Panasonic

For Servo System MINAS

Set-up Support Software (PANATERM ver.7)

Tuning Help for Manual TUNING

- Thank you for purchasing a Panasonic product.
- Please use it correctly and safely after reading this document and the Set-Up Support Software (PANATERM Ver. 7) Operating Manual, Operating Instructions (Overall), Operating Instructions (Tuning), Technical Reference Functional Specification and Technical Reference Communication Specification carefully.
- Be sure to read the Safety Precautions in the Set-up Support Software (PANATERM ver.7) Operating Manual before use.
- Keep this Tuning Help for Manual TUNING safe.
- This product is for industrial use. It cannot be used for any other (e.g. household) purpose.

Rev.1.0

IMG64
Z0526-0

Table of Contents

1 Introduction 3
1.1 Overview 4
1.2 List of Issues During Tuning and Target Functions 4

2 Tuning Method 6
2.1 Shortening the Settling Time 7
2.2 Reducing Overshoot/Undershoot 9
2.3 Reducing Abnormal Noise and Oscillation 12
2.4 Reducing Vibration Just Before Stopping 13
2.5 Suppressing Speed Changes During Constant Speed Control 14
2.6 Preventing Falling on the Vertical Axis After Servo-On 16
2.7 Suppressing Quadrant Glitches When Speed Is Inverted for Processing Machines, Etc. 17
2.8 Ensuring Own Axis Is Not Moved When Other Axes Are Moved 18
2.9 Reducing Vibration When Gain Is Increased in Full-Closed Control 20

1 Introduction

1.1 Overview....4
1.2 List of Issues During Tuning and Target Functions....4

1.1 Overview

On the set-up support software (PANATERM Ver. 7), manual tuning is possible if gain adjustment has not been adequately performed using an automatic tuning function, or to ensure the best responsiveness and stability for individual loads.

The control parameters to be tuned vary depending on the issue, such as shortening the settling time or reducing vibration.

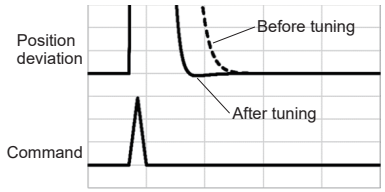
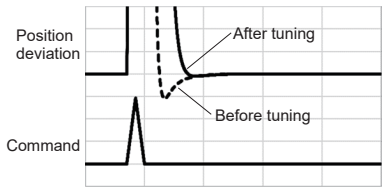
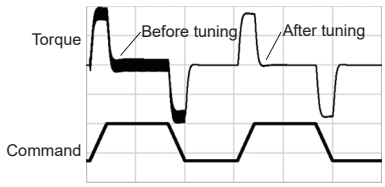
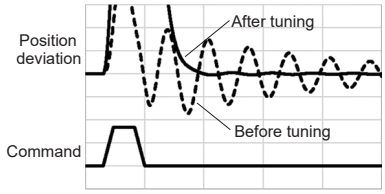
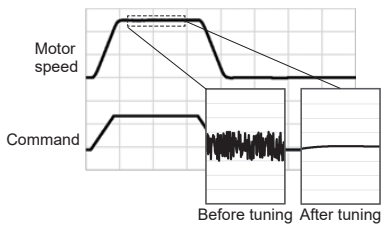
This document describes how to tune for each issue.

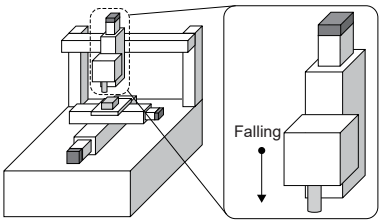
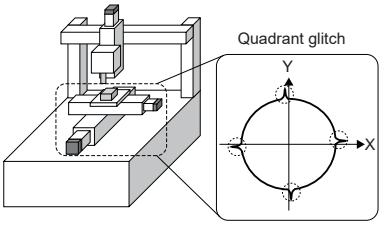
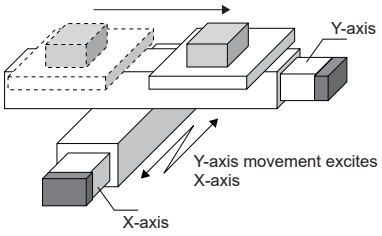
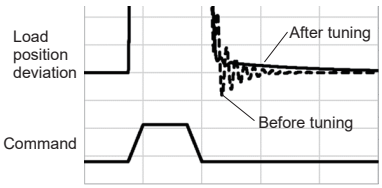
1.2 List of Issues During Tuning and Target Functions

The main issues during tuning and the corresponding tuning functions are listed in the table below.

Tuning procedures are detailed in Chapter 2. Click on the title of each issue.

There are restrictions on operational conditions, such as the control mode supported by each function. The functions available vary depending on the model. For details, see the operating instructions for the model you are using.

Issues During Tuning	Image	Tuning Functions Reference
"2.1 Shortening the Settling Time"		● Real-time auto tuning function ● Position command filter function
"2.2 Reducing Overshoot/Undershoot"		● Real-time auto tuning function ● Feedforward function ● Load fluctuation control function (disturbance suppression applications) ● High response current control function ● 3rd gain switching function
"2.3 Reducing Abnormal Noise and Oscillation"		● Position command filter function ● Notch filter function
"2.4 Reducing Vibration Just Before Stopping"		● Model-type damping filter function ● Damping control function
"2.5 Suppressing Speed Changes During Constant Speed Control"		● Real-time auto tuning function ● Load fluctuation control function (disturbance suppression applications) ● High response current control function

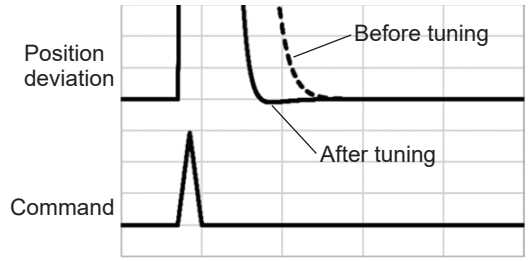
Issues During Tuning	Image	Tuning Functions Reference
"2.6 Preventing Falling on the Vertical Axis After Servo-On"		● Friction torque compensation function
"2.7 Suppressing Quadrant Glitches When Speed Is Inverted for Processing Machines, Etc."		● Quadrant glitch suppression function
"2.8 Ensuring Own Axis Is Not Moved When Other Axes Are Moved"		● Real-time auto tuning function ● Load fluctuation control function (disturbance suppression applications) ● High response current control function
"2.9 Reducing Vibration When Gain Is Increased in Full-Closed Control"		● Hybrid vibration suppression function

2 Tuning Method

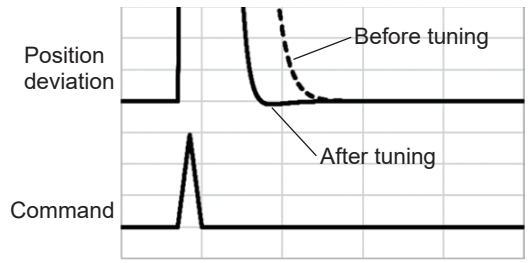
2.1 Shortening the Settling Time 7
2.2 Reducing Overshoot/Undershoot 9
2.3 Reducing Abnormal Noise and Oscillation 12
2.4 Reducing Vibration Just Before Stopping 13
2.5 Suppressing Speed Changes During Constant Speed Control 14
2.6 Preventing Falling on the Vertical Axis After Servo-On 16
2.7 Suppressing Quadrant Glitches When Speed Is Inverted for Processing Machines, Etc. 17
2.8 Ensuring Own Axis Is Not Moved When Other Axes Are Moved 18
2.9 Reducing Vibration When Gain Is Increased in Full-Closed Control 20

2.1 Shortening the Settling Time

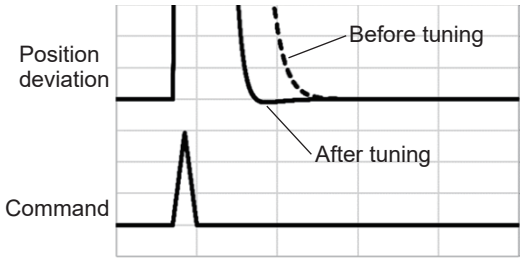
■ Two-Degree-of-Freedom Control Mode Standard Type

1	Tuning FF Gain Setting
	Procedure 1 Go to the Manual TUNING-Basic screen, and change the mode setting to 7 (Customize 2). 2 Click Customize setting, and set Inertia Ratio Update to ON and Stiffness setting to ON. 3 Increase the FF gain setting in increments of 1. 4 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping. In this case, see *"2.2 Reducing Overshoot/Undershoot"* or *"2.3 Reducing Abnormal Noise and Oscillation"* .
	Effect 
	If Set Value is Changed Too Much

■ Two-Degree-of-Freedom Control Mode Synchronization Type

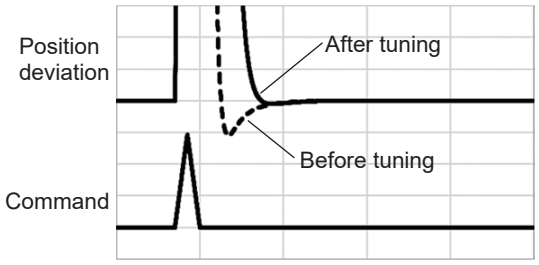
1	Tuning Positional Command Smoothing Filter
	Procedure 1 Go to the Load fluctuation suppression tuning screen. 2 Decrease Pr2.22 "Positional command smoothing filter" . The approximate change is 10 % decrease per change. 3 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping. In this case, see *"2.2 Reducing Overshoot/Undershoot"* or *"2.3 Reducing Abnormal Noise and Oscillation"* .
	Effect 
	If Set Value is Changed Too Much

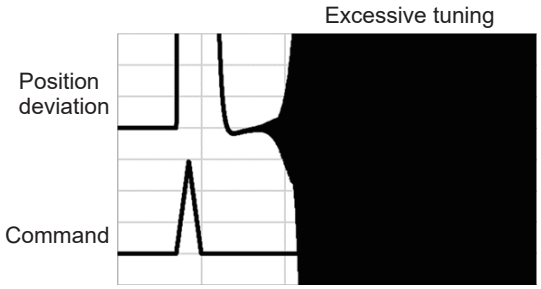
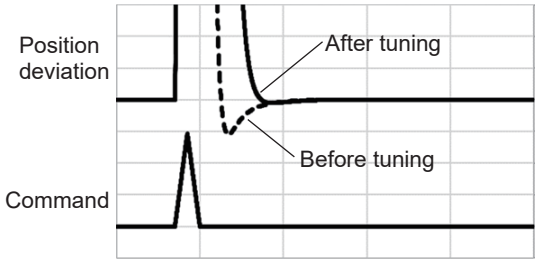
■ Two-Degree-of-Freedom Control Mode Disabled Type

1	Tuning FF Gain Setting
	Procedure 1 Go to the Manual TUNING-Basic screen, and change the mode setting to 7 (Customize 2). 2 Click Customize setting, and set Stiffness setting to ON. 3 Increase the Feedback gain setting in increments of 1. 4 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping. In this case, see *"2.2 Reducing Overshoot/Undershoot"* or *"2.3 Reducing Abnormal Noise and Oscillation"* .
	Effect 
	If Set Value is Changed Too Much

Return to *"1.2 List of Issues During Tuning and Target Functions"*

2.2 Reducing Overshoot/Undershoot

<table>
<tr><td>1</td><td>Tuning Feedback Gain Setting</td></tr>
<tr><td></td><td>Procedure
1 Go to the Manual TUNING-Basic screen, and change the mode setting to 7 (Customize 2).
2 Click Customize setting, and set Inertia Ratio Update to ON and Stiffness setting to ON.
3 Increase the Feedback gain setting in increments of 1.
4 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping. In this case, see “2.2 Reducing Overshoot/Undershoot” or “2.3 Reducing Abnormal Noise and Oscillation” .</td></tr>
<tr><td></td><td>Effect
 

If Set Value is Changed Too Much
 
</td></tr>
<tr><td>2</td><td>Tuning Overshoot Suppression</td></tr>
<tr><td></td><td>Procedure
For undershoot, proceed to No.3.
1 Go to the Manual TUNING-Basic screen.
2 Decrease overshoot suppression in increments of 5[%].
3 If the set value is set too low, operation may be delayed and settling time may increase. To shorten the settling time, see “2.1 Shortening the Settling Time” .</td></tr>
<tr><td></td><td>Effect
 

If Set Value is Changed Too Much
</td></tr>
</table>

3	Tuning Load Fluctuation Control Function (Disturbance Suppression Applications)

Procedure

1 Go to the Manual TUNING-Basic screen, and change the mode setting to 0.

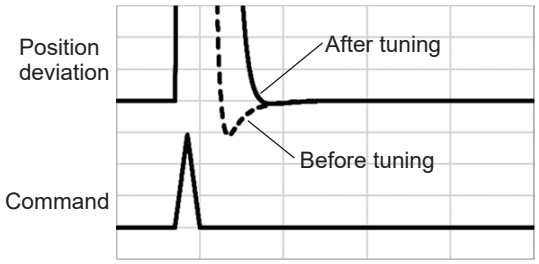
2 Go to Manual TUNING-Application screen-Load fluctuation suppression, and set Load fluctuation suppression function enabled to ON and Load fluctuation suppression function automatic tuning to OFF.

3 Decrease the load change compensation filter time constant from the set value. The approximate change is 10 % decrease per change.

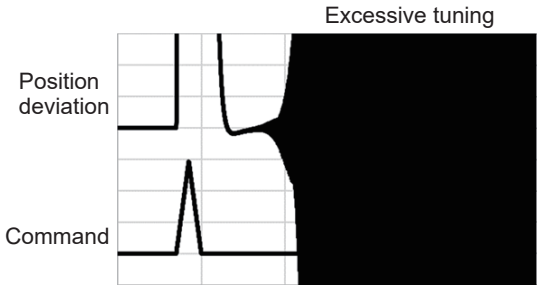
4 If the set value is set too low, abnormal noise or oscillation may occur. If abnormal noise or vibration occurs, increase the load estimation count in increments of 1.

5 If the oscillation does not subside even after raising the load estimation count to 8, set the load estimation count back to 0 and tune the notch filter. (Refer to *"2.3 Reducing Abnormal Noise and Oscillation"*)

Effect



If Set Value is Changed Too Much



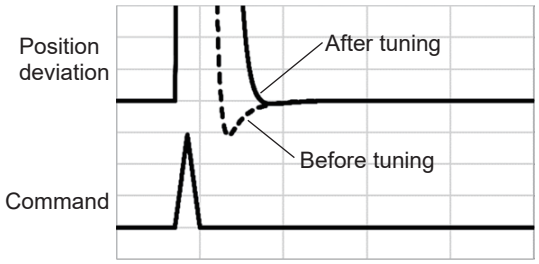
4	Tuning High Response Current Control

Procedure

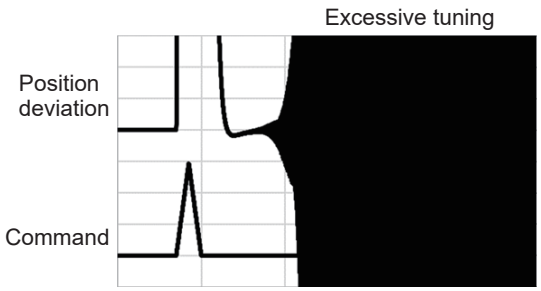
1 Go to Manual TUNING-Application screen-High response current control.

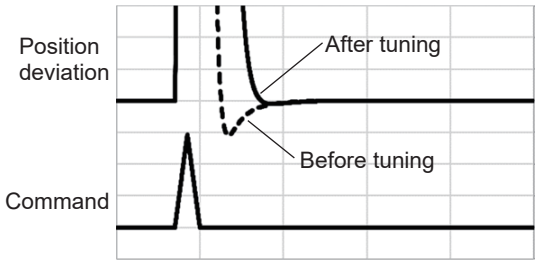
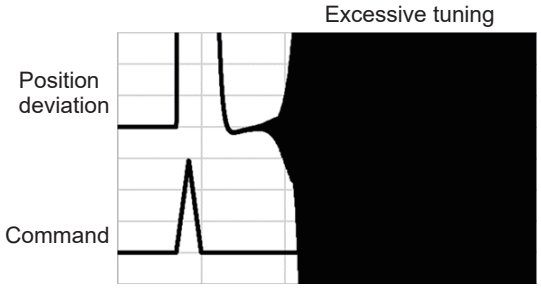
2 Set Pr6.11 "Current loop gain response setup" and Pr6.121 "Current feed forward response setup" to values greater than 100 within the range where no noise or vibration is generated. The approximate change is 30 % increase per change.

Effect



If Set Value is Changed Too Much



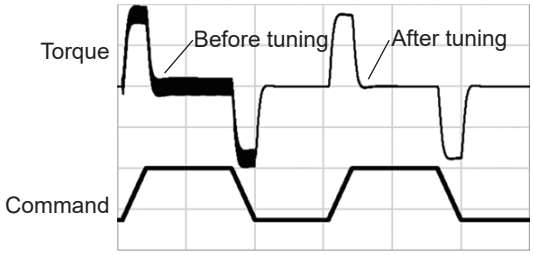
<table>
<tr><td>5</td><td colspan="2">Tuning 3rd Gain Switching Function</td></tr>
<tr><td></td><td colspan="2">Procedure
1 Go to Manual TUNING-Application screen-Gain switching function.
2 Set the time of the interval you want to suppress to Position 3rd gain valid time while observing amounts of overshoot/undershoot.
3 Increase the Position 3rd gain scale factor from 100 in intervals of 10 within the range where no noise or vibration is generated.</td></tr>
<tr><td></td><td>Effect
 
</td><td>If Set Value is Changed Too Much
 
</td></tr>
</table>

Return to *"1.2 List of Issues During Tuning and Target Functions"*

2.3 Reducing Abnormal Noise and Oscillation

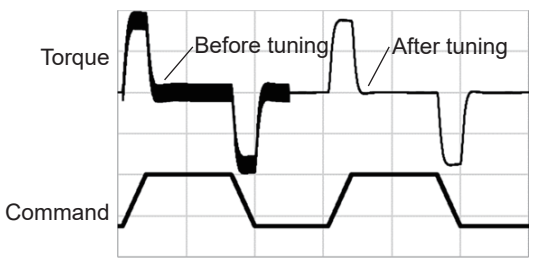
■ Abnormal Noise and Oscillation Occurs Only During Operation

Vibration may be occurring, caused by infrequent command resolution and command updating cycles.

1	Tuning Positional Command FIR Filter	
	Procedure 1 Go to Manual TUNING-Damping settings screen. 2 Click the FIR filter “Automatic setting” button. Pr2.23 “Positional command FIR filter” is automatically set based on the command updating cycle setting and communication cycle setting.	
	Effect  	If Set Value is Changed Too Much —

■ Abnormal Noise and Oscillation Occurs During Operation and When Stopped

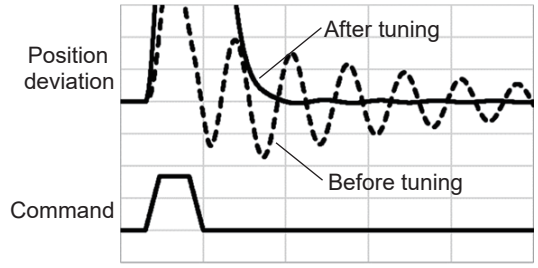
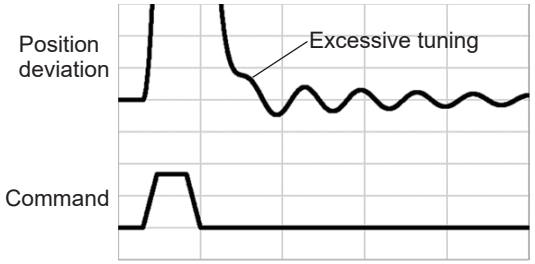
This may be caused by resonance in the high frequency range of the device.

1	Tuning Notch Filter	
	Procedure **Tuning based on positioning operation** 1 Go to Manual TUNING-Notch settings screen. 2 Set Pr2.00 “Adaptive filter mode setup” to between 1 to 2, or 5. (5: High-precision adaptive filter is recommended) 3 Run the motor in actual operation. If an abnormal noise occurs during operation, the parameters of one or both of the 3rd notch filter and 4th notch filter are automatically set to silence the abnormal noise, depending on the adaptive filter mode setting. 4 If the abnormal noise does not subside after setting the notch filter, reduce the Feedback gain setting or the 1st velocity loop gain, then retune the notch filter. **Tuning based on frequency characteristics** 1 Go to Logging-Frequency characteristic screen. 2 Measure frequency response. (Measurement mode: Speed closed loop characteristics) 3 From the measurement results, read the frequency at which the gain peak exceeds 0 dB. 4 Go to Manual TUNING-Notch settings screen. 5 Set the frequency read in step 3 above as the notch frequency. 6 If the abnormal noise does not subside after setting the notch filter, reduce the Feedback gain setting or the 1st velocity loop gain, then retune the notch filter.	
	Effect  	If Set Value is Changed Too Much —

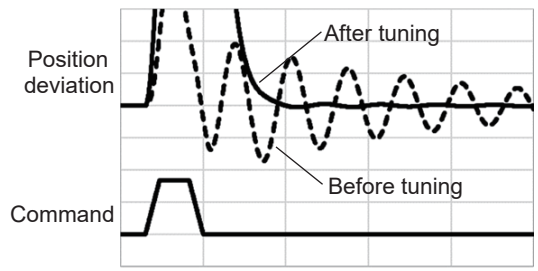
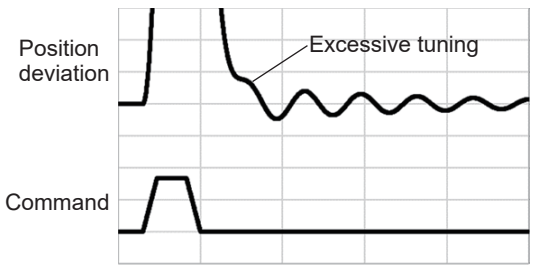
Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.4 Reducing Vibration Just Before Stopping

■ Suppressing Residual Vibration of Approximately 100 Hz or Less at the Moving Part Tip of the Device

1	Tuning Model-Type Damping Filter	
	Procedure 1 Go to Manual TUNING-Damping setting screen, and set Pr2.13 “Selection of damping filter switching” to between 4 to 6. 2 Tune the Model-type damping filter. For details, see the explanation of the model-type damping filter function in Operating Instructions (Overall) or Operating Instructions (Tuning). 3 Even with this function, vibration may not be reduced or overshoot/undershoot may not be reduced. If vibration does not subside, try tuning the damping filter as described in the next section. To suppress overshoot/undershoot, see *“2.2 Reducing Overshoot/Undershoot”* .	
	Effect	If Set Value is Changed Too Much
		

■ Suppressing Residual Vibration of Approximately 100 Hz or Less at the Moving Part Tip of the Device or the Overall Device

1	Tuning Damping Filter	
	Procedure 1 Go to Manual TUNING-Damping settings screen, and set Pr2.13 “Selection of damping filter switching” to between 0 to 3, or 7. 2 Set the automatic frequency setting to either the 1st, 2nd or 3rd damping frequency. 3 Perform positioning operation. When vibration is detected, the vibration monitor displays “detected”, and the frequency of the detected vibration is set to the damping frequency of the damping filter selected in automatic frequency setting. 4 If no vibration is detected, disable the automatic frequency setting. Check the vibration frequency using the Set-up Support Software (PANATERM ver.7) waveform measurement function or an external sensor and set the damping frequency. 5 Tune the damping filter setup, damping depth settings and damping width settings as necessary. For details, see the explanation of the damping control function in Operating Instructions (Overall) or Operating Instructions (Tuning).	
	Effect	If Set Value is Changed Too Much
		

Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.5 Suppressing Speed Changes During Constant Speed Control

1	Tuning Feedback Gain Setting

Procedure

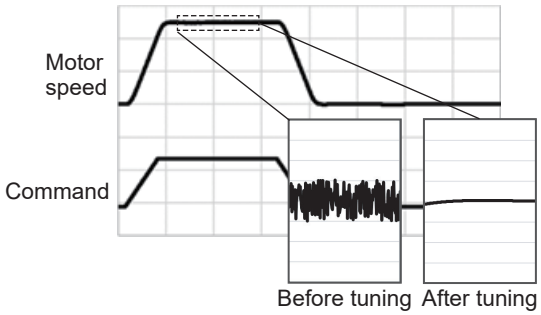
1 Go to the Manual TUNING-Basic screen, and change the mode setting to 7 (Customize 2).

2 Click Customize setting, and set Inertia Ratio Update to ON and Stiffness setting to ON.

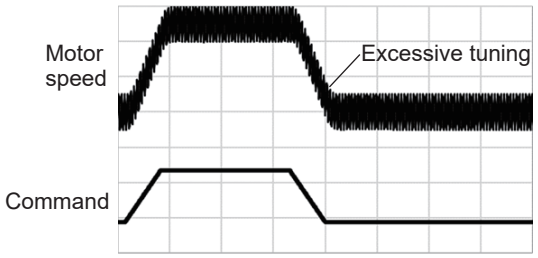
3 Increase the Feedback gain setting in increments of 1.

4 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping. In this case, see *"2.2 Reducing Overshoot/Undershoot"* or *"2.3 Reducing Abnormal Noise and Oscillation"* .

Effect



If Set Value is Changed Too Much



2	Tuning Load Fluctuation Control Function (Disturbance Suppression Applications)

Procedure

1 Go to the Manual TUNING-Basic screen, and change the mode setting to 0.

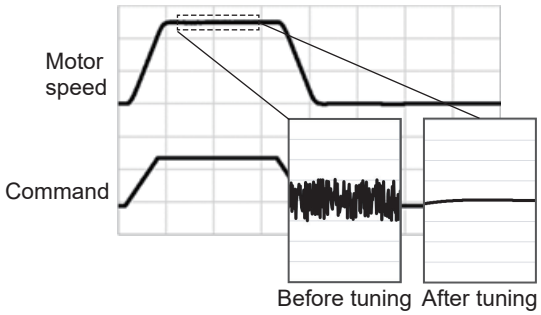
2 Go to Manual TUNING-Application screen-Load fluctuation suppression, and set Load fluctuation suppression function enabled to ON and Load fluctuation suppression function automatic tuning to OFF.

3 Decrease the load change compensation filter time constant from the set value. The approximate change is 10 % decrease per change.

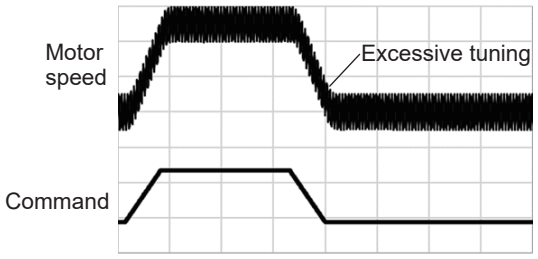
4 If the set value is set too low, abnormal noise or oscillation may occur. If abnormal noise or vibration occurs, increase the load estimation count in increments of 1.

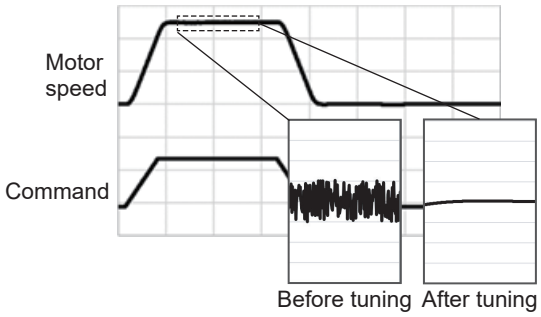
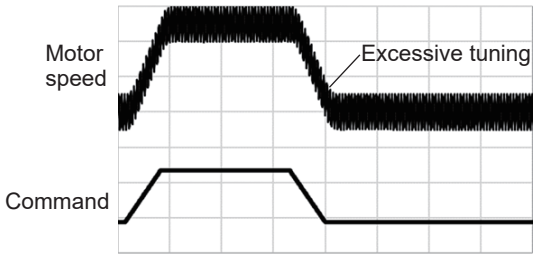
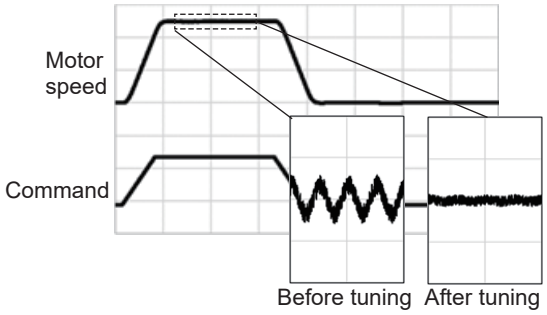
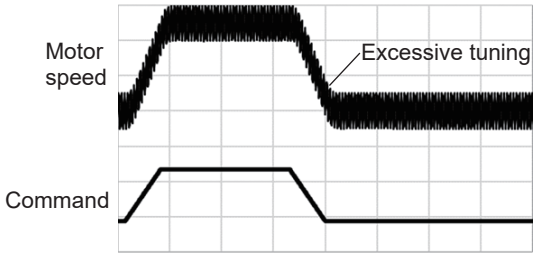
5 If the oscillation does not subside even after raising the load estimation count to 8, set the load estimation count back to 0 and tune the notch filter. (Refer to *"2.3 Reducing Abnormal Noise and Oscillation"*)

Effect



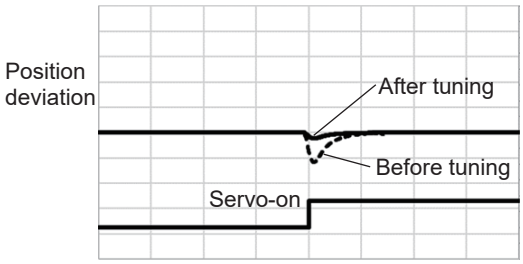
If Set Value is Changed Too Much



<table>
<tr><td>3</td><td colspan="2">Tuning High Response Current Control</td></tr>
<tr><td></td><td colspan="2">Procedure
1 Go to Manual TUNING-Application screen-High response current control.
2 Set Pr6.11 “Current loop gain response setup” and Pr6.121 “Current feed forward response setup” to values greater than 100 within the range where no noise or vibration is generated. The approximate change is 30 % increase per change.</td></tr>
<tr><td></td><td>Effect
 
</td><td>If Set Value is Changed Too Much
 
</td></tr>
<tr><td>4</td><td colspan="2">Tuning Speed Change Control Filter Function</td></tr>
<tr><td></td><td colspan="2">Procedure
1 Go to Manual TUNING-Application screen-Speed change control filter function.
2 Tune the speed change control filter function.
For details, see the explanation of the speed change control filter function in Operating Instructions (Overall) or Operating Instructions (Tuning).</td></tr>
<tr><td></td><td>Effect
 
</td><td>If Set Value is Changed Too Much
 
</td></tr>
</table>

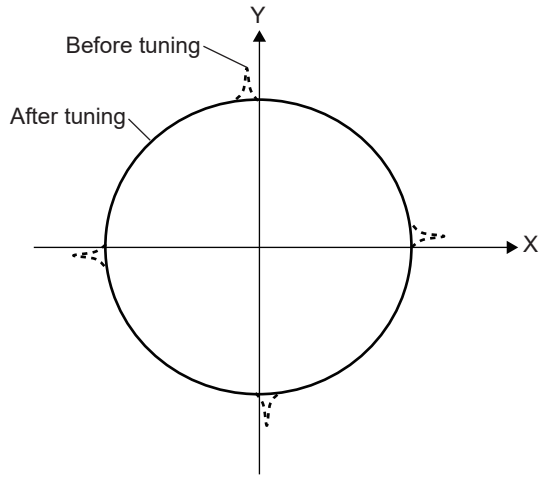
Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.6 Preventing Falling on the Vertical Axis After Servo-On

<table>
<tr><td>1</td><td colspan="2">Tuning Torque Command Additional Value</td></tr>
<tr><td></td><td colspan="2">Procedure
1 Go to Manual TUNING-Basic screen, and set the mode setting to 7 (Customize 2).
2 Click Customize setting, turn Torque compensation setting switching to ON, then after that turn Load characteristics estimation to ON and Tuning torque command additional value to ON.
3 Run the motor in actual operation. Once it has operated for a while, the estimated Torque command additional value is automatically calculated and set. The set values can be checked in the Manual TUNING-Load characteristic screen.
4 If the Torque command additional value is not set correctly, set it manually.
For details, see the explanation of the friction torque compensation function in Operating Instructions (Overall) or Operating Instructions (Tuning).</td></tr>
<tr><td></td><td>Effect
 
</td><td>If Set Value is Changed Too Much
—</td></tr>
</table>

Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.7 Suppressing Quadrant Glitches When Speed Is Inverted for Processing Machines, Etc.

<table>
<tr><td rowspan="3">1</td><td colspan="2">Tuning Quadrant Glitch Suppression Function</td></tr>
<tr><td colspan="2">Procedure
1 Go to Manual TUNING-Application screen-Quadrant glitch suppression function, turn Enable quadrant glitch compensation function to ON, then turn the power back on.
2 Set the following settings.
● Quadrant glitch compensation delay time: 0
● Quadrant glitch compensation filter setting L: Pr1.04 “1st torque filter time constant” set value
● Quadrant glitch compensation filter setting H: 0
3 Tune the quadrant glitch positive-direction compensation value and quadrant glitch negative-direction compensation value for each axis while measuring the size of the quadrant glitch.
For details, see the explanation of the quadrant glitch suppression function in Operating Instructions (Overall) or Operating Instructions (Tuning).</td></tr>
<tr><td>Effect
 
</td><td>If Set Value is Changed Too Much
—</td></tr>
</table>

Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.8 Ensuring Own Axis Is Not Moved When Other Axes Are Moved

1	Tuning Feedback Gain Setting

Procedure

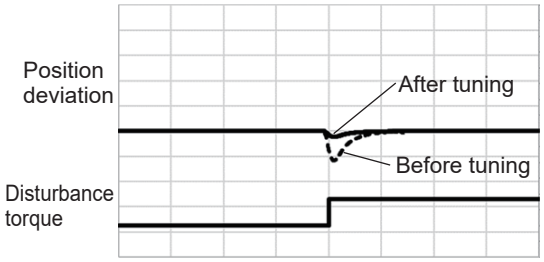
1 Go to the Manual TUNING-Basic screen, and change the mode setting to 7 (Customize 2).

2 Click Customize setting, and set Inertia Ratio Update to ON and Stiffness setting to ON.

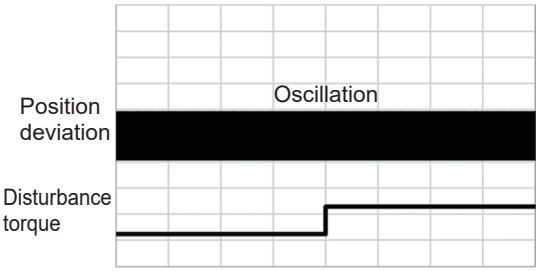
3 Increase the Feedback gain setting in increments of 1.

4 If the set value is set too high, there may be abnormal noise or overshoot/undershoot just before stopping.
In this case, see *"2.2 Reducing Overshoot/Undershoot"* or *"2.3 Reducing Abnormal Noise and Oscillation"* .

Effect



If Set Value is Changed Too Much



2	Tuning Load Fluctuation Control Function (Disturbance Suppression Applications)

Procedure

1 Go to the Manual TUNING-Basic screen, and change the mode setting to 0.

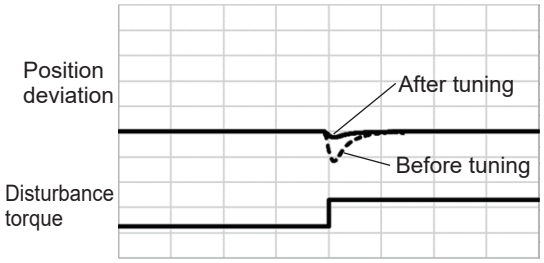
2 Go to Manual TUNING-Application screen-Load fluctuation suppression, and set Load fluctuation suppression function enabled to ON and Load fluctuation suppression function automatic tuning to OFF.

3 Decrease the load change compensation filter time constant from the set value. The approximate change is 10 % decrease per change.

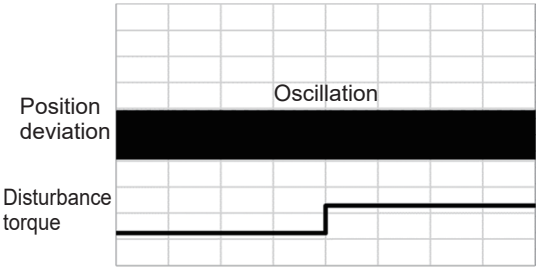
4 If the set value is set too low, abnormal noise or oscillation may occur. If abnormal noise or vibration occurs, increase the load estimation count in increments of 1.

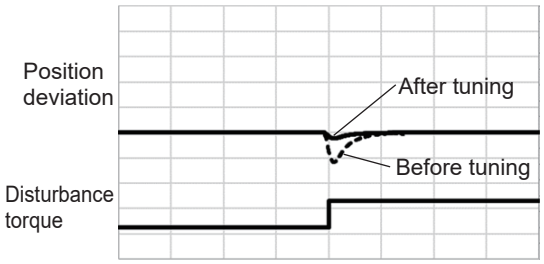
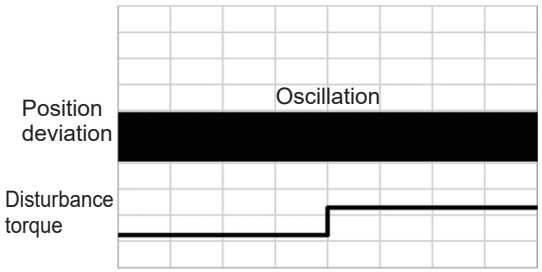
5 If the oscillation does not subside even after raising the load estimation count to 8, set the load estimation count back to 0 and tune the notch filter. (Refer to *"2.3 Reducing Abnormal Noise and Oscillation"*)

Effect



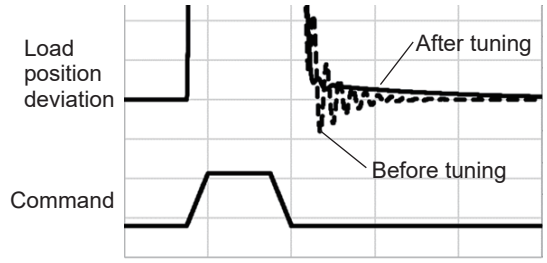
If Set Value is Changed Too Much



3	**Tuning High Response Current Control**
	Procedure 1 Go to Manual TUNING-Application screen-High response current control. 2 Set Pr6.11 “Current loop gain response setup” and Pr6.121 “Current feed forward response setup” to values greater than 100 within the range where no noise or vibration is generated. The approximate change is 30 % increase per change.
	Effect 
	If Set Value is Changed Too Much 

Return to *“1.2 List of Issues During Tuning and Target Functions”*

2.9 Reducing Vibration When Gain Is Increased in Full-Closed Control

<table>
<tr><td>1</td><td colspan="2">Tuning Hybrid Vibration Suppression Function</td></tr>
<tr><td></td><td colspan="2">Procedure
1 Use the Set-up Support Software (PANATERM ver.7) waveform measurement function to check the vibration cycle.
2 Go to Manual TUNING-Application screen-Hybrid vibration suppression function.
3 Set the hybrid vibration suppression gain to the same value as Pr1.00 “1st gain of position loop” or Pr1.05 “2nd gain of position loop” , and set the hybrid vibration suppression filter value to (vibration cycle checked in 1. / 2π). Pay attention to the units when doing so.
4 Run the motor in actual operation. If the response improves when gradually increasing the hybrid vibration suppression filter set value, tune the hybrid vibration suppression gain and the hybrid vibration suppression filter to find the combination that gives the optimal response.
5 If vibration does not decrease, it may be caused by other factors.
In this case, see “2.4 Reducing Vibration Just Before Stopping” or “2.3 Reducing Abnormal Noise and Oscillation” .</td></tr>
<tr><td></td><td>Effect
 
</td><td>If Set Value is Changed Too Much
—</td></tr>
</table>

Return to *“1.2 List of Issues During Tuning and Target Functions”*

REVISIONS

Date	Rev.	Page	Description
May 29, 2026	1.0	–	NEWLY ISSUED

Repairs, Inquiries and Technical Information

Repairs

Contact your dealer regarding repairs.

If installed in a machine or device, consult with the machine or device manufacturer first.

Contact us

If you have any questions, please contact the seller of the product (Sales office or Distributor).

Technical information

- **Operating instructions, technical reference, CAD data downloads, and Web-based inquiries are available online.**

"industry.panasonic.com/global/en/"

Panasonic Industry Co., Ltd.

1006, Oaza Kadoma, Kadoma-shi, Osaka 571-8506, Japan

© Panasonic Industry Co., Ltd. 2026