INA-F7157E(87-3-300)h

FUJI ELECTRIC

INSTRUCTION MANUAL

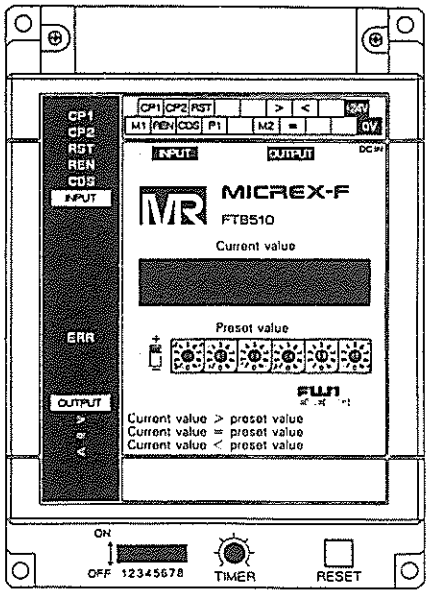
FUJI PROGRAMMABLE CONTROLLER

MICREX-F

TYPE FTB510A

HIGH-SPEED COUNTER UNIT FOR F50 SERIES

Before operating the unit, please read this instruction manual thoroughly.



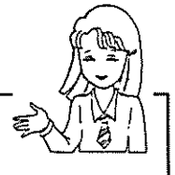
1. Outline

This unit is one of expansion units for F50, and is an incremental/decremental counter applicable to input counts up to 50kpps. In addition, it makes precise positioning possible by outputting directly the results of comparing current values with preset values inside the counter.

2. Specifications

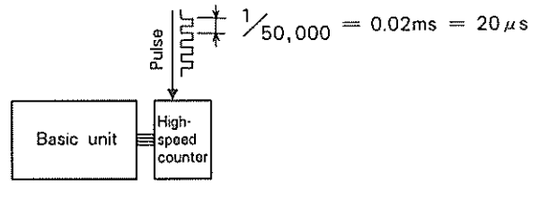
Item		Specification	Remarks
Type		FTB510A	
Counting	Type	Incremental/decremental counter	
	No. of stage	1 stage	READ/WRITE possible from F50
	Digits	Signed BCD 6 digits (−999,999~999,999)	
	Operation mode	Command, up/down count, phase difference	Changeover by DIP SW
	Input speed	30pps or 50kpps	Changeover by DIP SW
Setting	Method	Slide switch and rotary switches	Slide switch : Signs
	No. of stage	1 stage	READ/WRITE impossible from F50
	Digits	Signed BCD 6 digits (−999,999~999,999)	
Control	Input signal	Reset of current values, reset enable, count disable	Push-button reset available
	Input speed	30pps or 50kpps	Changeover by DIP SW
Direct output		Results of comparison (equipped with 3 relays)	>, =, < are outputted by relays
Internal input		Reset of current values, rewrite of current values, count stop	Output when viewed from F50
Internal output		Current values, results of comparison, errors	Input when viewed from F50
Display		Current values, input signals, output signals, errors	Display of current values by 7-segment LED

May we have your attention ?



50kpps means 50,000 pulses per second.

This counter is capable of counting pulses of 50 kilopulses per second.



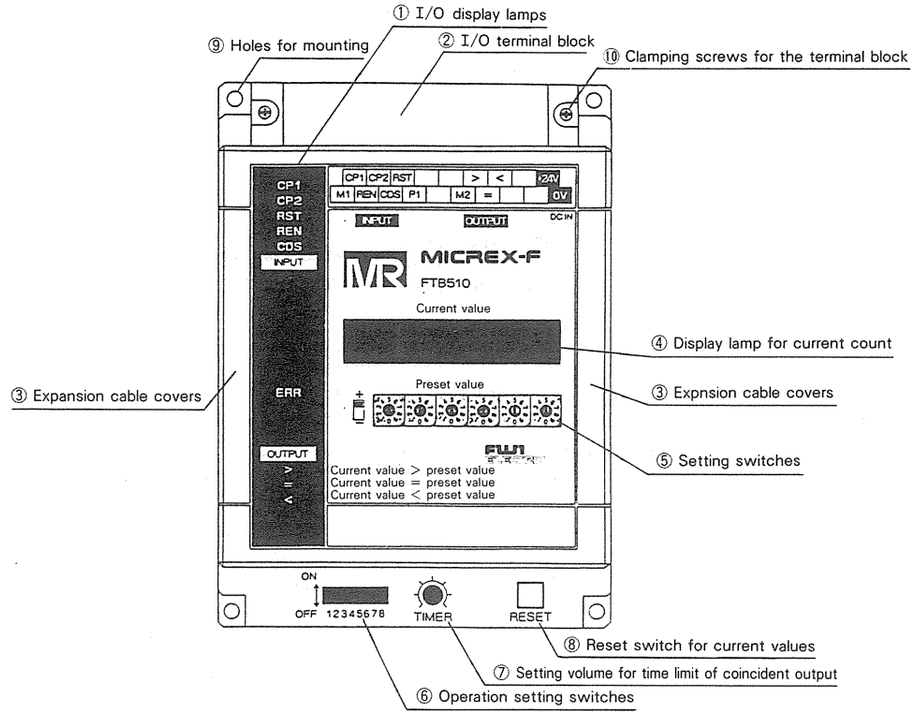
Item			Specification
Input	No. of points		5 points (CP1, CP2, RST, REN, CDS; — common)
	Method		No-voltage contact input (Open collector input of transistors) ＊Note 1
	Rated voltage		5VDC to 12VDC
	Oprating voltage ＊Note 2	ON level	0V～1V
		OFF level	3.5V～13.2V
	Input current		5mA/5V 17mA/12V
	Response time		3ms or 3μs both for ON to and from OFF (changeover with DIP SW)
	Insulating method		Photocoupler
Output	No. of points		3 points (>, =, <; one-side common)
	Method		Relay contact output
	Rated voltage		Max. 242V
	Output current		2A/point
	Min. load current		24VDC 3mA
	OFF-state leakage current		Below 1mA (200VDC, 60Hz)
	Response time		Below 10ms both for ON to and from OFF
	Insulating method		Photocouler
I/O signal indicator			LED display
External wire connecting method			Terminal block, Terminal screws M3.5 with Washers.
Power failure memory			None
External dimensions			130W×182 H×97D (mm)

＊Note 1. voltage output of transistors can also be inputted.

＊Note 2. Please give the input device your careful consideration, because this unit is low active.

3. Component Names and Functions

3-1 Names and Functions



No.	Name	Outline	Remarks
①	I/O display lamps	Each lamp is lit at ON. Confirm the output specification of the input device and check the lighting conditions. The meaning of signals of CP1 and CP2 in each operation mode is as follows.	CP1, CP2 (Count pulse) Count pulse. The meaning of the pulse is different according to the operating mode as shown on the table. RST (Reset) Reset signal of current values. This is made effective in conjunction with REN. The current value is reset to zero even under inputting of CP1 or CP2. REN (Reset enable) Reset-enable signal, which is made effective in conjunction with RST. CDS (Count disable) Count stop signal. Count operation is stopped by this signal input even during input of CP1 or CP2 . ERR (Error) This signal indicates that any other code than BCD has been set in current-value area. > This signal indicates that the current value is larger than the preset value. = This signal indicates that the current value is equal to the preset value. < This signal indicates that the current value is smaller than the preset value.

	Operating mode		
	Command	Up/down count	Phase
CP1	Count signaling	Down count signal	A-phase
＊CP2	Direction designation	Up count signal	B-phase

<table>
<tr><th>No.</th><th>Name</th><th>Outline</th><th>Remarks</th></tr>
<tr><td>②</td><td>I/O terminal block</td><td>For connecting external I/O devices.</td><td>Terminal screws M3.5</td></tr>
<tr><td>③</td><td>Expansion cable covers</td><td>To be detached for connection of expansion cables.
To be covered during operation.</td><td></td></tr>
<tr><td>④</td><td>Display lamp for current value</td><td>For indication of current value in 7-segment LED.</td><td></td></tr>
<tr><td>⑤</td><td>Setting switches</td><td>For obtaining preset values. Setting change is possible also during operation of the unit. However, please note that outputting of the results of comparison (>, =, <) is unstable for several microseconds after the change.</td><td>Preset values are not allocated to data memory.
Setting −0 is not accept.</td></tr>
<tr><td>⑥</td><td>Operation setting switches</td><td>For setting various operation modes of the unit. There is the possibility that the setting change during the unit operation will cause change in current values, output, etc.
Please change setting after turning off power source of the unit.</td><td>SW1
Changeover switch for response speed to input signals (CP1, CP2, RST, REN, CDS).
ON : 30pps (for contact input such as limit switches, etc.)
OFF : 50kpps (for encoder input, etc.)
SW2, SW3
Changeover switches for operation modes (of CP1, CP2)
Either will do.
<table>
<tr><th>SW2</th><th>SW3</th><th>Operation mode</th></tr>
<tr><td>OFF</td><td>OFF</td><td rowspan="2">Phase difference</td></tr>
<tr><td>OFF</td><td>ON</td></tr>
<tr><td>ON</td><td>OFF</td><td>Up/down count</td></tr>
<tr><td>ON</td><td>ON</td><td>Command</td></tr>
</table>
SW4, SW5
Changeover switches for multiplication function during phase difference mode. ＊Note 1
<table>
<tr><th>SW4</th><th>SW5</th><th>Multiplication</th></tr>
<tr><td>OFF</td><td>OFF</td><td>× 1</td></tr>
<tr><td>OFF</td><td>ON</td><td>× 2</td></tr>
<tr><td>ON</td><td>OFF</td><td>× 4</td></tr>
<tr><td>ON</td><td>ON</td><td>× 0 ＊Note 2</td></tr>
</table>
SW6
Operation setting switch for push-button reset and RST & REN input.
ON : Level reset (Reset continues during signal input.) ＊Note 3
OFF : Pulse reset (Reset at the leading edge of input signals.) ＊Note 4</td></tr>
</table>

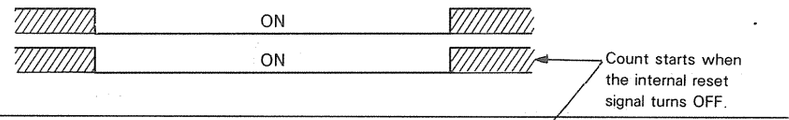
No.	Name	Outline	Remarks
			SW7 Setting switch for output of >, <. ON : Without masking by coincident (=) output. OFF: With masking by coincident (=) output. ＊Note 6 SW8 Not engaged.
⑦	Setting volume for time limit of coincident output	For setting the time limit of coincident output (=). Change is possible also during the operation of the unit.However, Please note that outputting of the result of comparison (>, =, <) is unstable for several microseconds after the change. Setting range: 0.01s～0.1s(10ms～100ms)	
⑧	Reset switch for current values	Push-button switch for resetting current values to zero.	
⑨	Holes for mounting	Four holes for M4 screws are provided at corners for mounting on switchboards.	
⑩	Clamping screws fo for the terminal block	Please loosen the screws for detaching the I/O terminal block and tighten the screws for fixing.	The terminal block is of a connector type, and disconnedtion of wiring is unnecessary for replacement of the unit.

＊Note 1. This is a function of counting the input more in detail without replacement of encoders. (Refer to Phase difference mode in page 6 for details.)

＊Note 2. This is a state receiving no count input.

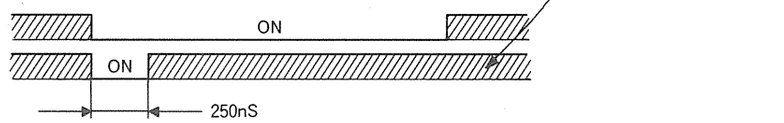
＊Note 3. Push-button or RST & REN signal ♯(or 4.)

Internal reset signal



＊Note 4. Push-button or RST & REN signal ♯(or 4.)

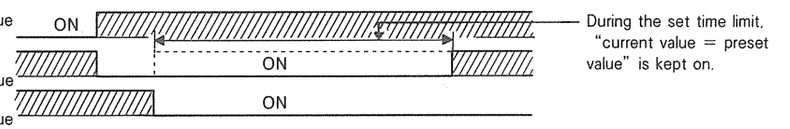
Internal reset signal



＊Note 5. Current value < Preset value ♯(or 6)

Current value = Preset value

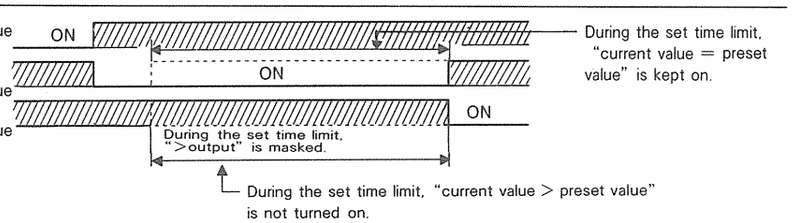
Current value > Preset value



＊Note 6. Current value < Preset value ♯(or 6)

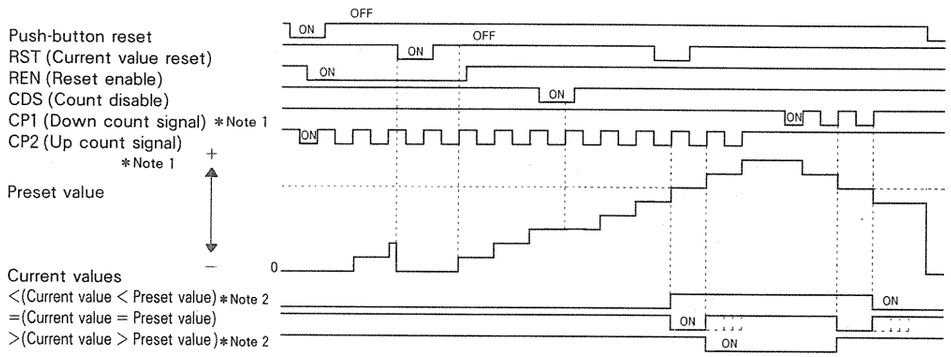
Current value = Preset value

Current value > Preset value



3-2 Operation

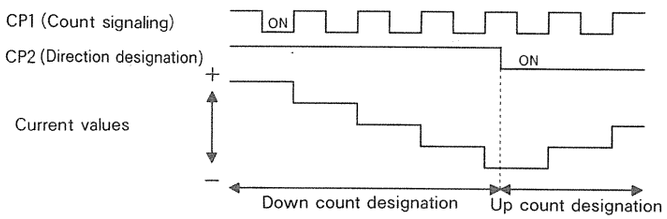
1) Basic operation



*Note 1. Do not turn on CP1 and CP2 at the same time.
*Note 2. No masking by consident (=) output.

2) Counting operation in each mode

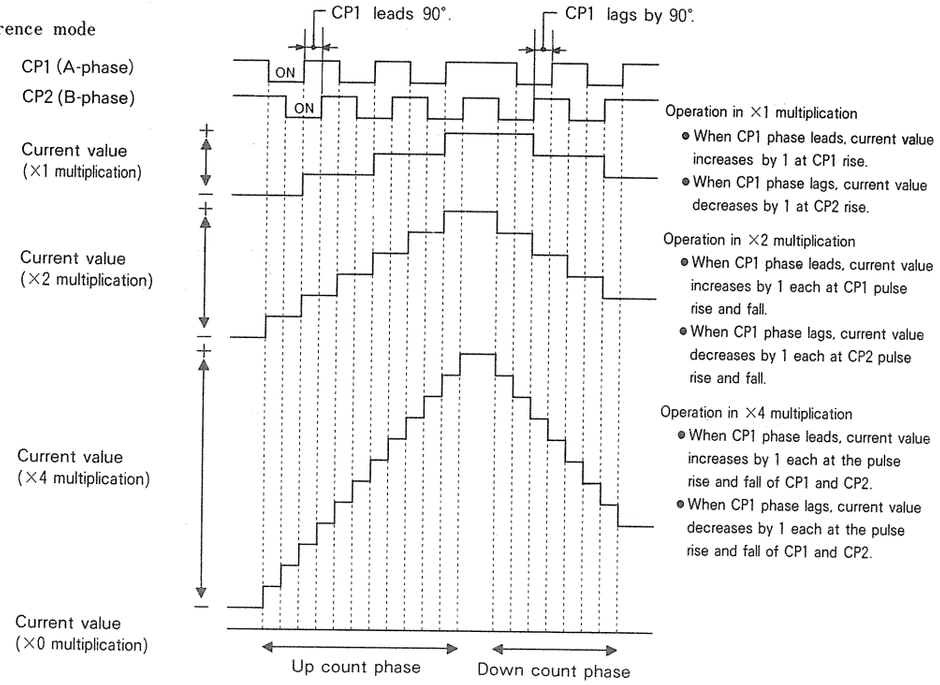
● Command mode



*Note 3. Do not change over CP2 during CP1 ON.

● Up/down count mode Refer to 1) Basic operation

● Phase difference mode



Operation in ×1 multiplication
- When CP1 phase leads, current value increases by 1 at CP1 rise.
- When CP1 phase lags, current value decreases by 1 at CP2 rise.

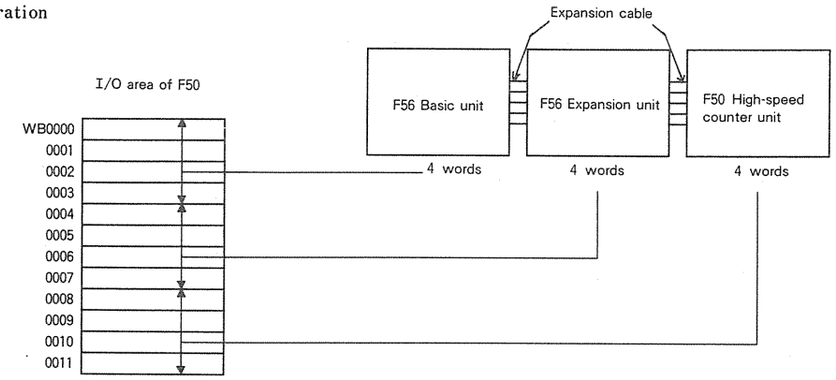
Operation in ×2 multiplication
- When CP1 phase leads, current value increases by 1 each at CP1 pulse rise and fall.
- When CP1 phase lags, current value decreases by 1 each at CP2 pulse rise and fall.

Operation in ×4 multiplication
- When CP1 phase leads, current value increases by 1 each at the pulse rise and fall of CP1 and CP2.
- When CP1 phase lags, current value decreases by 1 each at the pulse rise and fall of CP1 and CP2.

4. Address Allocation

This unit is handled as 64-point I/O module, 32 points input and 32 points output, when viewed from F50. Illustrated below is an example of adress and bit allocation in a combination of a basic unit, an expansion unit and a high-speed counter unit.

1) Configuration



2) Contents of addresses of the high-speed counter in the above configuration

Address \ Bit No.	0	1	2	3 *Note 4	4	5	6	7 *Note 5	8	9	A	B	C	D	E	F
WB008 (Input)	Current value negative	Current value >Preset value	Current value =Preset value	Current value <Preset value	ERR	Current value >Preset value	Current value =Preset value	Current value <Preset value	Current value ×10⁵ 8	4	2	1	Current value ×10⁴ 8	4	2	1
WB009 (Input)	Current value ×10³ 8	4	2	1		Current value ×10² 8	4	2	1	Current value ×10¹ 8	4	2	1	Current value ×10⁰ 8	4	2	1
WB010 (Output)	Current value rewrite data negative	Current value rewrite designation	Current value reset designation	Count stop designation					Current value rewrite data ×10⁵ 8	4	2	1	×10⁴ 8	4	2	1
WB011 (Output)	Current value rewrite data ×10³ 8	4	2	1		Current value rewrite data ×10² 8	4	2	1	Current value rewrite data ×10¹ 8	4	2	1	Current value rewrite data ×10⁰ 8	4	2	1

*Note 4. Bits No. 1～3 indicate the state of output relays.
*Note 5. Bits No. 5～7 indicate the result of comparison.

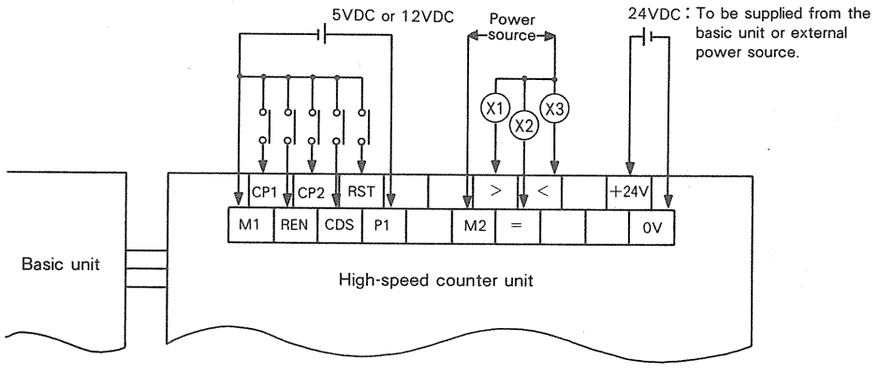
3) Contents of the bits (The meaning at logic "1(ON)" is mentioned.)

	Address	Bit No.	Designation	Description
Input	WB008	0	Current value negative	Sign of current value
		1	Current value > Preset value	Results of comparison of current values with the preset value. The on-time coincides with the on-time of direct output. (It does not coincide with the change of count.)
		2	Current value = Preset value	
		3	Current value < Preset value	
		4	ERR	It indicates that any other code than BCD has been rewrite in current value area.
		5	Current value > Preset value	Results of comparison of current values with the preset value. The on-time coincides with the change of count. (It does not coincide with direct output.)
		6	Current value = Preset value	
		7	Current value = Preset value	
		—	Current value	Processed in BCD.
Output	WB010	0	Current value rewrite data negative	Sign of current value rewrite data.
		1	Current value rewrite designation	During off, current value rewrite data is not rewrite even if it has been set.
		2	Current value reset designation	During on, the current value is reset.
		3	Count stop designation	During on, counting operation is stopped.
		—	Current value rewrite data	Do not rewrite in any other code than BCD.

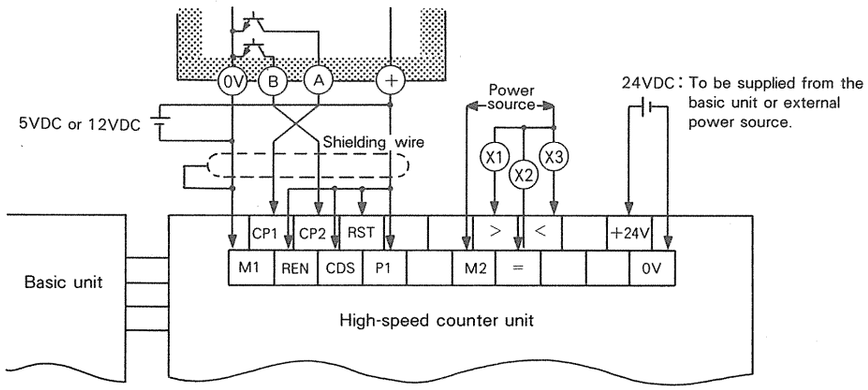
5. External Connection

Illustrated below is the external connection method of the unit.

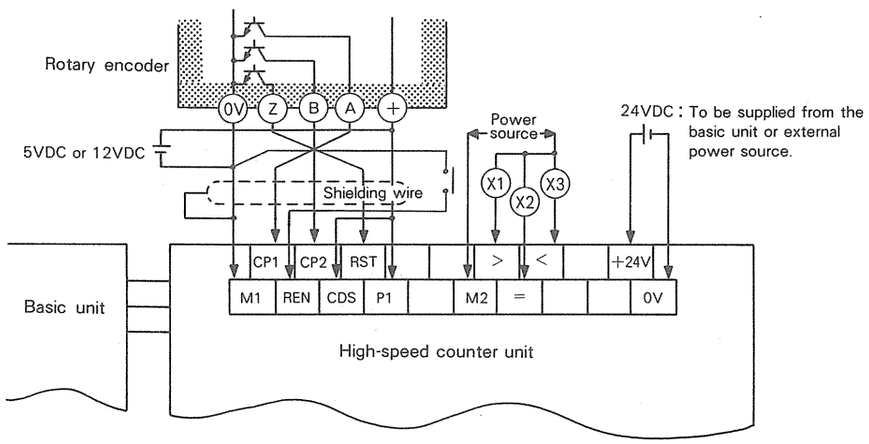
1) Basic connection



2) An example of the connection with an incremental, 2-phase output type rotary encoder



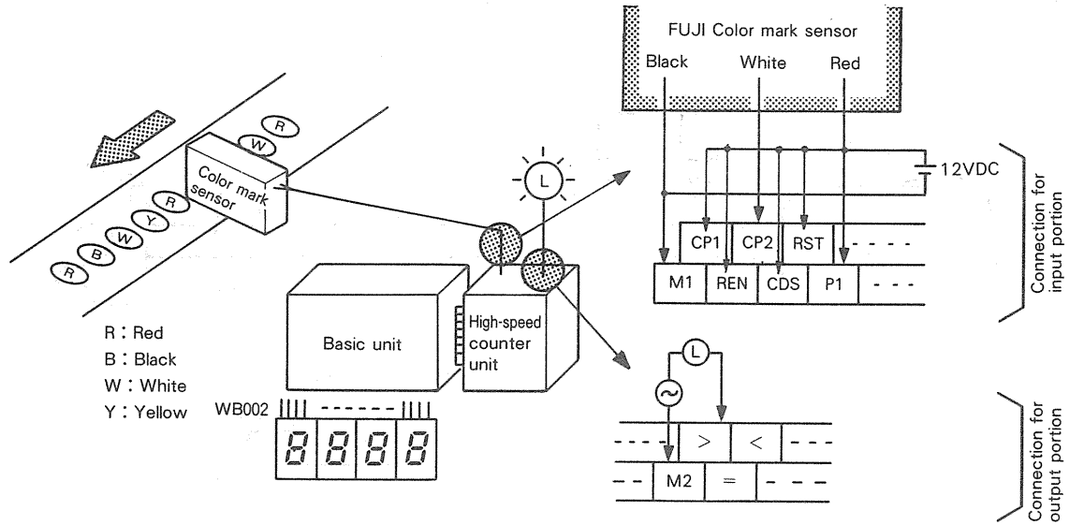
3) An example of the connection with an incremental, 2-phase output type rotary encoder with Z-phase



6. Application Examples of High-Speed Counters

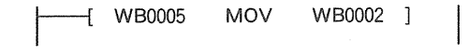
6-1 Example of Counting

Illustrated below is a program in which out of the products flowing at high speed the number of the red ones is counted and displayed by 4-digit 7-segment LED, and the indicating lamp is lit when the number exceeds 2, 000.



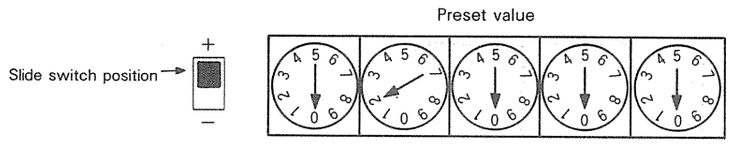
1) Loading of user's program

Load the following program into the basic unit.



2) Setting of the preset value setting switch

Set it to 2, 000.



3) Setting of the operation setting switch (Refer to page 4.)

① SW1 Input signal response speed is set to 50kpps here. (SW1 : OFF)

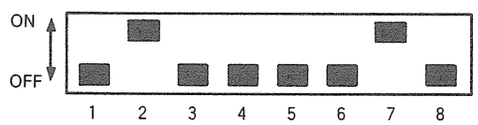
② SW2, SW3 Since this sample requires only counting, operating mode is set to Up/down count mode. (SW2: ON, SW3: OFF)

③ SW4, SW5 This example in the count mode has nothing to do with multiplication function.

④ SW6 RST is not used, and there is nothing to do with it.

⑤ SW7 Here selected is no masking by coincident (=) output for > and < output. (SW7: ON)

⑥ SW8 Not engaged.



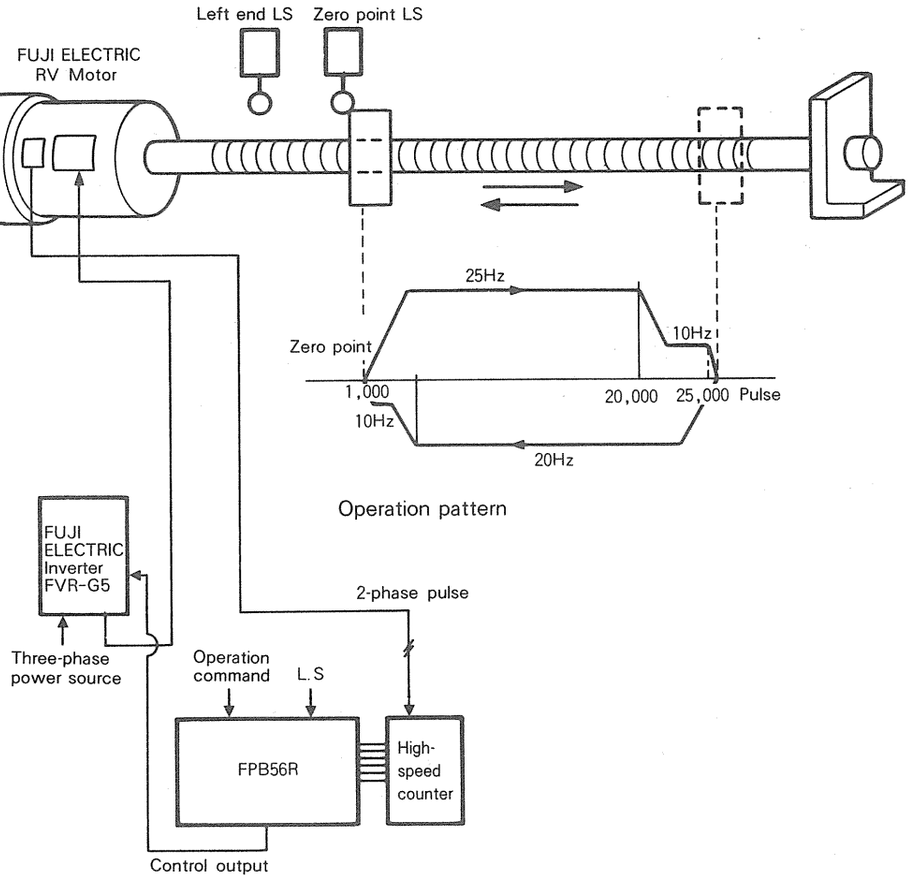
4) Operation

Set the basic unit to Operation (RUN) mode.

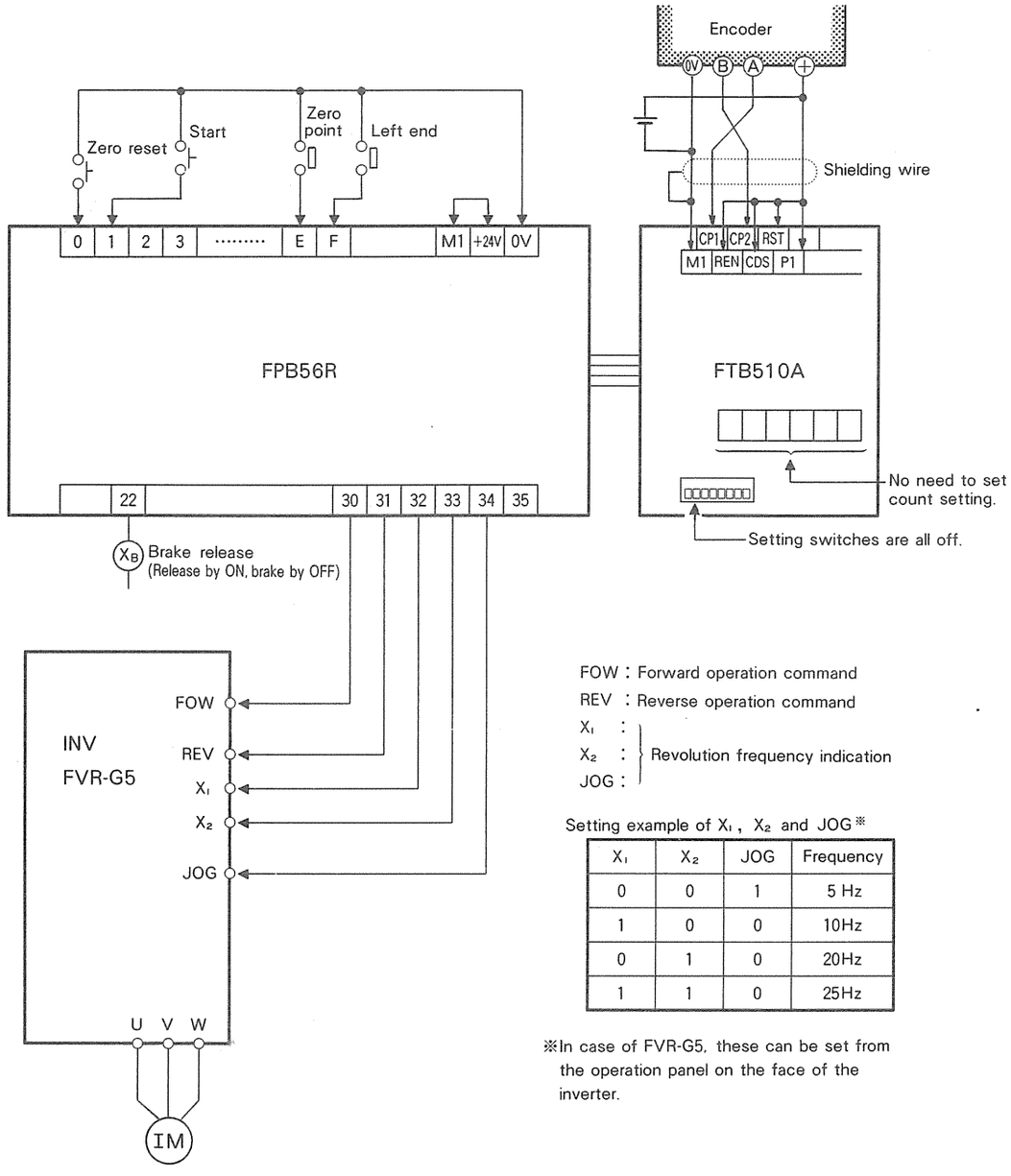
6-2 Example of Positioning

Illustrated below is an example of a combination of the high-speed counter with an inverter and a three-phase induction motor with brake (with encoder).

1) System configuration



2) Example of a connection diagram



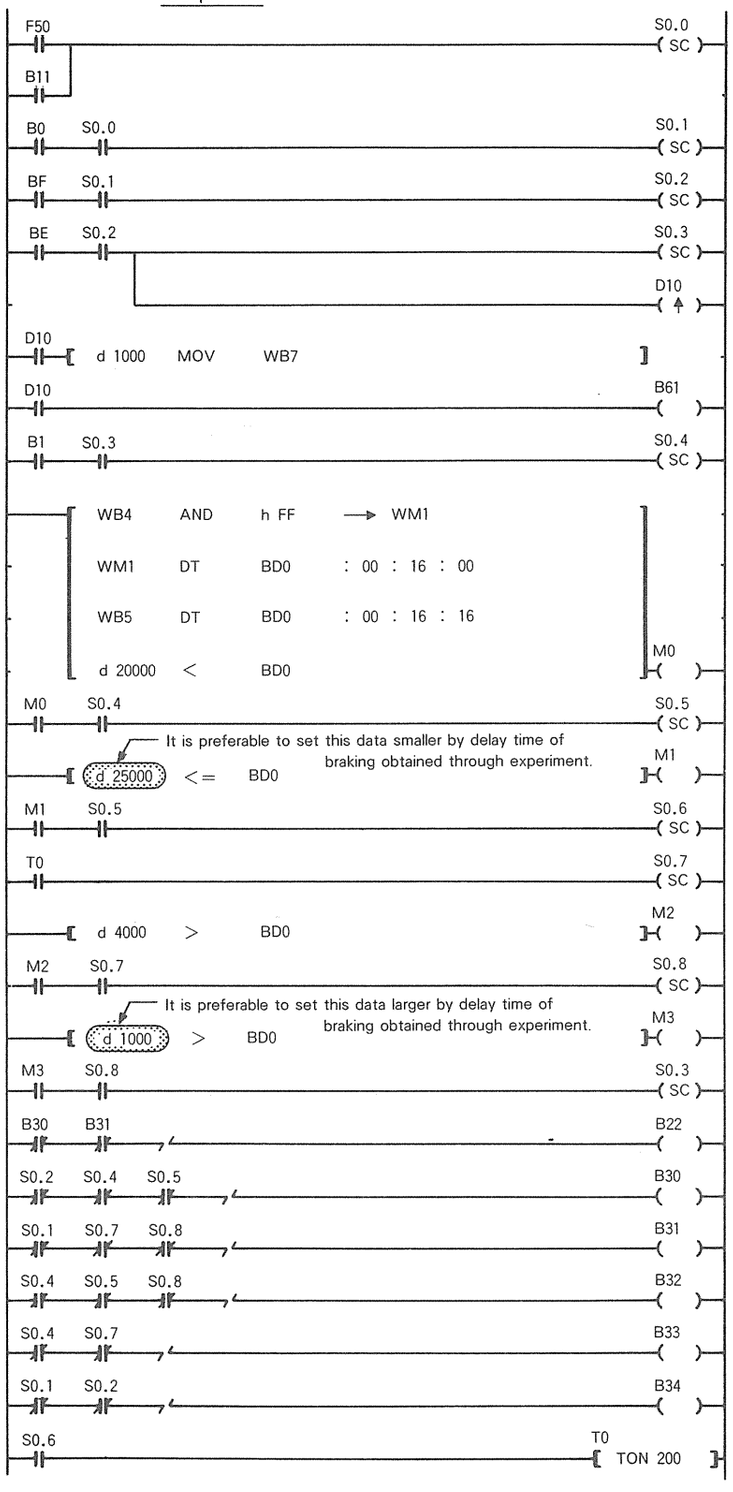
FOW : Forward operation command
REV : Reverse operation command
X_1 :
X_2 : } Revolution frequency indication
JOG :

Setting example of X_1, X_2 and JOG※

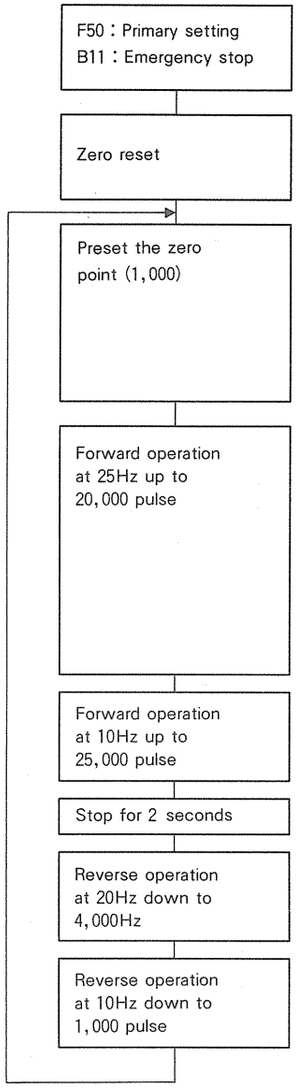
X_1	X_2	JOG	Frequency
0	0	1	5 Hz
1	0	0	10Hz
0	1	0	20Hz
1	1	0	25Hz

※In case of FVR-G5, these can be set from the operation panel on the face of the inverter.

3) Sequence



Flow



- Brake release during forward/reverse operation
- Forward operation when S0.2, S0.4 and S0.5 are on.
- Reverse operation when S0.1, S0.7 and S0.8 are on.
- Designation of revolution frequency
- Changeover time from forward to reverse.

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