# FS100 OPTIONS
# INSTRUCTIONS

**SUPPLEMENTARY FOR SPEED OVERRIDE FUNCTION**

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
FS100 INSTRUCTIONS
FS100 OPERATOR'S MANUAL
FS100 MAINTENANCE MANUAL

Part Number: 159663-1CD
Revision: 0

YASKAWA

## 🛑 MANDATORY

- This manual supplementarily explains the speed override function of the FS100 system. Read this manual carefully and be sure to understand its contents before handling the FS100.

- General items related to safety are listed in Chapter 1: Safety of the FS100 Instructions. To ensure correct and safe operation, carefully read the FS100 Instructions before reading this manual.

## ⚠️ CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

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## Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the FS100.

In this manual, the Notes for Safe Operation are classified as "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".

| | | |
|---|---|---|
| ⚠ | **WARNING** | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel. |
| ⚠ | **CAUTION** | Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices. |
| ❗ | **MANDATORY** | Always be sure to follow explicitly the items listed under this heading. |
| 🚫 | **PROHIBITED** | Must never be performed. |

Even items described as "CAUTION" may result in a serious accident in some situations.

At any rate, be sure to follow these important items

NOTE To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "CAUTION" and "WARNING".

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<div align="center">

⚠️ **WARNING**

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- Before operating the manipulator, check that servo power is turned OFF when the emergency stop button on the programming pendant is pressed.
  When the servo power is turned OFF, the SERVO ON LED on the programing pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop button does not function.

*Fig. : Emergency Stop Button*

- In the case of not using the programming pendant, be sure to supply the emergency stop button on the equipment. Then before operating the manipulator, check to be sure that the servo power is turned OFF by pressing the emergency stop button.
  Connect the external emergency stop button to the 5-6 pin and 16-17 pin of the robot system signal connector (CN2).

- Upon shipment of the FS100, this signal is connected by a jumper cable in the dummy connector. To use the signal, make sure to supply a new connector, and then input it.

If the signal is input with the jumper cable connected, it does not function, which may result in personal injury or equipment damage.

- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

*Fig. : Release of Emergency Stop Button*

TURN

- Observe the following precautions when performing teaching operations within the manipulator's operating range:

  – View the manipulator from the front whenever possible.

  – Always follow the predetermined operating procedure.

  – Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

| ⚠ WARNING |
| --- |
| • Confirm that no person is present in the manipulator's operating range and that you are in a safe location before:<br><br>  – Turning ON the power for the FS100.<br><br>  – Moving the manipulator with the programming pendant.<br><br>  – Running the system in the check mode.<br><br>  – Performing automatic operations.<br><br>Injury may result if anyone enters the manipulator's operating range during operation.  Always press an emergency stop button immediately if there are problems.<br>The emergency stop button is located on the programing pendant. |

| ⚠ CAUTION |
| --- |
| • Perform the following inspection procedures prior to teaching the manipulator. If problems are found, correct them immediately, and be sure that all other necessary tasks have been performed.<br><br>  – Check for problems in manipulator movement.<br><br>  – Check for damage to the insulation and sheathing of external wires.<br><br>• Return the programming pendant to a safe place after use.<br><br>If the programming pendant is inadvertently left on the manipulator, on a fixture, or on the floor, the manipulator or a tool may collide with the programming pendant during manipulator movement, which may result in personal injury or equipment damage.<br><br>• Read and understand the Explanation of Warning Labels in the FS100 Instructions before operating the manipulator. |

## Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the FS100 controller, manipulator cables, the FS100 programming pendant (optional), and the FS100 programming pendant dummy connector (optional).

In this manual, the equipment is designated as follows:

| Equipment | Manual Designation |
| --- | --- |
| FS100 controller | FS100 |
| FS100 programming pendant | Programming pendant |
| Cable between the manipulator and the controller | Manipulator Cable |
| FS100 programming pendant dummy connector | Programming pendant dummy connector |

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Descriptions of the programming pendant, buttons, and displays are shown as follows:

| Equipment | | Manual Designation |
|---|---|---|
| Programming Pendant | Character Keys | The keys which have characters printed on them are denoted with [ ].<br>ex. [ENTER] |
| | Symbol Keys | The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture.<br><br>ex. PAGE key <br>The Cursor is an exception, and a picture is not shown. |
| | Axis Keys<br>Numeric Keys | "Axis Keys" and "Numeric Keys" are generic names for the keys for axis operation and number input. |
| | Keys pressed simultaneously | When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them,<br><br>ex. SHIFT key  +COORD key  |
| | Mode Key | Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH |
| | Button | Three buttons on the upper side of the programming pendant are denoted as follows:<br>HOLD button<br>START button<br>EMERGENCY STOP button |
| | Displays | The menu displayed in the programming pendant is denoted with { }.<br>ex. {JOB} |
| PC Keyboard | | The name of the key is denoted<br>ex. Ctrl key on the keyboard |

# Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • • " means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

# Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.

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# 1      Specification for Speed Override in AUTO Cycle Operation

## 1.1      Functional Overview

This specification allows the manipulator to temporarily change its operation speed during playback.
The operation speed is specified by setting the speed override percentage (1 to 100% in increments of 1%) for the operation speed (play speed) specified in the current job.
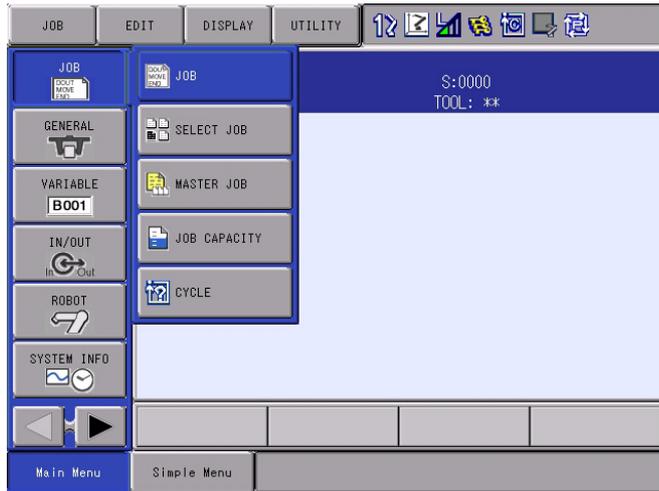This function also enables an automatic setting of the speed override function when changing modes from TEACH to PLAY.
speed override function can be performed with this specification by setting the parameter S2C701.

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## 1.2    Setting the Speed Override Function

> **NOTE**    Set the mode selection switch to PLAY.

1.  Select {JOB} under the main menu, and press {JOB}.
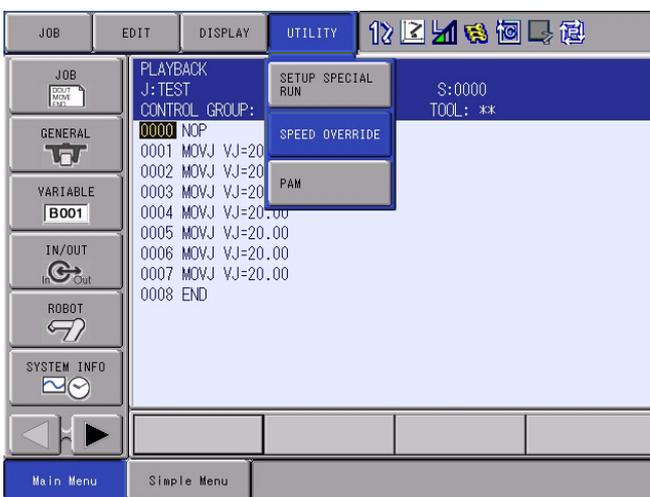


– The PLAYBACK window appears.

2.  Select {UTILITY} in the menu area.



3.  Select {SPEED OVERRIDE}.



–   The speed override setting is enabled.  (As shown below, an asterisk "*" appears beside {SPEED OVERRIDE}, and "SPEED ADJUSTMENT" appears in the input buffer line.)

4.  Set the override ratio.

   –  1. Move the Cursor to highlight the "RATIO" edit box.

   –  2. Hold the SHIFT key ▣SHIFT  and press the Cursor (up or down) to
      modify the percentage.



*To directly enter the value, perform the followings.

   –  1. Move the Cursor to highlight the "RATIO" edit box, and press
      [SELECT].

   –  2. Enter the desired percentage using the numeric keypad.

   –  3. Press [ENTER].

5.  Setting is completed.

## 1.3    Performing the Speed Override Function

> **NOTE**    Set the mode selection switch to PLAY.

1. Start the job.
   - Press [START].
2. Speed override is executed.
   - The manipulator moves in the specified speed percentage.

## 1.4    Modifying the Speed Override Percentage

> **NOTE**    • Set the mode to PLAY mode.
>
> • This operation can be performed during playback.

1. Modify the override ratio.

   - Highlight the "RATIO" edit box, and hold the SHIFT key ⬛ and
     press the Cursor (up or down) when "SPEED ADJUSTMENT" is
     displayed in the input buffer line.
     *The value is increased or decreased by 1% increments.



2. Modification completed.

   - The manipulator moves in the specified speed percentage.

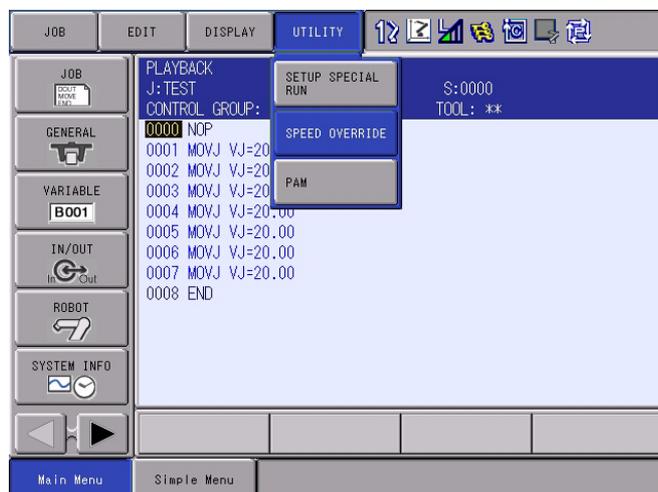## 1.5    Disabling the Speed Override Function

1.  Select {UTILITY} in the menu area.



2.  Select {*SPEED OVERRIDE}.



–  When the speed override function is disabled, as shown below, the asterisk beside {SPEED OVERRIDE} and the "SPEED ADJUSTMENT" input buffer line dissapears.



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3. Disabling operation is completed.

– Additionally, the speed override function is automatically disabled in the following cases;

• When the dry-run speed mode is set.

• When the mode is changed to any mode other than PLAY.

• When the alarm or error occurred.

• When the power is turned OFF.

## 1.6  Automatic Setting of Speed Override

> SUPPLE-MENT    The automatic setting of the speed override function is enabled by specifying the parameter S2C702.

The speed override function can be automatically set when the operation mode is changed from TEACH to PLAY.
The percentage of the automatic setting corresponds to the manual speed and the coordinate system selected during the TEACH mode.

When the coordinate system to be operated is joint coordinate.

| Manual Speed | Applicable Percentage |
|---|---|
| Inching | Maximum jog operation link speed x S1CxG045 |
| Low | Maximum jog operation link speed x S1CxG045 |
| Medium | Maximum jog operation link speed x S1CxG046 |
| High | Maximum jog operation link speed x S1CxG047 |

When the coordinate system to be operated is cartesian coordinates but not joint coordinate.

| Manual Speed | Applicable Percentage |
|---|---|
| Inching | S1CxG026 / Maximum jog operation linear speed |
| Low | S1CxG026 / Maximum jog operation linear speed |
| Medium | S1CxG027 / Maximum jog operation linear speed |
| High | S1CxG028/ Maximum jog operation linear speed |

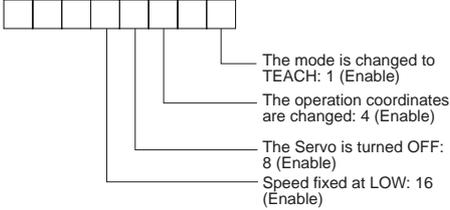## 1.7    Manual Speed in the TEACH Mode

SUPPLE
-MENT        The function is enabled by setting the parameter S2C699.

The manual speed (inching, low, medium, and high) in the TEACH mode
is changed by using the MANUAL SPEED keys on the programming
pendant.

The manual speed is automatically set at LOW when:

- Changing modes from PLAY to TEACH.
- Changing coordinate system in the TEACH mode.
- Turning OFF the SERVO power in the TEACH mode.

## 1.8    Parameter

| Parameter | Description | Details | Setting Value |
|---|---|---|---|
| S2C699 | Automatic change of manual speed to LOW | Automatically sets the manual speed to LOW.<br><br><br><br>The mode is changed to TEACH: 1 (Enable)<br>The operation coordinates are changed: 4 (Enable)<br>The Servo is turned OFF: 8 (Enable)<br>Speed fixed at LOW: 16 (Enable) | 0 |
| S2C701 | Speed override setting | Specifies the usage of speed override.<br>0: Disables continuous cycle operation; Enables speed modification (standard specification).<br>1: Enables the Continuous cycle operation;Disables speed modification. | 0 |
| S2C702 | Automatic speed override Setting 1 in mode change (When S2C701 = 1) | Specifies whether to automatically set speed override when the mode is changed to PLAY.<br>0: Disables speed override.<br>1: Sets the percentage corresponding to the manual speed. | 0 to 1 |
| S2C709 | Automatic speed override Setting 2 in mode change (When S2C701 = 1) | Specifies whether to automatically set speed override when the mode is changed to PLAY.<br>0: Disables speed override.<br>1: Sets the percentage applied last time. | 0 to 1 |

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# 2 Specification for Speed Override with Input Signals

## 2.1 Functional Overview

This specification allows the manipulator to temporarily change its operation speed during playback using the external input signals. The operation speed is specified by setting the speed override percentage (1 to 255% in increments of 1%) for the operation speed (play speed) specified in the current job.

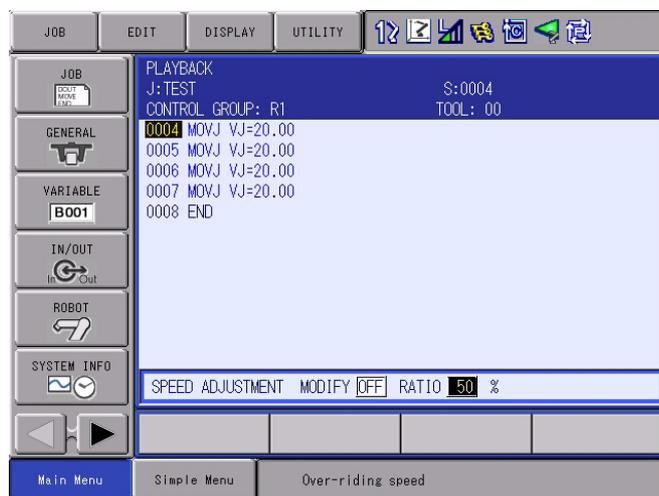Fig. 2-1: Play Speed and Override Speed
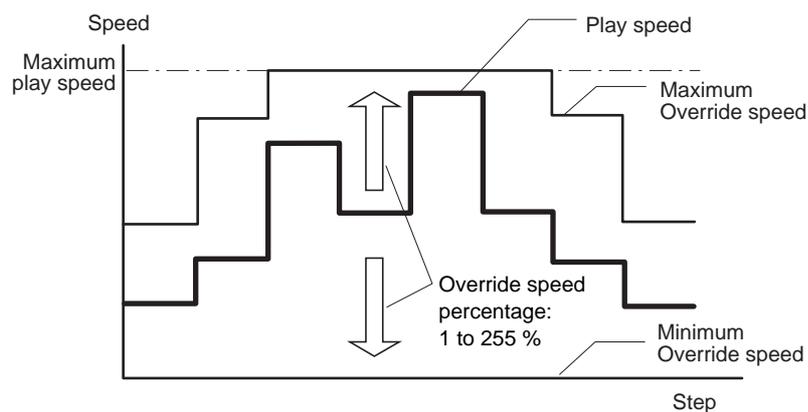


> NOTE
> - The speed override function can be continued in the auto cycle operation.
> - The play speed data of the job will not be modified.
> - The maximum and minimum manipulator speeds limit the play speed modified by speed override.

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## 2.2 Performing the Speed Override Function

> **NOTE**
> • Set the mode selection switch to PLAY.
> • Refer to *chapter 2.4 "Parameters"* when performing speed override with this specification.

1. Playback a job.

2. Input the external signals for speed override.
   – The message "Over-riding speed" and the speed override percentage appear on the screen.



```
JOB        EDIT      DISPLAY    UTILITY

JOB          PLAYBACK
             J:TEST                          S:0004
             CONTROL GROUP: R1               TOOL: 00
GENERAL      0004 MOVJ VJ=20.00
             0005 MOVJ VJ=20.00
             0006 MOVJ VJ=20.00
VARIABLE     0007 MOVJ VJ=20.00
B001         0008 END

IN/OUT

ROBOT

SYSTEM INFO
             SPEED ADJUSTMENT  MODIFY OFF  RATIO 50 %

Main Menu    Simple Menu    Over-riding speed
```

3. Speed override is executed.
   – The manipulator moves in the specified speed percentage.

## 2.3   Disabling the Speed Override Function

Speed override is disabled when:

- External signals are OFF.

- Changing modes from PLAY to TEACH.

## 2.4  Parameters

| Parameter | Description | Details | Setting Value |
|---|---|---|---|
| S2C701 | Speed override setting | Specifies the usage of speed override.<br>*To enable speed override with external signals, set "1" for the setting value.<br>0: Disables the Continuous Cycle operation; Enables speed modification (standard spec).<br>1: Enables the Continuous Cycle operation; Disables speed modification. | 1 |
| S4C287 | Universal Input Group number setting (signals 1 to 8) | Specifies the signals to be used.<br>Eight Universal Input points correspond to the signals 1 to 8 of S4C288 to S4C295. | 1 to 256 |
| S4C288 | Speed percentage (%) Signal 1 | Specifies the speed percentage by the Universal Input signals set in S4C287.<br>    Priority: Signal 1 > Signal 8<br><br>If S4C288 to S4C295 are all "0", the input status 1 to 255 of the Universal Input signals (8 points) will be applied to the speed percentage. | 0 to 255 |
| S4C289 | Speed percentage (%) Signal 2 | | |
| S4C290 | Speed percentage (%) Signal 3 | | |
| S4C291 | Speed percentage (%) Signal 4 | | |
| S4C292 | Speed percentage (%) Signal 5 | | |
| S4C293 | Speed percentage (%) Signal 6 | | |
| S4C294 | Speed percentage (%) Signal 7 | | |
| S4C295 | Speed percentage (%) Signal 8 | | |

The Override Speed percentage can be specified with the parameters (S4C288 to S4C295) in two ways as follows:

**Setting a Speed Percentage with Respect to Each Signal**

- Specify the speed percentage 1 to 255 in the parameters (S4C288 to S4C295). As to the speed percentage for unused signals, set "0": speed override will not take effect even when the external signals are input.

- The signal priority is: "Signal 1 > Signal 8". For example, when the signals 1 to 3 are input simultaneously, speed override will be performed applying the speed percentage of signal 1.

**Using Eight Points of External Signals as the Speed Percentage Data**

- Set "0" for all the parameters (S4C288 to S4C295).

- Speed override will be performed applying the input status of signals 1 to 255 as the speed percentage.
  For example, when the signals 5 and 7 are input simultaneously, speed override will be performed applying 80% of the speed percentage.

NOTE  When this function is enabled, speed override cannot be operated with a programming pendant.

# FS100 OPTIONS
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## SUPPLEMENTARILY fOR SPEED OVERRIDE FUNCTION

Specifications are subject to change without notice
for ongoing product modifications and improvements.