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**TOSVERT VF-S15**

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**My function-S Instruction Manual**

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## 1. Introduction

My function-S adds programming capability to inverter's input/output signals without external relays or a PLC (programmable logic controller) in some cases.

The function makes it possible to reduce the space and cost required for the system.

## 2. Parameters used

My function-S uses the parameters *A900* to *A977*.

⇒ For details of each parameter, refer to the relevant section.

## 3. Summary of My function-S

My function-S has the combined terminal function that combines the functions of the inverter's input and output terminals and the relay sequence function that combines logic operation functions.

### ■ Combined terminal function

The combined terminal function is activated to assign two or more functions to one terminal.

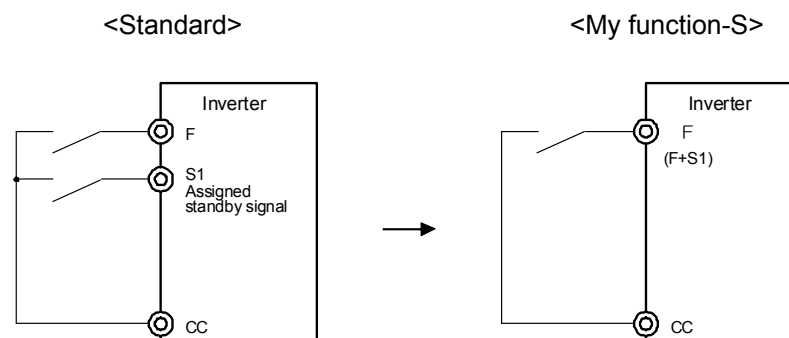
The function can reduce the numbers of terminals and cables for your required operations.

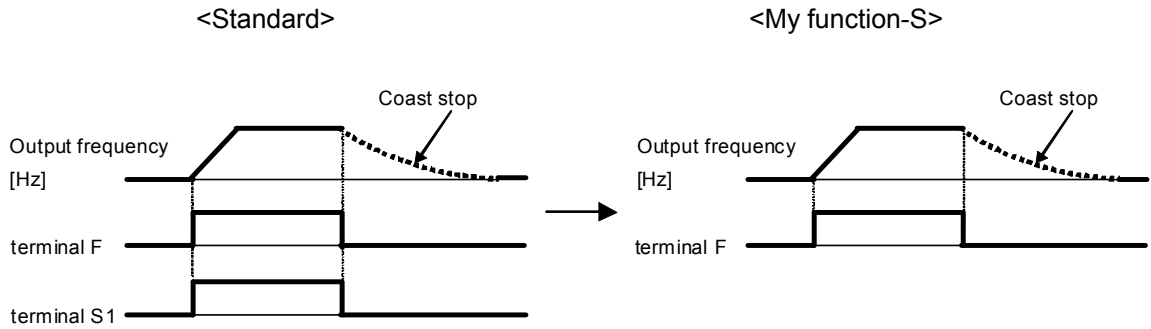
And it is possible to process some circuit without external circuit.

For example, you can assign the standby signal (default setting: always active) and the forward run command signal (default setting: Terminal F) to one terminal (example: Terminal F).

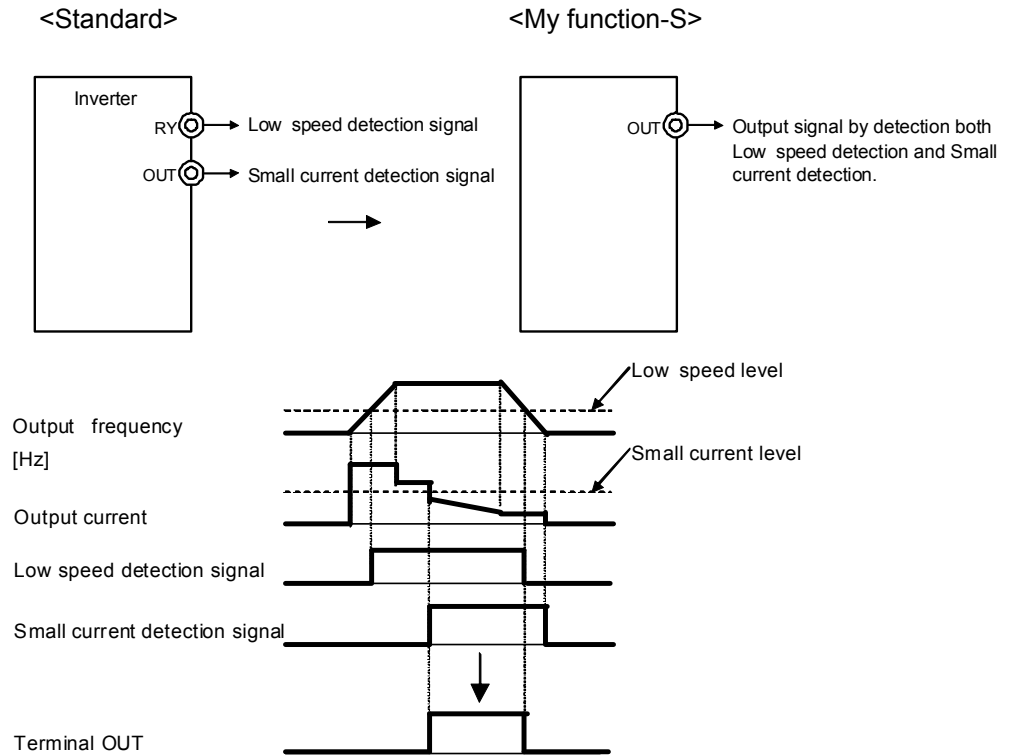
Terminal F can perform the two functions.

See Example 1 in Chapter 5 for details.





The combined terminal function can be used for output signals.  
 For example, you can assign the low speed detection signal (function No: 4) and small current detection (function No: 26) to one terminal (Terminal OUT). When both signals are detected, Terminal OUT outputs signal.  
 See Example 4 in Chapter 5 for details.



■ Relay sequence function

In case that an inverter is controlled by a PLC (programmable logic controller), the PLC receives, processes, and sends the signals as processing result to the inverter.

(See Fig 3-1.)

The relay sequence function enables the inverter to perform itself in 28 steps without a PLC. Because the function uses internal data and signals directly, the processing speed is faster than control with the PLC.

Furthermore, the function enables the inverter to use its multi-function input and output signals at the same time, and thus to perform various operations in a reduced number of steps.

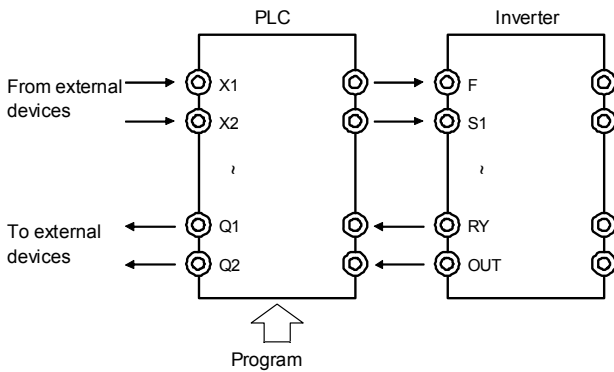


Fig. 3-1 Signal flow between PLC and inverter

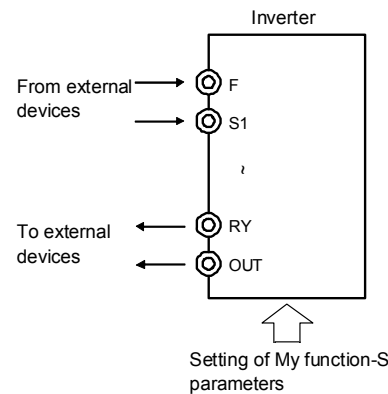
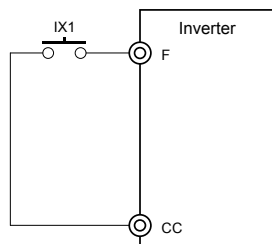


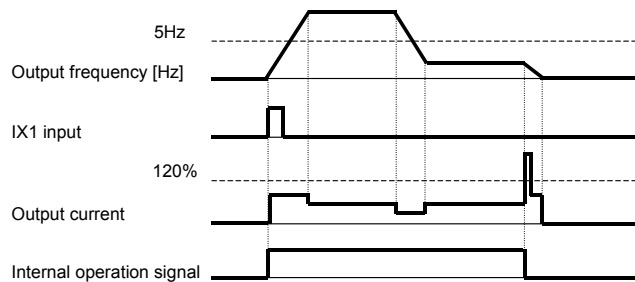
Fig. 3-2 Signal flow of inverter with My function-S

«Example» Start forward run with a push switch (non self hold switch).  
 Stop automatically if the output current is 120% or more of the rated current when the output frequency is 5Hz or less.  
 For the sake of simplicity, stop signal input terminals are omitted here.  
 See Example 6 in Chapter 5 for details.

● Input and output symbols



● Timing chart

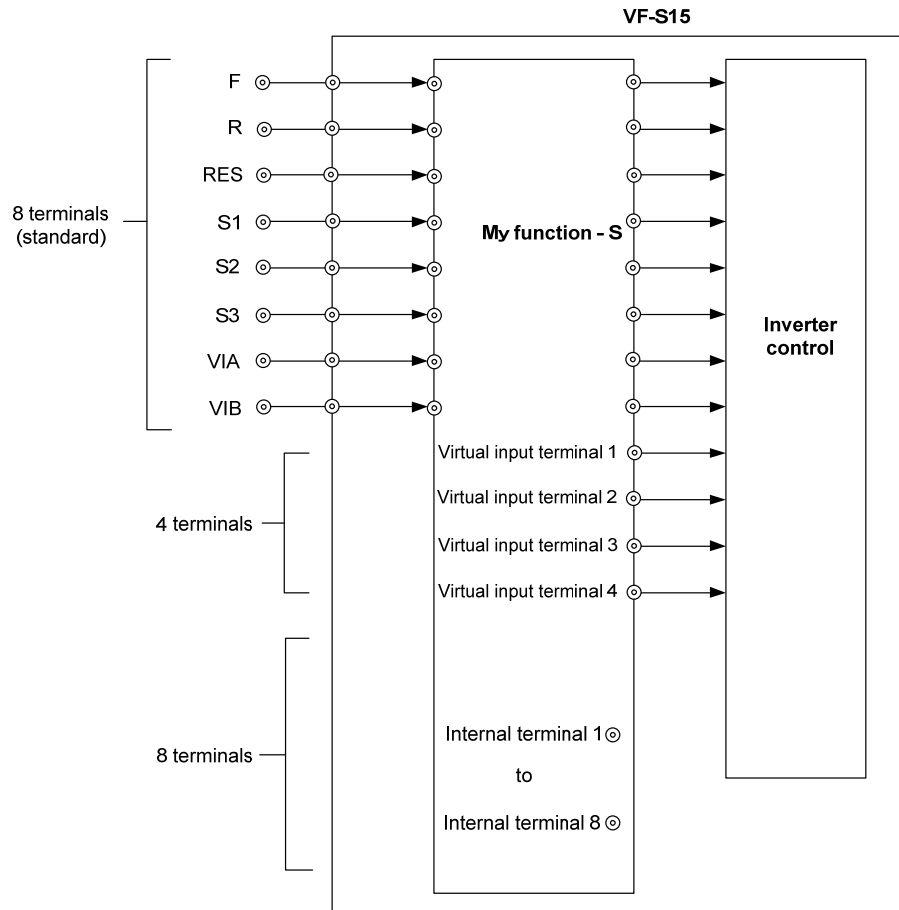


## 4. Setting parameters

This chapter explains how to set parameters related to the My function-S using the composition of the My function-S and the rules.

### ■ Input terminals

Input signal terminals that can be used with the My function-S are as follows;



- **Input terminals (8 terminals: F, R, RES, S1, S2, S3, VIA, VIB)**

VF-S15 has 8 input terminals.

The input terminals are used for following 2 ways.

- 1) Input terminals to which assign multiple functions
- 2) Simple ON-OFF signal input terminals like a PLC

In this manual, such input terminals are referred to as X1, X2 to X8 to distinguish them from case 1).

- **Virtual input terminals (4 terminals)**

Virtual input terminals cannot be turned on and off electronically unlike actual input terminals. Virtual input terminals can be turned on and off using communication function or My function-S. You can assign the multiple functions as same as actual input terminals.

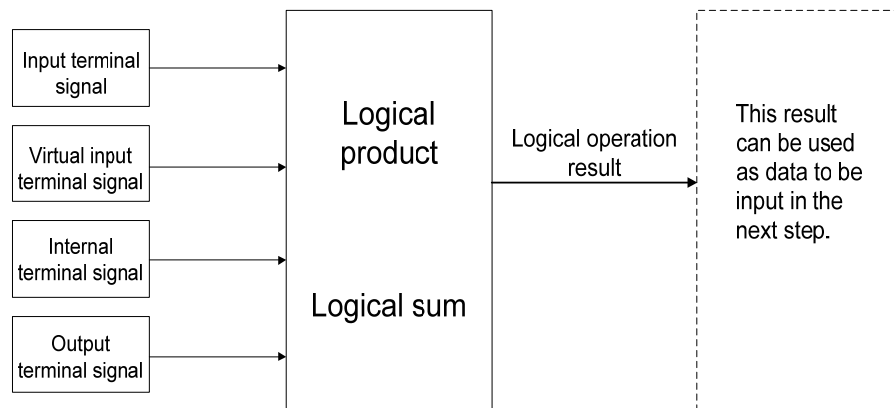
• **Internal terminals (8 terminals)**

Internal terminals cannot be turned on and off electronically unlike actual input terminals. Internal terminals can be turned on and off using communication function or My function-S. You can not assign the multiple functions as same as the virtual input terminals. They correspond to the internal relay used in PLC. They are used for preserving and reading the status.

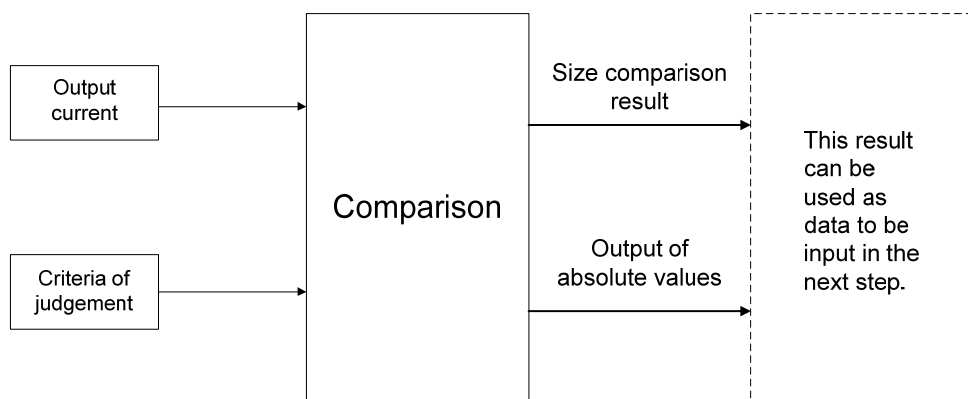
■ **Computing function**

The My function-S can perform logical operations on input/output signals and compares and computes some data, such as frequency, current, and torque data that the inverter detects. A table of computing functions is shown in Appendix 2. Available data that the inverter detects are listed in Appendix 5.

• **Logical comparison**

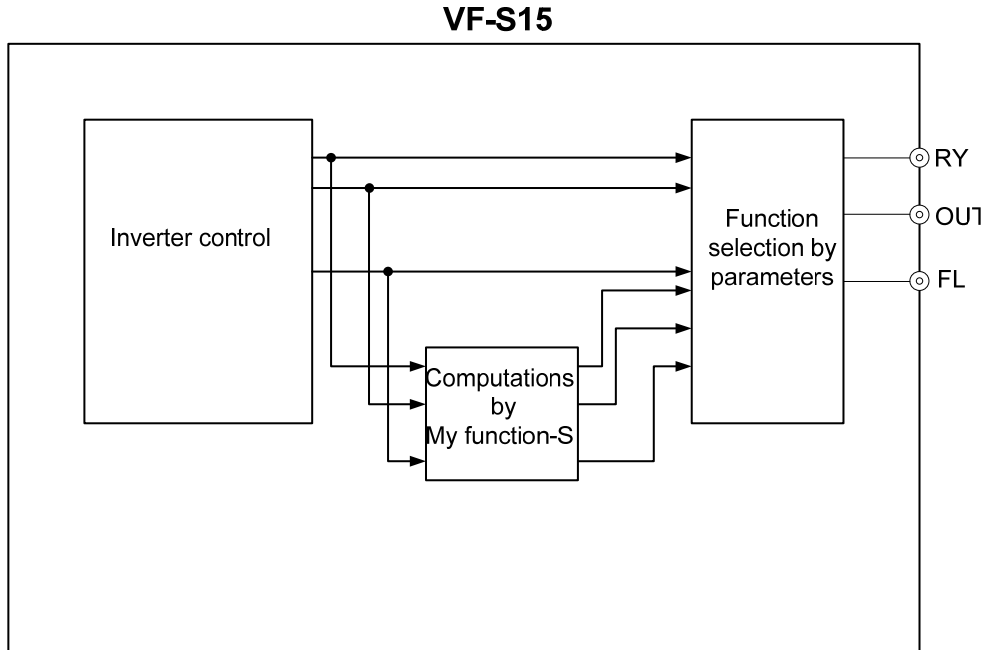


• **Commutation**



■ Output terminals

Output signal terminals used with the My function-S are following.



● Output terminals (3 terminals: RY, OUT, FL)

VF-S15 has 3 output terminals.

You can assign the multiple functions to the output terminals.

A table of output terminal functions is shown in Appendix 4. Only the positive logic settings are used for My function-S.

Note) Negative logic settings of output terminal functions cannot be used for the My function-S.

Computation results can be output by assigning the My function-S output 1 to 16 to the output terminals .

■ Setting parameters

The My function-S consists of 7 units of the same composition. Each unit consists of 4 steps, and therefore there are 28 steps in total. See Fig.4-1 for the composition of each unit.

Each step consists of one command.

Each unit begins with a data read (LD) command as step 1 and ends with a data transfer (ST) command as step 4. You set the commands and objects to step 2 and 3 in accordance with the requested functions.

Unit 1			Unit 2			Unit 7	
Step 1	LD <i>A900</i>		Step 1	LD <i>A906</i>		Step 1	LD <i>A953</i>
Step 2	<i>A901 A902</i>	→	Step 2	<i>A907 A908</i>	→→	Step 2	<i>A954 A955</i>
Step 3	<i>A903 A904</i>		Step 3	<i>A909 A910</i>		Step 3	<i>A956 A957</i>
Step 4	ST <i>A905</i>		Step 4	ST <i>A911</i>		Step 4	ST <i>A958</i>

Fig. 4-1 My function-S block diagram



## ■ Parameters

Table 4-1 is the My function-S parameters.

Table 4-1 Table of My function-S parameters

		Title	Function	Adjustment range	Default setting
Unit 1	Step 1 (Objects)	<i>A900</i>	Input function target 11	Input terminal number 0: No function 1: Terminal F 2: Terminal R 3: Terminal RES 4: Terminal S1 5: Terminal S2 6: Terminal S3 7: Terminal VIB 8: Terminal VIA 9 to 20: - 21 to 24: Virtual input terminal 1 to 4 25 to 32: Internal terminal 1 to 8 33 to 34: - My function-S output data number. 1000 to 1255: Output selection number (Note 1) 2000 to 2099: FD00 - FD99 (Note 2) 3000 to 3099: FE00 - FE99 (Note 2)	0
	Step 2 (Commands)	<i>A901</i>	Input function command 12	0: NOP (no operation) 1: ST (move) 2: STN (move (inversion)) 3: AND (logical product ( $A \cap B$ )) 4: ANDN (logical product ( $A \cap \overline{B}$ )) 5: OR (logical sum ( $A \cup B$ )) 6: ORN (logical sum ( $A \cup \overline{B}$ )) 7: EQ (equal) 8: NE (not equal) 9: GT (greater than) 10: GE (greater or equal) 11: LT (less than) 12: LE (less or equal) 13: ASUB (absolute) 14: ON (on delay timer) 15: OFF (off delay timer) 16: COUNT1 (counter 1) 17: COUNT2 (counter 2) 18: HOLD (hold) 19: SET (set) 20: RESET (reset) 21: CLR (clear) 22: CLRN (clear (inversion)) 23: ON2 (on delay timer 2) 24: OFF2 (off delay timer 2)	0
	Step 2 (Objects)	<i>A902</i>	Input function target 12	Same as <i>A900</i>	0
	Step 3 (Commands)	<i>A903</i>	Input function command 13	Same as <i>A901</i>	0
	Step 3 (Objects)	<i>A904</i>	Input function target 13	Same as <i>A900</i>	0
	Step 4 (Output to)	<i>A905</i>	Output function assigned object 1	Same as <i>A900</i>	0

Note 1: See Table 8-6 "Output terminal functions" in Appendix 4.

Note 2: See Table 8-7 "Data that My function-S can handle" in Appendix 5.

		Title	Function	Adjustment range	Default setting
Unit 2	Step 1 (Objects)	<i>A906</i>	Input function target 21	Same as <i>A900</i>	<i>0</i>
	Step 2 (Commands)	<i>A907</i>	Input function command 22	Same as <i>A901</i>	<i>0</i>
	Step 2 (Objects)	<i>A908</i>	Input function target 22	Same as <i>A900</i>	<i>0</i>
	Step 3 (Commands)	<i>A909</i>	Input function command 23	Same as <i>A901</i>	<i>0</i>
	Step 3 (Objects)	<i>A910</i>	Input function target 23	Same as <i>A900</i>	<i>0</i>
	Step 4 (Output to)	<i>A911</i>	Output function assigned object 2	Same as <i>A900</i>	<i>0</i>
Unit 3	Step 1 (Objects)	<i>A912</i>	Input function target 31	Same as <i>A900</i>	<i>0</i>
	Step 2 (Commands)	<i>A913</i>	Input function command 32	Same as <i>A901</i>	<i>0</i>
	Step 2 (Objects)	<i>A914</i>	Input function target 32	Same as <i>A900</i>	<i>0</i>
	Step 3 (Commands)	<i>A915</i>	Input function command 33	Same as <i>A901</i>	<i>0</i>
	Step 3 (Objects)	<i>A916</i>	Input function target 33	Same as <i>A900</i>	<i>0</i>
	Step 4 (Output to)	<i>A917</i>	Output function assigned object 3	Same as <i>A900</i>	<i>0</i>
Unit 4	Step 1 (Objects)	<i>A935</i>	Input function target 41	Same as <i>A900</i>	<i>0</i>
	Step 2 (Commands)	<i>A936</i>	Input function command 42	Same as <i>A901</i>	<i>0</i>
	Step 2 (Objects)	<i>A937</i>	Input function target 42	Same as <i>A900</i>	<i>0</i>
	Step 3 (Commands)	<i>A938</i>	Input function command 43	Same as <i>A901</i>	<i>0</i>
	Step 3 (Objects)	<i>A939</i>	Input function target 43	Same as <i>A900</i>	<i>0</i>
	Step 4 (Output to)	<i>A940</i>	Output function assigned object 4	Same as <i>A900</i>	<i>0</i>
Unit 5	Step 1 (Objects)	<i>A941</i>	Input function target 51	Same as <i>A900</i>	<i>0</i>
	Step 2 (Commands)	<i>A942</i>	Input function command 52	Same as <i>A901</i>	<i>0</i>
	Step 2 (Objects)	<i>A943</i>	Input function target 52	Same as <i>A900</i>	<i>0</i>
	Step 3 (Commands)	<i>A944</i>	Input function command 53	Same as <i>A901</i>	<i>0</i>
	Step 3 (Objects)	<i>A945</i>	Input function target 53	Same as <i>A900</i>	<i>0</i>
	Step 4 (Output to)	<i>A946</i>	Output function assigned object 5	Same as <i>A900</i>	<i>0</i>
Unit 6	Step 1 (Objects)	<i>A947</i>	Input function target 61	Same as <i>A900</i>	<i>0</i>
	Step 2 (Commands)	<i>A948</i>	Input function command 62	Same as <i>A901</i>	<i>0</i>
	Step 2 (Objects)	<i>A949</i>	Input function target 62	Same as <i>A900</i>	<i>0</i>
	Step 3 (Commands)	<i>A950</i>	Input function command 63	Same as <i>A901</i>	<i>0</i>
	Step 3 (Objects)	<i>A951</i>	Input function target 63	Same as <i>A900</i>	<i>0</i>
	Step 4 (Output to)	<i>A952</i>	Output function assigned object 6	Same as <i>A900</i>	<i>0</i>

		Title	Function	Adjustment range	Default setting
Unit 7	Step 1 (Objects)	<i>R953</i>	Input function target 71	Same as <i>R900</i>	<i>0</i>
	Step 2 (Commands)	<i>R954</i>	Input function command 72	Same as <i>R901</i>	<i>0</i>
	Step 2 (Objects)	<i>R955</i>	Input function target 72	Same as <i>R900</i>	<i>0</i>
	Step 3 (Commands)	<i>R956</i>	Input function command 73	Same as <i>R901</i>	<i>0</i>
	Step 3 (Objects)	<i>R957</i>	Input function target 73	Same as <i>R900</i>	<i>0</i>
	Step 4 (Output to)	<i>R958</i>	Output function assigned object 7	Same as <i>R900</i>	<i>0</i>

The four kinds of data in the table below, percentage, frequency, time (second), and the number of times can be compared and computed, and they are specified with parameters for the object to which commands are issued.

Title	Function	Adjustment range	Default setting
<i>R918</i>	Output percent data 1	<i>0.00 - 200.0%</i>	<i>0.00</i>
<i>R919</i>	Output percent data 2	<i>0.00 - 200.0%</i>	<i>0.00</i>
<i>R920</i>	Output percent data 3	<i>0.00 - 200.0%</i>	<i>0.00</i>
<i>R921</i>	Output percent data 4	<i>0.00 - 200.0%</i>	<i>0.00</i>
<i>R922</i>	Output percent data 5	<i>0.00 - 200.0%</i>	<i>0.00</i>
<i>R923</i>	Output frequency data 1	<i>0.0 - 500.0Hz</i>	<i>0.0</i>
<i>R924</i>	Output frequency data 2	<i>0.0 - 500.0Hz</i>	<i>0.0</i>
<i>R925</i>	Output frequency data 3	<i>0.0 - 500.0Hz</i>	<i>0.0</i>
<i>R926</i>	Output frequency data 4	<i>0.0 - 500.0Hz</i>	<i>0.0</i>
<i>R927</i>	Output frequency data 5	<i>0.0 - 500.0Hz</i>	<i>0.0</i>
<i>R928</i>	Output time data 1	<i>0.0 1 - 600.0s</i>	<i>0.0 1</i>
<i>R929</i>	Output time data 2	<i>0.0 1 - 600.0s</i>	<i>0.0 1</i>
<i>R930</i>	Output time data 3	<i>0.0 1 - 600.0s</i>	<i>0.0 1</i>
<i>R931</i>	Output time data 4	<i>0.0 1 - 600.0s</i>	<i>0.0 1</i>
<i>R932</i>	Output time data 5	<i>0.0 1 - 600.0s</i>	<i>0.0 1</i>
<i>R933</i>	Nmber of times of output data 1	<i>0 - 9999 times</i>	<i>0</i>
<i>R934</i>	Nmber of times of output data 2	<i>0 - 9999 times</i>	<i>0</i>

The table below lists the four virtual input terminals available.

Title	Function	Adjustment range (Note 1)	Default setting
<i>R973</i>	Virtual input terminal selection 1	<i>0 - 203</i>	<i>0</i>
<i>R974</i>	Virtual input terminal selection 2	<i>0 - 203</i>	<i>0</i>
<i>R975</i>	Virtual input terminal selection 3	<i>0 - 203</i>	<i>0</i>
<i>R976</i>	Virtual input terminal selection 4	<i>0 - 203</i>	<i>0</i>

Note 1: See Table 8-4 "Input terminal functions" in Appendix 3.

## ■ Enable or disable state of My function-S

You can set enable or disable state of the My function-S

**When you set the My function-S parameters, be sure to set  $P977 = 0$  (disabled) to prevent the system from starting accidentally.**

After setting the My function-S parameters, change  $P977$  to  $1$  (My function-S + permission signal) or  $2$  (My function-S always ON) to make My function-S ready to be enabled. (If you set  $P977 = 1$ , My function-S is enabled when a permission signal is issued.)

Note: It takes a maximum of 0.5 second for a change of the My function-S parameters to be reflected internally. Keep standby state at least 0.5 second after setting the parameters.

Title	Function	Adjustment range	Default setting
$P977$	My function-S selection	$0$ : Disabled $1$ : My function-S + permission signal $2$ : My function-S always ON	$0$

$0$  (Disabled):

My function-S is disabled.

$1$  (My function-S + permission signal):

My function-S is in standby state.

When you put input signal into the input terminal assigned functions  $B4$  or  $B5$  (My function-S trigger signal), the My function-S is enabled.

$2$  (My function-S always ON):

My function-S is enabled when the inverter is turned on.

Note: You cannot change the parameter  $P977$  during inverter operation.

- **In case that the My function-S is disabled**

The My function-S settings are disabled.

If the input terminals are turned on, the inverter operates by the input terminal function.

- **In case that the My function-S is in a standby state**

All signals except the followings are recognized as OFF signals inside of the inverter.

1. My function-S trigger signal
2. Emergency stop and reset command

Note: Don't use the input terminals assigned the above functions in the My function-S. Or the My function-S permission, the emergency stop function, etc might not activate normally.

- **In case that My function-S is enabled**

If the input terminals are turned on, the inverter operates by the My function-S.

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## 5. Examples of setting

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This chapter gives some examples of setting.

Note that the settings described below are examples and there are other ways to set a function for some examples.

### • Examples of the setting of the combined terminal function

Example 1: Performing 2 functions by 1 terminal.

Standby signal is connected with Terminal F (Forward run command). (F+ST)

Standby signal is connected with Terminal R (Reverse run command). (R+ST)

Example 2: Performing 2 functions by 1 terminal.

Performing standby and forward run command by the Terminal S1. (ST+F)

Example 3: Performing 3 functions by 1 terminal.

Performing standby, forward run command, and preset-speed command 1 by the Terminal S1. (ST+F+SS1)

Example 4: Output signal by logical product of 2 functions.

Output the signal on the condition of detecting both a low-speed signal and a small current signal from Terminal OUT.

### • Examples of the setting of the relay sequence function

Example 5: Operation with a combination of 2 input signals

Forward run: Either input terminal is turned on.

Reverse run: Both input terminals are turned on.

Stop : Both input terminals are turned off.

Example 6: Operation with push type switch.

Example 7: Automatic stop by some conditions.

Automatically stop on the condition of 5Hz or less of output frequency and 120% or more of output current.

■ Examples of the setting of the combined terminal function

<Example 1: Performing 2 functions by 1 terminal>

Standby signal is connected with Terminal F (Forward run command). (F+ST)

Standby signal is connected with Terminal R (Reverse run command). (R+ST)

See Fig 5-1 for wiring diagram and Fig.5-2 for block diagram.

Assign the forward run command (F) to Terminal F and reverse run command (R) to Terminal R. (Default setting)

Assign the standby (ST) to virtual input terminal.

If the Terminal F (R) is turned on, the virtual terminal is turned on automatically.

F (R) +ST functions are performed.

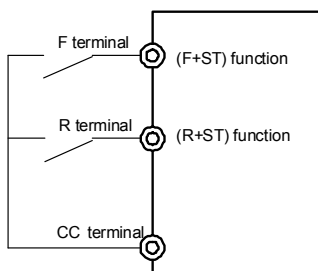


Fig. 5-1 Wiring diagram for Example 1

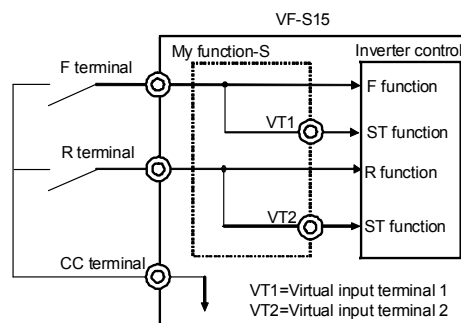


Fig. 5-2 Block diagram for Example 1

Parameter setting

		Title	Parameter setting	Description
Prior setting		<i>A977</i>	0 (Default)	Set to "Disabled" of the My function-S.
		<i>F111</i>	2 (Default)	Assign the forward run command to the Terminal F.
		<i>F112</i>	4 (Default)	Assign the reverse run command to the Terminal R.
		<i>A973</i>	6	Assign the standby to the virtual input terminal 1.
		<i>A974</i>	6	Assign the standby to the virtual input terminal 2.
Unit 1	Step 1	<i>A900</i>	1	Read Terminal F input signal (LD F).
	Step 2	<i>A901</i>	0 (Default)	NOP command (no operation)
		<i>A902</i>	0 (Default)	
	Step 3	<i>A903</i>	0 (Default)	NOP command (no operation)
		<i>A904</i>	0 (Default)	
Step 4	<i>A905</i>	2 1	Transfer the result to the virtual input terminal 1.	
Unit 2	Step 1	<i>A906</i>	2	Read Terminal R input signal (LD R).
	Step 2	<i>A907</i>	0 (Default)	NOP command (no operation)
		<i>A908</i>	0 (Default)	
	Step 3	<i>A909</i>	0 (Default)	NOP command (no operation)
		<i>A910</i>	0 (Default)	
Step 4	<i>A911</i>	2 2	Transfer the result to the virtual input terminal 2.	
-	-	<i>A977</i>	2	Set to "My function-S always ON".

<Example 2: Performing 2 functions by 1 terminal>

Performing standby and forward run command by the Terminal S1. (ST+F)

See Fig 5-3 for wiring diagram and Fig.5-4 for block diagram.

Assign the standby (ST) to Terminal S1.

Assign the forward run command (F) to virtual input terminal 1.

If the Terminal S1 is turned on, the virtual terminal is turned on automatically.

ST+F functions are performed.

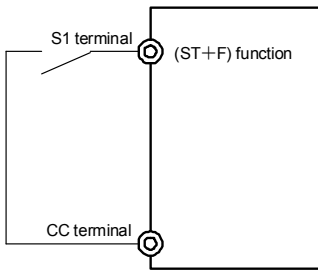


Fig. 5-3 Wiring diagram for Example 2

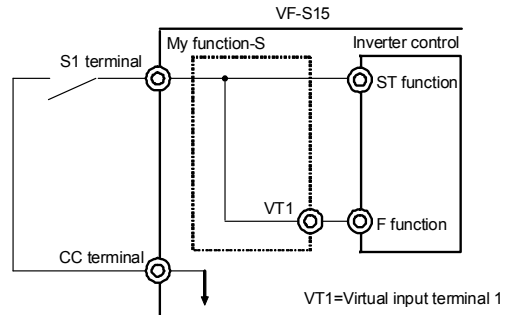


Fig. 5-4 Block diagram for Example 2

Parameter setting

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	0 (Default)	Set to "Disabled" of the My function-S.
		<i>F114</i>	6	Assign the standby to the Terminal S1.
		<i>A973</i>	2	Assign the forward run command to the virtual input terminal 1.
Unit 1	Step 1	<i>A900</i>	4	Read Terminal S1 input signal (LD S1).
	Step 2	<i>A901</i>	0 (Default)	NOP command (no operation)
		<i>A902</i>	0 (Default)	
	Step 3	<i>A903</i>	0 (Default)	NOP command (no operation)
		<i>A904</i>	0 (Default)	
Step 4	<i>A905</i>	21	Transfer the result to the virtual input terminal 1.	
-	-	<i>A977</i>	2	Set to "My function-S always ON".

<Example 3: Performing 3 functions by 1 terminal>

Performing standby, forward run command and preset-speed command 1 by the Terminal S1. (ST+F+SS1)

See Fig 5-5 for wiring diagram and Fig.5-6 for block diagram.

Assign the standby (ST) to Terminal S1.

Assign the forward run command (F) to virtual input terminal 1.

Assign the preset-speed command 1 (SS1) to virtual input terminal 2.

If the Terminal S1 is turned on, the virtual terminals are turned on automatically.

ST+F+SS1 functions are performed.

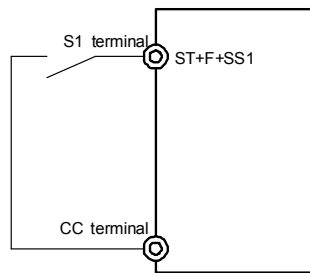


Fig. 5-5 Wiring diagram for Example 3

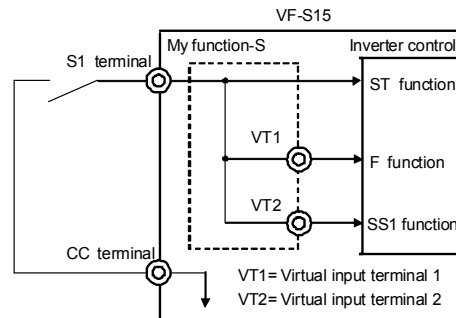


Fig. 5-6 Block diagram for Example 3

Parameter setting

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F114</i>	<i>6</i>	Assign the standby to the Terminal S1.
		<i>A973</i>	<i>2</i>	Assign the forward run command to the virtual input terminal 1.
		<i>A974</i>	<i>10</i>	Assign the preset-speed command 1 to the virtual input terminal 2.
Unit 1	Step 1	<i>A900</i>	<i>4</i>	Read Terminal S1 input signal (LD S1).
	Step 2	<i>A901</i>	<i>1</i>	Transfer command
		<i>A902</i>	<i>21</i>	Transfer the result to the virtual input terminal 1.
	Step 3	<i>A903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A904</i>	<i>0</i> (Default)	
Step 4	<i>A905</i>	<i>22</i>	Transfer the result to the virtual input terminal 2.	
-	-	<i>A977</i>	<i>2</i>	Set to "My function-S always ON".



<Example 4: Output signal by logical product of 2 functions>

Output the signal on the condition of detecting both a low-speed signal and a small current signal from Terminal OUT.

See Fig 5-7 for block diagram.

Compute by logical product (AND) of a low-speed signal and a small current signal.

Transfer the result to the My function-S output1, and output signal from Terminal OUT.

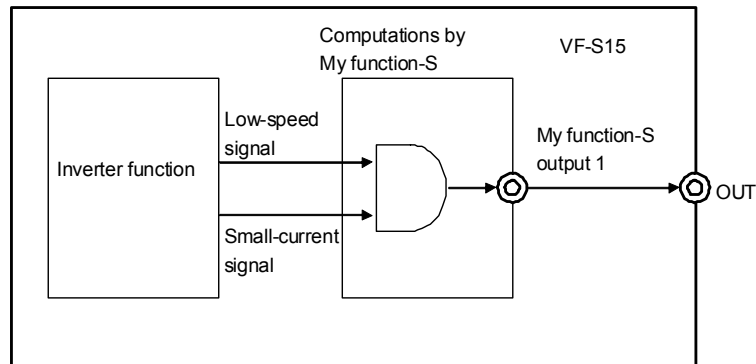


Fig. 5-7 Block diagram for Example 4

Parameter setting

		Title	Parameter setting	Description
Prior setting	-	A977	0 (Default)	Set to "Disabled" of the My function-S.
		F131	222	Assign the My function-S output 1 to the Terminal OUT.
Unit 1	Step 1	A900	1004	Read the low speed signal (LD LOW)
	Step 2	A901	3	AND command
		A902	1026	The logical product of low speed signal and small current signal.
	Step 3	A903	0 (Default)	NOP command (no operation)
		A904	0 (Default)	
Step 4	A905	1222	Transfer the logical product to the My function-S output 1.	
-	-	A977	2	Set to "My function-S always ON".

■ Examples of the setting of the relay sequence function

This section gives an explanation of the relay sequence function using ladder diagrams. One unit consists of maximum 4 steps. If your sequence consists of 5 steps or more, you need to change the composition to 4 steps or less.

<Example 5: Operation with a combination of 2 input signals>

Input terminals are used as ON/OFF signal like a PLC in this example.

Forward run: Either input terminal is turned on.

Reverse run: Both input terminals are turned on.

Stop : Both input terminas are turned off.

See Fig 5-8 for wiring diagram and timing chart.

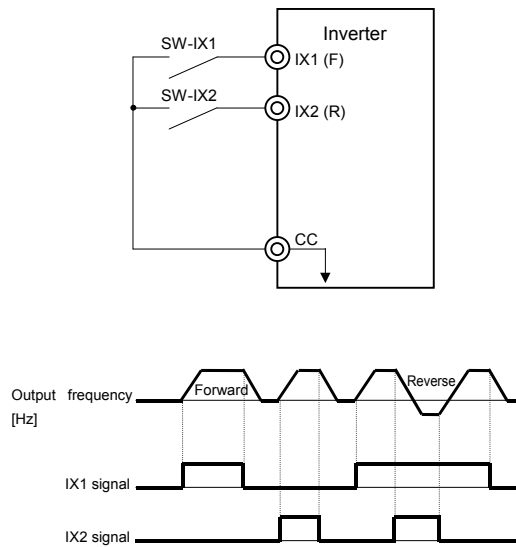
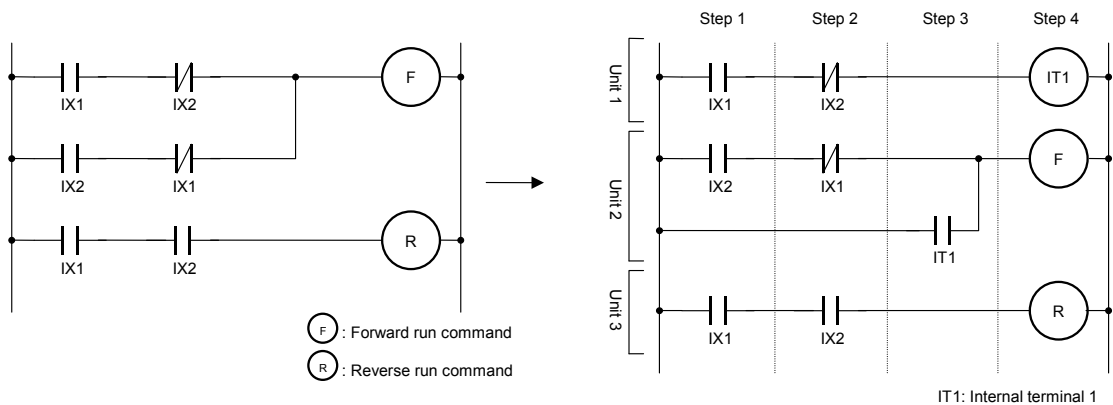


Fig. 5-8 Wiring diagram and timing chart for Example 5

Following is the ladder diagram.

The left is general sequence. The sequence of forward run command consists of 5 steps.

You need to change the composition to 4 steps as the right for the My function-S.



## Parameter setting

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F111</i>	<i>0</i>	Assign the "no function" to the Terminal F. Use the Terminal F as a simple input terminal (IX1).
		<i>F112</i>	<i>0</i>	Assign the "no function" to the Terminal R. Use the Terminal R as a simple input terminal (IX1).
		<i>A973</i>	<i>2</i>	Assign the forward run command to the virtual input terminal 1 (VT1).
		<i>A974</i>	<i>4</i>	Assign the reverse run command to the virtual input terminal 2 (VT2).
Unit 1	Step 1	<i>A900</i>	<i>1</i>	Read IX1 (F) terminal input signal. (LD IX1)
	Step 2	<i>A901</i>	<i>4</i>	ANDN command $(IX1 \cap \overline{IX2})$
		<i>A902</i>	<i>2</i>	
	Step 3	<i>A903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A904</i>	<i>0</i> (Default)	
Step 4	<i>A905</i>	<i>25</i>	Transfer the result to the internal terminal 1. $(IX1 \cap \overline{IX2} \Rightarrow IT1)$	
Unit 2	Step 1	<i>A906</i>	<i>2</i>	Read IX2 (R) terminal input signal. (LD IX2)
	Step 2	<i>A907</i>	<i>4</i>	ANDN command $(IX2 \cap \overline{IX1})$
		<i>A908</i>	<i>1</i>	
	Step 3	<i>A909</i>	<i>5</i>	OR command $((IX2 \cap \overline{IX1}) \cup IT1)$
		<i>A910</i>	<i>25</i>	
Step 4	<i>A911</i>	<i>21</i>	Transfer the result to the virtual input terminal 1. $((IX2 \cap \overline{IX1}) \cup IT1 \Rightarrow VT1)$	
Unit 3	Step 1	<i>A912</i>	<i>1</i>	Read IX1 (F) terminal input signal. (LD IX1)
	Step 2	<i>A913</i>	<i>3</i>	AND command $(IX1 \cap IX2)$
		<i>A914</i>	<i>2</i>	
	Step 3	<i>A915</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A916</i>	<i>0</i> (Default)	
Step 4	<i>A917</i>	<i>22</i>	Transfer the result to the virtual input terminal 2. $(IX2 \cap IX1 \Rightarrow VT2)$	
-	-	<i>A977</i>	<i>2</i>	Set to "My function-S always ON".

NE (mismatch) command enables to combine the steps of unit 1 and 2.

If the signal of input terminal 1 and 2 don't match, forward run command is valid.

		Title	Parameter setting	Description
Unit 1	Step 1	<i>A900</i>	<i>1</i>	Read IX1 (F) terminal input signal. (LD IX1)
	Step 2	<i>A901</i>	<i>8</i>	NEQ command $((IX1 \cap \overline{IX2}) \cup (\overline{IX1} \cap IX2))$
		<i>A902</i>	<i>2</i>	
	Step 3	<i>A903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A904</i>	<i>0</i> (Default)	
Step 4	<i>A905</i>	<i>2 1</i>	Transfer the result to the virtual input terminal 1. $((IX1 \cap \overline{IX2}) \cup (\overline{IX1} \cap IX2)) \Rightarrow VT1$	

<Example 6: Operation with push type switch>

Start and stop by push type (non self-hold type) switches.

Start with the forward run command (reverse run command), and stop with the stop command.

See Fig 5-9 for wiring diagram and timing chart.

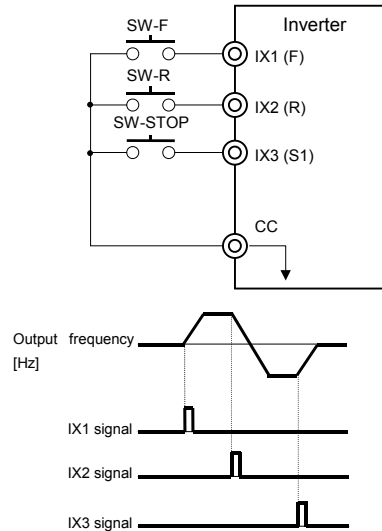


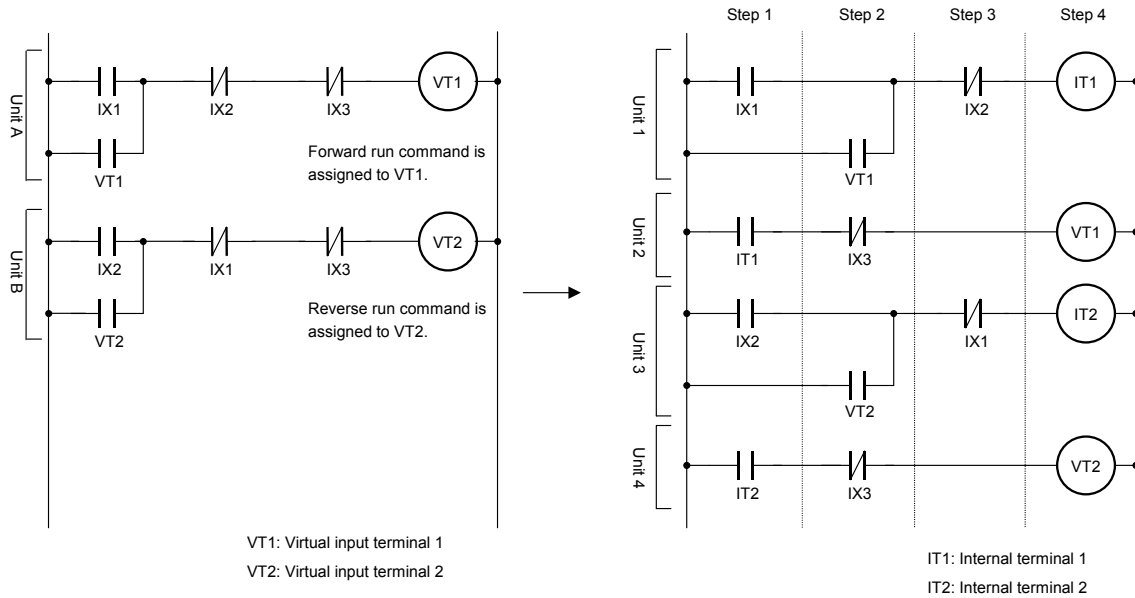
Fig. 5-9 Wiring diagram and timing chart for Example 6

Construct self-hold circuit for each forward run command and reverse run command. Break the self-hold by the other command or a stop command.

Following is the ladder diagram.

The left is general sequence of self-hold circuit. Each unit consists of 5 steps.

You need to change the unit A and B to two units each and make composition of 4 setps according to the My function-S.



### Parameter setting

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	0 (Default)	Set to "Disabled" of the My function-S.
		<i>F111</i>	0	Assign the "no function" to the Terminal F. Use the Terminal F as a simple input terminal (IX1).
		<i>F112</i>	0	Assign the "no function" to the Terminal R. Use the Terminal R as a simple input terminal (IX2).
		<i>F114</i>	0	Assign the "no function" to the Terminal S1. Use the Terminal S1 as a simple input terminal (IX3).
		<i>A973</i>	2	Assign the forward run command to the virtual input terminal 1 (VT1)
		<i>A974</i>	4	Assign the reverse run command to the virtual input terminal 2 (VT2)
Unit 1	Step 1	<i>A900</i>	1	Read IX1 (F) terminal input signal. (LD IX1)
	Step 2	<i>A901</i>	5	OR command (IX1 U VT1) self-hold circuit
		<i>A902</i>	2 1	
	Step 3	<i>A903</i>	4	ANDN command $(IX1 U VT1 \cap \overline{IX2})$
<i>A904</i>		2		
Step 4	<i>A905</i>	25	Transfer the result to the internal terminal 1 $(IX1 U VT1 \cap \overline{IX2} \Rightarrow IT1)$	
Unit 2	Step 1	<i>A906</i>	25	Read IT1 (Internal terminal 1) signal (LD IT1).
	Step 2	<i>A907</i>	4	ANDN command $(IT1 \cap \overline{IX3})$
		<i>A908</i>	4	
	Step 3	<i>A909</i>	0 (Default)	NOP command (no operation)
		<i>A910</i>	0 (Default)	
Step 4	<i>A911</i>	2 1	Transfer the result to the virtual input terminal 1 (VT1) $(IT1 \cap \overline{IX3} \Rightarrow VT1)$	

Unit 3	Step 1	<i>R912</i>	<i>2</i>	Read IX2(R) terminal input signal. (LD IX2)
	Step 2	<i>R913</i>	<i>5</i>	OR command $(IX2 \cup VT2)$ self-hold circuit
		<i>R914</i>	<i>22</i>	
	Step 3	<i>R915</i>	<i>4</i>	ANDN command $(IX2 \cup VT2 \cap \overline{IX1})$
<i>R916</i>		<i>1</i>		
Step 4	<i>R917</i>	<i>26</i>	Transfer the result to the internal terminal 2 (IT2) $(IX2 \cup VT2 \cap \overline{IX1} \Rightarrow IT2)$	
Unit 4	Step 1	<i>R935</i>	<i>26</i>	Read IT2 (Internal terminal 2) signal (LD IT2)
	Step 2	<i>R936</i>	<i>4</i>	ANDN command $(IT2 \cap \overline{IX3})$
		<i>R937</i>	<i>4</i>	
	Step 3	<i>R938</i>	<i>0</i> (Default)	NOP command (no operation)
<i>R939</i>		<i>0</i> (Default)		
Step 4	<i>R940</i>	<i>22</i>	Transfer the result to the virtual input terminal 2 (VT2) $(IT2 \cap \overline{IX3} \Rightarrow VT2)$	
-	-	<i>R977</i>	<i>2</i>	Set to "My function-S always ON".

<Example 7: Automatic stop by some conditions>

Automatically stop on the condition of 5Hz or less of output frequency and 120% or more of output current.

Start by push type (non self-hold type) switch.

See Fig 5-10 for wiring diagram and timing chart.

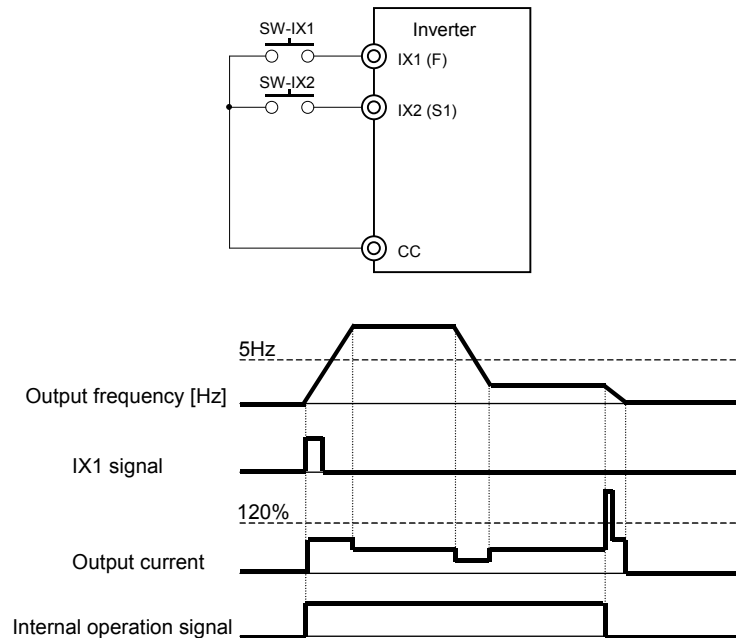


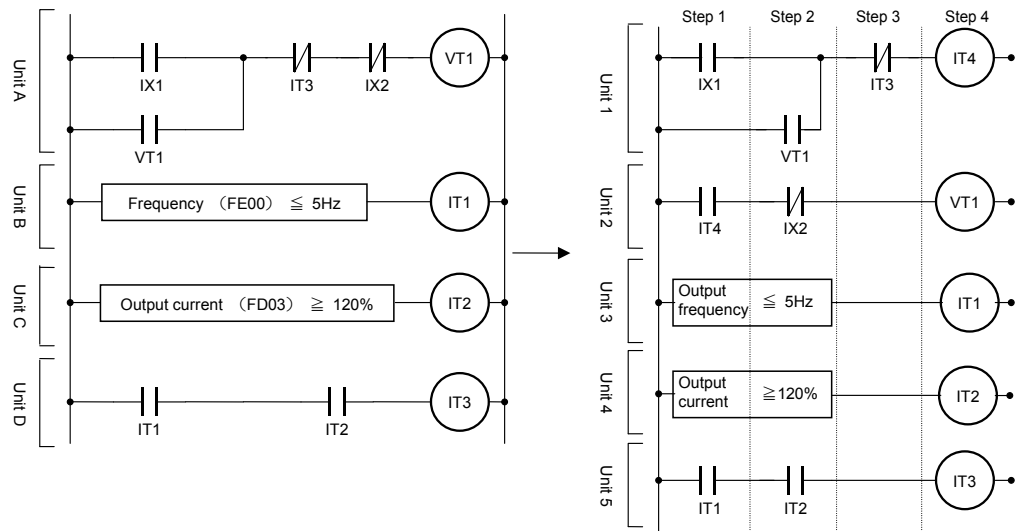
Fig. 5-10 Wiring diagram and timing chart for Example 7

- Terminal F is used as forward command with push type (non self-hold type) switch.
- Break the forward run command in case that the output frequency is 5Hz or less and the output current is 120% or less of the rated.
- Forced stop by input signal from Terminal S1 (by breaking forward run command).

Following is the ladder diagram.

The left is general sequence of self-hold circuit. Unit A consists of 5 steps.

You need to change the unit to two units, and make the composition of 4 steps according to the My function-S



VT1: Virtual input terminal (forward run command)  
 IT1: Internal terminal 1  
 IT2: Internal terminal 2  
 IT3: Internal terminal 3  
 IT4: Internal terminal 4

Parameter setting by the ladder diagram

		Title	Parameter setting	Description
Prior setting	-	<i>R977</i>	<i>0</i> (Default)	Set My function-S to "Disabled".
		<i>F111</i>	<i>0</i>	Assign the "no function" to the Terminal F. Use the Terminal F as a simple input terminal (IX1).
		<i>F114</i>	<i>0</i>	Assign the "no function" to the Terminal S1. Use the Terminal S1 as a simple input terminal (IX2).
		<i>R918</i>	<i>120</i>	Set the limit at 120% to use it as a reference value when comparing and computing currents.
		<i>R923</i>	<i>5</i>	Set the limit at 5Hz to use it as a reference value when comparing and computing frequencies.
		<i>R973</i>	<i>2</i>	Assign the forward run command to the virtual input terminal 1 (VT1)
Unit 1	Step 1	<i>R900</i>	<i>1</i>	Read IX1(F) terminal input signal (LD IX1)
	Step 2	<i>R901</i>	<i>5</i>	OR command (IX1UVT1)
		<i>R902</i>	<i>21</i>	
	Step 3	<i>R903</i>	<i>4</i>	ANDN command (IX1UVT1∩IT3)
<i>R904</i>		<i>27</i>		
Step 4	<i>R905</i>	<i>28</i>	Transfer the result to the internal terminal 4 (IT4) (IX1UVT1∩IT3 ⇒ IT4)	
Unit 2	Step 1	<i>R906</i>	<i>28</i>	Read IT4(Internal terminal 4) signal (LD IT4)
	Step 2	<i>R907</i>	<i>4</i>	ANDN command (IT4∩IX2)
		<i>R908</i>	<i>4</i>	
	Step 3	<i>R909</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R910</i>	<i>0</i> (Default)	
Step 4	<i>R911</i>	<i>21</i>	Transfer the result to the virtual input terminal 1 (VT1). (IT4∩IX2 ⇒ VT1)	



		Title	Parameter setting	Description
Unit 3	Step 1	<i>R912</i>	<i>3000</i>	Read the output frequency (LD Output frequency)
	Step 2	<i>R913</i>	<i>12</i>	LE command (Comparison to 5Hz)
		<i>R914</i>	<i>923</i>	
	Step 3	<i>R915</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R916</i>	<i>0</i> (Default)	
Step 4	<i>R917</i>	<i>25</i>	Transfer the result to the internal terminal 1 (IT1) (Comparison to 5Hz ⇒ IT1)	
Unit 4	Step 1	<i>R935</i>	<i>2003</i>	Read the output current (LD Output current)
	Step 2	<i>R936</i>	<i>10</i>	GE command (Comparison to 120%)
		<i>R937</i>	<i>918</i>	
	Step 3	<i>R938</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R939</i>	<i>0</i> (Default)	
Step 4	<i>R940</i>	<i>26</i>	Transfer the result to the internal terminal 2 (IT2) (Comparison to 120% ⇒ IT2)	
Unit 5	Step 1	<i>R941</i>	<i>25</i>	Read IT1 (Internal terminal 1) signal (LD IT1)
	Step 2	<i>R942</i>	<i>3</i>	AND command (IT1∩IT2)
		<i>R943</i>	<i>26</i>	
	Step 3	<i>R944</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R945</i>	<i>0</i> (Default)	
Step 4	<i>R946</i>	<i>27</i>	Transfer the result to the internal terminal 3 (IT3) (IT1∩IT2 ⇒ IT3)	
-	-	<i>R977</i>	<i>2</i>	Set to "My function-S always ON".

## Appendix 1 Table of My function-S parameters

Table 8-1 is the My function-S parameters.

Table 8-1 Table of My function-S parameters

Title	Function	Adjustment range	Default setting
<i>A900</i>	Input function target 11	Input terminal number <i>0</i> : No function <i>1</i> : Terminal F <i>2</i> : Terminal R <i>3</i> : Terminal RES <i>4</i> : Terminal S1 <i>5</i> : Terminal S2 <i>6</i> : Terminal S3 <i>7</i> : Terminal VIB <i>8</i> : Terminal VIA <i>9</i> to <i>20</i> : - <i>21</i> to <i>24</i> : Virtual input terminal 1 to 4 <i>25</i> to <i>32</i> : Internal terminal 1 to 8 <i>918</i> to <i>934</i> : My function-S output data number <i>1000</i> to <i>1255</i> : Output selection number (Note 1) <i>2000</i> to <i>2099</i> : FD00-FD99 (Note 2) <i>3000</i> to <i>3099</i> : FE00-FE99 (Note 2)	<i>0</i>
<i>A901</i>	Input function command 12	<i>0</i> : NOP (no operation) <i>1</i> : ST (move) <i>2</i> : STN (move (inversion)) <i>3</i> : AND (logical product (A∩B)) <i>4</i> : ANDN (logical product (A∩B)) <i>5</i> : OR (logical sum (A∪B)) <i>6</i> : ORN (logical sum (A∪B)) <i>7</i> : EQ (equal) <i>8</i> : NE (not equal) <i>9</i> : GT (greater than) <i>10</i> : GE (greater or equal) <i>11</i> : LT (less than) <i>12</i> : LE (less or equal) <i>13</i> : ASUB (absolute) <i>14</i> : ON (on delay timer) <i>15</i> : OFF (off delay timer) <i>16</i> : COUNT1 (counter 1) <i>17</i> : COUNT2 (counter 2) <i>18</i> : HOLD (hold) <i>19</i> : SET (set) <i>20</i> : RESET (reset) <i>21</i> : CLR (clear) <i>22</i> : CLRN (clear (inversion)) <i>23</i> : ON2 (on delay timer 2) <i>24</i> : OFF2 (off delay timer 2)	<i>0</i>
<i>A902</i>	Input function target 12	Same as <i>A900</i>	<i>0</i>
<i>A903</i>	Input function command 13	Same as <i>A901</i>	<i>0</i>
<i>A904</i>	Input function target 13	Same as <i>A900</i>	<i>0</i>
<i>A905</i>	Output function assigned object 1	Same as <i>A900</i>	<i>0</i>
<i>A906</i>	Input function target 21	Same as <i>A900</i>	<i>0</i>
<i>A907</i>	Input function command 22	Same as <i>A901</i>	<i>0</i>
<i>A908</i>	Input function target 22	Same as <i>A900</i>	<i>0</i>
<i>A909</i>	Input function command 23	Same as <i>A901</i>	<i>0</i>
<i>A910</i>	Input function target 23	Same as <i>A900</i>	<i>0</i>
<i>A911</i>	Output function assigned object 2	Same as <i>A900</i>	<i>0</i>

Note 1: See Table 8-6 "Output terminal functions" in Appendix 4.

Note 2: See Table 8-7 "Data that My function-S can handle" in Appendix 5.

Title	Function	Adjustment range	Default setting
A912	Input function target 31	Same as A900	0
A913	Input function command 32	Same as A901	0
A914	Input function target 32	Same as A900	0
A915	Input function command 33	Same as A901	0
A916	Input function target 33	Same as A900	0
A917	Output function assigned object 3	Same as A900	0
A918	Output percent data 1	0.00~200.0%	0.00
A919	Output percent data 2	0.00~200.0%	0.00
A920	Output percent data 3	0.00~200.0%	0.00
A921	Output percent data 4	0.00~200.0%	0.00
A922	Output percent data 5	0.00~200.0%	0.00
A923	Output frequency data 1	0.0~500.0Hz	0.0
A924	Output frequency data 2	0.0~500.0Hz	0.0
A925	Output frequency data 3	0.0~500.0Hz	0.0
A926	Output frequency data 4	0.0~500.0Hz	0.0
A927	Output frequency data 5	0.0~500.0Hz	0.0
A928	Output time data 1	0.01~600.0s	0.01
A929	Output time data 2	0.01~600.0s	0.01
A930	Output time data 3	0.01~600.0s	0.01
A931	Output time data 4	0.01~600.0s	0.01
A932	Output time data 5	0.01~600.0s	0.01
A933	Number of times of output data 1	0~9999 times	0
A934	Number of times of output data 2	0~9999 times	0
A935	Input function target 41	Same as A900	0
A936	Input function command 42	Same as A901	0
A937	Input function target 42	Same as A900	0
A938	Input function command 43	Same as A901	0
A939	Input function target 43	Same as A900	0
A940	Output function assigned object 4	Same as A900	0
A941	Input function target 51	Same as A900	0
A942	Input function command 52	Same as A901	0
A943	Input function target 52	Same as A900	0
A944	Input function command 53	Same as A901	0
A945	Input function target 53	Same as A900	0
A946	Output function assigned object 5	Same as A900	0
A947	Input function target 61	Same as A900	0
A948	Input function command 62	Same as A901	0
A949	Input function target 62	Same as A900	0
A950	Input function command 63	Same as A901	0
A951	Input function target 63	Same as A900	0
A952	Output function assigned object 6	Same as A900	0
A953	Input function target 71	Same as A900	0
A954	Input function command 72	Same as A901	0
A955	Input function target 72	Same as A900	0
A956	Input function command 73	Same as A901	0
A957	Input function target 73	Same as A900	0
A958	Output function assigned object 7	Same as A900	0
A973	Virtual input terminal selection 1	0-203 (Note3)	0
A974	Virtual input terminal selection 2	0-203 (Note3)	0
A975	Virtual input terminal selection 3	0-203 (Note3)	0
A976	Virtual input terminal selection 4	0-203 (Note3)	0
A977	My function-S selection	0: Disabled 1: My function-S +permission signal 2: My function-S always ON	0

Note 3: See Table 8-4 "Input terminal functions" in Appendix 3.

## Appendix 2 Computing functions

Table 8-2 is the computing functions provided by the My function-S.

Table 8-2 Computing functions

Input function command	Computation name	Function	Description
0	NOP	No operation	Unnecessary sections (columns) of the My function-S program.
1	ST	Transfer	Used mainly to read data.
2	STN	Transfer (inversion)	Used mainly to invert data and read inverted data.
3	AND	Logical product	Logical product of data ( $A \cap B$ )
4	ANDN	Logical product (inversion of right side)	Logical product of data ( $A \cap \bar{B}$ )
5	OR	Logical sum	Logical product of data ( $A \cup B$ )
6	ORN	Logical sum (inversion of right side)	Logical product of data ( $A \cup \bar{B}$ )
7	EQ	Comparison of data for matching	Compare two pieces of data, and puts out a 1 if they match each other or a 0 if not.
8	NE	Comparison of data for mismatch	Compare two pieces of data, and puts out a 0 if they match each other or a 1 if not.
9	GT	Comparison of sizes ( $A > B$ )	Compare the size of two pieces of data ( $A\_GT\_B$ ), and puts out a 1 if A is more than B ( $A > B$ ) or a 0 if A is equal to or less than B ( $A \leq B$ )
10	GE	Comparison of sizes ( $A \geq B$ )	Compare the size of two pieces of data ( $A\_GT\_B$ ), and puts out a 1 if A is equal to or more than B ( $A \geq B$ ) or a 0 if A is less than B ( $A < B$ )
11	LT	Comparison of sizes ( $A < B$ )	Compare the size of two pieces of data ( $A\_GT\_B$ ), and puts out a 1 if A is less than B ( $A < B$ ) or a 0 if A is equal to or more than B ( $A \geq B$ )
12	LE	Comparison of sizes ( $A \leq B$ )	Compare the size of two pieces of data ( $A\_GT\_B$ ), and puts out a 1 if A is equal to or less than B ( $A \leq B$ ) or a 0 if A is more than B ( $A > B$ )
13	ASUB	Absolute value of difference	Put out the absolute value of the difference between two pieces of data. $ A - B $
14(Note 1)	ON (ON timer)	ON delay	Delays the timing of turning data ON by the time specified with $R928$ to $R932$ . Put out the data simultaneously with turning on the power in case the signal is already on.
15(Note 1)	OFF (OFF timer)	OFF delay	Delay the timing of turning data OFF by the time specified with $R928$ to $R932$ . Put out the data simultaneously with turning on the power in case the signal is off.
15(Note 1)	COUNT1	Counter	Count the number of input pulses (count the number of rising edges) and put out a 1 when reached the pulse count specified with $R933$ .
17(Note 1)	COUNT2	Counter	Count the number of input pulses (count the number of rising edges) and put out a 1 when reached the pulse count specified with $F934$ .
18(Note 1)	HOLD	Peak hold	Put out the peak input value.
19(Note 1)	SET	Set	Set data.
20(Note 1)	RESET	Reset	Reset data.
21(Note 1)	CLR	Clear	Clear data.

$\overline{22}$ (Note 1)	CLRN	Clear (Inversion)	Clear data (Inversion).
$\overline{23}$	ON2 (ON timer 2)	ON delay	Delay the timing of turning data on by the time specified with $\overline{A928}$ to $\overline{A932}$ . Delay the timing of data output by specified time in case the signal is on when the power is turned on.
$\overline{24}$	OFF2 (OFF timer 2)	OFF delay	Delay the timing of turning data off by the time specified with $\overline{A928}$ to $\overline{A932}$ . Delay the timing of data output by specified time in case the signal is off when the power is turned on.

Note 1: For details of computing functions  $\overline{14}$  to  $\overline{24}$ , see Appendix 6.

## Appendix 3

### Input terminal function selection parameters

Table 8-3 is the function setting of 12 input terminals (including 4 virtual input terminals).

Table 8-4 is the input terminal functions.

Table 8-3 Input terminal function selection parameters

Title	Communication No.	Function	Adjustment range (Note 1)	Default setting
<i>F 104</i>	0104	Always active function selection 1	<i>0-153</i>	<i>0</i>
<i>F 108</i>	0108	Always active function selection 2	<i>0-153</i>	<i>0</i>
<i>F 110</i>	0110	Always active function selection 3	<i>0-153</i>	<i>6</i>
<i>F 111</i>	0111	Input terminal selection 1A (F)	<i>0-203</i>	<i>2</i>
<i>F 112</i>	0112	Input terminal selection 2A (R)	<i>0-203</i>	<i>4</i>
<i>F 113</i>	0113	Input terminal selection 3A (RES)	<i>0-203</i>	<i>8</i>
<i>F 114</i>	0114	Input terminal selection 4A (S1)	<i>0-203</i>	<i>10</i>
<i>F 115</i>	0115	Input terminal selection 5 (S2)	<i>0-203</i>	<i>12</i>
<i>F 116</i>	0116	Input terminal selection 6 (S3)	<i>0-203</i>	<i>14</i>
<i>F 117</i>	0117	Input terminal selection 7 (VIB)	<i>0-203</i>	<i>16</i>
<i>F 118</i>	0118	Input terminal function selection 8 (VIA)	<i>8-55</i>	<i>24</i>
<i>F 151</i>	0151	Input terminal function selection 1B (F)	<i>0-203</i>	<i>0</i>
<i>F 152</i>	0152	Input terminal function selection 2B (R)	<i>0-203</i>	<i>0</i>
<i>F 153</i>	0153	Input terminal selection 3B (RES)	<i>0-203</i>	<i>0</i>
<i>F 154</i>	0154	Input terminal selection 4B (S1)	<i>0-203</i>	<i>0</i>
<i>F 155</i>	0155	Input terminal selection 1C (F)	<i>0-203</i>	<i>0</i>
<i>F 156</i>	0156	Input terminal selection 2C (R)	<i>0-203</i>	<i>0</i>
<i>A973</i>	A973	Virtual input terminal selection 1	<i>0-203</i>	<i>0</i>
<i>A974</i>	A974	Virtual input terminal selection 2	<i>0-203</i>	<i>0</i>
<i>A975</i>	A975	Virtual input terminal selection 3	<i>0-203</i>	<i>0</i>
<i>A976</i>	A976	Virtual input terminal selection 4	<i>0-203</i>	<i>0</i>

Note 1: For an explanation of the adjustment range, see Table 8-4 "Input terminal functions."

Table 8-4 Input terminal functions

Parameter setting		Function	Parameter setting		Function
Positive logic	Negative logic		Positive logic	Negative logic	
0	1	No function	88	89	Frequency UP
2	3	F: Forward run command	90	91	Frequency DOWN
4	5	R: Reverse run command	92	93	Clear frequency UP/DOWN
6	7	ST: Standby	96	97	Coast stop command
8	9	RES: Reset command	98	99	Forward/reverse selection
10	11	SS1: Preset-speed command 1	100	101	Run/stop command
12	13	SS2: Preset-speed command 2	104	105	Frequency setting mode forced switching
14	15	SS3: Preset-speed command 3	106	107	Frequency setting mode terminal block
16	17	SS4: Preset-speed command 4	108	109	Command mode terminal block
18	19	Jog run mode	110	111	Parameter editing permission
20	21	Emergency stop by external signal	120	121	Fast stop command 1
22	23	DC braking command	122	123	Fast stop command 2
24	25	2nd acceleration/deceleration	134	135	Traverse permission signal
26	27	3rd acceleration/deceleration	136	137	Low voltage operation signal
28	29	2nd V/F control switching	140	141	Forward deceleration
32	33	2nd stall prevention level	142	143	Forward stop
36	37	PID control prohibition	144	145	Reverse deceleration
46	47	External thermal error input	146	147	Reverse stop
48	49	Forced local from communication	148	149	Factory specific coefficient (Note1)
50	51	Operation hold (hold of 3-wire operation)	150	151	Factory specific coefficient (Note1)
52	53	PID integral/differential clear	152	153	No.2 motor switching (AD2+VF2+OCS2)
54	55	PID characteristics switching	158	159	Reset Command 2
56	57	Forced run operation	200	201	Parameter editing prohibition
58	59	Fire speed operation	202	203	Parameter reading prohibition
60	61	Acceleration/deceleration suspend signal			
62	63	Power failure synchronized signal			
64	65	My function-S trigger signal			
70	71	Factory specific coefficient (Note1)			
74	75	Integrating wattmeter(kWh) display clear			
76	77	Trace back trigger signal			
78	79	Light-load high-speed operation prohibitive signal			
80	81	Holding of RY-RC terminal output			
82	83	Holding of OUT terminal output			

Note1: Do not set the value. The function is for manufacturer setting.

## Appendix 4

### Output terminal function selection parameters

Table 8-5 is the function setting of 3 output terminals.

Table 8-6 is the output terminal functions.

Table 8-5 Output terminal function selection parameters

Title	Communication No.	Function	Adjustment range (Note 1)	Default setting
<i>F 130</i>	0130	Output terminal selection 1A (RY-RC)	<i>0-255</i>	<i>4</i>
<i>F 131</i>	0131	Output terminal selection 2A (OUT)	<i>0-255</i>	<i>6</i>
<i>F 132</i>	0132	Output terminal selection 3 (FL)	<i>0-255</i>	<i>10</i>
<i>F 137</i>	0137	Output terminal selection 1B (RY-RC)	<i>0-255</i>	<i>255</i>
<i>F 138</i>	0138	Output terminal selection 2B (OUT)	<i>0-255</i>	<i>255</i>

Note 1: For an explanation of the adjustment range, see Table 8-6 "Output terminal functions."

Table 8-6 Output terminal functions

Select the positive-logic of the output terminal functions for the My function-S.

Note that negative-logic settings cannot be used for the output terminals.

Input setting	Parameter setting	Function	Operation output specifications (in case of positive logic)
<i>1000</i>	<i>0</i>	Frequency lower limit	ON: Output frequency is more than <i>LL</i> OFF: <i>LL</i> or less
<i>1002</i>	<i>2</i>	Frequency upper limit	ON: Output frequency is <i>UL</i> or more OFF: less than <i>UL</i>
<i>1004</i>	<i>4</i>	Low-speed detection signal	ON: Output frequency is <i>F 100</i> or more OFF: less than <i>F 100</i>
<i>1006</i>	<i>6</i>	Output frequency attainment signal (acceleration/deceleration completed)	ON: Output frequency is within command frequency $\pm$ <i>F 102</i> OFF: more than command frequency $\pm$ <i>F 102</i>
<i>1008</i>	<i>8</i>	Set frequency attainment signal	ON: Output frequency is within <i>F 101</i> $\pm$ <i>F 102</i> OFF: more than <i>F 101</i> $\pm$ <i>F 102</i>
<i>1010</i>	<i>10</i>	Fault signal (trip output)	ON: Inverter tripped OFF: Inverter not tripped
<i>1014</i>	<i>14</i>	Over-current detection pre-alarm	ON: Output current is <i>F 601</i> or more OFF: less than <i>F 601</i>
<i>1016</i>	<i>16</i>	Overload detection pre-alarm	ON: <i>F 657</i> (%) or more of calculated value of overload protection level OFF: Less than <i>F 657</i> (%)
<i>1020</i>	<i>20</i>	Overheat detection pre-alarm	ON: Approx. 95°C or more of IGBT element OFF: Less than approx. 95°C (90°C or less after detection is turned on)
<i>1022</i>	<i>22</i>	Overvoltage detection pre-alarm	ON: Overvoltage limit in operation
<i>1024</i>	<i>24</i>	Power circuit undervoltage detection	ON: Power circuit undervoltage ( <i>NOFF</i> ) detected OFF: Undervoltage detection canceled
<i>1026</i>	<i>26</i>	Small current detection	ON: After output current comes to <i>F 611</i> or less, value of less than <i>F 611 + F 609</i> for <i>F 612</i> set time OFF: more than <i>F 611</i> ( <i>F 611 + F 609</i> or more after detection turns on)
<i>1028</i>	<i>28</i>	Over-torque detection	ON: After torque comes to <i>F 616</i> or more, value of more than <i>F 616 - F 619</i> for <i>F 618</i> set time OFF: less than <i>F 616</i> ( <i>F 616 - F 619</i> or less after detection turns on)



Input setting	Parameter setting	Function	Operation output specifications (in case of positive logic)
1030	30	Braking resistor overload pre-alarm	ON: 50% or more of calculated value of <i>F309</i> set overload protection level OFF: Less than 50%
1040	40	Run/stop	ON: While operation frequency is output or DC braking is in operation ( <i>db</i> ) OFF: Operation stopped
1042	42	Serious failure	ON: At trip ( <i>OCL, OCA, EPH1, EPH0, Oe, Oe2, OeC3, UeC3, OH2, E, EEP1 to 3, Err2 to 5, UC, UP1, Etn, Etn1 to 3, EF2, PrF, EtyP, E-13, E-18 to 21, E-23, E-26, E-32, E-37, E-39</i> ) OFF: Other than those trip above
1044	44	Light failure	ON: At trip ( <i>OL1 to 3, OP1 to 3, OH, OL1 to 3, OLr</i> ) OFF: Other than those trip above
1050	50	Cooling fan ON/OFF	ON: Cooling fan is in operation OFF: Cooling fan is off operation
1052	52	In jogging operation	ON: In jogging operation OFF: Other than jogging operation
1054	54	Operation panel / terminal block operation	ON: At terminal block operation command OFF: Other than those operation above
1056	56	Cumulative operation time alarm	ON: Cumulative operation time is <i>F621</i> or more OFF: less than <i>F621</i>
1058	58	Communication option communication error	ON: Communication error of communication option occurs OFF: Other than those above
1060	60	Forward/reverse run	ON: Reverse run OFF: Forward run (Operation command state is output while motor operation is stopped. No command is to OFF.)
1062	62	Ready for operation 1	ON: Ready for operation (with ST / RUN)
1064	64	Ready for operation 2	ON: Ready for operation (without ST / RUN)
1068	68	Brake release	ON: Brake exciting signal OFF: Brake releasing signal
1070	70	Pre-alarm	ON: One of the following is turned on Pre-alarm of over load, over heat, or over torque. Undervoltage, small current, over torque, lower limit frequency stop, cumulative operation time or momentary power failure deceleration stop. Alarm of <i>C, P</i> or <i>H</i> OFF: Other than those operation above
1078	78	RS485 communication error	ON: Communication error occurred OFF: Communication works
1092	92	Designated data output 1	ON: bit0 of FA50 is ON OFF: bit0 of FA50 is OFF
1094	94	Designated data output 2	ON: bit1 of FA50 is ON OFF: bit1 of FA50 is OFF
1106	106	Light load output	ON: Less than heavy load torque ( <i>F335</i> to <i>F338</i> ) OFF: ( <i>F335</i> to <i>F338</i> ) or more
1108	108	Heavy load output	ON: Heavy load torque ( <i>F335</i> to <i>F338</i> ) or more OFF: Less than ( <i>F335</i> to <i>F338</i> )
1120	120	Lower limit frequency stop	ON: Lower limit frequency continuous operation
1122	122	Power failure synchronized operation	ON: Power failure synchronized operation
1124	124	Traverse in progress	ON: Traverse in progress

Input setting	Parameter setting	Function	Operation output specifications (in case of positive logic)
1126	126	Traverse deceleration in progress	ON: Traverse deceleration in progress
1128	128	Parts replacement alarm	ON: Any one of cooling fan, control board capacitor, or main circuit capacitor reaches parts replacement time
1130	130	Over-torque detection pre-alarm	ON: Torque current is 70% of $F615$ setting value or more OFF: less than $F615 \times 70\% - F619$
1132	132	Frequency setting mode selection 1/2	ON: Select frequency setting mode selection 2 ( $F207$ ) OFF: Select frequency setting mode selection 1 ( $F70d$ )
1136	136	Panel / remote selection	ON: Operation command is panel
1138	138	Forced continuous operation in progress	ON: Forced continuous operation in progress
1140	140	Specified frequency operation in progress	ON: Specified Frequency operation in progress
1144	144	Signal in accordance of frequency command	ON: Frequency commanded by $F389$ and $F369$ are within $\pm F167$
1146	146	Fault signal (output also at a retry waiting)	ON: While inverter is tripped or retried
1150	150	PTC input alarm signal	ON: PTC thermal input value is 60% of $F646$ or more OFF: less than 60% of $F646$
1152	152	Safe torque off signal	ON: Safe torque off signal output
1154	154	Analog input break detection alarm	ON: VIB terminal input value is $F633$ or less OFF: more than $F633$
1156	156	F terminal state	ON: terminal F is ON state
1158	158	R terminal status	ON: terminal R is ON state
1160	160	Cooling fan replacement alarm	ON: Cooling fan reaches parts replacement time
1162	162	Number of starting alarm	ON: Number of starting is $F648$ or more
1166	166	Acceleration operation in progress	ON: Acceleration operation in progress
1168	168	Deceleration operation in progress	ON: Deceleration operation in progress
1170	170	Constant speed operation in progress	ON: Constant speed operation in progress
1172	172	DC braking in progress	ON: DC braking in progress
1174	174	Factory specific coefficient	Do not set the value. The function is for manufacturer setting.
1176	176		
1178	178		
1180	180	Integral input power pulse output signal	ON: Integral input power unit reach
1182	182	Shock monitoring pre-alarm signal	ON: Current / torque value reach the shock monitoring detection condition

Input setting	Parameter setting	Function	Operation output specifications (in case of positive logic)
1222	222	My function-S output 1	ON: My function-S output 1 is ON.
1224	224	My function-S output 2	ON: My function-S output 2 is ON.
1226	226	My function-S output 3	ON: My function-S output 3 is ON.
1228	228	My function-S output 4	ON: My function-S output 4 is ON.
1230	230	My function-S output 5	ON: My function-S output 5 is ON.
1232	232	My function-S output 6	ON: My function-S output 6 is ON.
1234	234	My function-S output 7	ON: My function-S output 7 is ON.
1236	236	My function-S output 8	ON: My function-S output 8 is ON.
1238	238	My function-S output 9	ON: My function-S output 9 is ON.
1240	240	My function-S output 10	ON: My function-S output 10 is ON.
1242	242	My function-S output 11	ON: My function-S output 11 is ON.
1244	244	My function-S output 12	ON: My function-S output 12 is ON.
1246	246	My function-S output 13	ON: My function-S output 13 is ON.
1248	248	My function-S output 14	ON: My function-S output 14 is ON.
1250	250	My function-S output 15	ON: My function-S output 15 is ON.
1252	252	My function-S output 16	ON: My function-S output 16 is ON.
1254	254	Always OFF (for terminal signal tests)	Output signal always OFF

## Appendix 5 Internal data

Table 8-7 is the internal data that the My function-S can handle.

This data is not rewritable. It can be used only as input data for comparison and computation.

Table 8-7 Data that My function-S can handle

	Input setting	Communication No.	Function	Unit (Communication)
Monitor display output value	3000	FE00	Operation frequency	0.01Hz
	3002	FE02	Frequency setting value	0.01Hz
	3003	FE03	Output current	0.01%
	3004	FE04	Input voltage (DC detection)	0.01%
	3005	FE05	Output voltage	0.01%
	3014	FE14	Comulative operation time	1=1hour
	3015	FE15	Frequency setting value (after compensation)	0.01Hz
	3018	FE18	Torque	0.01%
	3022	FE22	PID feedback value	0.01Hz
	3023	FE23	Motor cumulative load factor	0.01%
	3024	FE24	Inverter cumulative load factor	0.01%
	3025	FE25	Braking resistance cumlative load factor	1%
	3026	FE26	Motor load factor	1%
	3027	FE27	Inverter load factor	1%
	3029	FE29	Input power	0.01kW
	3030	FE30	Output power	0.01kW
	3035	FE35	VIA input value	0.01%
	3036	FE36	VIB input value	0.01%
	3037	FE37	VIC input value	0.01%
	3040	FE40	FM output value	0.01%
	3070	FE70	Inverter rated current	0.1A
	3076	FE76	Integral input power	It depends on F749
	3077	FE77	Integral output power	It depends on F749
	3080	FE80	Cumulative power ON time	1=10hours
	2032	FD32	Number of starting	1=1000times
	2033	FD33	Number of forward starting	1=1000times
	2034	FD34	Number of reverse starting	1=1000times
	2040	FD40	Pulse train output value	pps
2041	FD41	Cumulative fan operation time	1=10hours	
2070	FD70	Inverter rated current (Carrier frequency corrected)	0.1A	

	Input setting	Communication No.	Function	Unit (Communication)
FM/AM output Pulse train output	2000	FD00	Output frequency	0.01Hz
	2002	FD02	Frequency reference	0.01Hz
	2003	FD03	Output current	0.01%
	2004	FD04	Input voltage (DC detection)	0.01%
	2005	FD05	Output voltage	0.01%
	2015	FD15	Frequency setting value (after compensation)	0.01Hz
	2022	FD22	PID feedback value	0.01Hz
	2023	FD23	Motor cumulative load factor	0.01%
	2024	FD24	Inverter cumulative load factor	0.01%
	2025	FD25	Braking resistance cumulative load factor	1%
	2029	FD29	Input power	0.01kW
	2030	FD30	Output power	0.01kW
	2040	FD40	Pulse train input value	pps
	3035	FE35	VIA input value	0.01%
	3036	FE36	VIB input value	0.01%
	3037	FE37	VIC input value	0.01%
	3040	FE40	FM output value	0.01%
	3050	FE50	Fixed output 2	-
	3051	FE51	Fixed output 1	-
	3052	FE52	Fixed output 3	-

## Appendix 6 Examples of computing function settings

Of the computing functions listed in Appendix 2, this chapter explains in detail the timer function, counter function, peak hold function, set & reset function, and clear function, and gives examples of their settings.

### ■ Input function command 14: ON (ON timer), 23: ON2 (ON timer 2)

When the input signal is turned ON, the ON command delays the timing of putting out an ON signal by the setting time of the ON timer, as shown in the figure below. The timer is turned on only when it receives an ON signal, as illustrated in the timing chart, so no ON signal is put out if the input signal ON time is shorter than the timer ON time (time during which the timer is activated). Conversely, when the input signal is turned OFF, an OFF signal is put out immediately and the timer is reset.

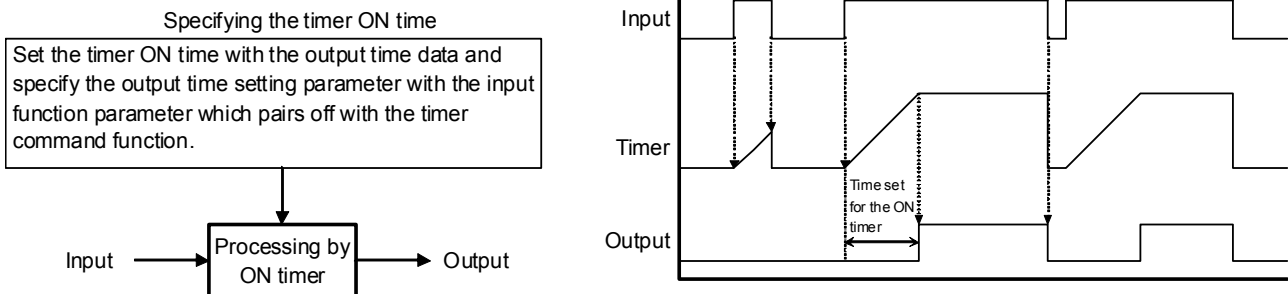


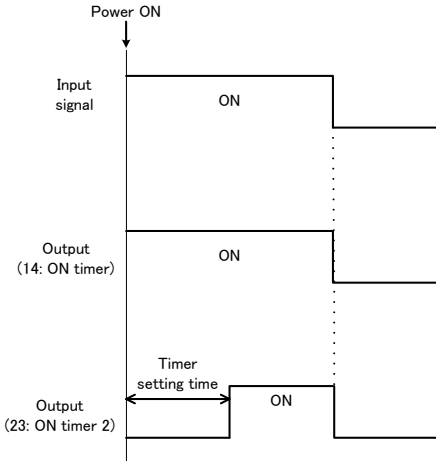
Fig. 8-1 Processing by ON timer

< Example > Input a signal to the S1 terminal, and output the signal from the Terminal RY-RC with 1 second of delay time (timer ON time) .

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	<i>0</i> (Default)	Set My function-S to "Disabled".
		<i>F114</i>	<i>0</i>	Assign the "no function" to the Terminal S1.
		<i>F130</i>	<i>222</i>	Assign the My function-S output 1 to the Terminal RY-RC.
		<i>A928</i>	<i>1.0</i>	Set a delay time (timer ON time) of 1.0 second for the output time data 1.
Unit 1	Step 1	<i>A900</i>	<i>4</i>	Read Terminal S1 input signal. (LD S1)
	Step 2	<i>A901</i>	<i>14</i>	Activate the ON timer set by <i>A928</i> .
		<i>A902</i>	<i>928</i>	
	Step 3	<i>A903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A904</i>	<i>0</i> (Default)	
Step 4	<i>A905</i>	<i>1222</i>	Transfer the result to the My function-S output 1.	
-	-	<i>A977</i>	<i>2</i>	Set to "My function-S always ON".

\*Difference between ON (ON timer) and ON2 (ON timer 2)

The operation of above 2 commands is different in case the signal is already ON when the power is ON.



■ Input function command 15: OFF (OFF timer), 24: OFF2 (OFF timer 2)

When the input signal is turned OFF, the OFF command delays the timing of putting out an OFF signal by the setting time of the OFF timer, as shown in the figure below. The timer is activated only when it receives an OFF signal, as illustrated in the timing chart.

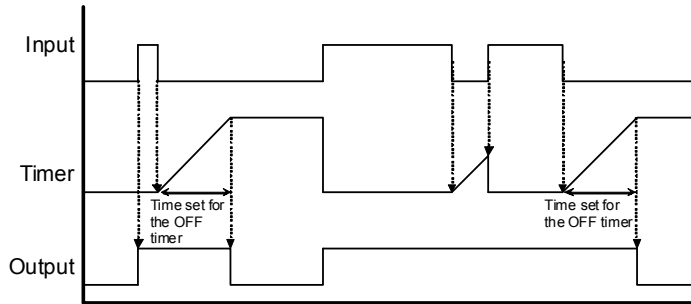
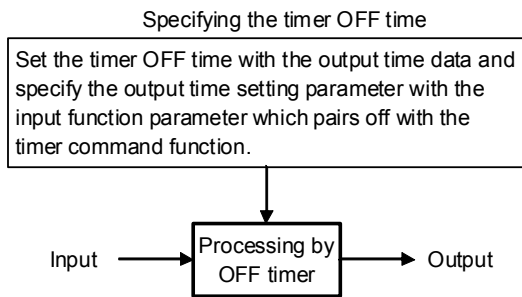


Fig. 8-2 Processing by OFF timer

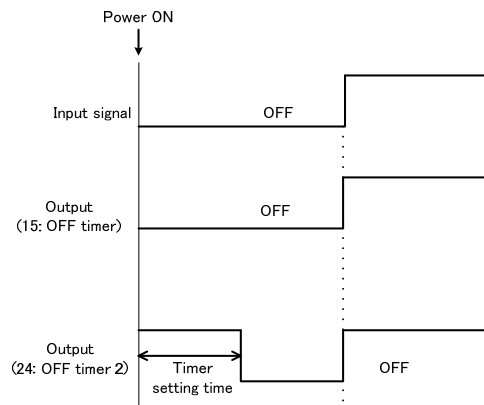
< Example > Input a signal to the Terminal S1, and output of Terminal RY-RC is retained for 1 second.

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F114</i>	<i>0</i>	Assign the "no function" to the Terminal S1.
		<i>F130</i>	<i>222</i>	Assign the My function-S output 1 to the Terminal RY-RC.
		<i>A928</i>	<i>1.0</i>	Set a delay time (timer OFF time) of 1.0 second for the output time data 1.
Unit 1	Step 1	<i>A900</i>	<i>4</i>	Read Terminal S1 input signal. (LD S1)
	Step 2	<i>A901</i>	<i>15</i>	Activate the OFF timer setted by <i>A928</i>
		<i>A902</i>	<i>928</i>	
	Step 3	<i>A903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>A904</i>	<i>0</i> (Default)	
Step 4	<i>A905</i>	<i>1222</i>	Transfer the result to the My function-S output 1.	
-	-	<i>A977</i>	<i>2</i>	Set to "My function-S always ON".

\*Difference between OFF (OFF timer) and OFF2 (OFF timer 2)

The operation of above 2 commands is different in case the signal is already ON when the power is ON.

Note) In case of OFF timer 2, please note that output is ON when the power is ON even though input signal is OFF.





■ Input function command 16: COUNT 1 (counter), Input function command 17: COUNT 2 (counter)

COUNT1 and COUNT2 commands make the inverter count the number of times the input signal is turned on and off, as shown in the figure below, and put out a signal when reaching the specified count. The count is reset to zero using the signal specified with the input function parameter which pairs off with the count command parameter. Note that this command has no relation to the SET and RESET commands described later.

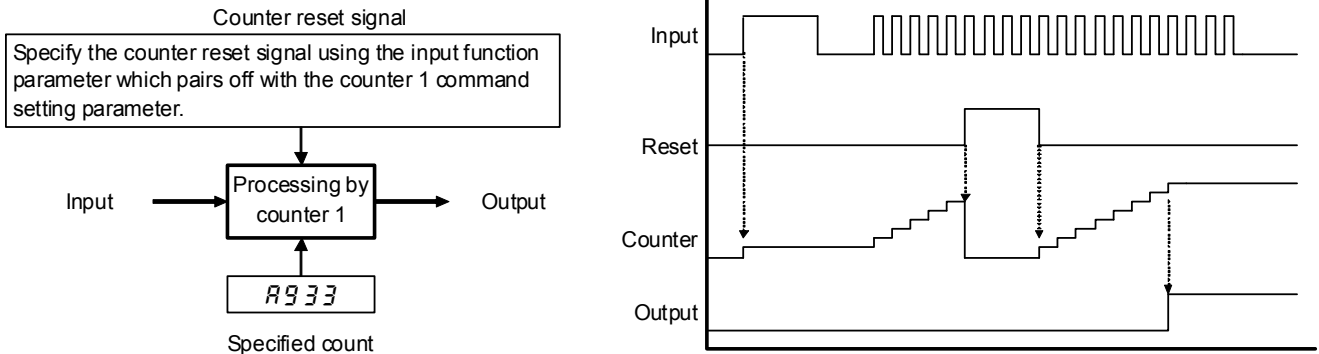


Fig. 8-3 Processing by counter

Note 1: Specify a pulse width of at least 5 ms for both ON and OFF pulse input signals.

Note 2: RESET commands have priority over COUNT commands. Therefore, if a reset command is entered instantly the specified count has been reached, the count is reset to zero and no signal is put out.

Note 3: This command cannot be used in plural. Even if do so, that will not result in an intended operation.

<Example> Input count signal from Terminal S1 and input reset signal from Terminal S2.

Output the signal from Terminal RY-RC with the count of 10.

		Title	Parameter setting	Description
Prior setting	-	A977	0 (Default)	Set to "Disabled" of the My function-S.
		F114	0	Assign the "no function" to the Terminal S1.
		F115	0	Assign the "no function" to the Terminal S2.
		F130	222	Assign the My function-S output 1 to the Terminal RY-RC.
		A933	10	Set the count of 10 times for COUNT 1.
Unit 1	Step 1	A900	4	Read Terminal S1 input signal (LD S1)
	Step 2	A901	16	Count the number of pulse signals from the Terminal S1.
		A902	5	Assign the reset signal output function to the Terminal S2.
	Step 3	A903	0 (Default)	NOP command (no operation)
		A904	0 (Default)	
Step 4	A905	1222	Transfer the result to the My function-S output 1.	
-	-	A977	2	Set to "My function-S always ON".

Input function command 17 (COUNT 2 (counter)) is the same function as COUNT 1.

For command 17, however, the parameter A934 is used to set the count.

■ Input function command 18: HOLD (peak hold)

The HOLD command makes the inverter hold the peak value of analog input signal and monitor date, as illustrated in the timing chart below.

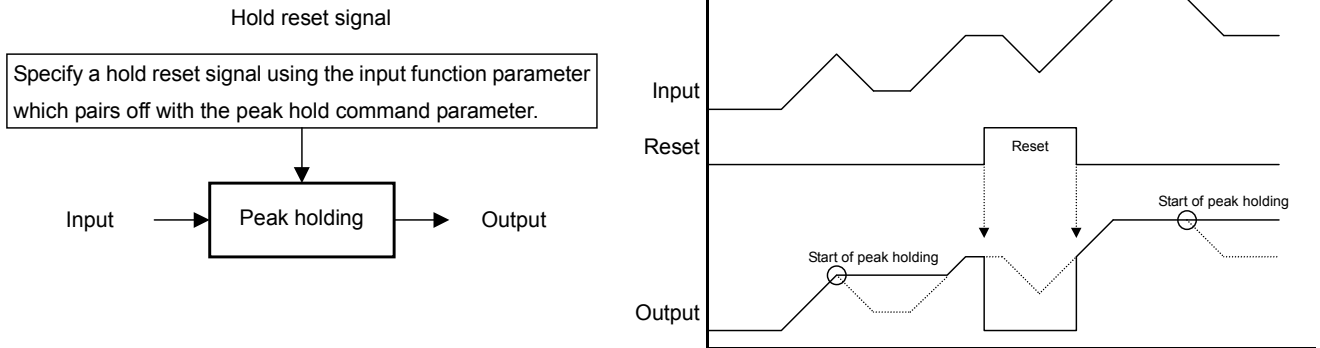


Fig. 8-4 Processing by peak hold

<Example> Hold the peak output current. When the output current exceeds 120% of the rated current, output the signal from Terminal RY-RC. Reset the hold by the signal from Terminal S1.

		Title	Parameter setting	Description
Prior setting	-	<i>A977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F114</i>	<i>0</i>	Assign the "no function" to the Terminal S1.
		<i>F130</i>	<i>222</i>	Assign the My function-S output 1 to the Terminal RY-RC.
		<i>A918</i>	<i>120</i>	Assign a reference value of 120% to the output percent data 1.
Unit 1	Step 1	<i>A900</i>	<i>3003</i>	Read the output current. (LD Output current)
	Step 2	<i>A901</i>	<i>18</i>	Start holding the peak output current.
		<i>A902</i>	<i>4</i>	Assign the reset signal output function to the Terminal S1.
	Step 3	<i>A903</i>	<i>9</i>	Output a signal if the peak value reaches 120% of the rated current.
		<i>A904</i>	<i>918</i>	
Step 4	<i>A905</i>	<i>1222</i>	Transfer the result to the My function-S output 1.	
-	-	<i>A977</i>	<i>2</i>	Set to "My function-S always ON".

■ Input function command 19: SET

■ Input function command 20: RESET

The SET command turns on (sets) the output signal when the input signal is turned on, as shown in the figure below, and holds the output signal ON even if the input signal is turned off. The RESET command is used to turn off the output signal.

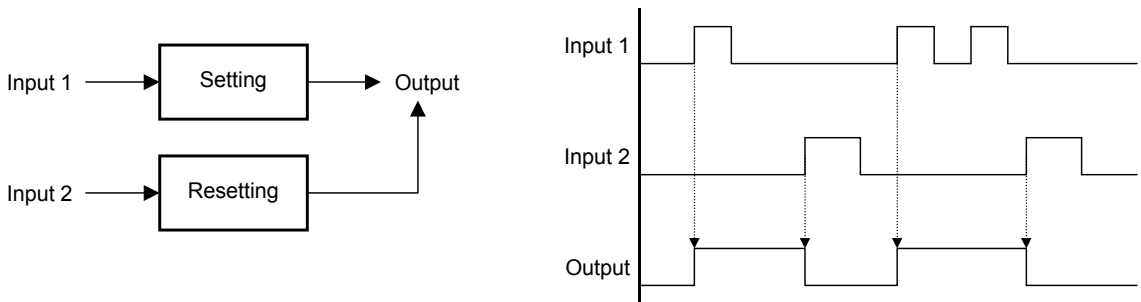


Fig. 8-5 Setting and resetting

<Example> Output the input signal from Terminal F to the Terminal RY-RC as the hold signal by using SET command. Reset the output signal by the signal from Terminal S1.

		Title	Parameter setting	Description
Prior setting	-	<i>R977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F111</i>	<i>0</i>	Assign the "no function" to the Terminal F.
		<i>F114</i>	<i>0</i>	Assign the "no function" to the Terminal S1.
		<i>F130</i>	<i>222</i>	Assign the My function-S output 1 to the Terminal RY-RC.
Unit 1	Step 1	<i>R900</i>	<i>1</i>	Read F input terminal signal. (LD F)
	Step 2	<i>R901</i>	<i>19</i>	Send a signal to the My function-S output 1 by the SET command, and output a hold signal from the Terminal RY-RC.
		<i>R902</i>	<i>1222</i>	
	Step 3	<i>R903</i>	<i>0</i> (Default)	NOP command (no operation)
<i>R904</i>		<i>0</i> (Default)		
Step 4	<i>R905</i>	<i>0</i> (Default)	NOP command (no operation)	
Unit 2	Step 1	<i>R906</i>	<i>4</i>	Read S1 input terminal signal. (LD S1)
	Step 2	<i>R907</i>	<i>20</i>	Cancel the hold command of the My function-S output 1 by the RESET command.
		<i>R908</i>	<i>1222</i>	
	Step 3	<i>R909</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R910</i>	<i>0</i> (Default)	
Step 4	<i>R911</i>	<i>0</i> (Default)	NOP command (no operation)	
-	-	<i>R977</i>	<i>2</i>	Set to "My function-S always ON".

- Input function command 21: CLR (clear)
- Input function command 22: CLRN (clear (inversion))

The CLR command turns off the input signal set by the My function-S when the clear signal is turned on, as shown in the figure below. The CLRN command turns off the input signal when the clear signal is turned off.

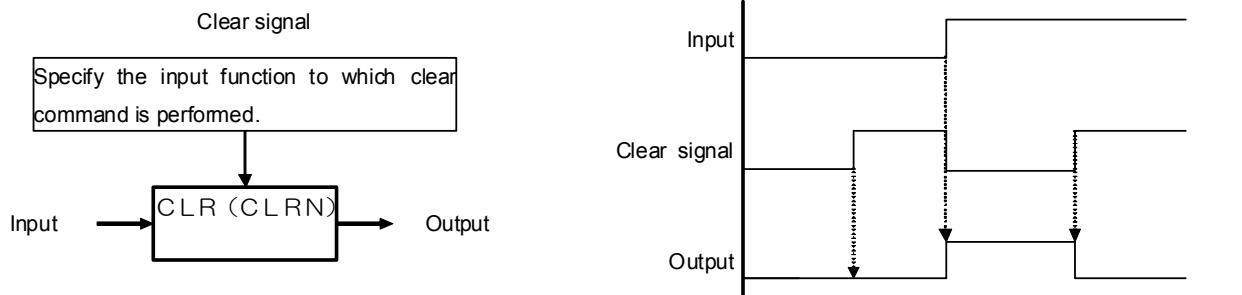


Fig. 8-6 Processing by clear

<Example> Turn off the input signal from Terminal F by the clear command from Terminal R.

		Title	Parameter setting	Description
Prior setting	-	<i>R977</i>	<i>0</i> (Default)	Set to "Disabled" of the My function-S.
		<i>F111</i>	<i>0</i>	Assign the "no function" to the Terminal F.
		<i>F112</i>	<i>0</i>	Assign the "no function" to the Terminal R.
		<i>F130</i>	<i>222</i>	Assign the My function-S output 1 to the Terminal RY-RC.
Unit 1	Step 1	<i>R900</i>	<i>1</i>	Read F input terminal signal. (LD F)
	Step 2	<i>R901</i>	<i>21</i>	CLR command for the Terminal F.
		<i>R902</i>	<i>2</i>	Assigning the CLR command to the Terminal R
	Step 3	<i>R903</i>	<i>0</i> (Default)	NOP command (no operation)
		<i>R904</i>	<i>0</i> (Default)	
Step 4	<i>R905</i>	<i>1222</i>	Transfer the result to the My function-S output 1.	
-	-	<i>R977</i>	<i>2</i>	Set to "My function-S always ON".