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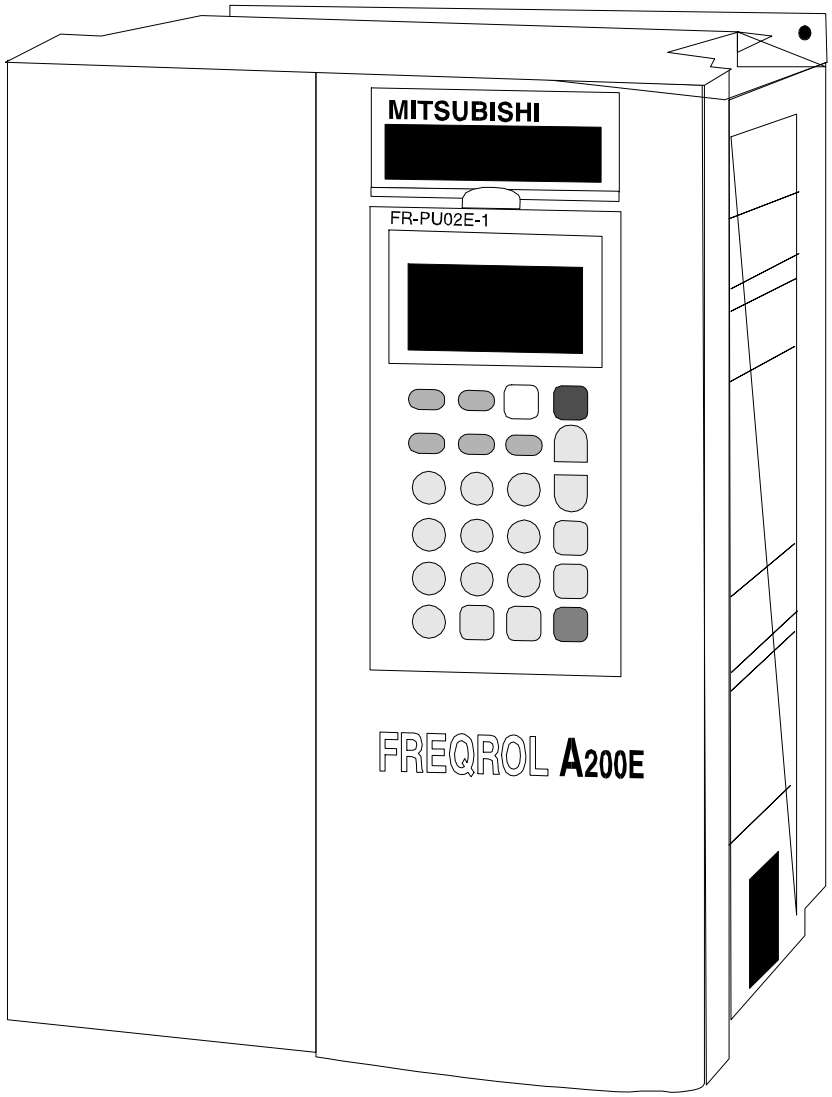
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Variable Frequency Drives
A200E
TRAINING CLASS

A200E TRAINING



Mitsubishi Electronics America, Inc.

MITSUBISHI

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Introduction

- Detailed explanation of the Mitsubishi A200E Variable Frequency Drive

MITSUBISHI

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Contents

- Inputs and Outputs
- Parameter Description
- Parameter Unit
- Magnetic Flux Vector Control
- Auto Tuning
- Trouble Shooting
- Options

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Overview

- To enable users of the A200E VFD to better adapt it to their application.

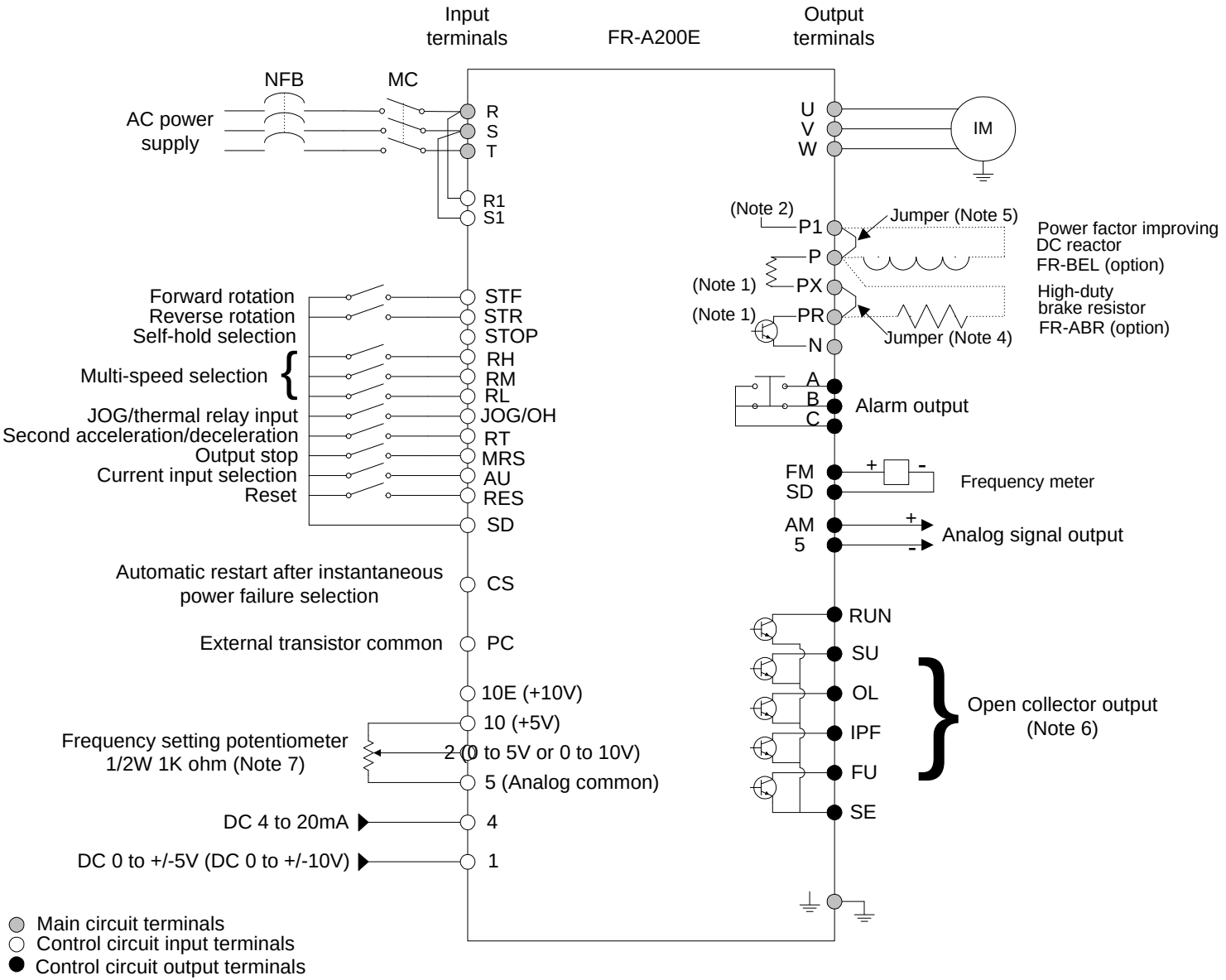
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INPUTS and OUTPUTS

- Input Power Terminals
- Motor Terminals
- Option Terminals
- Control Terminals (Contact)
- Control Terminals (Analog Speed Signal)
- Control Terminals (Contact)
- Status Output Terminals (Open Collector)
- Status Output Terminals (Pulse & Analog)

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Connection Diagram



NEXT PAGE

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CONTINUED

Note: 1. Terminals PR and PX are provided for the FR-A220E-0.4K to 7.5K and FR-A240E-0.4K to 7.5K.
2. Terminal P1 is provided for the for the FR-A220E-5.5K to 55K and FR-A240E-5.5K to 55K.
3. The models 11K and up are not provided with the built-in brake resistor and brake transistor.
4. When the FR-ABR or FR-BU brake unit or FR-RC power return unit are used, disconnect this jumper.
5. When the FR-BEL is used, disconnect this jumper.
6. The output terminals other than (RUN) allow alarm definitions to be output in alarm code and 10 different functions to be assigned individually.
7. When the frequency setting is changed frequently, it is recommended to use 2W 1K ohm potentiometer.

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Input Power Terminals

Symbol	Terminal Name	Description
R, S, T	AC power input	Connect to the commercial power supply.
R1, S1	Power supply for control circuit	Connected to the AC power supply terminals R and S. To retain the alarm display and alarm output, remove the jumper from the terminal block and apply external power to these terminals.

Motor Terminals

U, V, W	Inverter output	Connect a three-phase squirrel-cage motor.

Option Terminals

P, PR	Brake resistor connection	Disconnect the jumper from terminals PR-PX and connect the optional brake resistor (FR-ABR) across terminals P-PR.
P, N	Brake unit connection	Connect the optional FR-BU brake unit or power return converter (FR-RC).
P, P1	Power factor improving DC reactor connection	Disconnect the jumper from terminals P-P1 and connect the optional power factor improving reactor (FR-BEL).
PR, PX *	Built-in brake circuit connection	When the jumper is connected across terminals PX-PR (factory setting), the built-in brake resistor is valid.
⏚	Ground	For grounding the inverter chassis. Must be earthed.

* Terminals PR and PX are provided for the FR-A220E-0.4K to 7.5K and FR-A240E-0.4K to 7.5K

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Control Terminals Input (Contact)

Symbol	Terminal Name	Description	
STF	Forward rotation start	Turn on the signal across STF-SD for forward rotation and turn off to stop. Acts as a programmed operation start signal in the programmed operation mode. (Turn on to start and turn off to stop.)	When the signals across terminals STF-SD and STR-SD are turned on simultaneously, the stop command is given
STR	Reverse rotation start	Turn on the signal across STR-SD for reverse rotation and turn off to stop.	
STOP	Start self-holding selection	Turn on the signal across terminals STOP-SD to select the self-holding of the start signal.	
RH, RM, RL	Multi-speed selection	Turn on the signal across RH/RM/RL-SD as appropriate to select up to 7 speeds. Act as group 1, 2 and 3 select signals in the programmed operation mode.	
JOG/OH	JOG mode selection or external thermal relay input	Turn on the signal across terminals JOG-SD to select the jog operation (factory setting). Jog operation can be performed with the start signal (STF or STR). Can also be used as the thermal relay contact input terminal to stop the inverter by the operation of the external relay.	
RT	Second acceleration/ deceleration time selection	Turn on the signal across terminals RT-SD to select the second acceleration/deceleration time. When the second torque boost and second V/F (base frequency) functions have been set, these functions can also be selected by turning on the signal across terminals RT-SD. Turn on the signal across terminals RT-SD to switch between the two control modes, magnetic flux vector control and V/F control.	

NEXT PAGE

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Control Terminals Input (Contact)

Symbol	Terminal Name	Description
MRS	Output stop	Turn on the signal across terminals MRS-SD (20ms or longer) to stop the inverter output. Used to shut off the inverter output to bring the motor to a stop by the magnetic brake. Can also be used to as the dynamic brake operation start signal or PU operation interlock signal.
RES	Reset	Used to reset the protective circuit activated. Turn on the signal across terminals RES-SD for more than 0.1 sec., then turn it off.
AU	Current input selection	Only when the signal across terminals AU-SD is turned on, the inverter can be operated with the 4-20mADC frequency setting signal.
CS	Automatic restart after instantaneous power failure selection	When the signal across terminals CS-SD has been turned on, restart can be made automatically when the power is restored after an instantaneous power failure. Note that this operation requires restart parameters to be set. When the inverter is shipped from the factory, it is set to disallow restart.
SD	Contact input common	Common to the contact input terminals and terminal FM. Isolated from the common terminal of the control circuit.
PC	External transistor common	When transistor output (open collector output), such as a programmable controller (PC), is connected, connect the external power supply common for transistor output to this terminal to prevent a fault caused by sneak current.

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Control Terminals Input (Analog Speed Signal)

<table>
<tr><th>Symbol</th><th>Terminal Name</th><th colspan="2">Description</th></tr>
<tr><td>10E</td><td rowspan="2">Frequency setting power supply</td><td>10VDC, permissible load current 10mA</td><td rowspan="2">When the frequency setting potentiometer is connected in the factory-set state, connect it to terminal 10. When it connected to terminal 10E, change the input specifications of terminal 2.</td></tr>
<tr><td>10</td><td>5VDC, permissible load current 10mA</td></tr>
<tr><td>2</td><td>Frequency setting (voltage)</td><td colspan="2">By entering 0 to 5VDC (0 to 10VDC), the maximum output frequency is reached at 5V (or 10V) and I/O are proportional. Switch between input 0 to 5VDC (factory setting) and 0 to 10VDC from the parameter unit. Input resistance 10K ohms. Max. permissible voltage 20VDC.</td></tr>
<tr><td>4</td><td>Frequency setting (voltage)</td><td colspan="2">By entering 4 to 20mADC, the maximum output frequency is reached at 20mA and I/O are proportional. The input signal is valid only when the signal across terminals AU-SD is on. Input resistance 250 ohms. Max. permissible current 30mADC.</td></tr>
<tr><td>1</td><td>Auxiliary frequency setting</td><td colspan="2">By entering 0 to +/-5VDC (0 to +/-10VDC), the signal is added to the frequency setting signal of terminal 2 or 4. Switch between input 0 to +/-5VDC and 0 to +/-10VDC (factory setting) from the parameter unit. Input resistance 10K ohms. Max. permissible voltage 20VDC.</td></tr>
<tr><td>5</td><td>Frequency setting input common</td><td colspan="2">Common to the frequency setting signals (terminals 2, 1 or 4) and analog output terminal AM. 0V line of the common circuit of the control circuit. Do not ground.</td></tr>
</table>

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Control Terminals Output (Contact)

Symbol	Terminal Name	Description
A, B, C	Alarm Output	Change-over contact output indicating that the output has been stopped by the inverter protective function activated. 200VAC 0.3mA, 30VDC 0.3mA permissible load. Alarm: discontinuity across B-C (continuity across A-C) Normal: continuity across B-C (discontinuity across A-C)

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Status Output Terminals (Open Collector)

Symbol	Terminal Name	Description
RUN	Inverter running	Switched low when the inverter output frequency is equal to or higher than the starting frequency (factory set to 0.5Hz, variable). Switched high during stop or DC dynamic brake operation (**). Permissible load 24VDC 0.1mA.
SU	Up to frequency ***	Switched low when the output frequency has reached within +/-10% of the set frequency (factory setting, variable). Switched high during acceleration, deceleration or stop (**). Permissible load 24VDC 0.1mA.
OL	Overload alarm ***	Switched low when the current limit function has caused stall prevention to be activated. Switched high when stall prevention is reset (**). Permissible load 24VDC 0.1mA.
IPF	Instantaneous power failure ***	Switched low when instantaneous power failure or undervoltage protection is activated (**). Permissible load 24VDC 0.1mA.
FU	Frequency detection ***	Switched low when the output frequency has reached or exceeded the detection frequency set optionally. Switched high when below the detection frequency (**). Permissible load 24VDC 0.1mA.
SE	Open collector output common	Common to the RUN, SU, OL IPF and FU terminals. Isolated from the common circuit of the control circuit.

** : Low indicates that the open collector outputting transistor is on (conducts). High indicates that the transistor is off (does not conduct).

***: The output of these terminals can be reassigned by the output terminal assignment function (see page 115 of manual).

Note: Application of the voltage in the wrong direction will damage the inverter. Use care when wiring.

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Status Output Terminals (Pulse & Analog)

Symbol	Terminal Name	Description	
FM	For meter (pulse)	One selected from 16 monitoring items, such as output frequency, is output. The output signal is proportional to the magnitude of each monitoring item. Terminals FM and AM can be used at the same time.	Factory-set output item: frequency Permissible load current 1mA 1440Hz at 60Hz. (Max. frequency 2400Hz)
AM	Analog signal output (analog)		Factory-set output item: frequency Output signal 0 to 10VDC Permissible load current 1mA (Max. output voltage 10VDC)

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PARAMETER DESCRIPTION

- Detailed Description of each Parameter Setting

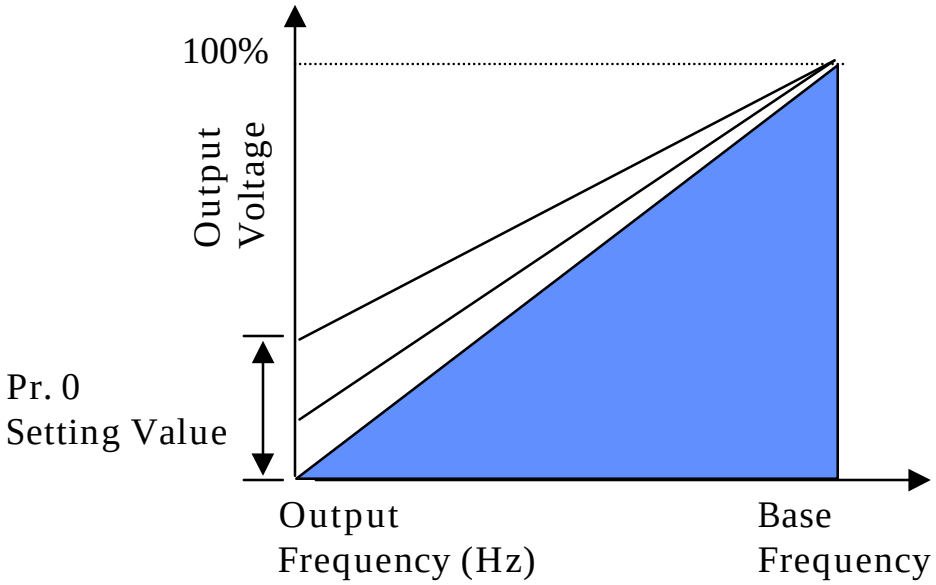
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Pr. 0 - "TORQUE BOOST (MANUAL)"

•Used to adjust the motor torque in the low-frequency range to the load, thereby increasing the motor torque at the time of start.

Model	Factory Setting	Setting Range
7.5K and down	6%	0 to 30%
11K and up	3%	

Note: 1. This parameter is ignored when Pr. 80 and Pr. 81 have been set to select the magnetic flux vector control mode.
2. When the inverter-dedicated motor (constant-torque motor) is used, change the setting of this parameter as follows:
7.5K and down ... 4%
11K and up ... 2%



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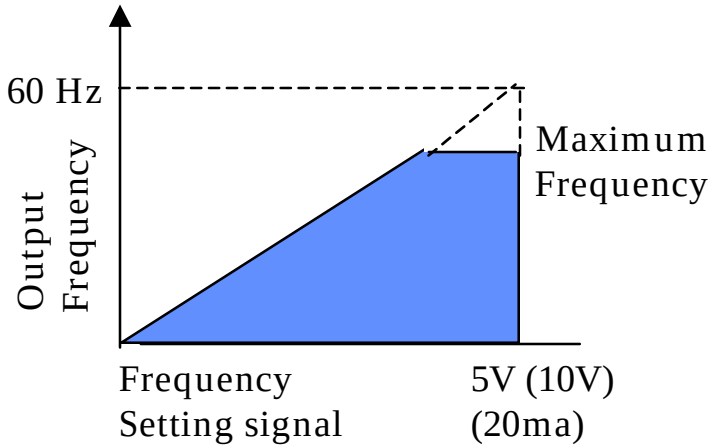
Pr. 1 - "MAXIMUM FREQUENCY"
Pr. 18 - "HIGH-SPEED MAXIMUM FREQUENCY"

•Allows the upper limit of the output frequency to be clamped.

•The maximum setting is within 120 Hz.

Use parameter Pr. 1 "Maximum Frequency" to set the upper limit of the output frequency.

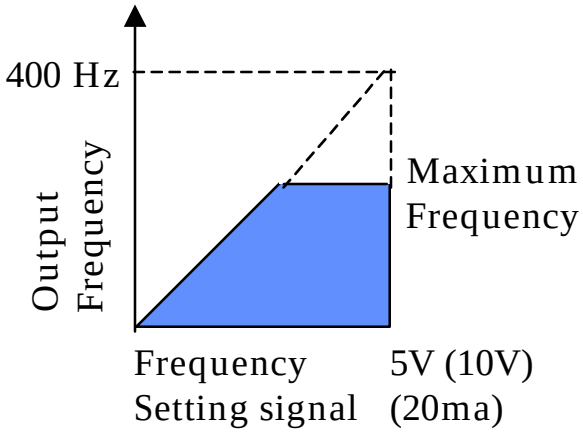
Factory Setting	Setting Range
120 Hz	0 to 120 Hz



•The maximum setting is higher than 120 Hz

Use parameter Pr. 18 "High-Speed Maximum Frequency" to set the upper limit of the output frequency. Setting this parameter automatically changes Pr. 1 "Maximum Frequency" to this setting.

Factory Setting	Setting Range
120 Hz	120 to 400 Hz



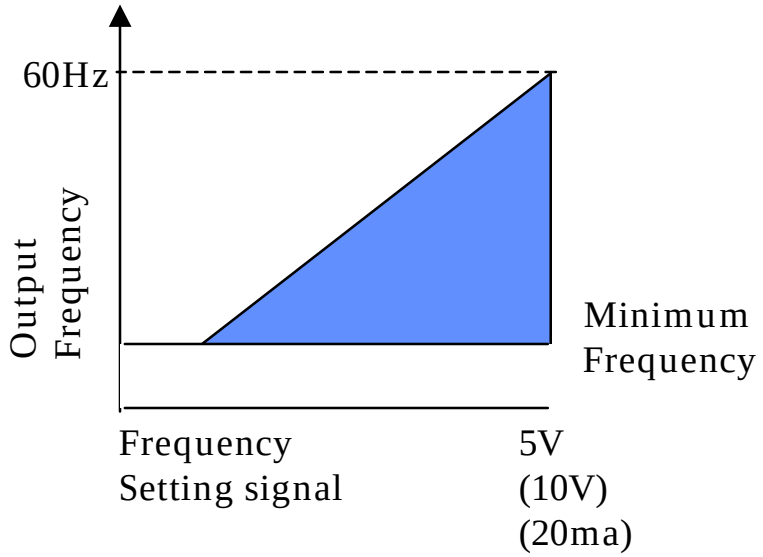
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Pr. 2 - “MINIMUM FREQUENCY”

•Allows the lower limit of the output frequency to be clamped.

•By merely turning the start signal on, the motor is run at the set frequency.

Factory Setting	Setting Range
0 Hz	0 to 120 Hz

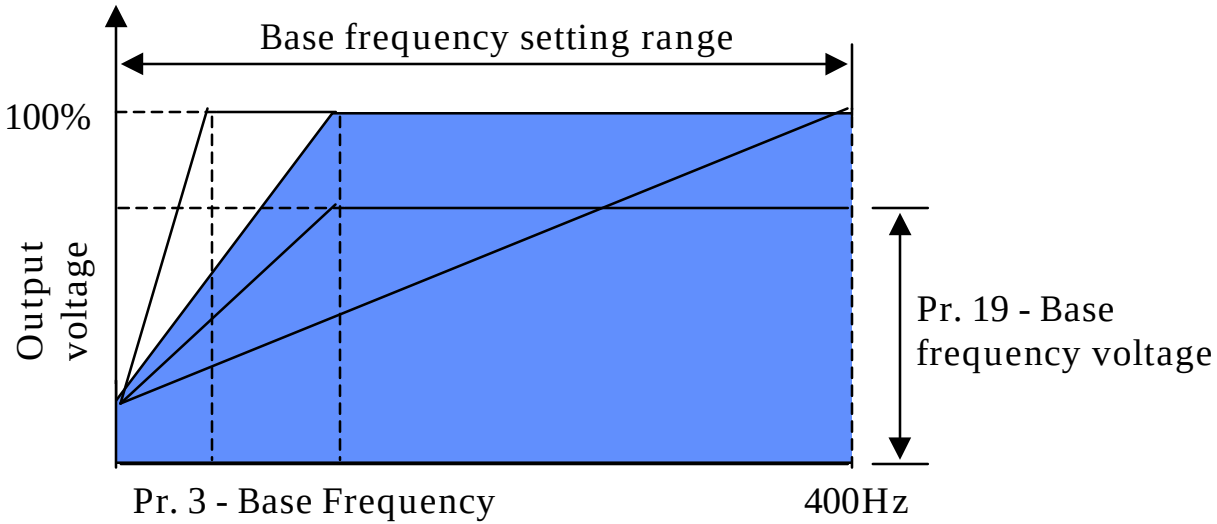


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Pr. 3 - “BASE FREQUENCY”
Pr. 19 - “BASE FREQUENCY VOLTAGE”

•Allows the base frequency (reference frequency at the rated motor torque) to be set as appropriate between 0 and 400 Hz according to the motor rating.

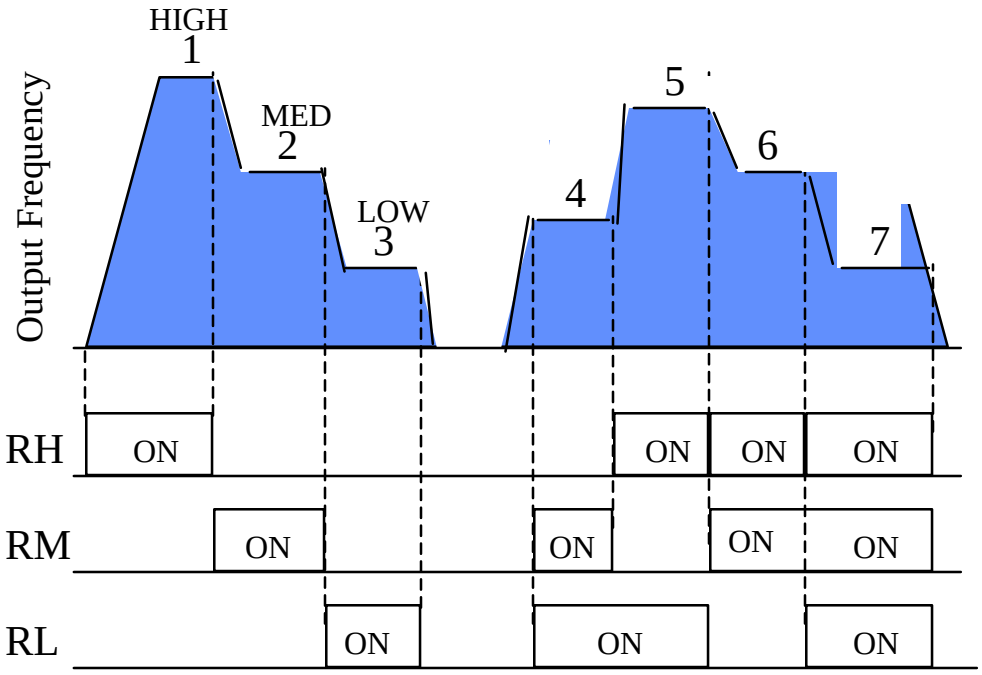
Note: 1. Set the base frequency to 60 Hz for use of an inverter-dedicated motor (constant-torque motor).
2. When the magnetic flux vector control mode has been selected in Pr. 80 and Pr. 81, Pr. 19 is regarded as 200V (or 400V).
3. Setting “9999” (factory setting) in Pr. 19 makes the maximum output voltage identical to the power supply voltage. Setting “8888” in Pr. 19, the maximum output voltage is 95% of the power supply voltage.



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Pr. 4 - “3-SPEED SETTING (HIGH SPEED)”, Pr. 5 - “3-SPEED SETTING (MIDDLE SPEED)”
Pr. 6 - “3-SPEED SETTING (LOW SPEED)”, Pr. 24 - “MULTI-SPEED SETTING (SPEED 4)”
Pr. 25 - “MULTI-SPEED SETTING (SPEED 5)”, Pr. 26 - “MULTI-SPEED SETTING (SPEED 6)”
Pr. 27 - “MULTI-SPEED SETTING (SPEED 7)”

- Allows any speed to be selected by switching the external contact signal (across terminals RH, RM, RL and SD).
- Each speed (frequency) may be specified as appropriate between 0 and 400Hz during inverter operation. The speed may also be set using the [▲] and [▼] keys. (On releasing the [▲] and [▼] keys, the set frequency is stored, that is the [WRITE] key may not be pressed).
- By using these functions with jog frequency (Pr. 15), maximum frequency (Pr. 1) and minimum frequency (Pr. 2), up to 10 speeds can be set.



Note: 1. Speeds 4 to 7 are not selected if the setting is “9999” (factory setting).
2. These speeds have priority over the main speed (across terminals 2-5, 4-5).
3. This setting may also be made during PU operation or external operation.
4. With 3-speed setting, if two or three speeds are simultaneously selected, priority is given to the frequency of lower signal.

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Pr. 7 - “ACCELERATION TIME”
Pr. 20 - “ACCELERATION/DECELERATION REFERENCE FREQUENCY”
Pr. 21 - “ACCELERATION/DECELERATION TIME INCREMENTS”

(1) Confirmation of Acceleration time setting range and minimum setting increments

Use Pr. 21 “acceleration/deceleration time increments” to set the acceleration time setting range and minimum setting increments. Before setting the acceleration time, the set value must be checked.

Set value “0” ..... 0 to 3600 seconds (minimum setting increments: 0.1 seconds) (factory setting)

Set value “1” ..... 0 to 360 seconds (minimum setting increments: 0.01 seconds)

(2) Setting of acceleration time

In acceleration time (Pr. 7), set a period of time required to reach the acceleration/deceleration reference frequency (Pr.20) from 0 Hz. Set a longer time to accelerate more slowly, and a shorter time to accelerate more rapidly. (See Note)

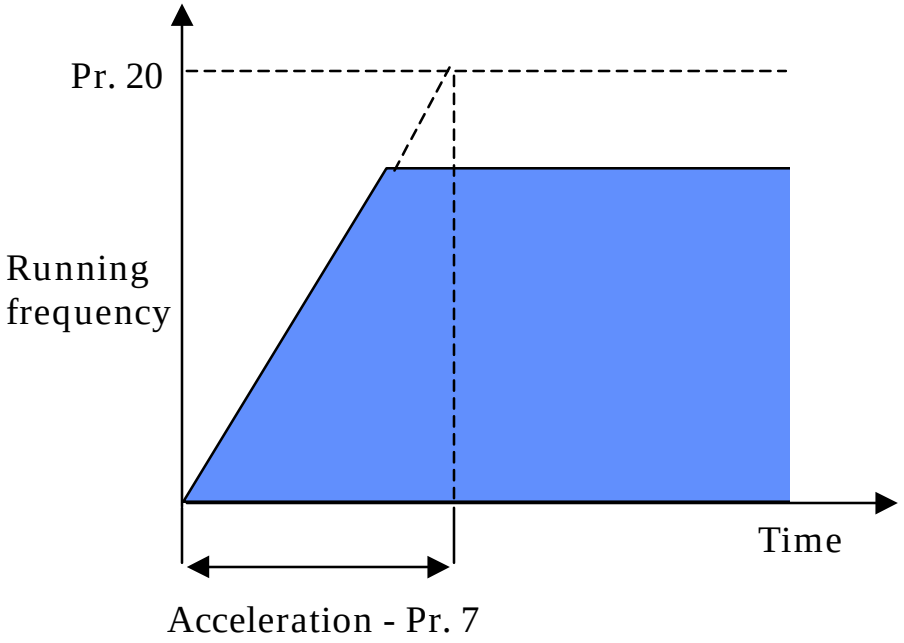
Model	Factory Setting	Setting Range
7.5K and down	5 seconds	0 to 3600 seconds / 0 to 360 seconds
11K and up	15 seconds	0 to 3600 seconds / 0 to 360 seconds

Note: 1. In only S-pattern acceleration/deceleration time A (see page 111), the set time is is a period of time required to reach the base frequency (Pr. 3).
2. If Pr. 20 (acceleration/deceleration reference frequency) setting is changed, the set values of calibration Pr. 903 and Pr. 905 (frequency setting signal gain) remain unchanged. To adjust the gains, adjust calibration Pr. 903 and Pr. 905.
3. When the set value of Pr. 7 is “0”, the acceleration time is set to 0.04 seconds.

NEXT PAGE

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Pr. 8- "DECELERATION TIME"
Pr. 20 - "ACCELERATION/DECELERATION REFERENCE FREQUENCY"
Pr. 21 - "ACCELERATION/DECELERATION TIME INCREMENTS"

(1) Confirmation of Deceleration time setting range and minimum setting increments

Use Pr. 21 "acceleration/deceleration time increments" to set the acceleration time setting range and minimum setting increments. Before setting the acceleration time, the set value must be checked.

Set value "0" ..... 0 to 3600 seconds (minimum setting increments: 0.1 seconds) (factory setting)

Set value "1" ..... 0 to 360 seconds (minimum setting increments: 0.01 seconds)

(2) Setting of deceleration time

In deceleration time (Pr. 8), set a period of time required to reach 0Hz from the acceleration/deceleration reference frequency (Pr.20). Set a longer time to decelerate more slowly, and a shorter time to decelerate more rapidly. (See Note)

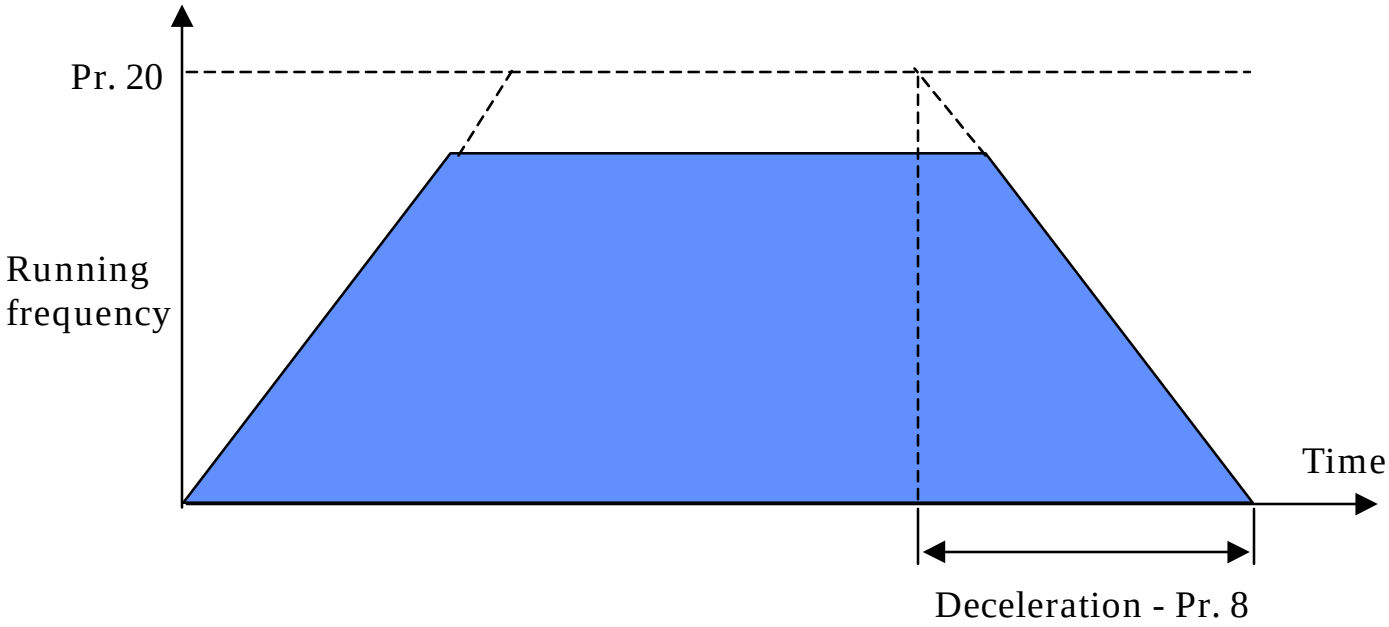
Model	Factory Setting	Setting Range
7.5K and down	5 seconds	0 to 3600 seconds / 0 to 360 seconds
11K and up	15 seconds	0 to 3600 seconds / 0 to 360 seconds

Note: 1. In only S-pattern acceleration/deceleration time A (see page 111), the set time is is a period of time required to reach the base frequency (Pr. 3).
2. If Pr. 20 (acceleration/deceleration reference frequency) setting is changed, the set values of calibration Pr. 903 and Pr. 905 (frequency setting signal gain) remain unchanged. To adjust the gains, adjust calibration Pr. 903 and Pr. 905.
3. When the set value of Pr. 8 is "0", the acceleration time is set to 0.04 seconds.

NEXT PAGE

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Pr. 9 - “ELECTRONIC OVERCURRENT PROTECTION”

•The set value for motor overheat protection may be set as a current value (A). Normally set the rated current value of the motor at 60Hz. This function provides an optimum protective characteristic including a reduction in motor cooling capability in low speed operation.

•Setting of “0” makes the motor protection function invalid. (The inverter output transistor protective function is valid).

•When the Mitsubishi constant-torque motor is used, set “1” or any of “13” to “16” in Pr. 71 “applied motor” to select the 100% continuous torque characteristic in the low speed range, and set the rated motor current in Pr. 9 “electronic overcurrent protection”.

Factory setting of Pr. 9 ..... [rated output current of the inverter]

Note that the 0.4K and 0.75K are factory set to 85% of the rated inverter current.

Note: When two or more motors are run simultaneously, provide a thermal relay for each motor.

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Pr. 10 - “DC DYNAMIC BRAKE OPERATION FREQUENCY”
Pr. 11 - “DC DYNAMIC BRAKE OPERATION TIME”
Pr. 12 - “DC DYNAMIC BRAKE VOLTAGE”

•Setting the stopping DC dynamic brake voltage (torque), operation time and operation starting frequency allows the stopping accuracy of positioning operation, etc. to be adjusted according to the load.

<When load is large>
Set a short time in Pr. 11 “DC dynamic brake operation time”.
Set a large value in Pr. 12 “DC dynamic brake voltage”.

<When load is small>
Set a long time in Pr. 11 “DC dynamic brake operation time”.
Set a small value in Pr. 12 “DC dynamic brake voltage”.

Parameter	Factory Setting	Setting Range
Pr. 10	3 Hz	0 to 120Hz, 9999 (Note 1)
Pr. 11	0.5 seconds	0 to 10 seconds, 8888 (Note 2)
Pr. 12	7.5K and down ... 6% 11K and up ... 3%	0 to 30%

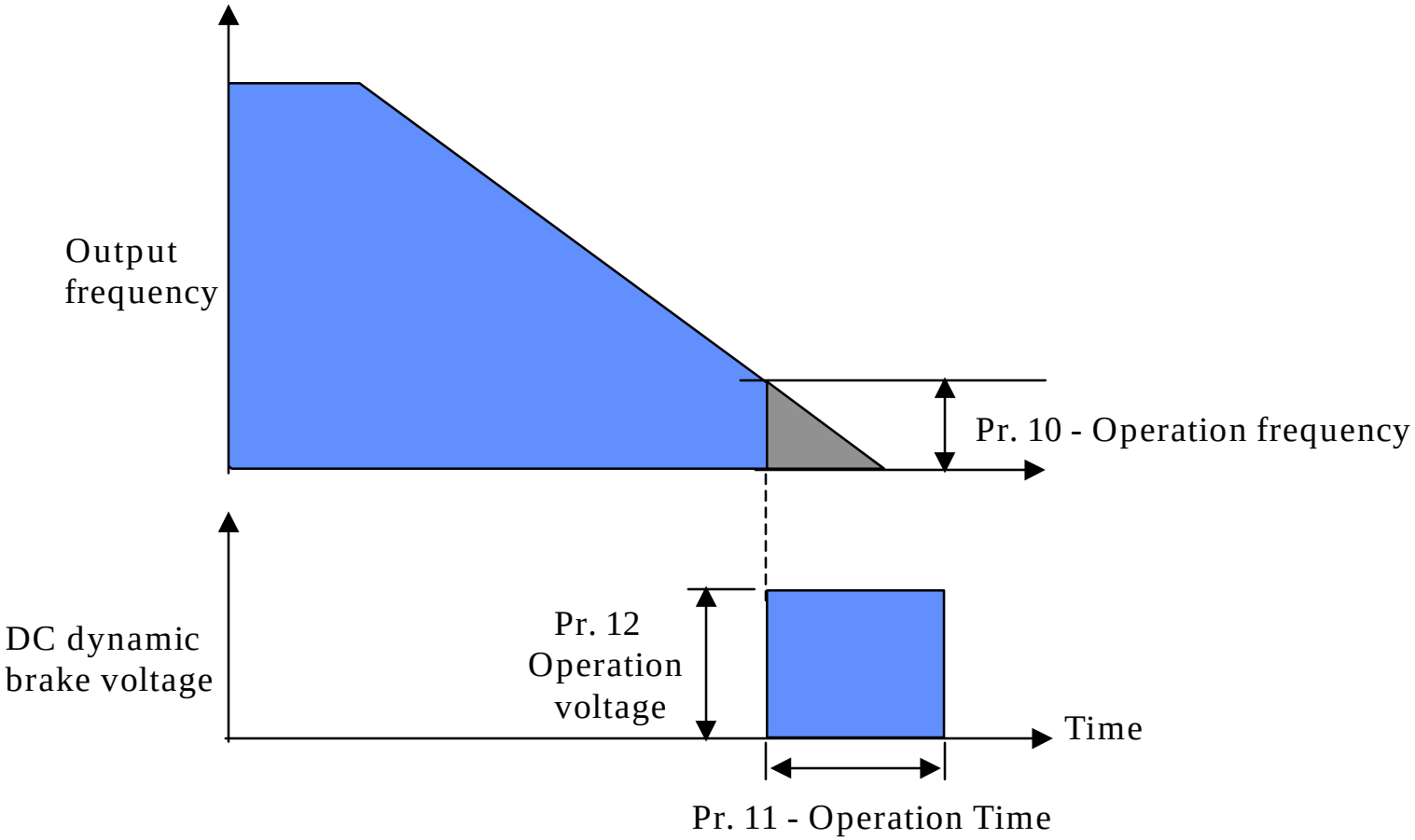
Note: 1. Setting 9999 in Pr. 10 allows the DC dynamic brake to start at the frequency set in Pr. 13 (starting frequency).
2. When 8888 is set in Pr. 11, connection of terminal MRS-SD starts the DC dynamic brake. At this time, the essential function (output stop) of terminal MRS is invalid.
3. When the inverter-dedicated motor (constant-torque motor) is used, change the setting of Pr. 12 “DC dynamic brake operation frequency” as described below:

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7.5K and down ... 4% 11K and up ... 2%

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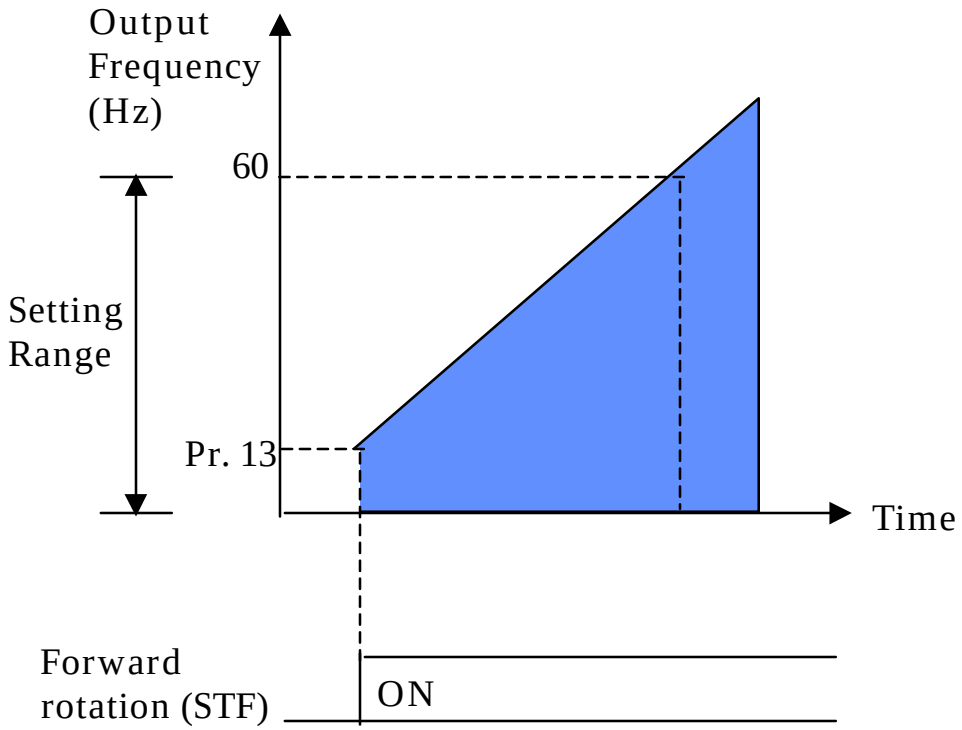


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Pr. 13 - “STARTING FREQUENCY”

•Allows the starting frequency to be set between 0 and 60Hz.

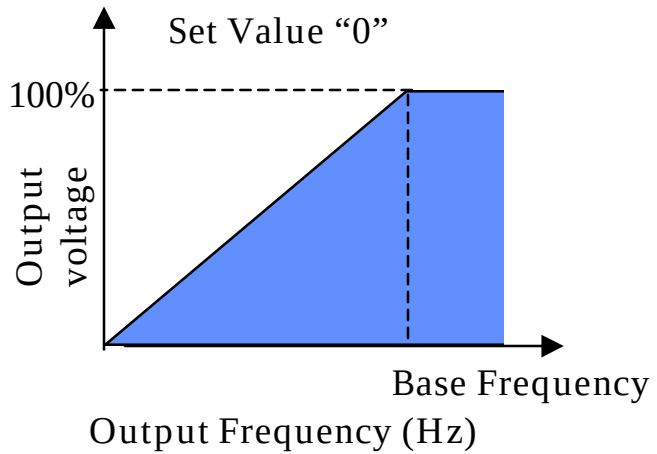
For example, when the starting frequency setting is 5Hz, the motor starts running as soon as the the frequency setting signal reaches 5Hz.
Also, when the setting is higher than 5Hz, entering the start signal causes the frequency output to start from 5Hz.



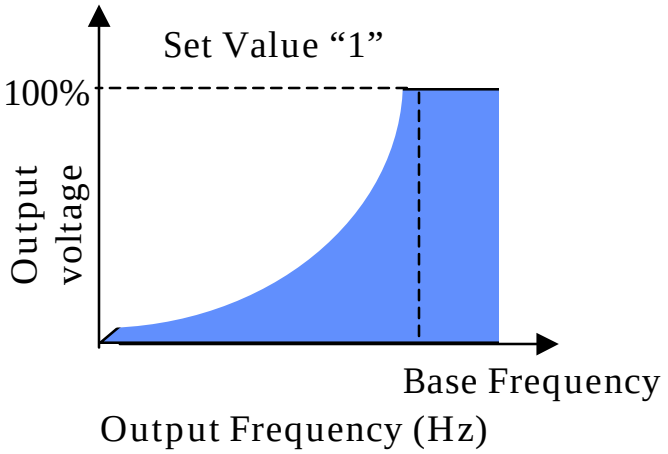
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Pr. 14 - "APPLIED LOAD SELECTION"

•**Conveyor, carrier, etc. (for constant-torque loads)**
Set "0" (factory setting)



•**Fan and pump (for variable-torque loads)**
Set "1"
The inverter accelerates slowly until the motor starts running to prevent the inverter from being stopped by the overcurrent protection function. Since an overvoltage is more likely to occur in this load characteristic, set a longer deceleration time.



NEXT PAGE

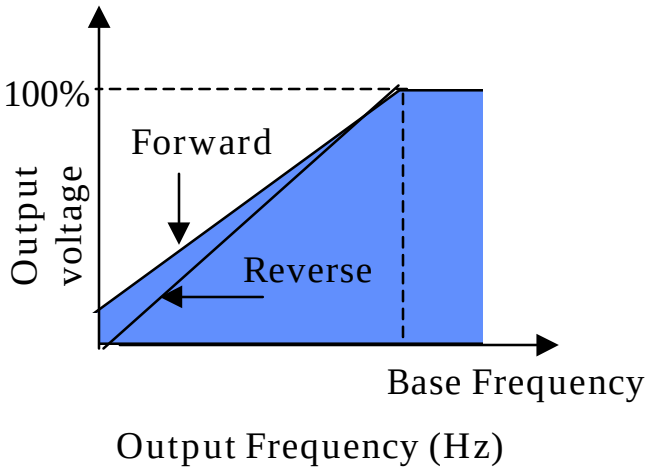
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•**For lift**

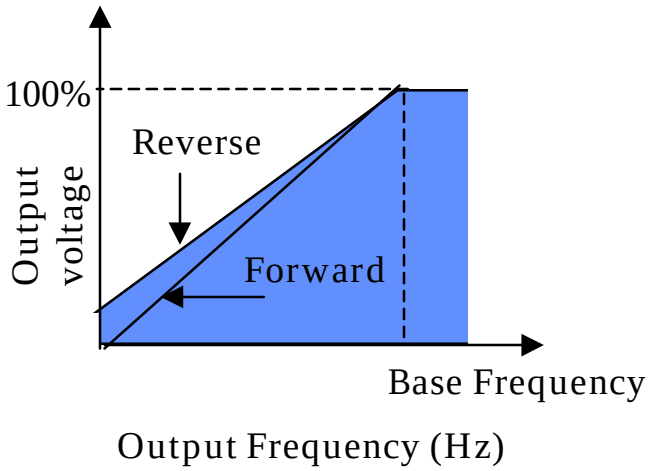
Set “2” or “3”.

Set “2” to select a boost for forward rotation, and set “3” to select a a boost for reverse rotation.

Set Value “2”
For lift
Boost for forward rotation ..... Pr. 0 set value
Boost for reverse rotation 0%



Set Value “3”
For lift
Boost for forward rotation 0%
Boost for reverse rotation ..... Pr. 0 set value



NEXT PAGE

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•**Applied load selection switching function according to RT terminal signal ON/OFF**

By setting “4” or “5” in Pr. 14, the output characteristic can be changed as indicated below according to the ON/OFF state of the RT terminal (second acceleration/deceleration time select terminal) signal.

Set Value	ON (Note)	OFF
4	For constant-torque loads (Pr. 14 = 0)	For lift - No boost for reverse rotation (Pr.14 = 2)
5	For constant-torque loads (Pr. 14 = 0)	For lift - No boost for forward rotation (Pr. 14 = 3)

Note: When the RT terminal signal is on, the second control functions (second acceleration/deceleration time, second torque boost, second base frequency) are selected. When the magnetic flux vector control mode has been selected in Pr. 80 and Pr. 81, the setting of this parameter is ignored.

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Pr. 15 - "JOG FREQUENCY"
Pr 16 - "JOG ACCELERATION /DECELERATION TIME"
Pr. 20 - "ACCELERATION/DECELERATION REFERENCE FREQUENCY"
Pr. 21 - "ACCELERATION/DECELERATION TIME INCREMENTS"

•Allows jog operation to be started and stopped by selecting the jog mode (connecting terminals JOG-SD) and turning on/off the start signal (terminals STF, STR). Jog operation may also be performed by using the parameter unit. For full information on the procedure, see page 41.

•Setting of frequency and acceleration/deceleration time

(1) Confirmation of acceleration/deceleration time setting range and minimum setting increments

Use Pr. 21 "acceleration/deceleration time increments" to set the acceleration time setting range and minimum setting increments. Before setting the acceleration time, the set value must be checked.

Set value "0" ..... 0 to 3600 seconds (minimum setting increments: 0.1 seconds) (factory setting)

Set value "1" ..... 0 to 360 seconds (minimum setting increments: 0.01 seconds)

(2) Setting of acceleration/deceleration time

In Pr. 16, "jog acceleration/deceleration time", set acceleration/deceleration time for jog operation. Acceleration time is a period of time required to reach the acceleration/deceleration reference frequency (Pr. 20) from 0Hz. Deceleration time is a period of time required to reach 0Hz from the acceleration/deceleration reference frequency (Pr. 20). Set a longer time to accelerate or decelerate more slowly, and a shorter time to accelerate or decelerate more rapidly. (Note 1, 2)

Factory setting	Setting Range
0.5 seconds	0 to 3600 seconds/ 0 to 360 seconds

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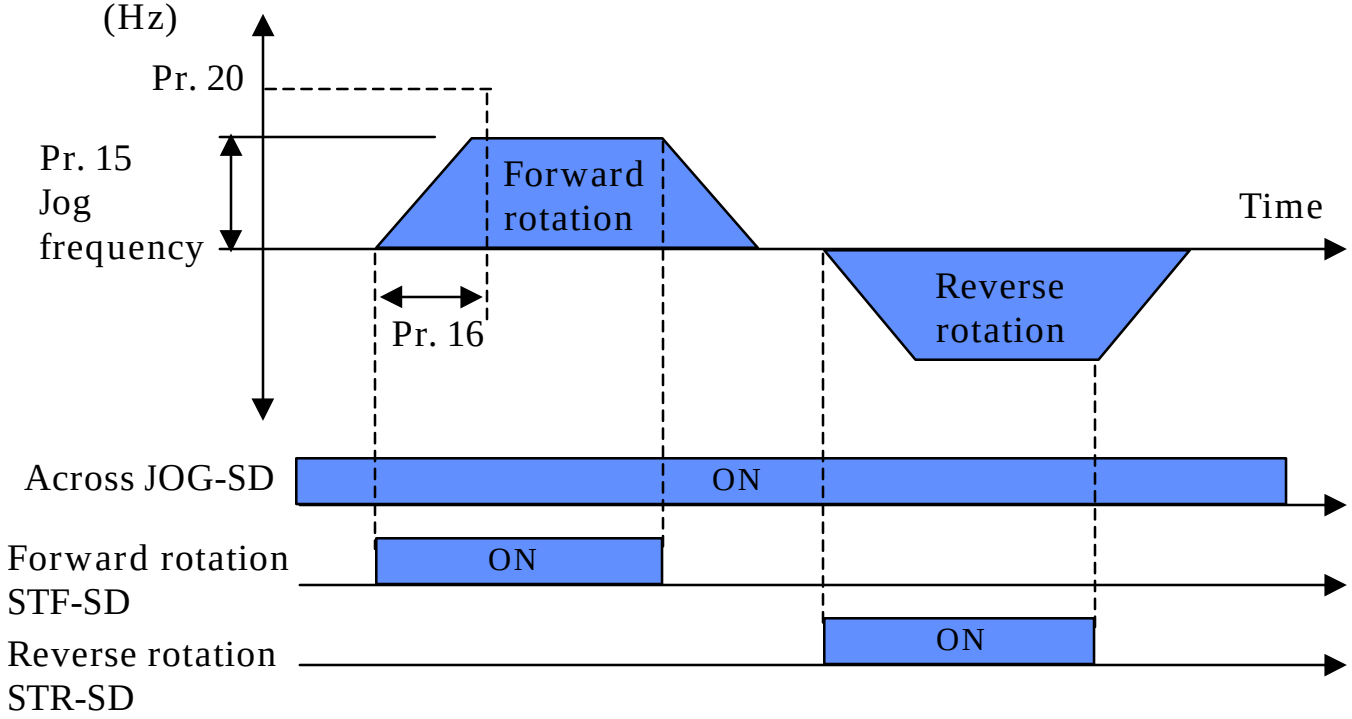
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Note: 1. In only S-pattern acceleration/deceleration A (see page 111), the set time is period of time required to reach the base frequency (Pr. 3).
2. If Pr. 20 (acceleration/deceleration reference frequency) setting is changed, the set values of calibration Pr. 903 and Pr. 905 (frequency setting signal gain) remain unchanged. To adjust the gains, adjust calibration Pr. 903 and Pr. 905.

(3) Setting of frequency

In Pr. 15 (jog frequency), set the running frequency for jog operation.

Factory Setting	Setting Range
5Hz	0 to 400Hz



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Pr. 17 - “EXTERNAL THERMAL RELAY INPUT”

•Change the set value to “1” or “3” to switch the function of the input terminal JOG/OH from the factory setting of the jog mode to OH (external thermal relay input). OH is used to input the signal contact of a thermal relay installed on the outside of the inverter or that of a temperature relay built in the motor. Change the set value to “2” or “3” to switch the function of the MRS terminal to N/C contact input specification (normally closed input).

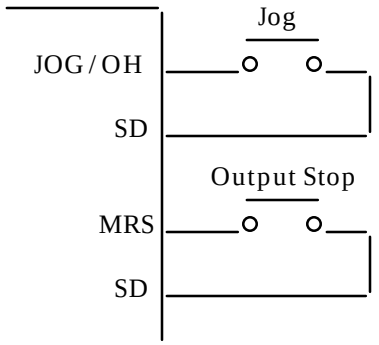
Pr. 17 Set Value	JOG/OH Terminal Function		MRS Terminal Function	
	Jog Mode	OH (External thermal relay input)	N/O Input	N/C Input
0 (factory setting)	●	—	●	—
1	—	●	●	—
2	●	—	—	●
3	—	●	—	●

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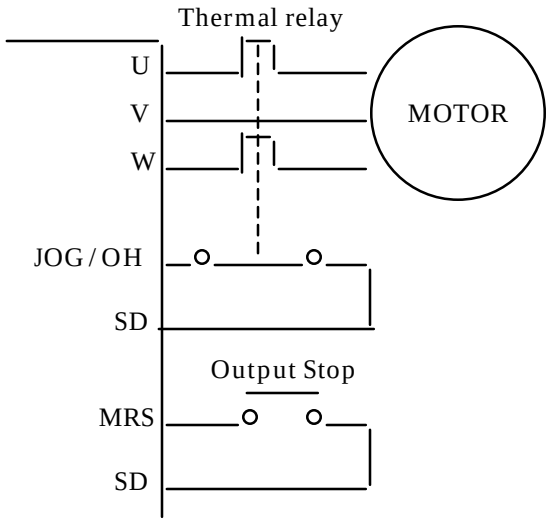
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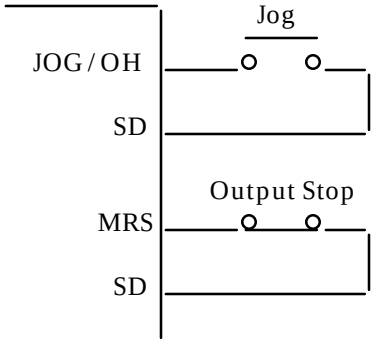
Set value “0”
(factory setting)



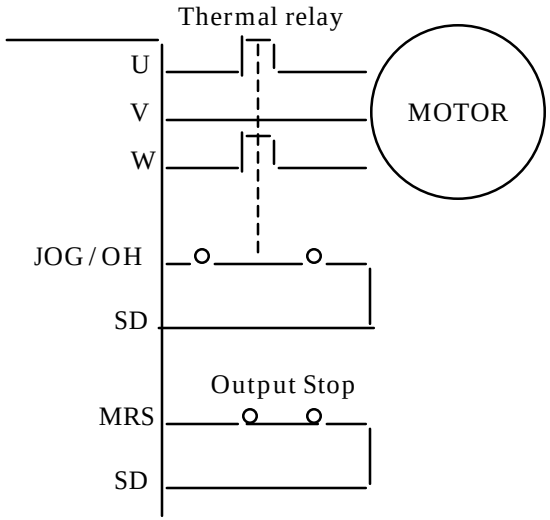
Set value “1”



Set value “2”



Set value “3”



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Pr. 18 - “HIGH-SPEED MAXIMUM FREQUENCY”

•This inverter is factory-set to the maximum running frequency of 120Hz. To run at a frequency over 120Hz, set a value of more than 120Hz in Pr. 18 “high-speed maximum frequency”. Pr. 1 “maximum frequency” is automatically changed to this set value.

Factory Setting	Setting Range
120Hz	120 to 400Hz

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Pr. 19 - “BASE FREQUENCY VOLTAGE”

•By setting motor’s name plate voltage rating in Pr. 19, the motor of rated voltage lower than the power supply voltage of the inverter can be used most appropriately.

Factory Setting	Setting Range
9999	0 to 1000V 8888, 9999

Note: 1. Setting “9999” (factory setting) in Pr. 19 makes the maximum output voltage identical to the power supply voltage.

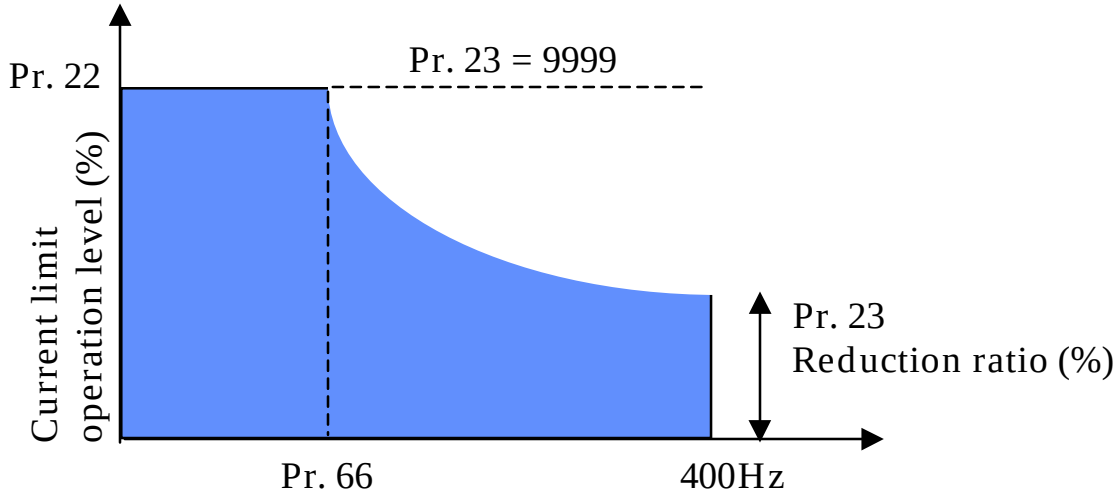
2. When the magnetic flux vector control mode has been selected in Pr. 80 and Pr. 81, Pr. 19 is regarded as about 200V (400V).

3. By setting “8888” in Pr. 19, the maximum output voltage is 95% of the power supply voltage. (Set “8888” in Pr. 19 when using a special motor of other than a Japanese manufacturer, for example.)

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Pr. 22 - “STALL PREVENTION OPERATION LEVEL”
Pr. 23 - “STALL PREVENTION OPERATION LEVEL AT DOUBLE SPEED”
Pr. 66 - “STALL PREVENTION OPERATION LEVEL REDUCTION STARTING FREQUENCY”

•In Pr. 22, “stall prevention operation level”, set the stall prevention (current limit) operation level. Normally set to 150% (factory setting).



•When operation is performed at high speed at or over 60Hz, acceleration may not be made because the motor current does not increase. To improve the operation characteristics of the motor is such a case, the current limit level in the high-frequency range can be reduced. When operation is performed in the high-frequency range, the current in the locked motor state is smaller than the rated output current of the inverter and the inverter does not result in an alarm (protective function not activated).

Pr. 66 is for the reduction starting frequency and Pr. 23 for the reduction ratio correction coefficient.

•By setting “9999” (factory setting) in Pr. 23, the stall prevention (current limit) level is kept constant at the Pr. 22 set value up to 400Hz.

NEXT PAGE

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•Calculation expression for current limit operation level

$$\text{level (\%)} = A + B \times \left\lceil \frac{\text{Pr. 22} - A}{\text{Pr. 22} - B} \right\rceil \times \left\lceil \frac{\text{Pr. 23} - 100}{100} \right\rceil$$

$$\text{where, } A = \left\lceil \frac{\text{Pr. (Hz)} \times \text{Pr. 22 (\%)}}{\text{output frequency (Hz)}} \right\rceil \qquad B = \left\lceil \frac{\text{Pr. 66 (Hz)} \times \text{Pr. 22 (\%)}}{400\text{Hz}} \right\rceil$$

•When “0” is set in Pr. 22, the stall prevention operation is not performed.

•When “9999” is set in Pr. 22, the stall prevention level can be changed by terminal No. 1. A specific method is given below.

•Set “9999” in Pr. 22 to change the stall prevention operation level according to the voltage applied to terminal 1. (The fast response current limit level remains unchanged.)

Set “9999” in Pr. 22 “stall prevention operation level”.

Enter 0-5V (or 0 - 10V) into terminal 1. (Setting “9999” in Pr. 22 automatically switches the function of the auxiliary input terminal to a stall prevention operation level signal input.)

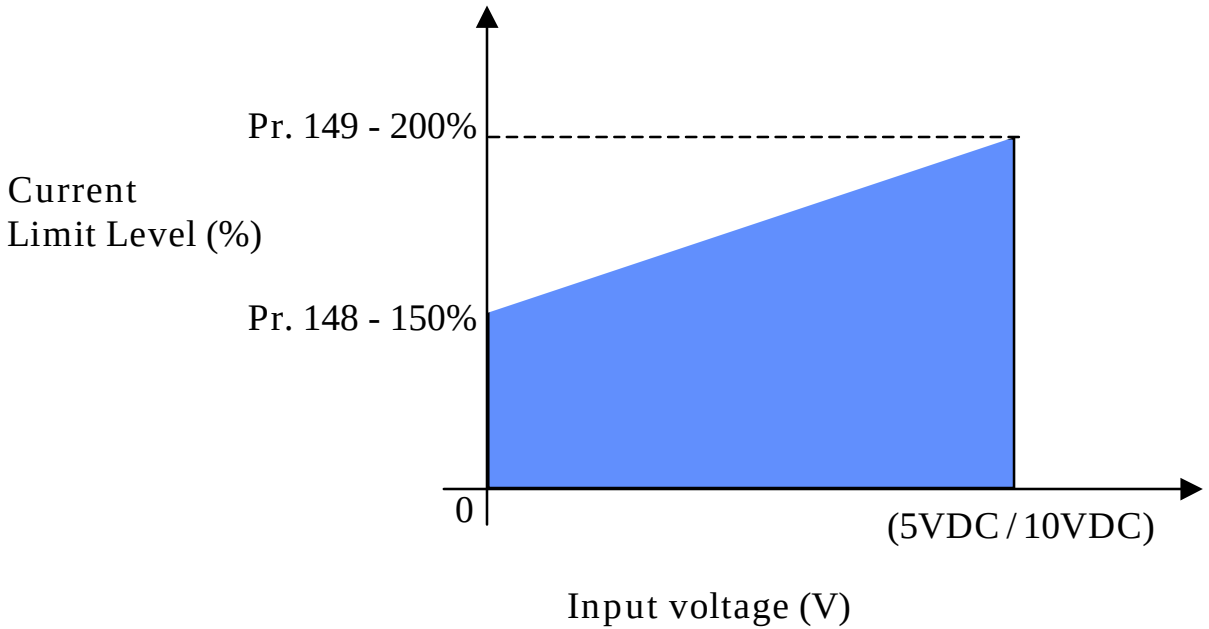
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Pr. No.	Description	Setting Range	Min. Inc.	Factory Setting	Remarks
22	Stall prevention level	0 to 200%, 9999	0.1%	150%	9999: Analog Input
149 (Note)	Current limit level at the input voltage of 0V	0 to 200%	0.1%	150%	
148 (Note)	Current limit level at the input voltage of 10V	0 to 200%	0.1%	200%	

Note: 1. Set 701 in Pr. 77 to enable read and write.
2. Use Pr. 73 to switch the terminal 1 input voltage between 0 to 5V and 0 to 10V.
3. When 9999 is set in Pr. 22, the terminal 1 input is dedicated to stall prevention level setting. Therefore, the auxiliary input and override functions of terminal 1 are made invalid.



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Pr. 28 - “MULTI-SPEED INPUT COMPENSATION”

•By entering a compensation signal into the auxiliary input terminal 1 (Note), the speeds (frequencies) of multi-speed settings selected by the RH, RM and RL terminals can be compensated for.

Set Value	Compensation by Auxiliary Input
0	No compensation (factory setting)
1	Compensation available

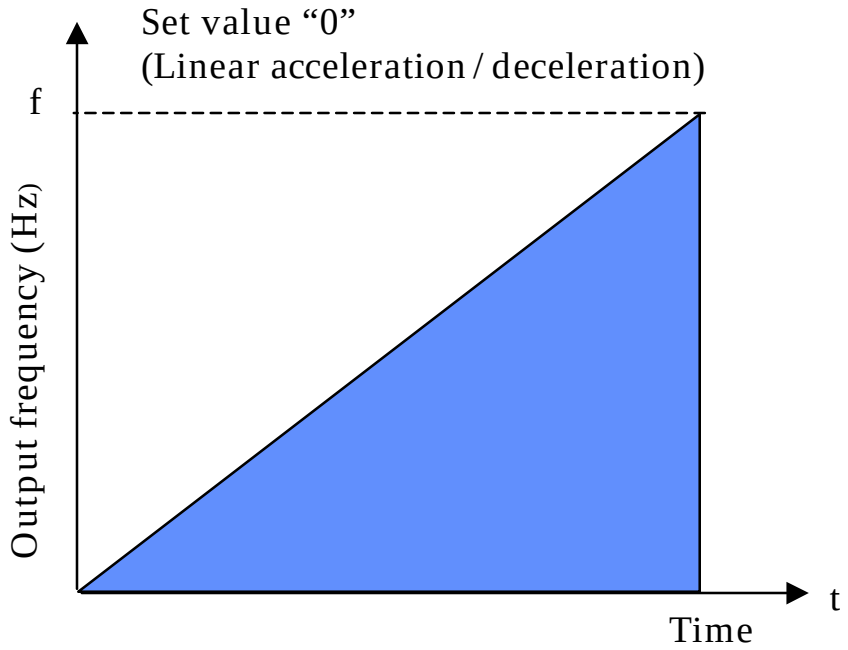
Note: When any of 4, 5, 14 and 15 are set in Pr. 73, the compensation signal is entered into terminal 2.

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Pr. 29 - “ACCELERATION/DECELERATION PATTERN”

•General Application

Set “0” (factory setting). A general acceleration/deceleration pattern (linear acceleration/deceleration) is achieved. Generally, this setting is used for standard applications.



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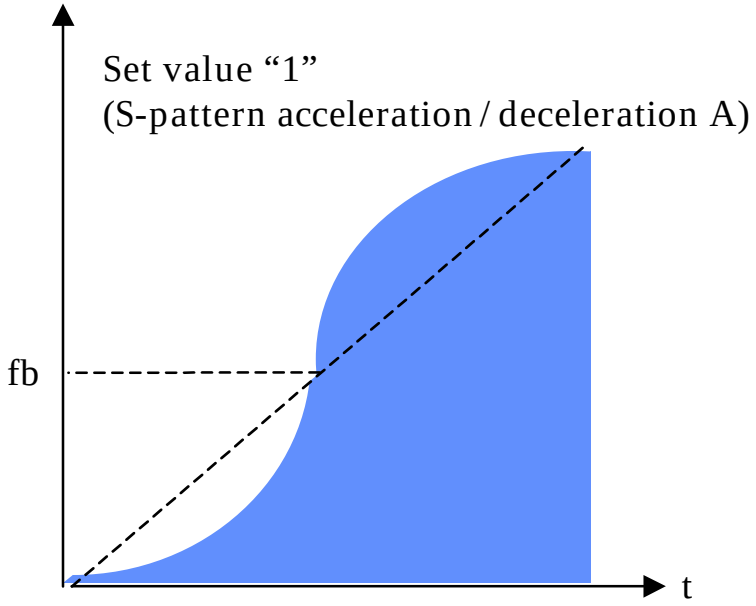
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•For machine tool spindles

Set “1”. This setting is used when it is necessary to make acceleration/deceleration in a short time up to the 60Hz or higher speed range (S-pattern acceleration/deceleration A). In this acceleration/deceleration pattern, fb (base frequency) is always the inflection point of an S shape, allowing acceleration/deceleration time to be set according to the reduction in motor torque in the 60Hz or higher constant-output operation range (Pr. 7 and Pr. 8).

Note: For the acceleration/deceleration time, set the time required to reach the base frequency (Pr. 3), not the acceleration/deceleration reference frequency (Pr. 20).

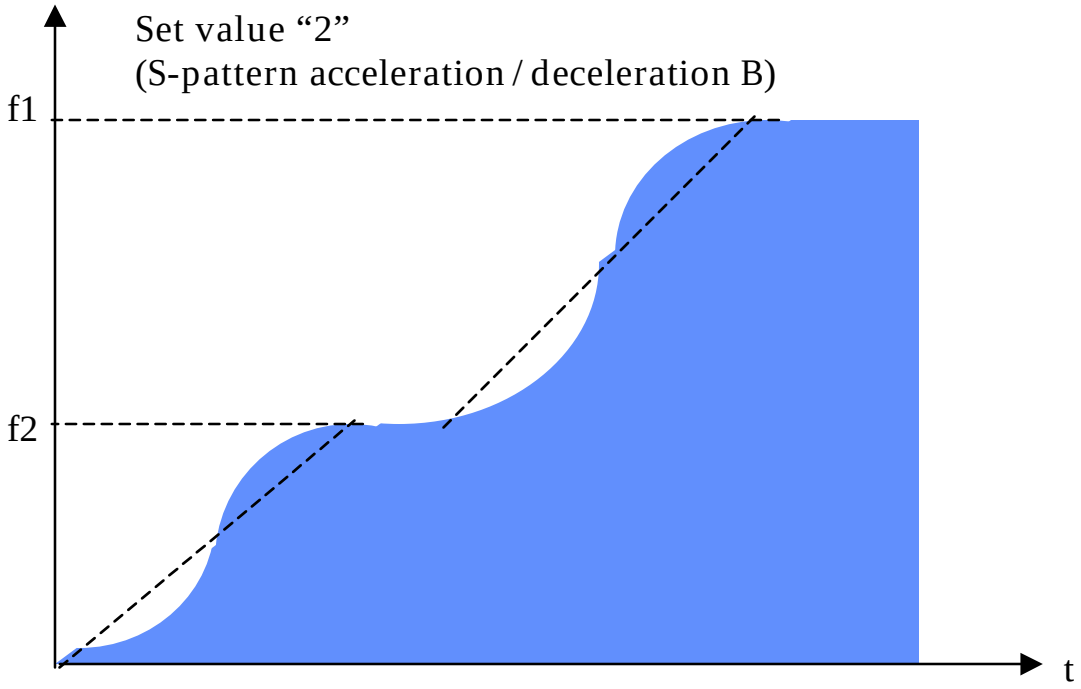


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•**Prevention of cargo collapse on conveyor, etc.**
Set “2” to provide an S-pattern acceleration/deceleration from f2 (current frequency) to f1 (target frequency), easing the any acceleration/deceleration shock. This pattern has an effect on the prevention of cargo collapse, etc.



NEXT PAGE

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•Backlash compensation for reduction gear, etc.

Set “3”. This function stops the output frequency change temporarily during acceleration/deceleration, reducing a shock (backlash) generated when a reduction gear backlash is eliminated suddenly.

Use Pr. 33 to Pr. 36 for the setting.

Pr. Number	Function Name	Setting Range	Factory Setting
33	Backlash acceleration stopping frequency	0 to 400Hz	1Hz (9999)
34	Backlash acceleration stopping time	0 to 3600 seconds	0.5 seconds (9999)
35	Backlash deceleration stopping frequency	0 to 400Hz	1Hz (9999)
36	Backlash deceleration stopping time	0 to 3600 seconds	0.5 seconds (9999)

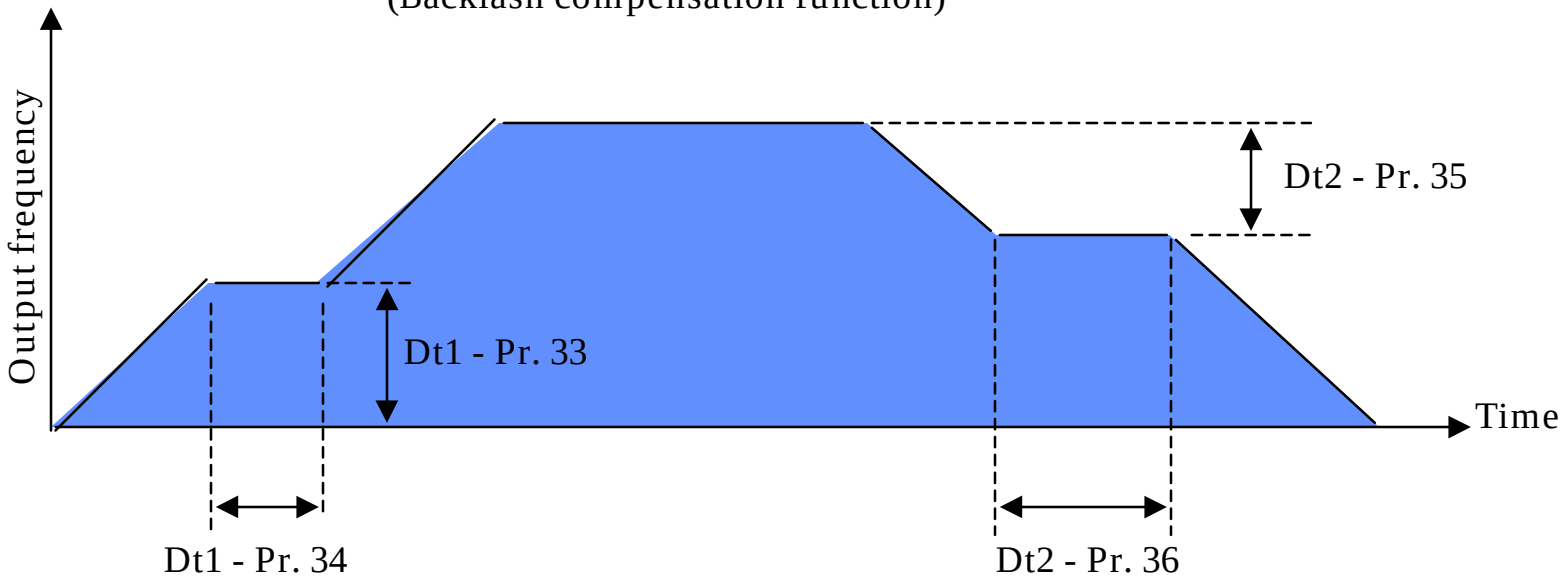
Note: Pr. 31 and Pr. 32 are implemented as frequency jump functions.

NEXT PAGE

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Set value “3”
(Backlash compensation function)



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Pr. 30 - "REGENERATIVE BRAKE DUTY CHANGE SELECTION"
Pr. 70 - "SPECIAL REGENERATIVE BRAKE DUTY"

•Set these parameters when it is necessary to increase the regenerative brake duty for frequent start/stop operations. In this case, as a higher brake resistor capacity is required, use the optional FR-ABR(H) high-duty brake resistor.

<Setting method>

After setting "1" in Pr. 30 "regenerative brake duty change selection", set the duty in Pr. 70 "special regenerative brake duty".

<Regenerative brake duty when Pr. 30 = 0>

FR-A220E-0.4K to 3.7K 3%
FR-A220E-5.5K to 7.5K 2%
FR-A240E-0.4K to 7.5K 2%

<Pr. 70 "special regenerative brake duty" setting range when Pr. 30 = 1>

Model	Factory Setting	Setting Range
0.4K to 1.5K	0%	0 to 15%
2.2K to 7.5K	0%	0 to 30%
11K and up	0%	0%

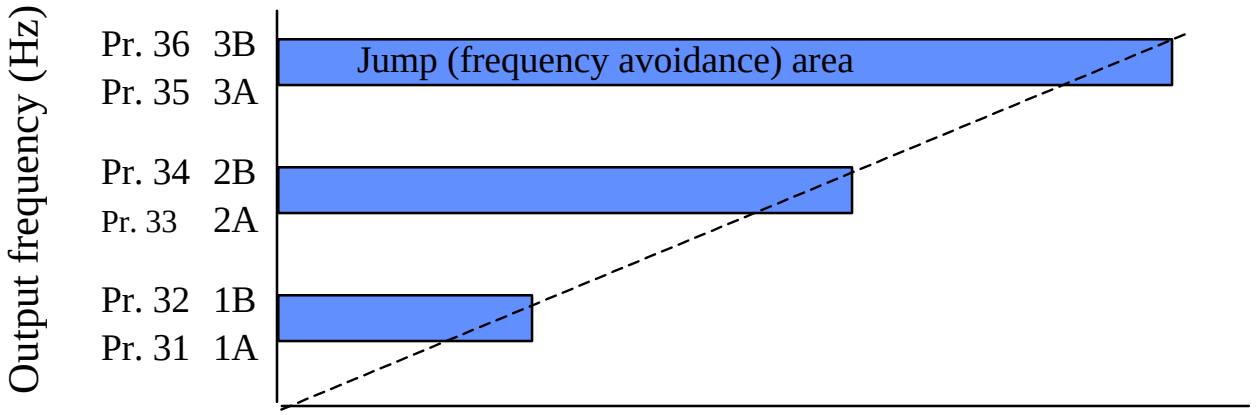
Note: 1. When the Pr. 70 setting is increased from the factory setting, the set value must be matched to the permissible brake duty of the external brake resistor (FR-ABR(H) see page 165).
2. Setting is invalid for models 11K and up.
3. The brake duty indicates %ED of the built-in brake transistor operation.
4. When Pr. 30 is "0", Pr. 70 is not displayed.

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Pr. 31 - “FREQUENCY JUMP 1A”, Pr. 32 - “FREQUENCY JUMP 1B”
Pr. 33 - “FREQUENCY JUMP 2A”, Pr. 34 - “FREQUENCY JUMP 2B”
Pr. 35 - “FREQUENCY JUMP 3A”, Pr. 36 - “FREQUENCY JUMP 3B”

•Allows a mechanical resonant point to be jumped. Up to three areas may be set, with the jump frequency set to either the top or bottom point of each area.

•The value set to 1A, 2A or 3A is a jump point and operation is performed at this frequency.



Note: 1. Frequency jump is not made when the set value is “9999” (factory setting).
2. Setting “3” in Pr. 29 switches Pr. 33-36 into the backlash compensation setting functions. But Pr. 33 to 36 setting ranges are not displayed on the PU screen. And the set values of the frequency jump parameters are displayed in the parameter change list and initial value list, that is, when Pr. 29 is set to 3, the set values of Pr. 33 to 36 are not displayed in the lists.
3. During acceleration/deceleration, the running frequency within the set area is valid.

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Pr. 37 - “SPEED DISPLAY”
Pr. 51 - “INVERTER LED DISPLAY DATA SELECTION”
Pr. 52 - “PU MAIN DISPLAY DATA SELECTION”
Pr. 53 - “PU LEVEL DISPLAY DATA SELECTION”

•To change the inverter LED display

(1) Set “6” (running speed) in Pr. 51 “inverter LED display data selection”.

(2) Set Pr. 37 “speed display” in accordance with the following table:

Pr. 37 Set Value	Running Speed Display
2 to 10	• The set value is the number of motor poles. • The displayed value is the motor speed. Example: When the set value is “2”, 3600 (r/min) is displayed at the output of 60Hz.
11 to 9998	• Set the machine speed at 60Hz operation. Example: When the set value is 150 (m/min), 150 (without display unit) is displayed at the output of 60Hz.

Note: 1. Only the display unit is set in this parameter. For the other frequency-related parameters (such as Pr. 1), set a frequency unit.
2. In the V/F control mode, the motor speed is converted into the output frequency and does not match the actual speed. When the magnetic flux vector control mode has been selected in Pr. 80 and 81, this display shows the actual speed (estimated value resulting from the compensation of motor slippage).
3. The factory setting is “4” (poles) (1800 r/min is displayed at the output of 60Hz).

NEXT PAGE

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•**To change the PU level meter (PU level display)**

(1) Set “6” (running speed) in Pr. 53 “PU level display data selection”.
(2) Press the [HELP] key to call the selective monitor (other monitor) screen.

•**To change the PU main monitor (PU main display)**

(1) Set “0” (factory setting) in Pr. 52 “PU main display data selection”.
(2) Press the [HELP] key to call the selective monitor (other monitor) screen.
(3) Move the cursor to “6 rpm” and press the [READ] key to call the speed monitor screen (unit: r/min).
(4) Then press the [WRITE] key to define the speed monitor screen as the first priority screen.

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Pr. 38 - “AUTOMATIC TORQUE BOOST”
Pr. 39 - “AUTOMATIC TORQUE BOOST STARTING CURRENT”

•Automatically controls the inverter output voltage (torque) according to the load current detected.

Parameter	Factory Setting	Set Value
Pr. 38	0%	Set the boost compensation value (%) Set “0” to disable the automatic torque boost. Normally set “100” (%) to operate the automatic torque boost.
Pr. 39	0Amps	Set the automatic torque boost starting current (A). Normally set “0” (A).

Note: When the magnetic flux vector control mode has been selected in Pr. 80 and 81, the setting of the automatic torque boost is ignored.

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Pr. 40 - "OUTPUT TERMINAL ASSIGNMENT"

•Any of 10 functions can be reassigned to the SU, IPF, OL and FU output terminals individually.
Set a 4-digit integer in Pr. 40.
The value in each digit indicates the function of the corresponding terminal.

Pr. 40:	1st digit	2nd digit	3rd digit	4th digit
	SU	IPF	OL	FU

•**Factory setting ..... "1234"**

Terminal SU : SU (up-to-frequency) signal
Terminal IPF : IPF/UVT (instaneous power failure or undervoltage) signal
Terminal OL : OL (overload alarm) signal
Terminal FU : FU1 (frequency detection) signal

NEXT PAGE

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Set Value	Function Code	Function Name	Operation	Related Pr.	Note
0	RUN	Inverter running	Output during operation when the inverter output frequency reaches or exceeds the starting frequency.	-	-
1	SU	Up-to-frequency	Output when the output frequency reaches within +/-10% of the set frequency. (Note 4) (Note 5)	Pr. 41	
2	IPF/UVT	Instantaneous power failure or undervoltage	Output when instantaneous power failure or undervoltage occurs.	-	
3	OL	Overload alarm	Output while the current limit function is operating.	Pr. 22, 23	
4	FU1	Frequency detection	Output when the output frequency reaches or exceeds the specified detection frequency. (Note 4)	Pr. 42, 43	
5	FU2	Second frequency detection	Output when the output frequency reaches or exceeds the specified detection frequency. (Note 4)	Pr. 50	
6	RBP	Regenerative brake pre-alarm	Pre-alarm is output on reaching 85% of the regenerative brake duty set in Pr. 70.	Pr. 70	
7	THP	Electronic overcurrent protection alarm	Output when the electronic overcurrent protection cumulative value reaches 85% of the set value.	Pr. 9	
8	* RUN	0Hz detection	Output during operation when the inverter output frequency under the starting frequency.	-	Pr. 96=9* Pr. 77=701
9	* SU	Down to frequency	Output during operation until the inverter output frequency reaches within +/-10% of the set frequency.	Pr. 41	

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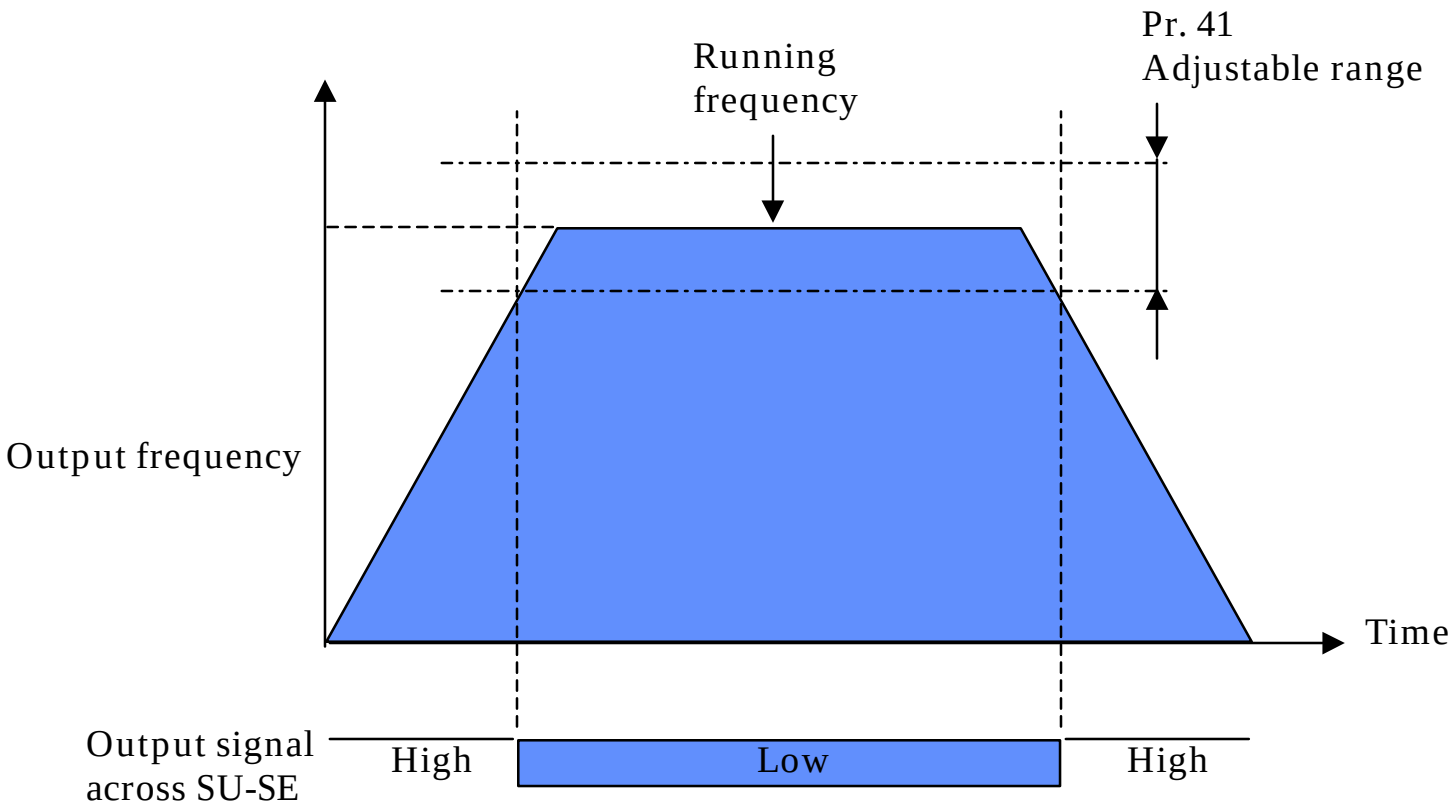
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Note: 1. “0” set in the first digit of the four digits is not displayed. However, “0” set in other than the first digit is displayed.
2. The function of terminal RUN (output during inverter running) is fixed. This function cannot be changed using Pr. 40.
3. “Output “ indicates that the built-in transistor for open collector is turned on (conducts).
4. In the PLG feedback control mode, the operation of up-to frequency (SU) and frequency detection (FU1, FU2) are described below:
   SU, FU1 : Output when the actual speed (frequency) under the control of the PLG feedback signal reaches or exceeds the specified detection frequency.
   FU2 : Output when the inverter output frequency reaches or exceeds the specified detection frequency.
5. Note that when the frequency setting is changed by the analog or the [UP]/[DOWN] arrow keys of the PU, the output of the SU (up-to-frequency) signal may alternate between ON and OFF depending on the speed of that change and the timing of the changing speed determined by the setting of the acceleration/deceleration time. (Such alternation does not take place when the acceleration/deceleration time setting is “0 seconds”.)
6. When switching the power on until 800msec. (max.) later, and then switching the power off, these functions do not work.

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Pr. 41 - "UP-TO-FREQUENCY SENSITIVITY" "DOWN-TO-FREQUENCY SENSITIVITY"

•Allows the output signal ON range to be adjusted between 1 and +/- 100% of the running frequency when the output frequency reaches the running frequency.



Low: Output transistor ON, High: Output transistor OFF

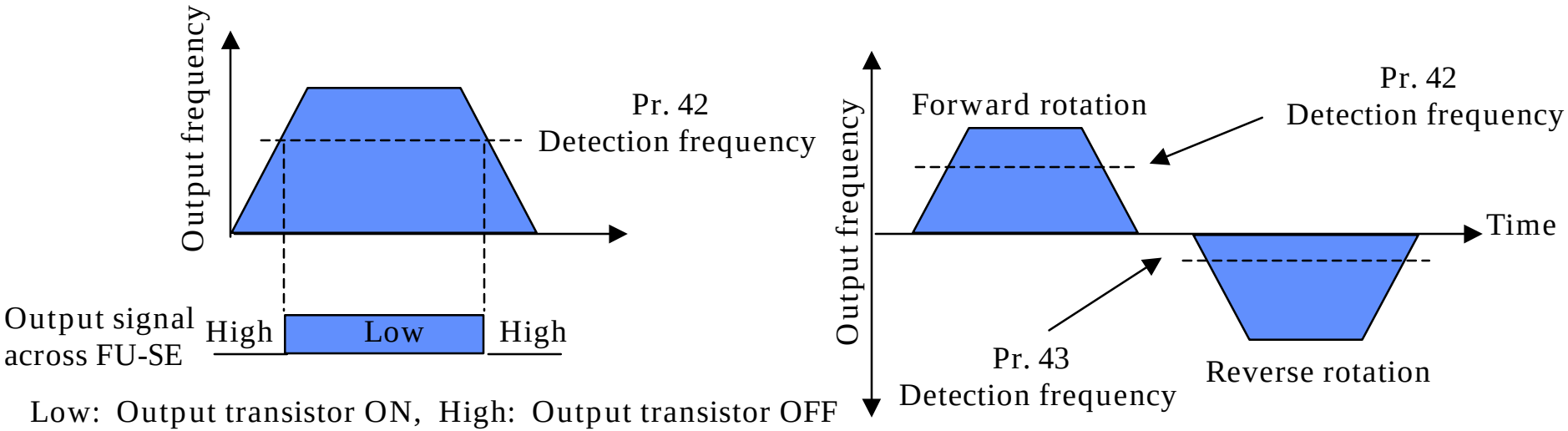
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Pr. 42 - "OUTPUT FREQUENCY DETECTION",
Pr. 43 - "OUTPUT FREQUENCY DETECTION AT REVERSE ROTATION"

•The signal across terminals FU-SE is switched low when the output frequency reaches or exceeds the selected detection frequency (value set in "output frequency detection", Pr. 42), and is switched high when it drops below the detection frequency. This function can be used to for electromagnetic brake operation, open and other signals.

•Setting a value in Pr. 43 "output frequency detection at reverse rotation" allows the frequency to be detected exclusively for the reverse rotation. (In this case, the set value in Pr. 42 is for the forward rotation only.) This function is effective for switching the timing of electromagnetic brake operation between forward rotation (rise) and reverse rotation (fall) during elevator operation. This parameter is factory-set to "9999". In this state, the detection frequency is the Pr. 42 set value for both the forward rotation and reverse rotation.

Note: When the inboard option unit is used to exercise PLG feedback control, use the RUN (running) signal. (If the FU (output frequency detection) signal is used, the brake may not be released.)



Low: Output transistor ON, High: Output transistor OFF

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Pr. 44 - “SECOND ACCELERATION/DECELERATION TIME”, Pr. 45 - “SECOND DECELERATION TIME”, Pr. 46 - “SECOND TORQUE BOOST”, Pr. 47 - “SECOND V/F (BASE FREQUENCY)”

•The external contact signal (across terminals RT-SD) allows the acceleration and deceleration times, boost setting, etc. to be changed together. Effective for switching between two motors different in parameter setting, e.g. elevating and traversing.

Set Function		Signal across Terminals RT-SD	
	Parameter number	OFF	ON
Acceleration time	Pr. 7	●	
	Pr. 44		●
Deceleration time	Pr. 8	●	
	Pr. 45		●
Torque boost (manual)	Pr. 0	●	
	Pr. 46		●
Base frequency	Pr. 3	●	
	Pr. 47		●

Note: 1. Setting”9999” (factory setting) in Pr. 45 causes both the second acceleration time and deceleration time to be the value set in Pr. 44.

2. When the magnetic flux vector control mode has been selected in Pr. 80 and Pr. 81, the setting of Pr. 46 is ignored.

3. The second acceleration/deceleration time is the time taken for acceleration to the frequency set in Pr. 20 “acceleration/deceleration reference frequency”, as in Pr. 7 “acceleration time” and Pr. 8 “deceleration time”.

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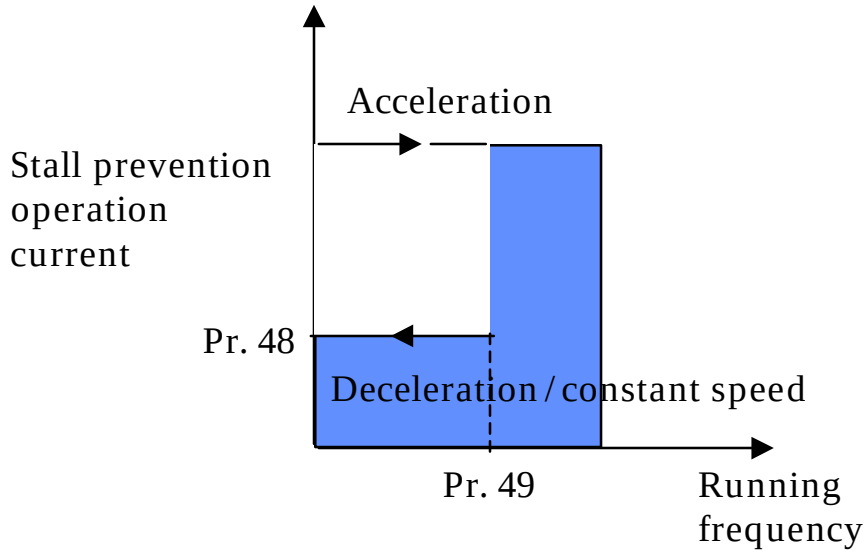
Pr. 48 - "SECOND STALL PREVENTION OPERATION CURRENT", Pr. 49 - "SECOND STALL PREVENTION OPERATION FREQUENCY"

- Allows the stall prevention (current limit) operation level to be changed within the range from 0Hz to the frequency set in Pr. 49. The setting of a low value is effective for a stop on contact, which requires low torque at low speed.

- This function is not valid during acceleration and is only valid during deceleration or at constant speed.

- This function is invalid when "0" is set in Pr. 49 (factory setting).

Note: The set value (%) indicates the ratio to the rated inverter output current.



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Pr. 50 - “SECOND OUTPUT FREQUENCY DETECTION”

•In addition to the detected output frequencies set in Pr. 42 and Pr. 43, the detected output frequency can be set.

•By setting “5” (FU2) in any of the first to fourth digits of Pr. 40, the signal can be output from any of the SU, IPF, OL and FU terminals. The terminal signal is turned on at or above the set frequency (the built-in transistor is switched on). (See the section on Pr. 42 and Pr. 43.)

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Pr. 51 - “INVERTER LED DISPLAY DATA SELECTION”, Pr. 52 - “PU MAIN DISPLAY DATA SELECTION”, Pr. 53 - “PU LEVEL DISPLAY DATA SELECTION”, Pr. 54 - “ FM TERMINAL FUNCTION SELECTION”, Pr. 158 - “AM TERMINAL FUNCTION SELECTION”

•By setting any of the numbers in the following table, the required signal can be selected from among the 21 signals for the monitor and output signals.

•There are two types of signal outputs: FM pulse train output terminal and AM analog output terminal. Different signals can be output at the same time. Select the signals using Pr. 54 and Pr. 158.

<Factory Setting>
Pr. 51 ..... “1”
Pr. 52 ..... “0”
Pr. 53 ..... “1”
Pr. 54 ..... “1”
Pr. 158 ..... “9999”

NEXT PAGE

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Signal Type	Display Unit	Parameter Set Value						Full-Scale Value of FM, AM, Level meter
		Pr. 51	Pr. 52	Pr. 53	Pr. 54		Pr. 158	
		Inverter	PU main monitor	PU level meter	FM terminal	AM terminal	AM terminal	
No display	---	LED X	X	0	X	X	X	---
Output frequency	Hz	1	0	1	1	101	1	Pr. 55
Output current	A	2	0	2	2	102	2	Pr. 56
Output voltage	V	3	0	3	3	103	3	400V or 800V
Alarm display	---	4	0	X	X	X	X	---
☆ Frequency set value	Hz	5	*	5	5	105	5	Pr. 55
☆ Running speed	(r/min)	6	*	6	6	106	6	Value converted from Pr. 55 by Pr. 37 value
☆ Motor torque **	%	7	*	7	7	107	7	400V or 800V
☆ Converter output voltage	V	8	*	8	8	108	8	Rated torque of applied motor x 2
☆ Regenerative brake duty	%	9	*	9	9	109	9	Pr. 70
☆ Electronic overcurrent protection load factor	%	10	*	10	10	110	10	Protector operation level
☆ Output current peak value	A	11	*	11	11	111	11	Pr. 56
☆ Converter output voltage peak value	V	12	*	12	12	112	12	400V or 800V
☆ Inverter input power	KW	13	*	13	13	113	13	Rated power of applied motor x 2
☆ Inverter output power	KW	14	*	14	14	114	14	Rated power of applied motor x 2
Input terminal status	---	X	*	X	X	X	X	---
Output terminal status	---	X	*	X	X	X	X	---
☆ Load meter	%	17	17	17	17	117	17	Pr. 56
☆ Motor exciting current	A	18	18	18	18	118	18	Pr. 56
Position pulse	---	X	19	X	X	X	X	---
Cumulative energization time	hr	X	20	X	X	X	X	---
☆ Reference voltage output	---	X	X	X	21	121	21	1440Hz is output to FM terminal. Full-scale voltage is output to AM terminal.
Orientation status	---	X	22	X	X	X	X	---
Actual operation time	hr	X	23	X	X	X	X	---
Motor load factor	%	X	24	X	X	X	X	Rated load of applied motor x 2

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Note: 1. Monitor cannot be selected for items marked x.
2. Setting “0” in Pr. 52 “PU main monitor” allows the monitoring of “output frequency to alarm display” to be selected in sequence by the SHIFT key. (Factory setting)
3. The load meter is displayed in %, with the current set in Pr. 56 regarded as 100%.
4. * “Frequency set value to output terminal status” on the PU main monitor are selected by “other monitor selection” of PU operation.
5. ** “Motor torque” display is valid only in the magnetic flux vector control mode.
6. When any of the signals marked ☆ has been selected in Pr. 54 “FM terminal function selection”, the outputs of the FM and AM terminals are zero while the inverter is at stop or alarm.
7. Setting “1, 2, 5, 6, 11, 17 or 18” in Pr. 53 or 54 allows the full-scale value to be set in Pr. 55 or 56.
8. The cumulative energization time is calculated from 0 to 6535 hr, is then cleared, and is recalculated from 0.
9. By setting “0” in Pr. 53, the level meter display of the PU can be switched off.
10. For the actual operation time, the length of time when the inverter is running is calculated. (The time when the inverter is at a stop is not calculated.) The operation time under 1 hr is ignored from the actual operation time.
11. When the fast-response current limit function is activated, the outputs of terminals FM and AM are zeroed. (To prevent this, make the fast-response current limit function invalid or use the extension analog output of the FR-EPA or EPE option.)
12. The orientation status functions properly when the FR-EPA option is used. If the option is not used, “22” may be set in Pr. 52 but the orientation status does not function and “0” is kept displayed.

NEXT PAGE

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•Use Pr. 54 and Pr. 158 to select the function of the AM terminal in accordance with the following table:

<table>
<tr><th>Pr. 158
Set Value</th><th>Pr. 54
Set Value</th><th>FM, AM Terminal
Output Status</th><th>Remarks</th></tr>
<tr><td rowspan="2">9999
(factory setting)</td><td>1 to 21</td><td rowspan="2">Both the FM and AM terminals output the signal set in Pr. 54</td><td>The calibration Pr. 900 value may only be read or written.</td></tr>
<tr><td>101 to 121</td><td>The calibration Pr. 901 value may only be read or written.</td></tr>
<tr><td rowspan="2">1 to 21</td><td>1 to 21 *</td><td rowspan="2">The FM terminal outputs the signal set in Pr. 54.
The AM terminal outputs the signal set in Pr. 158.</td><td rowspan="2">Both the calibration Pr. 900 and Pr. 901 values can be read or written.</td></tr>
<tr><td>101 to 121 *</td></tr>
</table>

* : When any of “1 to 21” has been set in Pr. 158, setting either any of “1 to 21” or any “101 to 121” in Pr. 54 causes the same signal to be output from the FM terminal.

<Setting example>

To output the output frequency from the FM terminal and the output current from the AM terminal

- Set 1 in Pr. 54 (adjust the full-scale value in Pr. 55).
- Set 2 in Pr. 158 (adjust the full-scale value in Pr. 56).

For adjustment, see pages 64 to 66 of manual.

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Pr. 55 - "FREQUENCY MONITORING REFERENCE", Pr. 56 - "CURRENT MONITORING REFERENCE"

•Set the frequency or current which is referenced for display when the frequency or current is selected for the FM and AM terminals and PU level meter display.

Monitoring Reference Setting Pr.	Monitor Screen Selection (Setting Unit)	Pr. 53 Setting	FM, AM Terminal Function Selection Pr. 54 Setting	
f monitoring reference Pr. 55	Output f (Hz)	1	1	101
	f setting (Hz)	5	5	105
	Running speed (Pr. 37)	6	6	106
I monitoring reference Pr. 56	Output I (A)	2	2	102
	Peak I (A)	11	11	111
	Load meter (%)	17	17	117
	Motor exciting I (A)	18	18	118
Setting method using Pr. 55, Pr. 56		PU level meter indication is full-scale.	Terminal FM output is 1440Hz	Terminal AM output is 10V

Note: 1. FM maximum output f is 2400Hz. Hence, adjust Pr. 55. If Pr. 55 is not adjusted, the output of terminal FM will be stabilized.
2. AM terminal output voltage is 10VDC.

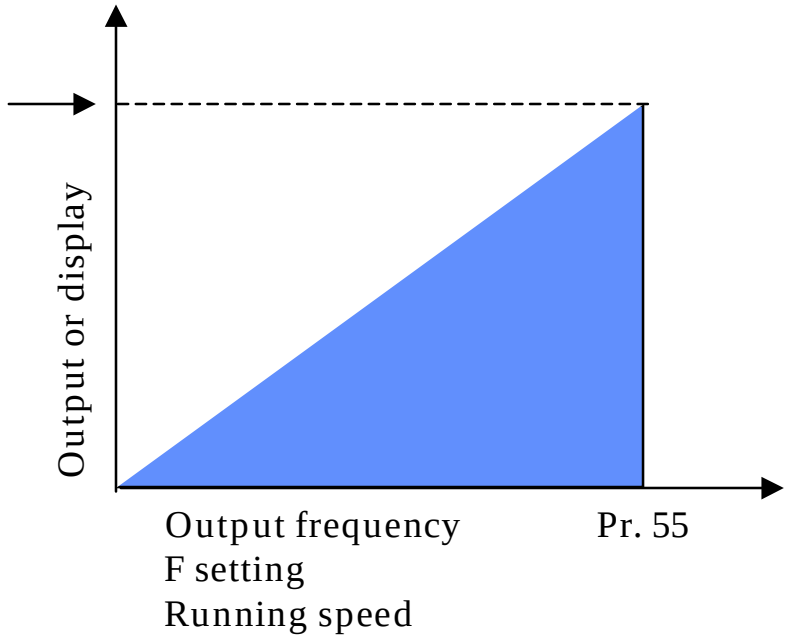
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See also p.118 of manual for other settings of Pr. 54.

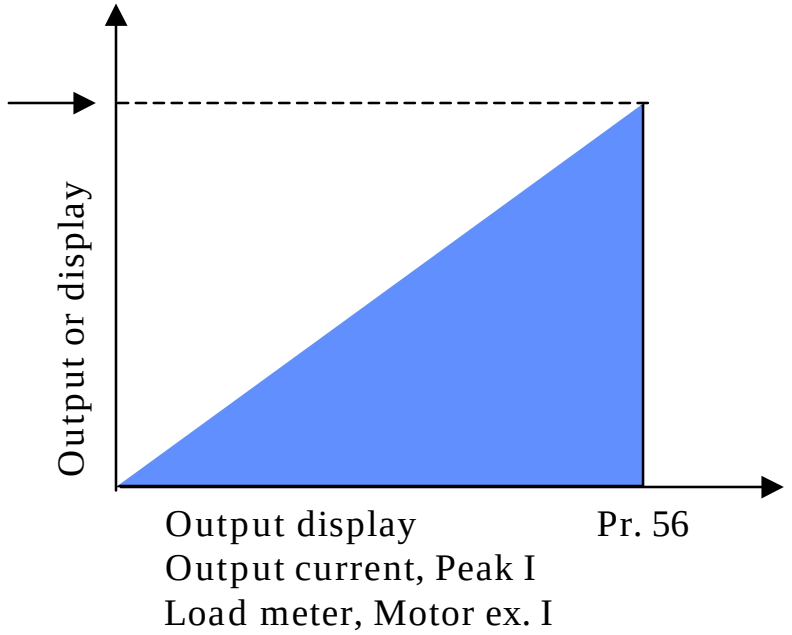
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1440Hz (terminal FM)
10VDC (terminal AM)
Full scale (PU level monitor)



1440Hz (terminal FM)
10VDC (terminal AM)
Full scale (PU level monitor)



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Pr. 57 - "COASTING TIME FOR AUTOMATIC RESTART AFTER INSTANTANEOUS POWER FAILURE/COMMERCIAL POWER SUPPLY-INVERTER SWITCH-OVER
Pr. 58 - "RISE TIME FOR AUTOMATIC RESTART AFTER INSTANTANEOUS POWER FAILURE/COMMERCIAL POWER SUPPLY-INVERTER SWITCH-OVER"

•Allows the inverter to be restarted without stopping the motor (with the motor coasting) when the commercial power supply is switched to the inverter operation or when the power is restored after an instantaneous power failure. (When automatic restart operation is set to be enabled, the alarm output signal will not be switched on at the occurrence of an instantaneous power failure.)

- **Pr. 57 "coasting time for automatic restart after instantaneous power failure/commercial power supply-inverter switch-over"**

Set Value	Automatic Restart Operation Enable/Disable
9999 (factory setting)	Disable
0, 0.1 to 5 seconds	Enable

Coasting time indicates a waiting time for automatic restart after power restoration.

* Setting "0" in Pr. 57 sets the coasting time to the following standard time. Most applications can be satisfied with with this setting. This time may be adjusted between 0.1 and 5 seconds according to the magnitude of load inertia (GD) and torque.

0.4K to 1.5K ..... 0.5 seconds
2.2K to 7.5K ..... 1.0 seconds
11K and up ..... 3.0 seconds

NEXT PAGE

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CONTINUED

- **Pr. 58 setting of "rise time for automatic restart after instantaneous power failure/commercial power supply-inverter switch-over"**

Normally, operation is satisfactory with this parameter remaining at the factory setting of 1.0 second. The output voltage rise time for restart control may also be adjusted between 0.1 and 5 seconds according to the magnitude of load specifications (inertia, torque).

Note: When any value other than 9999 is set in Pr. 57, disconnection of terminals CS-SD will make the inverter inoperative.

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Pr. 59 - "REMOTE SETTING FUNCTION SELECTION"

•By setting "1" or "2" in Pr. 59, the functions of the RH, RM and RL terminals can be changed to the remote setting input functions.

•Merely setting this parameter provides the acceleration, deceleration and setting clear setting functions of the FR series FR-FK motorized speed setter (option).

Pr. 59 Set Value	Operation	
	Remote setting function	Frequency set value storage function (*)
0	X	—
1	●	●
2	●	X

X = no, ● = yes

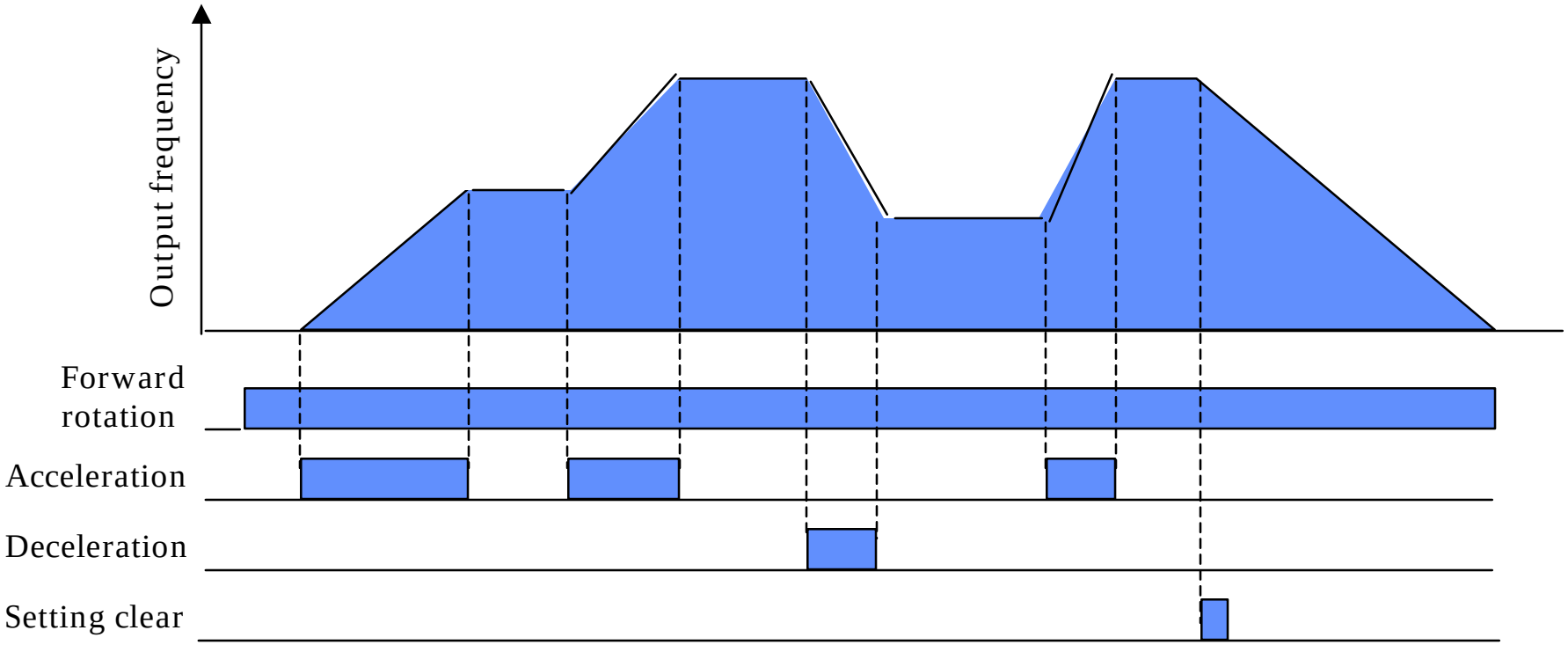
•After RH-SD and RM-SD are kept open for more than about one minute, the running frequency set value is stored in memory. When the power is switched off, then on, operation is resumed at this set value.

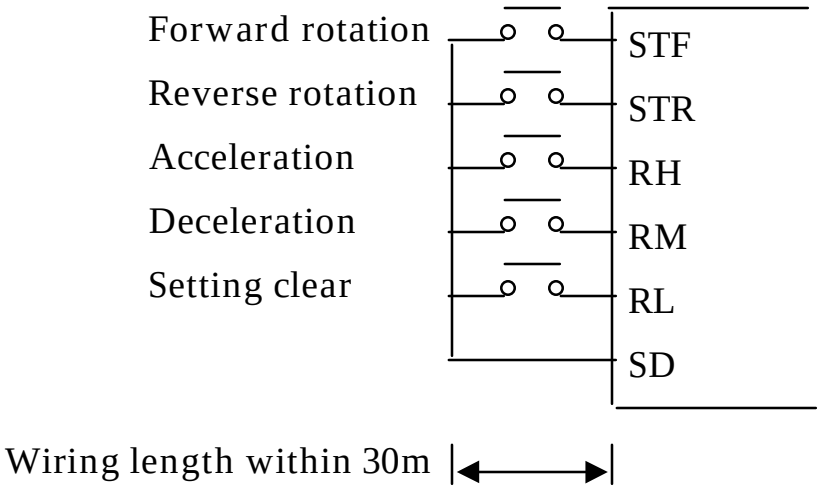
Note: The frequency set value up/down times are set in Pr. 44 and Pr. 45, but the output f acceleration/ deceleration times set in Pr. 7 and Pr. 8. Therefore, the actual acceleration/deceleration times become the the longer set values respectively.

NEXT PAGE

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Pr. 60 - "INTELLIGENT MODE SELECTION"

•By selecting this parameter, the inverter is automatically adjusted as if the appropriate value had been set in each parameter, without needing to set the acceleration and deceleration times and V/F pattern. This operation mode is useful to perform operation immediately without making the parameter settings.
(Note 1) The inverter automatically selects appropriate parameters.

Pr. 60 Set Value	Set Function	Operation	Automatically Set Parameters
0 (factory setting)	Ordinary operation mode	——	——
1, 2	Shortest acceleration/ deceleration mode	Set when it is desired to accelerate/decelerate the motor in the shortest time. The inverter makes acceleration/deceleration in the shortest time using its full capabilities. During deceleration, an insufficient brake capability make cause the overvoltage alarm (E.OV3). Set value "1" : current limit value 150% • Set value "2" : current limit value 180%	Pr. 7 (shortest) Pr. 8 (shortest)
3	Optimum acceleration/ deceleration mode	The self-learning system automatically sets the boost value, acceleration and decelerations times so that the current during acceleration/deceleration is lower than the rated current of the inverter. Optimum operation can be carried out by fully utilizing the inverter capabilities in the rated continuous range. Appropriate for applications where the load will not vary largely. (Note 2)	Pr 0 Pr. 7 Pr. 8
4	Energy saving mode	Tunes the inverter output voltage on-line so that the inverter output voltage is minimized during constant speed operation. (Note 6) Appropriate for energy-saving applications such as fan and pump.	Output voltage
5, 6	Elevator mode	Automatically controls the inverter output voltage so that the maximum torque can be delivered in the driving and regenerative modes. Appropriate for a counter-balanced elevator. • Set value "5" : current limit value 150% • Set value "6" : current limit value 180%	Pr. 0 Pr. 13 (2Hz) Pr. 19

NEXT PAGE

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CONTINUED

Note: 1. When more accurate control is required for application, set parameters manually.

2. Because of the learning system, this control is not valid the first time.

3. When the magnetic flux vector control has been selected using Pr. 80 and Pr. 81, the settings of the energy-saving mode and elevator mode are ignored. (Magnetic flux vector control has priority.)

4. If an overvoltage (OV3) trip has occurred during operation in the optimum acceleration/ deceleration mode, reset Pr. 8 “deceleration time” to a slightly larger value and restart operation in this mode.

5. When any of “1 to 6” has been set in Pr. 60, the parameters dedicated to intelligent mode Pr. 61 to Pr. 64 are valid. Pr. 61 to Pr. 64, which need not be set unless required, may be set to improve performance. Set “0” in Pr. 60 to automatically set “9999” (factory setting) in Pr. 61 to Pr. 64.

6. When the motor is decelerated to a stop in the energy-savings mode, the deceleration time may become longer than the setting. Also, since an overvoltage is more likely to occur in this mode than in the constant-torque load characteristic, set a longer deceleration time.

7. The optimum acceleration/deceleration mode is only valid for the frequency setting of 30.01Hz or higher.

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Pr. 61 - “REFERENCE CURRENT”, Pr. 62 - “REFERENCE CURRENT FOR ACCELERATION”, Pr. 63 - “REFERENCE CURRENT FOR DECELERATION”, Pr. 64 - “STARTING FREQUENCY FOR ELEVATOR MODE”

•Set these parameters to improve performance in the intelligent mode.

Note: These parameters are valid only when any of “1 to 6” has been selected in Pr. 60.

Pr. 61 Reference current (A)

Set Value	Reference Current
9999 (factory setting)	Rated inverter current
0 to 500A	Set value (rated motor current)

Pr. 62 Reference current for acceleration (%)

The reference value setting can be changed. (The reference value differs between the shortest acceleration/deceleration mode and optimum acceleration/deceleration mode.

Set Value	Remarks	Reference Value
9999 (factory setting)	150% (180%) is the limit value.	Shortest acceleration/deceleration mode
	100% is the optimum value.	Optimum acceleration/deceleration mode
0 to 200%	The set value of 0 to 200% is the limit value.	Shortest acceleration/deceleration mode
	The set value of 0 to 200% is the limit value.	Optimum acceleration/deceleration mode

NEXT PAGE

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CONTINUED

Pr. 63 Reference current for deceleration (%)

The reference value setting can be changed. (The reference value differs between the shortest acceleration/deceleration mode and optimum acceleration/deceleration mode.

Set Value	Remarks	Reference Value
9999 (factory setting)	150% (180%) is the limit value.	Shortest acceleration/deceleration mode
	100% is the optimum value.	Optimum acceleration/deceleration mode
0 to 200%	The set value of 0 to 200% is the limit value.	Shortest acceleration/deceleration mode
	The set value of 0 to 200% is the limit value.	Optimum acceleration/deceleration mode

Pr. 64 Starting frequency for elevator mode

Set Value	Set Frequency
9999 (factory setting)	2Hz is the starting frequency.
0 to 10Hz	The set value of 0 to 10Hz is the starting frequency.

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Pr. 65 - "RETRY SELECTION"

• This parameter allows the selection of the errors reset for retry.

Errors Reset for Retry		Set Values					
Inverter LED display	Parameter unit display	0 (factory setting)	1	2	3	4	5
E.OC1	OC During Acc	⬭	⬭		⬭	⬭	⬭
E.OC2	Steady Speed OC	⬭	⬭		⬭	⬭	
E.OC3	OC during Dec	⬭	⬭		⬭	⬭	⬭
E.OV1	OV during Acc	⬭		⬭	⬭	⬭	
E.OV2	Steady Speed OV	⬭		⬭	⬭	⬭	
E.OV3	OV during Dec	⬭		⬭	⬭	⬭	
E.IPF	Inst. Pwr. Loss	⬭				⬭	
E.UVT	Under Voltage	⬭				⬭	
E.BE	Br. Cct. Fault	⬭				⬭	
E.GF	Ground Fault	⬭				⬭	
E.OLT	Stll Prev STP	⬭				⬭	
E.OPT	Option Fault	⬭				⬭	
E.PE	Corrupt Memry	⬭				⬭	
E.THM	Motor Overload	⬭					
E.THT	Inv. Overload	⬭					
E.OHT	OH Fault	⬭					
E.RET	Retry No. Over	⬭					
E.CPU	CPU Fault	⬭					

Note: ⬭ Indicates the errors selected for retry

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Pr. 67 - "NUMBER OF RETRIES AT TRIP OCCURRENCE",
Pr. 68 - "RETRY WAITING TIME",
Pr. 69 - "RETRY COUNT DISPLAY ERASURE"

•Retry is a function which causes the inverter to automatically reset a trip at its occurrence, and continue operation.

•In Pr. 67, set the number of retries at trip occurrence.

Pr. 67 Set Value	Number of Retries	Alarm Signal Input
0 (factory setting)	Retry is not made.	—
1 to 10	1 to 10 times	No output
101 to 110	1 to 10 times	Output

Note: The setting range of 0 to 10, 9999 is displayed on the setting display screen of the PU. 101 to 110 is not displayed.

•By reading the value of Pr. 69, the cumulative number of restart times made by retry is provided. The set value of "0" erases the cumulative number of times.

Note: 1. Since the inverter automatically starts operation after the retry waiting time set in Pr. 68 has elapsed, this function must be used care so as not to jeopardize the operator.

2. The cumulative number in Pr. 69 is incremented by "1" when retry operation is regarded as successful, i.e. when normal operation is continued without any alarm occurring during a period four time longer than the time set in Pr. 68 "retry waiting time" after the start of the retry.

3. If alarms have occurred successively during the above period for a time longer than the waiting time setting, different displays may be provided on the inverter LED and PU; the most recent display on the inverter LED and the first retry on the PU. For errors occurring at retries, the definition of only the alarm that occurred at the first retry is stored.

4. When the inverter trip is reset at the restart time, the data of the electronic overcurrent protection, regenerative brake duty, etc. is not reset. (Different from the power-on reset.)

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Pr. 0 - “TORQUE BOOST (MANUAL)”, Pr. 3 - “BASE FREQUENCY”, Pr. 9 - “ELECTRONIC OVERCURRENT PROTECTION”, Pr. 71 - “APPLIED MOTOR”

•Mitsubishi’s new constant-torque motor (SF-JRCA) and old constant-torque motor can be run continuously at 100% torque down to low speed under magnetic flux vector control and V/F control, respectively. Without requiring the load torque to be reduced at low speed, they can be run continuously at constant torque (100% torque) within the range of 1/10 speed ratio (6 to 60Hz). The setting for magnetic flux vector control are given on page 79 of the manual. When Mitsubishi’s old constant-torque motor is used, the settings of the following parameters must be changed:

Pr. 0 - “torque boost (manual)” ..... 7.5K and down - 4%, 11K and up - 2%
Pr. 3 - “base frequency” ..... 60Hz (factory setting)
Pr. 9 - “electronic overcurrent protection ..... rated current of motor
Pr. 71 - “applied motor” ..... set value “1”

Note: When the old 200V series 4-pole constant-torque motor (SF-JRC) is to be used, the special parameters must also be set in addition to the above parameters. For full information on the setting method, see page 79 of the manual.

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Pr. 71 - “APPLIED MOTOR”

•In accordance with the following table, set this parameter according to the motor used:

<table>
<tr><th>Pr. 71 Set Value</th><th colspan="3">Characteristics of Electronic Overcurrent Protection</th></tr>
<tr><td>0</td><td colspan="3">For a general-purpose motor (factory setting)</td></tr>
<tr><td>1</td><td colspan="3">For Baldor’s constant-torque motor</td></tr>
<tr><td>2</td><td colspan="3">For a general-purpose motor 5-point flexible v/f characteristic</td></tr>
<tr><td>20</td><td colspan="3">MITSUBISHI Standard motor SF-JR (1.5KW or less)</td></tr>
<tr><td>3</td><td>Standard motor</td><td colspan="2" rowspan="3">“ Auto tuning setting” is selected</td></tr>
<tr><td>13</td><td>Constant-torque motor</td></tr>
<tr><td>23</td><td>MITSUBISHI Standard motor 1.5KW or less</td></tr>
<tr><td>4</td><td>Standard motor</td><td colspan="2" rowspan="3">“ Auto tuning setting” data read/change setting is selected</td></tr>
<tr><td>14</td><td>Constant-torque motor</td></tr>
<tr><td>24</td><td>MITSUBISHI Standard motor 1.5KW or less</td></tr>
<tr><td>5</td><td>Standard motor</td><td rowspan="2">Star connection</td><td rowspan="4">Direct input of motor constants is enabled</td></tr>
<tr><td>15</td><td>Constant-torque motor</td></tr>
<tr><td>6</td><td>Standard motor</td><td rowspan="2">Delta connection</td></tr>
<tr><td>16</td><td>Constant-torque motor</td></tr>
</table>

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CONTINUED

Note: 1. For the adjustment of the 5-point flexible v/f characteristic, refer to page 94 of manual.

2. When “9999” has been selected in Pr. 19, “2” cannot be set in Pr. 71. When “2” is selected in Pr. 71, set the appropriate value (other than “9999”) in Pr. 19.

3. When “2” has been set in Pr. 71, the setting ranges of Pr. 100 to Pr. 109 are not displayed on the PU screen. At this time, if the set value of any Pr. 100 to Pr. 109 is changed, the new set value is not displayed in the “INITIAL VALUE LIST” and “CHANGE LIST”.

4. Set “3” or “13” for auto tuning.

5. For full information on “4 to 6, 14 to 16” settings, see page 84 of the manual.

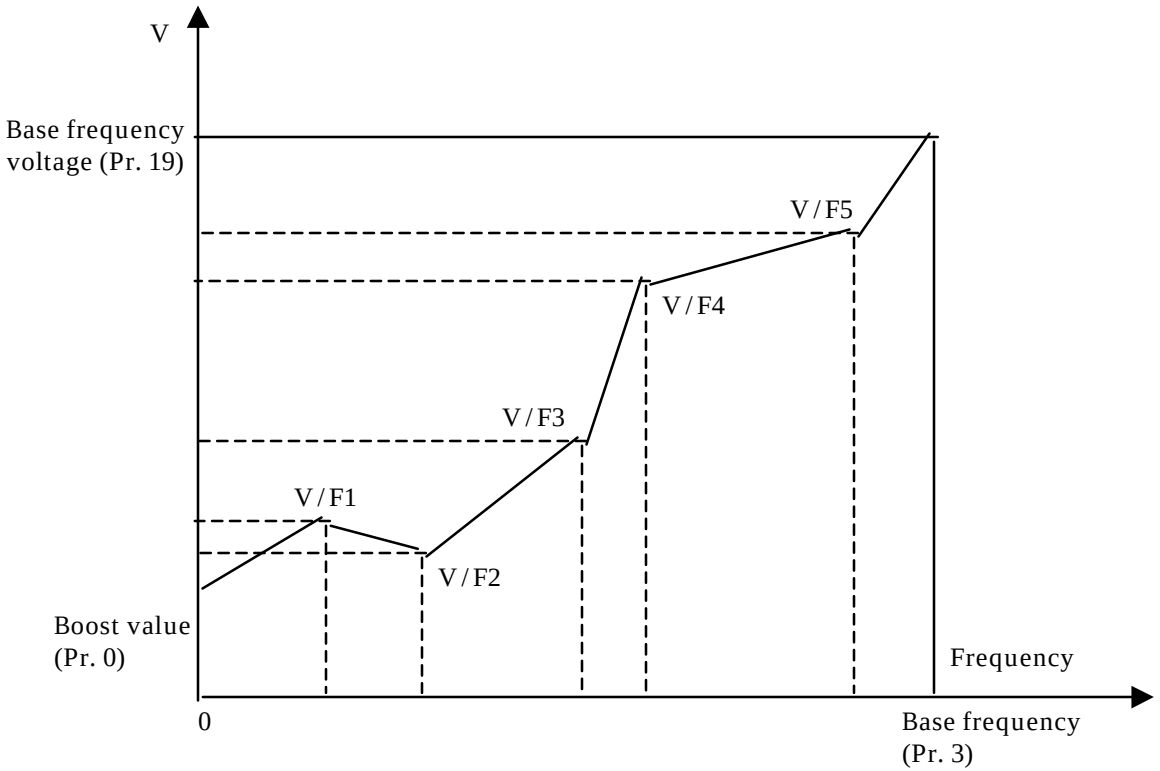
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Pr. 71 - "applied motor", Pr. 100 to Pr. 109

•The ratio of the output voltage to the output frequency (V/F characteristic) can be changed by linear interpolation made between five points set from V/F1 to V/F5. For the setting method, see page 94 of the manual.



V / F characteristic

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Pr. 72 - “PWM FREQUENCY SELECTION”

•The FR-A series PWM carrier frequency of 14.5KHz can be changed by using Pr. 72 when this frequency must be changed due to the effect of motor/mechanical system resonance. Lowering the PWM carrier frequency will increase motor noise but reduce inverter-generated noise and leakage current.

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Pr. 73 - “0 TO 5V, 0 TO 10V SELECTION”

•Select the override function to make the main speed setting using the auxiliary frequency setting terminal1. Set the input specifications of terminal 1, 2 and 4 and the presence/absence of the override function.

Pr. 73 Set Value	Terminal AU Signal	Terminal 2 Input Voltage	Terminal 1 Input Voltage *1	Terminal 4 Input 4 to 20ma	Override Function *2	Polarity Reversible
0	No	* 0 to 10V	0 to +/-10V	X	X	* 3
1		* 0 to 5V	0 to +/-10V			
2		* 0 to 10V	0 to +/-5V			
3		* 0 to 5V	0 to +/-5V			
4		0 to 10V	* 0 to +/-10V			
5		0 to 5V	* 0 to +/-5V			
10		* 0 to 10V	0 to +/-10V		X	O
11		* 0 to 5V	0 to +/-10V			
12		* 0 to 10V	0 to +/-5V			
13		* 0 to 5V	0 to +/-5V			
14		0 to 10V	* 0 to +/-10V			
15		0 to 5V	* 0 to +/-5V			
0	Yes	X	0 to +/-10V	* O	X	* 3
1			0 to +/-10V			
2			0 to +/-5V			
3			0 to +/-5V			
4		0 to 10V	X			
5		0 to 5V				
10		X	0 to +/-10V		X	O
11			0 to +/-10V			
12			0 to +/-5V			
13			0 to +/-5V			
14		0 to 10V	X			
15		0 to 5V				

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CONTINUED

*1: The value of terminal 1 (auxiliary frequency setting input) is added to the main speed setting signal of terminal 2 or 4.
*2: When override has been selected, terminal 1 or 4 is for the main speed setting and 2 is for the override signal (50 to 150% at 0 to 5V or 0 to 10V).
*3: Indicates that a negative-polarity frequency command signal is accepted.

Note: 1. X indicates that a signal is not accepted.
2. To change the maximum output frequency when the maximum frequency command voltage (current) has been input, use the frequency setting voltage (current) gain, Pr. 903 (Pr. 905). At this time, the command voltage (current) need not be input. Also, the acceleration / deceleration time, which is an inclination up to the acceleration / deceleration reference frequency, is not affected by the change of Pr. 73 setting.
3. The set value hatched is the factory setting. The * indicates the main speed setting.
4. When the set value of Pr. 22 is “9999”, the value of terminal 1 is for the stall prevention level setting.

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Pr. 74 - “INPUT FILTER TIME CONSTANT”

- Allows the setting of the built-in filter time constant in the external voltage or current frequency setting signal input section. Effective for eliminating noise in the frequency setting circuit.

- Increases the filter time constant if stable operation cannot be performed due to noise. A larger set value results in lower response.

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Pr. 75 - "RESET SELECTION / PU DISCONNECTION DETECTION"

- Detecting that the PU (parameter unit) has been disconnected from the inverter, this function brings the inverter to an alarm stop. Also, this function allows the reset (terminal RES) function to be selected.

- Operation

When this parameter has been set to detect the disconnection of the PU, this function detects that the PU has been disconnected from the inverter and brings the inverter to an alarm stop.

Pr. 75 Set Value	Description		Stop Key Function on PU
0	Reset input normally accepted. *	Operation will be continued with the PU disconnected.	Disabled
1	Reset input enabled only when the protective function is activated.		
2	Reset input normally accepted.	When the PU is disconnected, an error is displayed and the inverter output is shut off. (Note)	
3	Reset input enabled only when the protective function is activated.		
14 (factory setting)	Reset input normally accepted. *	Operation will be continued with the PU disconnected.	Enabled (Note 6)
15	Reset input enabled only when the protective function is activated.		
16	Reset input normally accepted.	When the PU is disconnected, an error is displayed and the inverter output is shut off. (Note)	
17	Reset input enabled only when the protective function is activated.		

NEXT PAGE

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CONTINUED

* By short-circuiting across terminal RES-SD during operation, the inverter shuts off output while the signal is on, the data of electronic current protection and regenerative braking duty is reset, and the motor is coasted to a stop.

Note:
1. If the PU had been disconnected from initial start, this is not defined as an alarm.
2. This disconnection detection judges that the PU is disconnected when the PU is removed for more than 1 second.
3. When the FR-PUO1E is used, this function can also be used. Note that the alarm display of the FR-PUO1E is “E.PE” and that of the inverter LED is “E.PUE”.
4. To resume operation, reset the inverter after checking that the PU is connected securely.
5. The motor is decelerated to a stop when the PU is disconnected during PU jog operation with “2” or “3” set in Pr. 75. The motor is not brought to a stop at occurrence of the PU disconnection alarm.
6. Stop key function only valid for FR-PUO2E-1 and FR-A200E-UL.

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Pr. 76 - "ALARM CODE OUTPUT SELECTION"

- When alarm occurs, its code can be output as a 4-bit digital signal from the open collector output terminals. When programmed operation has been selected, this parameter also serves as a group operation signal output.

Set Value	Output Terminals			
	SU	IPF	OL	FU
0 (factory setting)	Depends on the output terminal assignment (Pr. 40).			
1	Alarm Code bit 3	Alarm Code bit 3	Alarm Code bit 3	Alarm Code bit 3
2	Normal operation ..... Operation status signal (same as set value "0") Alarm occurrence ..... Alarm code signal			
3 (programmed operation output)	Output at time-out	Group 3 operation	Group 2 operation	Group 1 operation

Note: For alarm codes, see page 70 of manual.

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Pr. 77 - "PARAMETER WRITE DISABLE SELECTION"

• Prevents parameter values from being written from the parameter unit.

Set Value	Write Disable Function
0 (factory setting)	Parameter write enable (only at stop in PU operation mode) (Note 1)
1	Parameter write disable (Note 2)
2	Parameter write also enabled during operation in PU operation or external operation mode. (Note 3)

Note: 1. Monitor-related parameters Pr. 51 to Pr. 56 can be set at any time.
2. Write is allowed for Pr. 77 and Pr. 79 "operation mode selection".
3. Write is disallowed during operation for PR. 22, 23, 48, 49, 60, 66, 71 and 79 to 81.

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Pr. 78 - “REVERSE ROTATION SELECTION”

- Set Pr. 78 to prevent any reverse rotation fault resulting from the mis-input of the start signal.

Set Value	Direction of Rotation
0	Both forward and reverse rotation allowed (factory setting)
1	Reverse rotation disallowed
2	Forward rotation disallowed

Note: This function is valid for both the parameter unit and external operations.

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Pr. 79 - "OPERATION MODE SELECTION"

- Allows operation to be performed in either or both of the external signal and parameter unit operation modes of the inverter.

Set Value	Description
0 (factory setting)	Operation can be switched between the parameter unit and external operation modes.
1	Operation is only allowed in the parameter unit operation mode.
2	Operation is only allowed in the external operation mode.
3 (Note 1)	Running frequency ..... Set from the parameter unit Start signal ..... External signal input
4 (Note 1)	Running frequency ..... External signal input Start signal ..... Input from the parameter unit
5 (Note 2)	Programmed operation Operation start ..... STF, timer reset ... STR group selection ..... RH, RM, RL
6 (Note 5)	Switch-over function
7 (Note 4)	PU operation interlock
8	External signal-based operation mode switching

NEXT PAGE

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Note: 1. In the parameter unit / external signal combined operation mode, the following signals are made valid:

Set Value	Operation Frequency	Start Signal
3	Parameter unit • Direct setting and [▲] / [▼] key setting	Terminal symbol • STF • STR
4	Terminal signal • Across 2-5 0 to 5VDC • Across 2-5 0 to 10VDC • Across 4-5 4 to 20mADC • Across 1-5 0 to +/-5VDC Across 1-5 0 to +/-10VDC • Jog frequency (Pr. 15) (JOG / OH) • Multi-speed selection (Pr. 4 to 6, 24 to 27)	Parameter unit • Forward rotation key • Reverse rotation key

2. For the adjustment of the programmed operations functions, see page 89 of manual.
3. This function number can also be rewritten in the external operation mode. The settings of the other parameters cannot be changed. To change any of the other settings, set “0” or “1” in Pr. 79 to switch to the PU operation mode.
4. For full information on the PU operation interlock function available with the set value of “7” and the external signal-based operation mode switching function available with the set value of “8”, see page 95 of the manual.

NEXT PAGE

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CONTINUED

- The programmed operation function allows 10 types of operation starting time of day, direction of rotation and running frequency to be set individually for each of the selected three groups. This function allows the inverter to be automatically run in the preset operation schedule and operation pattern. If a power failure occurs, operation can be continued without corrupting the the set schedule by installing the FR-EPD automatic control compatible unit. This unit contains a backup battery.

- When the PU operation interlock signal is switched off, the PU operation interlock function forcibly switches the operation mode to the external operation mode. This function prevents the inverter from not starting operation under the external command if the mode is left unswitched from the PU operation mode.

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Pr. 80 - “MOTOR CAPACITY”
Pr. 81 - “NUMBER OF MOTOR POLES”

- Set these parameters to perform operation in the magnetic flux vector control mode. To select the magnetic flux vector control mode, set the applied motor capacity in Pr. 80 and the number of motor poles (2, 4, 6) in Pr. 81.
  When the constant-torque motor is used, set “1” (constant-torque motor) in Pr. 71 “applied motor”. For more information, see page 79 of manual.

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Pr. 145 - "PARAMETER UNIT LANGUAGE SWITCHING"

- Allows selection of the language displayed on the FR-PUO2ER / FR-ARWER four-language parameter (copy) unit (option).

Set Value	Language Displayed
0	English (factory setting)
1	German
2	French
3	Spanish

Note: This function is invalid when the FR-PUO2, FR-PUO2E or FR-ARW parameter (copy) unit is used.

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Pr. 155 - "TERMINAL RT ACTIVATED CONDITION SELECTION"

- The condition activated by the second control function selection (terminal RT) can be selected.

Pr. 155 Set Value	Second Control Function Condition
0 (factory setting)	Immediately activated and deactivated according to the signal ON / OFF of terminal RT.
10	Activated only when the signal of terminal RT is ON at constant speed. (The function is not activated during acceleration / deceleration if the signal of terminal is on.

Note: "1" or "11" is for exclusive use by the manufacturer and must not be set.

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Pr. 156 - "STALL PREVENTION OPERATION SELECTION"

- By setting Pr. 156, stall prevention (overcurrent stall prevention) can be disabled and the OL signal output delayed.

Pr. 156 Set Value	Fast-Response Current Limit Function Selection ○ .... Activated ● .... Not activated	Stall Prevention Selection ○ .... Activated ● .... Not activated			OL Signal Output ○ .... Operation continued ● .... Operation not continued *	Factory Setting
		During acceleration	During constant speed	During deceleration		
0	○	○	○	○	○	0
1	●	○	○	○	○	
2	○	●	○	○	○	
3	●	●	○	○	○	
4	○	○	●	○	○	
5	●	○	●	○	○	
6	○	●	●	○	○	
7	●	●	●	○	○	
8	○	○	○	●	○	
9	●	○	○	●	○	
10	○	●	○	●	○	
11	●	●	○	●	○	
12	○	○	●	●	○	
13	●	○	●	●	○	
14	○	●	●	●	○	
15	●	●	●	●	○	
16	○	○	○	○	●	
17	●	○	○	○	●	
18	○	●	○	○	●	
19	●	●	○	○	●	

NEXT PAGE

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CONTINUED

Pr. 156 Set Value		Fast-Response Current Limit Function Selection ○ .... Activated ● .... Not activated	Stall Prevention Selection ○ .... Activated ● .... Not activated			OL Signal Output ○ .... Operation continued ● .... Operation not continued *	Factory Setting
			During acceleration	During constant speed	During deceleration		
20		○	○	●	○	●	0
21		●	○	●	○	●	
22		○	●	●	○	●	
23		●	●	●	○	●	
24		○	○	○	●	●	
25		●	○	○	●	●	
26		○	●	○	●	●	
27		●	●	○	●	●	
28		○	○	●	●	●	
29		●	○	●	●	●	
30		○	●	●	●	●	
31		●	●	●	●	●	
100	D	○	○	○	○	○	
	R	●	●	●	●	○	

D: Driving R: Regenerative

Note: 1. When “Operation not continued at the time of OL signal output” has been selected, the “E.OLT” alarm code (stop by stall prevention) is displayed and operation stopped.

2. The output voltage reduces during stall prevention operation. When high torque is required (e.g. for an elevator), set the parameter in the following procedure:
   1. Record the Pr. 77 value in advance.
   2. Set “701” in Pr. 77.
   3. Set “1” in Pr. 156.
   4. Return Pr. 77 to the previous value.

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Pr. 157 - “OL SIGNAL OUTPUT WAITING TIME”

•The overload alarm (OL) signal can be output when the time set in Pr. 157 is exceeded.

Pr. 157 Set Value	Output Signal
0 (factory setting)	Output according to overload (OL).
0.1 to 25 seconds	Output after the set time has elapsed.
9999	Overload (OL) alarm signal is not output.

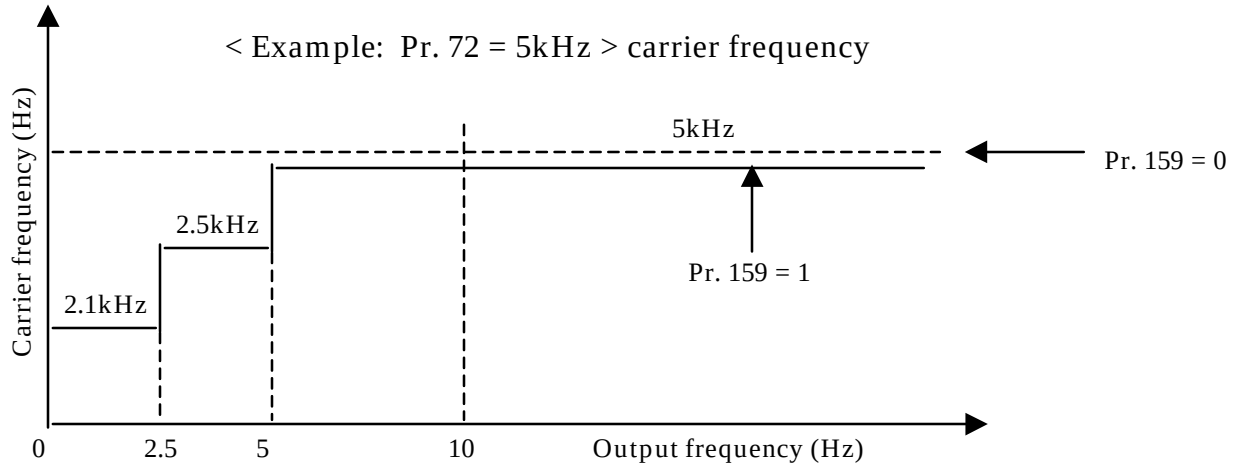
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Pr. 159 - "PWM FREQUENCY DECREASE AT LOW SPEED"

- Speed in the low range (10Hz or less) can be smoothed to correct speed fluctuation. (To be set only when you care about speed fluctuation.)

Pr. 159 Set Value	Description	
	Improvement of speed fluctuation	Correction at high speed
0 (factory setting)	No	No
1	Yes	No
2	No	Yes
3	Yes	Yes

Note: Since the carrier frequency reduces at the set value of "1" or "3", motor noise increase in the low range.

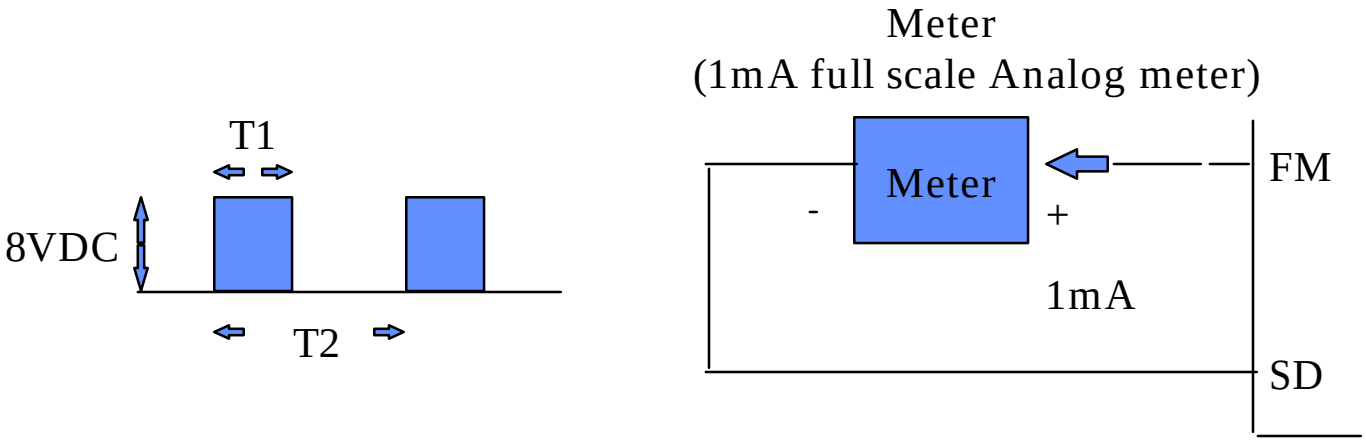


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Pr. 900 - "FM TERMINAL CALIBRATION"

- Allows a meter connected to terminal FM to be calibrated from the parameter unit. Common to all monitored data selected in Pr. 54.

- Terminal FM provides the pulse output as shown below. The setting of Pr. 900 allows the meter connected to the inverter to be calibrated from the parameter unit without providing a calibration resistor.
  (For information on the adjusting method, see page 64 of the manual.)



Pulse width T1 : Adjusted with Pr. 900
Pulse period T2 : Set in Pr. 55 (valid for frequency monitoring only)

NEXT PAGE

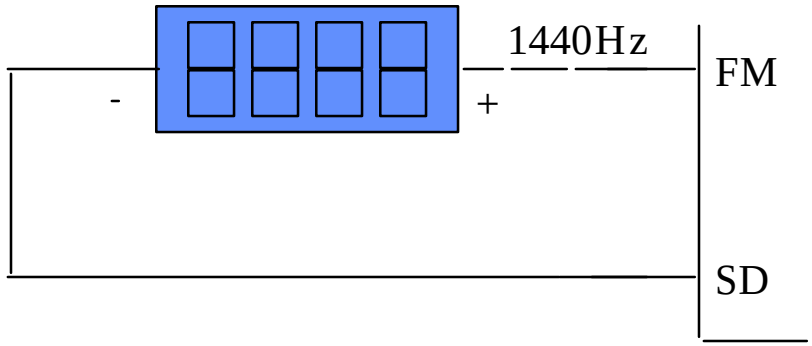
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- Monitoring using a digital meter

Allows a digital value to be displayed on a digital counter using the pulse train signal from the FM terminal. 1440 Hz output is provided at the full scale value explained in the section of Pr. 54. When the running frequency has been selected for monitoring, the ratio of this FM output frequency can be set in Pr. 55.

Digital Meter



Note: At 60Hz, the parameter is factory set to 1mA full-scale and 1440Hz FM output frequency. The maximum output frequency of FM is 2400Hz.

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Pr. 901 - "AM TERMINAL CALIBRATION"

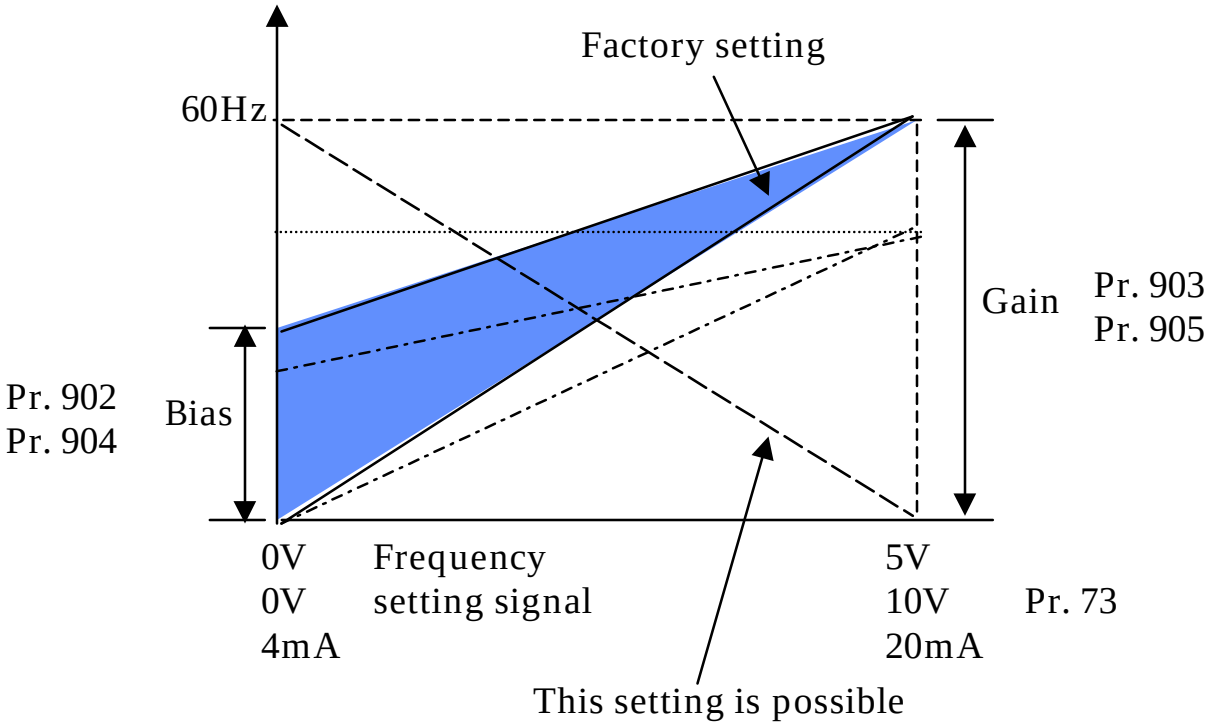
- Used when any of "101 to 118" has been set in Pr. 54 to select analog output to terminal AM and when any of "1 to 21" has been set in Pr. 158 to use the outputs of terminals FM and AM separately.
  As explained in the section of Pr.54, the analog output is factory set to 10VDC in the full-scale of each monitored data. This parameter allows the output voltage ratio (gain) to be adjusted according to the meter reading. Note that the maximum output voltage is 10VDC.
  (For details of the adjustment, see page 65 of the manual.)

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Pr. 902 - "FREQUENCY SETTING VOLTAGE BIAS"
Pr. 903 - "FREQUENCY SETTING VOLTAGE GAIN"
Pr. 904 - "FREQUENCY SETTING CURRENT BIAS"
Pr. 905 - "FREQUENCY SETTING CURRENT GAIN"

- Allows the output frequency to be set in relation to the frequency setting signal (0 to 5V, 0 to 10V, 4 to 20mADC). For adjustment method, see page 73 of the manual.

Note: If the gain adjustment (Pr. 903, Pr. 905) is changed, the acceleration / deceleration reference frequency (Pr. 20) does not change. The signal to the terminal 1 (aux. input) is added to the frequency setting signal.



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V/F SLIP CONTROL

Motor slip is calculated on the basis of iq during V/F control to make the slip compensation.

iq: torque component current

- The output frequency is raised in the driving load mode and is lowered in the regenerative load mode.

Related Parameters

Pr. No.	Function	Setting Range	Increments	Factory Setting	Remarks
107	Slip compensation selection	0, 10	—	0	0 - no slip comp. 10 - slip comp. selected If Pr. 77=701, write during operation is disabled
89	Speed control gain	0 to 1000.0%	0.1%	100%	*1

Pr. 107 This parameter selects the FR-A's slip compensation function which will improve speed regulation.

Pr. 89 Use Pr. 89 to adjust the slip compensation value. This parameter determines the amount of speed correction that the slip compensation function will add. Experimentation is usually required.

*1: Pr. 89 is also used for magnetic flux vector control.
Pr. 89 setting value can be read under the following conditions:
- 801 is in Pr. 77 and 9999 is not in Pr. 80 and Pr. 81.
- 10 is in Pr. 107

*2: Motor slip is calculated on the assumption that the motor capacity is equal to the inverter capacity and the motor pole number is 4 when 10 is set in Pr. 107 with 9999 in Pr. 80 and Pr. 81.

*3: Set values other than 9999 in Pr. 80 and Pr. 81 to give priority to magnetic flux vector control.

*4: Slip compensation does not work at the output frequency of 120Hz and above.

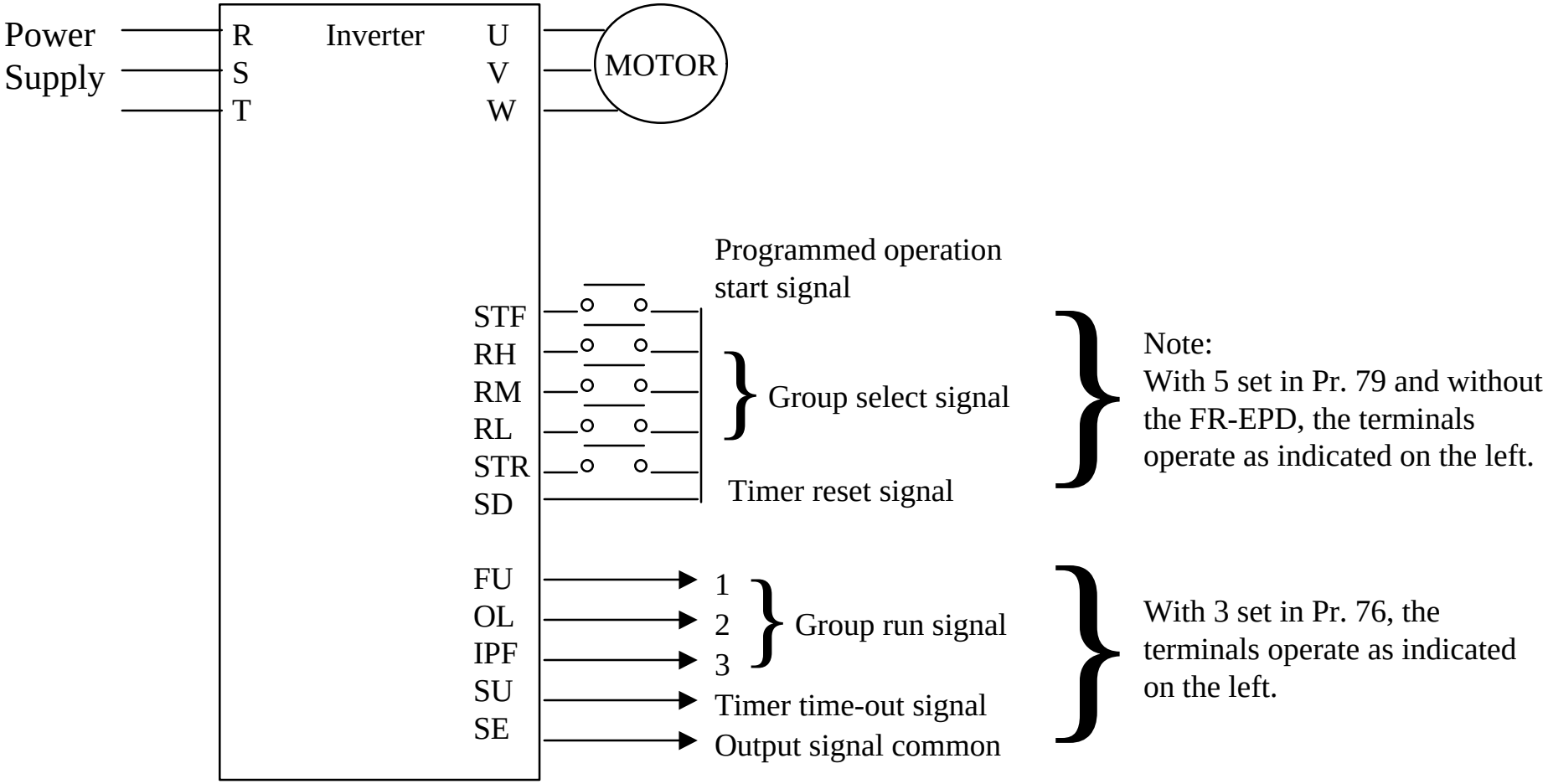
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Programmed Operation Function - Pr. 200 - 231

In programmed operation, automatic operation is performed under the control of the internal timer in accordance with the desired time of day, running frequency and direction of rotation.

< Setting of operation mode and output terminals (Pr. 76, Pr. 79) >

To perform programmed operation, set “5” (programmed operation) in Pr. 79 “operation mode selection” and “3” (programmed operation output) in Pr. 76 “alarm code output selection).



NEXT PAGE

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When “5” (programmed operation) is set in Pr. 79, the following terminals are made valid or invalid and are used for programmed operation:

Valid Terminals	Invalid Terminals	Terminals Used
RES	AU	STF
MRS	STOP	STR
RT	No. 2	RH
OH	No. 4	RM
	No. 1	RL
	JOG	

Note: When the battery pack for programmed operation (FR-EPD) is fitted, note that the terminals used for programmed operation are not as indicated on the left. (For details, see the option instruction manual.)

During programmed operation, the inverter cannot be operated in any other operation mode. When the programmed operation start signal (STF) and timer reset signal (STR) are ON, the operation mode cannot be switched between PU operation and external operation. When “5” is set in Pr. 79, the following functions are unavailable if the corresponding inboard option is used:

(1) Orientation control
(2) 12-bit digital input
(3) PI control

NEXT PAGE

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< Programmed operation time unit selection (Pr. 200) >

Set the time unit for programmed operation. Select either of "minute/second" and "o'clock/minute" in Pr. 200.

Set Value	Description
0 (factory setting)	Minute/second unit (voltage monitor)
1	O'clock/minute unit (voltage monitor)
2	Minute/second unit (reference time of day monitor)
3	O'clock/minute unit (reference time of day monitor)

Note: When 2 or 3 is set in Pr. 200, the reference time of day is set in Pr. 231, programmed operation is started at this time of day.

< Setting of reference time of day (Pr. 231) >

The FR-A200E has an internal timer (RAM). When the reference time of day is set in Pr. 231, programmed operation is started at this time of day.

(1) Setting range

The time unit depends on the set value of Pr. 200.

Pr. 200 Set Value	Pr. 231 Setting Range	Pr. 200 Set Value	Pr. 231 Setting Range
0 (factory setting)	Max. 99 minutes 59 seconds	2	Max. 99 minutes 59 seconds
1	Max. 99 o'clock 59 minutes	3	Max. 99 minutes 59 seconds

NEXT PAGE

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Note: The reference time-of-day timer starts the timing of the reference time of day when both the start signal and group signal are entered. Set the reference time of day in Pr. 231 when both signals are on.

(2) Resetting the reference time of day

The reference time of day is cleared (returns to "0") by switching on the timer reset signal (STR) or resetting the inverter (see page 72 of the manual). Note that the reference time-of-day value set in Pr. 231 is also reset to "0".

(3) Timer accuracy

Instantaneous error: +/- 0.16 seconds
Cumulative error: +/- 50ppm (according to the accuracy of the crystal oscillator)

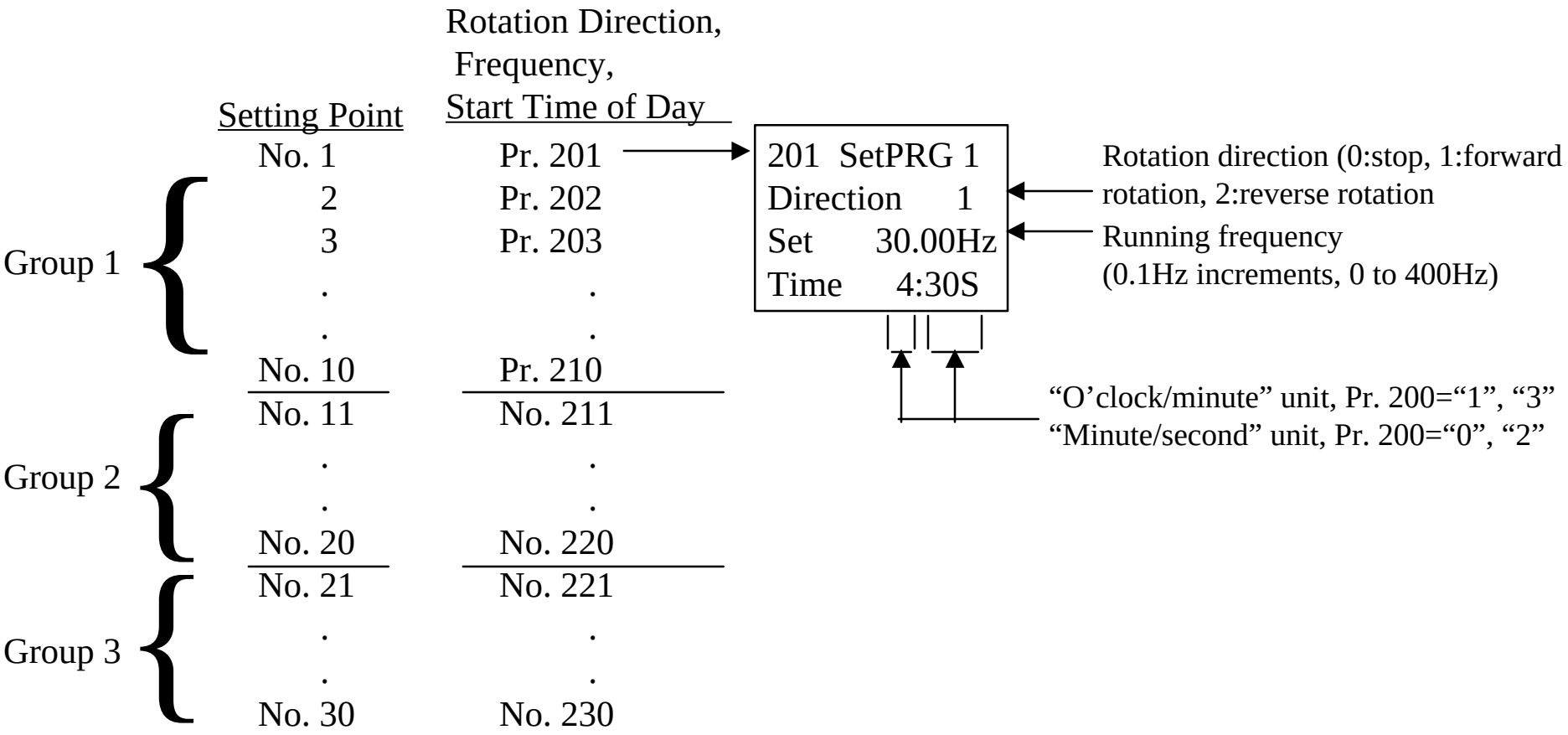
FR-A200E independent error: Max. 4.5 seconds per day
(24Hr x 60 x 60 x 50ppm = 4.32 seconds)

NEXT PAGE

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Program Setting (Pr. 201 to 230)

The rotation direction, running frequency and start time of day are defined as one point and every 10 points are grouped into three. Pr. 201 to Pr. 231 are used for this setting. Note that when the time unit setting of Pr. 200 has been changed independently, the units of Pr. 201 to 230 change (the numerals do not change).



Note: If either of Set or Time is "9999", no setting is made.

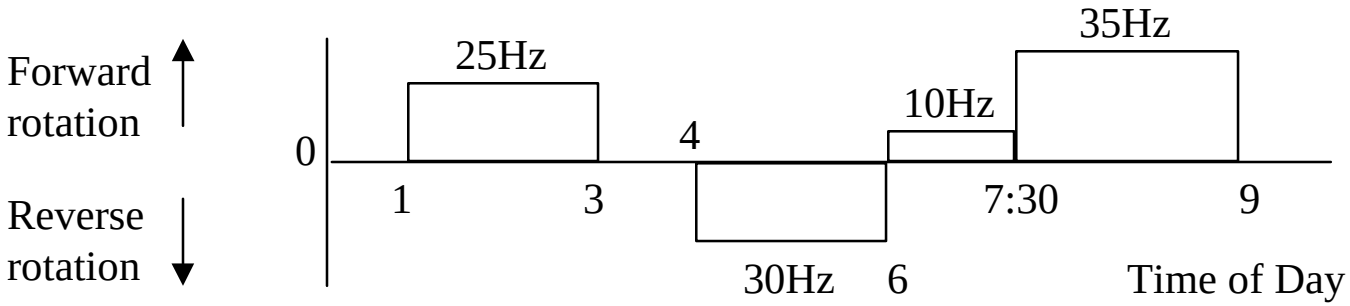
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< Operation Pattern >

Assuming that operation has been programmed as indicated in the following table, the operation pattern is as shown in the figure below:

No.	Operation	Parameter Setting
1	Forward rotation, 20Hz, 1 o'clock 0 minutes	Pr. 201=1, 20, 1:00
2	Stop, 3 o'clock 0 minutes	Pr. 202=0, 0, 3:00
3	Reverse rotation, 30Hz, 4 o'clock 0 minutes	Pr. 203=2, 30, 4:00
4	Forward rotation, 10Hz, 6 o'clock 0 minutes	Pr. 204=1, 10, 6:00
5	Forward rotation, 35Hz, 7 o'clock 30 minutes	Pr. 205=1, 35, 7:30
6	Stop, 9 o'clock 0 minutes	Pr. 206=0, 0, 9:00



NEXT PAGE

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Details of the Functions

< Parameters used >

Pr. No.	Name	Range	Increments/ Unit	Factory Setting	Remarks
200	Programmed operation minute/second selection	0 to 3	1	0	0 - minute/second unit/voltage monitor 1 - o'clock/minute unit/voltage monitor 2 - minute/second unit/reference time of day monitor 3 - o'clock/minute unit/reference time of day monitor
201 to 230	Programmed operation program setting	0 to 2	1	9999	Rotation direction setting 0 - stop, 1 - forward rotation 2 - reverse rotation
		0 to 400 Hz	0.1Hz		Frequency setting
		0 to 99:59	Minutes or seconds		Time of day setting
231	Timer setting	0 to 99:59	———	0	Reference time-of-day timer (RAM) (Note1)

Note: 1. When both the start signal and group select signals are entered, the set value of Pr. 231 "timer setting" returns to "0". Set the optional time of day with both signals on. Note that if the start signal and group select signals are entered after setting the optional time of day, the Pr. 231 set value returns to "0" again.

2. Note that when the setting of Pr. 200 has been changed independently, the units of Pr. 231 and Pr. 201 to 230 change.

3. When 2 or 3 is set in Pr. 200, the reference time-of-day monitor screen is displayed instead of the voltage monitor screen.

NEXT PAGE

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< Input Signals >

Name	Description	Signal Level	Remarks
Group select signal RH (group 1) RM (group 2) RL (group 3)	Used to select the group for programmed operation.	Photocoupler isolated	May also be driven by transistor. When ic = 10mA, Vec < 0.5V should be installed.
Timer reset signal (STR)	Input to zero the reference the time of day.	Photocoupler isolated	
Programmed operation start signal (STF)	Input to start programmed operation.	Photocoupler isolated	

< Output Signals >

Name	Description	Signal Level	Remarks	
Time-out signal Inverter terminal (SU)	Output on completion of the operation of the selected group and cleared on timer reset.	Open collector output (isolated)	Permissible load 24VDC, 0.1A	Only when Pr. 76 = 3
Group select signal Inverter terminal (FU, OL, IPF)	Output during operation of corresponding group's program and cleared on timer reset.	Open collector output (isolated)	Permissible load 24VDC, 0.1A	

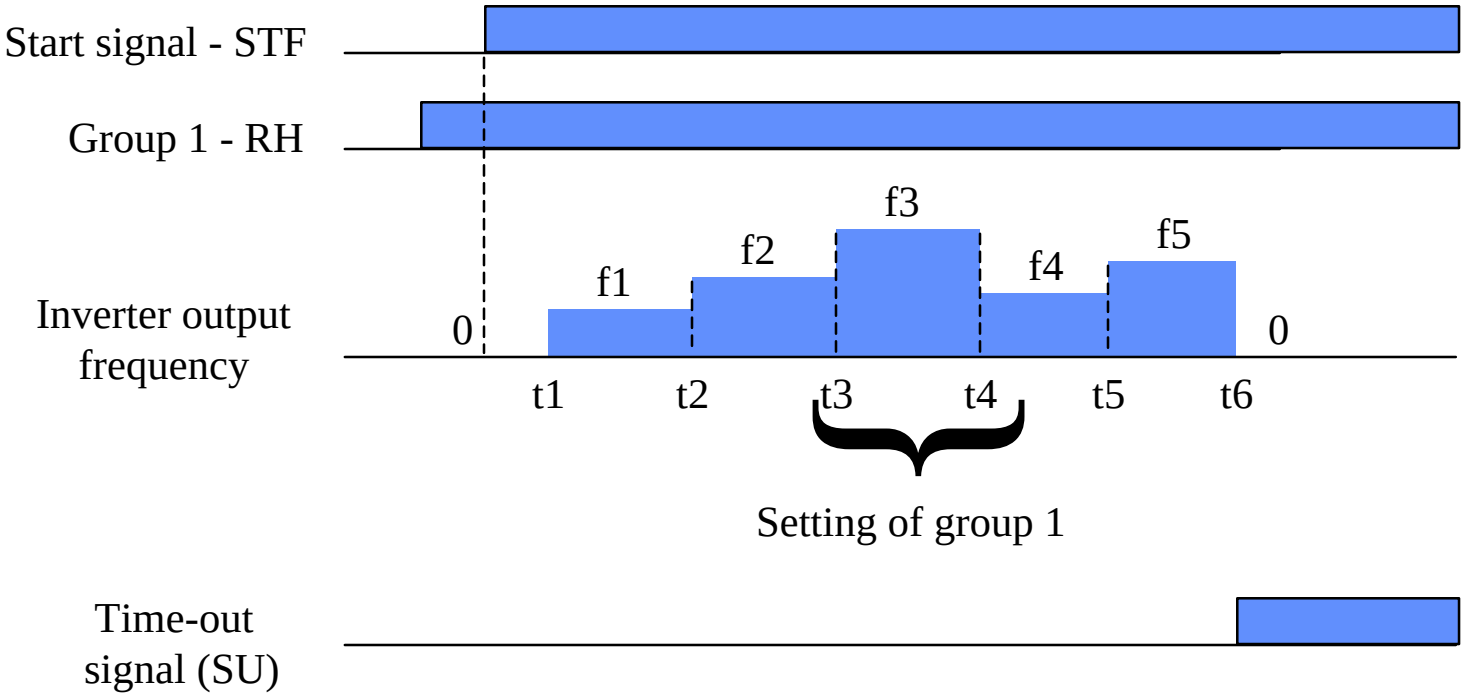
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Operation

< Ordinary operation >

After completion of all preparations and settings, turn on the desired group select signal (any of RH (group 1), RM (group 2) and RL (group 3)), then turn on the start signal (STF). This causes the internal timer (reference time of day) to be reset automatically and the operation of that group to be performed in sequence in accordance with the settings. When the operation of the group ends, a signal is output from time-out output terminal. (The open collector signal of SU is turned on.)



Note that the operation is not started if the timer reset (STR) is on.

Note: Use the programmed operation function with “5” set in Pr. 79. Programmed operation will not be performed if any of the group select signals is switched on during PU operation or data link operation.

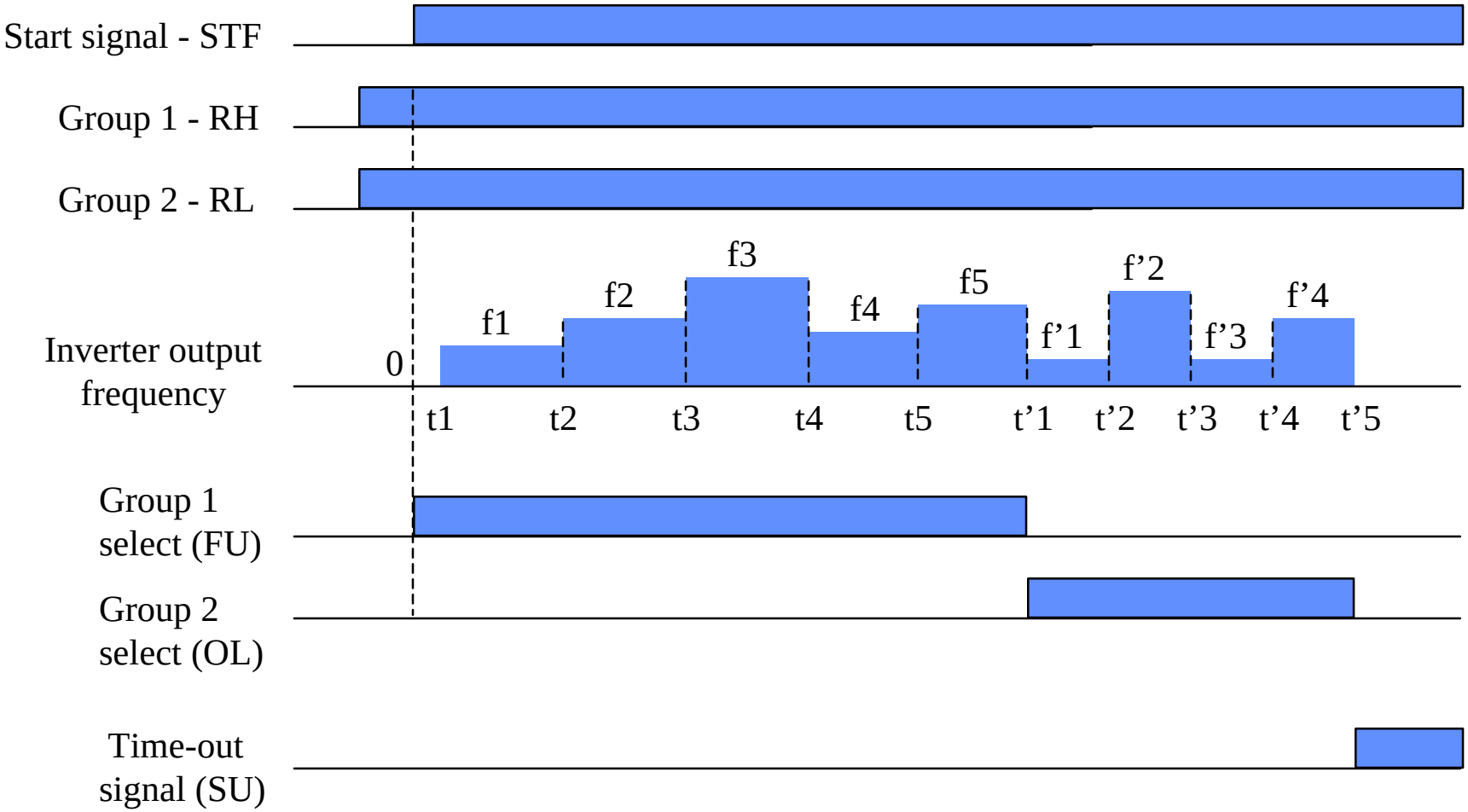
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< Multi-group select operation >

When two or more groups are selected at the same time, the operations of the selected groups are executed in sequence of group 1, group 2 and group 3.

For example, if group 1 and group 2 have been selected, the operation of group 1 is first carried out, and after that operation ends, the reference time of day is reset, the operation of group 2 is started, and the time-out signal (SU) is output after the operation of group 2 ends.



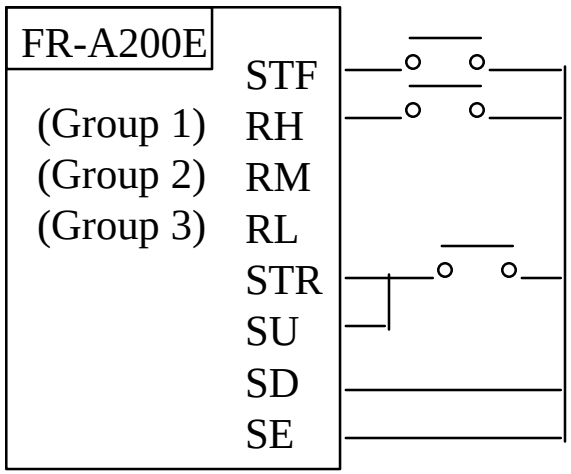
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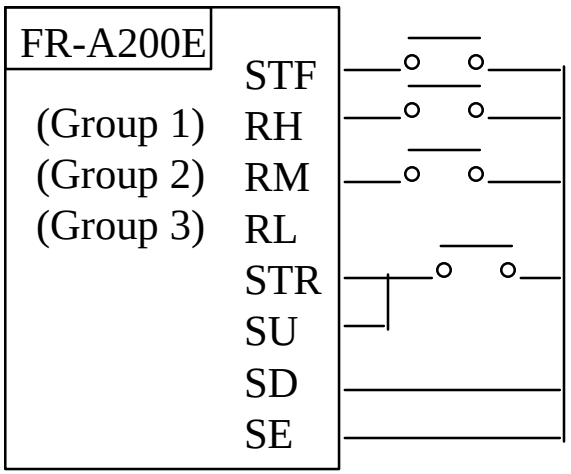
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< Repeated operation >

To repeat the operation of the same group, reset the timer using the time-out signal as shown below:

1) To repeat the operation of only group 1	2) To repeat the operation of groups 1 and 2





Note: If the inverter is powered down, then up (including a power failure or an instantaneous power failure) during the execution of the programmed operation, the internal timer is reset and the inverter does not restart if the power is restored. To resume the operation, turn the programmed operation start signal (terminal STF) off, then on again. (At this time, the reference time of day is zeroed. When it is required to set the reference time of day, switch the start signal on before setting.)

NEXT PAGE

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Programmed Operation Battery Backup (FR-EPD option)

To continue programmed operation at the occurrence of an instantaneous power failure, install this unit (FR-EPD) and start programmed operation.

< Operation at occurrence of instantaneous power failure >

(1) When a power failure has occurred, operation is continued as shown below with the operation during the power failure period eliminated. (The internal timer for programmed operation continues timing.)

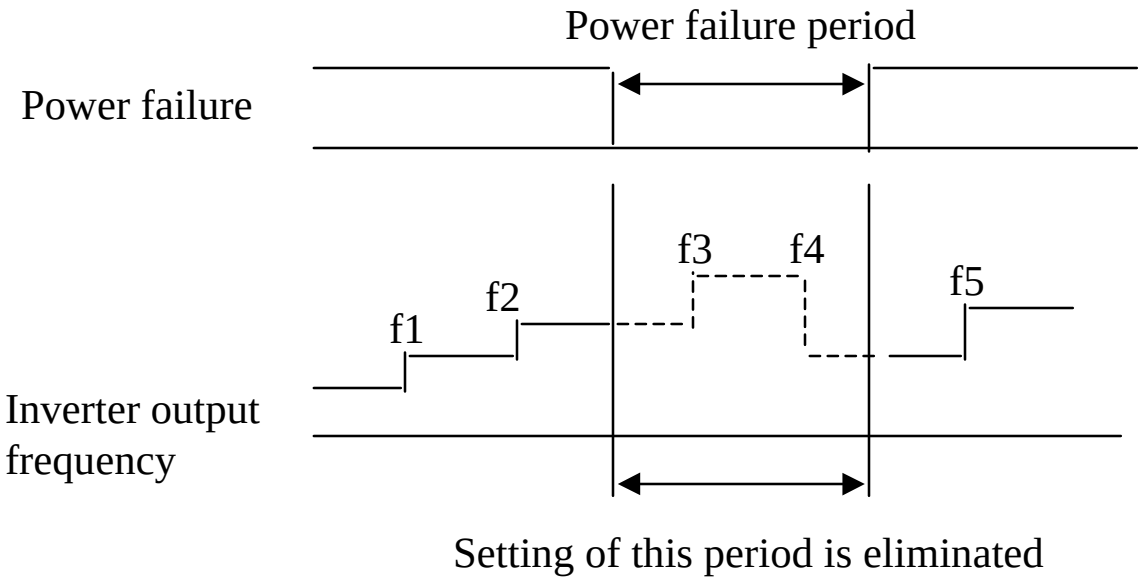
(2) If the group selected has been changed during the power failure, the operation of the group selected is started from the beginning after the power is restored.

(3) The battery is guaranteed for 10 years. If the BAT.E lamp is lit, change the battery.

(4) The operation is not performed if the power is restored when or after the time-out signal is output.

(5) If the power is restored after a long power failure period, programmed operation is not resumed. Perform group selection and time setting again.

Max. permissible power failure period ..... 18 hours when Pr. 200 = “0” or “2” (minute/second selection)
30 days when Pr. 200 = “1” or “3” (o’clock/minute selection)



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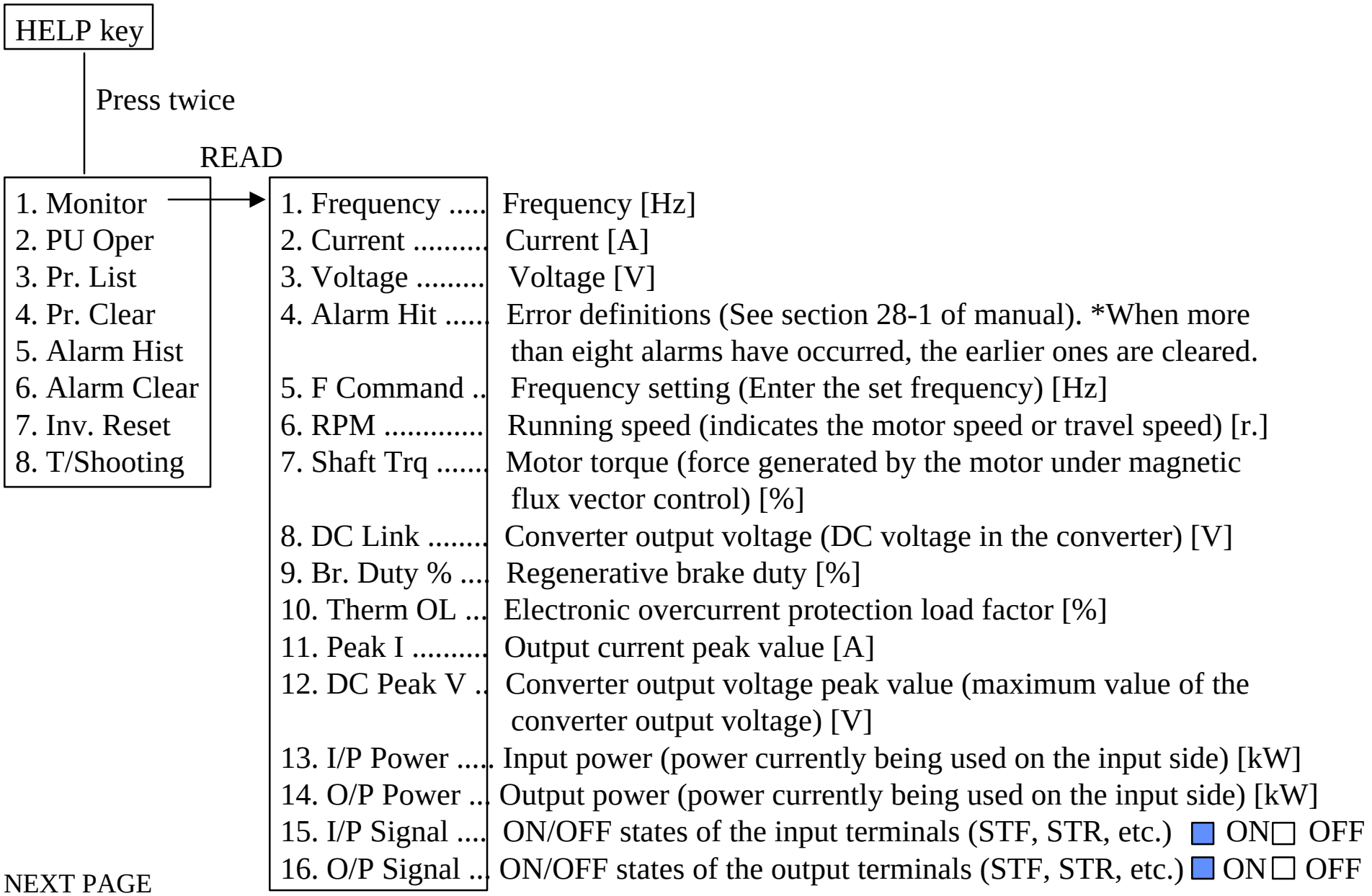
PARAMETER UNIT

- Help Functions
- FR-PU02E-1

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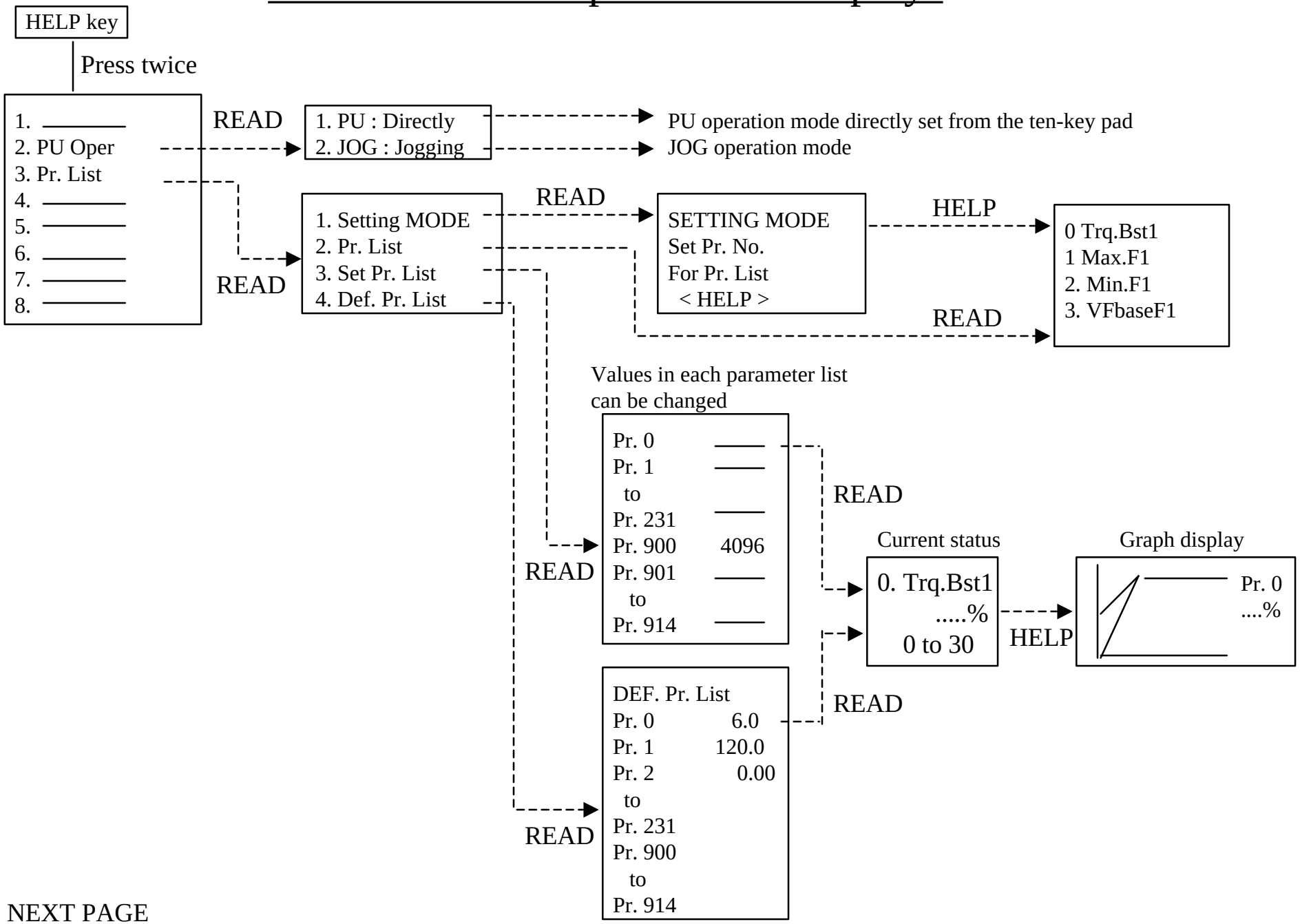
Definitions of Help Function Displays



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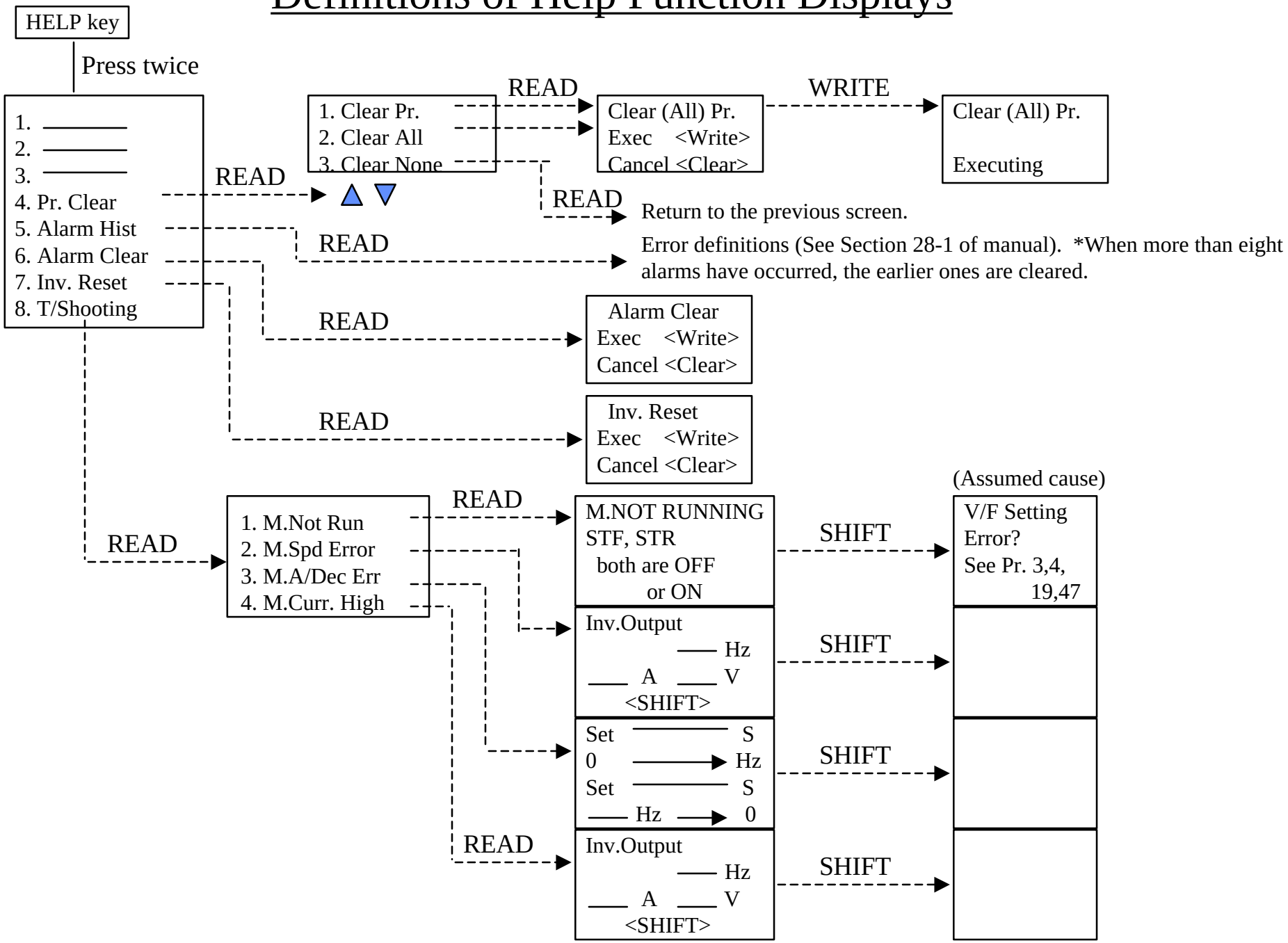
Definitions of Help Function Displays



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Definitions of Help Function Displays



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FR-PUO2E-1

Enables the STOP key of the parameter unit to function in either PU or EXT mode.
To run drive after STOP key function has been activated while in external mode, reset must be performed.
To enable STOP function, refer to Pr. 75 description.
For use with the FR-A200E-UL variable frequency drive only.

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MAGNETIC FLUX VECTOR CONTROL

- How to Enable
- Limitations

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Selection of Magnetic Flux Vector Control

Only set any other values other than 9999 in Pr. 80 (motor capacity) and Pr. 81 (number of poles) to select the magnetic flux vector control. (When 9999 has been set to either of Pr. 80 and Pr. 81, V/F control is selected.)
When the Baldor constant-torque motor is used, set “1” in Pr. 71 “applied motor”.
By switching on/off the signal across RT-SD during a stop, operation can be switched between the V/F control and magnetic flux vector control. Switch the signal off to select the magnetic flux vector control.

< Applications appropriate for magnetic flux vector control >

- Machines which require large starting torque
- Machines which require torque at low speed
- Machines where load fluctuates widely

(Magnetic flux vector control is not appropriate for machines where speed fluctuation at low speed is not allowed, e.g. grinder, wrapping machine.)

NEXT PAGE

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CONTINUED

Parameter Number	Parameter Name	Setting Range	Set Value	Description			Factory Setting
80	Motor capacity	9999, 0.4 to 55kW	9999	V/F control is selected.			0
			0.4 to 55	Motor capacity (kW) is set.			———
81	Number of motor poles	9999, 2, 4, 6, 14, 16	9999	V/F control is selected.			0
			2, 4, 6	Number of poles is selected.			———
			12, 14 16	Switch on the signal across terminals RT-SD to select V/F control if the number of motor poles has been set. (Control is switched at a stop.) • 12: 2-pole motor • 14: 4-pole motor • 16: 6-pole motor			———
71	Applied motor *	0 to 6, 13 to 16 20	0	Standard motor (more than 1.5kW)			0
			1	Constant-torque motor			———
			2	Standard motor (5-point flexible V/F characteristic)			
			20	Mitsubishi Standard motor (SF-JR) (1.5kW or less)			
			3	Standard motor	"Auto tuning setting" is selected		
			13	Constant-torque motor			
			23	Mitsubishi standard motor (SF-JR) (1.5kW or less)			
			4	Standard motor	Auto tuning data read/change setting is enabled		
			14	Constant-torque motor			
			24	Mitsubishi standard motor (SF-JR) (1.5kW or less)			
			5	Standard motor	Star connection	Direct input of motor constants is enabled	
			15	Constant-torque motor			
			6	Standard motor	Delta connection		
			16	Constant-torque motor			

* The electronic overcurrent protection characteristic is also set simultaneously.

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Magnetic Flux Vector Control Limitations

< Conditions >

- The motor capacity is equal to or one rank lower than the inverter capacity.
- The type of the motor is the Baldor standard motor (0.75kW or more) or Baldor constant-torque motor (200V class 4-pole motor is used with 0.4kW to 55kW). When any other motor is used, consider using the auto tuning on page 80 of the manual.
- The number of motor poles is any of 2, 4 and 6. (4-poles only for the constant-torque motor.)
- Single-motor operation (one motor for one inverter) is performed.
- The wiring length between the inverter and motor is within 30m.

Note: Precautions for magnetic flux vector control

1. The degree of speed fluctuation correction is slightly lower than in the V/F control.
2. There is a delay of 0.1 to 0.2 seconds at start.

Note: The output torque may reduce when the optional noise reduction reactor (FR-BOL) or surge voltage suppressing filter (FR-ASF-H) is connected between the inverter and the motor. (See page 168 of the manual.)

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AUTO TUNING

- Operation Procedure
- Error Codes
- Manual Setting of Motor Constants

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Auto Tuning Procedure

If the motor used is not Baldor's standard motor (0.4kW or more) or Baldor's constant-torque motor (4-pole, 0.4kW to 55kW), the auto tuning function allows the motor to be run with the optimum operation characteristics under magnetic flux vector control.

Also, tuning data (motor constants) can be copied to the other inverter by the FR-ARWE parameter copy unit.

Note that a special motor, e.g. a high-slip motor or a high-speed motor, cannot be tuned. Also, the maximum speed is up to 120Hz.

< Operation procedure > < Step 1 - Checking the wiring and load >

Before performing auto tuning, check the following:

(1) The motor is connected. However, the motor must be at a stop at the start of tuning.

(2) Auto tuning can be performed if the motor is connected with a load (e.g. friction, heavy load). Note that as the load is smaller, tuning accuracy is higher. Also note that if inertia is large, tuning accuracy remains unchanged.

(3) When "101" (auto tuning is performed with the motor rotated) has been set in Pr. 96 (auto tuning setting state), note the following:

1) Enough torque is not provided during tuning.
2) There should be no problem if the motor is run at about the rated motor frequency (set value of of Pr. 84).
3) The brake is released.
4) No force is applied to rotate the motor.

(4) If "1" (tuning without motor rotating) is set in Pr. 96, the motor may run slightly. Therefore, make tuning after fixing the motor securely with a mechanical brake or ensuring that motor rotation will not compromise safety. * The motor should be fixed securely especially for an elevator.
Note that slight rotation of the motor will not affect the tuning performance.

(5) Auto tuning is not performed properly when the optional noise reduction reactor (FR-BOL) or surge voltage suppressing filter (FR-ASF-H) is connected between the inverter and the motor. Disconnect it before starting auto tuning.

NEXT PAGE

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< Step 2 - Selection of magnetic flux vector control >
Select the magnetic flux vector control in accordance with page 79 of the manual.

< Step 3 - Setting of parameters >
Set the following parameters in accordance with the parameter settings on this page.

(1) Pr. 96 “auto tuning setting/state” ..... Set “1” or “101”.
Set value “1” ..... Tuned without the motor rotated.
Set value “101” ..... Tuned with the motor rotated.

(2) Pr. 83 “rated motor voltage” (Note) ..... Set the rated motor voltage (V).

(3) Pr. 84 “rated motor frequency” (Note) ..... Set the rated motor frequency (Hz).

(4) Pr. 71 “applied motor” ..... Select the set value in accordance with the following table:
Standard motor ..... Set “3”.
Constant-torque motor ..... Set “13”.

Note: Pr. 83 and Pr. 84 are displayed only when the magnetic flux vector control has been selected (Pr. 80, Pr. 81). Set these parameters according to the rating plate of the motor. When there are two or more rated values for a standard motor, etc., set 230V/60Hz or 460V/60Hz.

NEXT PAGE

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Parameter Number	Name	Setting Range	Set Value	Description	Factory Setting
71	Applied motor * 1	0 to 6, 13 to 16 20	See page 80 of manual for set value and description		0
83	Rated motor voltage	0 to 1000V	0 to 1000V	Rated motor voltage (V) is set.	* 4 200
84	Rated motor frequency	50 to 120Hz	50 to 120Hz	Rated motor frequency (Hz) is set.	60
90	Motor constant R1	9999, 0 to 10.000ohm	9999	Tuning data *2	0
			0 to 10.000ohm		——
91	Motor constant R2	9999, 0 to 10.000ohm	9999		0
			0 to 10.000ohm		——
92	Motor constant L1	9999, 0 to 10.000mH	9999		0
			0 to 10.000mH		——
93	Motor constant L2	9999, 0 to 10.000mH	9999		0
			0 to 10.000mH		——
94	Motor constant X	9999, 0 to 1000%	9999		0
			0 to 1000%		——
96	Auto tuning setting/state	0, 1, 101 *3	0	“No auto tuning” is selected.	0
			1	Auto tuning is performed without the motor rotated.	——
			101 *3	Auto tuning is performed with the motor rotated.	——

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*2: The values measured by auto tuning are set automatically.
*3: Select “101” to increase tuning accuracy.
*4: The factory setting for the FR-A240E (400V) series is 400V.

Setting method of the special parameters

The special parameters must be set in the following procedure, otherwise the values of Pr. 80 to Pr. 90 cannot be read.
1) Set 801 in Pr. 77. (Note)
2) Change the setting of the special parameters in (2)
3) Set 0 or 1 in Pr. 77 (return to the initial set value).

Note: When 801 is set in Pr. 77, the values of Pr. 82 to 99 are also displayed together, but these parameters must not be changed. Otherwise, the inverter may be damaged.

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< Step 4 - Switching the auto tuning command ON >

In the PU operation mode, press the [FWD] or [REV] key.
In the external operation mode, turn on the start switch (connect across terminals STF or STR-SD).

Note: 1. When "101" is set in Pr. 96, be careful to avoid hazard because the motor rotates.
2. During auto tuning, the input/output terminals are made valid/invalid as indicated below:

Input terminals	Valid Terminals	Invalid Terminals
	STOP OH RT, JOG, CS RST STF / STR	RH, RM, RL 2, 1, 4 AU

Output terminals	Valid Terminals	Invalid Terminals
	RUN OL IPF FM, AM A, B, C	SU FU

• To force the motor to stop during tuning
Terminate tuning using the MRS terminal, RES terminal or [STOP] key.

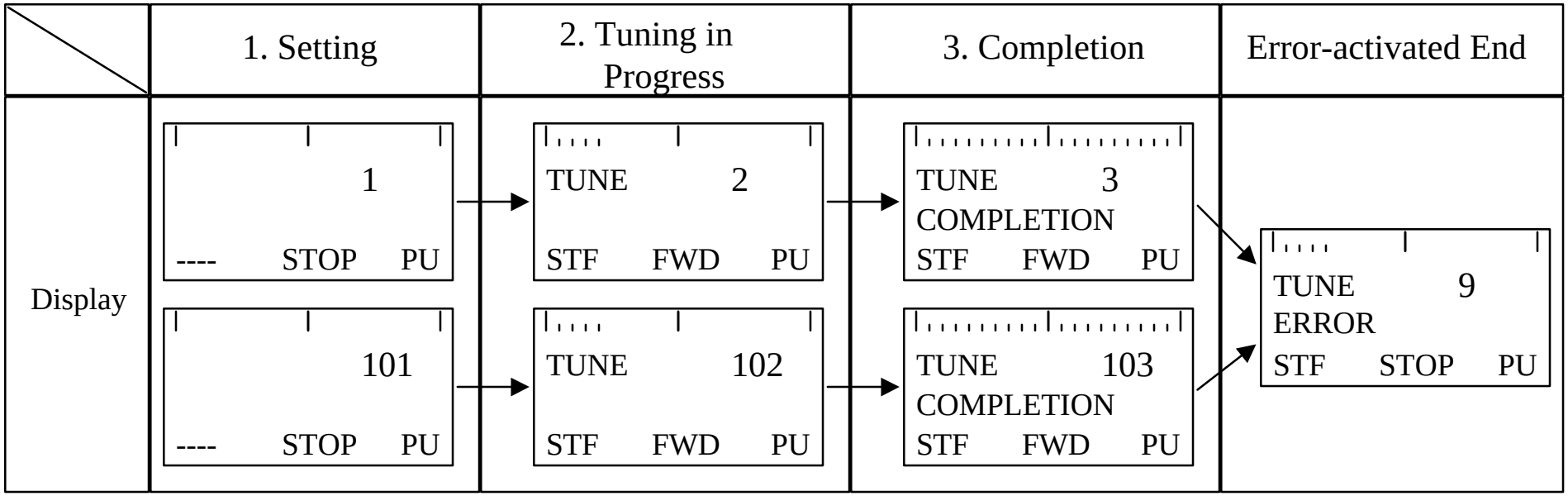
3. Be careful especially when the RUN signal has been used to create a mechanical brake releasing sequence.

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< Step 5 - Tuning state monitoring >

During tuning, the value of Pr. 96 is displayed on the main monitor and level meter of the PU as indicated below. As on the PU, 1, 2, 3, 8, 9, 91, 92, 93, 102 or 103 is shown on the inverter LED.
(When Pr. 51 = "1" (factory setting))

• **PU main monitor** (In case of inverter trip)



• **PU level meter**

Indicates tuning progress with 0% (start) to full-scale 100% (end).

• **Inverter LED** (In case of inverter trip)

	1. Setting	2. Tuning in Progress	3. Completion	Error-activated End
Displayed Value	1 →	2 →	3	9
	101 →	102 →	103	

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< Step 6 - Auto tuning end >

Check the value of Pr. 96.

• Normal end ..... "3" or "103" is displayed.

• Error-activated end ..... Any of "9", "91", "92" and "93" is displayed.

When tuning came to an normal end in the PU operation mode, press the [STOP] key. When in the external operation mode, turn off the start switch (disconnect terminals STF or STR-SD). This operation resets auto tuning and returns the PU monitor to an ordinary display.

Note that if this operation is not performed, next operation cannot be started.

When tuning resulted in an error-activated end, auto tuning did not come to a normal end and the motor constant was not set. In this case, reset the inverter (see page 72 of the manual) and restart from operation step 1.

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Definition of Display at Error-Activated End

Error Display	Cause	Corrective Action
9	Inverter trip	Set again.
91	The current limit (stall prevention) function has been activated.	Increase the acceleration/deceleration time.
92	The converter output voltage has dropped to 75% of the rated value.	Check the variation of the power supply voltage.
93	Calculation error	Set again.

Note: If OL (stall prevention) occurs during auto tuning, auto tuning cannot be performed.

Reference: Auto tuning time (factory setting)

Auto Tuning Setting	Time
1: Mode in which the motor does not rotate	Approx. 10 seconds
101: Mode in which the motor rotates	Approx. 25 seconds *1

*1: The auto tuning time changes as indicated below according to the variation of the acceleration/deceleration time:

Auto tuning time = acceleration time + deceleration time + approx. 15 seconds

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Manual Setting of Motor Constants

The motor constants (Pr. 90 to 94) may either be set as appropriate by reading and changing the data measured by auto tuning, or without using the auto tuning data:

< Setting the motor constants by reading and changing the auto tuning data >

< Operation procedure >

1. Change the set value of Pr. 77 “parameter write disable selection” to “801”. Only when the settings of Pr. 80 and Pr. 81 are other than “9999”, the parameters of the motor constants (Pr. 90 to 94) can be displayed. Though the parameters (Pr. 82 to 99) other than the motor constants (Pr. 90 to 94) may also be displayed, they are to be set by the manufacturer and must not therefore be set carefully without mistake.
2. Set Pr. 71 “applied motor” as indicated below:

   Standard motor: Set “4” Constant-torque motor: Set “14”
3. In the parameter setting mode, read the following parameters and set the required values (Note 1):

Parameter Number	Name	Setting Range (Note 4)	Minimum Setting Increment	Factory Setting
Pr. 90	Motor constant R1	0 to * * * *, 9999	1	9999
Pr. 91	Motor constant R2	0 to * * * *, 9999	1	9999
Pr. 92	Motor constant L1	0 to * * * *, 9999	1	9999
Pr. 93	Motor constant L1	0 to * * * *, 9999	1	9999
Pr. 94	Motor constant X	0 to * * * *, 9999	1	9999

4. Return the setting of Pr. 77 to the original value.

NEXT PAGE

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Note: 1. Only when the settings of Pr. 80 and Pr. 81 are other than “9999” (magnetic flux vector control is selected), Pr. 90 to 94 can be read.

2. Set “9999” in Pr. 90 to 94 to use the standard motor constants (including the constant-torque motor).

3. Set “3” (standard motor) or “13” (constant-torque motor) on Pr. 71 to use the motor constants measured by auto tuning. If “4” or “14” has been set in Pr. 71 and the motor constants changed, the original data measured by auto tuning remain changed.

4. The motor constants measured by auto tuning have been converted into internal data (****).
When setting the motor constants, see the following setting example:

Setting example:

When Pr. 90 “motor constant R1” value displayed is 2516 and it is desired to increase the Pr. 90 value slightly (5%), set 2642 (i.e. 2516 x 1.05 = 2641.8) in Pr. 90. (The value displayed has been converted into internal data for internal use. Hence, there is no significance if an optional value is simply added to the displayed value.)

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< Setting the motor constants without using the auto tuning data >

The motor constants of Pr. 92 and 93 may either be entered in [ohms] or [mH]. Check the unit of the motor constants before starting the setting operation.

• Entering the motor constants of Pr. 92 and 93 in ohms

< Operation procedure >

1. Change the set value of Pr. 77 “parameter write disable selection” to “801”. Only when the settings of Pr. 80 and Pr. 81 are other than “9999”, the parameters of the motor constants (Pr. 90 to 94) can be displayed. Though the parameters (Pr. 82 to 99) other than the motor constants (Pr. 90 to 94) may also be displayed, they are to be set by the manufacturer and must therefore be set carefully without mistake.
2. Set Pr. 71 “applied motor” as indicated below:

		Star Connection Motor	Delta Connection Motor
Set value	Standard motor	5	6
	Constant-torque motor	15	16

3. In the parameter setting mode, read the following parameters and set the required values:

Parameter Number	Name	Setting Range	Minimum Setting Increment	Factory Setting
Pr. 90	Motor constant r1	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 91	Motor constant r2	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 92	Motor constant x1	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 93	Motor constant x1	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 94	Motor constant xm	0 to 500 ohms, 9999	0.01ohms	9999

NEXT PAGE

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4. Set Pr. 84 “rated motor frequency” with reference to the following table:

Parameter Number	Name	Setting Range	Minimum Setting Increment	Factory Setting
Pr. 84	Rated motor frequency	50 to 120Hz, 9999	0.01Hz	9999

5. Return the setting of Pr. 77 to the original value.

Note: 1. Only when the setting of Pr. 80 and Pr. 81 are other the “9999” (magnetic flux vector control is selected), Pr. 90 to 94 can be read.
2. Set “9999” in Pr. 90 to 94 to use the standard motor constants (including the constant-torque motor).
3. If the “star connection” or “delta connection” selected in Pr. 71 does not match the actual motor, proper magnetic flux vector control will not be carried out.

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• Entering the motor constants of Pr. 92 and 93 in mH

< Operation procedure >

1. Change the set value of Pr. 77 “parameter write disable selection” to “801”. Only when the settings of Pr. 80 and Pr. 81 are other than “9999”, the parameters of the motor constants (Pr. 90 to 94) can be displayed. Though the parameters (Pr. 82 to 99) other than the motor constants (Pr. 90 to 94) may also be displayed, they are to be set by the manufacturer and must therefore be set carefully without mistake.
2. Set Pr. 71 “applied motor” as indicated below:

   Standard motor: [More than 1.5kW: Set “0”] [1.5kW or less: Set “20”]

   Constant-torque motor: Set “1”

3. In the parameter setting mode, read the following parameters and set the required values:

Parameter Number	Name	Setting Range	Minimum Setting Increment	Factory Setting
Pr. 90	Motor constant R1	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 91	Motor constant R2	0 to 10 ohms, 9999	0.001ohms	9999
Pr. 92	Motor constant L1	0 to 1000mH, 9999	0.1mH	9999
Pr. 93	Motor constant L1	0 to 1000mH, 9999	0.1mH	9999
Pr. 94	Motor constant x	0 to 100%, 9999	0.1%	9999

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4. Set Pr. 84 “rated motor frequency” with reference to the following table:

Parameter Number	Name	Setting Range	Minimum Setting Increment	Factory Setting
Pr. 84	Rated motor frequency	50 to 120Hz, 9999	0.01Hz	9999

5. Return the setting of Pr. 77 to the original value.

Note: 1. Only when the setting of Pr. 80 and Pr. 81 are other the “9999” (magnetic flux vector control is selected), Pr. 90 to 94 can be read.
2. Set “9999” in Pr. 90 to 94 to use the standard motor constants (including the constant-torque motor).

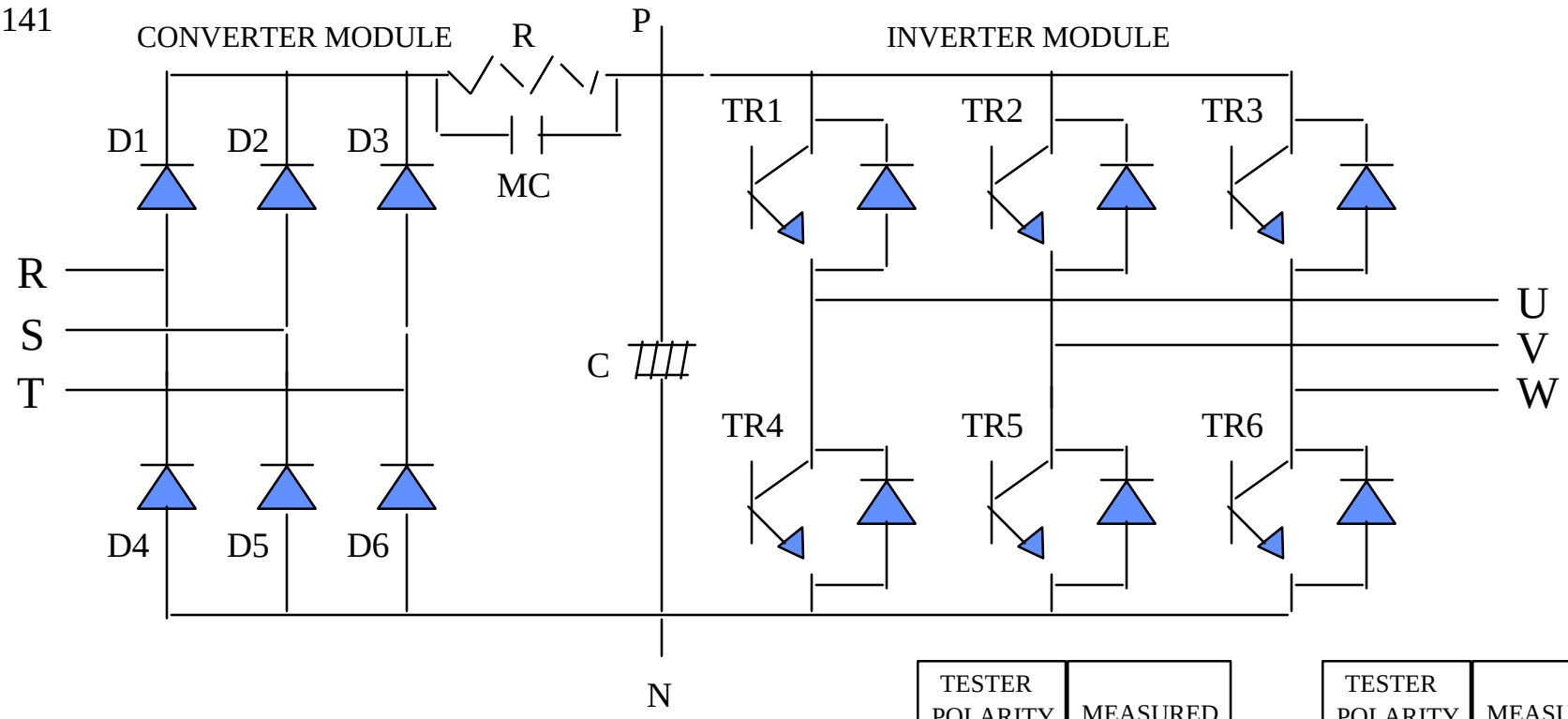
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TROUBLE SHOOTING

- Checking Input and Output Devices
- Alarm Codes
- Common Cause of Alarm

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TESTER = DIGITAL VOLT METER
WITH DIODE SETTING

		TESTER POLARITY +	TESTER POLARITY -	MEASURED VALUE		TESTER POLARITY +	TESTER POLARITY -	MEASURED VALUE
CONVERTER MODULE	D1	R	P	DIODE	D4	R	N	OPEN
		P	R	OPEN		N	R	DIODE
	D2	S	P	DIODE	D5	S	N	OPEN
		P	S	OPEN		N	S	DIODE
	D3	T	P	DIODE	D6	T	N	OPEN
		P	T	OPEN		N	T	DIODE
INVERTER MODULE	TR1	U	P	DIODE	TR4	U	N	OPEN
		P	U	OPEN		N	U	DIODE
	TR2	V	P	DIODE	TR5	V	N	OPEN
		P	V	OPEN		N	V	DIODE
	TR3	W	P	DIODE	TR6	W	N	OPEN
		P	W	OPEN		N	W	DIODE

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Alarm Codes

If any fault has occurred in the inverter, the corresponding protective function is activated to bring the inverter to an alarm stop and automatically give the corresponding error (alarm) indication on the PU display and inverter LED. When the protective function is activated, reset the inverter in accordance with page 72 of the manual.

Display		Name		Description	Alarm Code	Alarm Output Across B-C
Parameter Unit	Inverter LED					
OC During Acc	E.OC1	During acceleration	Overcurrent shut-off	If the inverter output current reaches or exceeds 200% of the rated current, the protective circuit is activated to stop the inverter. When any main circuit device is overheated, the protective circuit is also activated to stop the output of the inverter.	1	Provided (Open)
Stedy Spd OC	E.OC2	During constant speed			2	
OC During Dec	E.OC3	During deceleration During stop			3	
OV During Acc	E.Ou1	During acceleration	Regenerative over-voltage shut-off	If the converter output voltage is excessive due to the regenerative energy from the motor, the protective circuit is activated to stop the inverter output. This may also be activated by a surge voltage generated in the power supply system.	4	Provided (Open)
Stedy Spd OV	E.Ou2	During constant speed			5	
OV During Dec	E.Ou3	During deceleration During stop			6	

NEXT PAGE

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CONTINUED

Display		Name	Description	Alarm Code	Alarm Output Across B-C
Parameter Unit	Inverter LED				
Motor overload	E.THM Motor protection	Overload shut-off (electronic overcurrent protection)	The electronic overcurrent protection in the inverter detects inverter overload or motor overheat and activates the protective circuit to stop the inverter output. When more than one motor is driven, the motors cannot be protected by the electronic overcurrent protection. Provide a thermal relay in the inverter output circuit. In this case, setting the electronic overcurrent protection value to 0A activates the inverter protection only. (Activated at a current 150% or more of the rated current.)	5	Provided (Open)
Inv, Overload	E.THT inverter protection			6	
Inst. Pwr. Loss	E.IPF	Instantaneous power failure protection	If an instantaneous power failure has occurred in excess of 15ms (this applies also to inverter input power shut-off), this function is activated to stop the inverter output. (If the power failure is within 15ms, the control circuit operates without fault. If the power failure persists for more than about 100ms, the protective circuit is reset.)	7	Provided (Open)
Under Voltage	E.UuT	Undervoltage protection	If the inverter power supply voltage has reduced, the control circuit cannot operate properly, resulting in the decrease in motor torque and/or the increase in heat generation. To prevent this, if the power supply voltage reduces below about 150V (300V for the 400V series), this function stops the inverter output.	8	Provided (Open)

NEXT PAGE

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Display		Name	Description	Alarm Code	Alarm Output Across B-C
Parameter Unit	Inverter LED				
Br. Cct. Fault	E. bE	Brake transistor alarm detection	If the brake transistor fault has occurred due to extremely large regenerative brake duty, etc., this function detects that fault and stops the inverter output.	A	Provided (Open)
Ground Fault	E. GF	Output side ground fault overcurrent protection	If a ground fault current has flown due to a ground fault occurring in the output (load) side of the inverter, this function stops the inverter output. A ground fault occurring at low ground resistance may activate the overcurrent protection (OC1 to OC3).	B	Provided (Open)
OH Fault	E.OHT	External thermal relay operation	If the external thermal relay for motor overheat protection or the internally mounted temperature relay in the motor has been switched on (relay contacts open), this function stops the inverter output and keeps it stopped. This protection is only provided when “1” or “3” has been set in Pr. 17 “external thermal relay input function”.	C	Provided (Open)

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CONTINUED

Display		Name	Description	Alarm Code	Alarm Output Across B-C
Parameter Unit	Inverter LED				
OL is shown (during motor rotation) Stll Prev STP (at a motor stop)	E.OLT Indicates a stop due to the activation of the function for a long time during constant speed operation	Acceleration/constant speed stall prevention current limit	If a current not less than 150% of the rated inverter current flows in the motor during acceleration, this function stops the increase in frequency until the load current reduces to prevent the inverter form resulting in overcurrent trip. If a current not less than 150% of the rated inverter current flows during constant-speed operation, this function also lowers the output frequency until the load current reduces to prevent the inverter from resulting in overcurrent trip. When the load current has reduced below 150%, this function increases the frequency again and accelerates up to the set speed or continues operation.	D	Not Provided Provided by EOLT display (Open)
		Deceleration stall prevention	If the brake operating amount has exceeded the specified value due to excessive regenerative energy during motor deceleration, this function stops the decrease in frequency to prevent the inverter from resulting in overvoltage trip. As soon as the regenerative energy has reduced, this function reduces the frequency again and continuous deceleration.		

NEXT PAGE

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Display		Name	Description	Alarm Code	Alarm Output Across B-C
Parameter Unit	Inverter LED				
Option Fault	E.OPT	Inboard option connection alarm	Stops the inverter output if the dedicated option used in the inverter results in connection (connector) fault during operation.	E	Provided (Open)
Currupt Memory	E. PE	Parameter storage device alarm	Stops the inverter output if the fault of EPROM which stores the function set values has occurred.	F	Provided (Open)
Retry No. Over	E.rET	Retry count exceeded	If operation cannot be resumed within the number of retry times set, this function stops the inverter output.	F	Provided (Open)
CPU Fault	E.CPU	CPU error	If the operation of the built-in CPU does not end within a predetermined period of time, the inverter self-determines it as alarm and stops the output.	F	Provided (Open)
PU Leave Out	E.PUE	Parameter unit disconnection	Stops the inverter output if the parameter unit is disconnected. This protective function is activated when “2” or “3” has been set in Pr. 75 “reset selection/PU disconnection detection”.	F	Provided (Open)
(not displayed)	(not displayed)	Brake resistor overheat protection	If the regenerative brake duty from the motor has exceeded the specified value, the brake operation is stopped to protect the brake resistor from overheat. When the brake resistor has cooled, the brake operation is resumed.	—	Not Provided (Closed)

NEXT PAGE

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PU to Inverter comms. Error Inv. Reset ON
Parameter unit display at inverter power up. This display is shown during inverter self-test routine. If the self-test routine fails, this display remains on the parameter unit an the inverter is inoperative.

• **To know the operating status at the occurrence of alarm**

When any alarm has occurred, the display automatically switches to the indication of the corresponding protective function (error). By pressing the [MONITOR] key at this point without resetting the inverter (see page 72 of the manual), the display shows the output frequency. In this way, it is possible to know the running frequency at the occurrence of the alarm. It is also possible to know the current in the same manner. These values are not stored in memory and are erased when the inverter is reset.

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Common Cause of Alarm

Parameter Unit	Inverter LED	Description	Possible Cause of Fault
OC During Acc	E.OC1	200% output current for 0.5 sec. during accel.	Acceleration too fast Load to large Output short circuit or ground fault Drive overheating - fan not working *1
Stedy Spd OC	E.OC2	200% output current for 0.5 sec. during constant speed	Sudden load change Output short circuit or ground fault Drive overheating - fan not working *1 Flux vector control enabled - Set 89 to “0”
OC During Dec	E.OC3	200% output current for 0.5 sec. during decel.	Deceleration too fast Output short circuit or ground fault Drive overheating - fan not working *1 Problem with braking device
OV During Acc	E.OV1	Overvoltage on DC bus (terminals P-N)	Acceleration too fast AC line voltage too high
Stedy Spd OV	E.OV2	Overvoltage on DC bus (terminals P-N)	Sudden load change AC line voltage too high Flux vector control enabled - Set 89 to “0”
OV During Dec	E.OV3	Overvoltage on DC bus (terminals P-N)	Deceleration too fast Problem with braking device
Motor overload	E.THM	Thermal relay for motor	Load to large At low speed, current draw high enough to overheat motor over time
Inv. overload	E.THT	Thermal relay for inverter	

NEXT PAGE

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CONTINUED

Parameter Unit	Inverter LED	Description	Possible Cause of Fault
Inst. Pwr. Loss	E.IPF	Instantaneous power loss	Problem with AC power source
Under voltage	E.UVT	Undervoltage on DC bus (terminals P-N)	AC line voltage low Large motor started Open inrush resistor - check brake unit and brake resistor
Br. Cct. Fault	E. BE	Brake transistor fault	Damaged brake transistor Proper brake duty set
Ground Fault	E. GF	Ground fault occurred in output circuit	Low impedance of output to ground - high current draw on single output phase Damaged output transistor or power PCB
OH Fault	E.OHT	External thermal relay operated.	Check for cause of open circuit between terminals OH-SD
Stll Prev STP	E.OLT	150% output current for 1 min.	Load to large
Option Fault	E.OPT	Option and inverter connected improperly	Check for loose connection
Corrupt Memry	E. PE	EEPROM faulty	Return inverter for repair
Retry No. Over	E.RET	Operation could not be resumed within the number of retry times set	Check cause of continuing fault

NEXT PAGE

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Parameter Unit	Inverter LED	Description	Possible Cause of Fault
CPU Fault	E.CPU	CPU malfunction	Return inverter for repair
PU Leave Out	E.PUE	PU has been disconnected from the inverter or cable	Cable over 5m not working PU not connected
PU to Inverter comms. Error Inv. Reset ON	0.00 (Proper LED display)	Self-test routine	Reset signal on at power up Loose connection of PU *2 Communication circuit fault
	Err. (Improper LED display) FR-A	CPU malfunction *3	Reset inverter Return inverter for repair

Note: *1. This alarm does not occur due to the cooling fan stop, but it will occur to prevent the main circuit devices from overheating by the fan failure.

*2. The parameter unit display remains unchanged but operation may be performed in the external operation mode.

*3. If the alarm is kept displayed on the parameter unit and inverter LED after remedy, the internal circuit may be faulty. Consult your sales representative.

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OPTIONS

- Plug-In Options
- External Options

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Plug-In Options

Function \ Option	FR-EPA	FR-EPB	FR-EPC	FR-EPD	FR-EPE	FR-EPG	FR-EPH	FR-EPN
PLG feedback control	●	●	●					
Orientation control	●							
12-bit digital input	●				●			
Relay output					●	● Note 1	● Note 1	
Extension analog output	●				●			
Computer link		●				●		
MELSECNET/MINI-S3			●					
PI control				●				
Programmed operation				●			●	
Analog current output						● Note 2	● Note 2	
Pulse train output							●	
Device Net								● Note 3

Note: 1. FR-EPG and FR-EPH has only one relay output
2. FR-EPG and FR-EPH has 20mADC output
3. Modified control PCB required for use with FR-A200E

NEXT PAGE

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Of the previous option units, only one can be installed in the inverter.
Each option unit has several functions as listed below:

PLG feedback control	The motor speed is detected by the pulse encoder, this detection signal is fed back to the inverter, and its speed variation is automatically compensated for. Hence, the motor speed can be kept constant if load variation occurs. The actual motor speed can be monitored on the inverter LED display and parameter unit. [Application example] extruder, winder, conveyor	Speed variation ration: within +/- 0.2% at the load variation of 0 to 100% (*) (at 1800r/min). Applicable motor: standard motor of 2 to 8 poles. Encoder specifications: 3-phase, differential output, 1024P/rev. 5VDC power supply (*) Load of 100% indicates the continuous operation torque of the motor at each running frequency.
Orientation control	Used with a pulse encoder installed to a machine tool spindle to allow the spindle to be stopped at a predetermined position (orientation function). The current position can be monitored on the inverter LED display or parameter unit. [Application example] fixed-position stop and indexing of a machine tool spindle.	Positioning accuracy +/- 1.5 degrees Encoder specifications: same as those for the above PLG feedback function.
12-bit digital input	Input interface used to set the inverter frequency accurately using external BCD or binary digital signals. Either 12-bit binary or BDC 3-digit signal can be selected. Gain and offset can also be adjusted.	Input voltage: 24VDC, 5mA (per circuit) Input signal format: contact signal input or transistor open collector (sink type) input

NEXT PAGE

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Relay output (3 points)	Any three signals can be selected and output as relay contacts (change-over contacts) from among the 10 standard output signals (RUN, SU, IPF/UVT, OL, FU1, FU2, RBP, THP PRG, PU) of the inverter	Signal types: change-over contact (three output relays installed) Contact capacity: 230VAC 0.3A 30VDC 0.3A
Extension analog output Analog current output (Note 2)	16 signals, which can be monitored on the FM and AM terminals, such as output frequency, output voltage, output current and motor torque, are expanded and outputted. A 1mADC or 5V(10V)DC meter can be connected. (FR-EPA, FR-EPE) A 20mADC or 5V(10V)DC meter can be connected (FR-EPG, FR-EPH) Gain and offset can also be adjusted.	Output voltage (across LM0-LM1): 0 to 10VDC, 1mA max. Output current (across LM1-LM2): 0 to 1mADC, (20mADC) Output resolution: 3mV for voltage output Output resolution: 1uA for current output (20mA) Output accuracy +/- 10%
Computer link function (serial communication)	Allows inverter operation/monitoring and parameter read/write to be performed using user program from a computer or FA controller, which is connected by communication cables. Noiseless communication system using twisted pair cables.	Conforming standard: EIA Standard, for RS-422 and RS-485 Transmission format: multidrop link system Communication speed: Max. 19200 baud rates Max. number of inverters: RS-422 - 10 inverters RS-485 - 32 inverters Overall extension: 500 meters
Device Net	Allows communication with other DeviceNet compatiable devices. Send control commands, monitor VFD status and read/write parameters.	Conforming standard: CAN Communication speed: 500Kbps Max. number of devices: 62

NEXT PAGE

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MELSEC/MINI-S3 interface	Allows inverter operation/monitoring and parameter read/write to be performed using user program from the master station in the Mitsubishi programmable controller data link system MELSEC/MINI-S3 (AJ71PT32-S3) which is connected by optical ables. Communication is made by via optical link system without noise.	Max. number of inverters connected: 16 inverters (up to 64 inverters when used with remote I/O stations) Interstation transmission distance: 50m max. 1m min.
PI control	PI control function is required when process control e.g. flow rate, air volume or pressure, is carried out by the inverter. The set value can be set from any of terminal 2, 1 or parameter unit. The measured value (feedback signal) is input to terminal 4 by a 4-20mA current signal.	PI control range: proportional band 1 to 1000% intergral time 0.1 to 3600 seconds Output signal: high limit, low limit, during forward rotation, during reverse rotation
Battery backup for programmed operation	Allows the timer to be battery backed for programmed operation. If a power failure occurs, automatic operation can be continued after the power is restored. (Programmed operation is standard in the inverter. See Pr. 87.) Group selection and time-out output signal for the programmed operation are incorporated.	Battery life: 10 years (lithium battery) Permissible power failure time: max. 18 hours when Pr. 200=0 (sec. select) max. 30 days when Pr. 200=1 (min. select)
Pulse train input	Allows a pulse train signal to be used as a speed command input to the inverter.	Max. permissible number of pulses: 100KPPS or less Input interface: Open collector system Input voltage/current: 24VDC, 10mA

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External Options

FR-ABR (H)	10% DUTY CYCLE BRAKE RESISTOR (FOR 0.4KW TO 7.5KW DRIVES ONLY)
FR-ACA	NEMA 1 CONVERSION KIT
FR-ACN	HEAT SINK OUTSIDE MOUNTING ATTACHMENT
FR-ARWE-1	PARAMETER COPY UNIT (ENGLISH)
FR-ARWER-1	PARAMETER COPY UNIT (ENGLISH, GERMAN, FRENCH, SPANISH)
FR-ASF-H	SURGE VOLTAGE SUPPRESSION FILTER
FR-BAL (H)	POWER FACTOR IMPROVING AC REACTOR
FR-BEL (H)	POWER FACTOR IMPROVING DC REACTOR
FR-BIF (H)	RADIO NOISE FILTER
FR-BLF	LINE NOISE FILTER (5.5KW OR LARGER)
FR-BOL (H)	OUTPUT LINE REACTOR FOR NOISE EMISSIONS (INPUT OR OUTPUT)
FR-BR (H) (C)	BRAKE RESISTOR
FR-BSF01	LINE NOISE FILTER (3.7KW OR SMALLER)
FR-BU (H) (C)	BRAKE UNIT
FR-CBL (L)	PARAMETER UNIT CABLE (L-RIGHT ANGLE CONNECTOR)
FR-CU01	RS485 SERIAL COMMUNICATION (1200 BAUD)
FR-DUO1	DIGITAL OPERATION PANEL
FR-PUO2E-1	PARAMETER UNIT (ENGLISH)
FR-PUO2ER-1	PARAMETER UNIT (ENGLISH, GERMAN, FRENCH, SPANISH)
FR-RC (H)	POWER REGENERATIVE CONVERTER
SF	NOISE EMISSION FILTER FOR CE CERTIFICATION

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Summary

- Understand Terminals and their Functions
- Discussed Individual Parameter Settings
- Understand Parameter Unit and Help Functions
- Understand How to Apply MFVC and Auto Tuning
- Identified Alarms and Causes
- Identified Internal and External Options

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Where to get more information

- A200E-UL Instruction Manual
- A200E Brochure
- Inverter Price List
- A200E Interactive Software
- Technical Support
  - 1-800-950-7781

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