# **EPSON**

Epson RC+ 8.0 Option Vibration Reduction Technology

Rev.1

ENM247S6522F

Epson RC+ 8.0 Option Vibration Reduction Technology Rev.1

Epson RC+ 8.0 Option

# Vibration Reduction Technology

Rev.1

# FOREWORD

Thank you for purchasing our robot products. This manual contains the information necessary for the correct use of Vibration Reduction Technology. Please carefully read this manual and other related manuals when using this software. Keep this manual in a handy location for easy access at all times.

The robot system and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards. Please note that the basic performance of the product will not be exhibited if our robot system is used outside of the usage conditions and product specifications described in the manuals.

This manual describes possible dangers and consequences that we can foresee. Be sure to comply with safety precautions on this manual to use our robot system safety and correctly.

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## TRADEMARK NOTIFICATION IN THIS MANUAL

Microsoft® Windows® 10 operating system

Microsoft® Windows® 11 operating system

Throughout this manual, Windows 10 and Windows 11 refer to above respective operating systems. In some cases, Windows refers generically to Windows 10 and Windows 11.

## NOTICE

No part of this manual may be copied or reproduced without authorization. The contents of this manual are subject to change without notice. Please notify us if you should find any errors in this manual or if you have any comments regarding its contents.

# MANUFACTURER

### SEIKO EPSON CORPORATION

# CONTACT INFORMATION

For detailed contact information, see "SUPPLIER" of the manual below. "Safety Manual"

# **Before Use**

Before using this manual, be sure that you understand the following information. Installation of robots and robotic equipment should only be performed by qualified personnel in accordance with national and local codes. Please carefully read this manual and other related manuals when using this software.

Keep this manual in a handy location for easy access at all times.

### The Installation Folder for Epson RC+ 8.0

You can change the path for the installation folder for Epson RC+ 8.0 anywhere. This manual assumes that Epson RC+ 8.0 is installed in C:\EpsonRC80.

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# 1. Overview

### 1.1 Vibration Reduction Technology

Vibration Reduction Technology (hereinafter referred to as VRT) is a function that reduces vibration due to robot motion.

VRT function is optional. VRT option's key is required to use.

The vibrations of the following targets are reduced by VRT function.

Robot Hands Base table that the robot is mounted Image processing camera

Set VRT parameters by "VRT Set" command or Epson RC+ GUI (up to 15 parameters)

VRT parameters are necessary for vibration reductions. The parameters need to be changed depending on the following situations change.

Robot orientations (e.g., arm stretching / bending orientations)

When the weight of hands or an object held by hand changes

Condition or state of the base table

"VRT\_Set" command sets "enable" or "disable" of the VRT function.

If the VRT function is "enabled", robot motion is suppressed not to generate vibrations as much as possible. Therefore, robot motion path will be different depending on "enabled" or "disabled" of the VRT function. Also, motion time may take longer.

Note that the VRT function has the feature mentioned above. Make sure to "disable" the VRT function for motion that does not need to reduce vibrations.

When the VRT function is "enabled" and satisfying the following conditions, it will be "disabled" automatically. When the VRT function is not satisfying the "Conditions for disabling the VRT function" \*1 as shown below, the VRT function will be "enabled" automatically.

Conditions for disabling the VRT function and motion commands	Note
Power Low	
Move, TMove, BMove, FCSMove	
Arc	
Arc3	*0
CVMove	• 2
Jump3	
Jump3CP	
Continuous Jog	
Step Jog	

\*1 Following situations are when the VRT function is not satisfying the "Conditions for disabling the VRT function.":

- Switch from Power Low mode to Power High mode
- A motion command other than the command which automatically "disable" the VRT function is executed (e.g.: "Go" Command)

\*2 When executing these commands, the VRT function is automatically "disabled" since path or speed requires high accuracy.

(If giving high priority to low vibration, "enable" the VRT function by "VRT CPMOTION" command.)

When using conveyer tracking or force control function, the VRT function is "disabled" automatically and cannot be used.

### 1.2 VR (Vibration Reading) Unit

To use the VRT function effectively, you need to understand generated vibration conditions exactly and set proper VRT parameters.

VRT parameters are necessary for vibration reductions. The parameters need to be changed depending on the following situations change.

Robot orientations (e.g., arm stretching / bending orientations)

When the weight of hands or an object held by hand changes

Condition or state of the base table

You need to read the VRT parameters in the following situations:

When installing the robot newly

When changing the factory lines

When changing the factory layout

This option consists of software (VR software) and a vibration reading unit (VR unit) that is necessary for understanding vibration conditions. Understand the vibration conditions and provide the system to output VRT parameters.

You can read the VRT parameters by the following steps:

- 1. Install the VR unit directly to vibrating position.
- 2. Connect the VR unit to PC with USB cable.
- 3. Add "VRT\_Trigger" command to the motion program which generates vibrations.
- 4. Activate the VR software.
- 5. Set to waiting for trigger condition.
- 6. Execute the program added "VRT\_Trigger" command by Epson RC+.

You can check the improvement of the vibration conditions by the following steps.

- 1. Add VRT command to motion program by using parameter values read by VR software
- 2. Execute the program again and measure by the VR software.

Make sure to satisfy the following conditions to read the VRT parameters.

Connected to the robot controller (controller unit, drive unit)

(RC90, RC700, RC700DU, RC700-A, RC700DU-A, RC700-D, RC700-E, RC800-A)

The VR unit is connected to PC with USB cable.

VRT option is enabled.

"VRT\_Trigger" command is added to the motion program which generates vibrations.

Vibration reduction of the VRT function effectively works to the vibration right after the robot stops. When reading the parameters, the robot automatically stops for 1.5 seconds after stopping at measurement position of the robot motion.

After the parameters are added, make sure to delete the added "VRT\_Trigger" command. If you forget to delete it, the robot will not stop for 1.5 seconds in front of the measurement position unless the VR software will be waiting for trigger condition.

If you switch ON/OFF of waiting for trigger condition of VR software during execution of the robot motion wrote "VRT\_Trigger" command, additional stop function (1.5 seconds) will ON/OFF.

### 1.3 Related Manuals

Refer to the following related manuals along with this manual for using VRT.

#### Epson RC+ User's Guide

This manual contains information on using the Epson RC+ Robot Control System.

#### SPEL+ Language Reference Manual

This manual contains a complete description of all commands for the SPEL+ language.

#### Each Manipulator Manual

Each Manipulator manual contains information on our robots.

# 2. Safety

Please read this manual before using this option.

Keep this manual handy for easy access at all times and reread it when you find anything unclear.

## 2.1 Conventions

Important safety considerations are indicated throughout the manual by the following symbols. Be sure to read the descriptions shown with each symbol.

WARNING	This symbol indicates that a danger of possible serious injury or death exists if the associated instructions are not followed properly.
WARNING	This symbol indicates that a danger of possible harm to people caused by electric shock exists if the associated instructions are not followed properly.
	This symbol indicates that a danger of possible harm to people or physical damage to equipment and facilities exists if the associated instructions are not followed properly.

# 2.2 Safety Precautions

WARNING	<ul> <li>Do not use the product for the purpose to ensure safety.</li> <li>The product must be used within the conditions described in this manual. Using the product in an environment that exceeds the specified environmental conditions may not only shorten the life cycle of the product but may also cause serious safety problems.</li> </ul>
	Purchase VR unit and USB cables from our suppliers. Note that the VR unit and the USB cables of other manufacturers are not included in the warranty.
CAUTION	If executing "VRT_Trigger" command by VR software during waiting for trigger condition, the waiting time is added to normal motion. Click the [Stop] button of the VR software to cancel the wait condition and back to normal motion.

# 2.3 Robot Safety

Whenever you are working with robots or other automation equipment, safety must be the top priority. Epson RC+ system has many safety features built in, such as E-Stop and a Safety Guard Input. These safety features should be used when designing the robot cell.

For safety information and guidelines, refer to the following manual.

Safety Manual Robot Controller Manual Manipulator Manual

# 3. VRT Command Options

VRT option license is set to the robot controller.

The following version is required for the VRT option of Epson RC+ 8.0. Epson RC+ 8.0: Ver. 8.0.0 or later Firmware: Ver.7.5.4.x or later

Included items when VRT option purchased:

- 1. VRT option license
- 2. EPSON RC+ 7.0 Robot Control System Installation DVD For VRT Option (The DVD is for RC+ 7.0 only. For Epson RC+ 8.0, the installer is included with Epson RC+ 8.0. When you order this version, DVD is not supplied as it is not required.)

# 4. VR (Vibration Reading) Unit

VRT option license should be setup on the robot system controller that you want to read VRT parameters and enable VRT functions by using Vibration Reading unit (hereinafter referred to as VR unit).

If the VRT option license is not setup in the connected controller, the measurement by the VR unit is disabled.

The following version is required for the VR software. Epson RC+ 8.0: Ver. 8.0.0 or later Firmware: Ver.7.5.4.x or later

### 4.1 Included Items

1. VR unit



Symbol	Name	Function
а	USB MicroB connector	Connector to connect with USB cable
b	Screw hole	Screw hole to install the VR unit
С	Installation surface	-

- 2. VR unit screw (hexagon strut +nut/M3, M4  $\times$  1 for each)
- 3. USB cable (4m)
- 4. EPSON RC+ 7.0 Robot Control System Installation DVD For VRT Option (The DVD is for RC+ 7.0 only. For Epson RC+ 8.0, the installer is included with Epson RC+ 8.0. When you order this version, DVD is not supplied as it is not required.)

# 4.2 Configuration



The illustration below shows the system configuration using the VR unit.

After reading the parameters and checking the effect of VRT, remove the VR unit and USB cable immediately. Do not operate the robot continuously with connecting the VR unit. (It is not a flex resistance USB cable. Parameters cannot be read unlimitedly.)

# 4.3 System Requirements

#### 4.3.1 Required software

Supported OS : Windows 10, Windows 11 Epson RC+ 8.0 Ver. 8.0.0 or later VR software

#### 4.3.2 Recommended specification

We recommend using PC that satisfies the following conditions:

OS	Windows10 64 bit version (Version1607 or later) Windows11 64 bit version
	(Except Windows10S, Windows10 IoT Core and
	Windows11 SE)
CPU	Core i5 or higher
	(Models released in 2017, 8th generation or later)
Memory	8 GB or more
Graphic	DirectX 12 or later
Software	Microsoft .Net Frameworks 4.5 or more

#### 4.3.3 About Pre-required Software

When connecting the VR unit and PC with USB cable, USB driver manufactured by FTDI is necessary.

If you required the driver, install it in one of the following ways:

- Update the driver in at the Windows Device Manager (Automatically update drivers over the Internet is recommended.)
- Go to the FTDI Ltd. web site (<u>www.ftdichip.com/Drivers/VCP.htm</u>) then download and install the appropriate driver for your OS

### 4.4 Installing VR Unit

NOTE

(B)

To read the VRT parameters accurately, install the VR unit to vibrating position to check the conditions. If the VR unit is installed on a position where generates little vibration, incorrect parameters will be output or output parameters will not be stable.

Use the following items to install the VR unit:

Double-Sided Tape Screws

Installation by using double-sided tape

- (1) Attach the double-sided tape directly to installation surface of VR unit.
- (2) Attach the VR unit directly to vibrating position (flat surface).
- (3) Check that the attached unit does not move to both sides.

If the adhesion of the double-sided tape is too weak, the measurement accuracy may decrease. Also, if it is too strong, the painted surface of the vibration object may be peeled. Make sure to check the adhesion before using the double-sided tape.

Use "normal type" of the double-sided tape for commercialized product.





Symbol	Name
а	Double-sided tape
b	Installation surface

Installation by using screws

(1) Mount the screw\* to the screw hole of the vibrating position. Firmly tightening it by using spanner.

\*: Screws (M3, M4  $\times$  1) are included. Use proper screw for your screw hole.

- (2) Screw and fix the tightened screw at step (1) to the screw hole of the VR unit.
- (3) Fix the VR unit tightly with the nut by using spanner.

NOTE

Screw the VR unit approximately three times to the fixed screw at the step (1). Make sure that the VR unit is stable and does not move or rotate.



Symbol	Name
а	Nut
b	Screw (hexagon strut)
С	Installation surface

# 4.5 Connection with PC and Wiring Cables

After installing the VR unit, connect the VR unit to PC with USB cable. (Support for USB 3.0 , 2.0 , 1.1)



To read the VRT parameters accurately, make sure not to apply vibrations except generated vibrations. Fix the wirings at 150 to 200mm from the terminal by using the tape or cable tie.

	To connect the VR unit with PC, you can use the general USB cables (Type A – Micro B) other than attached ones. However, be sure to use products complying with the industrial standards or noise resistant USB cable. If you use USB cable (office use product), it may cause communication error and may not offer the proper performance.
$\triangle$	Make sure to use USB cable that can execute data transfer. Be careful since some of general USB cables are only for supplying power.
CAUTION	Target of the measurement is only one VR unit which set COM port by VR software. It is not possible to process more than one VR unit simultaneously.
	After reading the parameters and checking the effect of VRT, remove the VR unit and USB cable immediately. Do not operate the robot continuously with connecting the VR unit. (It is not a flex resistance USB cable. Parameters cannot be read unlimitedly.)

How to check USB COM port number of VR unit

- (1) Install the VR unit to vibrating position
- (2) Connect the VR unit to PC with USB cable.
- (3) Click Windows-[Start] menu-[Run].
- (4) Input "devmgmt.msc" to the [Name] box. Display the device manager.
- (5) Expand the [Ports (COM & LPT)] tree.

🗄 Device Manager	-	×
<u>File Action View H</u> elp		
V 📇 DESKTOP-V017SRP		 
> 🕡 Audio inputs and outputs		
> 💻 Computer		
> 👝 Disk drives		
> 🖙 Display adapters		
> 🔐 DVD/CD-ROM drives		
> 🦏 IDE ATA/ATAPI controllers		
> 🥅 Keyboards		
> III Mice and other pointing devices		
> 🛄 Monitors		
> 🖵 Network adapters		
> 🚺 Other devices		
🗸 🛱 Ports (COM & LPT)		
💭 Communications Part (COM1) 💭 USB Serial Port (COM3)		
> 🚍 Print queues		
>  Processors		
> 🛐 Security devices		
> Software devices		
> 🐗 Sound, video and game controllers		
> 🍇 Storage controllers		
> 🏣 System devices		
> 🏺 Universal Serial Bus controllers		

COM port number of the VR unit is displayed after the COM.

If more than one port numbers are already displayed, disconnect and connect the USB cable of the VR unit and check the number.

## 4.6 Maintenance Parts List

Please contact us when you purchase maintenance parts described below.

Name	Code	Note
Vibration Reading unit	2193072	Vibration Reading Unit
USB connection cable	2102004	USDC4M Torred MinneD 01
for Vibration Reading unit	2193094	USBC4M-TypeA-MicroB-01

# 5. Installing Software

VRT is paid option. Each controller needs 1 license.

When VRT option is installed to the control unit (RC700 / RC700-A), VRT will be available in robots (four robots at the maximum) connected to the drive unit (RC700DU).

You must have the authority of Windows Administrator to install VRT option.

When you purchased VRT option and enabled it, setting windows of VRT or options are displayed on Epson RC+. The following describes steps to install software and enable the option.

### 5.1 Check the Version of Epson RC+ and Firmware

Before using VRT option, make sure to check the version of Epson RC+ and controller firmware.

If the version of installed software is older than the following, refer to the manual to update the software.

Epson RC+ 8.0 Ver.8.0.0

Refer to: Epson RC+ 8.0 User's Guide Appendix B: Epson RC+ 8.0 Software

Firmware of Controller Ver.7.5.4.x

Refer to: *Robot Controller RC700 series Maintenance Manual* - *Firmware Update* 

> Robot Controller RC700-D Manual Installation - Firmware Update

> *Robot Controller RC700-E Manual* - Upgrading Firmware

Robot Controller RC90 series Maintenance Manual - Firmware Update

Robot Controller RC800-A Manual - Upgrading Firmware

For detail information on system to use VRT option or software version, refer to the following.

VRT command option:3. VRT Command OptionsVR (Vibration Reading) unit:4.3 System Requirements

# 5.2 Enable VRT Option

The procedure for enabling the VRT option differs depending on the Controller series. For details, refer to the following manual:

- Epson RC+ 8.0 User's Guide
  - Installing Controller Options

#### 5.2.1 Confirm that VRT Option is Enabled

When VRT option is installed, you can edit VRT data on Epson RC+.

Follow the steps below and confirm that the option is installed properly.

- (1) Select Epson RC+ menu-[Tools]-[Robot Manager].
- (2) Confirm the [VRT] tab.

PartFeeding.prg	Main.prg	Command	l ₽ Ro	bot Manage	r X			
Robot: 1, robot1, C4-A601	s	✓ EStop	o Safe	guard	Error			
Motor: Off Power: L	.ow Reset	t Local: 0	✓ Tool: 0	✓ Arm: 0	VRT:	o 🗸 🏭 🖂		
🛟 Jog & Teach	VRT						Apply	
Doints	Define VRT p	parameters					Restore	
Hands	Enable	VRT during CP	(VRT_CPMot	ion) VRT I	Parameter reading	Test	Clear	
Arch	Manually def	ine VRT						
人 Locals	VRT	Label	Param 1	Param 2	Description			
🟹 Tools	2							
Pallets	4							
ECP	6							
Boxes	7							
Planes	9 10							
😽 Weight	11 12							
lnertia	13 14							
VRT VRT	15							
XYZ Limits								
Range								
🗳 Home Config								

If the [VRT] tab is not displayed, follow the steps below.

(1) Select Epson RC+ menu-[Project]-[Properties]-[Operator Settings]-[Robot Manager].

Project General Properties		? ×
General Source Files In Controller Encrypted Files Compiler Operator Settings Operator Window Robot Manager I/O Monitor GUI Builder Vision	Select functions allowed for operators:         >       Jog & Teach panel         >       Ø points Page         Force Page       Hands Page         Locals Page       Locals Page         Dols Page       Arch Page         Box Page       Box Page         Pallet Page       Box Page         Plane Page       ECP Page         Weight Page       Inertia Page         Mass/Gravity Page       VRT Page         XYZ Limits Page       XYZ Limits Page	Close Apply Restore

- (2) Place a checkmark on [Select pages and options allowed for operators:]- [VRT Page].
- (3) Confirm that the [VRT] tab is displayed on Robot Manager.
- (4) If the [VRT] tab is still not displayed after performing the above steps, refer to the following sections.

Epson RC+ 8.0 User's Guide - Installing Controller Options

### 5.3 Installing VR Software

Install VR software and set references.

```
5.3.1 Installation Contents:
```

VR software has an installer. Following processes are operated automatically.

- 1. Install VR software
- 2. Install VR unit driver
- 3. Install evaluation software for VR unit
- 4. Create a folder : C:\EpsonRC80\projects\VRT

#### 5.3.2 Installation Steps

- Save Epson RC+ 8.0 from the Epson Robot Software Installer. For details, refer to the following manual: *Epson Robot Software Installer*
- (2) Unzip the Zip folder and right-click the following file: Epson\_RC+\*\*\*\*\VRSW\VRUnit\_install.bat (\*\*\*\*: RC+ version)

Select [Run as administrator].

#### 5.3.3 Installing VR Software

- When performing "5.3.2 Installation Steps", the user account control window is displayed. Permission for changing the PC is asked on user account control window. Click the [Yes] button.
- (2) The following window is displayed. Click the [Next] button without any changes.

URUnit_SW_Installer_Ver.*.*.*	-		×
<b>Destination Directory</b> Select the primary installation directory.			
All software will be installed in the following locations. To install software into a different location, click the Browse button and select another directory.			
Directory for VRUnit_SW_Installer_Ver.+.+	Brow	se	
Directory for National Instruments products	Brow	se	
<< Back Next >	$\rightarrow$	Canc	el

(3) License agreement for instrument driver technology of NATIONAL INSTRUMENTS and IVI (Interchangeable Virtual Instrument) is displayed. Confirm the contents.

Select [I accept the above 2 License Agreement[s]] and click the [Next] button.

WRUnit_SW_Installer_Ver.*.*.*	-		×
License Agreement You must accept the licenses displayed below to proceed.			
NI MI			
NATIONAL INSTRUMENTS SOFTWARE LICENSE	AGREE	MENT	^
CAREFULLY READ THIS SOFTWARE LICENSE AGREEMENT ("AGREEMEN DOWNLOADING THE SOFTWARE AND/OR CLICKING THE APPLICABLE BU COMPLETE THE INSTALLATION PROCESS, YOU AGREE TO BE BOUND BY THIS AGREEMENT. IF YOU DO NOT WISH TO BECOME A PARTY TO THIS A' BE BOUND BY ITS TERMS AND CONDITIONS, DO NOT INSTALL OR USE TI AND RETURN THE SOFTWARE (WITH ALL ACCOMPANYING WRITTEN MAT THEIR CONTAINERS) WITHIN THIRTY (30) DAYS OF RECEIPT. ALL RETUR SUBJECT TO NI'S THEN-CURRENT RETURN POLICY. IF YOU ARE ACCEP' TERMS ON BEHALF OF AN ENTITY, YOU AGREE THAT YOU HAVE AUTHOR FNTITY TO THESE TERMS	T"). BY ITTON TO 7 THE TEF GREEMEI HE SOFT ERIALS A NS TO NI TING THE ITY TO BII	RMS OF NT AND WARE, ND WILL BE SE ND THE	*
The software to which this National Instruments license applies is VRUnit_SW_Installer_V	er. * . * . *		
accept the above 2 Li	cense Agre	ement(s).	
U i do not accept all these	e License A	greements	
<< Back Next	>> <b>/</b>	Cance	el

(4) Confirmation window of the installation contents is displayed. Click the [Next] button.

URUnit_SW_Installer_Ver.*.*	-		×
Start Installation Review the following summary before continuing.			
Adding or Changing         • VRUnt_SW_installer_Ver.+.+Files         • NI-VISA 15.5         Runtime Support         .NET 4.0 - 4.5.1 Runtime Support (IVI)	settings.		
Save File << Back Next 2		Canc	el

(5) The following window is displayed. Installation of VR software has completed.

Click the [Next] button.			
<pre>URUnit_SW_Installer_Ver.*.*</pre>			<u>_                                    </u>
Installation Complete			
The installer has finished updating your system.			
	<< <u>B</u> ack	<u>N</u> ext>>	<u>F</u> inish

(6) Window to request a restart of your computer is displayed. Do not restart now. Click the [Restart Later] button.

VRUnit_	SW_Installer_Ver.*.	*.*	<u> </u>
Q	You must restart you If you need to install restart later, restart ;	r computer to complete this hardware now, shut down th your computer before running	operation. le computer. If you choose to g any of this software.
[	<u>R</u> estart	Shut Down	Restart Later

#### **Other References** 5.3.4

The following process is operated when "5.3.3 Installing VR Unit Driver" is completed. - Create a folder: C:\EpsonRC80\projects\VRT

Then, as shown below, entering key is required. Press any key on the command window.



Now, installation has been completed. Then, restart your computer.

# 6. Read VRT Parameters and Confirm Vibration Reduction Effect

This chapter describes about the following contents:

- Steps to read VRT parameters
- Steps to set VRT parameters and realize vibration reduction

### 6.1 Change a Program

Identify the motion that generates vibrations. Then, add a measurement trigger command for reading parameter to the command generating vibrations.

- Identify the motion that generates vibrations in program.
   (You can confirm the effect easily by extracting motions that you want to improve vibrations from the program.)
- (2) Start Epson RC+ and display the sub window of the program.
- (3) Add "VRT\_Trigger" command to the row of vibrating command.

Specify number (integer number from 1 to 4) after VRT\_Trigger.

VRT parameters are displayed on the tab (specified number) of VR software.

```
Command example:
Go P1 → Go P1 VRT_Trigger 1
```

#### SPEL+ program example:

#### Add underlined command.

```
Function vibration drive
  Motor On
  Power Low
  Weight 3
  Speed 10
  Accel 10, 10
           'Start Point
  Go Pl
  Wait 1
  Speed 100
  Accel 100, 100
  Power High
  Go P2 VRT Trigger 1
  Wait 3
  Power Low
Fend
```

(4) Execute the program added VRT\_Trigger command and check that there are no errors. Also, check the robot motion to decide how to install the VR unit. (No change in motions since the VR unit is not installed.)

#### VRT\_Trigger Command and VR Software

VRT\_Trigger has a function to send signals to VR software when the robot reaches to the destination point by the motion commands such as Go, Jump, and Move.

VR software measures residual vibrations. When "VRT\_Trigger" command is added to the program, waiting time (1.5 seconds) is added automatically.

The functions of sending signals and adding the waiting time will be enabled when the following conditions are satisfied.

- Epson RC+ and robot are connected
- VR software is waiting for trigger condition



When releasing the waiting for trigger condition of VR software, VRT\_Trigger command will be disabled. Additional waiting time will be reset and the robot operates normally.

### 6.2 Preparation for VR Unit

Install the VR unit and check motions of the program changed in "6.1 Change a Program". Then, adjust cable length or installation position.

(1) Install the VR unit at position where you want to improve vibrations.

For details, refer to the following section.

4.4 Installing VR Unit

Position to be improved (Installation position)	Measurement target	
Robot hands	Hand (workpiece included), robot, base table	
Camera	Camera, camera installation parts, base table	
Sensors in equipment	Base table, sensors in equipment Sensor installation parts in equipment	
Base table	Base table	

(2) Display the [RUN] window of Epson RC+.

Operate the robot in forced low power and low speed motion. At this time, consider how to wire the USB cable that connects the VR unit and PC.

- (3) Connect the USB cable to VR unit.
- (4) Fix the 150 to 200mm position from the connection terminal so that there is no influence of cables when measuring vibrations.
- (5) Connect another terminal of USB cable to PC.
- (6) Check the program motions again from Epson RC+ [RUN] window.

Note the following since VR unit and PC is connected with cable.

- Operate the robot in forced low power and low speed motion.
- Make sure that the emergency stop switch can be held down immediately to stop the robot in case of emergency.

# 6.3 Read VRT Parameters

When you can confirm that the USB cable is wired properly during the robot motion, keep the connection with Epson RC+ without any change.

- (1) Activate the VR software by either way.
  - With Epson RC+ 8.0, click the [Robot Manager]-[VRT]- [VRT Parameter reading] button.
  - Activate "C: \EpsonRC80\exe\VR\_SW.exe"

PartFeeding.prg ×	Main.prg	Command	i 음주 Rot	oot Manager	×			
Robot: 1, robot1, C4-A601	S	✓ EStop	o Safe	guard	Error			
Motor: Off Power:	Low Reset	Local: 0	✓ Tool: 0	✓ Arm: 0	VRT: 0	✓ Image:		
💠 Jog & Teach	VRT						Apply	
Doints	Define VRT p	arameters					Restore	
Hands	Enable	VRT during CP	(VRT_CPMoti	on) VRT Pa	rameter reading	Test	Clear	
Arch	Manually def	ine VRT						
人 Locals	VRT 1	Label	Param 1	Param 2	Description			
🟹 Tools	2							
Pallets	4							
ECP	6							
Boxes	8							
Planes	9							
💫 Weight	11 12							
s Inertia	13							
VRT VRT	15							
XYZ Limits								
Range								
🗳 Home Config								
			_					

#### Start from Epson RC+ 8.0

ration Reading S/W (RC+ 8.0 or higher)	Ver. X.X.X
Select VR Unit COM Port Robot Connect IP Address	
Read VRT parameter Short movement	
► Start Waiting for trigger ④	
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value
VRT Parameter 0 Vibration waveform	Vibration waveform 0.02 0.01 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0.25 0.5 0.75 1 1.25 1.5 Time[s]	0 0.25 0.5 0.75 1 1.25 1.5 Time[s]
Save graph Saved vibration waveform	Saved vibration waveform
-160 0 0.25 0.5 0.75 1 1.25 1.5	0.01 0.025 0.5 0.75 1 1.25 1.5 1.5

Start from VR software

- (2) Select the port number of USB connection port that connects VR unit. Refer to the following to check COM port number.
  - 4.5 Connection with PC and Wiring Cables: How to check USB COM port number of VR unit

ration Reading S/W (RC+ 8.0 or higher)	Ver. X.X.X
elect VR Unit COM Port Robot Connect IP Address	У/M/D н:
Read VRT parameter Short movement	
D Start Waiting for trigger	
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact valu
VRT Parameter 0 Vibration waveform	n Vibration waveform
120	E 0.02
र्षे यु 50	të o
	ğ -0.01 G -0.02
0 0.25 0.5 0.75 1 1.25 1.5 Time[s]	0 0.25 0.5 0.75 1 1.25 1.5 Time[s]
Save graph Saved vibration waveform	n Saved vibration waveform
-40	E 0.02
-100	ement
A A	ğ -0.01
-100 0 025 0.5 0.75 1 1.25 1.5	0 0.25 0.5 0.75 1 1.25 1.5

(3) Specify how to connect the running Epson RC+ and the robot. Ethernet connection:

input IP address.

USB connection:

input to IP address part is not required.

ation Reading S/W (RC+ 8.0 or h	igher)	Ver. 3.0.1	
ect VR Unit COM Port	P Address	Y/M)	р н Stop
Start Waiting	g for trigger 🕥		
Trigger1 Trigger2 Trigger3 Trigger4		Notes : Displacement value is not	an exact val
Vibra 100 20 50 0 0 0 0 0 0 0 0 0 0 0 0 0	1.25 1.5	Vibration Vibration	5 1.5
Save graph 40 20 20 20 40 20 40 40 40 40 40 40 40 40 40 4	1.25 1.5	Saved vibration Saved vibration	waveform

Now, setting has completed.

(4) To read VRT parameters, set the condition to waiting for trigger. Click the [Start] button to enable "VRT\_Trigger" command of Epson RC+. Also, [Waiting for trigger] will be lighted up in green.

Vibration Reading S/W	
Vibration Reading S/W (RC+ 8.0 or higher)	Ver. 3.0.1
Select VR Unit COM Port Robot Connect IP Address	Y/M/D H:M:S
Start     Waiting for trigger	Waiting for trigger
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value.
VRT Parameter 0 Vibration waveform	Vibration waveform
Saved vibration waveform	Out         Saved vibration waveform           001
0 0.25 0.5 0.75 1 1.25 1.5 Time[s]	0 0.25 0.5 0.75 1 1.25 1.5 Time[s]

- (5) Confirm that the [Waiting for trigger] is lighted up in green and execute the program by Epson RC+. The program to be executed is the program that added "VRT\_Trigger" command according to the following steps.
  - 6.1 Change a Program
- (6) When the robot reaches to the specified point of motion command that added "VRT\_Trigger" command, the VR software measures vibration and output calculated VRT parameter values.

Write down the value showed on [VRT Parameter].

husting Deading CAN (DC - 0.0 on high an)	
bration Reading S/W (RC+ 8.0 or higher)	Ver. 3.0.1
Select VR Unit COM Port Robot Connect IP Address	Y/M/D H:M:
	Stop
Read VRT parameter Short movement	
Start Waiting for trigger	Waiting for trigger
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value.
VRT Parameter 220	
Vibration waveform	Vibration waveform
120	0.02
- 100	톤 0.01
E Allantatatatatata	E o AAAAA
S 20	-0.01
0	품 -0.02
0 0.25 0.5 0.75 1 1.25 1.5	0 0.25 0.5 0.75 1 1.25 1.5
innes)	i ime[5]
Save graph Saved vibration waveform	Saved vibration waveform
-40	€ <sup>0.02</sup>
5	5 0.01
는 -100 것	ě o
A	음 -0.01
-160	0 0.02 0.5 0.75 1 1.25 1.5
0 0.25 0.5 0.75 1 1.25 1.5	0 0.25 0.5 0.75 1 1.25 1.5

Now, VRT parameter value has read.

When executing program with adding more than one "VRT\_Trigger" commands:

Every time program execution reaches to "VRT\_Trigger" command, measurement is performed and parameters are calculated

Click the [Stop] button to stop the trigger for reading. When the [Stop] button is clicked, "VRT\_Trigger" command set by Epson RC+ will be disabled.



#### How to measure again

Click an arrow icon (blue circle) on upper left and click the [Start] button. Condition will be the trigger start condition and measurement will start again.

# 6.4 Setting for VRT Parameters

- (1) Select [Tools]-[Robot Manager] on Epson RC+ menu and start Robot Manager.
- (2) Select the [VRT] tab.

PartFeeding.prg ×	Main.prg	E Command	i 음주 Rot	oot Manager	×		
Robot: 1, robot1, C4-A601	S	✓ EStop	D Safe	guard	Error		
Motor: Off Power: L	Low Rese	t Local: 0	✓ Tool: 0	✓ Arm: <mark>0</mark>	🗸 ECP: 0 🗸 VRT:	• 🗸 🎆 🖂	
🛟 Jog & Teach	VRT						Apply
Doints	Define VRT p	parameters					Restore
🕂 Hands	Enable	e VRT during CP	(VRT_CPMoti	on) VRT Pa	rameter reading	Test	Clear
↔ Arch	Manually de	fine VRT					
人 Locals	VRT	Label	Param 1	Param 2	Description		
🟹 Tools	2						
Pallets	4						
ECP	5						
fil Boxes	7						
Planes	9						
Weight	10						
- Vielgin	12						
Ky merua	14 15						
Size o							
Range							
Home Config							

- (3) Select row [1] in column [VRT].
- (4) Set the parameter read in 6.3 Read VRT Parameters to [Param1].



If the target motion (motion that you want to reduce vibration) is CP motion, place a checkmark on the [Enable VRT during CP] box.

Enable VRT during CP (VRT\_CPMotion)

- (5) Click the [Apply] button and wait for a few seconds. Read parameter is set in [VRT 1].
- (6) Change the [VRT] of [Robot Manager]to "1".



By this operation, VRT 1 is applied to subsequent programs.

Now, settings of VRT parameters have completed.

## 6.5 Confirmation of Vibration Reduction Effect

You can confirm the VRT effect by using VR software.

Measure the same motion with enabling VRT and disabling VRT in 6.4 Setting for VRT Parameters, then compare the results.

(1) Change the [VRT] of [Robot Manager] to "0".

VRT function will be disabled.



(2) Read parameters.

For details, refer to 6.3 Read VRT Parameters.

(3) Place a checkmark on the [Save graph] checkbox (red circle).



- (4) Confirm that the graph is copied to the lower graph. Remove the checkmark on the [Save graph] checkbox.
- (5) Change [VRT] of [Robot Manager] to "1".VRT function will be enabled.
- (6) Click an arrow icon (blue circle) on upper left and click the [Start] button. Condition will be the trigger start condition and measurement will start again.

ration Reading S/W (RC+ 8.0 or higher)	Ver. 3.0.1
Eelect VR Unit COM Port         Robot Connect         IP Address           COM1         USB         Image: Compared to the second seco	
Read VRT parameter Short movement	
Start Waiting for trigger	Waiting for trigger
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value
VRT Parameter 230 Vibration waveform	Vibration waveform
Save graph 5 Save divbration waveform	Saved vibration waveform

(7) Vibration results of enabling VRT are displayed on upper stage.

From the above operation steps, you can check the improvement effects of vibration when enabling VRT.

Displacement on the graph is calculated by values measured in acceleration. It is not precise value

To measure precise value, use dedicated measurement equipment.

Use displacement value output from this function as rough guide to check VRT function.

If the improvement is not enough, add the values of read VRT parameter to Epson RC+ menu- [Robot Manager] – [VRT] tab – [Param 2] and click the [Apply] button. Then check the improvement again.

You can set two VRT parameters simultaneously.
# 6.6 Steps to read VRT parameters when wiring is difficult

If it is difficult to wire the USB cable between VR unit and PC due to reasons such as equipment layout, you can read parameters by shortening the robot moving distance.

As shown below, you can change the path P1 $\rightarrow$ P2 to P3 $\rightarrow$ P2 to measure.



Program that shortened the robot moving distance for reading parameters can be create by VR software.

- (1) Start Epson RC+ and connect to the robot.
- (2) Activate the VR software by either way.
  - With Epson RC+ 8.0, click the [Robot Manager]-[VRT]- [VRT Parameter reading] button.





Select VR Unit COM Port Robo	t Connect IP Address	Ver. 3	0.1 Y/M/D H:M
Generate program for sho Use when cable setting is difficur This program uses a drive progra Required fields Robot No.	t movement t. (For short distance excitation) m to find the short drive start point.	Go ⊽ Dest	Generate program
Detail data Arm No. Weight Inertia Speed Accel	0 1 Kg 0 Kg*m^2 30 % 30 %	Tool No. Decel	0 v 0 mm 30 %
After clicking "Ge	erate program"		

(3) Select the [Short movement] tab.

- (4) Input point number, motion command, speed, and acceleration of the destination point of vibration generated motion to all items of [Require fields] and [Detail data].
- (5) Click the [Generate program] button.

Program that shortened the robot moving distance is created.

Select VR Unit COM Port	Robot Connect IF	P Address	2023/01/30 10:31
Read VRT parameter SI Generate program for Use when cable setting This program uses a driv	nort movement or short movement s difficult. (For short distance e program to find the short of	excitation) frive start point.	Generate program
Required fields Robot N	o. 1 $ abla$	Command Go ▽	Destination point no. 1
Detail data Arm No. Weight	0	Tool No Kg	0 🗸
Inertia Speed Accel	0 30 30	Kg*m^2 % Decel	0 mm

At this time, do not install VR unit. Also, do not wire by USB cable.

(6) Click the [After clicking "Generate program"] button to check the steps to create a program.

	Reading S/V	N (RC+ 8.0 or	higher)		Ver. 3.0.1
Select VR U	nit COM Port	Robot Connect	IP Address		2023/01/30 10:3
Read VRT p	barameter Sho	ort movement			
Generate Use wher This prog	program for n cable setting is gram uses a drive	r short movemen difficult. (For short dis program to find the si	nt tance excitation) nort drive start poir	ıt.	Generate program
Requir	red fields Robot No	1	Command	Go ▽	Destination point no. 1
Detai Ar	il data m No. /eight	0	∇	Tool No.	0
In	iertia		0 Kg*m^2		0 mm
Sp	eed		30 %		
Ac	ccel		30 %	Decel	30 %
	After clicking	) "Generate progr	am"		
	After clicking	) "Generate progr	am"	×	
	After clicking	) "Generate progr "Generate program RC+.	am"	× owing	

(7) Click Epson RC+ menu- [File] - [Import..] to import the program file created in step (5).
 C:\EpsonRC80\projects\VRT \VRT\_smalldrive.prg



(8) After do the [Project]-[Build], Select "VRT\_A\_Find\_ExPnt" on the [Run] window and click the [Start] button.

Search the start position of motion that read parameters (motion that generates vibrations).

🔝 Run - ForAtlasVRU			-	
▶ Run ×				~
-				
Is it the starting point? (Y/N) ?y Vibration move distance[mm]= 117.98515182514 Impuct distance Find Box[mm]= 5.88828 Impact start point: X: -67.720 Y: 356.828 2 /0	Z: 507.887 U:	100.746 V: -79.435 W:	180.000 /R /A /NF	/J6F0 /J4F0
O Form O Function				
VRT_A_Find_ExPnt	Start	Pause		
Low Power Speed Factor 100 *%	Stop	Continue		

After confirming that the robot moves to the start position (P1 on the first figure of this section), click the [Start] button.

(9) When clicking the [Start] button, a question whether the robot is at the start position is asked.

If the robot is at the start position, click [Y]. If the robot is not at the start position, click [N].

The program is halted if the robot is not at the start position. Move the robot to the start position and perform the step (8).

Search a point that is 5% from the destination point for the motion distance when vibration is generated. When the motion distance is 1mm or less, the point is 1mm position.

When the program ends, the setting has completed.

- (10)Refer to the following and install VR unit. Then, connect it to PC with USB cable.6.2 Preparation for VR Unit
- (11)Click the [Stop] button to be the waiting for Trigger condition.

Inration Reading S/W/ (	RC + 80 or higher)	Ver 201	
Select VR Unit COM Port Ro	hot Connect IR Address	vel. 5.0.1	
			Y/M/D H:M:S
		<u> </u>	Stop
Read VRT parameter Short n	novement		
▷ Start	Waiting for trigger		
		U	<u></u>
Trigger1 Trigger2 Tri	gger3 Trigger4	Notes : Displacement value	is not an exact value.
VRT Parameter	230		
120	Vibration waveform	0.02	bration waveform
100		E 0.01	
<u>9</u>		ogent	
Acc		9 -0.01	
0		-0.02	the state
0 0.25	0.5 0.75 1 1.25 1.5 Time[s]	0 0.25 0.5 0.75 1 Tin	1.25 1.5 ne[s]
Save graph	Saved vibration waveform	Saved vi	bration waveform
-40		E 0.02	
5		톤 0.01 닫	
Ē -100		e e e e e e e e e e e e e e e e e e e	
		······································	

(12) Click an arrow icon (blue circle) on upper left and execute software again.

- (13)Set the [Select VRU COM Port], [Robot Connect], and [IP Address]. For details, refer to the following:
  - 6.3 Read VRT Parameters
- (14)Select the [Read VRT parameter] tab.
- (15)Click the [Start] button and set to be waiting for trigger condition. The [Waiting for trigger] is lighted up in green.
- (16) The robot is at end position (P2) since VRT\_A\_Find\_ExPnt is executed. Select "VRT\_ReadParam" on the [Run] window. After confirming that the robot is at the end position (P2), click the [Start] button. Read parameters.

# 6.7 Restrictions

After reading VRT parameters and confirming effect, make sure to delete the "VRT\_Trigger" command from the program immediately. "VRT\_Trigger" command is disabled unless the trigger of reading VRT parameters will be wait condition. However, delete the command to prevent unnecessary commands from being executed.

Only one VR unit can be connected. When you want to measure more than one robot or other vibrating positions, re-install the unit to measure.

# 7. Software Window Layout

# 7.1 Epson RC+ GUI (VRT Tab)

Select Epson RC+ menu-[Tools]-[Robot Manager]-[VRT] tab to display the following window. Set VRT parameters.

PartFeeding.prg ×	Main.prg	Command	윩 Rol	bot Manager	×		
Robot: 1, robot1, C4-A6015	5 `	<ul> <li>EStop</li> </ul>	Safe	guard	Error		
Motor Off Downer		l and la a	d Task o				
Motor, On Power, L	.ow Reset	Local:	001:0				·
💠 Jog & Teach	VRT						Apply
Doints	Define VRT par	ameters					Restore
Hands	Enable V	RT during CP (	VRT CPMot		arameter reading	Test	Clear
		Kr duning Cr (	VICI_CFINIOU				
Arch	Manually define	e VRT					
人 Locals	VRT	Label	Param 1	Param 2	Description		
	1						
🟹 Tools	3						
Pallets	4						
HI Functs	5						
ECP ECP	6						
A Payres	7						
D boxes	9						
Planes	10						
9	11						
Weight	12						
A Inertia	13						
	14						
	15						
XYZ Limits							
😭 Range							
🗳 Home Config							
			_				

When selecting the [VRT] tab, all VRT parameter values that user can define are displayed.

If the [VRT] tab is not displayed, the VRT option's key is not set. Refer to the following section to set the option's key.

#### 5.2 Enable VRT Option

Values set by Robot Manager are saved if the controller is turned OFF.

Items	Descriptions
Enable VRT during CP	Set enable/disable of VRT function. (During CP motion)
(VRT_CPMotion)	Default: disable
Label	Set labels of the selected VRT number (optional)
Param1	Set value of VRTParam1.
	Setting range: 100 to 500
Param2	Set value of VRTParam2.
	Setting range: 100 to 500
	VRTParam2 value should be $\pm 10\%$ or more than VRTParam1.
Description	Set descriptions of the selected VRT number (optional)
Apply	Set the current value.
	Processes take a few seconds.
Restore	Restore to previous value.

Items	Descriptions
Clear	Delete all selected values.
Select VRT number	When selecting the number set VRT parameter, VRT function of the number is applied to subsequent robot motion.
	However, if VRT command is executed during the motion, the setting takes priority
	0: VRT OFF
VRT Parameter reading	Start the VR software.
VRT Parameter reading	Installing the VR software is necessary.
Test	Start the VR Unit Check (Software).
Test	You can check if VR unit is not malfunctioning with VR Unit Check. Refer to following for more information.
	10.3 VR Unit Confirmation
	Installing the VR software is necessary.

# 7.2 VR Software

The following items are necessary to use VR software.

Epson RC+ 8.0 Ver. 8.0.0 or later VRT option

VR unit

#### 7.2.1 How to Activate

Use either way to activate VR software.

- With Epson RC+ 8.0, click the [Robot Manager]-[VRT]- [VRT Parameter reading] button.
- Activate: C: \EpsonRC80\exe \VR\_SW.exe



a: Common part Vibration Reduction Technology Rev.1

b: Start date of activat	tion
c: Start time of activat	tion
d: Read parameters	[Read VRT Parameter] Receive signals from VRT_Trigger command and calculate VRT parameter by results of vibration measurement by VR unit.
e: Create short movem	nent
	[Short movement] When the wring is difficult, create a program to measure with short moving distance.
If the VR software do	bes not start properly, refer to the following section and troubleshoot

NOTE

If the VR software does not start properly, refer to the following section and troubleshoot the error.

10.2 Troubleshooting VR Software Errors

Items	Descriptions
During execution  Not in execution	Show the program conditions. The following buttons are enabled during the program execution: Start button Generate program button
Pause	Pause the program execution. Pause the program (waiting for trigger). (Same function as the Stop button.)
Select VR Unit COM Port	Select and set COM Port number. COM Port number is set when connecting VR unit and PC with USB cable.
Robot Connect	Select the connection of Epson RC+ and robot from below.
IP Address	Set IP address. Setting is required when selecting "Ethernet 1" on [Robot Connect].
Stop Stop	Release the waiting for trigger condition. (Same function as the Pause button.)

# 7.2.2 Common part

# 7.2.3 [Read VRT Parameter] Tab

Receive signals from VRT\_Trigger command and calculate VRT parameter by results of vibration measurement by VR unit.

Items	Descriptions
Start Start	Start the waiting for trigger condition.
VRT Parameter	Show VRT parameter values. Parameters are calculated by vibration measurement.
Trigger* tab	<ul><li>Show the measurement result.</li><li>*: Support the value (1 to 4) specified by "VRT_Trigger" command.</li></ul>
Trigger condition display Waiting for trigger	Show the trigger condition. Display is lighted up in green while waiting for trigger. Execute the robot motion program that added VRT_Trigger while the display is lighted up.
Condition display           Waiting for trigger	Show the execution condition of VR software. In preparation Waiting for trigger Reading the vibration data Calculating VRT parameter Reading parameter was completed!! Stop program! Stop clicked
Save graph	<ul> <li>Place a checkmark :         <ul> <li>Display, save, and output the graph of vibration measurement result on [Saved vibration waveform].</li> <li>Latest measurement result is overwritten.</li> </ul> </li> <li>Do not place a checkmark:         <ul> <li>Measured results are not displayed, saved, and overwritten.</li> </ul> </li> </ul>

Graph

pration Reading S/W (RC+ 8.0 or higher)	Ver. 3.0.1
Select VR Unit COM Port Robot Connect IP Address	
Read VRT parameter Short movement	
Start Waiting for trigger	Waiting for trigger
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value.
120 1 50 0 0 0 0 0 0 0 0 0 0 0 0 0	0.02 0.01 0.02 0.01 0.02 0.02 0.02 0.05 0.75 1 1.25 Time[s]
Saved vibration waveform	Saved vibration waveform

Show history of the measured values.

- 1. Acceleration after reaching the destination point. (Vertical axis: Accel mG, Horizontal axis: Time sec)
- Displacement after reaching the destination point. (Vertical axis: Displacement mm, Horizontal axis: Time sec)
- 3. Acceleration history that measured after placing a checkmark on [Save graph]
- 4. Displacement history that measured after placing a checkmark on [Save graph]

Displacement on the graph is calculated by values measured in acceleration. It is not precise value

To measure precise value, use dedicated measurement equipment.

Use displacement value output from this function as rough guide to check VRT function.

#### Graph extension function:

Right-click inside the graph to display the menu as shown below:

Copy Data	Plot Legend	
Description and Tip Visible Items	Scale Legend Graph Palette	
Clear Graph Create Annotation	Cursor Legend X Scrollbar	
Delete All Annotations	✓ X Scale	
✓ AutoScale X ✓ AutoScale Y	✓ Y Scale Unit Label	
✓ Smooth Updates		Export Data To Clipboard
✓ Ignore Time Stamp		Export Data To Excel
✓ Ignore Attributes		Export Data To DIAdem
Export		Export Simplified Image

To use the graph data, select [Export]-[Export Data to Excel]. You can use the data in Excel etc.,.

Items	Descriptions		
Copy data	Copy the image(s) of selected graph		
Description and Tip	Graph descriptions		
Visible Items	Plot Legend : Show the plot name		
	Scale Legend : S	how legend of each axis scale.	
	Graph Palette : S	how the palette for operating graph.	
	Cursor Legend : S	how cursor legend.	
	X Scrollbar : S	how scroll bar of X-axis	
	X Scale : S	how X-axis values	
	Y Scale : S	how Y-axis values	
	Unit Label : S	how unit	
Clear Graph	Clear the displayed graph		
Create Annotation	Create annotations in the graph.		
Delete All Annotations	Delete all annotations created in [Create Annotation].		
AutoScale X	Auto scaling X value		
AutoScale Y	Auto scaling Y value		
Smooth Updates	Reduce to generate flicker when plotting a graph (Speed will be slow.)		
Ignore Time Stamp	Ignore time stamp of X value		
Ignore Attributes	Ignore the attributes of plot name and graph scale.		
Export	Export Data to Clipboard	Copy the data to clipboard. Use "Paste" to output the data.	
	Export Data to Excel	Copy the data to Excel. Excel is started automatically.	
	Export Simplified image	Export the image in the following format.	
		Export Simplified Image × Bitmap (.bmp) Encapsulated Postscript (.eps) Enhanced Metafile (.emf) Export to clipboard Save to file Hide Grid Export Cancel Help	

How to change the Y-axis scale:

Y-axis scale can be changed by either of the following ways:

Right-click on the graph and remove a checkmark on [AutoScale Y].

Double-click the values on the graph and change it directly.

# 7.2.4 [Short movement] Tab

When the wring is difficult, create a program to measure with short moving distance.

Items	Descriptions		
Generate program	Generate SPEL+ program for short distance motion. Click the button when all settings have completed. Generated program: C:\EpsonRC80\projects\VRT\VRT_smalldrive.prg Click the button to pause the software. The following message is displayed. This program created c:\EpsonRC80\Projects\VRT\VRT_smalldrive.prg (For default path) Please import this file in RC+. OK		
Robot No.	Specify the robot number to measure vibrations (install VR unit). Setting values: 1 to 16		
Move instruction	Select move instruction (motion command) to measure vibration. Options: Go , Move , Jump		
Point number of destination point Destination point no. 1	Input a point number of the end point (destination point) (motion that has been vibrating). Setting value: integer number		
Arm No.	Set additional arm number of the robot that measures vibration. Setting value: 0 to 15		
Tool No. 0  ∇	Set robot tool number of the robot that measures vibration. Setting value: 0 to 15		
Weight 1 Kg	Set the weight of hand that the arm is installed. Unit: kg		
Innertia (Left) 0 Kg*m^2	Left: Set inertia moment around the center of the tip joint including hand and workpiece. (inertia) Unit: kgm <sup>2</sup>		
(Right) 0 mm	Right: Set distance from the center of inertia of hand and workpiece of the center of the tip joint. Unit: mm		

Go, Jump: Items	Descriptions
Speed	Specify as a percentage of maximum motion speed. Setting value: integer number from 1 to 100 Unit:%
Accel	Specify as a percentage of maximum acceleration. Setting value: integer number 1 or more Unit: %
Decel	Specify as a percentage of maximum deceleration. Setting value: 1 or more Unit: %

Jump: Items	Descriptions
Departure Speed	Set speed of departure motion. Setting value: integer number from 1 to 100 Unit: %
Approach Speed	Set speed of approach motion. Setting value: integer number from 1 to 100 Unit: %
Departure Accel	Set acceleration of departure motion. Setting value: integer number 1 or more Unit: %
Approach Accel	Set acceleration of approach motion. Setting value: integer number 1 or more Unit: %
Departure Decel	Set deceleration of departure motion. Setting value: integer number 1 or more Unit: %
Approach Decel	Set deceleration of approach motion. Setting value: integer number 1 or more Unit: %

Move: Items	Descriptions
SpeedS 30 mm/sec	Set speed in real number. Unit: mm/sec
AccelerationS	Set acceleration in real number. Unit: mm/sec^2
DecelerationS	Set deceleration in real number. Unit: mm/sec^2

Item	Description
Operation step after generating a program	Steps after clicking the [Generate program] button are displayed.
After clicking "Generate program"	After clicking "Generate program", execute the following operation on RC+. 1. File import "c:\#EpsonRCBo\\\\YETYEVRT_smalldrive.prg" (For defalt folder) 2. Move to start point. (Required) 3. Find to excitation start point. Run "VRT_A_Find_ExPnt" (Moved to end point) 4. Click start button on "Read VRT parameter" tab of this program [VR Unit S/W] 5. Run "VRT_ReadParam" or RC+ (Reading VRT parameter) OK

# 7.2.5 Input Window for Motion Command

Items displaying on [Detail data] differ depending on specified command on [Required fields]-[Move instruction].

Go

ation Reading S/W (RC+ 8.0 or higher) Elect VR Unit COM Port Robot Connect IP Address COM 2  USB  Elect VR Unit COM Port USB  Elect VR Unit Comment I		Ver. 30.1 Y/M/D H: M::
Severate program for short movement Use when cable setting is difficult. (For short distance excitation This program uses a drive program to find the short drive start p Decayliced fields	) ioint.	Generate program
Detail data Arm No.	Go Tool No.	Destination point no. 1
Weight         1         Kg           Inertia         0         Kg*m*2           Speed         30         %           Accel         30         %	Decel	0 mm
After clicking "Generate program"		

	+ 8.0 or higher)	Ver. 3.0.1
Select VR Unit COM Port Robot Co	onnect IP Address	Y/M/D H: M: \$
Read VRT parameter Short moven	nent	Stop
Generate program for short r Use when cable setting is difficult. (F This program uses a drive program t	novement for short distance excitation) to find the short drive start point.	Generate program
Required fields Robot No. 1	Command Move	Destination point no.
Detail data	0 ml Tool	No. 0 E
Weight		
Inertia	0 Kg*m^2	o mm
SpeedS	30 mm/sec	1
AccelerationS	30 mm/sec^2	
	30 mm/sec^2	
DecelerationS		
DecelerationS		
DecelerationS		

Jump

Select VR Unit COM Port Robot Con	nect IP Addre	55	Y/M/D H:M
Read VRT parameter Short moveme	nt		
Generate program for short me Use when cable setting is difficult. (For This program uses a drive program to	ovement short distance excita ind the short drive sta	tion) art point.	🥜 Generate program
Required fields Robot No. 1	√ Comma	and Jump   Destina	tion point no. 1
Detail data			
Arm No.	0	Tool No.	0
Weight	1 Kg		
Inertia	0 Kg*m	^2	0 mm
Speed	30 %		
Accel	30 %	Decel	30 %
Departure Speed	30 %	Approach Speed	30 %
Departure Accel	30 %	Approach Accel	30 %
Departure Decel	30 %	Approach Decel	30 %
			,

# 8. SPEL+ Command Reference

VRT	Select VRT number or display the selected VRT number.
VRT Function	Returns the current VRT number.
VRT_Clr	Clear the setting of VRT function.
VRT_CPMotion	Specifies whether enable or disable VRT function during CP motion.
VRT_CPMotion Function	Returns enable or disable VRT function during CP motion.
VRT_Def Function	Returns setting status of selected VRT number.
VRT_Description	Define a description for selected VRT number
VRT_Description\$ Function	Returns description of selected VRT number
VRT_Label	Define a label to selected VRT number.
VRT_Label\$ Function	Returns label of selected VRT number.
VRT_Number Function	Returns VRT number that corresponding VRT label.
VRT_Set	Define VRTParam1 and VRTParam2 of VRT function for each
	VRT number.
VRT_Set Function	Returns setting value of VRTParam1 and VRTParam2 that is set for
	each VRT number.
VRT_Trigger	Output measurement trigger to VR software.

# VRT

Select VRT number or display the selected VRT number.

## Syntax

(1) RT VRT number||VRT label(2) VRT

#### **Parameters**

VRT number	Specify VRT number (total is 16: integer from 0 to 15) to use
VRT label	Specify VRT label.

#### **Return Values**

When parameters are omitted, the current VRT number is displayed.

#### Description

VRT function reduces vibration due to robot motion by using VRT parameters that are set for each VRT number. Also, VRT function is disabled when VRT number is "0".

#### Note

#### Effect on VRT number when Power OFF

Selected VRT number does not change if turning OFF the power.

#### See Also

VRT\_Set, VRT\_CPMotion

#### **VRT Example**

**VRT** 1 Go XY(200, 200, 0, 0)

# **VRT** Function

Returns the current VRT number.

#### Syntax

VRT

## **Return Values**

Returns VRT number by the integer.

#### See Also

VRT

#### **VRT Example**

Print **VRT** 

# VRT\_Clr

Clear the definition of VRT function.

## Syntax

VRT\_Clr VRT number||VRT label

## Parameters

VRT number	Integer expression specifying VRT number to clear.	
	(VRT number 0 is default.	Cannot clear.)
VRT label	Specify VRT label to clear.	

## See Also

VRT\_Set, VRT\_CPMotion

### VRT\_CIr Example

VRT\_Clr 1

# VRT\_CPMotion

Specifies whether enable or disable VRT function during CP motion.

#### Syntax

- (1) VRT\_CPMotion {On|Off}
- (2) VRT\_CPMotion

#### Parameters

On Off	On: Enable VRT function during CP motion.
	Off: Disable VRT function during CP motion.

#### **Return Values**

When parameters are omitted, the current VRT\_CPMotion definitions are displayed.

#### Description

VRT function is only available for PTP motion. You need to turn On the VRT\_CPMotion to function in CP motion. For details of motion commands that VRT function can perform, refer to the table below.

Motion commands that VRT function can function and cannot function.

Motion command	VRT_CPMotion OFF	VRT_CPMotion ON
Go, BGo, TGo	OK	OK
Jump	OK	OK
JTran	OK	OK
PTran	OK	OK
Move, BMove, TMove	_	OK
FCSMove	_	OK
Arc	_	OK
Arc3	_	OK
CvMove	_	OK
Jump3CP	_	OK
Jump3(JumpTlz)	_	OK

- Initial definition of VRT\_CPMotion is OFF.

- If turning VRT\_CPMotion ON, automatically SoftCP turns ON.

- Cannot use with conveyor tracking or force control function. (VRT function automatically disabled.)

#### Note

## Effect on VRT\_CPMotion when Power OFF

Definition of selected VRT\_CPMotion does not change if turning OFF the power.

#### See Also

VRT, VRT\_Set

#### VRT\_CPMotion Example

VRT\_CPMotion On

# VRT\_CPMotion Function

Returns enable or disable VRT function during CP motion.

## Syntax

VRT\_CPMotion

#### **Return Values**

0 = VRT is disabled during CP motion.

1 = VRT is disabled during CP motion.

#### See Also

VRT, VRT\_Set

#### VRT\_CPMotion Example

Print VRT\_CPMotion

# VRT\_Def Function

Returns definition status of selected VRT number.

## Syntax

VRT\_Def (VRT number|VRT label)

### Parameters

VRT number	Integer expression specifying VRT number to return the status.
VRT label	Specify the VRT label to return the status.

## **Return Values**

Returns "True" when parameter is defined in specified VRT number and returns "False" when parameter is not defined in specified VRT number.

#### See Also

VRT\_Set, VRT\_CPMotion

## VRT\_ Def Example

Print VRT\_ Def(1)

# VRT\_Description

Define a description for selected VRT number.

## Syntax

VRT\_Description VRT number|VRT label, "Comment"

#### Parameters

VRT number	Integer expression specifying VRT number to description.	
	(VRT number 0 is default. Cannot define a description.)	
VRT label	Specify VRT label.	
Comment	Define a random character string (except NULL character) that is less than 255 words.	

## See Also

VRT\_Set, VRT\_CPMotion

### VRT\_Description Example

VRT\_Description 1, "Comment"

# VRT\_Description\$ Function

Returns description of selected VRT number.

## Syntax

VRT\_Description (VRT number|VRT label)

#### Parameters

VRT number	Integer expression specifying VRT number to return descriptions.
VRT label	Specifies VRT label that returns description.

#### **Return Values**

Returns defined descriptions of VRT number as a string.

### See Also

VRT\_Set, VRT\_CPMotion

## VRT\_Description Example

# VRT\_Label

Define a label to selected VRT number.

## Syntax

VRT\_Label VRT number, "Label"

## Parameters

VRT number	Integer expression specifying VRT number to define a label.	
	(VRT number 0 is default. Cannot define a description.)	
Label	Define a random character string (except NULL character) that is less than 32 words.	

## See Also

VRT\_Set, VRT\_CPMotion

## VRT\_Label Example

VRT\_Label 1, "Label"

# VRT\_Label\$ Function

Returns label of selected VRT number.

## Syntax

VRT\_Label(VRT number)

#### Parameters

VRT number Integer expression specifying VRT number to return a label.

## **Return Values**

Returns defined VRT label as a string.

#### See Also

VRT\_Set, VRT\_CPMotion

#### **VRT\_Description Example**

Print VRT\_Label\$(1)

# VRT\_Number Function

Returns VRT number that corresponding VRT label.

## Syntax

VRT\_Number(VRT label)

#### **Parameters**

VRT label Specify VRT label to return VRT number.

#### **Return Values**

Returns number of specified VRT label.

## See Also

VRT\_Set, VRT\_CPMotion

# VRT\_Set

Define VRTParam1 and VRTParam2 of VRT function for each VRT number.

#### Syntax

- (1) VRT\_Set VRT number||VRT label, VRTParam1, [VRTParam2](2) VRT\_Set VRT number||VRT label
- (3) VRT\_Set

#### Parameters

VRT number	Integer number (1 to 15) representing VRT number to define.
	(0 is default. Cannot be specified.)
VRT label	Specify the VRT label to define.
VRTParam1	Define a value of VRTParam1. Definition range is from 100 to 500.
VRTParam2	Define a value of VRTParam2. Definition range is from 100 to 500. Also,
	VRTParam2 should be defined a value that differs $\pm 10\%$ or more compared to
	VRTParam1.

### **Return Values**

When parameters are omitted, the current VRT definition value is displayed.

#### Description

VRT function reduces vibration due to robot motion by using definition value of VRTParam1 and VRTParam2.

### See Also

VRT\_Set, VRT\_CPMotion

#### VRT\_Set Example

**VRT\_Set** 1, 100, 2000

# VRT\_Set Function

Returns definition value of VRTParam1 and VRTParam2 that is define for each VRT number.

## Syntax

VRT\_Set (VRT number|VRT label, VRTParam)

#### Parameters

VRT number	Integer number (1 to 15) representing VRT number to define.
	(0 is default. Cannot be specified.)
VRT label	Specify the VRT label.
VRTParam	Specify VRTParam1 to return VRTParam1.
	Specify VRTParam2 to return VRTParam2.

Constant	Value
VRTParam1	1
VRTParam2	2

#### **Return Values**

Returns definition value of VRTParam1 or VRTParam2 in integer value.

#### See Also

VRT\_Set, VRT\_CPMotion

### VRT\_Set Example

Print VRT\_Set(1, VRTParam1)

# VRT\_Trigger

Output measurement trigger to VR software.

#### Syntax

VRT\_Trigger(VRTTrigger number)

#### Parameters

VRTTrigger number Integer number (1 to 4) representing VRTTrigger number to define.

#### **Return Values**

Output measurement trigger to VR software.

#### Description

When executing the robot motion by using VRT\_Trigger command, Waiting time (approx. 1.5 seconds) occurs. (If releasing from the waiting for trigger condition of VR software, automatically added Waiting time will not occur.)

In the following cases, compile error occurs:

Use motion command other than Go, Jump, and Move

Path motion is enabled.

Use it with Force Control function

Use Till command

Use Find command

Use Sense command

Use it with !Parallel Processing!.

Use it with conveyor tracking function.

Use it with ECP function.

#### VRT\_Trigger Example

Go P1 VRT\_Trigger 1

# 9. SPEL+ Command

# 9.1 Example

Example 1: VRT number: 1 parameter Main case: Use VRT function to all motion.

```
Function main
Motor On
Power High
Speed 100
Accel 100, 100
VRT_Set 1, 150, 300
VRT 1
Go XY(200, 200, 0, 0)
Go XY(-200, 200, 0, 0)
Fend
```

#### Example 2: VRT number: 2 parameters

Main case: Use two VRT parameters. Enable/disable VRT function.

Function main Motor On Power High Speed 100 Accel 100, 100 VRT\_Set 1, 150, 300 VRT\_Set 2, 100, 200 VRT 1 Go XY(200, 200, 0, 0) Go XY(-200, 200, 0, 0) VRT 0 Go XY(-150, 200, 0, 0) VRT 2 Go XY(-120, 200, 0, 0) Fend

Example 3: Do not change VRT number and change VRT parameter.

Function main Motor On Power High Speed 100 Accel 100, 100 VRT\_Set 1, 150, 300 VRT 1 Go XY(200, 200, 0, 0) Go XY(-200, 200, 0, 0) VRT\_Set 1, 250, 350 Go XY(-150, 200, 0, 0) Go XY(-120, 200, 0, 0) Fend

```
Example 4: Use VRT function in CP motion
```

```
Function main
Motor On
Power High
Speed 100
Accel 100, 100
SpeedS 2000
AccelS 25000, 25000
VRT_Set 1, 150, 300
VRT_1
VRT_CPMotion On
Go XY(200, 200, 0, 0)
Move XY(-200, 200, 0, 0)
Fend
```

Note: As shown below, path motion cannot be operated by motions that VRT function automatically "disabled" and "enabled". (Path motion is "disabled" automatically.)

```
VRT 1
VRT_CPMotion Off
Go P1 CP
Move P2
```

# 9.2 SPEL+ Command Use Condition List

Command window	Command can be used in the command window.
Program	Command can be used as a statement in the SPEL <sup>+</sup> program.
Function	Command can be used as a function.

Command		Command Window		Drogrom	Function
	Command	RC+	TP3/TP4	Program	FUNCTION
V	VRT	$\checkmark$	~	✓	$\checkmark$
	VRT_Clr	✓	~	✓	-
	VRT_CPMotion	✓	~	✓	$\checkmark$
	VRT_Def	✓	~	-	✓
	VRT_Description	✓	~	✓	-
	VRT_Description\$	✓	~	-	✓
	VRT_Label	✓	~	✓	-
	VRT_Label\$	✓	~	-	$\checkmark$
	VRT_Number	✓	~	-	$\checkmark$
	VRT_Set	$\checkmark$	~	✓	$\checkmark$
	VRT_Trigger	$\checkmark$	~	✓	-

The following (	commands cannot	be executed in	NoEmgAbort task	and background task
The following v		be executed in	Tobling toolt task	and buckground usk.

A	Accel	G	Go	S	Sense	V	VLoad
	AccelR	Н	Home		SFree		VLoadModel
	AccelS		HomeClr		SingularityAngle		VRun
	Arc		HomeSet		SingularitySpeed		VRT
	Arc3		Hordr		SLock		VRT Set
	Arch	I	Inertia		SoftCP		VRT CPMotion
	Arm	J	JTran		Speed		VSave
	ArmSet		Jump		SpeedFactor		VSaveImage
	ArmClr		Jump3		SpeedR		VSaveModel
	AutoLJM		Jump3CP		SpeedS		VSet
	AvoidSingularity		JRange		SyncRobots		VShowModel
В	Base	L	LimitTorque	Т	TC		VStasShow
	BGo		LimZ		TGo		VStatsReset
	BMove		LimZMargin		Till		VStatsResetAll
	Box		Local		TLSet		VStatsSave
	BoxClr		LocalClr		TLClr		VTeach
	Brake	М	MCal		TMove		VTrain
С	Cnv_AbortTrack		MCordr		Tool	W	WaitPos
	Cnv_Accel		Motor		Trap		Weight
	Cnv_DownStream		Move	V	VCal	Х	Xqt *3
	Cnv_Fine	0	OLAccel		VcalPoints		XYLim
	Cnv_Mode	Р	Pass		VCls		
	Cnv_QueAdd		Pg_LSpeed		VCreateCalibration		
	Cnv_QueMove		Pg_Scan		VCreateObject		*1: Reset Error is
	Cnv_QueReject		Plane		VCreateSequence		executable
	Cnv_QueUserData		PlaneClr		VDefArm		
	Cnv_Trigger		Power		VDefGetMotionRange		*2: Executable from
	Cnv_UpStream		PTPBoost		VDefLocal		the Trap Error
	СР	_	Pulse		VDefSetMotionRange		processing task
	Curve	Q	QP		VDefTool		
	CVMove		QPDecelR		VDeleteCalibration		*3: Executable from
Е	ECP		QPDecelS		VDeleteObject		the background
	ECPClr	R	Range		VDeleteSeuence		tasks
_	ECPSet		Reset *1		VGet		
F	Find		Restart *2		VGoCenter		
	Fine						

## See Also

Function/Fend, Halt, Resume, Quit, Startmain, Trap

# 10. Troubleshooting

# 10.1 SPEL<sup>+</sup> Error Massages

To get remedy for any SPEL<sup>+</sup> error, place the cursor on the error message in the run or command window and press the F1 key.

No.	Message	Remedy	Note 1	Note 2
2211	Cannot clear VRT ' 0 '.	The VRT number 0 cannot be cleared. Review the program.		
2212	Cannot clear the specified VRT number while in use.	The VRT cannot be cleared while it is in use. Check whether the VRT is not used.	VRT number	
2214	VRT number is out of range.	Available VRT numbers are from 1 to 15. Review the program.		
2215	Parameter is not defined in specified VRT number.	Parameter is not defined in specified VRT number. Review the VRT number.		
2375	Label name length is out of range	The label name length is 32 words. Review the label name.	1:VRT	
2376	Description length is out of range.	Description length is 255 words. Review the Description.	1:VRT	
2547	The option cannot be used.	Enable the option.	1:VRT	
2554	Duplicate data label. Specified label name is already used. Change the label name.	Change the label name.	1:VRT	
2555	Specified label was not defined. Specify a defined Label.	Specify a defined Label.	1:VRT	
4244	When VRT function was used, Improper acceleration reference was generated.	You attempted to operate the robot with the acceleration reference exceeding the specified value. Decrease the Accel and AccelS value.		
4245	When VRT function was used, Improper speed reference was generated in high power mode.	You attempted to operate the robot with the acceleration reference exceeding the specified value. Decrease the Accel and AccelS or Speed and SpeedS value.		
4246	When the VRT function was used, the route error occurred.	Change the value of VRTParam1 and VRTParam2 or disable the VRT function.		
4247	When the VRT function was used, The internal operation error occurred.	Change the value of VRTParam1 and VRTParam2 or disable the VRT function.		

# 10.2 Troubleshooting VR Software Errors

VR Software starting error: If you had the error below when starting VR software, your PC may be equipped with an AMD Ryzen processor. In that case, set the Windows system environment variables as shown in the

steps below.

sadin	ġ.		3 Los
#Eps	onRC80WEXEWVRU_Op	oCheck.exe¥1abvi3w¥vi.lib¥Instr¥_visa	IbWSA Configure Serial
ort ()	<b>H</b>		×
earch	Missing external fur	nction Ivanlys.dlbMean_head:C in VI \	RUnitCheck_V300.vi.
at pt		OK	

(1) Open the environment variables window. (The steps are different for Windows 10 and 11.)

Windows 10:

- 1. Open the Control Panel.
- 2. Select [System and Security]-[System]-[About]-[Advanced system settings]-[Advanced]-[Environment Variables].
- 3. "Environment Variables" window will open.

Windows 11:

- 1. Open the Windows Settings.
- 2. Select [System]-[About]- [Advanced system settings]-[Advanced]-[Environment Variables].
- 3. "Environment Variables" window will open.

Variable	Value	
OneDrive	the second se	
Path	CONTRACTOR AND AND A DESCRIPTION OF A DE	
TEMP	and the second se	
тмр	Construction (Spinster, etc.), Support	
	New Edit Dele	
	New Edit Dele	te
	New Edit Dele	te
rstem variables	New Edit Dele	te
rstem variables Variable	New Edit Dele	te
rstem variables Variable ComSpec	New Edit Dele	te
rstem variables Variable ComSpec DriverData	New Edit Dele	te
rstem variables Variable ComSpec DriverData NUMBER_OF_PROCESSORS	New Edit Dele	te
stem variables Variable ComSpec DriverData OS	New Edit Dele	te
rstem variables Variable ComSpec DriverData NUMBER_OF_PROCESSORS OS Path	New Edit Dele	te
variables Variable ComSpec DriverData NUMBER_OF_PROCESSORS OS Path PATHEXT	New Edit Dele	te
stem variables Variable ComSpec DriverData NUMBER_OF_PROCESSORS OS Path PATHEXT PROCESSOR ARCHITECTURI	New Edit Dele	te
rstem variables Variable ComSpec DriverData NUMBER_OF_PROCESSORS OS Path PATHEXT PROCESSOR ARCHITECTURI	New Edit Dele	te

(2) Click [New] of [Environment Variables] (red circle in the above figure). Following "New System Variable" window will open.

Enter as follows and click the [OK] button.

Variable name: MKL\_DEBUG\_CPU\_TYPE

Variable value: 4

New System Variable		×
Variable name:	[	
Variable value:		
Browse Directory	Browse File	OK Cancel

This section describes errors occurred in VR software and countermeasures.

ration Reading S/W (RC+ 8.0 or higher)	Ver. X.X.X
ielect VR Unit COM Port Robot Connect IP Address	У/M/D H:M
Read VRT parameter Short movement	
▷ Start Waiting for trigger ④	
Trigger1 Trigger2 Trigger3 Trigger4	Notes : Displacement value is not an exact value.
VRT Parameter 0 Vibration waveform	Vibration waveform
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	E 0 -0.01 -0.02 -0.02 -0.02 -0.02 -0.05 -0.75 -0.1
Save graph Saved vibration waveform	Saved vibration waveform
40 (0 20 20 20 20 20 20 20 20 20 20 20 20 20	E 0.02 H 0.01 H 0.01
-160 0.25 0.5 0.75 1 1.25 1.5	⊠ -0.02 0 0.25 0.5 0.75 1 1.25 1.5 Time[e]

Connection error	of VR unit		
Error display	VR Unit COM Port is not defined !	VR Unit COM Port is not defined! Unit Sampling Mode Error	
Countermeasure	Confirm that USB cable is c When the cable is connected back of USB connection par If there is no problem with the Select COM Port number of Port].	connected properly. d properly, red lamp is lighted up in the t of VR unit. ne connection, execute VR software again. f VR unit on VR software-[Select COM	
Connection error with Robot			
-----------------------------	---	--	--
Error display	Robot Connection Error !!	Robot Connection Error!! Proxy initialization error! Check robot Connection.	
Countermeasure	Make sure that the connection methods of VR software-[Robot Connect] and Epson RC+ - the robot are the same. When changing the settings, execute VR software again.		

Other error	
Error display	
	Time Out (3min) Error!
	Stop
Countermeasure	If VRT_Trigger command is not executed for 3 minutes by Epson RC+ with waiting for Trigger condition, "Time Out" error occurs.
	Execute VR software again.

## 10.3 VR Unit Confirmation

There is software to confirm whether sensor of VR unit is broken.

VR unit has function to measure acceleration. Read acceleration of gravity and determine whether the VR unit is normal.

- (1) Follow the either way to activate the software for the sensor confirmation.
  - With Epson RC+ 8.0, click the [Robot Manager]-[VRT]-[Test] button.
  - Activate "C: \EpsonRC80\exe\VRU\_OpCheck.exe"

B <sup>1</sup> VR Unit Check	
Vibration Reading Unit operation check	Ver. 3.0.1
<u>Y/M/D</u> H: M: S	
Unit setting Select COM Port	Serial No.
Unit check Progress Start	
Click start !	

- (2) Place the VR unit to position where the unit can stand still. If the unit does not move, you can place the unit on tilted surface. At this time, you can check the VR unit even if it is not installed on the robot.
- (3) Connect the VR unit and PC with USB cable.
- (4) Select USB COM number of VR unit on [Unit setting –Select COM Port].

VR Unit Check	
Vibration Reading Unit operation check	Ver. 3.0.1
Y / M / D H: M: S	
Unit setting Select COM Port	Serial No.
Unit check Progress	
Start	
Check result	
Click start !	

(5) Click the [Start] button to start measurement.

5 seconds after starting the measurement, measurement results are displayed on [Check result].

Berg VR Unit Check	-		×
••• •			
Vibration Reading Unit operation check		Ver	. 3.0.1
Unit setting Select COM Port	Seria 0000	al No. 2122	
Unit check Progress Start Check result Checking			

When "OK!" is displayed:

VR unit operates properly.

Big VR Unit Check	
File Edit Operate Tools Window Help	Unitt
Vibration Reading Unit operation check	Ver. 3.0.1
Y/M/D H:M: Unit setting Select COM Port	Serial No.
Unit check Progress	
Check result	

When "Retry" is displayed:

VR unit may not be stood still.

VR Unit Check	
File Edit Operate Tools Window Help	Uniit CHECK
Vibration Reading Unit operation check	Ver. 3.0.1
Y/M/D H:M:	
Unit setting Select COM Port	Serial No.
Unit check Progress Start	
Check result Retry	

Click the Execution button and the [Start] button.

If "OK" is not displayed on [Check result] after clicking the Execution button and the [Start] button repeatedly, please contact us.

(6) Ends the sensor confirmation software.

## 10.4 Confirmation of Saved Controller Condition

You can confirm the conditions of saved controller.

 Select Epson RC+ 8.0 menu-[Tools]-[Controller] menu to open the [Controller Tools] dialog.

💥 Controller Tools	? X		
<u>B</u> ackup Controller	Save all controller data and status to a PC folder.		
Restore Controller	Restore all controller data from a previous backup.		
<u>V</u> iew Controller Status	View controller status from a previous backup.		
Maintenance	View maintenance data and configure alarms.		
Reset Controller	Reset controller to startup state		
	Close		

(2) Click on the [View Controller Status] button to open the [Browse For Folder] dialog.

Browse For Folder		
Select folder for controller status to view		
V 🔒 Backup	^	
B_Virtual_00000_2023-04-25_164001		
> Controller		
> Conveyor		
> Default		
DefaultLayout		
> EXE		
> Fieldbus		
> GUI		
Hardlock		
> Help	~	
OK キャンセル	,	
	:	

(3) Select the folder where the information is stored.

NOTE

(P

B\_controller type\_controller serial number\_date/time

You can choose the folder that stored Controller status information.

BU\_controller type\_controller serial number\_date/time

(4) Click [OK] to view the selected controller status.

(5) The [Controller Status Viewer] dialog will be displayed.

📰 Controller Status V	liewer	?	×
Status <u>F</u> older: <mark>B_Virt</mark>	ual_00000_2023-04-25_164001 Status Date / Time: 2023-04	-25 16:40:01	
General Input / Output Tasks Robots System History Program Files Include Files Robot Points Force Force Sensor Part Feeders	General       Item       Controller Name       Controller Serial #       Firmware Version     7.5.4.9       Controller Total Hours     23.1       Controller Max On Hours     6.1       Project Name     Test_2       IP Address     IIP       IP Mask     IIP       IP Gateway     0.0.0       Options     ECP       ECP     Yes       PC Vision     Yes       OCR     Yes       GUI Builder     Yes       Fieldhuk Matter     Yes	Value	
	Legacy Force Sensing Yes VRT Yes		

- (6) Select items to view from the tree on the left side of the dialog.
- (7) To view another controller status, click the [...]button next to the [Status Folder] and select a new status folder.