

Firmware Upgrade for FR-A800-R2R Inverters (FR-A800 Plus Series) and FR-B4 Series Inverters

Thank you for your continued patronage of Mitsubishi Electric drive control products. The firmware of FR-A800-R2R inverters (FR-A800 plus series) and FR-B4 series inverters will be upgraded to improve functionality.

1. Products Affected

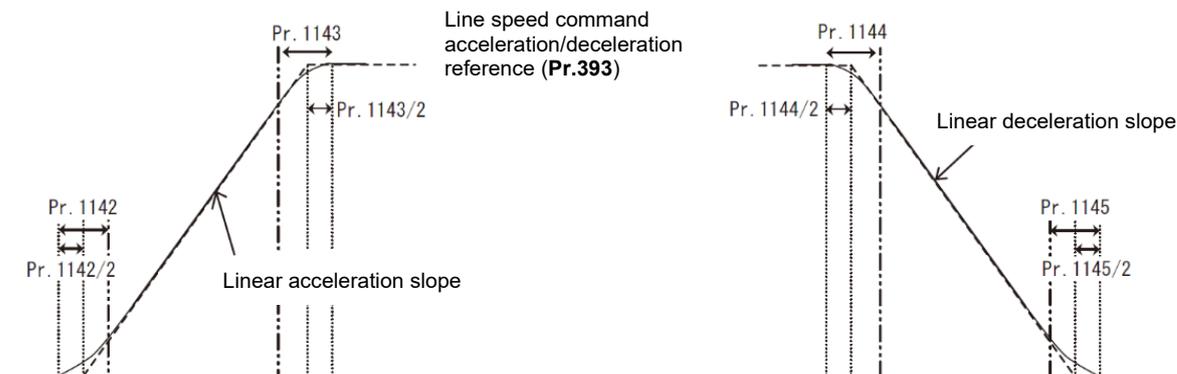
FR-A800-R2R, FR-A800-E-R2R, FR-B4

2. Details of Change

(1) S-curve acceleration/deceleration (pattern D) supported for line speed command operation

S-curve acceleration/deceleration (pattern D) will be supported for line speed command operation.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|-----------------|---|---------------|---------------|--|
| 1141 (R290) | Line speed command acceleration/deceleration pattern | 0 | 0 | Linear acceleration/deceleration |
| | | | 1 | S-curve acceleration/deceleration (pattern D) |
| 1142 (R291) | Line speed command acceleration start S-curve time | 0.1 s | 0.1 to 2.5 s | Set times for S-curve acceleration/deceleration (pattern D). The settings are also used for the inertia compensation cushion time. The settings are valid for S-curve acceleration/deceleration (Pr.1141 = "1"). |
| 1143 (R292) | Line speed command acceleration completion S-curve time | 0.1 s | 0.1 to 2.5 s | |
| 1144 (R293) | Line speed command deceleration start S-curve time | 0.1 s | 0.1 to 2.5 s | |
| 1145 (R294) | Line speed command deceleration completion S-curve time | 0.1 s | 0.1 to 2.5 s | |



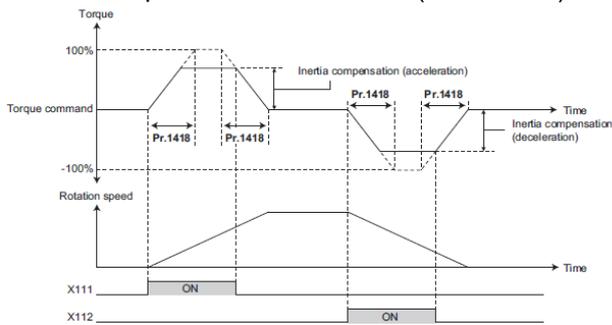
| | | | | |
|----------------------|---|--------------|---|---|
| Date of issue | Published in August 2021 Revised in October 2021 | Title | Firmware Upgrade for FR-A800-R2R Inverters (FR-A800 Plus Series) and FR-B4 Series Inverters | Mitsubishi Electric Corp., Nagoya Works 5-1-14 Yada-minami, Higashi-ku, Nagoya 461-8670 Tel.: +81 (52) 721-2111 Main line |
|----------------------|---|--------------|---|---|

(2) S-curve acceleration/deceleration (pattern D) supported for inertia compensation using line speed commands

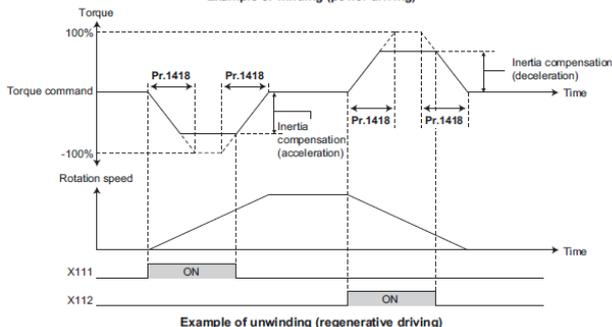
S-curve acceleration/deceleration (pattern D) using line speed commands will be supported for inertia compensation during acceleration/deceleration.

| Pr.1141 setting | Operation according to the X111 signal status | Operation according to the X112 signal status |
|---------------------------------------|---|---|
| 0 (Linear acceleration/deceleration) | When the X111 signal is turned ON, an inertia compensation for the acceleration torque is started. For winding (power driving), the torque command value is increased. For unwinding (regenerative driving), the torque command value is decreased. The variation ratio is determined according to Pr.1418 Inertia compensation cushion time. When the X111 signal is turned OFF, the acceleration torque for inertia compensation is decreased according to the Pr.1418 setting. The Line speed acceleration (Y237) signal of the inverter connected to the intermediate shaft is input to the terminal to which the X111 signal is assigned. | When the X112 signal is turned ON, an inertia compensation for the deceleration torque is started. For winding (power driving), the torque command value is decreased. For unwinding (regenerative driving), the torque command value is increased. The variation ratio is determined according to Pr.1418 Inertia compensation cushion time. When the X112 signal is turned OFF, the deceleration torque for inertia compensation is decreased according to the Pr.1418 setting. The Line speed deceleration (Y238) signal of the inverter connected to the intermediate shaft is input to the terminal to which the X112 signal is assigned. |
| 1 (S-curve acceleration/deceleration) | When the X111 signal is turned ON, an inertia compensation for the acceleration torque is started. For winding (power driving), the torque command value is increased. For unwinding (regenerative driving), the torque command value is decreased. The variation ratio is determined according to Pr.1142 Line speed command acceleration start S-curve time. When the X111 signal is turned OFF, the acceleration torque for inertia compensation is decreased according to the Pr.1143 Line speed command acceleration completion S-curve time. The Line speed acceleration (Y237) signal of the inverter connected to the intermediate shaft is input to the terminal to which the X111 signal is assigned. | When the X112 signal is turned ON, an inertia compensation for the deceleration torque is started. For winding (power driving), the torque command value is decreased. For unwinding (regenerative driving), the torque command value is increased. The variation ratio is determined according to Pr.1144 Line speed command deceleration start S-curve time. When the X112 signal is turned OFF, the deceleration torque for inertia compensation is decreased according to the Pr.1145 Line speed command deceleration completion S-curve time. The Line speed deceleration (Y238) signal of the inverter connected to the intermediate shaft is input to the terminal to which the X112 signal is assigned. |

Example when Pr.1141 = "0 (initial value)"

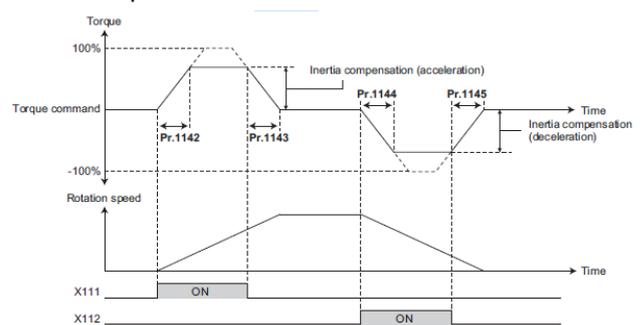


Example of winding (power driving)

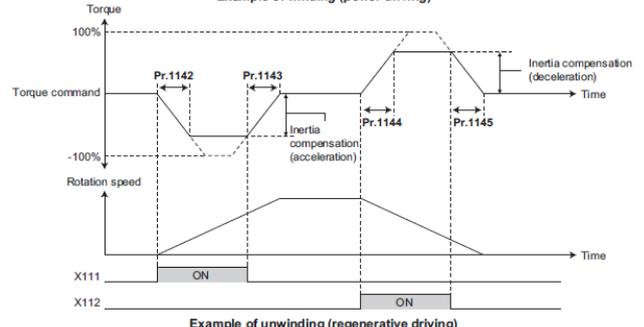


Example of unwinding (regenerative driving)

Example when Pr.1141 = "1"



Example of winding (power driving)



Example of unwinding (regenerative driving)

(3) Enhanced inverter-to-inverter link function (FR-A800-E-R2R)

Broadcast transmissions will be available for inverter-to-inverter communication. When the broadcast transmission type is selected, the maximum number of connectable inverters in the system will be ten.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|--|---------------|---|---|
| 1123 (N680) | Inverter-to-inverter link mode selection | 0 | 0, 100 | "100" (data is transmitted to the slave using broadcast transmissions) will be added. |
| 1124 (N681) | Station number in inverter-to-inverter link | 9999 | 0 to 5 (unicast transmissions), 0 to 9 (broadcast transmissions), 9999 | "0 to 9" (station number used when the broadcast transmission type is selected for the inverter-to-inverter link function) will be added. |
| 1125 (N682) | Number of inverters in inverter-to-inverter link system | 2 | 2 to 6 (unicast transmissions), 2 to 10 (broadcast transmissions) | "2 to 10" (total number of inverters used when the broadcast transmission type is selected for the inverter-to-inverter link function) will be added. |
| 361 (R200) | Line speed command input selection | 9999 | 0 to 8, 10, 9999 | "10" (line speed command input according to the inverter-to-inverter link function for broadcast transmissions) will be added. |
| 597 (N690) | Inverter-to-inverter link input terminal operation selection | 0 | 0 to 65535 | Enable or disable input terminal operations according to the inverter-to-inverter link function (when Pr.1123 = "100"). |

(4) Draw rate setting added for the line speed

A draw rate setting for the line speed command value of each shaft will be available.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|-----------|---------------|---------------|---|
| 398 (R203) | Draw rate | 100% | 0 to 200% | Set a draw rate to be multiplied to the line speed command value or the line speed command acceleration/deceleration reference. |

(5) Filter setting for line speed command input by pulse train input

Setting of the time constant of the primary delay filter relative to the pulse input value will be available.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|---|---------------|---------------|--|
| 1146 (R224) | Line speed command input filter time constant | 0 s | 0 to 5 s | Set the time constant of the primary delay filter relative to the pulse input value. |

(6) Maximum value setting added for the line speed command value

Maximum value setting will be available for the line speed command.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|----------------------------------|-------------------|------------------------|---|
| 1147 (R205) | Line speed command maximum value | 6553.4 m/min*1 | 0 to 6553.4 m/min*1 | Set the maximum value for the line speed command. |

*1 The increment varies depending on the Pr.358 setting.

(7) Winding diameter additionally stored at an inverter reset

The winding diameter value will be stored also at an inverter reset.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|------------------------------------|---------------|---------------|--|
| 645 (N680) | Winding diameter storage selection | 0 | 0, 1 | When "1" is set, the winding diameter value is stored also at an inverter reset. |

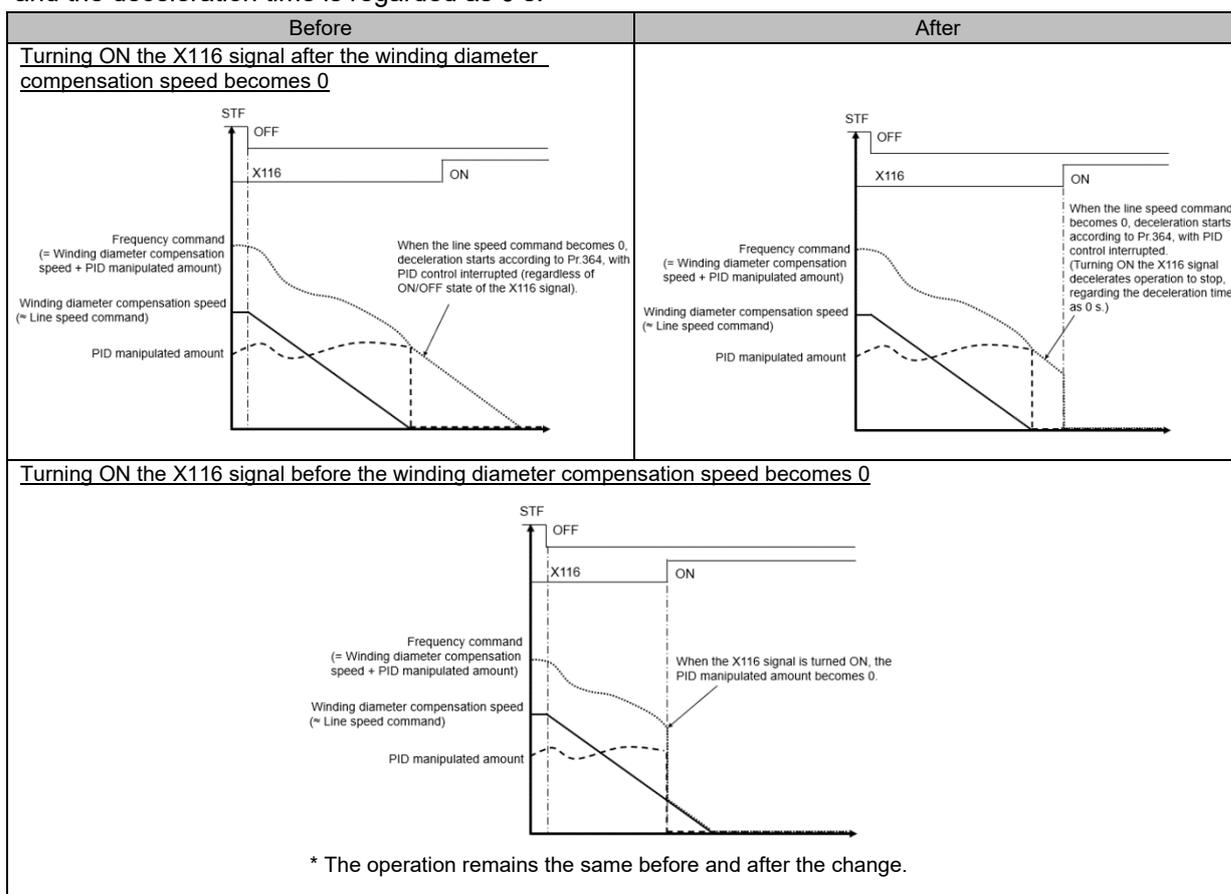
(8) Partial change in operation when the X116 signal is input

[Before change]

When the line speed command is 0 m/min, turning ON the X116 signal while the output frequency is not 0 Hz will not stop deceleration.

[After change]

When the line speed command is 0 m/min, turning ON the X116 signal while the output frequency is not 0 Hz will decelerate operation to stop. In this case, the frequency command is regarded as 0 Hz, and the deceleration time is regarded as 0 s.



(9) Cushion time added for the PID set point during dancer feedback speed control or tension sensor feedback speed control

Acceleration/deceleration time (cushion time) setting will be available for the PID set point during dancer feedback speed control or tension sensor feedback speed control.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|----------------------------|---------------|---------------|---|
| 1382 (R150) | PID set point cushion time | 0 s | 0 to 360 s | Set the cushion time required to reach the PID set point. |

(10) Taper function supported for tension sensor feedback speed control

Setting to enable the taper function will be available for tension sensor feedback speed control.

(11) Input via network supported for the feedback of dancer signal / tension or the actual line speed
 Setting to enable input via network (CC-Link / CC-Link IE Field Network Basic) will be available for the feedback of dancer signal / tension or the actual line speed.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|--|---------------|-----------------|--|
| 362 (R050) | Actual line speed input selection | 0 | 0 to 7, 9, 9999 | "9" (CC-Link or CC-Link IE Field Network Basic (0 to 65534)) will be added. |
| 363 (R102) | Dancer / tension sensor feedback input selection | 9999 | 3 to 6, 9, 9999 | "9" (the measured value is input via CC-Link or CC-Link IE Field Network Basic) will be added. |

(12) Additional units for PID manipulated amount setting

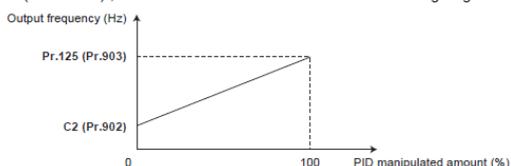
The PID manipulated amount for speed control can be set using line speed values instead of frequency values (initial setting). For tension sensor feedback torque control, the PID manipulated amount can be set using tension values (N) with reference to 100%.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|--------------------|---|---------------|---------------------------|--|
| 1148 (R105) | PID manipulated line speed bias | 0 m/min | 0 to 6553.4 m/min*1 | Convert the PID manipulated amount to a frequency value (Hz) or a line speed (m/min). 9999: No function |
| 1149 (R106) | PID manipulated line speed gain | 9999 | 0 to 6553.4 m/min*1, 9999 | |
| 1383 (R335) | PID torque control manipulated tension bias [N] | 0 N | 0 to 500 N*2 | Convert the PID manipulated amount to a tension value (N). 9999: No function |
| 1384 (R336) | PID torque control manipulated tension gain [N] | 9999 | 0 to 500 N*2, 9999 | |

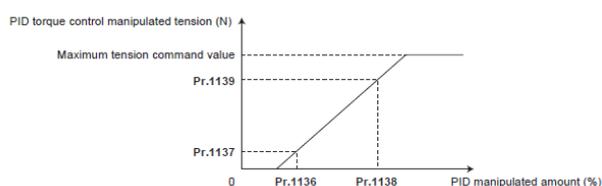
*1 The increment varies depending on the Pr.358 setting.

*2 The setting range varies depending on the Pr.1401 setting.

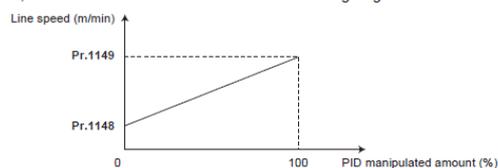
• When Pr.1149 = "9999" (initial value)", the amount is converted as shown in the following diagram.



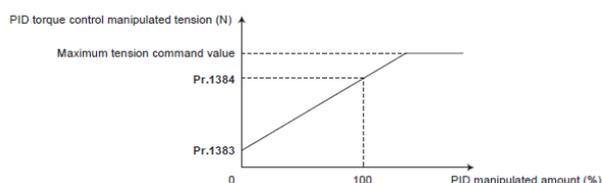
• When Pr.1384 = "9999" (initial value)", the amount is converted as shown in the following diagram.



• When Pr.1149 = "9999", the amount is converted as shown in the following diagram.



• When Pr.1384 ≠ "9999", the amount is converted as shown in the following diagram.



(13) Additional/enhanced monitor items

The actual line speed after winding diameter compensation and the line speed compensation amount during dancer feedback speed control can be additionally monitored.

Monitoring of the PID measured tension value will be available also during speed control.

| Monitor item | Increment and unit | Pr.52, Pr.774 to Pr.776, Pr.992 | RS-485 communication dedicated monitor (hexadecimal) | MODBUS RTU real time monitor | Description |
|--------------------------------|----------------------------|---------------------------------|--|------------------------------|---|
| PID measured tension value | 0.01 (N) / 0.1 (N) / 1 (N) | 92 | H5C | 40292 | PID measured tension value (also available during speed control) |
| Dancer compensation line speed | 0.1 | 95 | H5F | 40295 | Line speed compensation amount (manipulated amount) determined by the PID calculation when dancer feedback speed control is valid |
| Actual line speed 2 | 0.1 | 96 | H60 | 40296 | Actual line speed calculated inversely from the winding diameter using the gear ratio and the actual motor speed |

Filter setting and increment setting will be available for monitoring of the PID measured tension value.

| Pr. (Pr. group) | Name | Initial value | Setting range | Description |
|-----------------|--|---------------|---------------|---|
| 609 (R430) | PID measured tension monitor filter | 0 | 0 to 5 s | Set the primary delay filter time constant to the PID measured tension value. |
| 610 (R431) | PID measured tension monitor increment | 9999 | 0 | PID measured tension monitored in 0.01 N increments (0 to 500 N) |
| | | | 1 | PID measured tension monitored in 0.1 N increments (0 to 5000 N) |
| | | | 2 | PID measured tension monitored in 1 N increments (0 to 50000 N) |
| | | | 9999 | As set in Pr.1401. |

3. Date of Change

| Country of origin | Date of Change |
|-------------------|---|
| MADE IN JAPAN | The change will be sequentially applied to the July 2021 production or later. |
| MADE IN CHINA | The change will be sequentially applied to the August 2021 production or later. |

4. Product Identification

The SERIAL (determined by date of production) can be checked on the product's rating plate.

□ 1 7 ○○○○○○
Symbol Year Month Control number

SERIAL

The SERIAL consists of one symbol, two characters indicating the production year and month, and six characters indicating the control number.

The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).