper prevention, it can cause death or fatal injury or considerable loss of property.
! **CAUTION**	If not properly observed, it can cause a hazard situation to result in severe or slight injury or a loss of property.

However, a precaution followed with ! **CAUTION** can also result in serious conditions.

Both of two symbols indicate that an important content is mentioned, therefore, be sure to observe it.

Keep this manual handy for your quick reference in necessary.

Design Precautions

! **CAUTION**

- Design a safety circuit in the outside of the PLC for system safety in case of disorder of the external power or PLC module body.
- Otherwise, it can cause injury due to wrong output or malfunction.

! **CAUTION**

- Do not run I/O signal lines near to high voltage line or power line.
  Separate them as 100 mm or more as possible.
- Otherwise, noise can cause module malfunction.

Installation Precautions

! **CAUTION**

- Operate the PLC in the environment conditions given in the general specifications.
- If operated in other environment not specified in the general specifications, it can cause an electric shock, a fire, malfunction or damage or degradation of the module
- Make sure the module fixing projections is inserted into the module fixing hole and fixed.
- Improper installation of the module can cause malfunction, disorder or falling.

Wiring Precautions

CAUTION

- ▶ When grounding a FG terminal, be sure to provide class 3 grounding which is dedicated to the PLC.
- ▶ Before the PLC wiring, be sure to check the rated voltage and terminal arrangement for the module and obs erve them correctly.
  If a different power, not of the rated voltage, is applied or wrong wiring is provided, it can cause a fire or disorder of the nodule.
- ▶ Drive the terminal screws firmly to the defined torque.
  If loosely driven, it can cause short circuit, a fire or malfunction.
- ▶ Be careful that any foreign materials like wire scraps should not enter into the module.
  It can cause a fire, disorder or malfunction.

Test Run and Maintenance Precautions

WARNING

- ▶ Do not contact the terminals while the power is applied.
  It can cause malfunction.
- ▶ When cleaning or driving a terminal screw, perform them after the power has been turned off
- ▶ Do not perform works while the power is applied, which can cause disorder or malfunction.

CAUTION

- ▶ Do not separate the module from the printed circuit board(PCB), or do not remodel the module.
  They can cause disorder, malfunction, damage of the module or a fire.
  When mounting or dismounting the module, perform them after the power has been turned off.
- ▶ Do not perform works while the power is applied, which can cause disorder or malfunction.

Waste Disposal Precautions

CAUTION

- ▶ When disposing the module, do it as an industrial waste.

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Chapter 4. FUNCTION BLOCK

Chapter 5. GM PROGRAMMING

Chapter 6. BUFFER MEMORY AND I/O SIGNAL CONFIGURATION

Chapter 9. DIMENSIONS

Chapter 1. INTRODUCTION

This manual describes the specifications, handling instructions, and programming information for the G3F– HSCA, the G4F–HSCA and the G6F-HSCA.
It is the high speed counting module used with CPU of the GLOFA PLC GM1/2/3/4/6 series and the MASTER-K200S/300S/1000S series.

The G3F-HSCA is used for GM1/2/3 series and K1000S series, and the G4F-HSCA for GM4 series and K300S series, the G6F-HSCA for GM6 series and K200S series.

The G3F-HSCA, the G4F-HSCA and the G6F-HSCA consist of 24bit counting part which performs increment or decrement count, an external input part, a comparison part which compares the set value specified by the user with the current counting value, and an output part which outputs the comparison results.

Chapter 2. SPECIFICATIONS

2.1 General Specifications

Table 2.1 shows general specifications of the GLOFA GM series and MASTER-K series.

No	Item	Specifications					Standards
1	Operating ambient temperature	0 ~ 55℃(32 ~ 131°F)					
2	Storage ambient temperature	-25 ~ 75℃(-13~167°F)					
3	Operating ambient humidity	5 ~ 95%RH, non-condensing					
4	Storage ambient humidity	5 ~ 95%RH, non-condensing					
5	Vibration	Occasional vibration					IEC 61131-2
		Frequency	Acceleration	Amplitude	Sweep count		
		10≤f∠57 Hz	-	0.075 mm	10 times in each direction for X, Y, Z		
		57 ≤f≤150 Hz	0.001 Kg	-			
		Continuous vibration					
		Frequency	Acceleration	Amplitude			
		10≤f∠57 Hz	-	0.035 mm			
		57≤f≤150 Hz	4.9m/s²	-			
6	Shocks	*Maximum shock acceleration: 15g *Duration time :11 ms *Pulse wave: half sine wave pulse(3 times in each of X, Y and Z directions)					IEC 61131-2
7	Noise immunity	impulse noise	±1,500 V				IEC 61131-2 IEC 1000-4-2
		Electrostatic discharge	Voltage :4kV(contact discharge)				
		Radiated electromagnetic field	27 ~ 500 MHz, 10 V/m				IEC 61131-2 IEC 1000-4-3
		Fast transient burst noise	Severity Level	All power modules	Digital I/Os (Ue ≥ 24 V)	Digital I/Os (Ue < 24 V) Analog I/Os communication I/Os	IEC 61131-2 IEC 1000-4-4
			Voltage	2 kV	1 kV	0.25 kV	
8	Operating atmosphere	Free from corrosive gases and excessive dust					
9	Altitude for use	Up to 2,000m (6,562ft)					
10	Pollution degree	2 or lower					
11	Cooling method	Self-cooling					

[Table 2.1] General Specifications

Remark

1) IEC(International Electrotechnical Commission)

: The international civilian organization which produces standards for electrical and electronics industry.

2) Pollution degree

: It indicates a standard of operating ambient pollution level.

The pollution degree 2 means the condition in which normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

2.2 Performance Specifications

The following show various specifications of the High-speed counting module including basic performance specifications, input specifications, limit switch input specifications and transistor output specifications.

2.2.1 Basic Performance Specification

Item		Specifications		
		G3F - HSCA	G4F - HSCA	G6F - HSCA
I/O Points		32 Points	16 Points	
Number of Channels		2 channels	1 channel	
Counter input signal	Signal	Phase A, Phase B or Phase Z		
	Signal level	5 / 12 / 24 VDC (7-13mA)		
	Signal type	Voltage input		
Counting range		0 to 16,777,215 (24 Bits Binary)		
Counting speed		Maximum 50 kHz		
Limit switch input		24 VDC		
Setting Increment /Decrement	1-phase input	Set by program or Phase B is set		
	2-phase input	Set by difference of phase automatically		
External output	Type	Out 1, Out 2(One among '>', '=' and '<' is selected)		
	Signal type	Transistor output (open collector output, 10 to 30 V)		
Multiplication		The multiplication factor for the input pulse may be set to 1, 2 or 4 (Selected by DIP Switch adjustment)		
Current consumption		5 VDC , 0.3 A	5 VDC ,0.25 A	5 VDC ,0.18 A
Weight		620 g	330 g	160 g

2.2.2 Input Specifications

Item	Specifications	
Rated input voltage / current	5 VDC (7 mA) 12 VDC (7 mA) 24 VDC (13 mA)	
' On ' guarantee voltage	5 VDC	4.5 V or more
	12 VDC	11 V or more
	24 VDC	14 V or more
' Off ' guarantee voltage	5 VDC	0.8 or less
	12 VDC	1.5 V or less
	24 VDC	2.5 V or less

2.2.3 Limit Switch (L/S) Input Specifications

Item	Specifications
Input voltage	24 VDC
' On ' guarantee voltage	19 VDC or more
' Off ' guarantee voltage	6 VDC or less
On Delay Time	1.5 ms or less
Off Delay Time	2 ms or less

2.2.4 Transistor Output Specifications

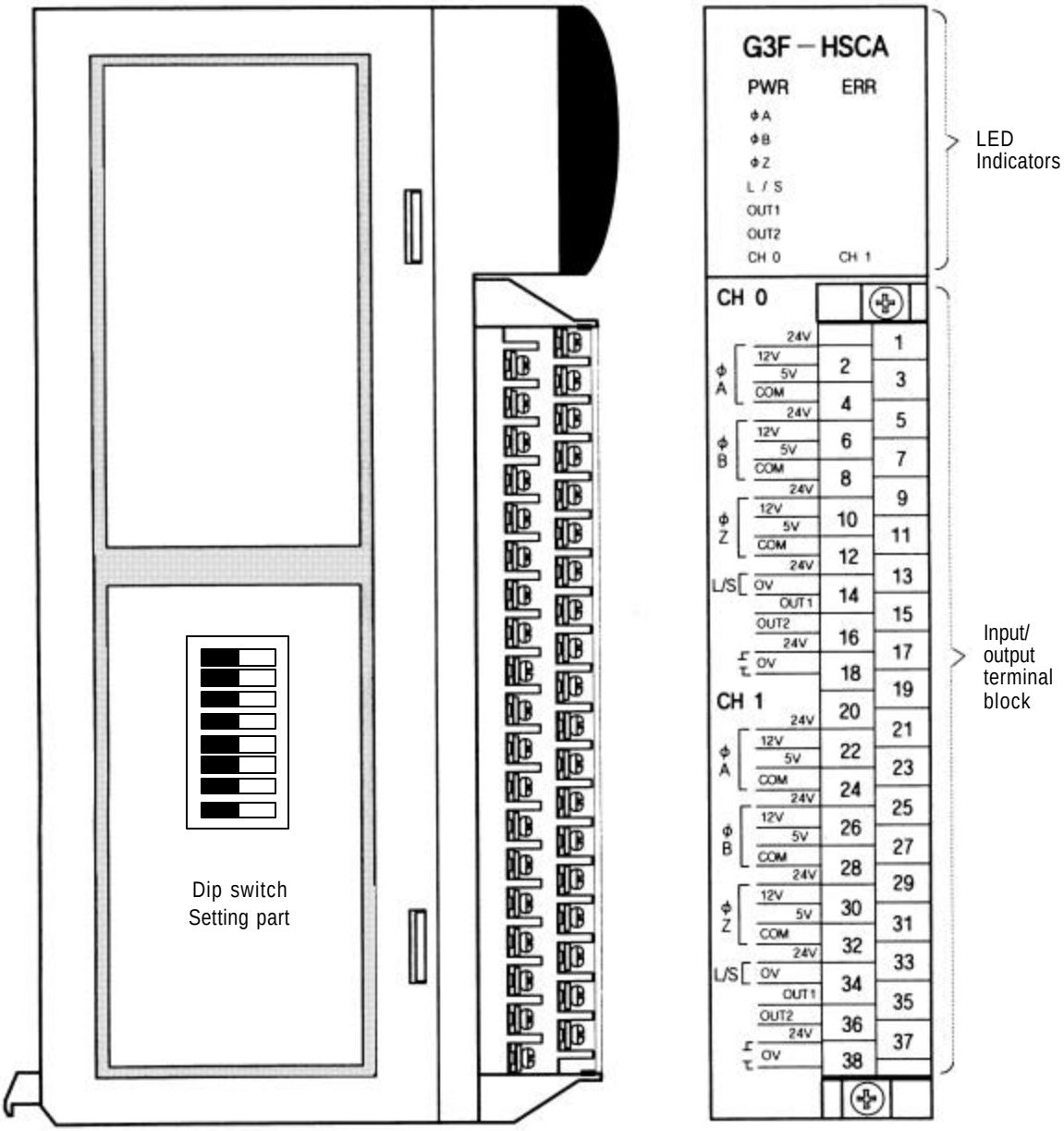
Item	Specifications
Rated output	24 VDC, 200 mA
Leakage current	50 μA or less
Saturated voltage	1.3V
On Delay Time	50 μs or less
Off Delay Time	50 μs or less

2.3 Names of Parts and Functions

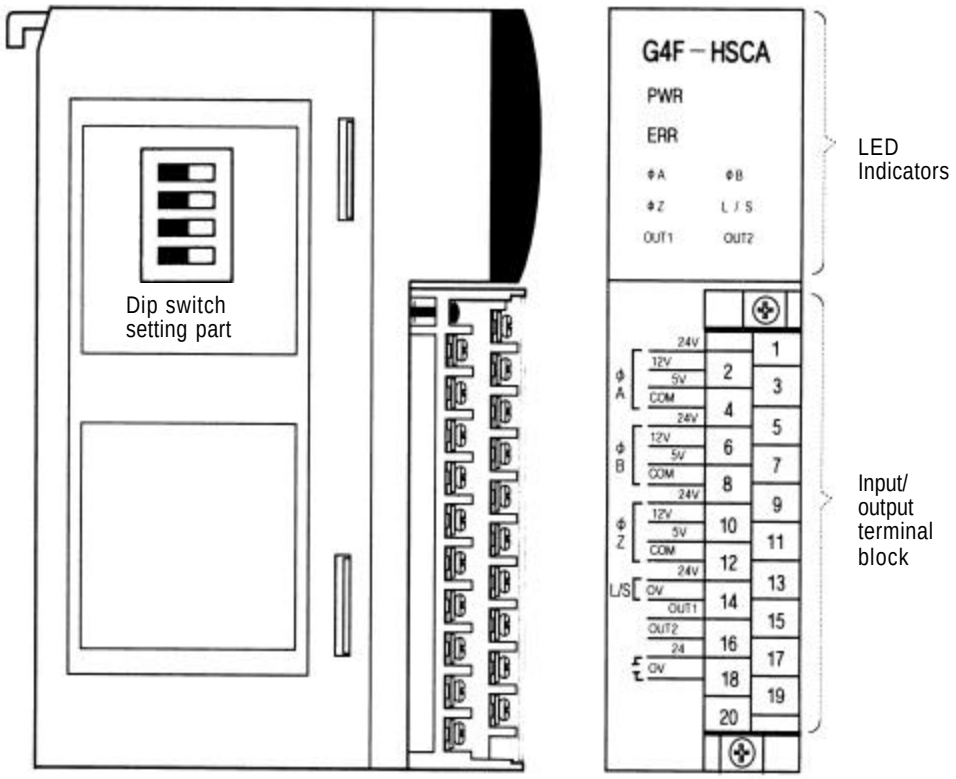
2.3.1 Names of Parts and Functions

The names of parts and functions of the high speed counter module are shown as below

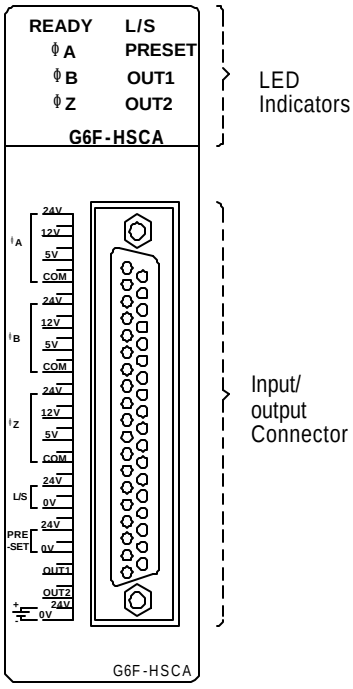
1) G3F－HSCA



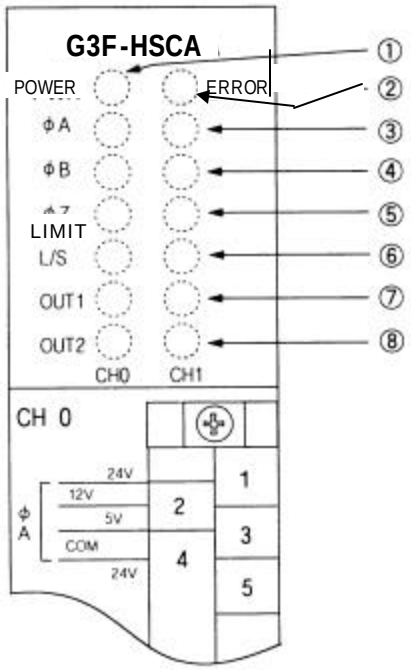
2) G4F－HSCA

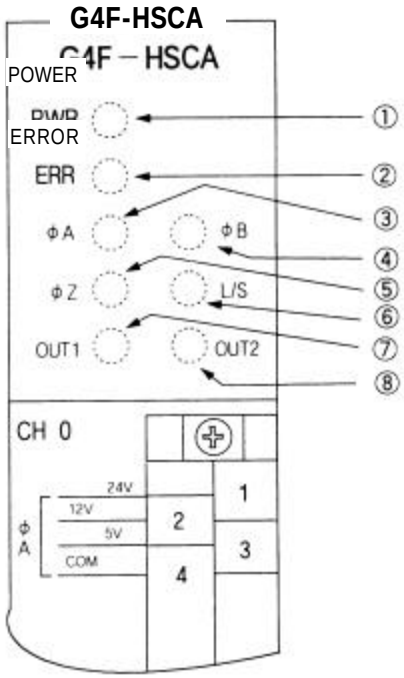


3) G6F-HSCA

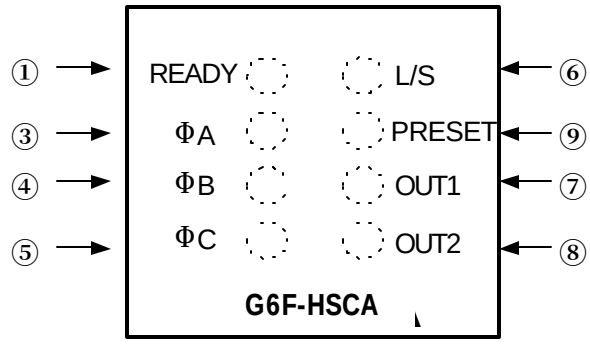


2.3.2 Function of LED Indicators



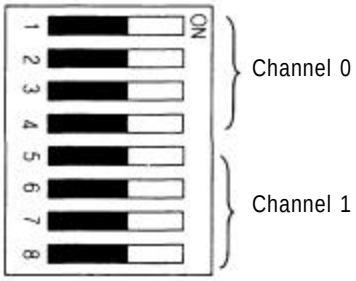
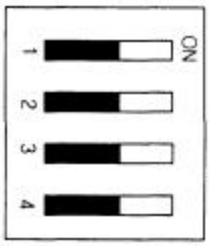


No.	Description
①	**Power LED** Turns On when the power is applied.
②	**Error LED** Turns on for 0.5 sec when the power is applied and then turns off if the system is normally running. Flickers with 0.1 sec, 0.2 sec or 0.3 sec cycle according to the error content, If an error has occurred.
③	**Phase A pulse input LED** Turns on when voltage is applied to phase A input terminal.
④	**Phase B pulse input LED** Turns on when voltage is applied to phase B input terminal
⑤	**Phase Z pulse input LED** Turns on when voltage is applied to phase B input terminal
⑥	**Limit switch input LED** Turns on when voltage is applied to limit switch input terminal
⑦	**OUT1 output LED** Indicate the magnitude comparison result of CMP 1
⑧	**OUT2 output LED** Indicate the magnitude comparison result of CMP 2
⑨	**Preset Switch Input (PRESET)** Turns on when voltage is applied to preset switch input terminal



2.3.3 DIP Switch Setting Part

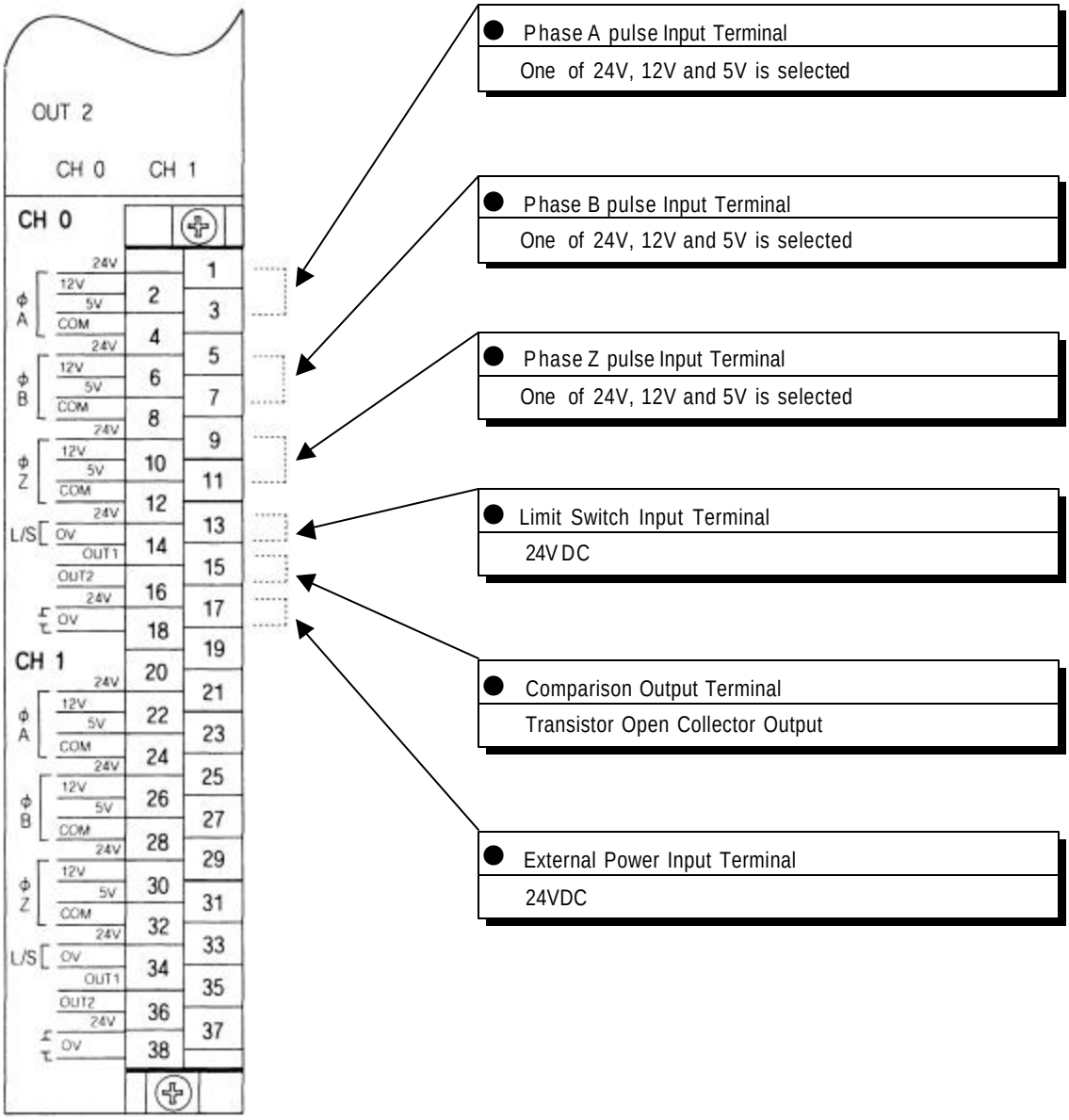
The DIP Switch settings are used for phase-2/ phase-1 operation mode specification, Increment / Decrement count method specification at 1-phase operation, and multiplication specification at 2-phase operation.

G3F-HSCA	G4F-HSCA/G6F-HSCA
	

Switch			Functions	
G3F-HSCA		G4F-HSCA, G6F-HSCA		
channel 0	channel 1		Status	Descriptions
SW 1	SW 5	SW 1	On	Specifies the 2 – phase pulse operation mode.
			Off	Specifies the 1 – phase pulse operation mode.
SW 2	SW 6	SW 2	On	Specifies the phase B pulse input mode as increment/decrement count method at 1 – phase pulse inputs
			Off	Specifies the program input mode as increment/decrement count method at 1 – phase pulse inputs
SW 3 SW 4	SW 7 SW 8	SW 3 SW 4	On On	Specifies as multiplicate 1
			On Off	Specifies multiplicate 2
			Off On	No multiplication is applied
			Off Off	Specifies multiplicate 4

2.3.4 Input / Output Terminal Block

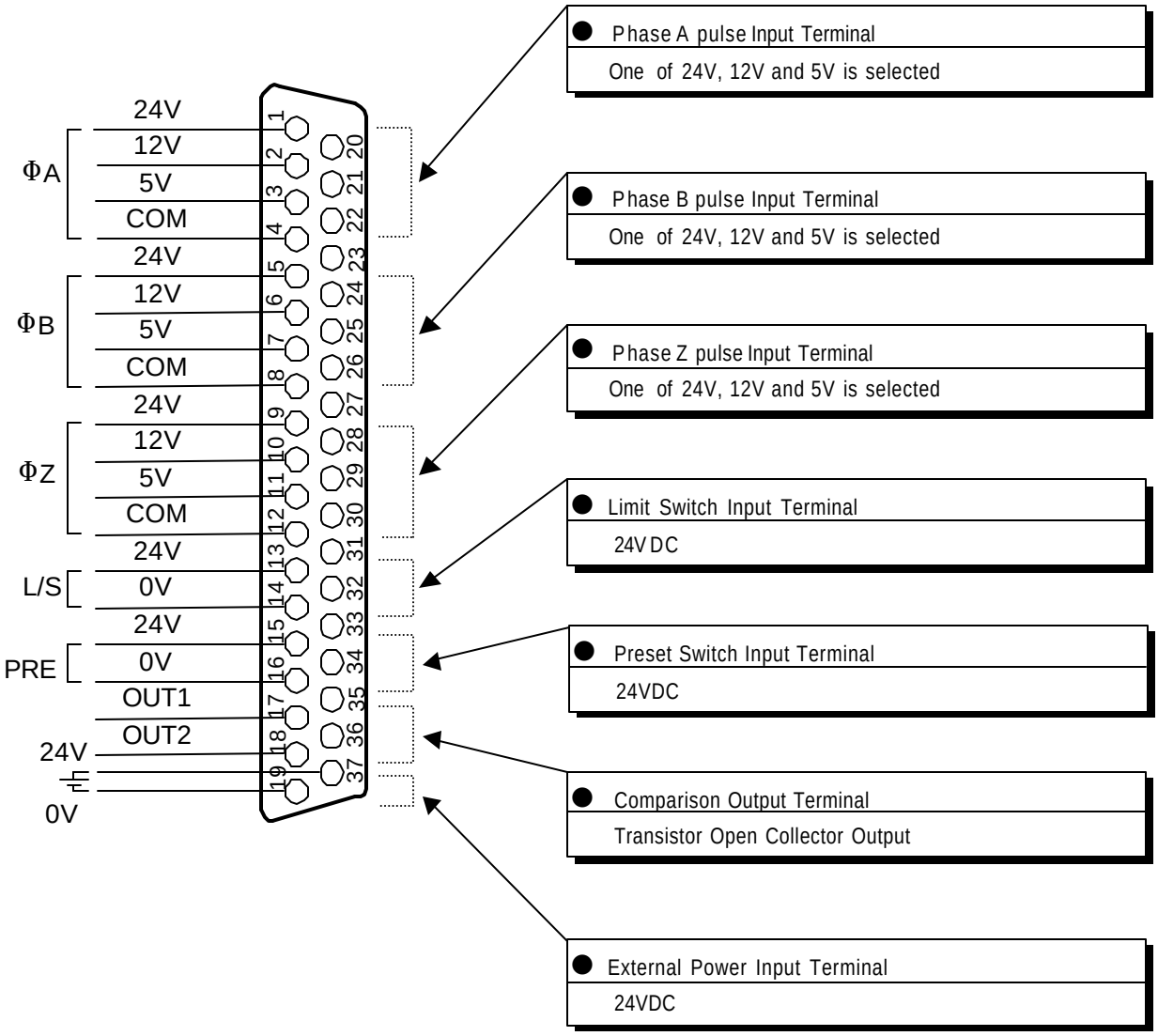
1) G3F-HSCA/G4F-HSCA



Remark

The above input/output terminals the CH0 and CH1 of the G3F–HSCA use the same input/output terminals as shown above.
The G4F–HSCA input/output terminal's configuration is also same as above.

2) G6F-HSCA



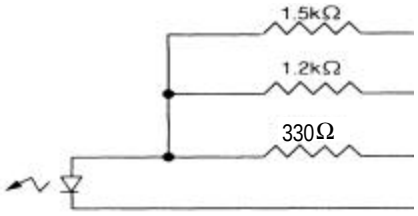
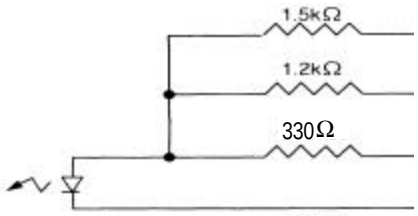
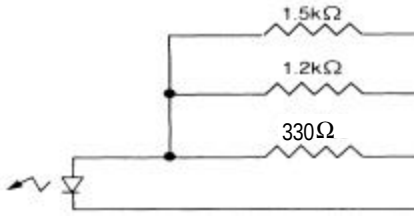
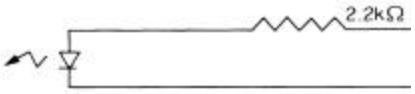
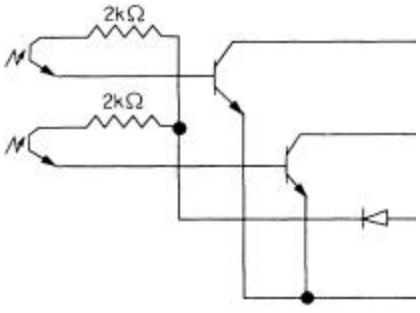
Remark

The G6F-HSCA module has external preset input terminal(15, 16).
And it is possible to used to preset value setting signal of external.

2.4 Interface with External Devices

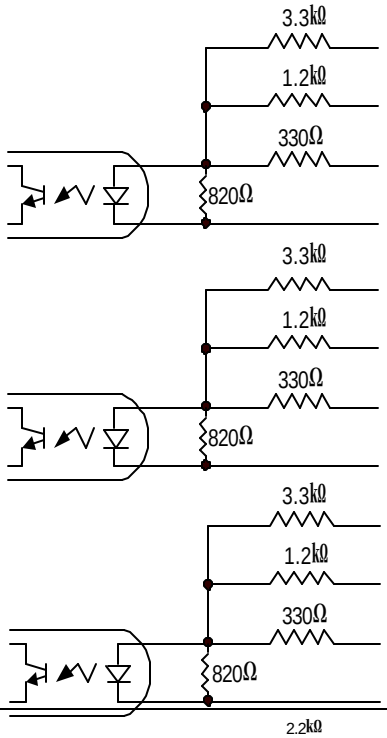
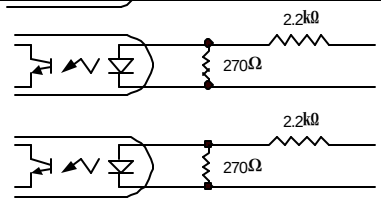
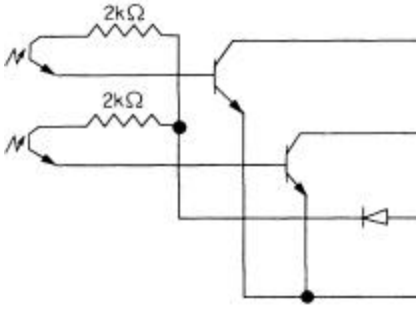
Table 2.1 and Table 2.2 shows the list for interface with external devices.

1) G3F-HSCA/G4F-HSCA

I/O	Internal Current	Terminal No. CH 0	Terminal No. CH 1	Signal Name	Operation	Input guarantied Voltage
Input		1	21	24 V, Phase A pulse input	On Off	14~26.4 V 2.5 V
		2	22	12 V, Phase A pulse input	On Off	11~13.2 V 1.5 V
		3	23	5 V, Phase A pulse input	On Off	4.5~5.5 V 0.8 V or less
		4	24	COM		
		5	25	24 V, Phase B pulse input	On Off	14~26.4 V 2.5 V
		6	26	12 V, Phase B pulse input	On Off	11~13.2 V 1.5 V
		7	27	5 V, Phase B pulse input	On Off	4.5~5.5 V 0.8 V or less
		8	28	COM		
		9	29	24 V, Phase Z pulse input	On Off	14~26.4 V 2.5 V
		10	30	12 V, Phase Z pulse input	On Off	11~13.2 V 1.5 V
		11	31	5 V, Phase Z pulse input	On Off	4.5~5.5 V 0.8 V or less
		12	32	COM		
Input		13	33	L/S input, 24 V	On Off	19~26.4 V 6 V or less
		14	34	L/S COM		
Output		15	35	Open collector output OUT1	Rated output: 24VDC, 200 mA Response time: Off→On 50 μs or less On→Off 50 μs or less	
		16	36	Open collector output OUT1		
		17	37	External power supply output 24 V	Input voltage 10.2 ~ 30 V	
		18	38	External power supply COM 0 V		

[Table 2.1] External interface list (G3F-HSCA / G4F-HSCA)

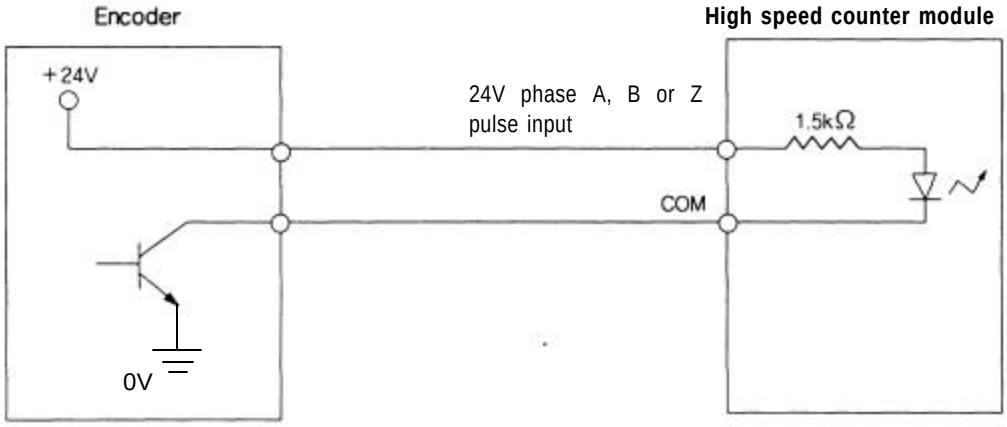
2) G6F-HSCA

I/O	Internal Current	Terminal pin No.	Signal Name	Operation	Input guarantied Voltage
Input		1	24 V, Phase A pulse input	On	14~26.4 V
				Off	2.5 V
		2	12 V, Phase A pulse input	On	11~13.2 V
				Off	1.5 V
		3	5 V, Phase A pulse input	On	4.5~5.5 V
				Off	0.8 V or less
		4	COM		
		5	24 V, Phase B pulse input	On	14~26.4 V
				Off	2.5 V
		6	12 V, Phase B pulse input	On	11~13.2 V
				Off	1.5 V
		7	5 V, Phase B pulse input	On	4.5~5.5 V
				Off	0.8 V or less
		8	COM		
		9	24 V, Phase Z pulse input	On	14~26.4 V
				Off	2.5 V
		10	12 V, Phase Z pulse input	On	11~13.2 V
				Off	1.5 V
		11	5 V, Phase Z pulse input	On	4.5~5.5 V
				Off	0.8 V or less
		12	COM		
Input		13	L/S input 24 V	On Off	19~26.4 V 6 V or less
		14	L/S COM		
		15	Preset input 24V	On	19~26.4 V
				Off	6 V or less
		16	L/S COM		
Output		17	Open collector output OUT1	Rated output: 24VDC, 200 mA Response time: Off→On 50 μs or less On→Off 50 μs or less	
		18	Open collector output OUT2		
		37	External power supply output 24 V	Input voltage 10.2 ~ 30 V	
		19	External power supply COM 0 V		

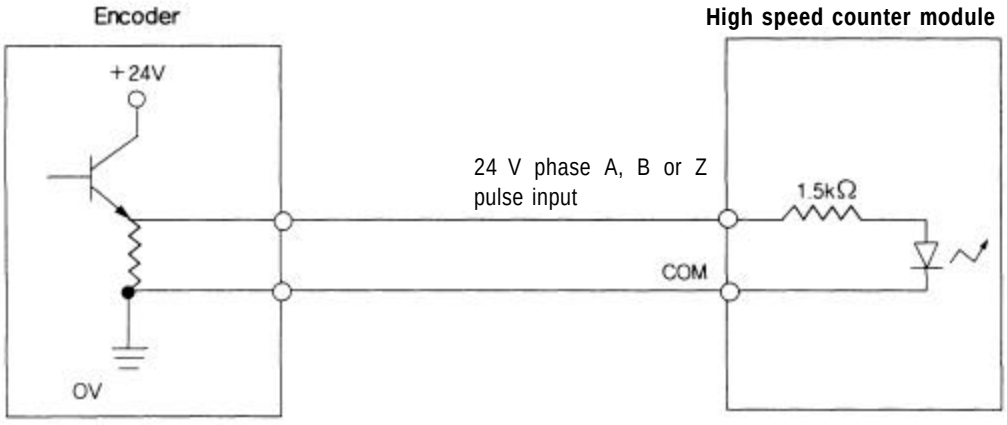
[Table 2.2] External interface list (G6F-HSCA)

2.5 Output Mode of Encoder

- **Open collector output**



- **Voltage output**



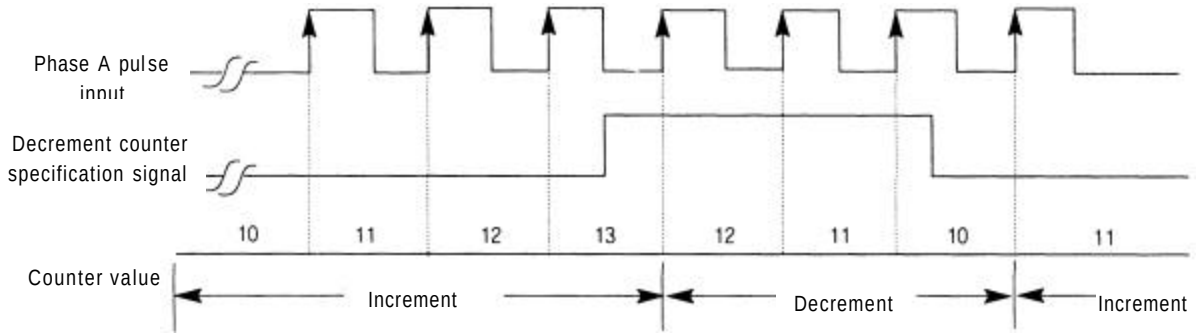
2.6 Function Descriptions

The High-speed counting module can count high-speed pulse which cannot be proceed with the CPU counting instructions (CTU,CTUD, etc.). Up to 24 bits binary (16,777,215) can be counted.
Pulse input mode is classified into 1-Phase (Phase A) pulse input and 2-Phase (Phase B) pulse input. In 1-Phase pulse input mode, there are two kinds of increment/decrement count methods. One is specified by program and the other is specified by phase B pulse input signal. In 2-Phase pulse input mode, the increment/decrement count method is specified by the phase difference between phase A and B pulsed.

2.6.1 Operation Modes

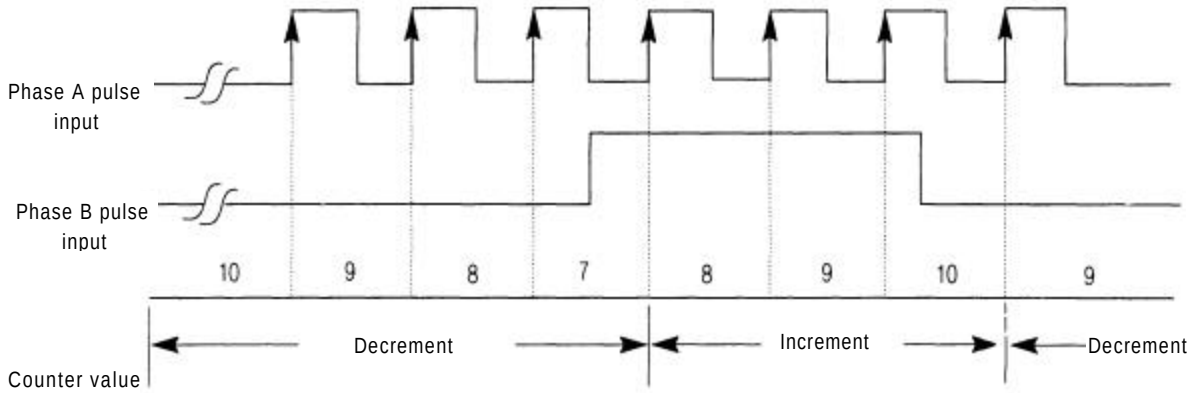
1) 1-phase Operation Mode (Increment /Decrement Count by Program)

When Phase A pulse input rises, the counter performs increment or decrement count by decrement counter specification signal.
If the decrement counter specification signal is low the counter performs increment count, and if high, it performs decrement count.



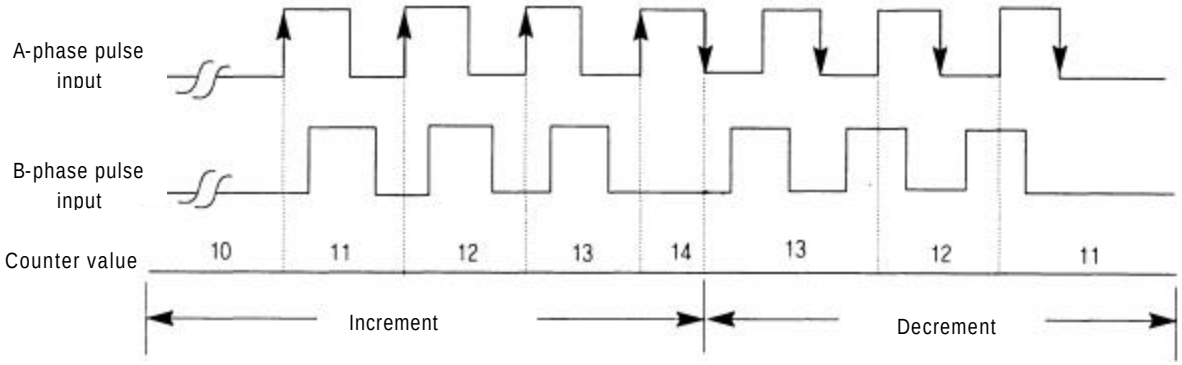
2) 1-phase Operation Mode (Increment /Decrement Count by Phase B Pulse Input)

When Phase A pulse input the counter performs increment or decrement count by Phase B pulse input.
If Phase B pulse input is low, it performs decrement count, and if high, it performs increment count.



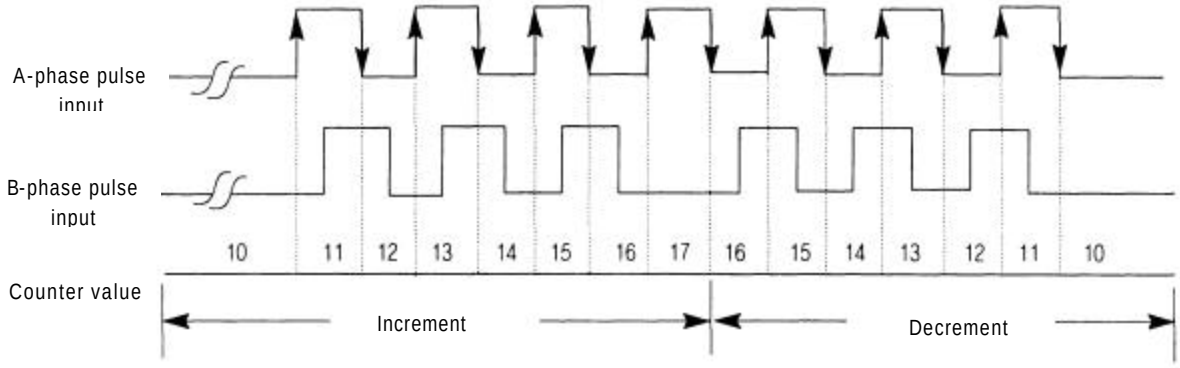
3) 2-Phase Operation Mode (Multiplicate 1)

When Phase A pulse-input leads Phase B, the counter performs increment count when phase B pulse-input leads phase A, it performs decrement count.
If Phase B pulse input is low when Phase A pulse input rises, the counter performs increment count.
If Phase B pulse input is low when phase A pulse input falls, it performs decrement count.



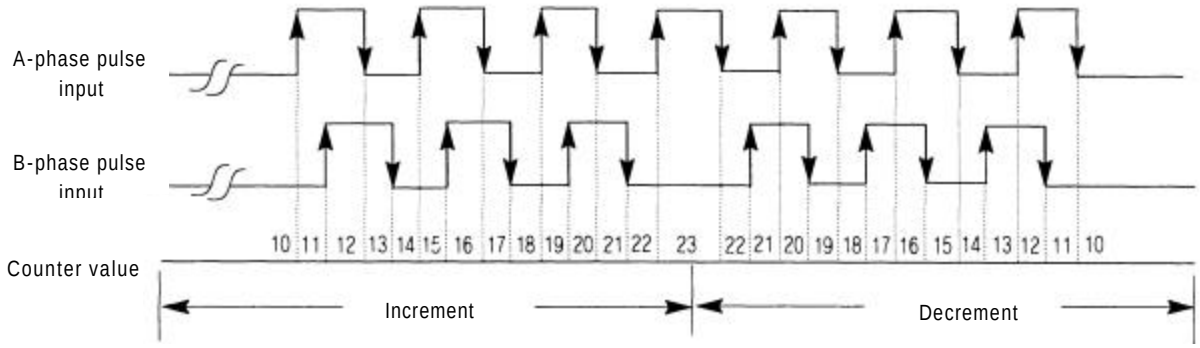
4) 2-Phase Operation Mode (Multiplicate 2)

When Phase A pulse-input leads Phase B, the counter performs increment count when phase B pulse-input leads phase A, it performs decrement count.
If Phase B pulse input is low when Phase A pulse input rises or it is high when phase A pulse input falls, the counter performs increment count.
If Phase B pulse input is high when Phase A pulse input rises or it is low when phase A pulse input falls, the counter performs decrement count.



5) 2-phase Operation Mode (Multiplicate 4)

When Phase A pulse input leads Phase B pulse input, the counter performs increment count. When the other leads the one, it performs decrement count.
The counting is performed when the Phase A and B pulse inputs rise or fall.



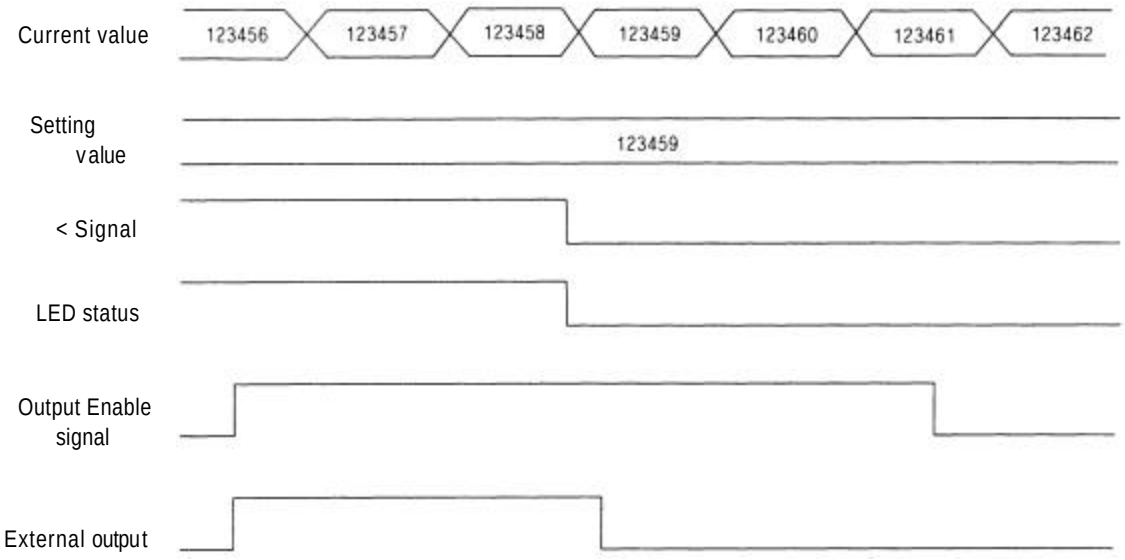
2.6.2 Comparison Signal Output

The counting module has the function of comparison output, which outputs the result of magnitude comparison between the Current value (=current value) and a comparison value.
There are two outputs in the comparison output and they can be used separately.
The magnitude comparison mode can be set as shown in the below table.

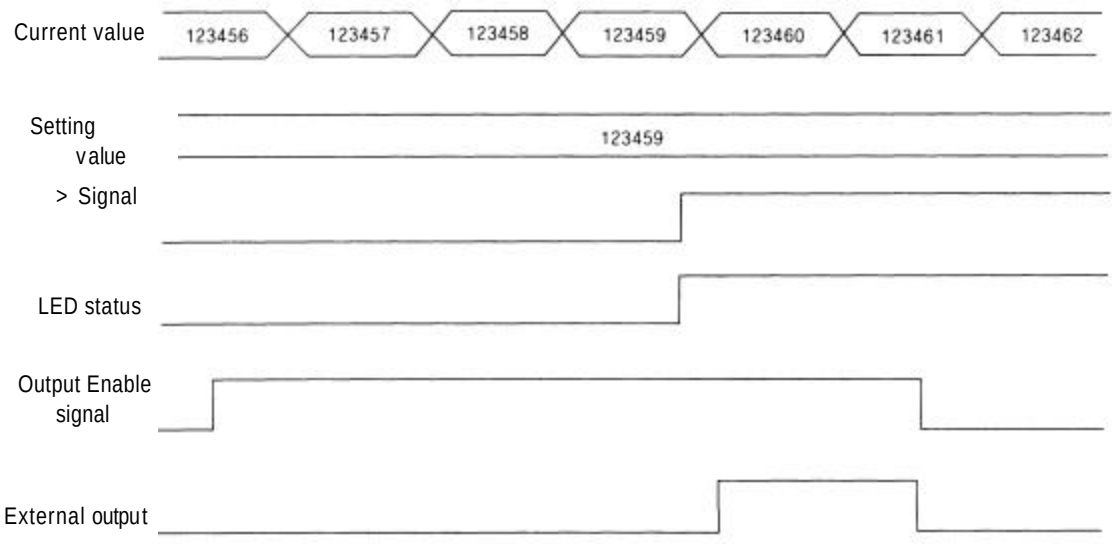
Comparison mode	Settings
0	No magnitude comparison is performed.
1	Current value < Setting value
2	Current value = Setting value
3	Current value $\leq$ Setting value
4	Current value > Setting value
5	Current value $\neq$ Setting value
6	Current value $\geq$ Setting value
7	Always On

The results as shown above will be indicated on the OUT1 LED or OUT2 LED regardless of the output.
Output to the external terminal block is performed only when the output enable signal is ON.

1) Example When the Comparison Mode Is Set to 'Current Value < Setting Value'



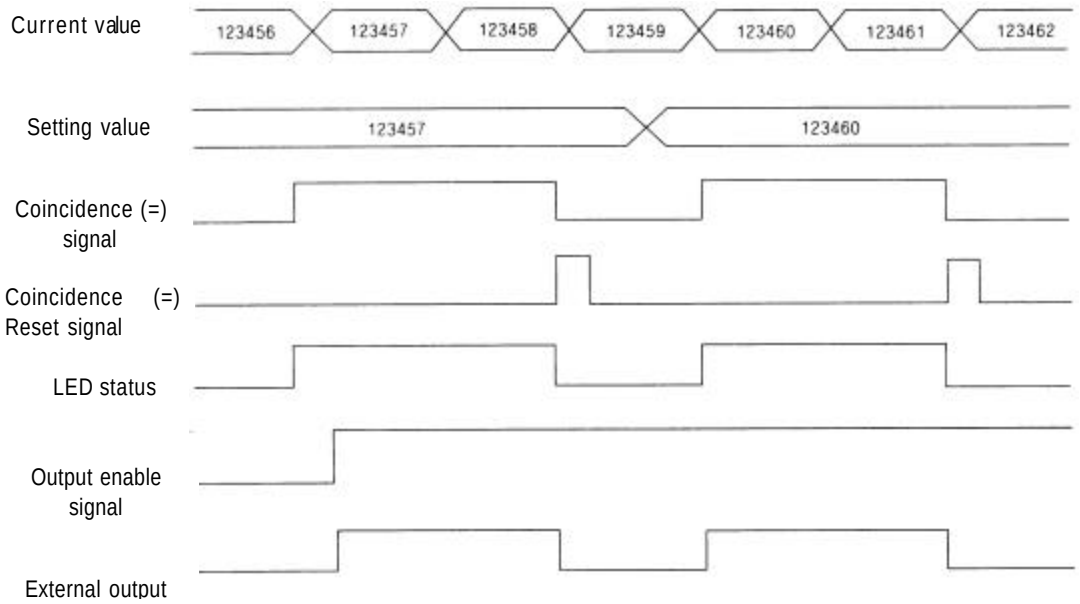
2) Example When the Comparison Mode Is Set to 'Current Value > Setting Value'



3) Example When the Comparison Mode Is Set to 'Current Value = Setting Value'

Contrary to the '>(GT)" and '<(LT)' signals, once the coincidence (=) signal is turned ON, it retains the ON state until the coincidence reset signal is turned ON.

The LED status is same as the coincidence signal. Output is performed only when the output enable signal is turned ON.

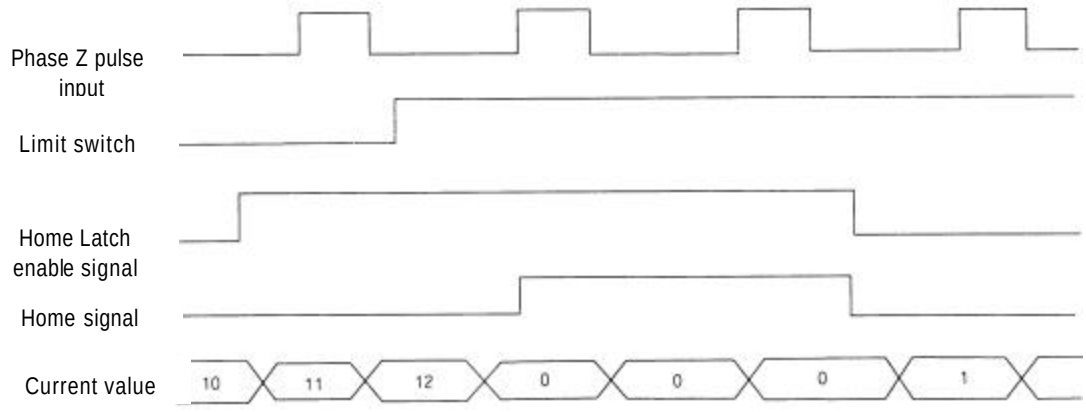


2.6.3 Home Signal

Home signal is operated only when the HOME-LATCH enable signal is turned on.

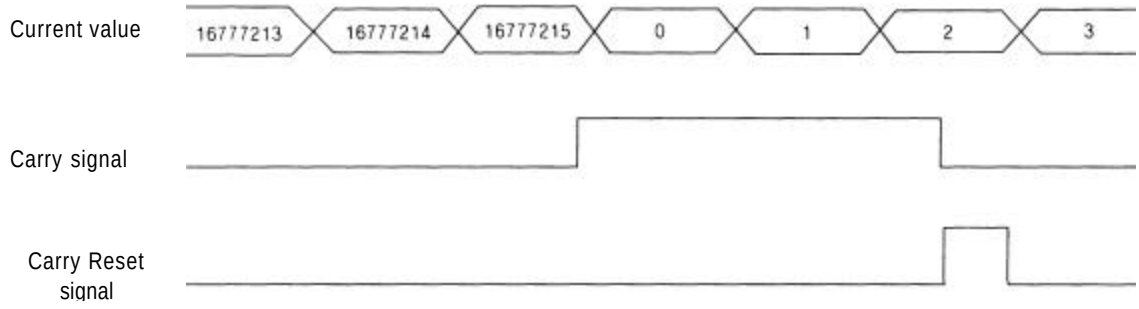
Home signal turns on when both of phase Z pulse input and limit switch input is turned on.

The count value retains '0' until the HOME-LATCH enable signal turns OFF though the counter continuos its counting operation.



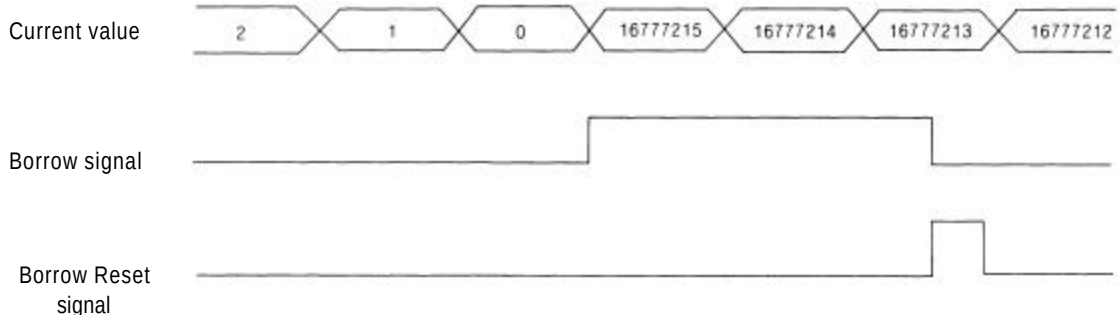
2.6.4 Carry Signal

The carry signal appears when the counter value changes from 16,777,215 to 0 during increment counting. The carry signal retains its ON State until the carry reset signal turns on. If the home signal is input, the carry signal will be cleared.



2.6.5 Borrow Signal

The borrow signal appears when the counter value changes from 0 to 16,777,215 during decrement counting. The borrow signal retains its ON State until the borrow reset signal turns on. If the home signal is input, the borrow signal will be cleared. The borrow reset signal is used together with the carry reset signal.



Chapter 3. INSTALLATION AND WIRING

3.1 Installation

3.1.1 Installation Ambience

This module has high reliability regardless of its installation ambience. But be sure to check the following for system in higher reliability and stability.

1) Ambience Requirements

Avoid installing this module in locations, which are subjected or exposed to:

- ▶Water leakage and dust a large amount of dust, powder and other conductive power, oil mist, salt, of organic solvent
- ▶Mechanical vibrations of impacts transmitted directly to the module body.
- ▶Direct sunlight.
- ▶Dew condensation due to sudden temperature change.
- ▶High or low temperatures (outside the range of 0-55°C)

2) Installing and Wiring

- ▶During wiring or other work, do not allow any wire scraps to enter into it.
- ▶Install it on locations that are convenient for operation.
- ▶Make sure that it is not located near high voltage equipment on the same panel.
- ▶Make sure that the distance from the walls of duct and external equipment be 50 mm or more.
- ▶ Be sure to be grounded to locations that have good noise immunity

3.2 Wiring Precautions

When using High-speed inputs, take the following precautions against noise in wiring.

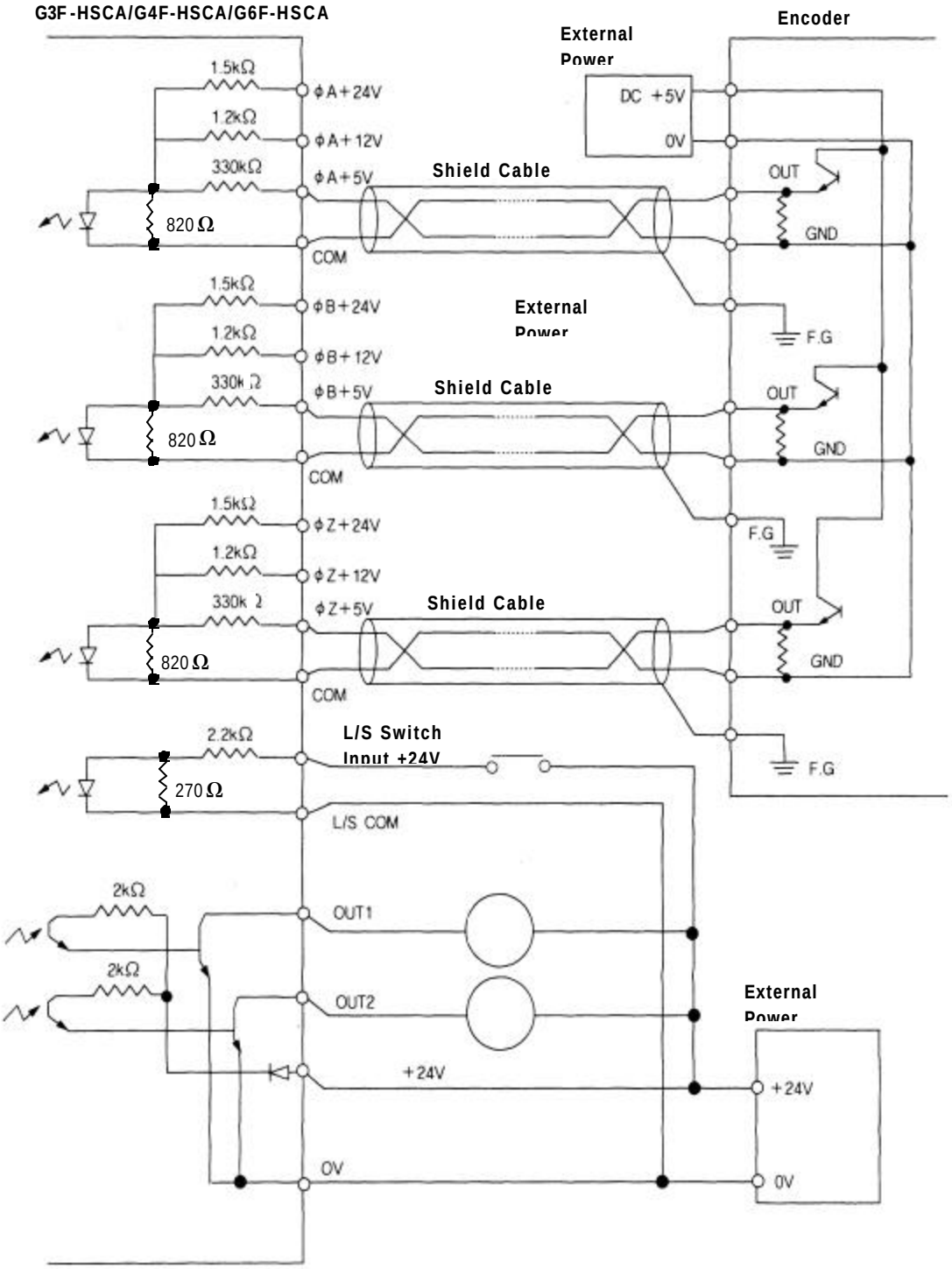
1) Be sure to use shielded twisted pair cables and provided class 3 grounding.

2) Separate a twisted pair cable from power cables or I/O line that may generate noise.

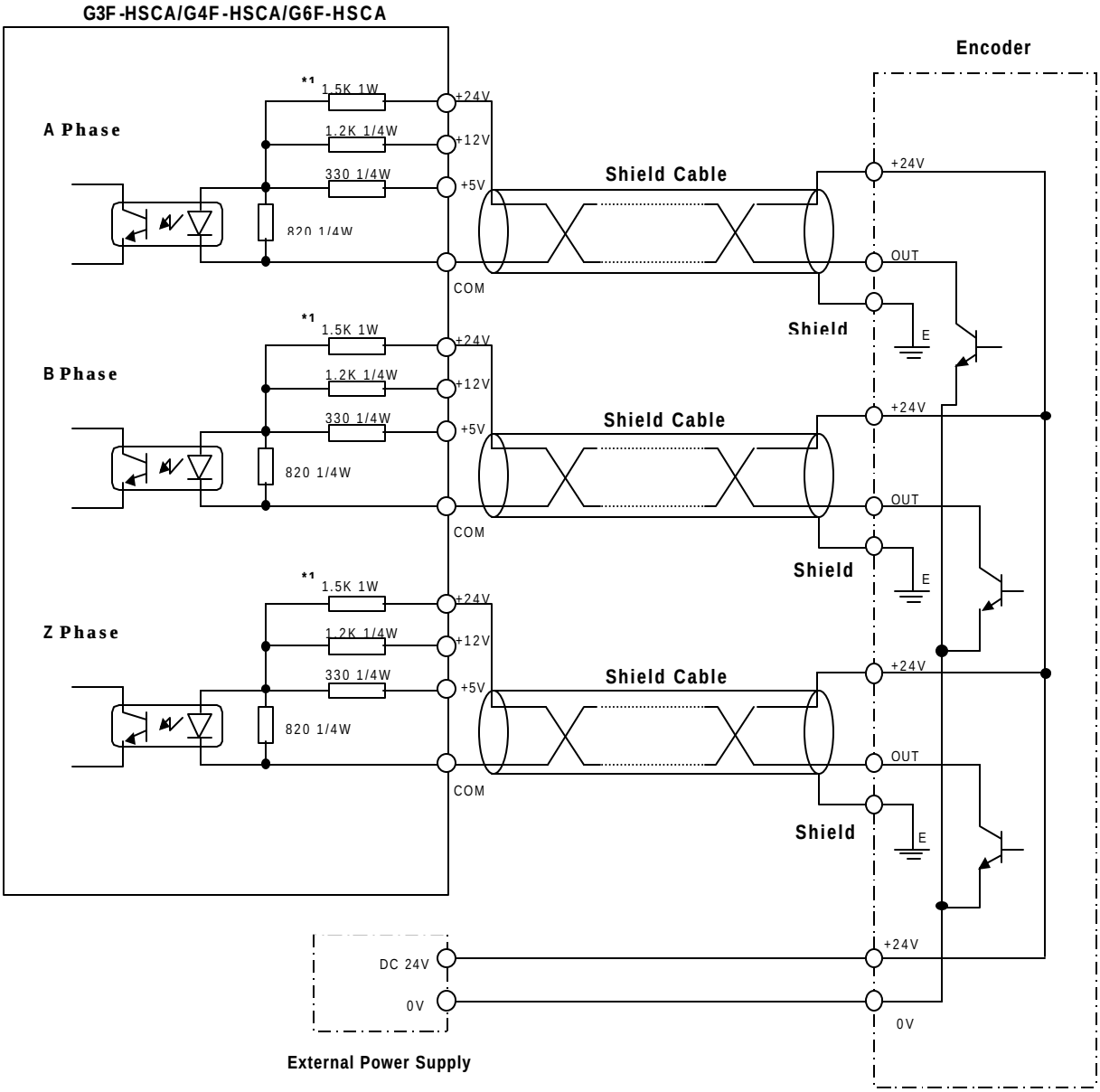
3) Use a stabilized power supply for pulse generator.
For 1-phase input, connect count-input signal only to phase A;
For 2-phase input, connect to phases A and B.

3.3 Wiring Example

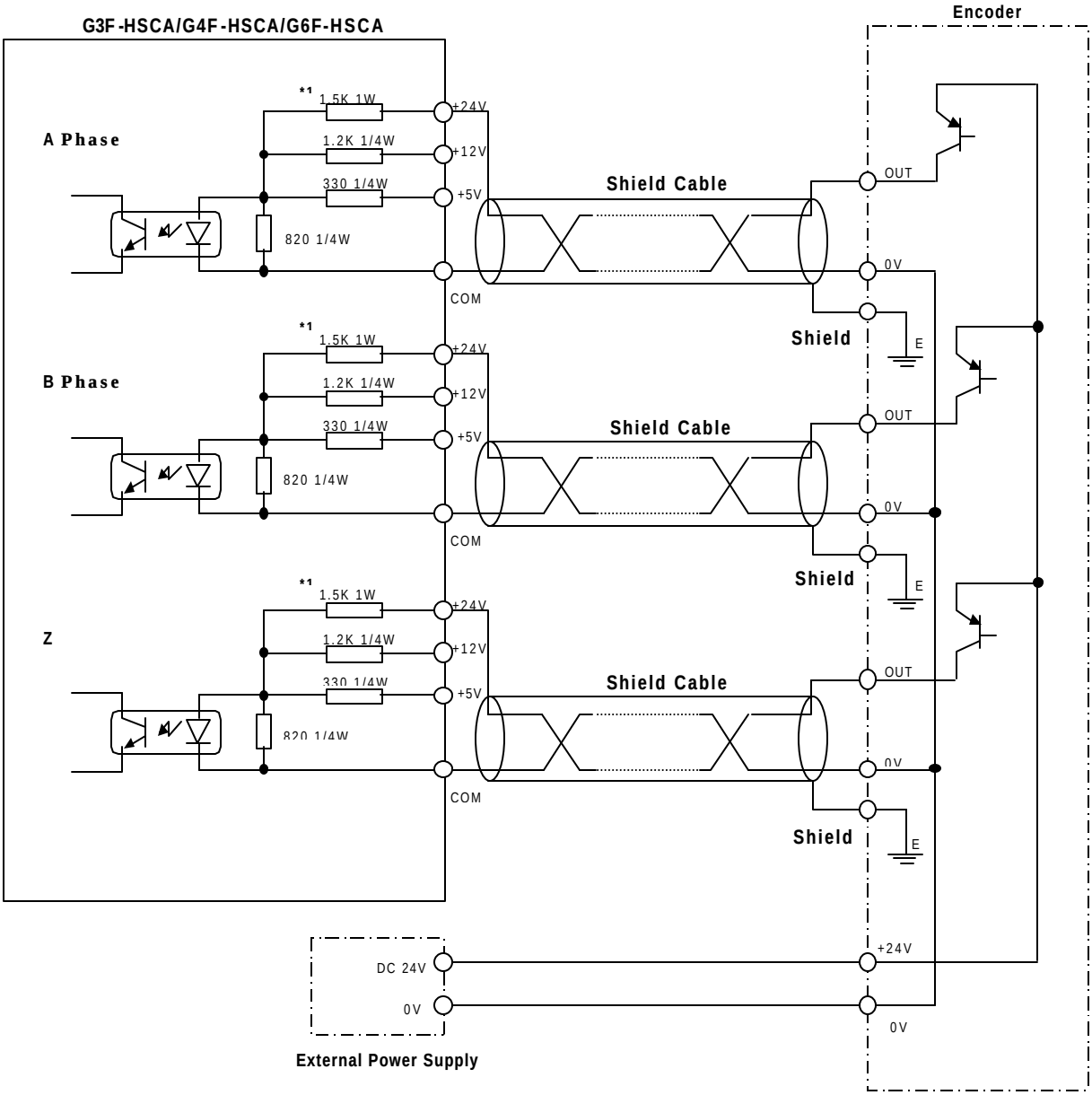
3.3.1 5VDC Voltage Output Type Encoder



3.3.2 24VDC NPN Open Collector Type Encoder



3.3.3 24VDC PNP Open Collector Encoder



Chapter 4. FUNCTION BLOCK

This shows function block for high speed counter module on the GMWIN.

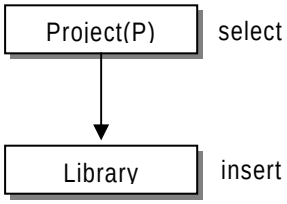
A kind of function block is as follows.

No	G3F-HSCA		G4F-HSCA		G6F-HSCA		Function
	Local	Remote	Local	Remote	Local	Remote	
1	HSC_PRE	HSCR1PRE	HSC_PRE	HSCR0PRE	HSC_PRE	HSCR6APR	Preset value setting
2	HSC_CMP	HSCR1CMP	HSC_CMP	HSCR0CMP	HSC_CMP	HSCR6ACP	Compare value setting
3	HSC_WR	HSCR1WR	HSC_WR	HSCR0WR	HSC_WR	HSCR6AWR	Operation information writing
4	HSC_RD	HSCR1RD	HSC_RD	HSCR0RD	HSC_RD	HSCR6ARD	Operation status value reading

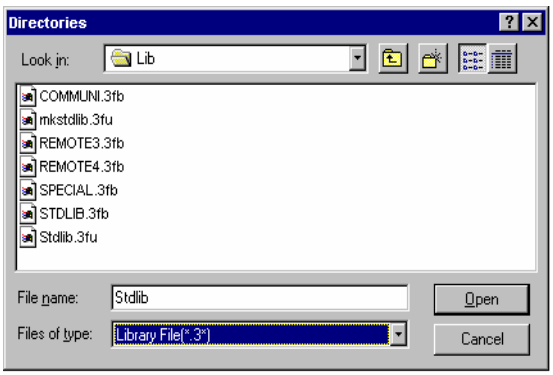
4.1 Insertion of the Function Block for High Speed Counter Module on the GMWIN

Function Block is inserted on the execution of the GMWIN according to following procedure.

Function block can be inserted only in the open condition of the Project.



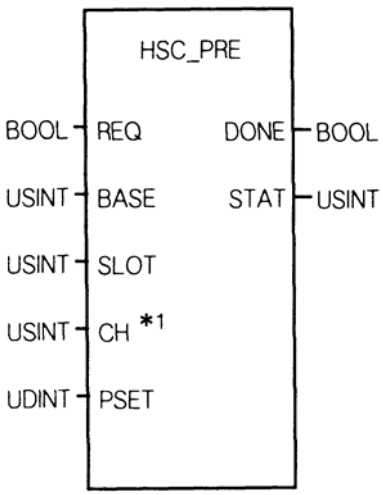
* GMWIN V3.1 above(G3F-HSCA)



4.2 Local Function Block

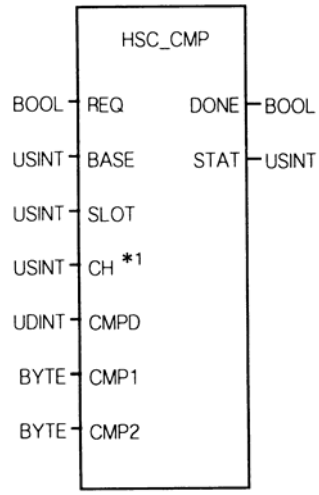
4.2.1 The specification of the preset value(HSC_PRE)

Specifying preset (Initial)value for the applicable channel of the High Speed Counter Module.

Function block	Descriptions
	■ INPUT REQ : Function block execution request at rising edge.(↑) BASE : Base location No. for the loaded high speed counting module. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT : Slot location No. for the loaded high speed counting module. (0 ~ 7) CH : Specifies the operating channel No.(0 ~ 1) PSET : Specifies the preset value setting(0 ~ 16,777,215) ■ OUTPUT DONE : Turns on when the function block has finished without error. The On state is kept until next request. However, turns off if error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. *1: G3F-HSCA only applicable

4.2.2 The specification of the comparison value(HSC_CMP)

Specifies the reference value, which will be compared with the current value for the corresponding channel of the High Speed Counter Module.

Function block	Description
	■ INPUT REQ : Function block execution request at rising edge.(⌐↑¬) BASE : Base location No. for the loaded high speed counting module. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT : Slot location No. for the loaded high speed counting module. (0 ~ 7) CH : Specifies the operating channel No.(0 ~ 1) CMPD : Specifies the Setting value (0 ~ 16,777,215) CMP1 : Specifies the comparison method for the first Setting value. (0 ~ 7) CMP2 : Specifies the comparison method for the second Setting value. (0 ~ 7)

No.	Symbol	Contents	OUT1 LED	OUT2 LED
0		Not compare	OFF	OFF
1	<	CNT < CMPD	ON	ON
2	=	CNT = CMPD	ON	ON
3	≤	CNT ≤ CMPD	ON	ON
4	>	CNT > CMPD	ON	ON
5	≠	CNT ≠ CMPD	ON	ON
6	≥	CNT ≥ CMPD	ON	ON
7	-	CNT - CMPD	ON	ON

■ OUTPUT

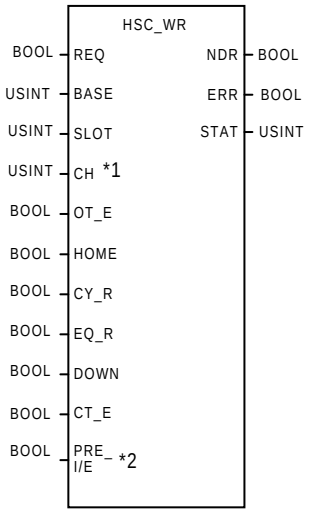
DONE : Turns on when the function block has finished without error. The On state is kept until next request. However, turns off if error occurs during execution of the function block.

STAT : Indicates the error that occurs during execution of the function block.

*1: G3F-HSCA only applicable

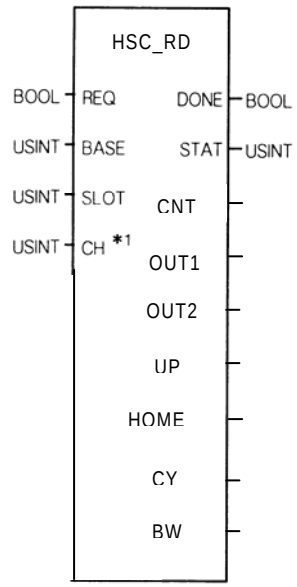
4.2.3 Writing the operating information(HSC_WR)

Specifies the run status control information for the corresponding channel of the High Speed Counter Module.

Function block	Description
	■ INPUT REQ : Function block execution request.(_┘▀▀└_) BASE : Base location No. for the loaded high speed counting module. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT : Slot location No. for the loaded high speed counting module. (0 ~ 7) CH : Specifies the operating channel No.(0 ~ 1) OT_E: Specifies output enable/disable (0:disable, 1:enable) HOME :Specifies Home-Latch enable/disable (0:disable, 1:enable) CY_R: Specifies carry/borrow reset enable/disable (0:disable, 1:enable) EQ_R: Specifies coincidence reset enable/disable (0:disable, 1:enable) DOWN: Specifies the increment/decrement (0:increment, 1:decrement) CT_E : Specifies counting enable/disable (0:disable, 1:enable) PRE_I/E : Specifies external preset input usable (0 : external preset input disable, 1 : external preset input usable) ■ OUTPUT DONE : Turns on when the function block has finished without error. The On state is kept until next request. However, turns off if error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. *1: G3F-HSCA only applicable *2: G6F-HSCA only applicable

4.2.4 Reading the value of the operating status (HSC_RD)

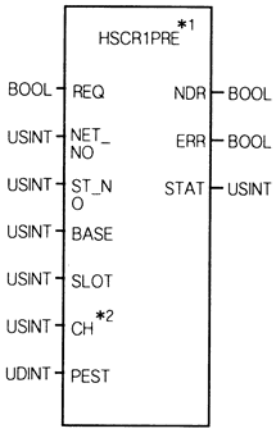
Reads the current value and operating status for the corresponding channel of the High Speed Counter Module.

Function block	Descriptions
	■ INPUT REQ : Function block execution request.(⎍▀⎍) BASE : Base location No. for the loaded high speed counting module. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT : Slot location No. for the loaded high speed counting module. (0 ~ 7) CH : Specifies the run channel No (0 ~ 1) ■ OUTPUT DONE : Turns on when the function block has finished without error. The On state is kept until next request. However, turns off if error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. CNT : Current count value read from the High Speed Counter Module (0~16,777,215) OUT1: OUT1 status (0:Off. 1:On) OUT2: OUT2 status (0:Off, 1:On) UP : Increment/decrement status (0:decrement, 1:increment) HOME: Home signal input status (0:Off, 1:On) CY :Carry signal status (0:Off, 1:On) BW :Borrow signal status (0:Off, 1:On) *1: G3F-HSCA only applicable

4.3 Remote Function Block

4.3.1 The specification of the preset value (HSCR1PRE)

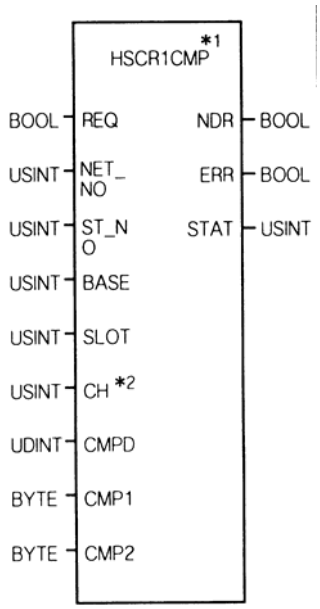
Sets the preset value for the corresponding channel of the High Speed Counter Module mounted on a remote station.

Function block	Descriptions
	■ INPUT REQ : Function block execution request at rising edge.(⌐↑) NET_NO : Location No.(0 ~ 7) of the slot where the local communication modules (G3L – FUEA, G4L – FUEA, G3L – FUOA) is loaded to which the function block will be sent. St_NO : Station No.(0 ~ 63) of the communication modules(G3L – RBEA, G4L – RBOA, G4L – BBEA) mounted on the remote I/O station. BASE: Location No. of the base unit where the High Speed Counter Module is loaded. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT: Location No. of the slot in the base unit where the High Speed Counter Module is loaded.(0 ~ 7) CH : Specifies operating channel No. (0 ~ 1) PSET : Specifies preset value (0 ~ 16,777,215) ■ OUTPUT NDR : Turns on when the function block has finished without error. Turns off at next scan. ERR : Turns on when an error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. *1: G4F-HSCA : “HSCR0PRE” G6F-HSCA : “HSCR6APR” *2: G3F-HSCA only applicable

4.3.2 The specification of the comparison value (HSCR1CMP)

Specifies the reference value, which will be compared with the current value for the corresponding channel of the High Speed Counter Module mounted on a remote station.

Function block	Descriptions



■ INPUT

REQ : Function block execution request at rising edge.(↑)
NET_NO : Location No.(0 ~ 7) of the slot where the local communication modules (G3L – FUEA, G4L – FUEA, G3L – FUOA) is loaded to which the function block will be sent.
St_NO : Station No.(0 ~ 63) of the communication modules(G3L – RBEA, G4L – RBOA, G4L – BBEA) mounted on the remote I/O station.
BASE: Location No. of the base unit where the High Speed Counter Module is loaded.
(GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0)
SLOT: Location No. of the slot in the base unit where the High Speed Counter Module is loaded.(0 ~ 7)
CH : Specifies operating channel No. (0 ~ 1)
CMPD : Specifies the Setting value (0 ~ 16,777,215,)
CMP1 : Specifies the comparison method for the first Setting value. (0 ~ 7)
CMP2 : Specifies the comparison method for the second Setting value. (0 ~ 7)

[Magnitude comparison method specification]

No.	Symbol	Contents	OUT1 LED	OUT2 LED
0		Not compare	OFF	OFF
1	<	CNT < CMPD	ON	ON
2	=	CNT = CMPD	ON	ON
3	≤	CNT ≤ CMPD	ON	ON
4	>	CNT > CMPD	ON	ON
5	≠	CNT ≠ CMPD	ON	ON
6	≥	CNT ≥ CMPD	ON	ON
7	-	CNT - CMPD	ON	ON

■ OUTPUT

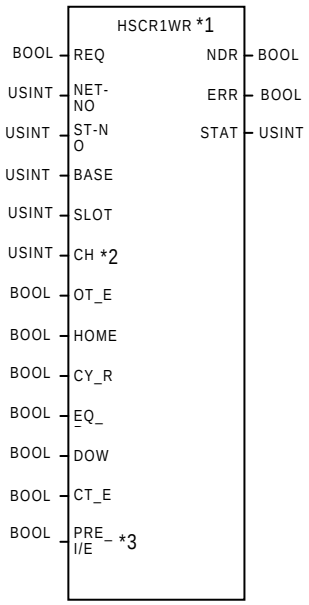
NDR : Turns on when the function block has finished without error. Turns off at next scan.
ERR : Turns on when an error occurs during execution of the function block.
STAT : Indicates the error that occurs during execution of the function block.

*1: G4F-HSCA : “HSCR0CMP”
G6F-HSCA : “HSCR6ACP”

*2: G3F-HSCA only applicable

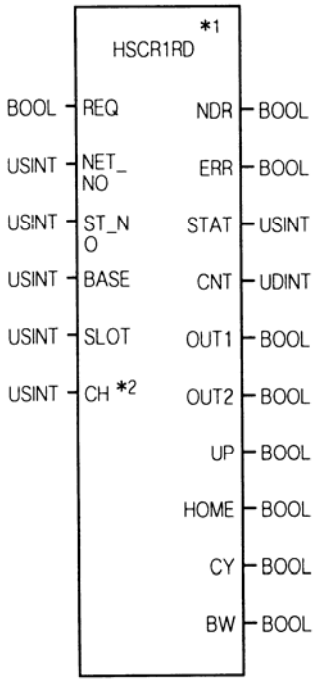
4.3.3 Writing the operating information (HSCR1WR)

Specifies the control information of the operating status for the corresponding channel of the High Speed Counter Module mounted on the remote station.

Function block	Descriptions
	■ INPUT REQ : Function block execution request at rising edge.(⌐↑¬) NET_NO : Location No.(0 ~ 7) of the slot where the local communication modules (G3L – FUEA, G4L – FUEA, G3L – FUOA) is loaded to which the function block will be sent. St_NO : Station No.(0 ~ 63) of the communication modules(G3L – RBEA, G4L – RBOA, G4L – BBEA) mounted on the remote I/O station. BASE: Location No. of the base unit where the High Speed Counter Module is loaded. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT: Location No. of the slot in the base unit where the High Speed Counter Module is loaded.(0 ~ 7) CH : Specifies operating channel No. (0 ~ 1) OT_E: Specifies output enable/disable (0:disable, 1:enable) HOME :Specifies Home-Latch enable/disable (0:disable, 1:enable) CY_R: Specifies carry/borrow reset enable/disable (0:disable, 1:enable) EQ_R: Specifies coincidence reset enable/disable (0:disable, 1:enable) DOWN: Specifies the increment/decrement (0:increment, 1:decrement) CT_E : Specifies counting enable/disable (0:disable, 1:enable) PRE_I/E : Specifies external preset input usable (0 : external preset input disable, 1 : external preset input usable) ■ OUTPUT NDR : Turns on when the function block has finished without error. Turns off at next scan. ERR : Turns on when an error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. *1: G4F-HSCA : “HSCR0WR” G6F-HSCA : “HSCR6AWR” *2: G3F-HSCA only applicable *3: G6F-HSCA only applicable

4.3.4 Reading the value of the operating status (HSCR1RD)

Reads the current value and operating status for the corresponding channel of the High Speed Counter Module mounted on the remote station.

Function block	Descriptions
	■ INPUT REQ : Function block execution request at rising edge.(↑) NET_NO : Location No.(0 ~ 7) of the slot where the local communication modules (G3L – FUEA, G4L – FUEA, G3L – FUOA) is loaded to which the function block will be sent. ST_NO : Station No.(0 ~ 63) of the communication modules(G3L – RBEA, G4L – RBOA, G4L – BBEA) mounted on the remote I/O station. BASE: Location No. of the base unit where the High Speed Counter Module is loaded. (GM1 : 0~31, GM2 : 0~7, GM3/4 : 0~3, GM6 : 0) SLOT: Location No. of the slot in the base unit where the High Speed Counter Module is loaded.(0 ~ 7) CH : Specifies operating channel No. (0 ~ 1) ■ OUTPUT NDR : Turns on when the function block has finished without error. Turns off at next scan. ERR : Turns on when an error occurs during execution of the function block. STAT : Indicates the error that occurs during execution of the function block. CNT : Current count value read from the High Speed Counter Module (0~16,777,215) OUT1: OUT1 status (0:Off. 1:On) OUT2: OUT2 status (0:Off, 1:On) UP :Increment/decrement status (0:decrement, 1:increment) HOME : Home signal input status (0:Off, 1:On) CY :Carry signal status (0:Off, 1:On) BW :Borrow signal status (0:Off, 1:On) *1: G4F-HSCA : “HSCR0RD” G6F-HSCA : “HSCR6ARD” *2: G3F-HSCA only applicable

4.4 Error code on the function block

This shows the errors on the output variable “STAT” of variables and the resolutions in accordance with them.

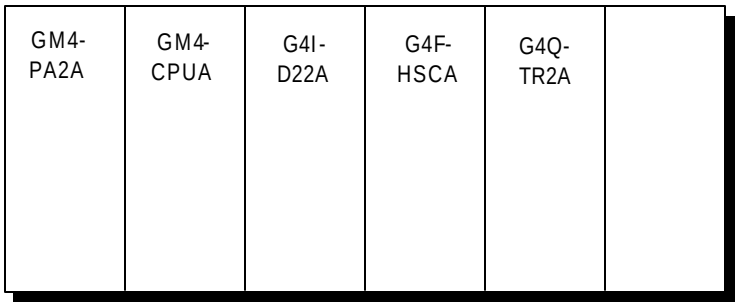
STAT No.	Local/ Remote	Descriptions	Resolutions
0	Local	Operating with no fault	-
1		The base location number is exceeding the proper setting range	Correct the number in accordance with the proper range(See Section 4.2)
2		H/W error of the base	Contact the service station.
3		The slot location number is exceeding the proper setting range	Set the right number to the slot mounting the high speed counter module.
4		The high speed counter module on the slot is empty	Mount the high speed counter module to the specified slot
5		The module loaded isn't the high speed counter module	Mount the high speed counter module to the specified slot
6		The channel number is exceeding the proper range	Specify the available channel correctly
7		H/W error of the high speed counter module	Contact the service station.
8		The high speed counter module's shared memory	Contact the service station.
9		The available channels are not specified	Make a correct specification of the available channel on the initialization function block
128	Remote	H/W error of the communication module for remote	See the manual for the remote communication module
129		The base location number is exceeding the proper setting range	Corsets the number in accordance with the proper range(See Section 4.2)
131		The slot location number is exceeding the proper setting range	Set the right number to the slot mounting the high speed counter module
133		The module loaded isn't the high speed counter module	Mount the high speed counter module to the specified slot
135		H/W error of the high speed counter module	Contact the service station.
136		The high speed counter module's shared memory	Contact the service station.
137		The available channels are not specified	Make a correct specification of the available channel on the initialization function block

Chapter 5. GM PROGRAMMING

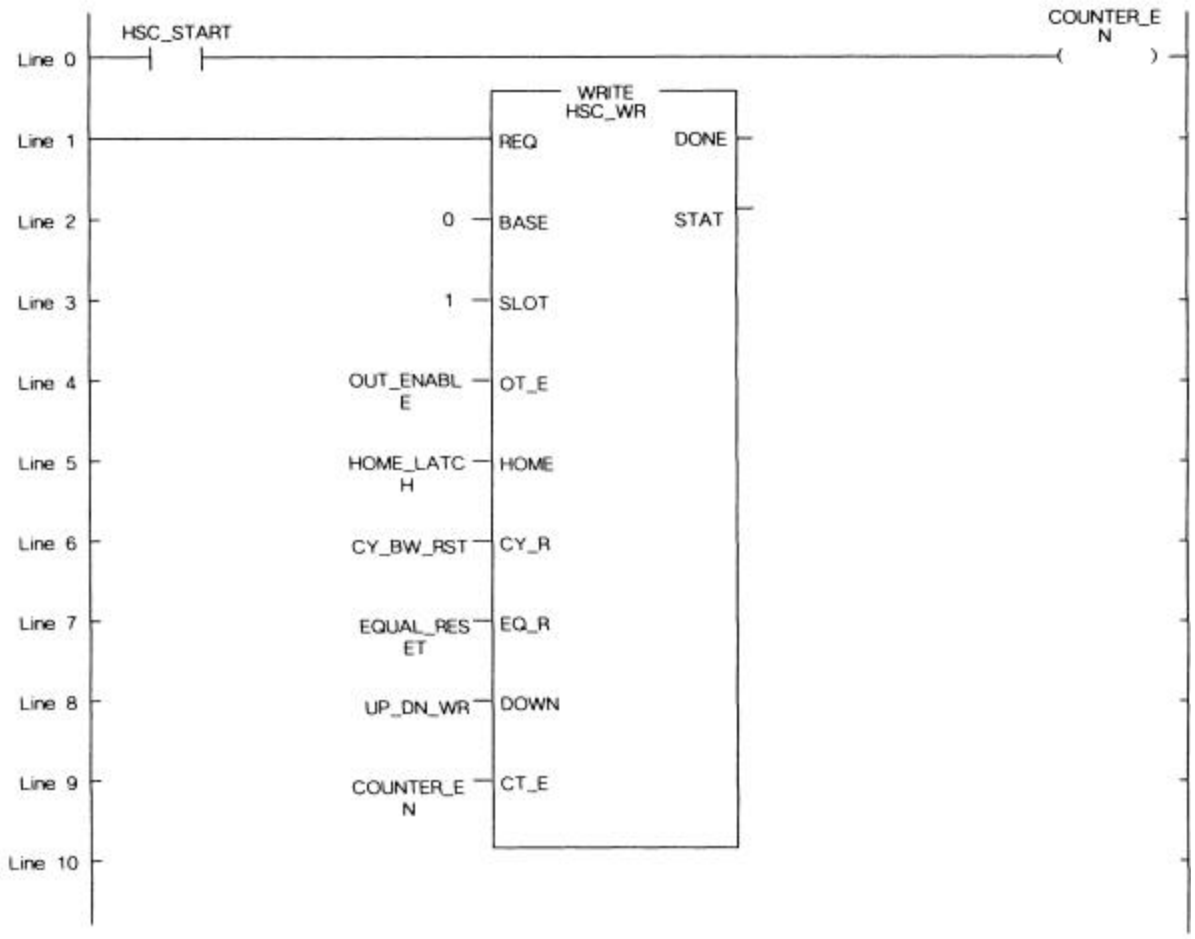
5.1 Programming Examples

If not especially noted, this section explains programming examples in reference with the G4F – HSCA that is loaded onto the system given below

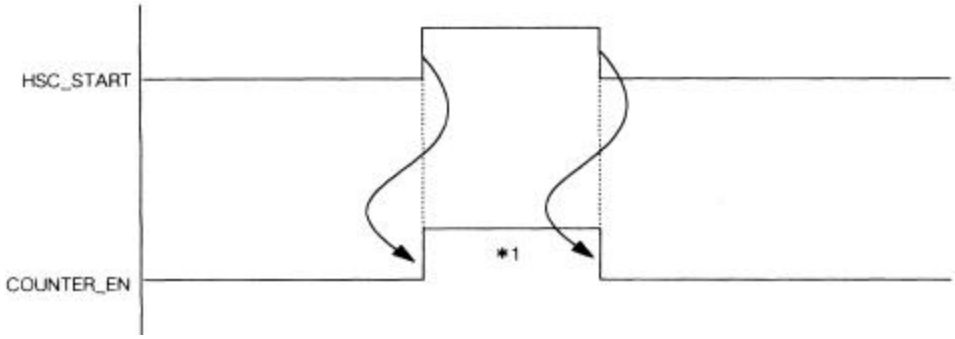
- **System configuration**



5.1.1 Enabling the count operation

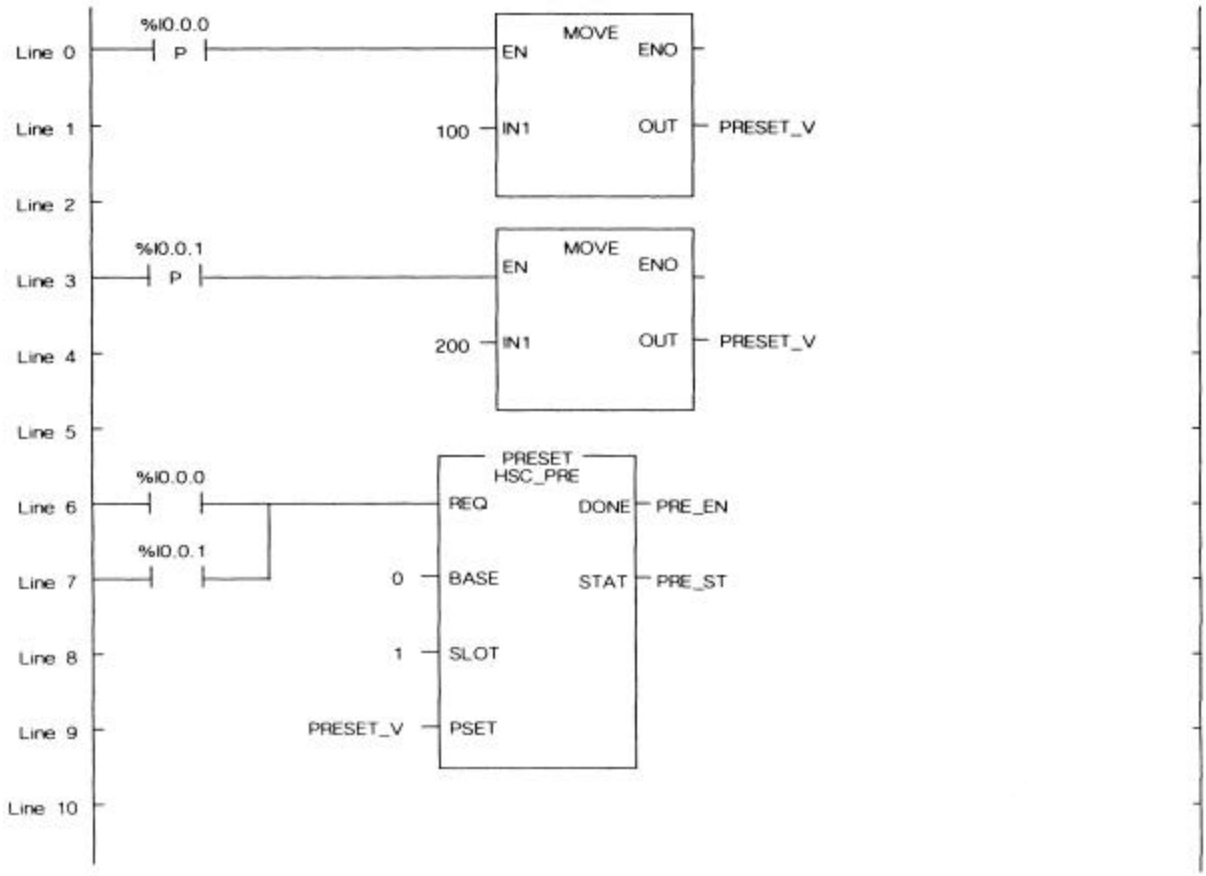


● **Timing Diagram**

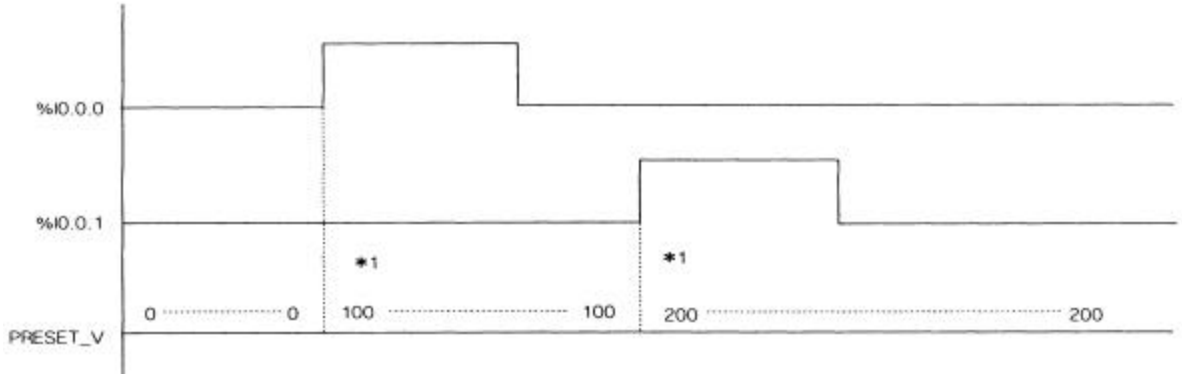


*1. Counting is only possible when the COUNTER_EN is turned on.

5.1.2 Preset

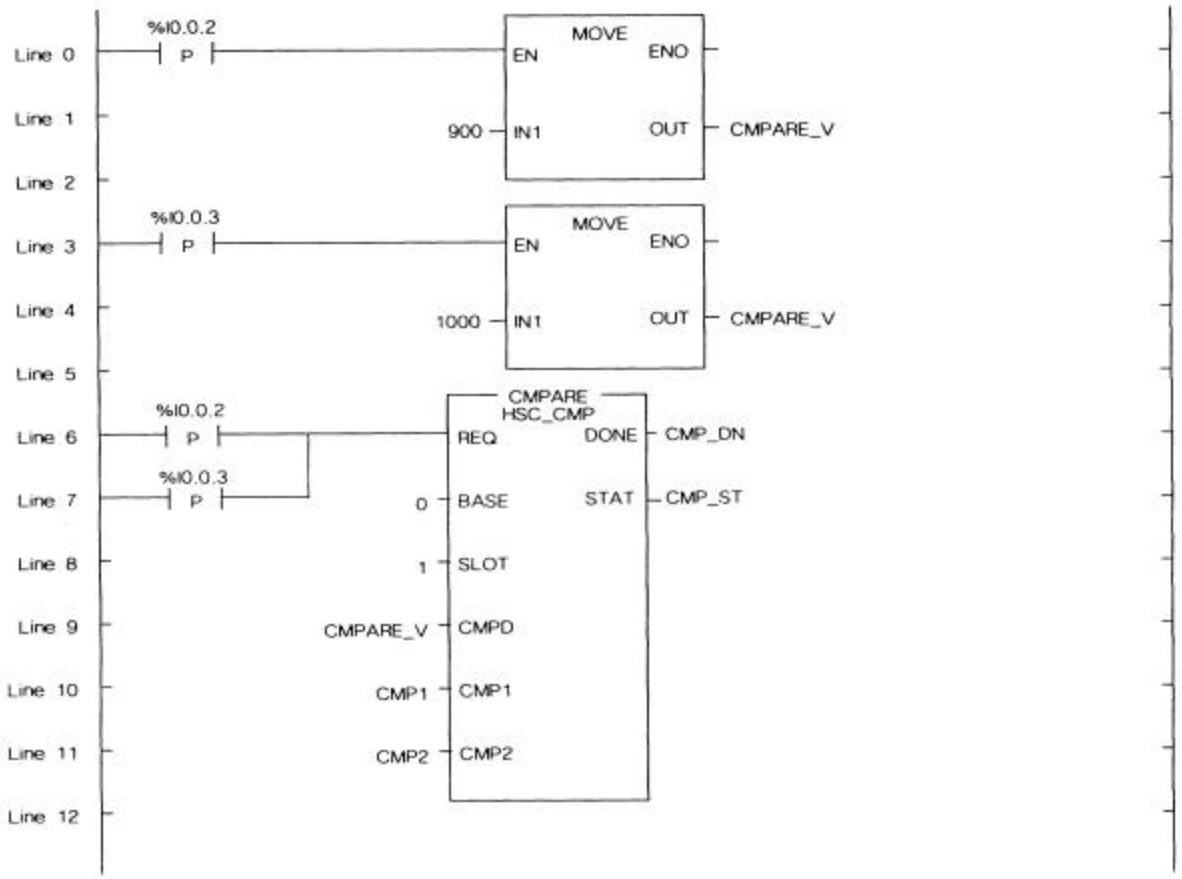


- **Timing diagram**

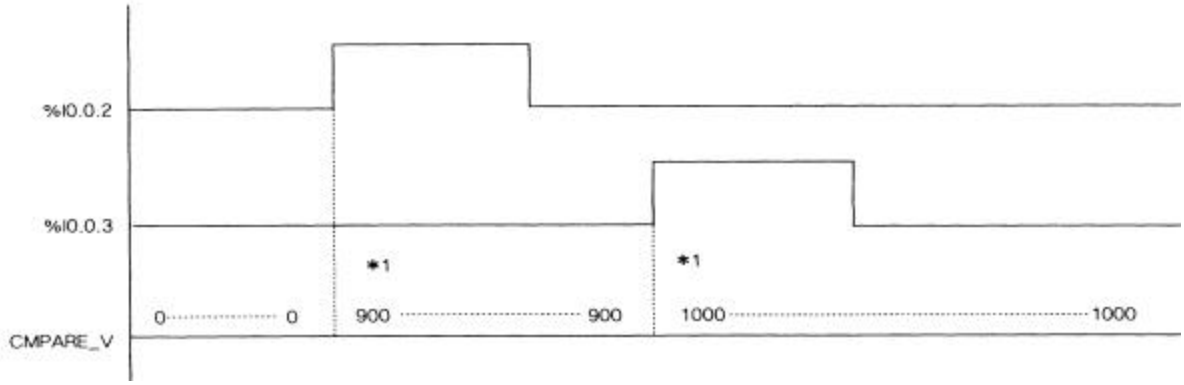


*The function block HSC_PRE will be processed for one scan.

5.1.3 Setting the comparison value

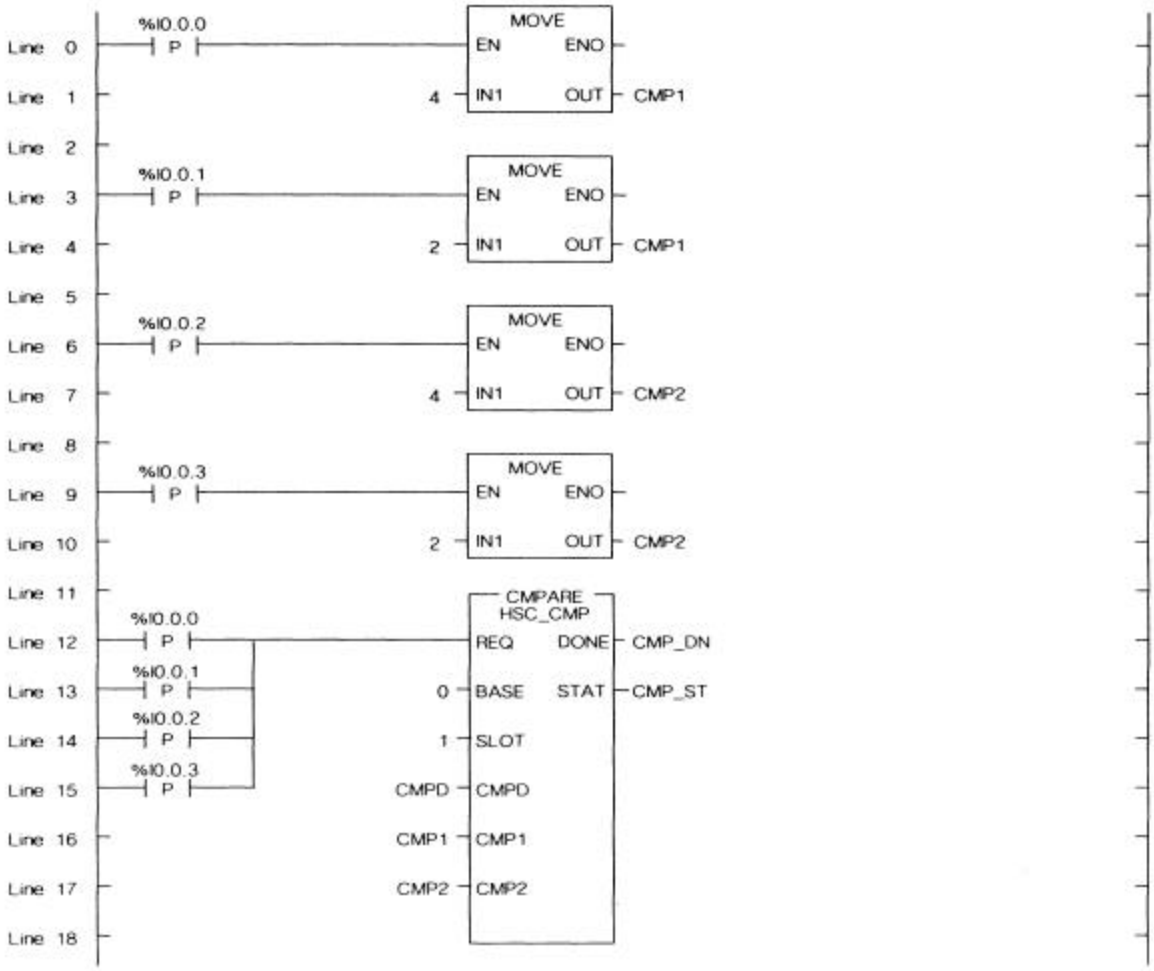


● **Timing Diagram**

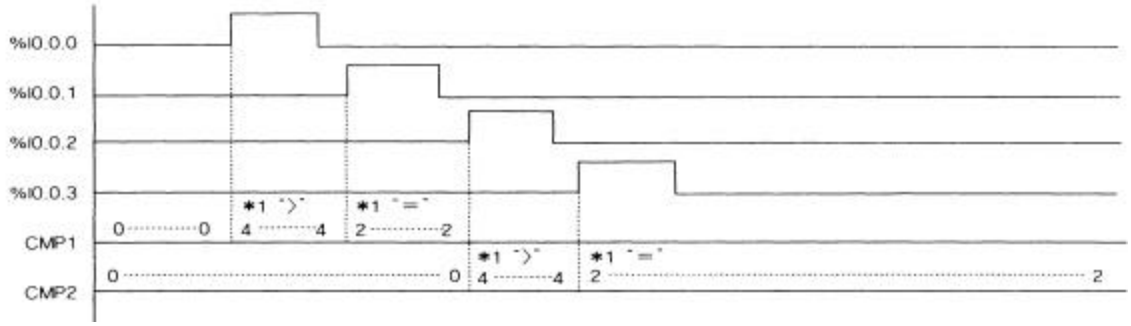


*1. The function block HSC_CMP will be processed for one scan.

5.1.4 Setting the magnitude comparison values

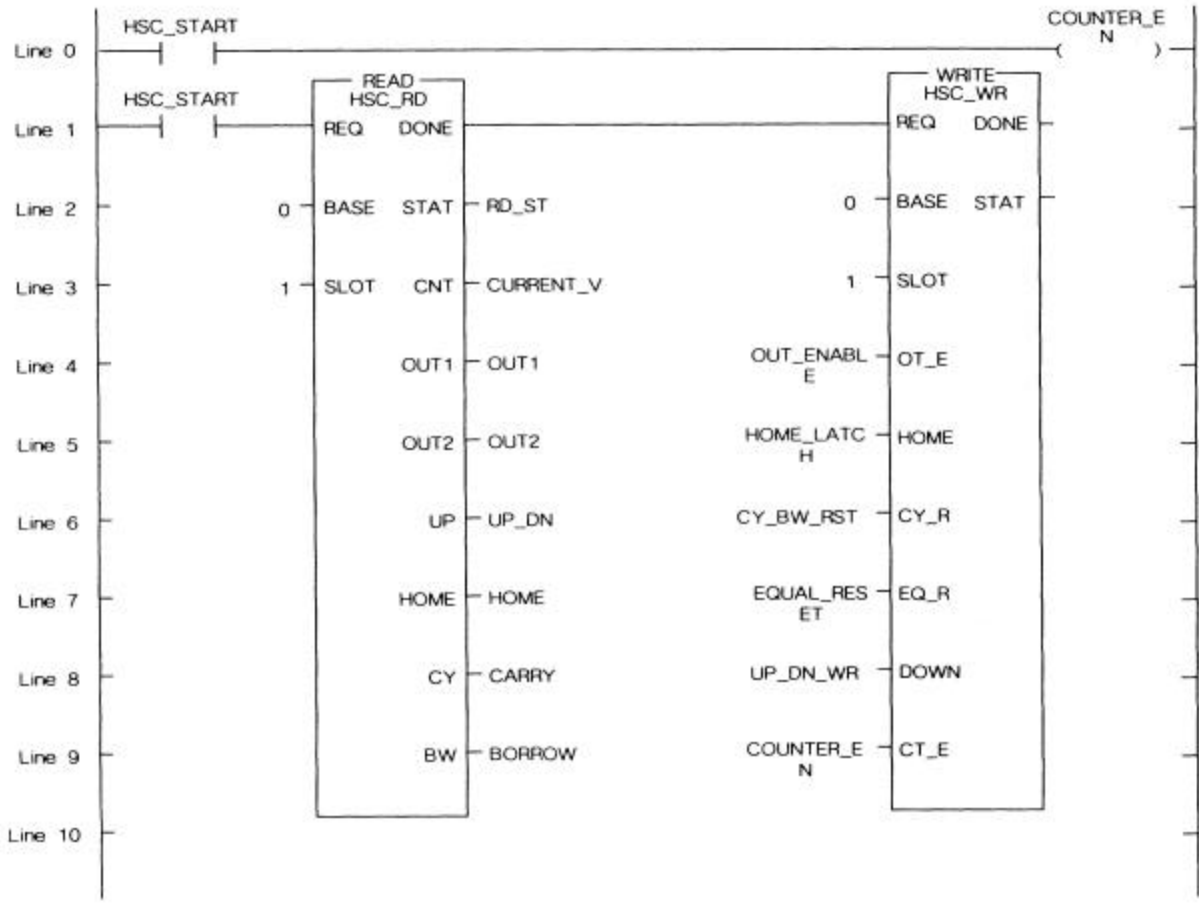


- **Timing Diagram**

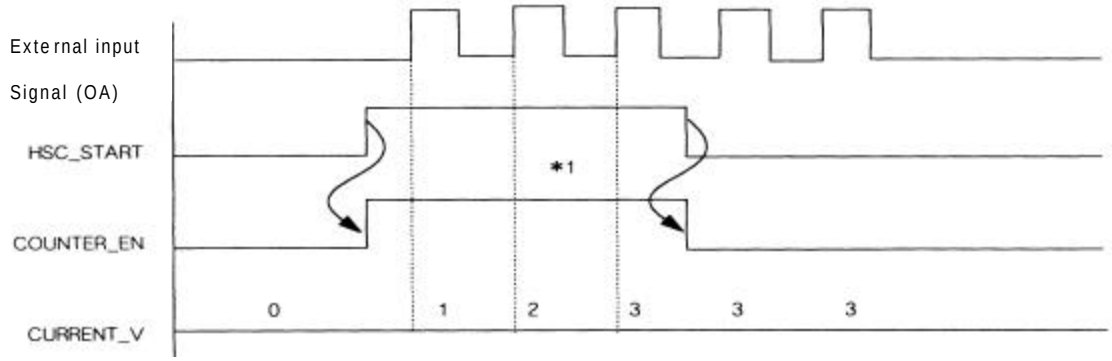


*1.The function block HSC_CMP will be processed for one scan.

5.1.5 Reading the current count value

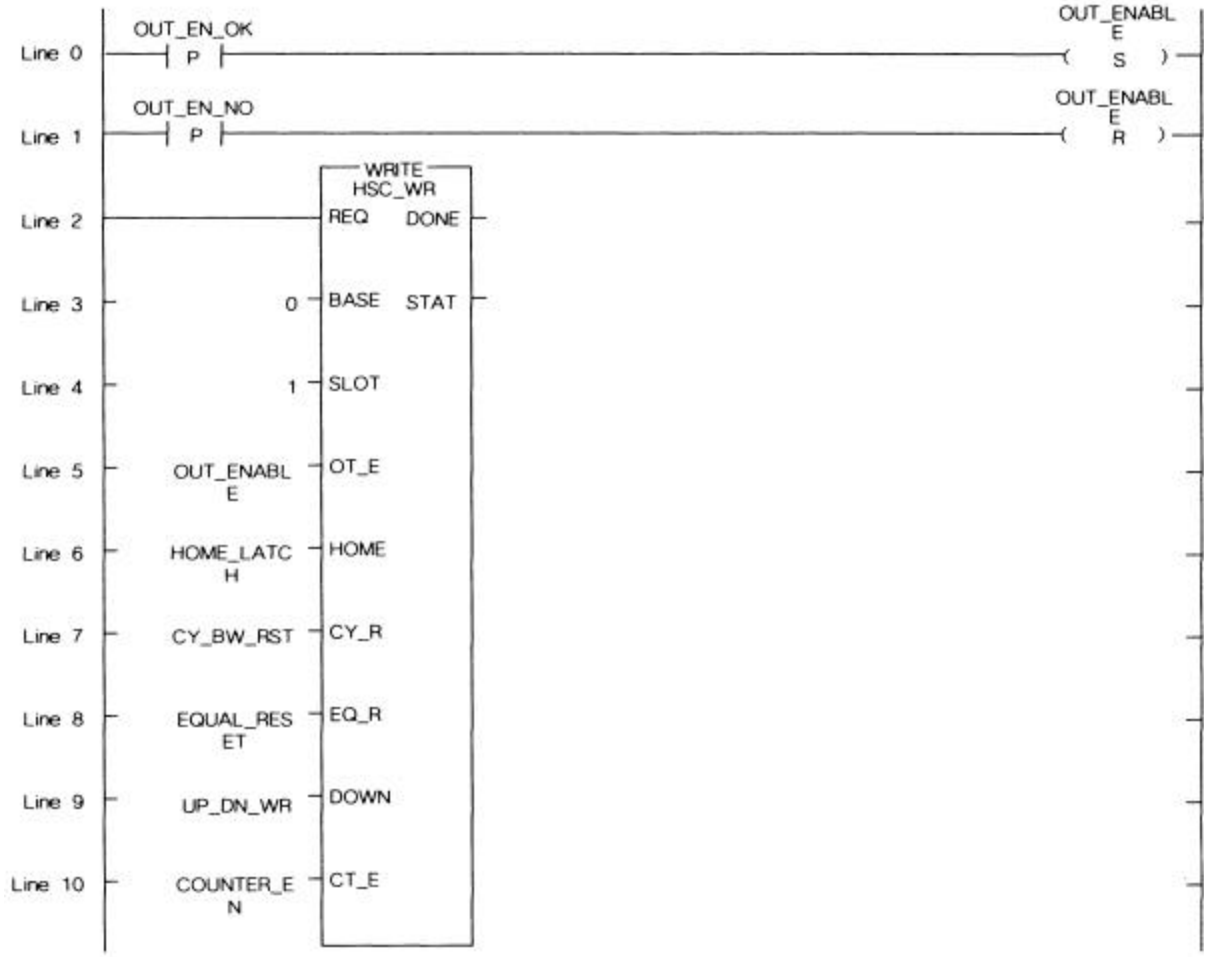


- **Timing Diagram**

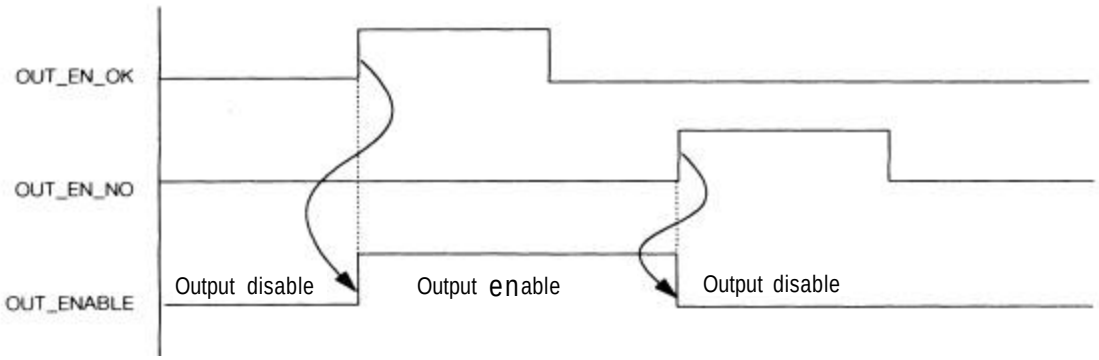


*1.The current count value (CNT) is read only when the COUNTER_EN is turned on.

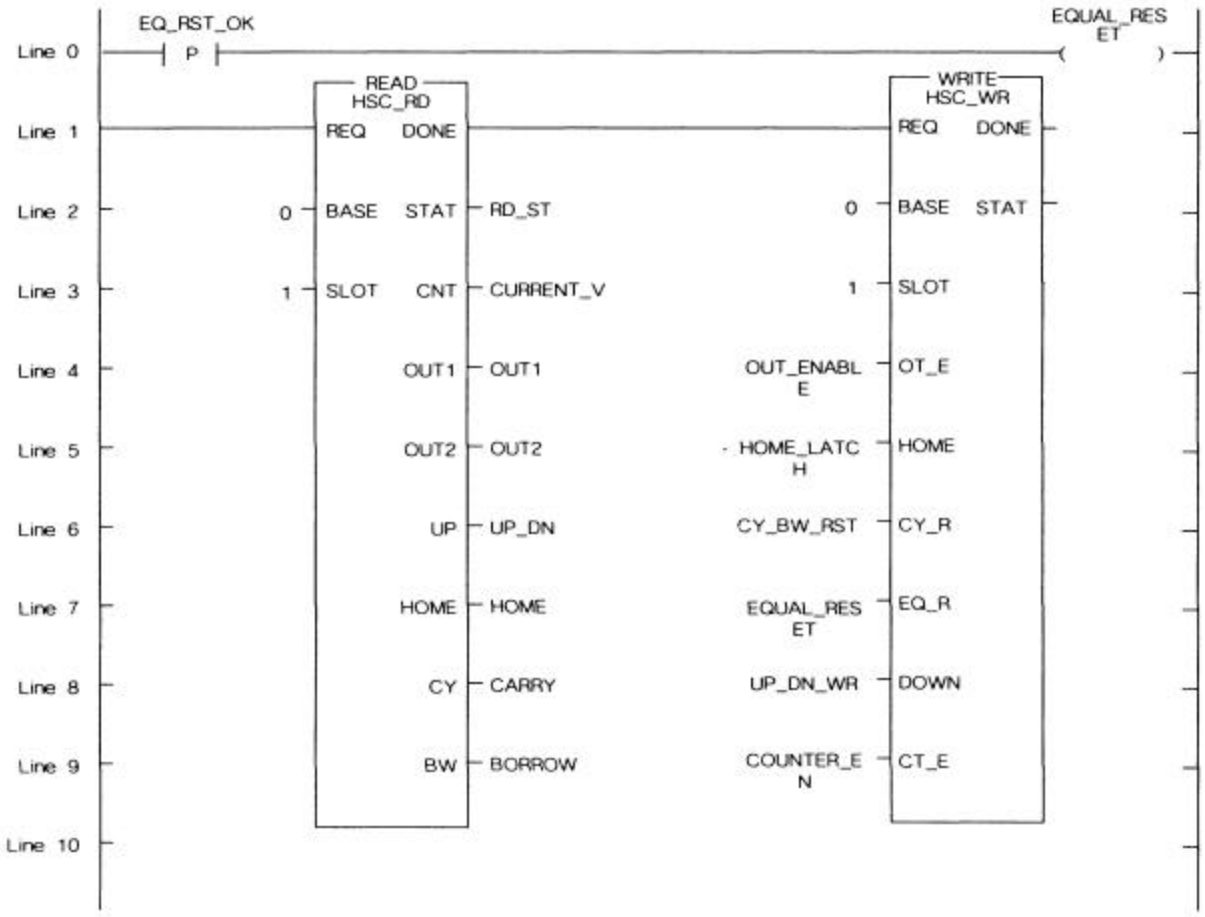
5.1.6 Enabling the external output



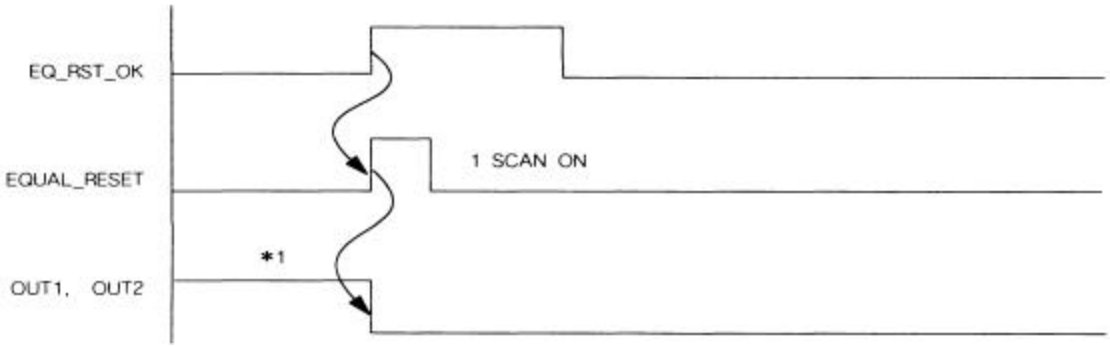
- **Timing Diagram**



5.1.7 Coincidence reset

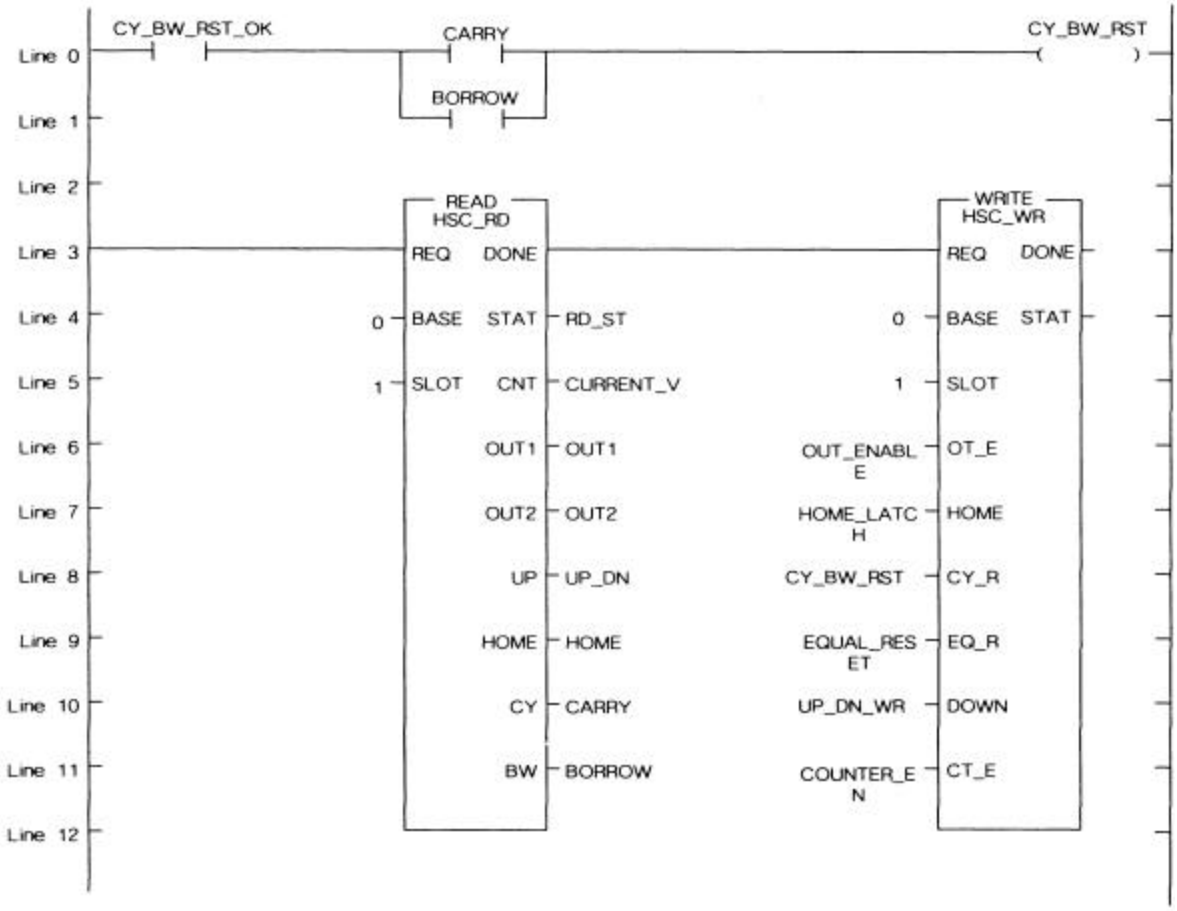


- **Timing Diagram**

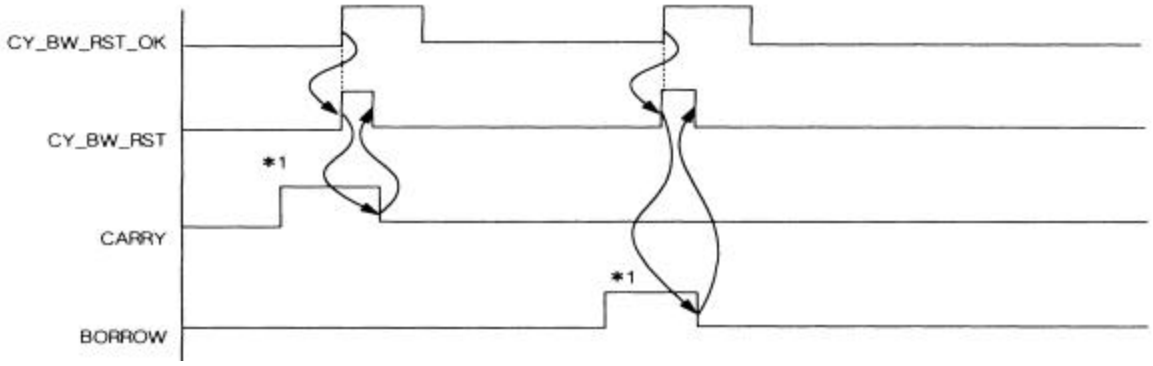


*1.This occurs only when the comparison values 1 and 2 are set to "=", " ≥ ", or " ≤ " and the current count value (CNT) equal to the comparison value (CMPD)

5.1.8 Carry / Borrow reset



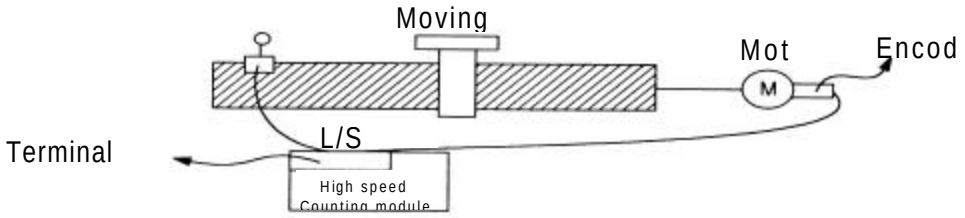
- **Timing Diagram**

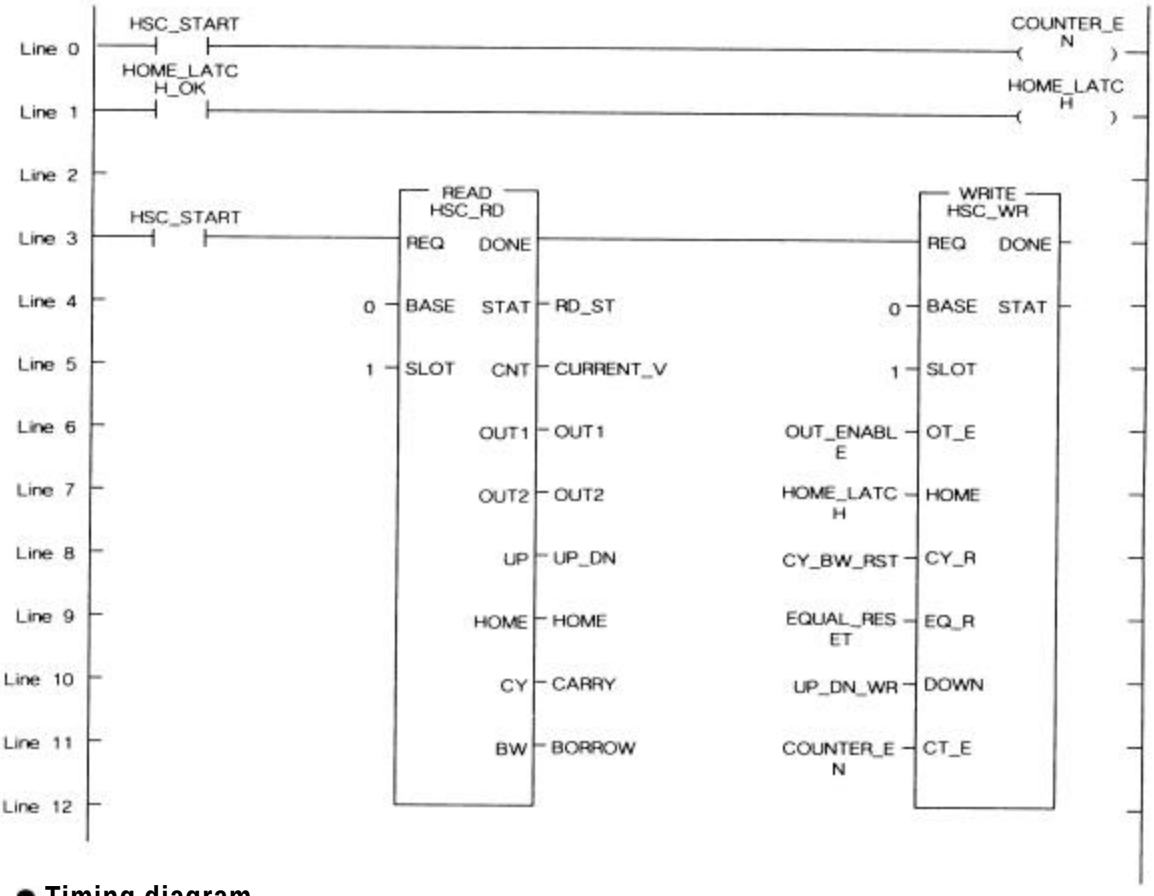


*1. Carry, Borrow signal occurs when the Current count value changes from 16,777,215 to 0 or from 0 to 16,777,215

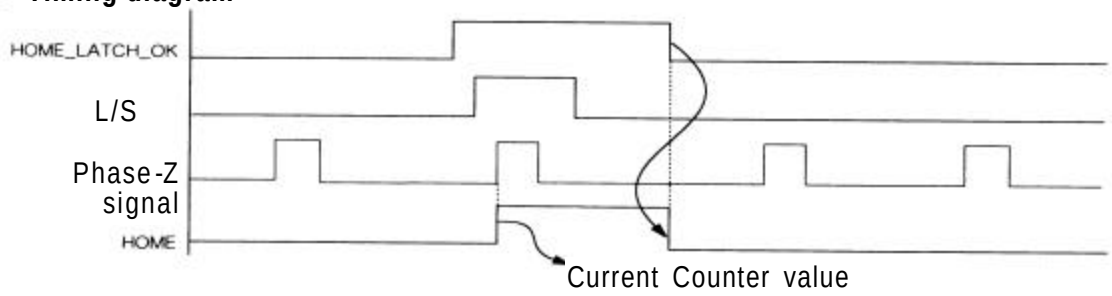
5.1.9 Enabling the home latch

Home Latch enable signal is used to set the current count value to 0 when the mechanical reference point has been reached.



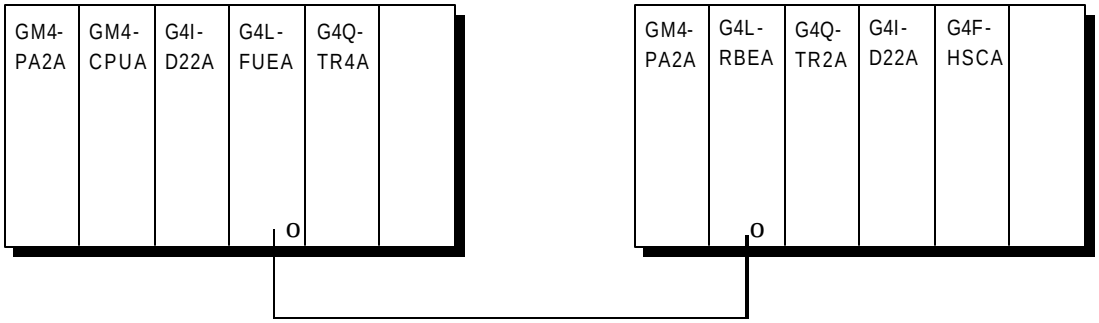


● **Timing diagram**



5.1.10 Read/ Write when the high speed counter module Is mounted onto the remote station

● **System configuration**



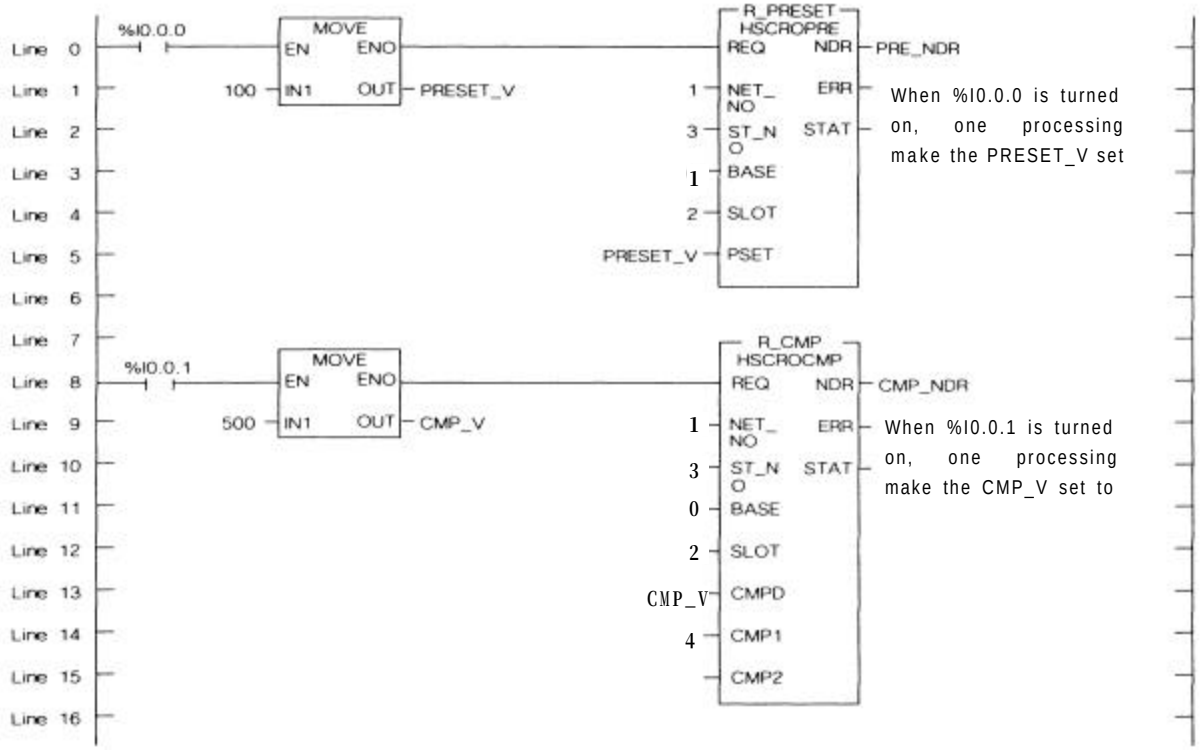
NET-NO : The number of the slot where the G4L – FUEA is loaded = 1

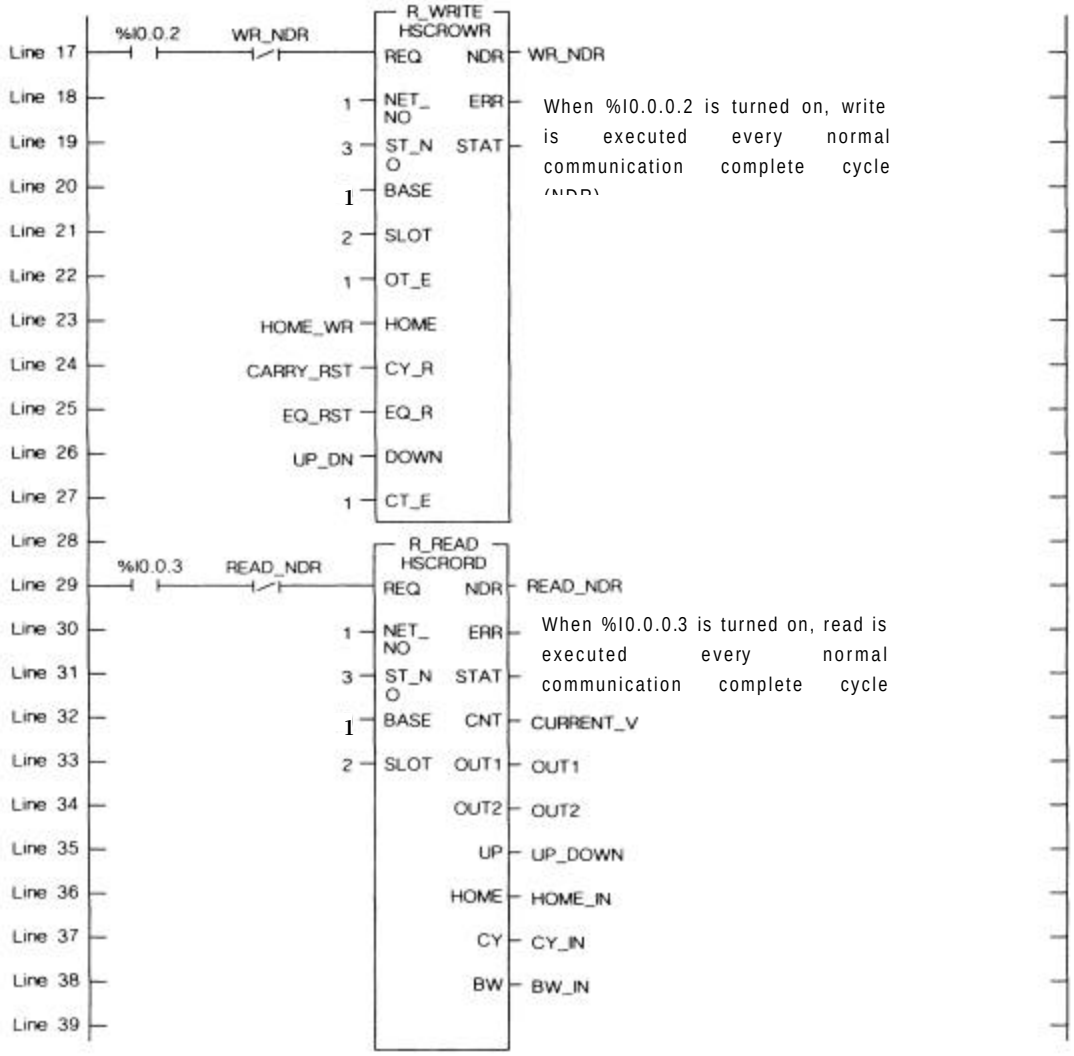
ST-NO : G4L-RBEA Station No. = 3

BASE : The number of the base unit where the G4F – HSCA is loaded = 1

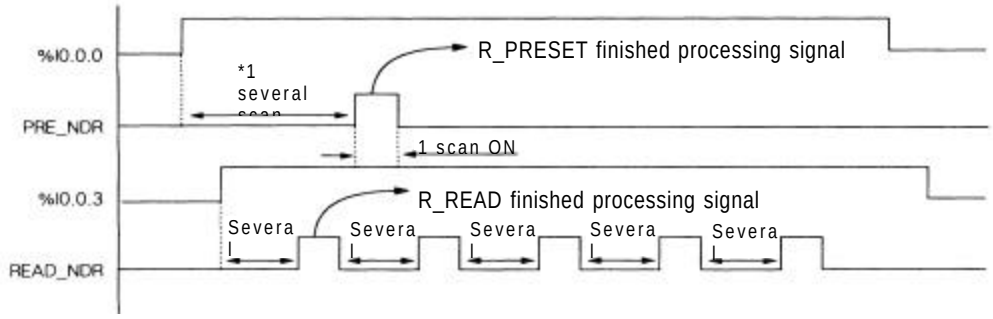
SLOT : The number of the slot where the G4F – HSCA is loaded = 2

● **Program**





- **Timing Diagram**

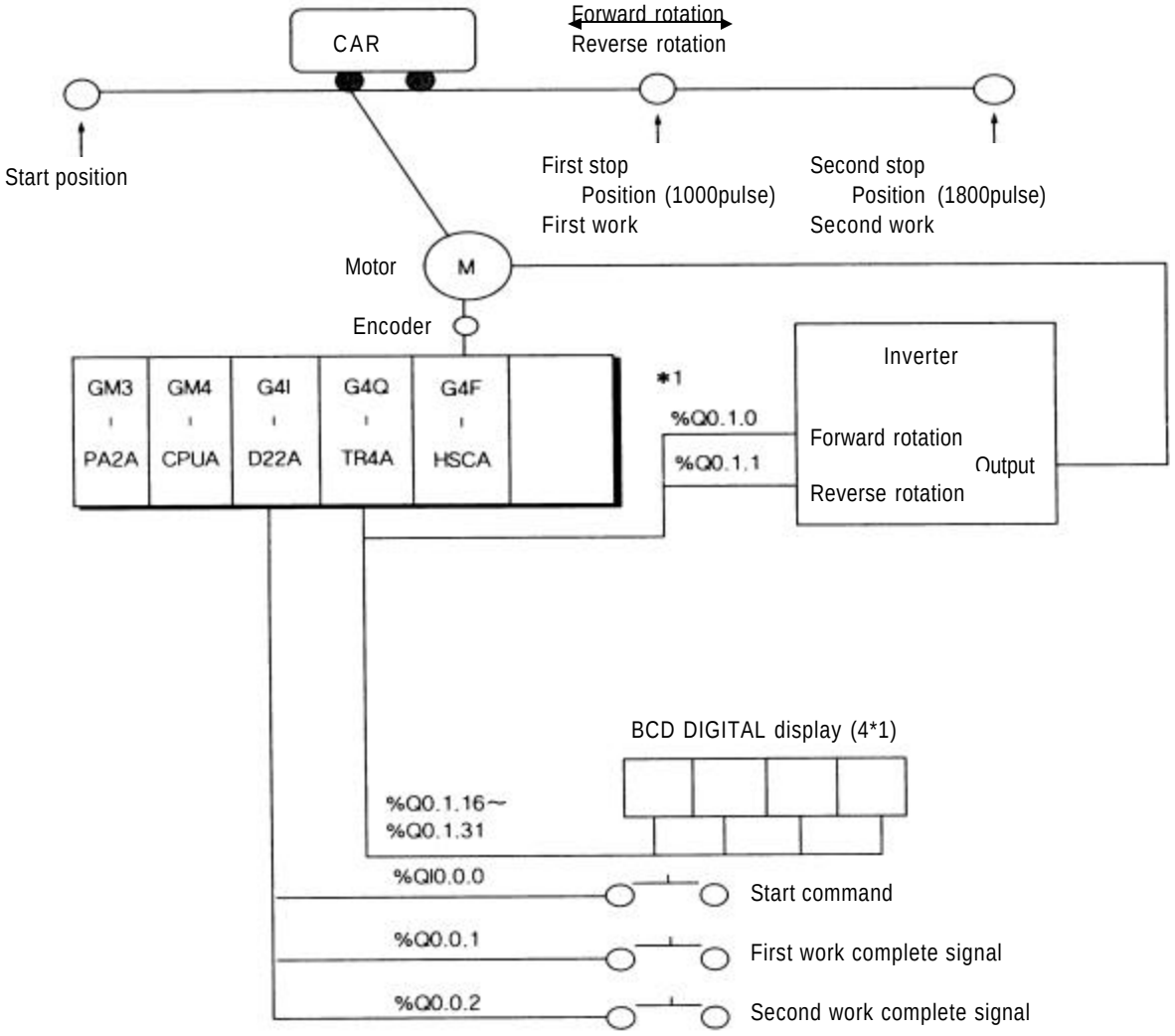


*1. It is normal communication complete cycle, and it extents in proportion with quantity of communication data and the number of stations connected to the communication module.

5.2 Application Examples

5.2.1 Program for moving the cart

● **System Configuration**



GM4 – CUPA : GM4 CPU Module
G4I – D22A : DC Input Module (16 Point)
G4Q – TR4A : TR Output Module (32 Point)
G4F – HSCA : High-speed counting module

● **Operation Description**

The motor for moving the cart rotates with start command, and makes the cart stop at the first stop position with the High-speed counting module counting the encoder signals from the motor.

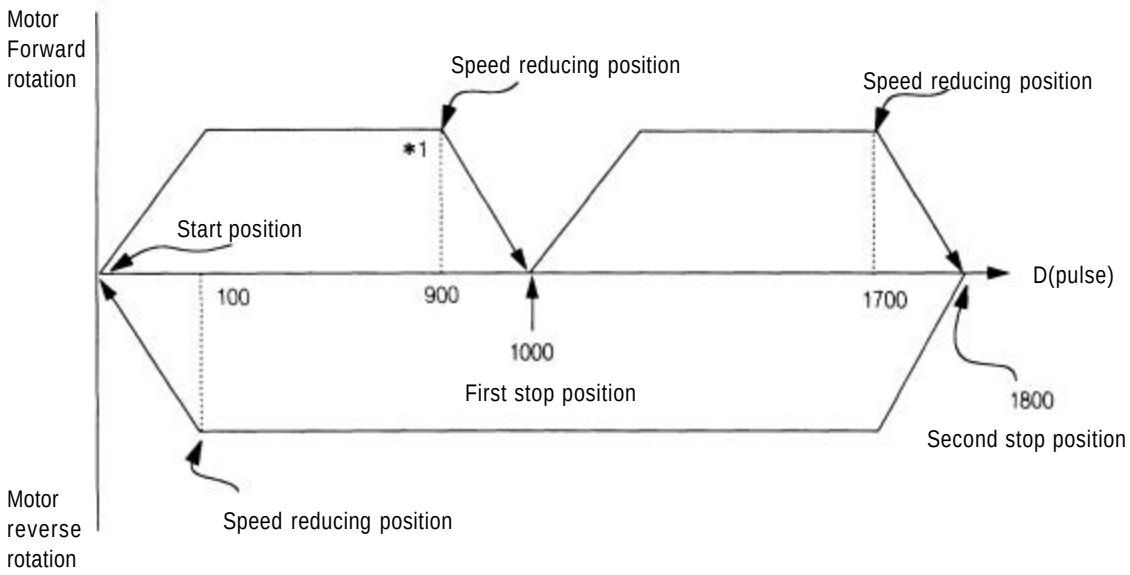
Then, if the first work complete signal turns ON, the motor moves the cart to stop at the second stop position. When the second work complete signal turns on, the motor return the cart to the start position.

● **Input/Output Signal Allocation**

%I0.0.0 : Start Command
%I0.0.1 : 1st Work Complete Signal
%I0.0.2 : 2nd Work Complete Signal
} Input

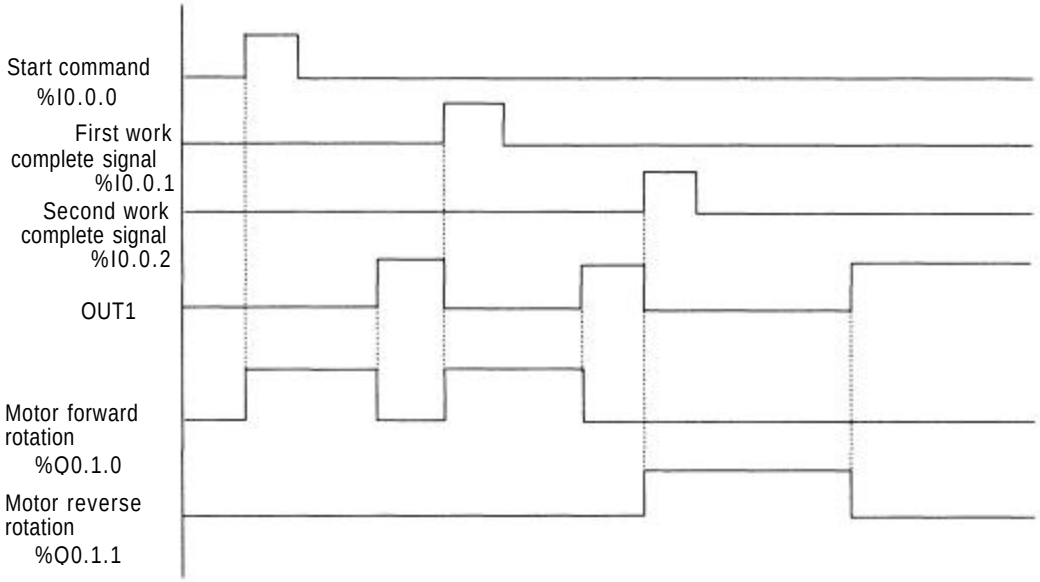
%Q0.1.0 : Motor forward rotation signal (On : forward rotation , Off : Stop)
%Q0.1.1 : Motor reverse rotation Signal (On : Backward rotation, Off : Stop)
%Q0.1.16 - %Q0.1.31 : Indicates the current count value(BCD) of the High-speed counting module.
} Output

● **Driving mode**



*1. 100(Difference between stop position and speed reducing position) is an interval delayed by reducing timing of the inverter.

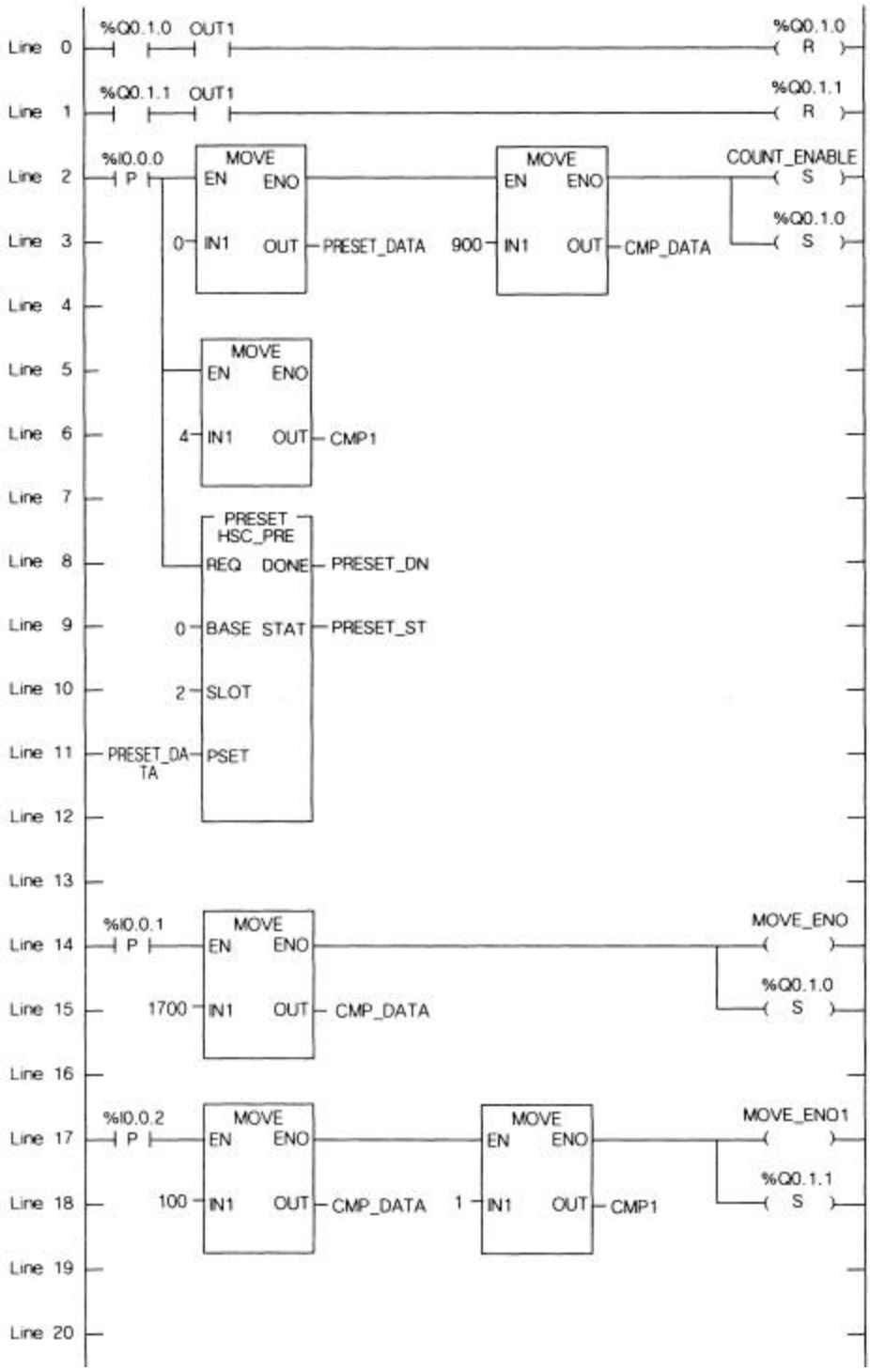
- **Operation**



- **Used Variable List**

Variable Name	Var_Kind	Data Type	(AT Address)	(Initial Value)
CMP_DATA	: VAR	: UDINT		
CMP_SET	: VAR	: FB Instance		
CMP_SET_DN	: VAR	: BOOL		
CMP_SET_ST	: VAR	: USINT		
CMP1	: VAR	: BYTE		
COUNT_ENABLE	: VAR	: BOOL		
CUR_DATA	: VAR	: UINT		
CUR_VALUE	: VAR	: UDINT		
CY_REST	: VAR	: BOOL		
EQ_RESET	: VAR	: BOOL		
HOME_LATCH	: VAR	: BOOL		
MOVE_ENO	: VAR	: BOOL		
MOVE_ENO1	: VAR	: BOOL		
OUT_EN	: VAR	: BOOL		
OUT1	: VAR	: BOOL		
PRESET	: VAR	: FB Instance		
PRESET_DATA	: VAR	: UDINT		
PRESET_DN	: VAR	: BOOL		
PRESET_ST	: VAR	: USINT		
READ	: VAR	: FB Instance		
READ_DN	: VAR	: BOOL		
UP_DOWN_OUT	: VAR	: BOOL		
WRITE	: VAR	: FB Instance		

- **Program**



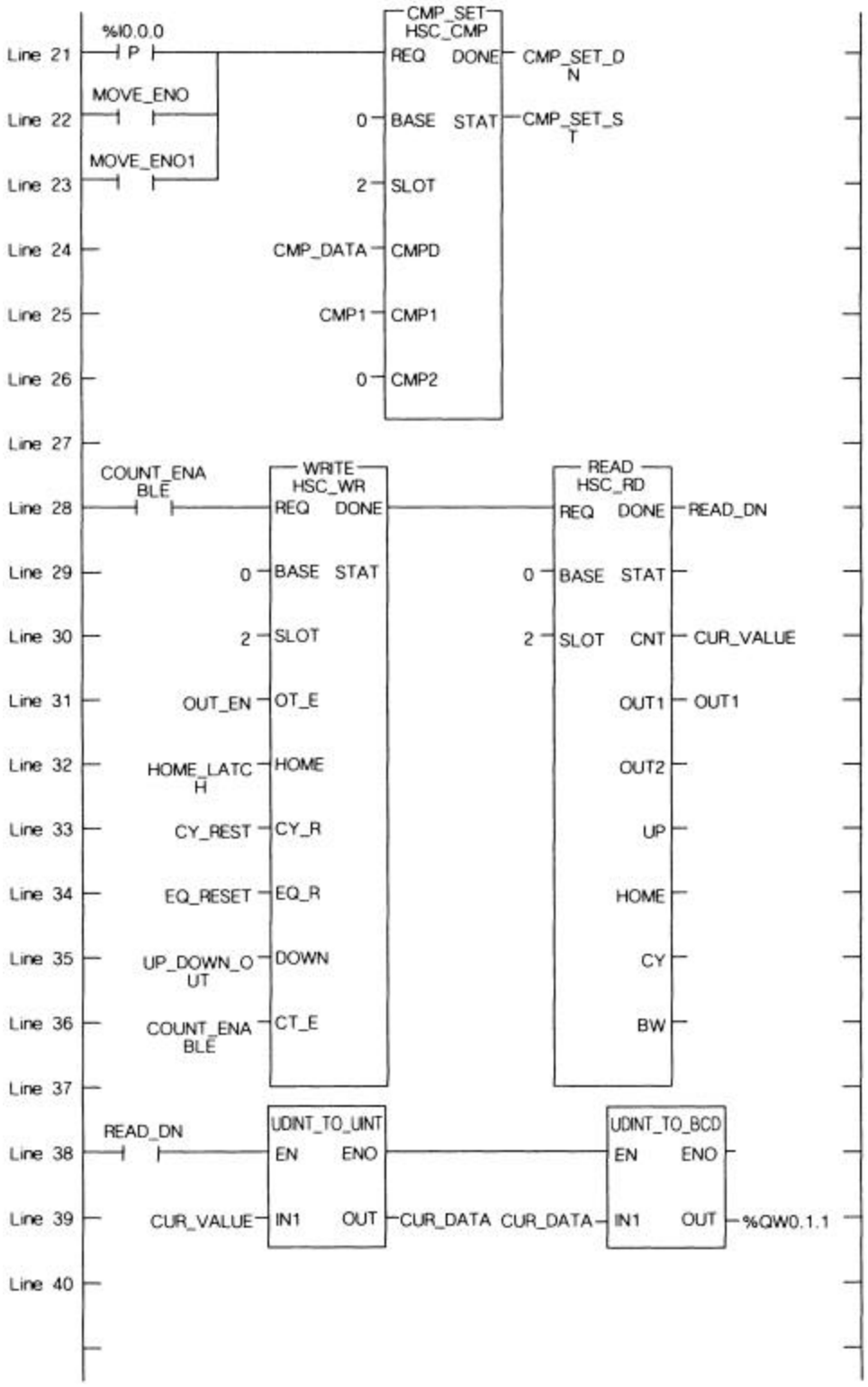
Stops forward rotation of the motor when speed-reducing position is over-passed.

Stops reverse rotation of the motor when speed-reducing position is over-passed

If start command turns on, PRESET_DATA = 0 CMP1=4,CMP_DATA=900. COUNT_ENABLE=ON, The motor starts forward

When the first work has been finished, CMP_DATA =1700 and the motor starts forward rotation.

When the second work has been finished CMP DATA =100 and the



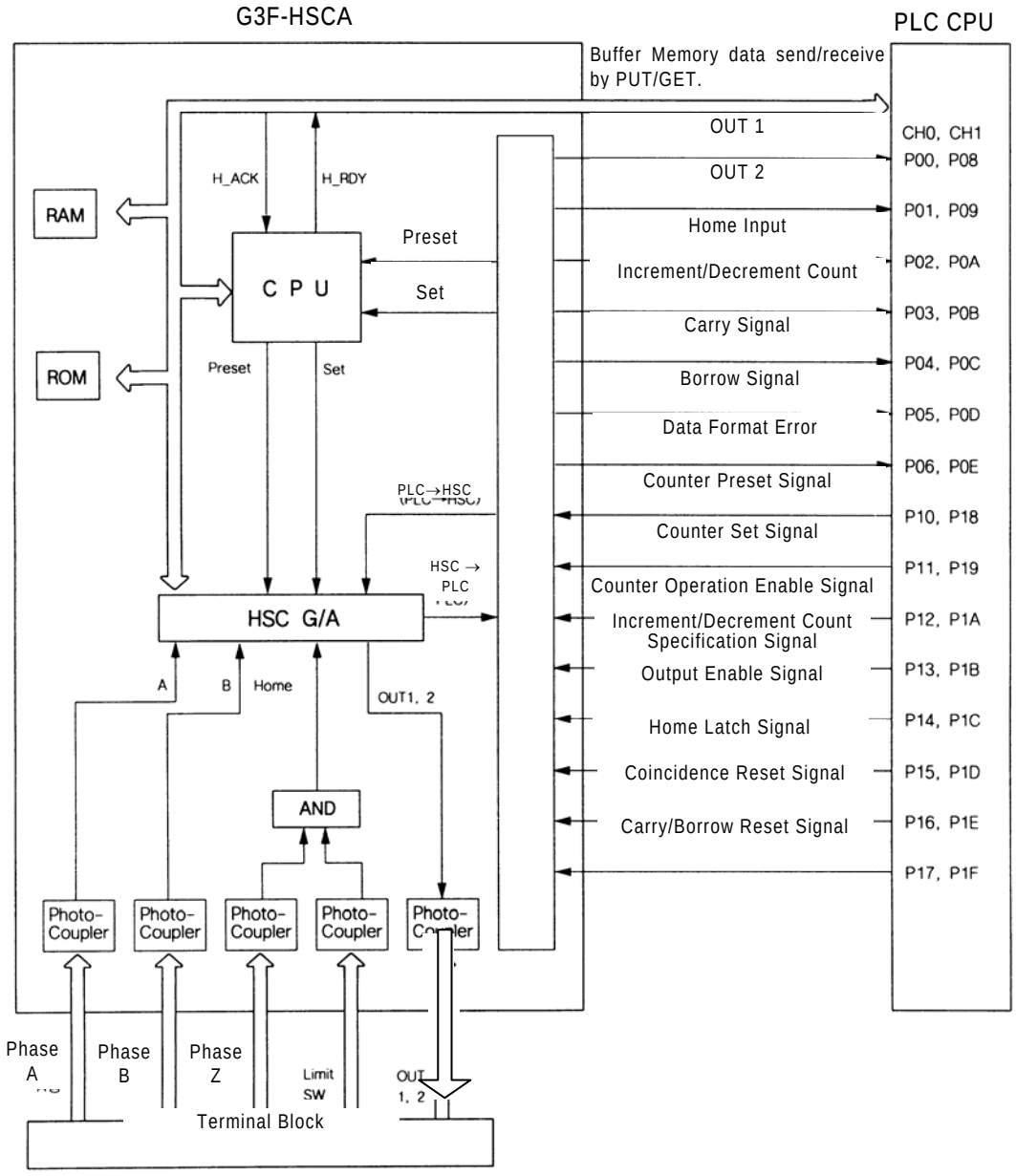
When first or second works or start command have been finished, CMP_DATA will be

Write/read are executed whenever COUNT_ENABLE = ON

The High Speed Counter Module outputs the current count value (CUR_VALUE) on the igital display.

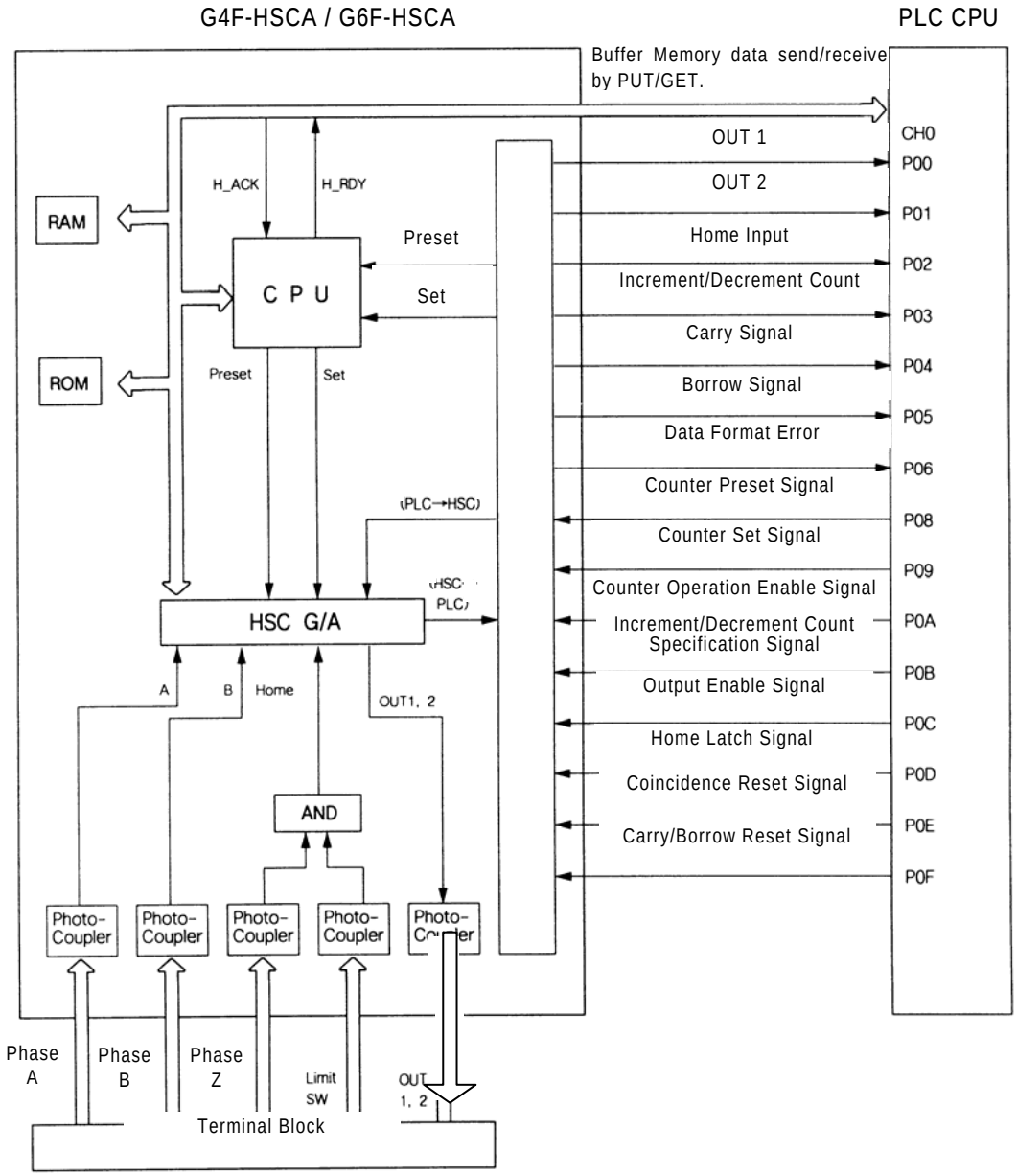
6.1 Operating block diagram

1) G3F-HSCA



※ The above shows the operation block diagram where the I/O word number of the G3F-HSCA is 0

2) G4F-HSCA / G6F-HSCA



※ The above shows the operation block diagram where the I/O word number of the G4F-HSCA / G6F-HSCA is 0.

6.2 Input / 0utput signal configuration

6.2.1 G3F-HSCA

1) Input signals: PLC CPU module ← High Speed Counter module

Signal	Contents	Remarks
P(N)0	OUT 1	Channel 0
P(N)1	OUT 2	
P(N)2	Home Input Signal	
P(N)3	Increment/Decrement Count Signal (1:Up, 0:Down)	
P(N)4	Carry Signal	
P(N)5	Borrow Signal	
P(N)6	Data Format Error	
P(N)7	Unused	
P(N)8	OUT 1	Channel 1
P(N)9	OUT 2	
P(N)A	Home Input Signal	
P(N)B	Increment/Decrement Count Signal (1:Up, 0:Down)	
P(N)C	Carry Signal	
P(N)D	Borrow Signal	
P(N)E	Data Format Error	
P(N)F	Unused	

※ 'N' means the I/O word number of the High Speed Counter module.

2) Output signals: PLC CPU module → High Speed Counter module

Signal	Contents	Remarks
P(N+1)0	Counter Preset Signal	Channel 0
P(N+1)1	Counter Set Signal	
P(N+1)2	Counter operation enable signal	
P(N+1)3	Increment/decrement count specification signal	
P(N+1)4	Output enable signal	
P(N+1)5	Home Latch enable signal	
P(N+1)6	Coincidence rest signal	
P(N+1)7	Carry/Borrow Reset Signal	
P(N+1)8	Counter Preset Signal	Channel 1
P(N+1)9	Counter Set Signal	
P(N+1)A	Counter operation enable signal	
P(N+1)B	Increment/decrement count specification signal	
P(N+1)C	Output enable signal	
P(N+1)D	Home Latch enable signal	
P(N+1)E	Coincidence rest signal	
P(N+1)F	Carry/Borrow Reset Signal	

※ 'N' means the I/O word number of the High Speed Counter module.

6.2.2 G4F-HSCA / G6F-HSCA

Signal	Contents	Remarks
P(N)0	OUT 1	Input Signals (PLC ← HSC)
P(N)1	OUT 2	
P(N)2	Home Input Signal	
P(N)3	Increment/Decrement Count Signal (1:Up, 0:Down)	
P(N)4	Carry Signal	
P(N)5	Borrow Signal	
P(N)6	Data Format Error	
P(N)7	Unused	
P(N)8	Counter Preset Signal	Output Signals (PLC → HSC)
P(N)9	Counter Set Signal	
P(N)A	Counter operation enable signal	
P(N)B	Increment/decrement count specification signal	
P(N)C	Output enable signal	
P(N)D	Home Latch enable signal	
P(N)E	Coincidence rest signal	
P(N)F	Carry/Borrow Reset Signal	

※ 'N' means the I/O word number of the High Speed Counter module.

6.2.3 Functions of I/O Signals

1) Input Signals

① OUT 1
A data among '>', '=' and '<' is selected and if the current comparison result conforms to the selected data this input signal will be set to high (On).

② OUT 2
A data among '>', '=' and '<' is selected and if the current comparison result conforms to the selected data this input signal will be set to high (On).

③ Home Input Signal
If the Home signal is inputed, this signal will be set to high (On). That is, this signal will be set to high if the both of the limit switch signal and phase Z signal are turned On when the Home Latch enable signal turns On. This signal will be set to low if the Home Latch signal turns Off.

④ Increment/Decrement Count Signal
This signal turns On if increment counting is being performed in present, and turns Off if decrement counting is being performed.

⑤ Carry Signal
If the current count value is '16,777,215' and increments by one pulse, the current value becomes '0' and the carry signal turns On.

⑥ Borrow Signal
If the current count value is '0' and decrements by one pulse, the current value becomes '16,777,215' and the borrow signal turns On.

⑦ Data Format Error
If a value of Preset, Set or Out data exceeds the input range, this signal turns On. If a normal data value is inputed it turns Off.

2) Output Signal

① Counter Preset Signal
This signal makes the high speed counting module process the counter initial set value(Preset value) written in the Buffer Memory (CH0: addresses 0 and 1, CH1: addresses 10 and 11). Only one pulse has to be turned On.

② Counter Set Signal
This signal makes the high speed counting module process the current value written in the Buffer Memory (CH0: addresses 2 and 3, CH1: addresses 12 and 13) and the set value(SET value) which will be compared with it.

③ Counter operation enable signal

This signal should be turned On in order that the high speed counting module start counting by the pulse input. If this signal turns Off, the high speed counting module does not execute counting.

④ Increment/decrement count specification signal

When the increment/decrement mode is the program mode at 1-phase pulse inputs, Decrement count will be proceeded if this signal is turned On. Increment count if Off. (See 5) of section 4.2)

⑤ Output enable signal

Turn this signal On to allow the terminal block(or external connector) output signals (OUT1 and OUT2) to be outputed.

⑥ Home Latch enable signal

If this signal is turned On and phase Z and L/S inputs turns On, then the Home input signal turns On and the current value will be reset(000000).

⑦ Coincidence Reset Signal

Turns this signal On to reset the signal 'current value = set value'.

⑧ Carry/Borrow Reset Signal

When a Carry or Borrow signal has occurred, this signal is used to reset it.

6.3 Buffer memory configuration

The high speed counting module has a Buffer Memory for data write/read to/from the PLC CPU. The PUT and PUTP instructions write data from the PLC CPU to the Buffer Memory. The GET and GETP instruction reads data. (Refer to the Manuals relating to the instructions.)

The followings explain the structure of the Buffer Memory and the data configuration.

6.3.1 Buffer memory configuration

▶ G3F-HSCA Buffer Memory

Address (Decimal)		
0000	Preset Value(Lower)	Channel 0
0001	Preset Value(Upper)	
0002	Set Value(Lower)	
0003	Set Value(Upper)	
0004	Out Data	
0005	Current Value (Lower)	
0006	Current Value (Upper)	

Address (Decimal)		
0010	Preset Value(Lower)	Channel 1
0011	Preset Value(Upper)	
0012	Set Value(Lower)	
0013	Set Value(Upper)	
0014	Out Data	
0015	Current Value (Lower)	
0016	Current Value (Upper)	

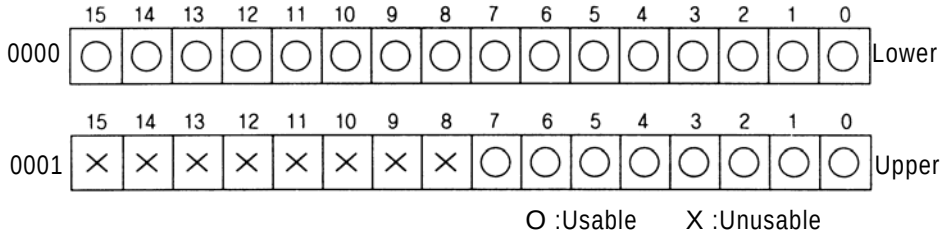
▶ G4F-HSCA / G6F-HSCA Buffer Memory

Address (Decimal)		
0000	Preset Value(Lower)	Channel 0
0001	Preset Value(Upper)	
0002	Set Value(Lower)	
0003	Set Value(Upper)	
0004	Out Data	
0005	Current Value (Lower)	
0006	Current Value (Upper)	

6.3.2 The contents and data configuration of buffer memory

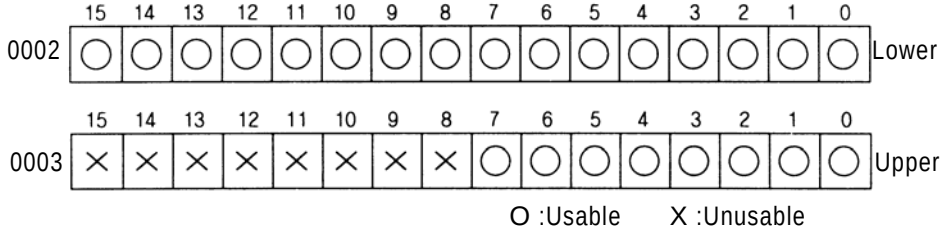
The followings explain them in reference with the channel 0. For the channel 1, only address is different and contents are same as the channel 0.

(1) Preset Value (Addresses 0 and 1)



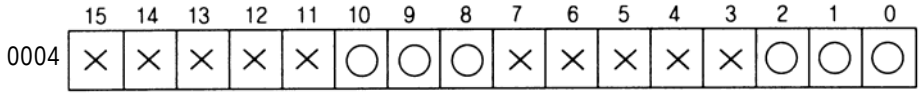
ⓐ Used to store the preset value from which count starts.
ⓑ The preset value setting range is 0 to h00FFFFFF(16,777,215 as decimal). Up to h00FF(bits 0 to 7) will be stored to the upper address (address 0001) and up to hFFFF(bits 0 to 15) to the lower address (address 0000). If a value is stored to the upper bits 8 to 15(exceeds the preset value setting range), the input signal P(N)6 turns On.
ⓒ For the channel 1, the upper address is 0011 and the lower address 0010. If the preset value exceeds the setting range the input signal P(N)E turns On.
ⓓ If a preset value exceeds the setting range, the ERR LED flickers with 0.5 sec cycle.

(2) Set Value (Addresses 2 and 3)



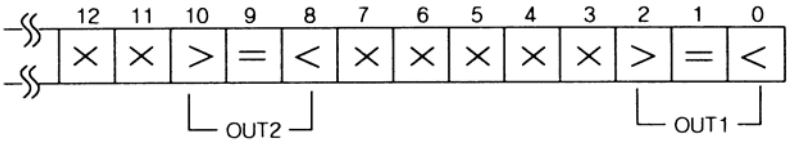
ⓐ Used to store the set value which will be compared with the current count value.
ⓑ The set value setting range is 0 to h00FFFFFF(16,777,215 as decimal). If the set value exceeds the setting range, the input signal P(N)6 turns On.
ⓒ For the channel 1, the lower address is 0012 and the upper address 0013. If the set value exceeds the setting range the input signal P(N)E turns On.
ⓓ If a set value exceeds the setting range, the ERR LED flickers with 0.5 sec cycle.

(3) Out Value (Address 4)



ⓐ Only bits 0, 1, 2, 8, 9 and 10 are usable. If other bit is used, the input signal P(N)6 turns On and the ERR LED flickers with 0.5 sec cycle.

ⓑ

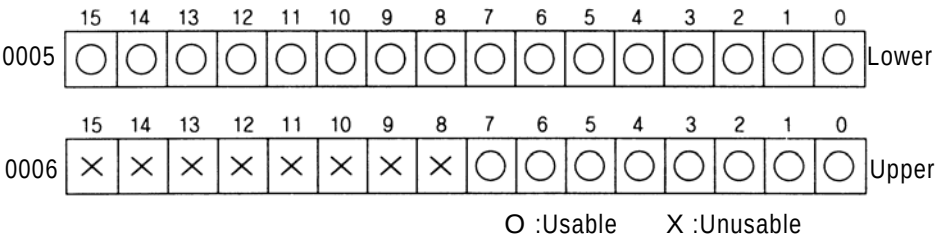


Bit 0 On : If current count value < set value, OUT1 will be turned On. (output enable)
Bit 1 On : If current count value = set value, OUT1 will be turned On. (output enable)
Bit 2 On : If current count value > set value, OUT1 will be turned On. (output enable)
Bit 8 On : If current count value < set value, OUT2 will be turned On. (output enable)
Bit 9 On : If current count value = set value, OUT2 will be turned On. (output enable)
Bit 10 On : If current count value > set value, OUT2 will be turned On. (output enable)
Bits 0, 1 and 2 can be used in combination.

[Example]
Bits 1 and 2 On : If current count value ≥ set value, OUT1 will be turned On. (output enable)
Bits 0 and 1 On : If current count value ≤ set value, OUT1 will be turned On. (output enable)
Bits 0 and 2 On : If current count value ≠ set value, OUT1 will be turned On. (output enable)
If bits 8, 9 and 10 are used in combination as shown above, the results same as above will be output to the OUT2.

ⓒ In relation to the channel 1, the address is 0014.

(4) Current Count Value (Addresses 5 and 6)



ⓐ If the counter operation enable signal turns On, the current count value to pulse inputs will be stored to these addresses.

ⓑ The input range is 0 to h00FFFFFF(16,777,215 as decimal). During increment counting, if the current count value is h00FFFFFF and next pulse input has been received, it changes into h00000000 and occurs a Carry. During decrement counting, if the current count value is h00000000 and next pulse input has been received, it changes into h00FFFFFF and occurs a Borrow.

ⓒ If a Carry occurs, the P(N)4 will turn On for the CH0 and the P(N)C for the CH1.
If a Borrow occurs, the P(N)5 will turn On for the CH0 and the P(N)D for the CH1.

ⓓ In relation to the channel 1, the addresses are 0015 and 0016.

Chapter 7. MK PROGRAMMING

This chapter explains the programming method for using the high speed counter module.

7.1 Buffer Memory Read / Write

The followings explain the read/write of the PLC CPU from/to the Buffer Memory.

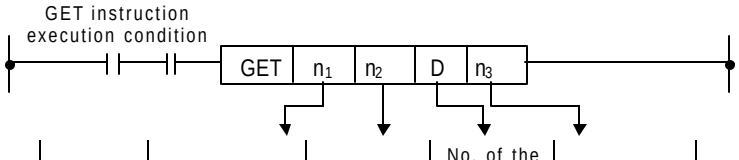
7.1.1 Read from the Buffer Memory(GET,GETP)

The instruction given below are used to read data from the Buffer Memory of the high speed counter module to the CPU. The data read can be stored to the CPU memory(F area is not excluded.).

Always executed when the execution condition is in the On state. .	GET
Executed when the execution condition turns On.	GETP

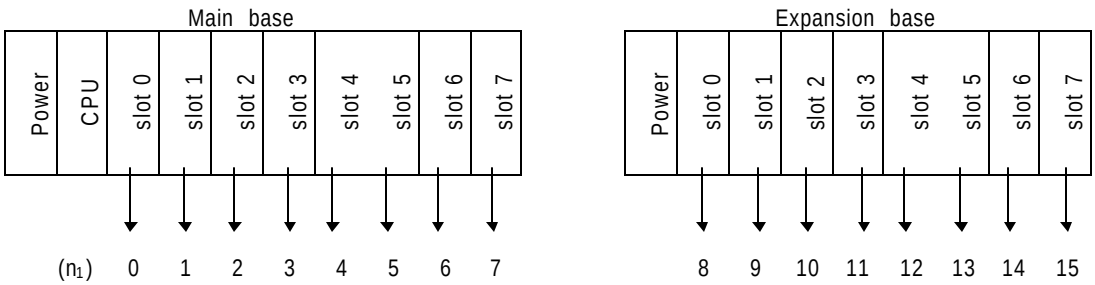
[Table 7.1] The difference between GET and GETP

Format



	n_1	n_2	D	n_3
Content	Number of the slot where the special module is loaded	Head address of the Buffer Memory where the data is stored.	No. of the head word of the CPU memory area where the read data is stored.	Number of words of the read data. (1~50)
Usable memory area	Integer	Integer (Decimal /Hex)	M,P,K,L, T, C, D or #D	Integer

[Fig 7.1] Read Instruction GET

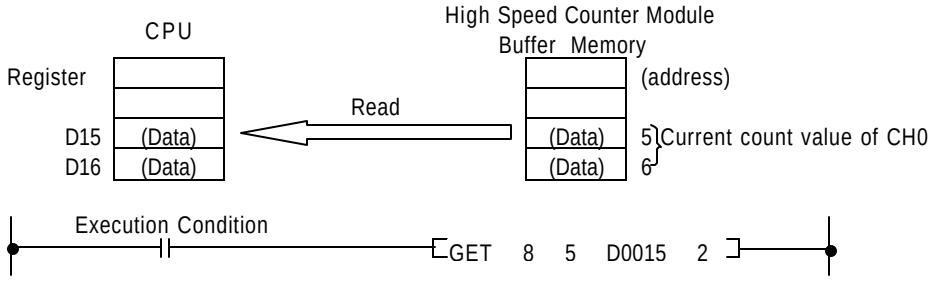


Point n_1 is calculated from 8 for the first expansion base board, from 16 for the second and from 24 for the third.

[Fig 7.2] Method for Obtaining n1.

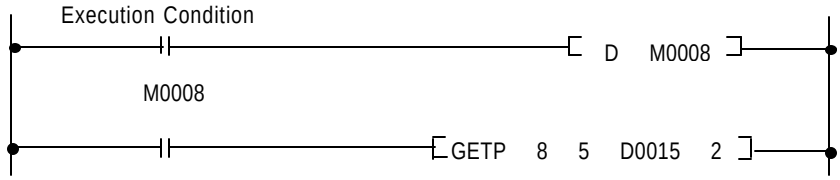
Example 1

When the high speed counter module is mounted on the first expansion base and the data at address 5 of the Buffer Memory is read to the two words D15 and D16.



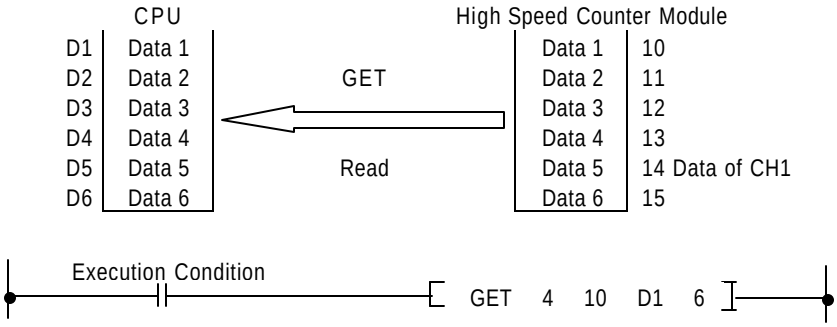
Example 2

When the same data as the example 1 is read but a pulse relay is used.



Example 3

When the high speed counter module is mounted on the slot 4 of the main base and the 6-word data from address 6 of the Buffer Memory are read to the D1 to D6.



[Fig 7.3] 16-Bit Data Read Example

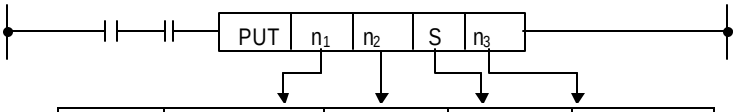
7.1.2 Write to the Buffer Memory(PUT,PUTP)

Besides the data stored in the CPU memory area, decimal integer(OO) and hexadecimal integer(HOO) can be used as the data that can be written from the CPU to the Buffer Memory of the high speed counter module.

Always executed when the execution condition is in the On state. .	PUT
Executed when the execution condition turns On.	PUTP

[Table 7.3] The Difference between PUT and PUTP

Format



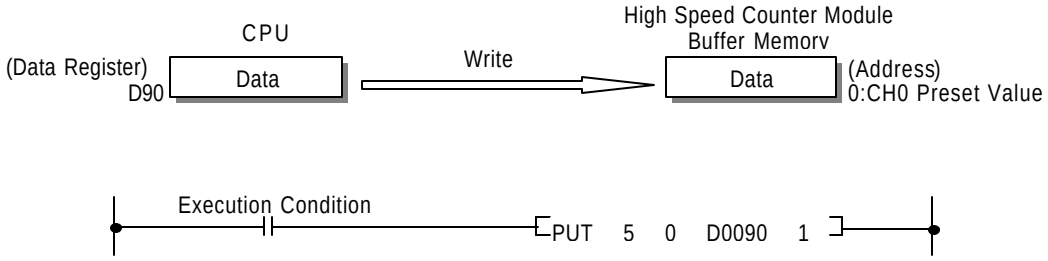
Content	Number of the slot where the special module is loaded	Head address of the Buffer Memory where the data is stored.	Integer or, No. of the head word of the CPU memory area where the write data is stored.	Number of words of the write data. (1~50)
Usable memory area	Integer	Integer (Decimal /Hex)	M,P,K,L, T, C, D or #D	Integer

[Fig 7.4] Write Instruction PUT

Example 1

- 16-bit data Write

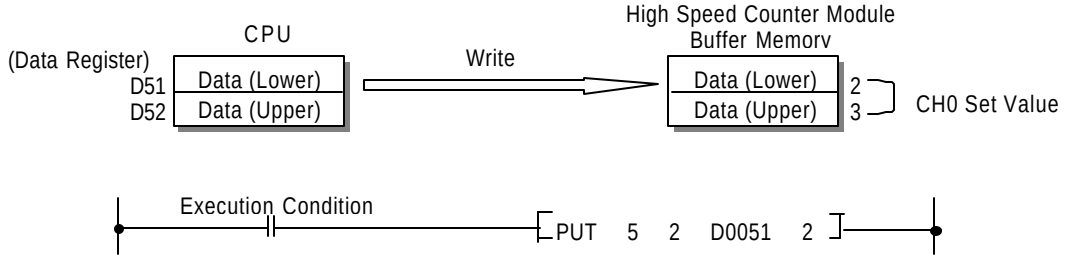
When the High Speed Counter Module is mounted on the slot 2 of the first expansion base unit and 1-word data stored in the data register D90 is written to the address 0 of the Buffer Memory.



Example 2

- 32-bit data Write

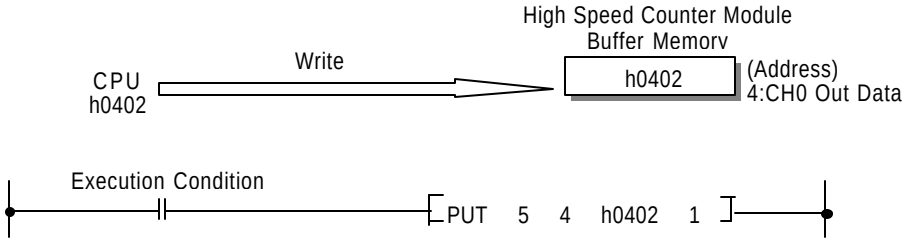
When the High Speed Counter Module is mounted on the slot 5 of the main base and 2-word(32-bit) data stored in the data registers D51 and D52 is written to the addresses 2 and 3 of the Buffer Memory.



Example 3

- Integer Write

When the High Speed Counter Module is mounted on the slot 5 of the main base and H0402 is written to the address 4 of the Buffer Memory.

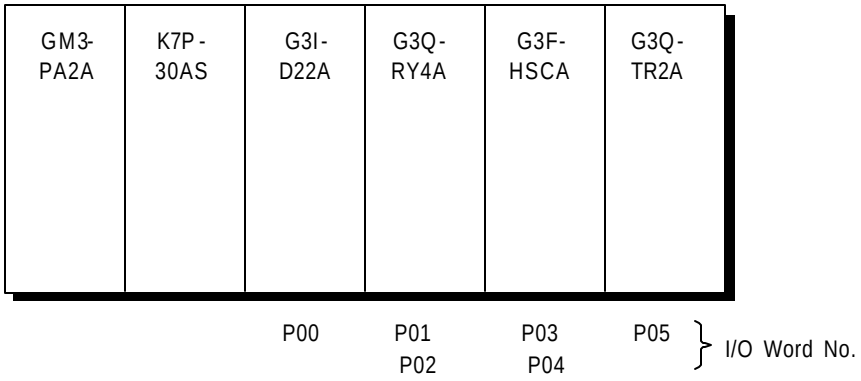


[Fig 7.5] Write Example

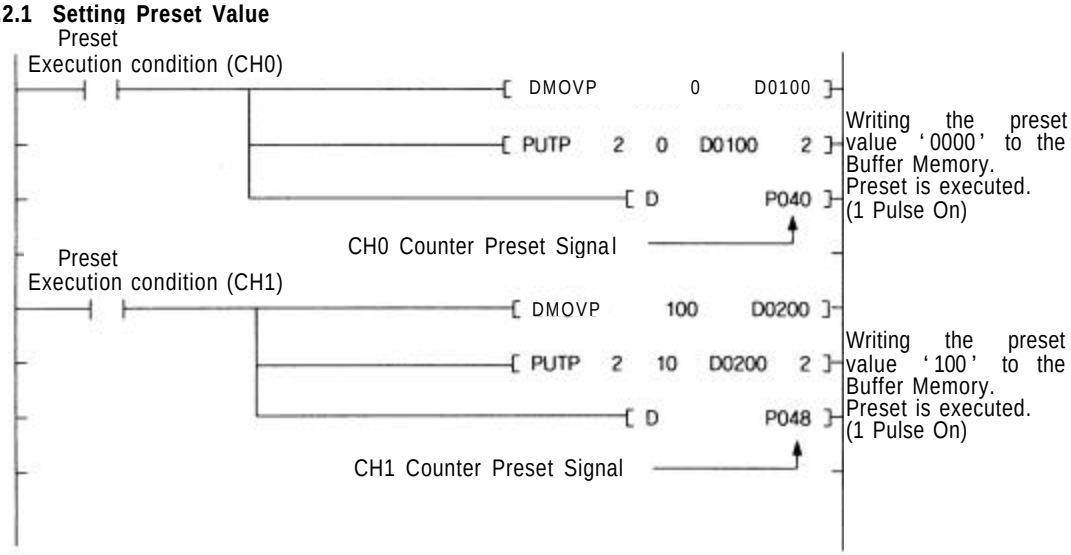
7.2 Programming Examples

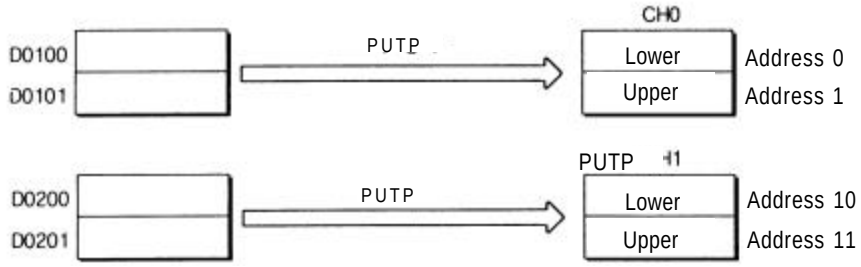
If not especially noted, this section explains programming examples in reference with the K7F-HSCA that is mounted on the system given below.

● **System configuration**

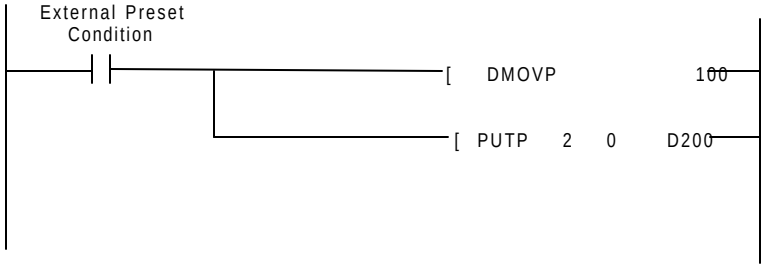


7.2.1 Setting Preset Value

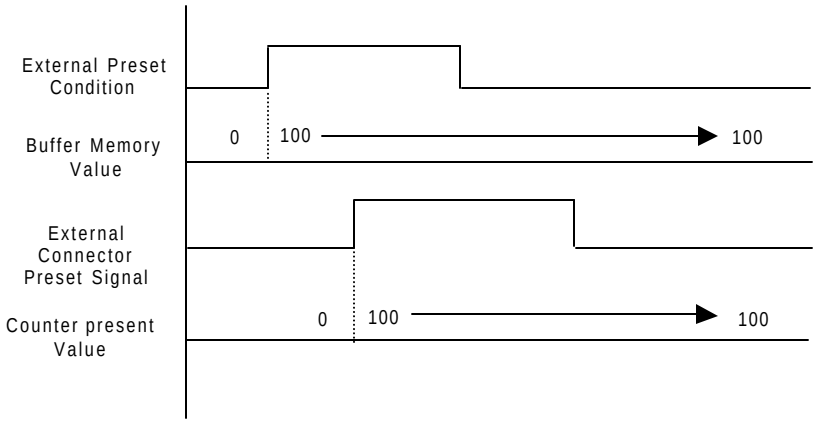




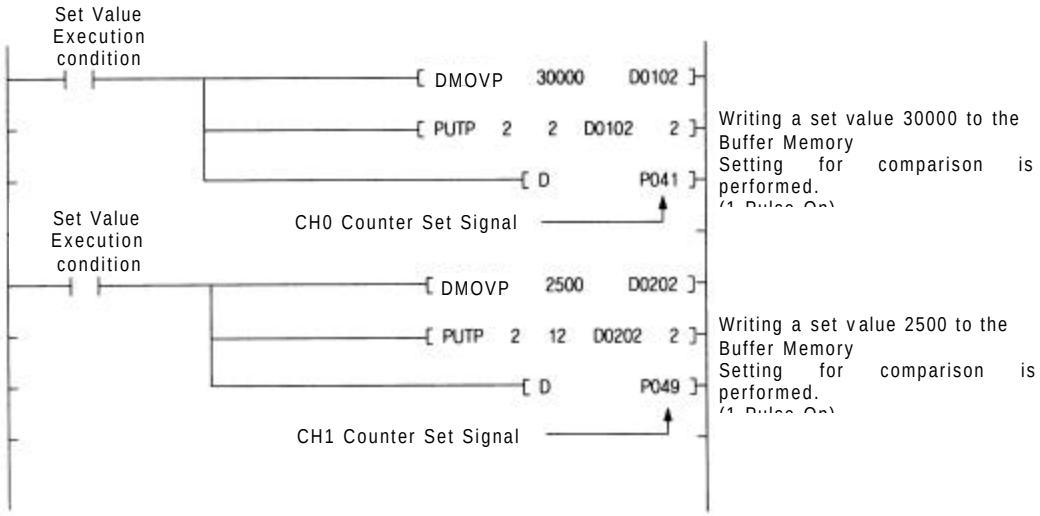
● Setting Preset Value by External Preset Input (Only G6F-HSCA)



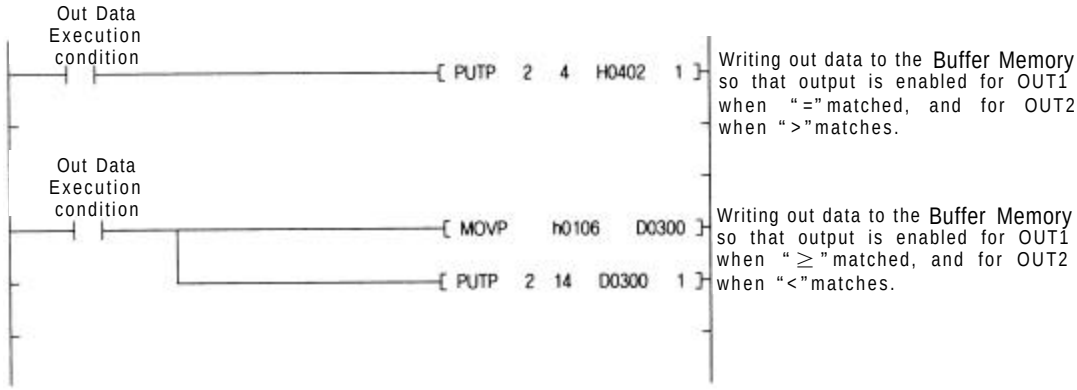
● Timing Chart



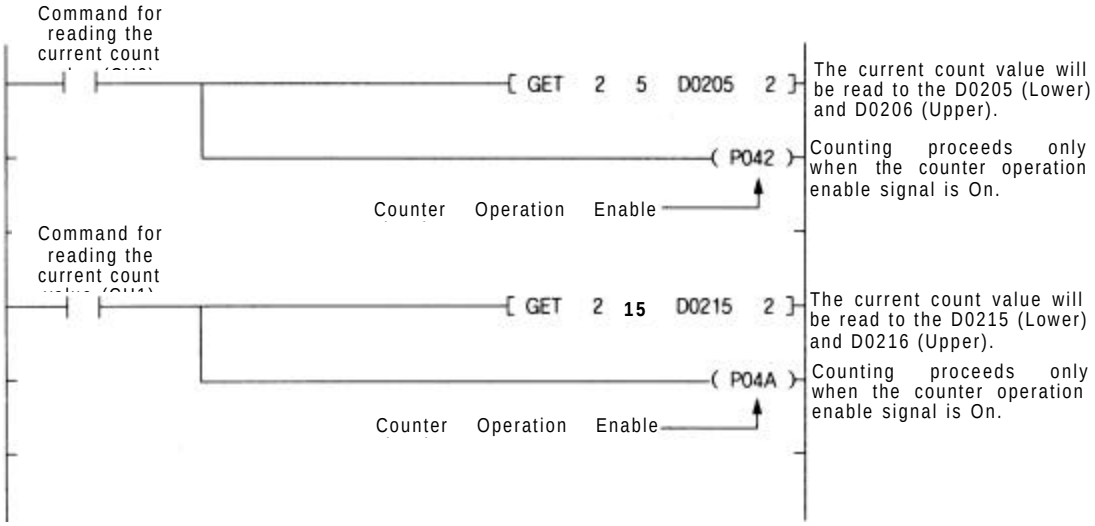
7.2.2 Setting Comparision Value



7.2.3 Setting OUT DATA

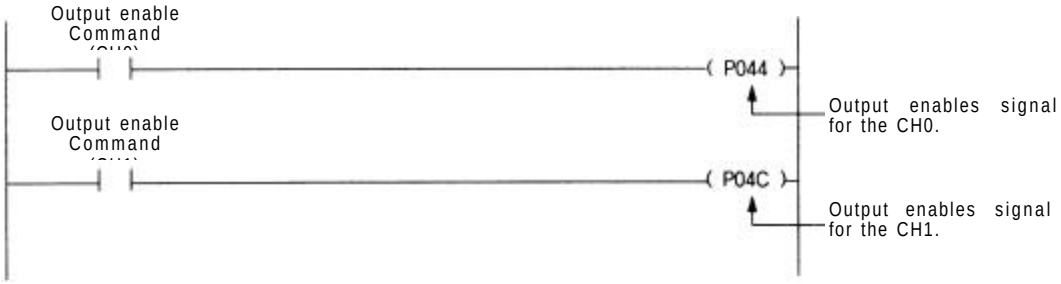


7.2.4 Reading the Current Count Value



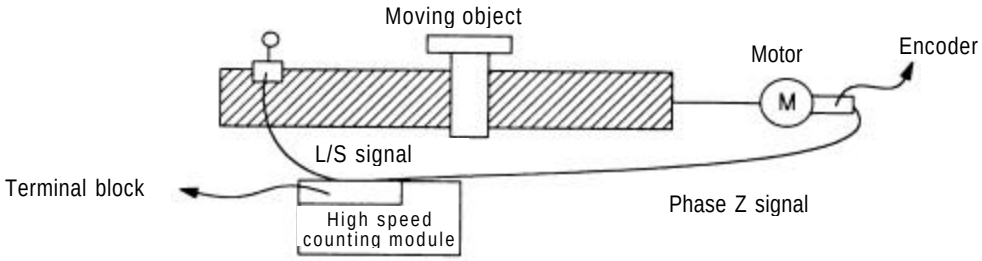
7.2.5 Enabling Output

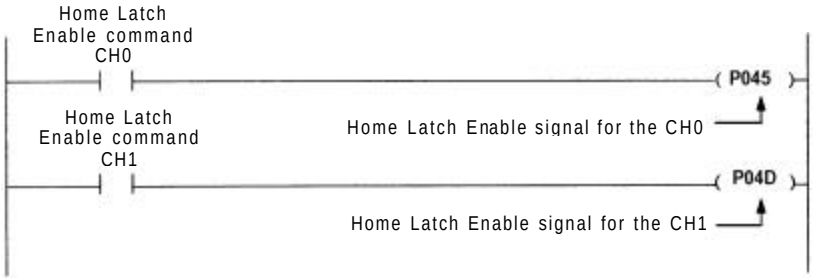
Turn On the P044 and P04C to enable outputs to the external terminals OUT1 and OUT2.



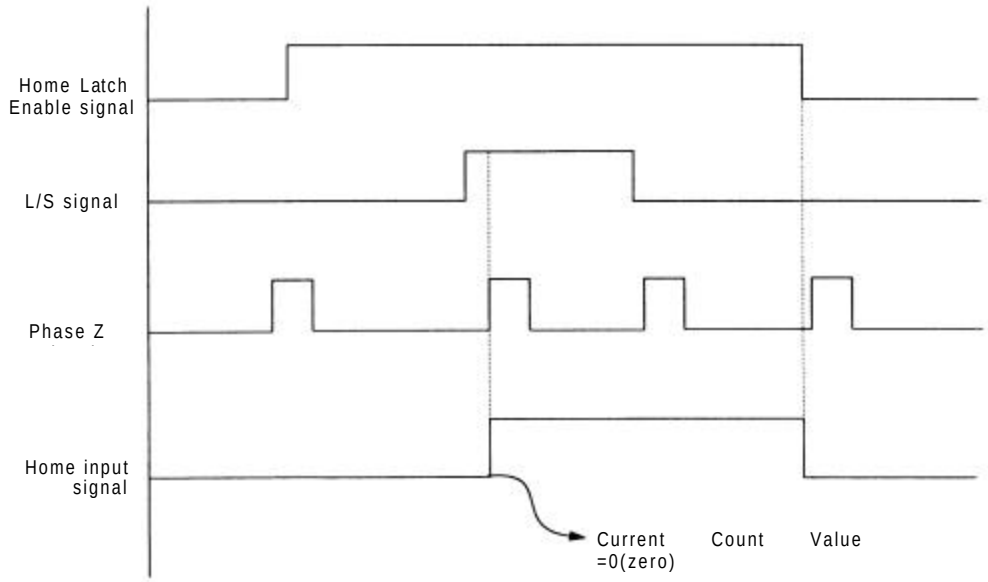
7.2.6 Enabling Home Latch

Home Latch enable signal is used to set the current count value to 0 (zero) when the mechanical reference point has been reached.

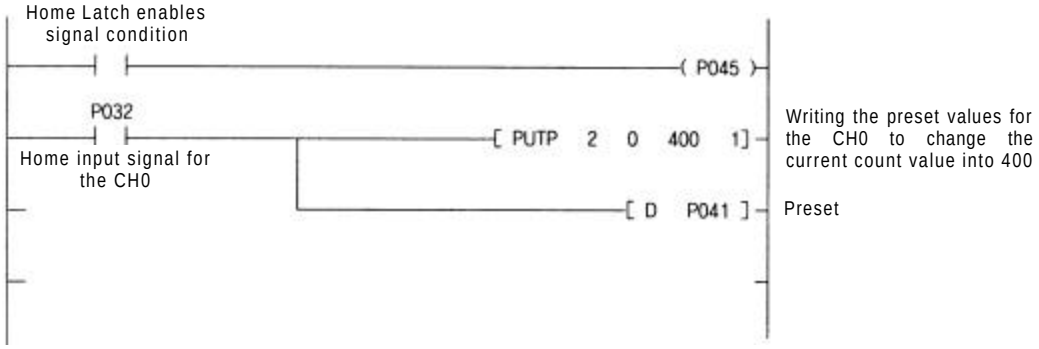




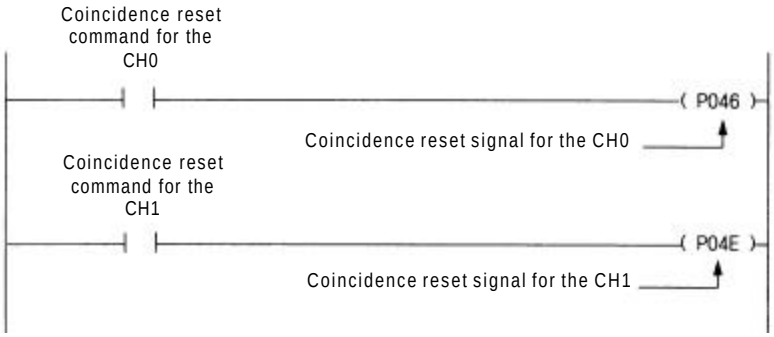
· **Timing Chart**



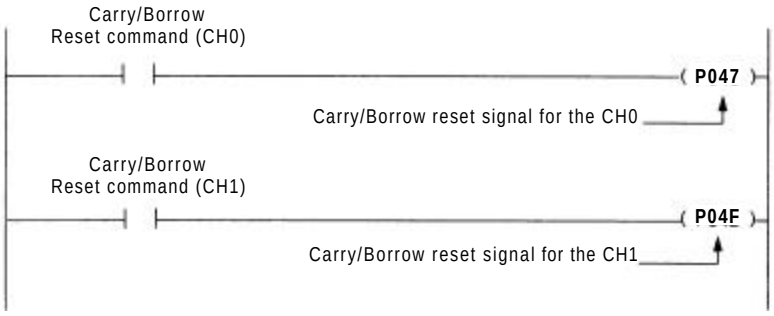
- **Setting Preset Value using the Home Input Signal**



7.2.7 Coincidence Reset



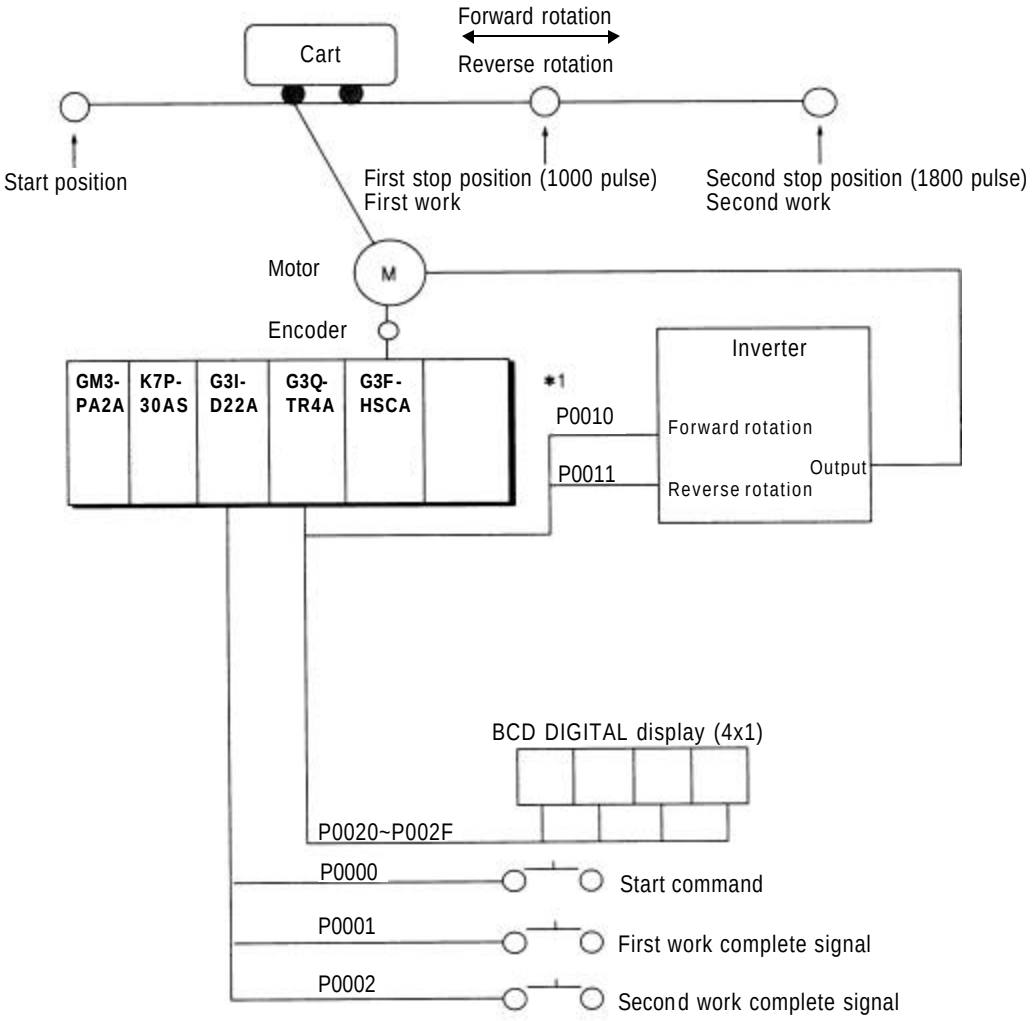
7.2.8 Carry/Borrow Reset



7.3 Application Examples

7.3.1 Program for moving the Cart

· **System Configuration**



K7P-30AS : MK 1000S CPU module

G3I-D22A : DC Input module (16 points)

G3Q-TR4A : TR Output module (32 points)

G3F-HSCA : High Speed Counter Module (32 points)

● **Operation explanation**

The motor for moving the cart rotates with start command, and makes the cart stop at the first stop position with the High Speed Counter Module counting the encoder signals from the motor.

Then, if the first work complete signal turns On, the motor moves the cart to stop at the second stop position. When the second work complete signal turns On, the motor return the cart to the start position.

● **Input/Output Signal Allocation**

P0000 : Start Command
P0001 : 1st Work Complete Signal
P0002 : 2nd Work Complete Signal
} Input

P0010 : Motor forward rotation signal (On : Forward rotation , Off : Stop)
P0011 : Motor reverse rotation Signal (On : Revese rotation, Off : Stop)
P0020 ~ P002F : Indicates the current count value(BCD) of the High Speed Counter Module.
} Output

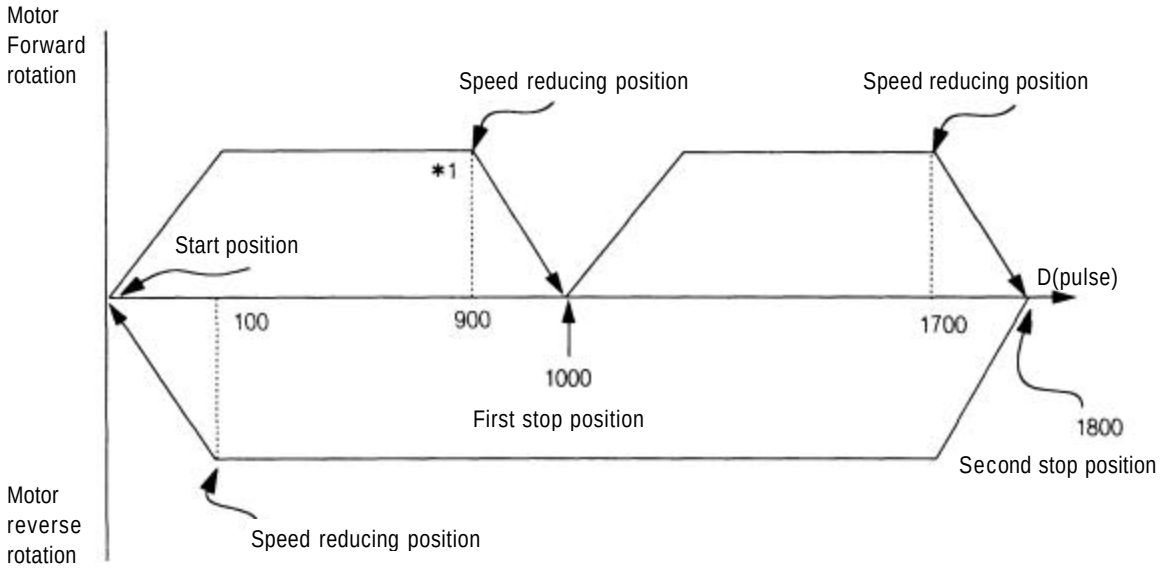
P0030 ~ P003F : High-speed counter Input Signal
P0040 ~ P004F : High-speed counter Output Signal

● **D Register Allocation**

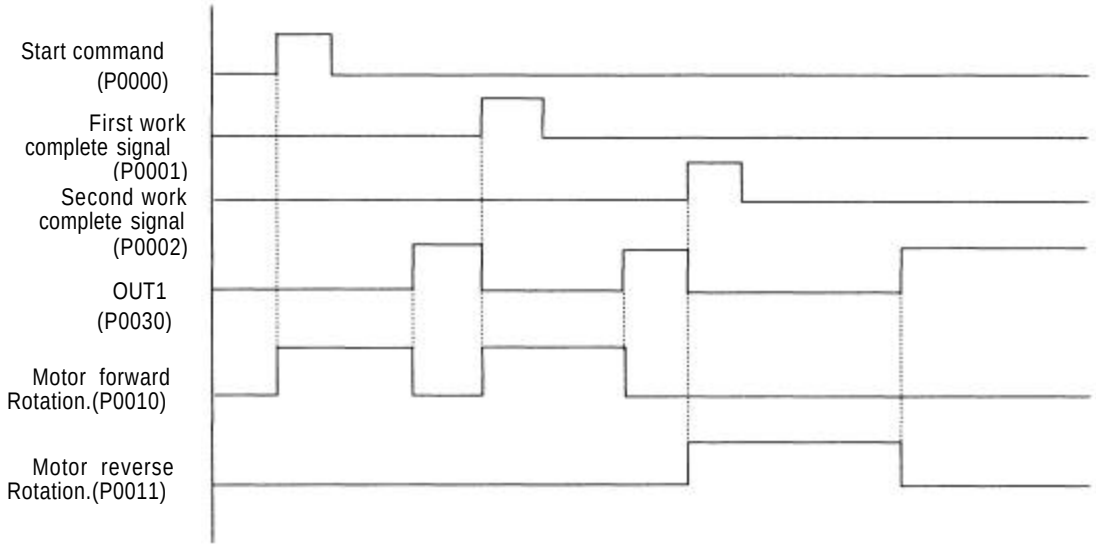
D0000 : High-speed counter Current count Value

● Operation pattern

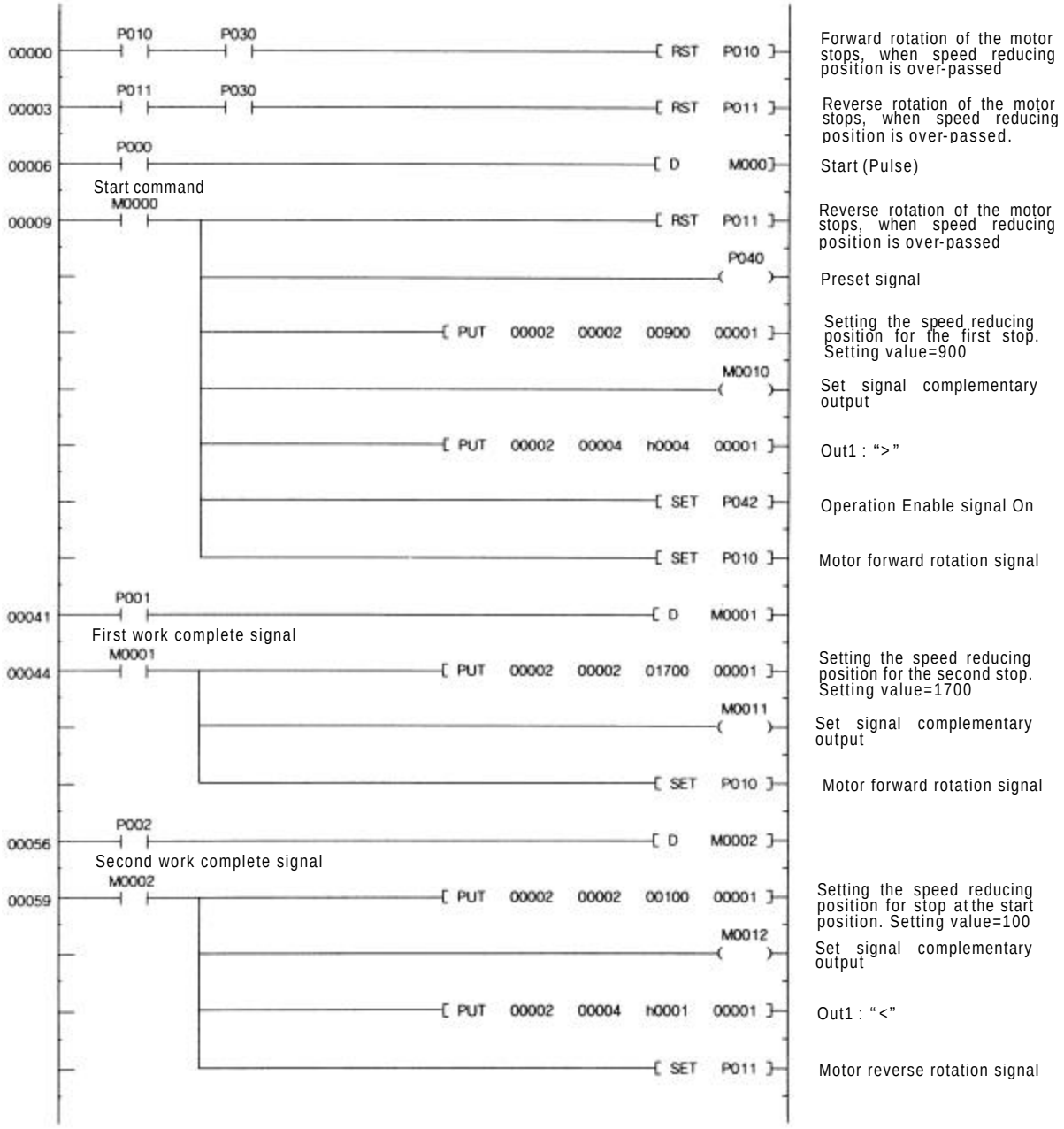
*1. 100(Difference between stop position and speed reducing position) is an interval delayed by reducing timing of the inverter

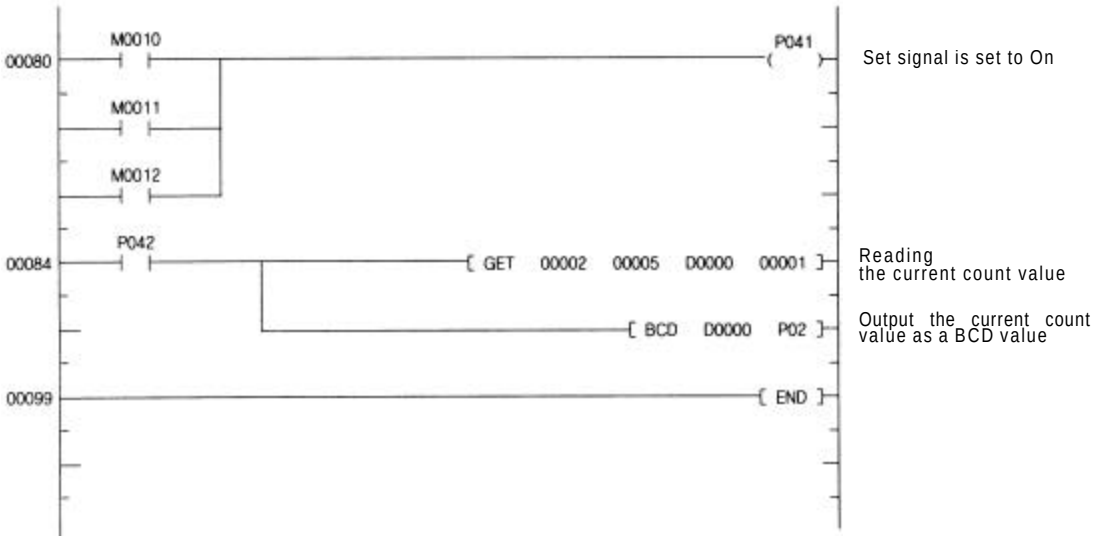


● Operation timing Diagram



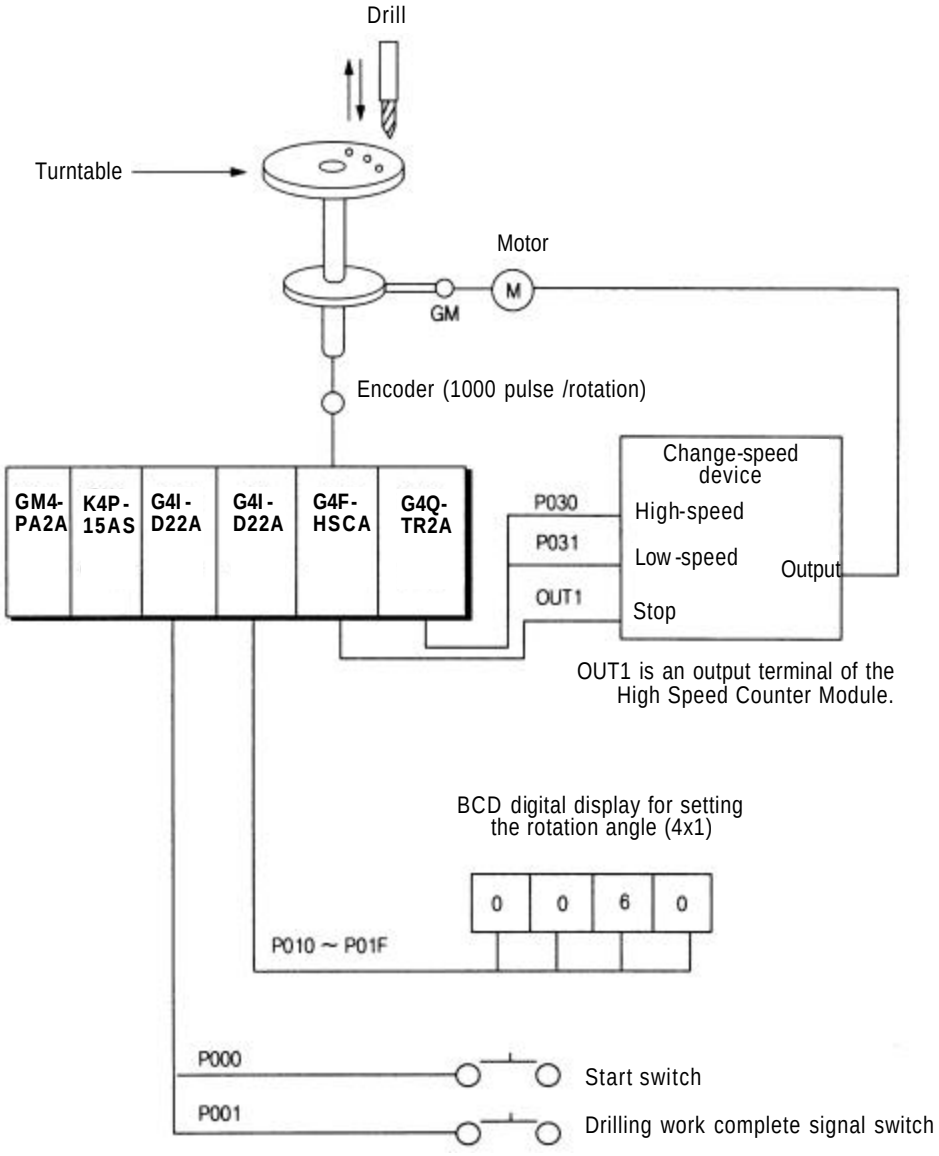
● **Program**


00000
P010
P030
[RST P010]
Forward rotation of the motor stops, when speed reducing position is over-passed
00003
P011
P030
[RST P011]
Reverse rotation of the motor stops, when speed reducing position is over-passed.
00006
P000
[D M000]
Start (Pulse)
Start command
00009
M0000
[RST P011]
Reverse rotation of the motor stops, when speed reducing position is over-passed
P040
Preset signal
[PUT 00002 00002 00900 00001]
Setting the speed reducing position for the first stop. Setting value=900
M0010
Set signal complementary output
[PUT 00002 00004 h0004 00001]
Out1 : “>”
[SET P042]
Operation Enable signal On
[SET P010]
Motor forward rotation signal
00041
P001
[D M0001]
First work complete signal
00044
M0001
[PUT 00002 00002 01700 00001]
Setting the speed reducing position for the second stop. Setting value=1700
M0011
Set signal complementary output
[SET P010]
Motor forward rotation signal
00056
P002
[D M0002]
Second work complete signal
00059
M0002
[PUT 00002 00002 00100 00001]
Setting the speed reducing position for stop at the start position. Setting value=100
M0012
Set signal complementary output
[PUT 00002 00004 h0001 00001]
Out1 : “<”
[SET P011]
Motor reverse rotation signal


M0010
P041
00080
Set signal is set to On
M0011
M0012
P042
00084
GET 00002 00005 D0000 00001
Reading
the current count value
BCD D0000 P02
Output the current count
value as a BCD value
00099
END

7.3.2 Program for Control of the Constant Angle rotation of the Turntable.

· **System Configuration**



K4P-15AS : MK 300S CPU Module

G4I-D22A : DC input Module (16 points)

G4F-HSCA : High speed counter Module (16 points)

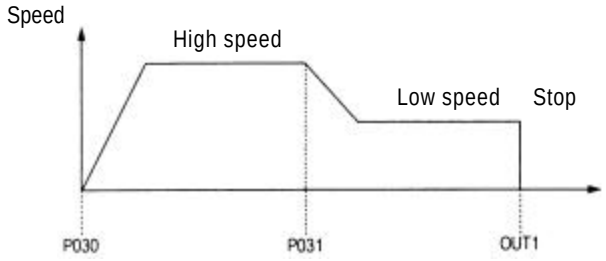
G4Q-TR2A : TR output Module (16 points)

· **Operation Description**

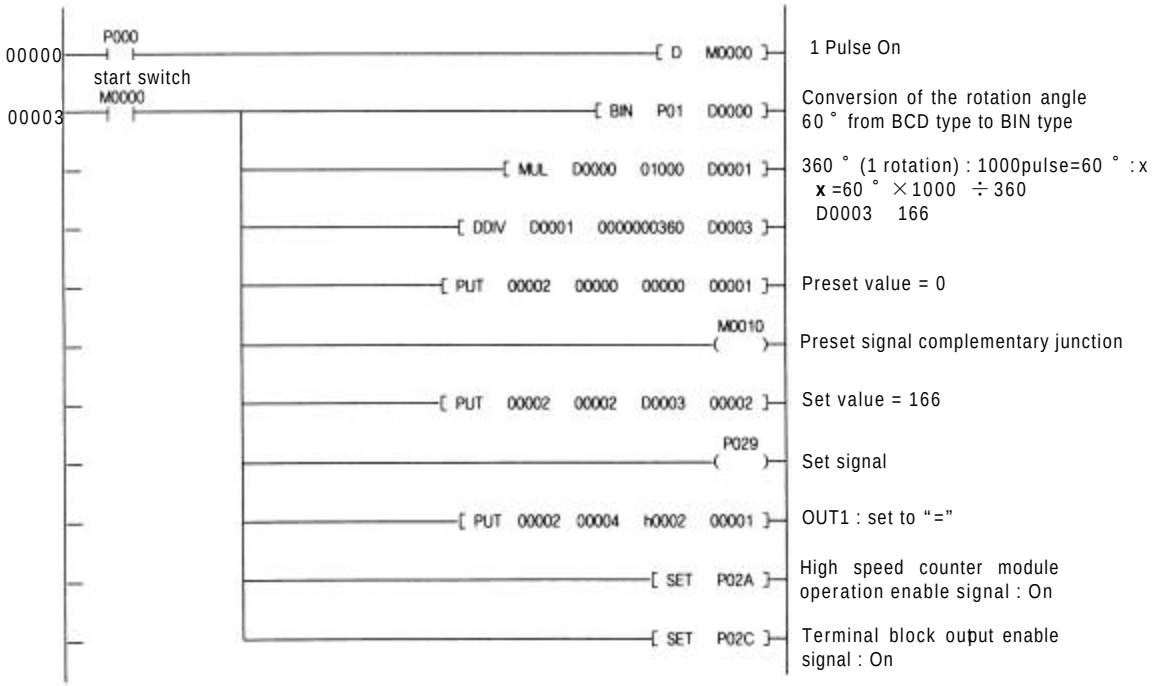
If the start switch is pushed, the turntable rotates as much as the rotation angle set (60 °) and completes drilling.

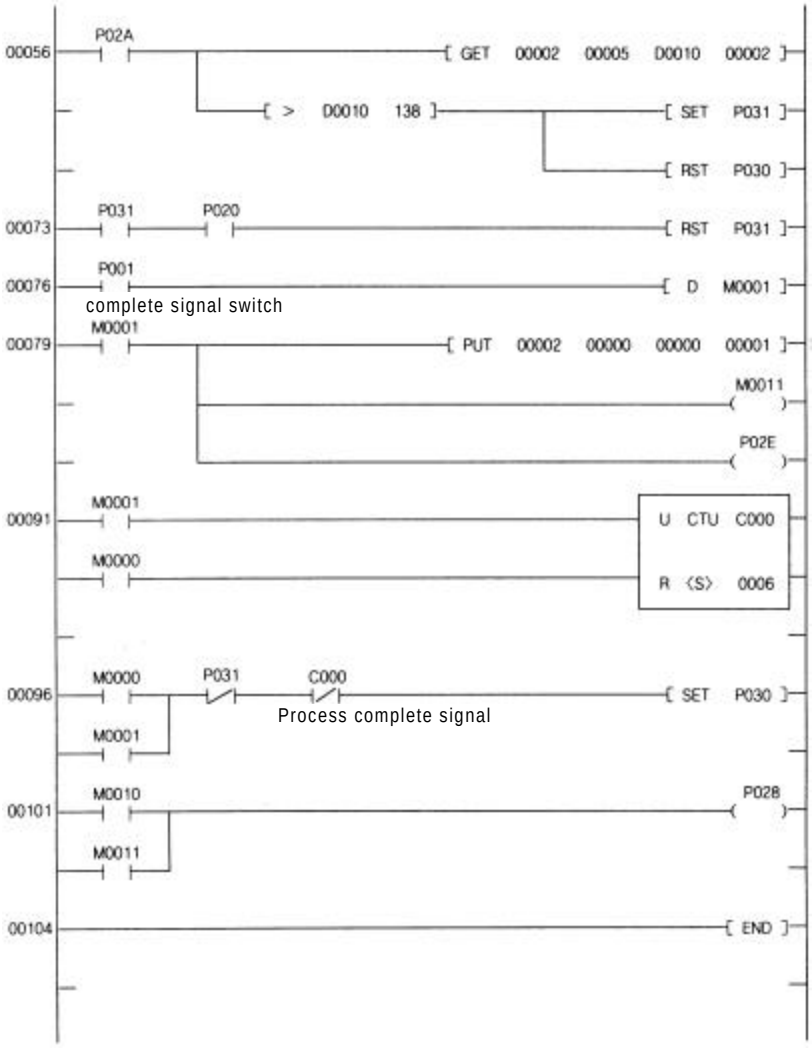
If the drilling work complete signal turns On, it rotates again 60 ° . If repeating the above operations has finished six drilling works, all processing will be finished.

· **Operation Format**



· **Program**





Reading the current count value of the high speed counter module to D0010 and D0011

If the turntable has rotated 138(50°), then the low speed operation turns On

If the turntable has rotated 60° with low speed, it will be stopped by the coincidence signal ("=") of OUT1

Setting the Preset value to '0' to change the current count value into '0'.

Preset signal complementary contact

Coincidence reset signal turns On.

After the drilling work has been repeated six times, the processing complete signal (C000) turns On.

High-speed operation turns On.

Preset signal turns On.

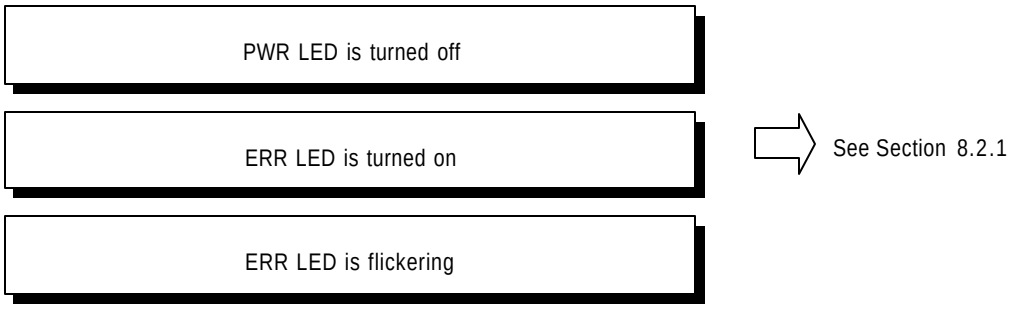
Chapter 8. TROUBLESHOOTING

The following explains troubles and corrections when using the High Speed Counter Module.

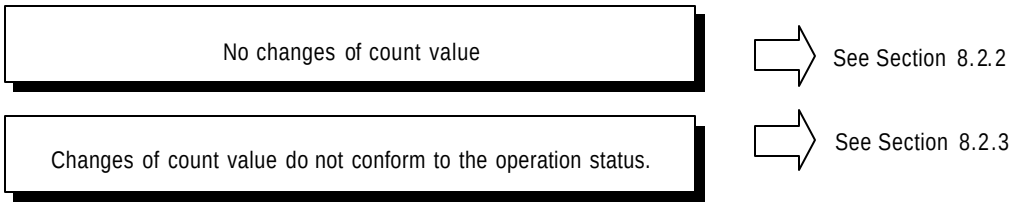
For troubleshooting relating to the CPU module, refer to the CPU module user's manual.

8.1 Troubleshooting

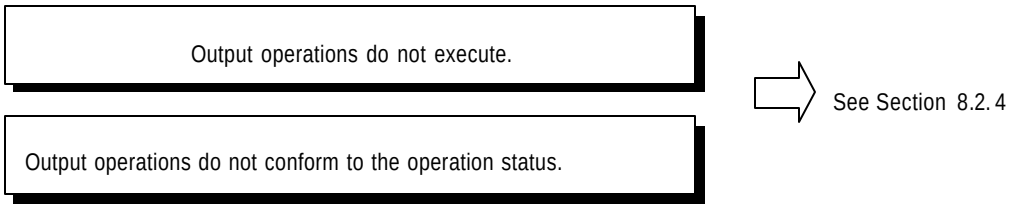
8.1.1 The LED status of High Speed Counter Module



8.1.2 The counting status of High Speed Counter Module

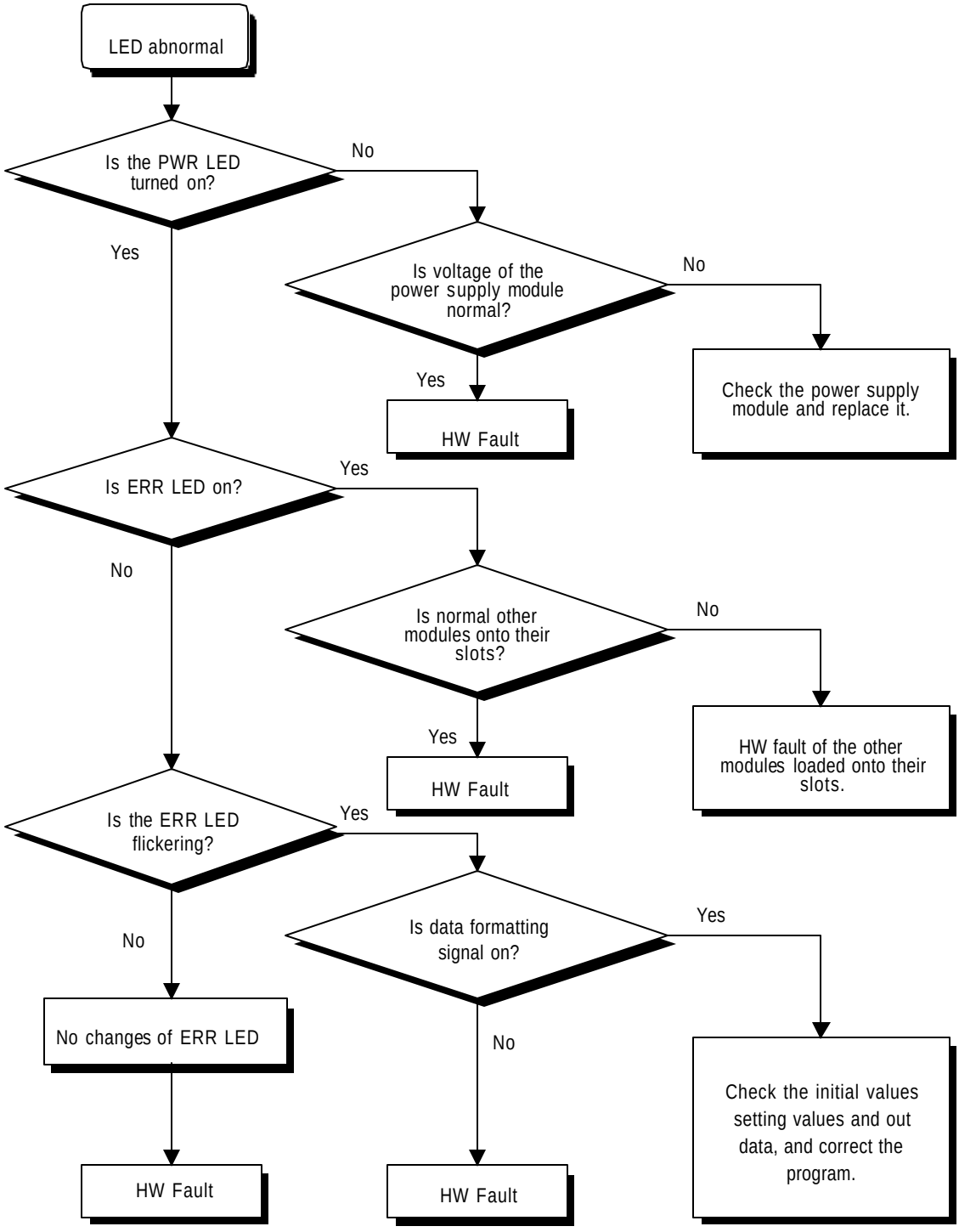


8.1.3 The output status of High Speed Counter Module

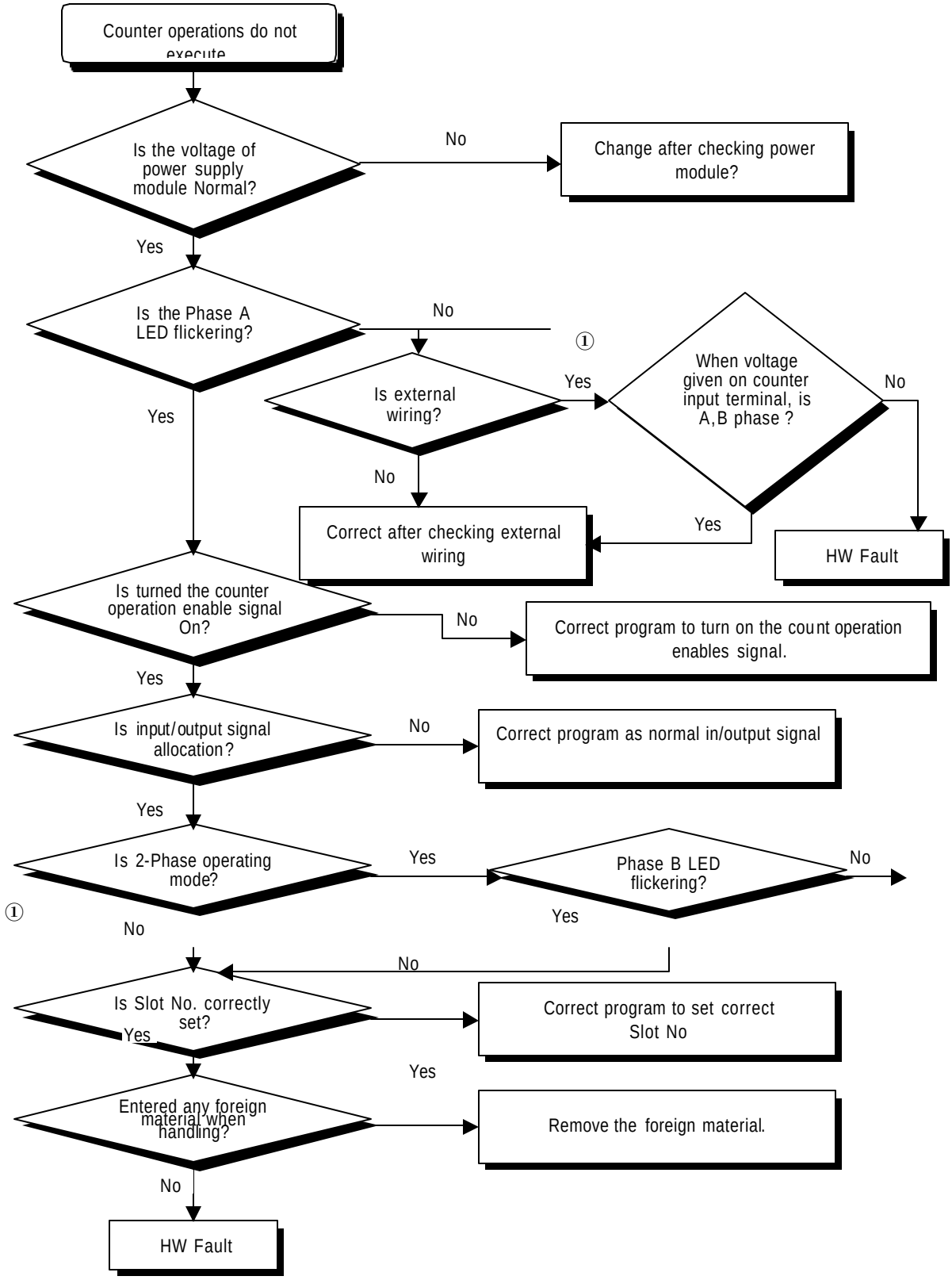


8.2 Troubleshooting Procedure

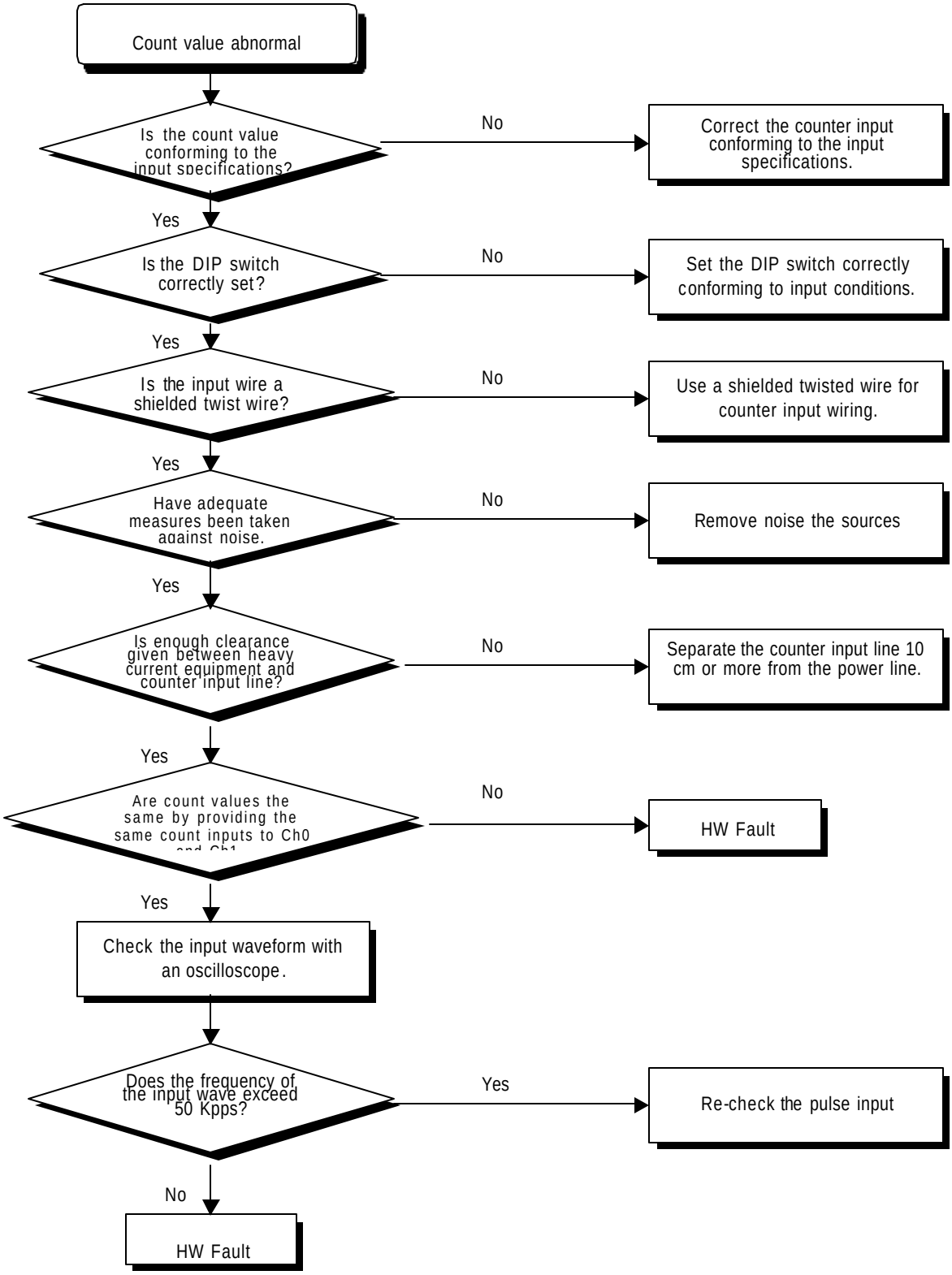
8.2.1 LED Indication Is Incorrect



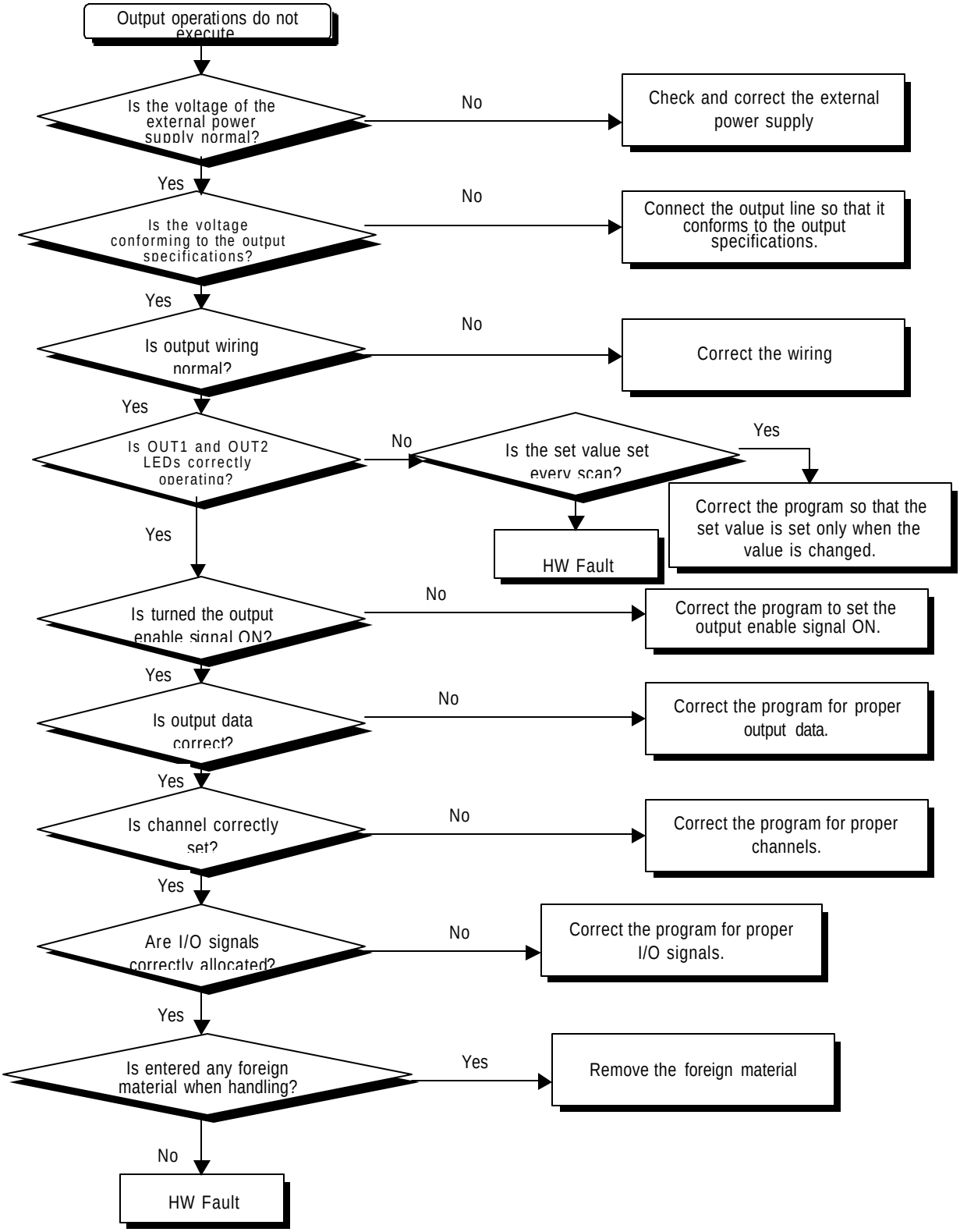
8.2.2 Counter Operations Do Not Execute.



8.2.3 Count Value Is Incorrect



8.2.4 Output Operations Do Not Execute



8.3 Error LED List

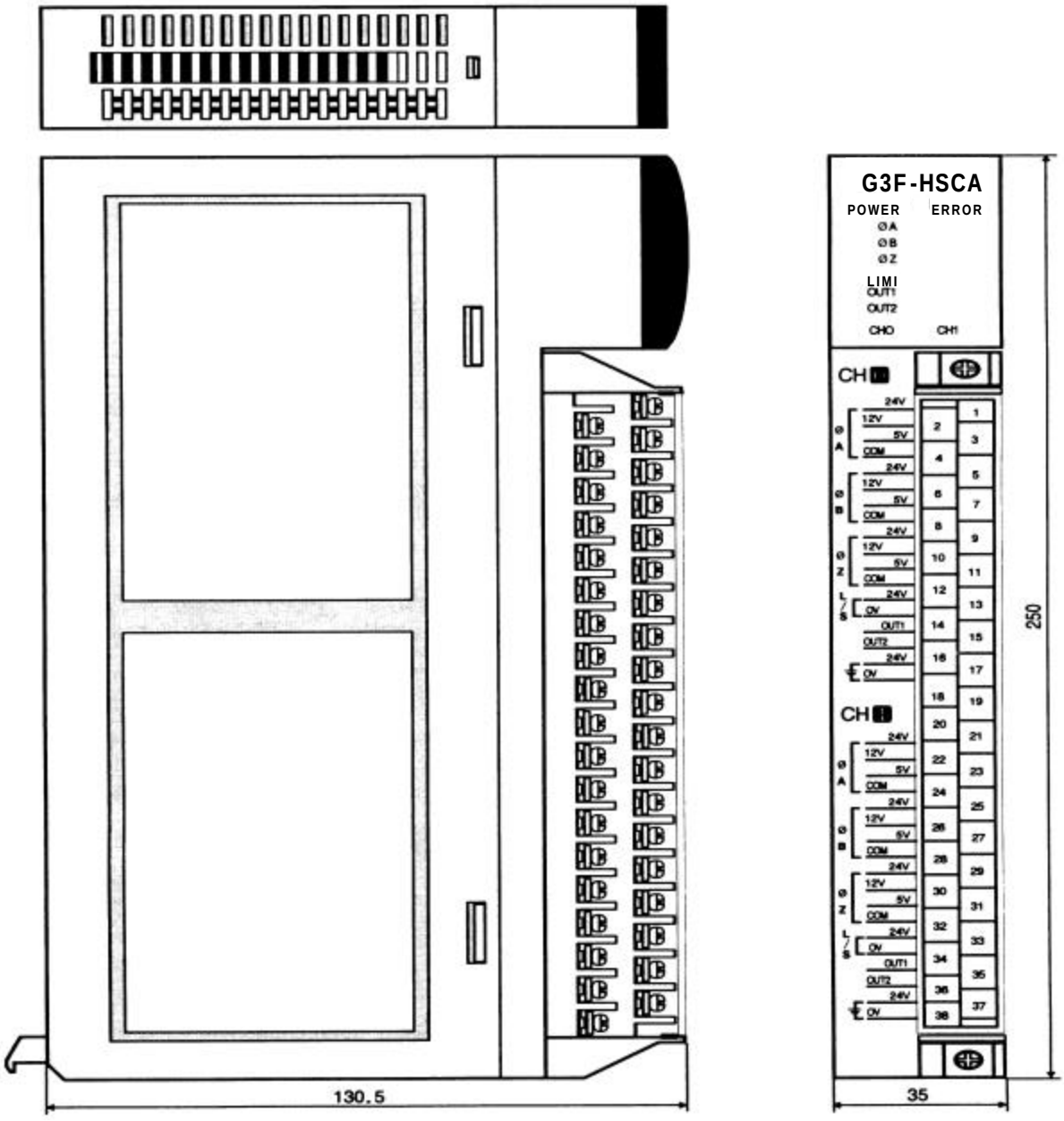
Type	LED operation	Correct action
Watchdog timer error	Cycle 100 ms flickering (50 ms on, 50 ms off)	Contact a service station
Common RAM error	Cycle 200 ms flickering (100 ms on, 100 ms off)	Contact a service station
Data format error	Cycle 500 ms flickering (250 ms on, 250 ms off)	The data set is outside the range. Correct the data.

Chapter 9. DIEMENSIONS

9.1 Dimensions

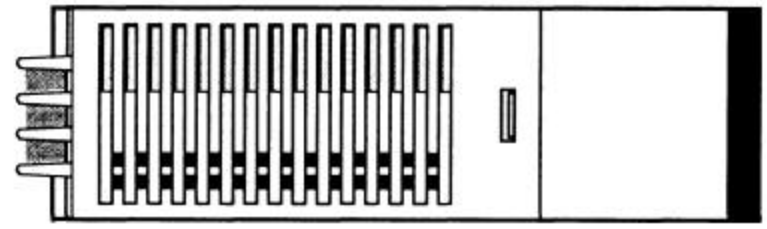
1) G3F-HSCA

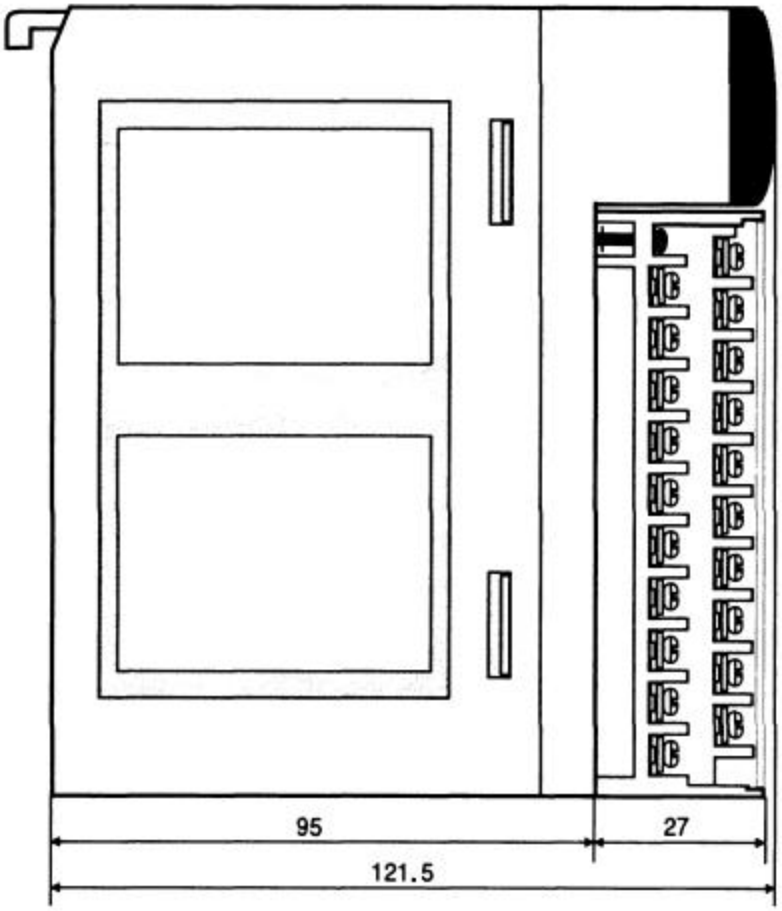
Unit: mm

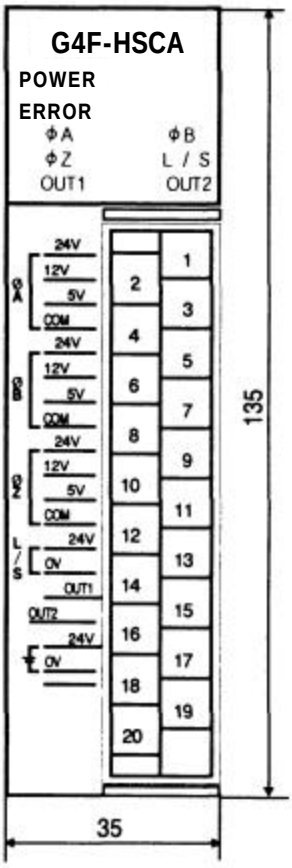


2) G4F-HSCA

Unit: mm







3) G6F-HSCA

Unit: mm