

FR-A800 Series

Instruction Manual Supplement

1 Second droop control

- The second droop control is added.
- Use the second droop control if the droop control setting needs to be switched according to application or if multiple motors are switched by a single inverter.
- Turning ON the RT signal enables the second droop control.

Pr.	Name	Initial value	Setting range	Description	
679 G420	Second droop gain	9999	0	Normal operation	
			0.1% to 100%	Droop control enabled. Set the droop gain when RT signal is ON. Set the droop amount at the time of rated torque as % value of the rated motor frequency.	
			9999	Same as the first droop control setting.	
680 G421	Second droop filter time constant	9999	0 to 1 s	Set the droop filter time constant when RT signal is ON. Set the filter time constant to apply to the current for torque.	
			9999	Same as the first droop control setting.	
681 G422	Second droop function activation selection	9999	0	Without droop control during acceleration/deceleration when RT signal is ON (With 0 limit)	Rated motor frequency is the droop compensation reference.
			1	Constant droop control during operation when RT signal is ON (With 0 limit)	
			2	Constant droop control during operation when RT signal is ON (Without 0 limit)	
			10	Without droop control during acceleration/deceleration when RT signal is ON (With 0 limit)	Motor speed is the droop compensation reference.
			11	Constant droop control during operation when RT signal is ON (With 0 limit)	
			9999	Same as the first droop control setting.	
682 G423	Second droop break point gain	9999	0.1 to 100%	Set the break point gain when RT signal is ON. Set the droop amount to be changed as % value of the rated motor frequency.	
			9999	Same as the first droop control setting.	
683 G424	Second droop break point torque	9999	0.1 to 100%	Set the break point torque when RT signal is ON. Set the torque to change the droop amount.	
			9999	Same as the first droop control setting.	

NOTE

- The RT signal is a second function selection signal. The RT signal also enables other second functions.
- The RT signal is assigned to the terminal RT in the initial status. Set "3" in any of **Pr.178 to Pr.189 (input terminal function selection)** to assign the RT signal to another terminal.
- Changing the terminal assignment using **Pr.178 to Pr.189 (input terminal function selection)** may affect the other functions. Set parameters after confirming the function of each terminal.
- For the details of the droop control operation, refer to page 628 of the Instruction Manual (Detailed).

2 Torque bias Sensorless Vector

- The torque bias function can be used under Real sensorless vector control.

Pr.	Name	Initial value	Setting range	Description
840 G230	Torque bias selection	9999	0 to 3, 24, 25, 9999	Valid under vector control or Real sensorless vector control. For the details, refer to page 202 of the Instruction Manual (Detailed).
841 G231	Torque bias 1	9999	600 to 1400%, 9999	
842 G232	Torque bias 2			
843 G233	Torque bias 3			
844 G234	Torque bias filter	9999	0 to 5 s, 9999	
845 G235	Torque bias operation time	9999	0 to 5 s, 9999	
846 G236	Torque bias balance compensation	9999	0 to 10 V, 9999	
847 G237	Fall-time torque bias terminal 1 bias	9999	0 to 400%, 9999	
848 G238	Fall-time torque bias terminal 1 gain	9999	0 to 400%, 9999	

NOTE

- The torque bias function cannot be used when the second motor is selected (RT signal ON).

3 Internal torque limit 2 Sensorless Vector PM

- An additional torque limit input method is added.
- The internal torque limit 2 is available by using a communication option (FR-A8NC or FR-A8NCE).

Pr.	Name	Initial value	Setting range	Description
810 H700	Torque limit input method selection	0	0	Internal torque limit (torque limited by parameter settings)
			1	External torque limit (torque limited by terminals 1 and 4)
			2	Internal torque limit 2 (torque limited by communication options)
804 D400	Torque command source selection	0	0	The internal torque limit 2 cannot be used.
			1	Torque limit (-400% to 400%) by the parameter setting (Pr.805 or Pr.806)
			3	Torque limit via CC-Link communication (FR-A8NC/FR-A8NCE)
			4	The internal torque limit 2 cannot be used.
			5	Torque limit via CC-Link communication (FR-A8NC/FR-A8NCE)
			6	Torque limit via CC-Link communication (FR-A8NC/FR-A8NCE)
805 D401	Torque command value (RAM)	1000%	600 to 1400%	Writes the torque limit value in RAM. Regards 1000% as 0%, and set torque command by an offset of 1000%.
806 D402	Torque command value (RAM, EEPROM)	1000%	600 to 1400%	Writes the torque limit value in RAM and EEPROM. Regards 1000% as 0%, and set torque command by an offset of 1000%.

◆ Internal torque limit 2 (Pr.810 = "2", Pr.805, Pr.806)

- When a communication option (FR-A8NC or FR-A8NCE) is used, the **Pr.805** or **Pr.806** setting is used as the torque limit value.
- When the CC-Link communication (Ver. 2) is used in the quadruple or octuple setting (**Pr.544**="14, 18, 114, or 118"), the torque limit value can be input using a remote register (RWwC).
- When the CC-Link IE Field Network is used, the torque limit value can be input using a remote register (RWw2).

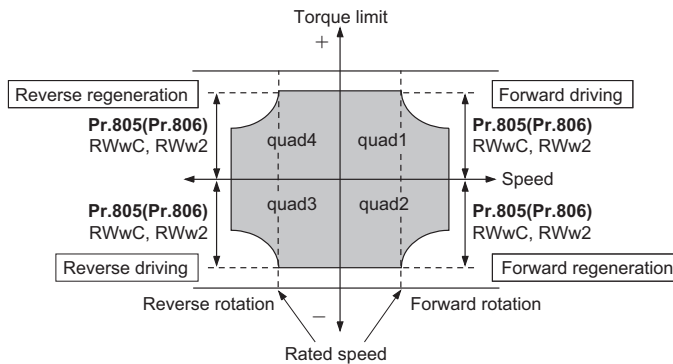
Pr.804 setting	Torque limit input		Setting range*1	Setting increments
	FR-A8NC PLC function	FR-A8NCE		
1	Torque limit by Pr.805 or Pr.806 *2	Torque limit by remote register (RWw2)*3	600 to 1400 (-400% to 400%)	1%
3	Torque limit by remote register (RWwC)*3	(RWw2)*3		
5	Torque limit by remote register (RWwC)*3			
6	Torque limit by Pr.805 or Pr.806 *2	Torque limit by remote register (RWw2)*3	-32768 to 32767 (complement of 2) (-327.68% to 327.67%)*4	0.01%*4

*1 The torque limit setting is defined as an absolute value.

*2 Can also be set from operation panel or parameter unit.

*3 The torque can also be limited by setting a value in **Pr.805** or **Pr.806**.

*4 Setting range if set by operation panel or parameter unit is "673 to 1327 (-327% to 327%)"; setting increment is 1%.



NOTE

- If "2" is set in **Pr.810** while the communication option is not connected, a protective function (E.OPT) is activated (when the PLC function is disabled).

◆ CC-Link extended setting (Pr.544)

- The functions of the remote register can be extended.

Pr.	Name	Initial value	Setting range	CC-Link Ver.	Description
544 N103	CC-Link extended setting	0	0	1	Occupies one station (FR-A5NC compatible)*1
			1		Occupies one station
			12*2	2	Occupies one station, double setting
			14*2		Occupies one station, quadruple setting
			18*2		Occupies one station, octuple setting
			24*2		Occupies one station, quadruple setting
			28*2	Occupies one station, octuple setting	
			100	1	Occupies one station
			112*2		Occupies one station, double setting
				Occupies one station, octuple setting	
				Occupies one station, octuple setting	

*1 The program used for the conventional inverter series (FR-A5NC) can be used. If RYD, RYE, and RYF are turned ON simultaneously, only one of these is executed. The upper 8 bits of RWw2 are not used for the link parameter extended setting.

*2 When the double, quadruple, or octuple setting of the CC-Link Ver. 2 is used, station data of the master station must be also set to double, quadruple, or octuple.

(If the master station is CC-Link Ver. 1, this setting is not available.)

*3 Refer to the PLC function programming manual.

NOTE

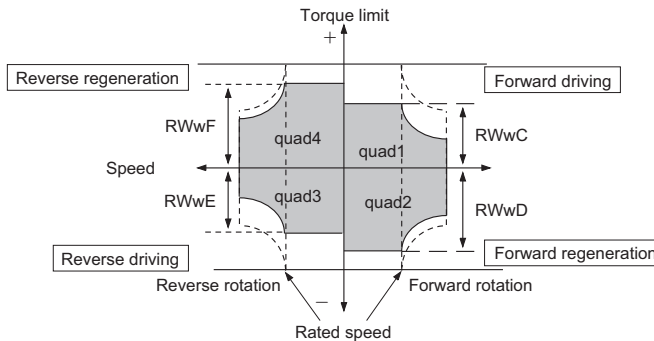
- The setting becomes valid after inverter reset.

◆CC-Link remote register

- The torque limit value can be specified in the CC-Link remote register (RWwC to RWwF). (For the details of the CC-Link remote register, refer to the Instruction Manual of FR-A8NC.)

Device number	Signal name	Description
RWwC	Torque command value	When Pr.544 CC-Link extended setting = "14, 18, 24, 28, 118, or 128" and Pr.804 Torque command source selection = "3 or 5" during torque control (Real sensorless vector control / vector control), torque command values can be specified. The value is written to the inverter by RYD or RYE. Pr.805 Torque command value (RAM) and Pr.806 Torque command value (RAM, EEPROM) are also updated at the same time. The setting range and the setting increment depend on the Pr.804 setting.
	Torque limit value	When Pr.544 CC-Link extended setting = "14, 18, or 118", Pr.804 Torque command source selection = "3 or 5", and Pr.810 Torque limit input method selection = "2" during speed control or position control (Real sensorless vector control / vector control), torque limit values can be specified. The value is written to the inverter by RYD or RYE. Pr.805 Torque command value (RAM) and Pr.806 Torque command value (RAM, EEPROM) are also updated at the same time. The setting range and the setting increment depend on the Pr.804 setting (absolute value).
RWwC, RWwD, RWwE, RWwF	Torque limit level (2nd quadrant to 4th quadrant)	When Pr.544 CC-Link extended setting = "24, 28, or 128" and Pr.810 Torque limit input method selection = "2" during speed control or position control (Real sensorless vector control / vector control), torque limit values can be specified for each of the 1st to the 4th quadrants. (Setting range: 0 to 40000 (0 to 400%), setting increment: 0.01%) The value is written to the inverter by RYD. (EEPROM write by RYE is disabled.) When "HFFF" is set in RWwD to RWwF, the RWwC setting is applied to the operation in the target quadrant. When a value within the setting range of Pr.805 or Pr.806 is entered in RWwC while Pr.804 ="3 or 5", the Pr.805/Pr.806 setting is updated.

- When the CC-Link communication (Ver. 2) is used in the quadruple or octuple setting (**Pr.544**="24, 28, or 128"), the torque limit value can be input using a remote register (RWwC to RWwF) for each of the four quadrants.



◆CC-Link IE Field remote register

- The torque limit value can be specified in the CC-Link IE Field remote register (RWw2). (For the details of the CC-Link IE Field remote register, refer to the Instruction Manual of FR-A8NCE.)

Device number	Signal name	Description
RWw2*1	Torque command value	The torque command value (torque limit value) can be specified. Set Pr.804 Torque command source selection ="1, 3, 5, or 6" to activate the signal under Real sensorless vector control or vector control. The value is written to the inverter by RY23 or RY24. Pr.805 Torque command value (RAM) and Pr.806 Torque command value (RAM, EEPROM) are also updated at the same time. The setting range and the setting increment depend on the Pr.804 setting.
	Torque limit value	

*1 The value in RWw2 is used as the torque limit value during speed control or position control, and as the torque command value during torque control. To use the value as the torque limit value, set **Pr.810**="2".

4 Monitor display with signs

- Monitor items to be displayed with minus signs can be selected.

Pr.	Name	Initial value	Setting range	Description
1018 M045	Monitor with sign selection	9999	0 9999	Select items to be displayed with minus signs.

Types of Monitor	Pr.1018 setting	
	9999	0
Output frequency	—	○
Running speed	—	○
Motor torque	○	○
Position command (lower)	○	○
Position command (upper)	○	○
Current position (lower)	○	○
Current position (upper)	○	○
Droop pulse (lower)	○	○
Droop pulse (upper)	○	○
Torque command	○	○
Torque current command	○	○
PID deviation	○	○
Cumulative pulse	○	○
Cumulative pulse carrying-over times	○	○

Types of Monitor	Pr.1018 setting	
	9999	0
Cumulative pulse (control terminal option)	○	○
Cumulative pulse carrying-over times (control terminal option)	○	○
Remote output 1	○	○
Remote output 2	○	○
Remote output 3	○	○
Remote output 4	○	○
PID manipulated amount	○	○
Second PID deviation	○	○
Second PID manipulated amount	○	○
Control circuit temperature	○	○

○: Displayed with minus sign,
—: Displayed without minus sign (positive only)

NOTE

- Use **Pr.290 Monitor negative output selection** to set the availability of values with minus signs (for terminal AM, operation panels, communication options). For the details, refer to page 368 of the Instruction Manual (Detailed).

5 Compatibility with the FR-A8TP

- The control terminal option FR-A8TP can be used.
- When the FR-A8TP is connected, a motor with encoder can be operated under vector control. When both the FR-A8AP and the FR-A8TP are used, the second motor can be operated under vector control.

◆ Selection of control method and control mode (Pr.451)

- The vector control can be selected for the second motor.

Pr.	Name	Initial value	Setting range	Description	
451 G300	Second motor control method selection	9999	0 to 6	Vector control	
			10 to 12	Real sensorless vector control	
			13, 14	PM sensorless vector control	
			20	V/F control (Advanced magnetic flux vector control)	
			100 to 106	Vector control	Fast-response operation
			110 to 112	Real sensorless vector control	
			110, 113, 114	PM sensorless vector control	
9999	The setting value of Pr.800 Control method selection is used.				

NOTE

- For the details of the control method and the control mode, refer to page 164 of the Instruction Manual (Detailed).

◆ Second motor online auto tuning (Pr.574)

- The magnetic flux observer can be selected for the second motor online auto tuning.

Pr.	Name	Initial value	Setting range	Description	
574 C211	Second motor online auto tuning	0	0	Do not perform online auto tuning.	Select online auto tuning for the second motor.
			1	Perform online auto tuning at startup.	
			2	Magnetic flux observer (tuning always)	

NOTE

- For the details of the online auto tuning, refer to page 460 of the Instruction Manual (Detailed).

◆ Brake operation selection for vector control (Pr.1299)

- The brake operation of the second motor can be selected under vector control or PM sensorless vector control. Turning ON the RT signal enables the second pre-excitation selection (when **Pr.450** ≠ "9999").

Pr.	Name	Initial value	Setting range	Description	
1299 G108	Second pre-excitation selection	0	0	Zero speed control	The pre-excitation operation of the second motor can be selected.
			1	Servo lock	

NOTE

- For the details of the pre-excitation operation, refer to page 609 of the Instruction Manual (Detailed).

◆ Position loop gain (Pr.1298)

- The position loop gain can be set for the second motor under vector control or PM sensorless vector control. Turning ON the RT signal validates the second position loop gain (when **Pr.450** ≠ "9999").

Pr.	Name	Initial value	Setting range	Description
1298 B013	Second position control gain	25 s ⁻¹	0 to 150 s ⁻¹	Set the position loop gain for the second motor.

NOTE

- For the details of the position loop gain, refer to page 251 of the Instruction Manual (Detailed).

◆ Pulse monitor selection (Pr.430)

- The current position 2 can be selected for the pulse monitor selection.

Pr.430 setting	Description	
0000	Pulse monitor selection	Displays the lower of the position command (accumulated value of command pulses).
0001		Displays the upper of the position command (accumulated value of command pulses).
0002		Displays the lower of the current position (accumulated value of feedback pulses*1).
0003		Displays the upper of the current position (accumulated value of feedback pulses*1).
0004		Displays the lower of the accumulated value of droop pulses.
0005		Displays the upper of the accumulated value of droop pulses.
0012		Displays the lower of the current position 2 (accumulated value of feedback pulses*1).
0013		Displays the upper of the current position 2 (accumulated value of feedback pulses*1).
0000	For pulse monitor selection	Displays the monitor item selected in the pulse monitor selection after the electronic gear operation.
0100		Displays the monitor item selected in the pulse monitor selection before the electronic gear operation.
0000	For the multifunction monitor / For the PLC function special register	Displays the monitor item selected in the multifunction monitor (position command, current position, and droop pulse) before the electronic gear operation.
1000		Displays the item in the PLC function special register (position command, current position, droop pulse, and current position 2) before the electronic gear operation.
1000		Displays the monitor item selected in the multifunction monitor (position command, current position, and droop pulse) after the electronic gear operation.
8888		Displays the item in the PLC function special register (position command, current position, droop pulse, and current position 2) after the electronic gear operation.
8888	Output frequency display	Displays the monitor item selected in the multifunction monitor (position command, current position, and droop pulse) after the electronic gear operation.
9999 (initial value)		Displays the item in the PLC function special register (position command, current position, droop pulse, and current position 2) after the electronic gear operation.
		Displays the monitor item selected in the multifunction monitor (position command, current position, and droop pulse) before the electronic gear operation.
		Displays the item in the PLC function special register (position command, current position, droop pulse, and current position 2) before the electronic gear operation.

*1 Accumulated value of estimated feedback pulses when PM sensorless vector control is used

- The following can be monitored with the PLC function special register.

Device number	Name	Description
SD1209	Current position 2 (lower 16 bits)	Stores the lower 16 bits of the current position 2 value.
SD1210	Current position 2 (upper 16 bits)	Stores the upper 16 bits of the current position 2 value.

- Pulses are cleared according to the following conditions.

Clearance condition	Position command / current position / droop pulse		Current position 2	
	Pr.419=0	Pr.419=2	Pr.419=0	Pr.419=2
Servo-OFF (output shutoff)	Cleared		Not cleared	
Clear signal input	Cleared		Cleared	
Home position return completed	Cleared*2	-	Not cleared	-

*2 The droop pulses are not cleared.



- The monitor value of the current position 2 is not cleared when the first and the second motors are switched each other.
- For the details of the pulse monitor selection, refer to page 246 of the Instruction Manual (Detailed).
- For the details of the PLC function special register, refer to page 22 of the PLC Function Programming Manual.

6 Cumulative pulse monitor

- When the plug-in option (FR-A8AP) or the control terminal option (FR-A8TP) is used, the accumulated value of the encoder pulses can be monitored.

Pr.	Name	Initial value	Setting range	Description
635 M610	Cumulative pulse clear signal selection	0	0 to 3	Select the clearance method for the cumulative pulse monitor.
636 M611	Cumulative pulse division scaling factor	1	1 to 16384	Set the division scaling factor on the cumulative pulse for the plug-in option (FR-A8AP).
637 M612	Control terminal option— Cumulative pulse division scaling factor	1	1 to 16384	Set the division scaling factor on the cumulative pulse for the control terminal option (FR-A8TP).
638 M613	Cumulative pulse storage	0	0 to 3	Select the processing method for the cumulative pulse monitor value when the power is turned OFF or the inverter is reset.

◆ Monitor selection

- The cumulative pulse monitor is available when "71 to 74" is set in the monitor selection parameters (**Pr.52**, **Pr.774**, **Pr.775**, **Pr.776**, and **Pr.992**).

Types of Monitor	Unit	Pr.52, Pr.774 to Pr.776, Pr.992	RS-485 communication dedicated monitor (hexadecimal)	Modbus-RTU real time monitor	Display with minus sign	Description
Cumulative pulse	—	71	H47	40271	○*1	The cumulative number of pulses is displayed (monitor range: -32767 to 32767) (for FR-A8AP).
Cumulative pulse carrying-over times	—	72	H48	40272	○*1	The number of the cumulative pulse carrying-over times is displayed (for FR-A8AP).
Cumulative pulse (control terminal option)	—	73	H49	40273	○*1	The cumulative number of pulses is displayed (monitor range: -32767 to 32767) (for FR-A8TP).
Cumulative pulse carrying-over times (control terminal option)	—	74	H4A	40274	○*1	The number of the cumulative pulse carrying-over times is displayed (for FR-A8TP).

*1 Negative values are not displayed on the operation panel. The values "-1 to -32767" are displayed as "65535 to 32769" on the operation panel.

- The following can be monitored with the PLC function special register.

Device number	Name	Description
SD1193	Cumulative pulse	The cumulative number of pulses is displayed (monitor range: -32767 to 32767) (for FR-A8AP).
SD1194	Cumulative pulse carrying-over times	The number of the cumulative pulse carrying-over times is displayed (monitor range: -32767 to 32767) (for FR-A8AP).
SD1195	Cumulative pulse (control terminal option)	The cumulative number of pulses is displayed (monitor range: -32767 to 32767) (for FR-A8TP).
SD1196	Cumulative pulse carrying-over times (control terminal option)	The number of the cumulative pulse carrying-over times is displayed (monitor range: -32767 to 32767) (for FR-A8TP).

NOTE

- For the details of the monitor selection, refer to page 359 of the Instruction Manual (Detailed).
- For the details of the PLC function special register, refer to page 22 of the PLC Function Programming Manual.

◆ Cumulative pulse division scaling factor (Pr.636, Pr.637)

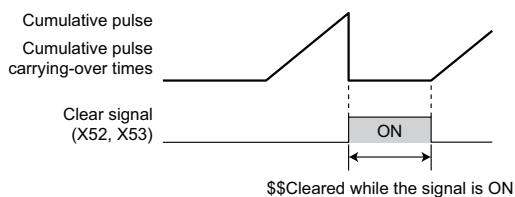
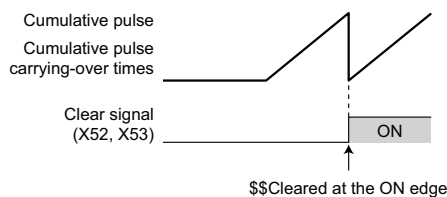
- Set the division scaling factor on the cumulative pulse in **Pr.636** or **Pr.637**.
- Cumulative pulse count value calculation method

$$\text{Cumulative pulse count value} = \text{Cumulative pulse division scaling factor} \times (\text{Cumulative pulse carrying-over times} \times 32768 + \text{Cumulative pulse monitor value})$$
- Cumulative pulse count value: Number of pulses multiplied by 4
- Cumulative pulse division scaling factor: **Pr.636** or **Pr.637**

◆ Cumulative pulse monitor value clear (Pr.635)

- The cumulative pulse monitor and the cumulative pulse carrying-over times can be cleared by X52 signal or X53 signal.
- To input the X52 or X53 signal, set "52 (X52)" or "53 (X53)" in any of **Pr.178** to **Pr.184** (**input terminal function selection**) to assign the function to a terminal.
- Use **Pr.635 Cumulative pulse clear signal selection** to select the clearance method for the cumulative pulse monitor and the cumulative pulse carrying-over times.

Pr.635 setting	X52 signal	X53 signal
	Cumulative pulse monitor clear	Cumulative pulse monitor clear (control terminal option)
0	Cleared at the edge when the signal is switched to ON.	Cleared at the edge when the signal is switched to ON.
1	Cleared while the signal is ON.	Cleared at the edge when the signal is switched to ON.
2	Cleared at the edge when the signal is switched to ON.	Cleared while the signal is ON.
3	Cleared while the signal is ON.	Cleared while the signal is ON.



◆ Cumulative pulse storage

- The cumulative pulse monitor value can be retained when the power is turned OFF or the inverter is reset.

Pr.638 setting	Cumulative pulse monitor		Cumulative pulse monitor (control terminal option)	
	At power-OFF	At reset	At power-OFF	At reset
0	Not stored in the EEPROM	Cleared	Not stored in the EEPROM	Cleared
1	Stored in the EEPROM	Retained	Not stored in the EEPROM	Cleared
2	Not stored in the EEPROM	Cleared	Stored in the EEPROM	Retained
3	Stored in the EEPROM	Retained	Stored in the EEPROM	Retained

NOTE

- When the power is turned OFF during the reset process, the cumulative pulse monitor value and the cumulative pulse carrying-over times are not stored in the EEPROM.