JANOME DESKTOP ROBOT

JR3000 Series

JANOME CARTESIAN ROBOT

JC-3 Series

JANOME SCARA ROBOT

JS3 Series

Operation Manual

Communication Control
(COM/LAN)

Thank you for purchasing this Janome Robot.

- **Before using your robot, read this manual thoroughly and always make sure you use the robot correctly. In particular, be sure to thoroughly read "For Your Safety" as it contains important safety information.**

- **After reading this manual, store in a safe place that can be easily accessed at any time by the operator.**

Original Instructions

JANOME

PREFACE

This manual covers the JR3200, JR3300, JR3400, JR3500, JR3600, JC-3, and the JS3 Series.

There are several manuals pertaining to these robots.

Manual	Details	JR3000	JC-3	JS3
Read This First	• For Your Safety Be sure to thoroughly read “For Your Safety” as it contains important safety information. • Package Contents (JS3 Series only) Check the items included with your robot. • CD-ROM Contents Explains the CD-ROM contents.	✓	✓	✓
Setup (JR3000 / JC-3) Installation (JS3)	Explains how to set up the robot. ■ Make sure you read this manual when installing the robot ■ NOTE: This manual is designed for people who have received safety and installation training regarding the robot.	✓	✓	✓
Maintenance	Explains maintenance procedures for the robot. ■ Make sure you read this manual when performing maintenance ■ NOTE: This manual is designed for people who have received safety and maintenance training regarding the robot.	✓	✓	✓
Basic Instructions	Provides part names, data configurations, and the basic knowledge necessary to operate the robot.	✓ (Common)		✓
Quick Start	Explains the actual operation of the robot by creating and running simple programs.	✓ (Common)		✓
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.	✓ (Common)		✓
Functions I	Explains point teaching.	✓ (Common)		
Functions II	Explains commands, variables, and functions.	✓ (Common)		
Functions III	Explains functions such as All Program Common Settings and PLC programs.	✓ (Common)		
Functions IV	Explains Customizing Functions.	✓ (Common)		
External Control (I/O / Fieldbus)	Explains I/O and Fieldbus. Refer to this manual if you are using Fieldbus.	✓	✓	✓
Communication Control (COM/LAN)	Explains COM 1 – 3 and LAN communication control.	✓ (Common)		
Camera & Sensor Functions	Explains the functions of the attachable camera and Z position sensor.	✓ (Common)		

Manual	Details	JR3000	JC-3	JS3
Specifications	Outlines general specifications such as the robot's operating range, mass, etc.	✓	✓	—
Auxiliary Axis Functions	Explains the auxiliary axis functions.	✓ (Common)		
Application Specifications	Explains the specialized functions of the various application specifications.	Standard model: - Application model: ✓		

⚠ Warning

Do not handle or operate the robot in ways not covered in the manuals listed here.
Contact Janome (listed on the back of this manual) for repairs.
Failure to do so can cause electric shock or injury.

⚠ Caution

To make full use of the machine's functions and capabilities, make sure that you use the robot according to the correct handling/operation procedures that are written in the manuals pertaining to this robot.

If you turn OFF the power after making changes to robot's settings or data without saving, those changes are lost and the robot will revert to its original settings.
Make sure that you save any changes to data and/or settings.

Before using this robot for the first time, make sure you back up robot data and save the individual configuration information. Individual configuration information is needed when replacing internal circuit boards.
For details on how to back up robot data, refer to "3. BACKING UP AND RESTORING ROBOT DATA" in the operation manual *Setup* for the JR3000 Series, "6.1 Backing Up and Restoring Robot Data" in the operation manual *Setup* for the JC-3 Series, and "9.1 Backing Up and Restoring Robot Data" in the operation manual *Installation* for the JS3 Series.

- The descriptions within this manual are based on standard specifications. The menu item names etc. may vary depending on the model type.
- Menu items related to the Z axis may appear with 2 axis specifications; however settings made for these items are not applied.

- For information regarding optional additions for this robot, refer to "24. Specifications" in the operation manual *Specifications* for the JR3000 Series,“14. Specifications” in the operation manual *Specifications* for the JC-3 Series, and "15. Specifications" in the operation manual *Basic Intructions* for the JS3 Series. The notation “optional” is not used in the main text of this manual except for diagrams.
- Machine specifications may be modified without prior notice to improve quality.

- The proper name of Windows® is Microsoft®Windows® Operating System.
- Microsoft, Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Remarks:

- The operation methods described in this manual are indicated as follows:
  TP Operation via the teaching pendant
  PC Operation via PC (JR C-Points II)
- Click text that appears blue and is underlined to jump to that section.
  Example: Refer to “1. OVERVIEW.”

CONTENTS

FOR YOUR SAFETY

The safety notes outlined below are provided in order to ensure safe and correct usage of the product, and to prevent injury to the operator or other people, and damage to property.

・・・・・Be sure to follow the safety guidelines detailed here・・・・・

The safety terms and symbols in this manual indicate the risk and hazard.
Refer to the information below for understanding these terms and symbols.

■ Symbols that indicate the level of danger and/or damage.
The level of danger or damage that could occur as a result of ignoring these safety guidelines and misusing the press are classified by the following symbols.

⚠ **Danger**	This symbol indicates an imminent risk of serious injury or death.
⚠ **Warning**	This symbol indicates a risk of serious injury or death.
⚠ **Caution**	This symbol indicates the possibility of serious injury or damage to property.

■ The following symbols indicate the nature of the danger and any necessary safety precautions to be taken.

△	Indicates caution must be taken
⚠	Take Caution (General Precaution)
⊘	Indicates a forbidden action
⊘	Never do this (General Prohibition)
⊘	Do not disassemble, modify or repair.
⊘	Do not touch (Contact Prohibition)
●	Indicates a required action
❗	Be sure to follow instructions (General Requirement)
	Be sure to unplug the power supply cord
	Make sure the machine is grounded

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If using auxiliary axis functions to operate a motor, such as a servo motor, that produces feedback and/or a motor with high output etc., or when using auxiliary axes in the robot setup etc., we ask that you perform a risk assessment on your side and take any necessary safety measures.

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Danger

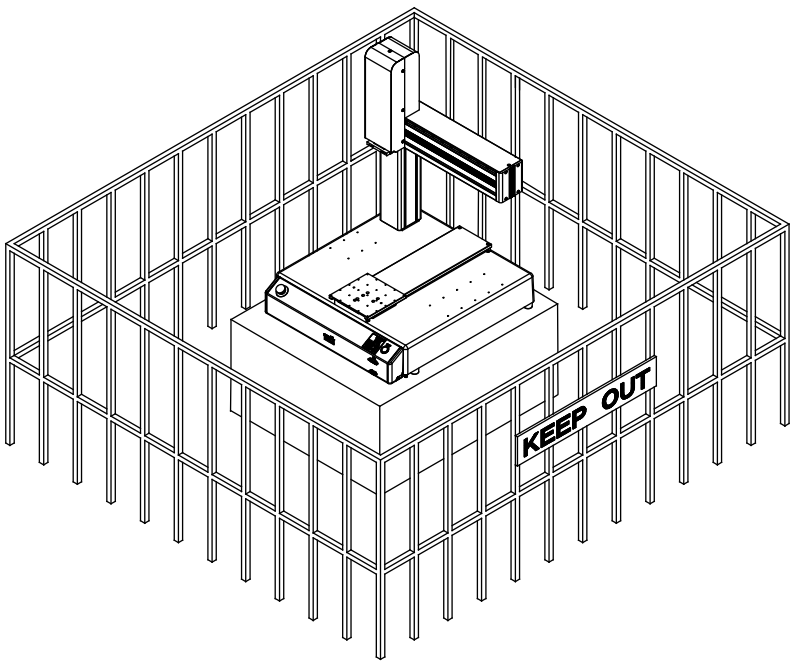
Always set up safety guards around the robot or the auxiliary axes so the moveable parts cannot be touched.

Anyone within the maximum reach of the robot and the auxiliary axes being controlled by the robot may be injured. Set up an **emergency stop interlock device that cuts off the motor power to the auxiliary axes when the entrance to the safety guard is opened** and make sure this entrance is the only way to access the machine.

NOTE: A stop made via a device connected to the I/O-S connector is a category 2 stop. Make sure to perform a separate risk assessment of the interlock device.

Furthermore, put up a **"Keep Out"** or **"Do Not Operate"** warning sign in a clearly visible place.

Example:



FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Danger

When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.
Entering the safety guard could result in injury.

When entering the safety guard due to something wrong with the robot or a peripheral device, or to inspect or lubricate the machine etc., **with both the power supply breaker and the robot switched OFF, make sure to lockout and tagout and confirm there is no electricity flowing to the robot.**
Failure to do so can cause electric shock or injury.

⚠ Warning

When creating a robot system using auxiliary axis functions, if the system can be categorized as an industrial robot, make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

Before performing a run or operation, always check the following:

- **Obstacles** : Make sure there are no obstacles or people within the safety guard.
- **Installation** : Make sure the robot is installed properly, that there are no abnormalities with the robot and the surrounding devices, and that the teaching pendant and tools are in the appropriate places.
- **Emergency Stop Switch** : Make sure the I/O-S circuit (interlock) and emergency stop switch(es) are functioning properly.

It is potentially dangerous to operate the robot without making these checks first.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

If Using Auxiliary Axis Functions in a Way that Require Safety Measures

⚠ Warning	
	**Construct safety guards that are strong enough to protect the operator against such dangers as the tool or workpiece splintering, etc.** When working within the safety guard, use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes. Failure to follow these safety measures can result in injury.
	If objects that the robot grasps have a risk of falling or being projected, **take into account the size, mass, and chemical composition of the objects for the required safety precautions.** Failure to do so can result in injury or unit breakdown.
	**When working within the safety guard, make sure not to come within the maximum range of the robot.** Failure to do so can cause injury.
	When starting a run, first confirm there are **no people inside of the safety guard and there are no obstacles that could interfere with the run.** Failure to do so can cause injury or unit breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Danger

Do not use where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions or fire.

⚠ Warning

Make sure that you securely install the unit in a place that can fully withstand both the unit's weight and its usage. Install the robot on a workbench 60 cm or higher above floor level, in the center of the workbench.
In addition, **for units with a cooling fan on the back, allow for 30cm or more clearance between the back of the unit and the wall.**
Install the switchbox 60 cm or more above floor level in an easily accessible place.
If installation is inadequate, the unit can drop or fall over causing injury and unit breakdown. Also, inadequate installation causes overheating or fire.

Make sure to power the unit within its rated current range.
Failure to do so causes electric shock, fire, or unit breakdown.

Plug the power cord into the power outlet firmly.
Failure to do so causes the plug to heat up resulting in fire.

Be sure to use the unit within its indicated voltage range.
Failure to do so causes unit breakdown, fire, or electric shock.

When replacing fuses, or inspecting or lubricating the unit, unplug the power cord from the power outlet, then remove the cord from the main unit and make sure there is no electrical current. Also, do not touch any of the power inlet pins within 5 seconds of removing the power cords. Failure to follow these steps causes electric shock or injury.

FOR YOUR SAFETY

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⚠ Warning	
	Always **make sure the machine is grounded through the power cord. Do not use the machine when it is not grounded.** Improper grounding causes electric shock, fire, malfunction, or unit breakdown.
	**Wipe the power plug with a clean, dry cloth periodically to eliminate dust.** Dust accumulation deteriorates the electrical insulation or causes fire.
	**Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time.** Dust accumulation causes fire.
	**Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable or LAN cable.** Failure to do so causes electric shock, data loss, unit breakdown, or malfunction.
	**If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not disassemble in any other way other than those specified.** Do not modify the machine in any way. Inappropriate disassembly or modification causes electric shock or unit breakdown.
	**Do not allow water or oil to come in contact with the unit, control box or the power cord.** Contact with water or oil causes electric shock, fire, or unit breakdown. IP Protection Rating: IP20.
	**If anything unusual occurs, such as a burning smell or unusual sound, stop operation and unplug the power cord immediately. Contact Janome (details on the back of this manual) or a Janome dealer.** Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Caution	
	**Do not drop or jar the unit during transport and/or installation.** This can cause injury or damage the unit.
	**Before performing any operation, ensure there is no imminent danger to any of the operators.** Failure to do so causes injury.
	**Use the unit in an environment between 0 and 40 °C, with a humidity level of 20 to 90 %, and without condensation.** Use outside of these conditions can cause unit breakdown or malfunction.
	**Use the unit in an environment where no electrical noise is present.** Failure to do so causes unit malfunction or breakdown.
	**For models with I/O-S circuits*, when installing the unit, take safety measures such as setting up area sensors and safety guards.** If there are no safety measures in place and someone enters the area of operation when the robot is running, they may be injured.
	**Keep the emergency stop switch within reach of the operator when running or operating the robot.** If the robot is operated when the emergency switch is not within reach, it may not be possible to stop the robot immediately and safely. This is potentially dangerous.
	**Make sure that you regularly perform a function check of the emergency stop switch(es). Also, for models with I/O-S circuits*, regularly perform an I/O-S circuit function check.** If the robot is operated without making these checks, it may not be possible to stop the robot immediately and safely in an emergency. This is potentially dangerous.

* A stop made via a device connected to the I/O-S connector is a category 2 stop. Make sure to perform a separate risk assessment of the interlock device.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■■ JR3000 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Caution	
	**When attaching tools, a USB camera, or any other device, make sure they are securely fitted before running the robot.** Failure to do so causes injury or breakdown.
	**When using the machine for extended periods of time, check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months or after every 750 hours of operation.** Failure to do so causes injury or breakdown.
	**Be sure to check the connections of the cords and cables to the main unit.** Improper wiring causes unit malfunction or breakdown.
	**When lifting or transporting the robot, do so in accordance with the following:** • **Secure the movable parts of the unit (the Z/ZR mechanism) before transportation.** • **Lift and transport the JR3200 Series with 2 or more people.** • **Lift and transport the JR3300 – JR3600 Series with 2 or more people or use a lifter.** • **Hold the bottom of the base and keep the robot horizontal.** • **Do not hold the robot by the column or Y body.** Failure to adhere to this can cause injury or damage the robot.
	**Use the unit in an environment that is not exposed to direct sunlight.** Direct sunlight causes unit malfunction or breakdown.
	Individual Configuration Information varies for each individual unit even if they are the same model. **Do not use backup data with a different robot. The robot cannot function normally with backup data from a different robot.**

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■■

Industrial Robot Safety Standards

Make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

FOR YOUR SAFETY

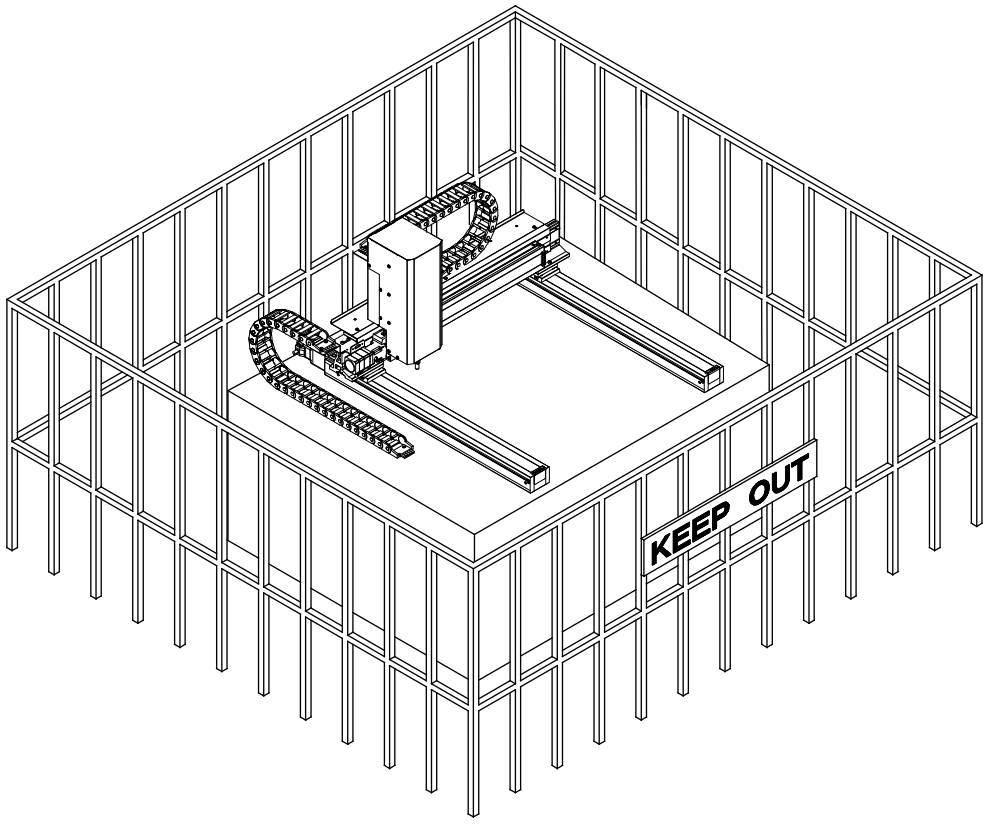
■■■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■■■

⚠ Danger

Do not use where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions or fire.

Always set up safety guards.
Anyone within the maximum reach of the robot may be injured.
Using the included EMG OUT connector, set up an emergency stop interlock system that is triggered when the entrance to the safety guard is opened and make sure this entrance is the only way to access the machine.
Furthermore, put up a **"Keep Out"** or **"Do Not Operate"** warning sign in a clearly visible place.

Example:



FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Danger

Construct a safety circuit before operating the robot.
Use the EMG OUT connector to maintain safety by installing a relay such as an external stop device on the power supply line which cuts the DC 48 V power input. Construct the safety circuit so it operates as a category 0 stop when the emergency stop switch is pressed. Without the construction of a safety circuit, motor power 48 V will not be cut OFF even if the emergency stop switch is pressed, leading to unexpected accidents and injury. An error will occur if you construct the safety circuit without it operating as a category 0 stop when the emergency stop switch is pressed.

When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.
Entering the safety guard could result in injury.

Before entering the safety guard or inspecting or performing maintenance on the robot, make sure there is no electrical current.
・ Unplug the controller power cord from the power outlet. Do not touch any of the power inlet pins within 5 seconds of removing the power cords.
・ If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.
Failure to follow these steps can cause unexpected operation, electric shock, or injury.

Before performing a run or operation, always check the following:

- **Obstacles** : Make sure there are no obstacles or people within the safety guard.
- **Installation** : Make sure the robot is installed properly, that there are no abnormalities with the robot and surrounding devices, and that the teaching pendant and tools are in the appropriate places.
- **Emergency Stop Switch** : Make sure the EMG OUT circuit (interlock) and emergency stop switch(s) are functioning properly.

It is potentially dangerous to operate the robot without making these checks first.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Danger

Keep the emergency stop switch within reach of the operator when running or operating the robot.
If the robot is operated when the emergency switch is not within reach, it may not be possible to stop the robot immediately and safely. This is potentially dangerous.

Make sure that you regularly perform a function check of the emergency stop switch(s). Also regularly perform an EMG OUT circuit function check.
If the robot is operated without making these checks, it may not be possible to stop the robot immediately and safely in an emergency. This is potentially dangerous.

⚠ Warning

Make sure to power the unit within its rated current range.
Failure to do so causes electric shock, fire, or unit breakdown.

Plug the power cord into the power outlet firmly.
Failure to do so causes the plug to heat up resulting in fire.

Make sure to connect and use crimp terminals with the power cord connecting to the terminal block (DC 48 V input) and to securely tighten the terminal block screws. Failure to do so causes electric shock, fire, or unit breakdown.

Make sure to perform work from outside of the safety guards when the power is ON. Failure to do so can cause injury.

Be sure to use the unit within its indicated voltage range.
Failure to do so causes unit breakdown, fire, or electric shock.

Install the controller within an industrial control panel, and make sure when the industrial control panel door is opened, the controller power is automatically cut off. In addition, for controllers with a cooling fan, allow for a clearance of 30 cm or more from the top of the controller, as well as 10 cm or more from the air vent on the side. Inadequate installation can cause overheating, fire, electric shock, or injury.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Warning

With the 3 axis specifications, if releasing the brake, do so after either removing the attached tool or taking measures to prevent the tool from dropping.
If you release the brake when turning the power ON in Teaching Mode, Switch Run Mode, or External Run Mode, the axis may drop down depending on the mass attached to the Z axis. If the Z axis drops down, it can cause injury or unit breakdown.

When inspecting or performing maintenance on the controller, **make sure there is no electrical current and perform the following**:

- **Unplug the controller power cord from the power outlet. Do not touch any of the power inlet pins within 5 seconds of removing the power cords.**
- **If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.**

Failure to follow these steps can cause electric shock, injury, data loss, unit breakdown, or malfunction.

Always **make sure the machine is grounded through the power cord.**
Do not use the machine when it is not grounded.
Improper grounding causes electric shock, fire, malfunction, or unit breakdown.

Wipe the power plug with a clean, dry cloth periodically to eliminate dust.
Dust accumulation deteriorates the electrical insulation or causes fire.

Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time. Dust accumulation causes fire.

If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not disassemble in any other way other than those specified. Do not modify the machine in any way.
Inappropriate disassembly or modification causes electric shock or unit breakdown.

Do not allow water or oil to come in contact with the unit, controller or the power cord. Contact with water or oil causes electric shock, fire, or unit breakdown.
IP Protection Rating: IP20.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Warning

If anything unusual occurs, such as a burning smell or unusual sound, stop the run, unplug the controller power cord from the power outlet, and make sure there is no electrical current. Contact Janome (details on the back of this manual) or a Janome dealer.

- **Unplug the controller power cord from the power outlet. Do not touch any of the power inlet pins within 5 seconds of removing the power cords.**
- **If using a controller with a terminal block (DC 48 V), turn the power OFF and remove the wiring from the terminal block.**

Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

Make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

⚠ Caution

Do not drop or jar the unit during transport and/or installation.
This can cause injury or damage the unit.

Before performing any operation, ensure there is no imminent danger to any of the operators.
Failure to do so causes injury.

Use the unit in an environment between 0 and 40 °C, with a humidity level of 20 to 90 %, and without condensation.
Use outside of these conditions can cause unit breakdown or malfunction.

Use the unit in an environment where no electrical noise is present.
Failure to do so causes unit malfunction or breakdown.

When attaching tools, a USB camera, or any other device, make sure they are securely fitted before running the robot.
Failure to do so causes injury or breakdown.

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JC-3 Series ■■■■■■■■■■■■■■■■■■

⚠ Caution	
	**When using the machine for extended periods of time, check and make sure none of the main unit's mounting screws are loose, and perform a routine inspection every 3 months or after every 750 hours of operation.** Failure to do so causes injury or breakdown.
	**Be sure to check the connections of the cords and cables to the main unit and controller.** Improper wiring causes unit malfunction or breakdown.
	**Secure the movable parts of the unit before transportation.** Failure to do so causes injury or breakdown.
	**When lifting and transporting the robot, do so with 2 or more people.** Failure to do so causes injury or breakdown.
	**Use the unit in an environment that is not exposed to direct sunlight.** Direct sunlight causes unit malfunction or breakdown.
	Individual Configuration Information varies for each individual unit even if they are the same model. **Do not use backup data with a different robot. The robot cannot function normally with backup data from a different robot.**

FOR YOUR SAFETY

■■■■■■■■■■■■■■■■■■ JS3 Series ■■■■■■■■■■■■■■■■■■

Industrial Robot Safety Standards

Make sure to use the robot in accordance with the laws and guidelines of the country where it is used.

FOR YOUR SAFETY

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Safety Precautions Regarding Installation

Robot Unit

⚠ Danger

Anyone within the maximum reach of the robot may be injured.
Install safety guards in adherence with the following:

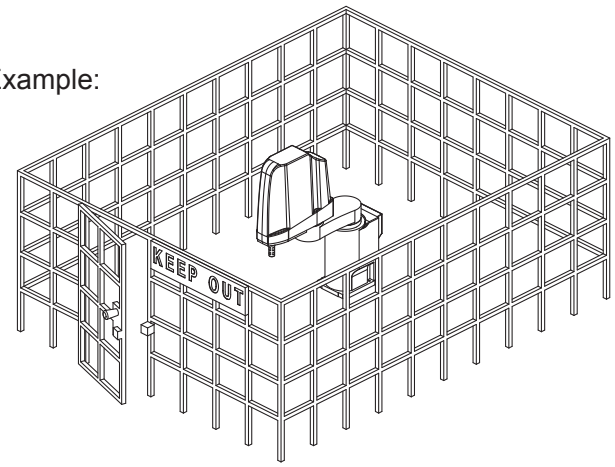
- The safety guards cannot easily be moved.
- The safety guards cannot easily fall over or be broken.
- Allow enough clearance between the robot and the safety guards so that even if the robot falls over, it does not hit the safety guards.
- No part of your body, such as your head or hands, can enter the safety guards.
- Install an interlock device on the entrance to the safety guards that activates an emergency stop when opened and make sure this entrance is the only way to access the machine. Connect the interlock device to the controller by using the included I/O-S connector.
- Place a warning sign such as [Keep Out] or [Do not Operate] on the safety guard entrance in a location that is easily visible.
- Affix the included danger sticker (shown below) in a location that is easily visible.

NOTE:

- A stop made via a device connected to the I/O-S connector is a category 1 stop. Make sure to perform a separate risk assessment for the interlock device.
- Refer to the operation manual *Installation* for details regarding I/O-S connections.
- After installing the unit, make sure to perform pre-operation checks from outside of the safety guards.

Warning Sticker

Example:



FOR YOUR SAFETY

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⚠ Danger

Do not remove the fixing plates from the robot arm until after transportation is complete.
Failure to do this can cause injury or breakdown.

If temporarily placing the robot on a mount, etc., make sure to secure the robot to the mount by tightening 2 or more bolts into the mounting holes on the mounting base to prevent the robot from tipping over.
Failure to do this may cause the robot to fall, resulting in injury or breakdown.

To set the home position for the J3 or J4-axis, release the brake and move the J3-axis (shaft) manually with two hands. When releasing the brake, take the following precautions:

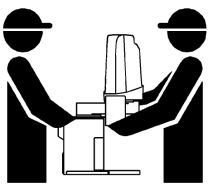
- Always release the brake with at least 2 people present.
- After the brake is released, the tool mass may cause the J3-axis to drop down. Make sure no people are within the operating range of the robot before releasing the brake.
- If there is risk that the robot may hit a peripheral device, make sure to position the robot arm appropriately before releasing the brake.

Failure to adhere to this can cause injury or breakdown.

⚠ Warning

Construct safety guards that are strong enough to protect the operator against such dangers as the tool or workpiece splintering, etc.
For the safety of the operator when working within the safety guard, use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes.
Entering the safety guards could result in injury.

Always have 2 people carry the robot with the fixtures attached as shown in the illustration to the right.
Mass: JS3-3520: Approx. 39 kg, JS3-4520: Approx. 40 kg
JS3-5520: Approx. 41 kg
Refer to “2.3 Transporting the Robot Unit” in the operation manual *Installation* for further details.



FOR YOUR SAFETY

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⚠ Warning

Avoid using the robot in operating environments such as the ones below. If using the robot in environments such as these, take measures to protect the robot from the direct effects of the work environment.

- An environment where the robot vibrates or is bumped at 3.5 G or more during transportation.
- An environment where the robot vibrates or is bumped at 0.5 G or more during operation.

Using the robot in these environments can cause malfunction or breakdown.

Avoid using the robot in an environment that exceeds the radiation tolerance value for the average person. If using the robot in an environment such as this, take measures to protect the robot from the direct effects of the work environment. Using the robot in this environment can cause malfunction or breakdown.

⚠ Caution

Do not hold the robot from the left and right sides or hold the robot by the covers. Doing so may tip the robot over or the covers may break; causing the robot to fall resulting in injury.

Do not hold the robot by the J2 arm cover during transportation.
Doing so can damage the cover.

Do not apply force to the shaft (J3-axis).
Doing so can damage the shaft and cause an overload error to occur when the robot is run.

Do not tip or place the robot on its side.
Doing so can cause a grease leak or breakdown.

Mount the robot on a steel base that is designed to withstand both the robot's mass and the force generated during operations. Inadequate installation may cause the robot to fall, resulting in injury or breakdown.

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⚠ Caution	
	Firmly fix the robot to a specified horizontal mounting surface using the mounting bolts and make sure that positional displacements cannot occur.
	Install the robot in a location that provides enough clearance to replace the battery at the front of the robot and enough clearance to connect the motor power cable and the encoder cable to the back of the robot. Also, do not install the robot in a place where it is exposed to direct sunlight or heat from lighting. The robot surface may heat up and cause errors to occur.
	The robot requires periodic lubrication. Make sure you install the robot in a location where greasing is possible. (Refer to “4.8 Lubrication” in the operation manual *Maintenance*.
	Check the air tubing is connected correctly, has not come loose, or cannot easily come loose. If there is a problem, reconnect the tubing as required. Failure to do so can cause injury or breakdown.
	**After installing the robot, make sure to remove the fixing plates attached to the robot arm.** Failure to do so may cause breakdown.
	After installation, perform a periodic inspection (every 3 months or 750 hours of use, depending on how often the robot is in use) to check the tightening torque of the mounting screws with a torque wrench, etc.
	Adhere to the following when constructing or selecting a hand for the robot: • Make sure the total mass of the hand and the workpiece does not exceed the rated payload capacity of the robot. Especially if attaching an unconventional hand, check that the wrist does not exceed the allowable moment of inertia. • Use a hand or tool that has sufficient ability to grasp workpieces. • Secure the hand to the mechanical interface using bolts that are sized accordingly for the attachment dimensions. Make sure the tool has no protruding parts or sharp edges, other than those required for operation, and construct a cover for the tool if required. Failure to adhere to this can cause injury or breakdown.

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⚠ Caution

If connecting cables or hoses to the hand, make sure they do not restrict the robot movements and make sure the robot operations do not cause the cables or hoses to get tangled and/or cause them to break.
Improperly attached cables or hoses can cause breakdown.

If using a pneumatic hand, make sure to provide clean air at the specified pressure. Also, make sure the air pressure does not exceed 0.7 MPa (7 kgf/cm^2).
Air pressure higher than this may cause the robot's internal air hoses to burst.

Robot Unit and Controller

⚠ Danger

Do not use the robot where flammable or corrosive gas is present.
Leaked gas accumulating around the unit causes explosions and fire.

⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when installing the machine.
Entering the safety guards could result in injury.

Before wiring the power cords, make sure there is no electrical current and perform the following:

- **Lockout/tagout with the power source circuit breaker in the OFF position, and remove the power cords from the terminal block.**
- Do not touch the terminal block within 5 seconds of removing the power cords.

Failure to adhere to this may cause electric shock, injury, data loss or breakdown.

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⚠ Warning

	**Be sure to use the unit within its indicated voltage range.** **Failure to do so causes unit breakdown, fire, or electric shock.**
	Make sure to isolate the robot motor power cable, the encoder cable, and external I/O cables from the power cable or grounding wire of other devices. Also make sure the external I/O cables are shielded. Do not apply voltages to terminals other than those specified in the operation manuals. Doing so can damage the robot or cause the terminal to explode.

⚠ Caution

	When transporting the robot, **do not excessively shock or vibrate the robot.** Doing so can cause malfunction or breakdown.
	**Do not drop or jar the unit during transport and/or installation.** This can cause injury or damage the unit.
	**Use the robot in an indoor environment where it is not exposed to direct sunlight.** Direct sunlight can cause unit malfunction or breakdown.
	**Place the machine in a well-ventilated area for the health and safety of the operator.**

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⚠ Caution
Use the robot in an environment that meets the following conditions: • **Ambient temperature of 0 to 40 °C** • **Relative humidity of 45 to 85 % (no condensation)** • **Altitude not exceeding 1000 m above sea level** • **The installation space is not in a vacuum.** Use outside of these conditions may cause malfunction or unit breakdown. If the unit is used where these conditions are not met, we cannot guarantee its operation. IP protection rating for the both the robot and the controller is IP20.
Use the unit in an environment where no electrical noise is present. Noise may cause unit malfunction or breakdown.
Do not use the machine in an environment that is damp or dusty. Dust and moisture can cause malfunction or breakdown. IP protection rating for the both the robot and the controller is IP20 (not water resistant).
Install the cables and connectors so there is no stress on them and do not forcefully bend or pull, or stand on them after they are installed. Protect the cables and connectors by using piping and covers, etc., as necessary. Make sure the latches and screws securing the cables and connectors are firmly secured. If the cables and connectors are not secure, they may come loose during a run.
If the hand input cable (optional) has free terminals, make sure to insulate them before supplying power to the hand input cable (optional). Uncovered terminals can cause a short circuit to occur.

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Controller

⚠ Danger	
	**Mount the controller outside of the safety guards in a location where the switches can easily be reached and the controller can always be monitored by the operator without turning their back on the robot unit itself.** Mount the controller so that the operation panel is 600 mm or more above floor level for maintenance work.
	Before connecting a Fieldbus, make sure safety can be maintained at all times when the robot is run. If signals such as a start signal, etc., are assigned to the Fieldbus, the Fieldbus may standby waiting to send signals and cause the robot to start running immediately after it is connected. Failure to do so can cause injury or breakdown.

⚠ Warning	
	Use a lifter, etc., to transport the controller. Failure to do so can cause injury or breakdown.
	If external vibrations can cause the controller to move, fix it in place using the base plate of the controller. (Do so without removing the rubber feet)
	**Make sure that you securely install the unit in a place that can fully withstand both the unit's mass and its usage.** If installation is inadequate, the unit can drop or fall over causing injury and unit breakdown. Inadequate installation can also cause overheating and fire.
	The controller has a fan and ventilation intakes for cooling. Do not block these openings and make sure there is a clearance of at least 20 mm on both the left and right sides and at least 40 mm on the back side. Blocking these openings can cause overheating or breakdown.

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⚠ Warning	
	Leave approximately 200 mm or more clearance from the front of the controller so there is no stress on the connectors and enough room to work. Failure to do so can cause malfunction or breakdown.
	In addition to the clearance required for installation, leave sufficient space around the controller for removing covers (with a screwdriver) as a contingency for maintenance work. The controller may get hot during a malfunction. Do not touch the controller immediately after use.
	Make sure the power cord prepared on your side uses the **correct crimped terminals for connecting to the terminal block. Make sure they are within the sizes outlined below and never forcefully connect them.** Incorrect connections may cause fire or breakdown. • Conductor size: AWG10 (cross-sectional area: 6.0 mm^2) • Crimped terminal: M4, with a width of 9.5 mm or less
	After wiring the power supply terminal block, attach the cover included to prevent electric shock. An unprotected terminal block can cause electric shock, fire, or unit breakdown.
	**Always make sure to connect the protective ground through the power cord.** **Do not use the machine when the protective ground is not connected.** **Make sure the protective grounding resistance is 100 Ω or less.** Improper grounding causes electric shock, fire, malfunction, or unit breakdown, etc.

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⚠ Caution	
	Do not apply pressure to any protruding parts, such as a switch, the terminal block, or a connector when transporting the controller. Doing so can cause breakdown.
	If you want to use the controller, operation box (optional), or teaching pendant as a monitor while in Run Mode, **mount the respective device 600 mm or more above floor level in an easily accessible place so that the emergency stop switch can be immediately reached in the event of an emergency.** It is dangerous to operate the machine without the emergency stop switch within reach; you will not be able to stop the robot immediately and safely in the event of an emergency. Installing one of these devices too low can also result in malfunction from people knocking the device with their feet, etc.
	Make sure installation allows for access to the memory port during maintenance.

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Safety Precautions Regarding Usage

Robot Unit

⚠ Warning	
	If objects that the robot grasps have a risk of falling or being projected, **take into account the size, mass, and chemical composition of the objects for the required safety precautions.** Failure to do so can result in injury or unit breakdown.
	**When manually moving the robot arm, do not insert your hands or fingers into any of the joints or openings.** Your hands or fingers may get caught in these openings depending on the robot pose.

⚠ Caution	
	Before performing any operation, make sure there is no imminent danger to any of the operators. Failure to do so causes injury.
	**When attaching tools, etc., make sure they are securely fitted before running the robot.** A loose tool can cause injury or breakdown.
	If weight is applied to the J3 (Z) / J4 (R) axis, the load may cause the J3/J4 axis to drop down when the power to the robot is turned OFF. To prevent this from happening, remove the load from the J3/J4 axis or install a safety block, etc.
	When performing work inside the safety guards, perform your own risk assessment and establish **"work regulations", as outlined below, with thorough planning for safety.** Entering the safety guards may result in injury. • Work regulations should be relevant and appropriate for the type of work, and consist of details such as robot operating procedures and signs to be used between operators. • When creating work regulations, incorporate the opinion of operators and work safety specialists. Make sure to review and update the contents of the work regulations regularly.

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⚠ Caution	
	If manually moving the robot arm, do so slowly. Moving the arm at high speed can cause large amounts of backlash, reducing the robot's accuracy and damage the backup data.
	Depending on the arm pose, the shaft may come in contact with the robot base even when operating the robot within the work envelope. Make sure the shaft does not come in contact with the base while making JOG movements*. * A JOG movement refers to moving the robot arm via the teaching pendant.
	The J3 (Z) axis is equipped with a brake. Do not forcibly move the J3-axis using an external source when the brake is active. Forcibly moving the axis can reduce accuracy and/or wear the brake, damaging the reduction drive.
	If the robot picks up a workpiece that is charged with static electricity, the electricity is discharged through the hand and the robot arm. To prevent the robot from malfunctioning, make sure to insulate the hand and robot arm. Also, when the robot places a charged workpiece on a device, the electricity is discharged through the device and may cause it to malfunction. Configure the system so that it provides a route for appropriate electrical discharge from charged workpieces. Failure to do so can cause malfunction or unit breakdown.
	The lubricant is not completely effective at low temperatures. Make sure to use the warmup function to prevent loss of positioning accuracy and to prevent servo errors such as Excessive Margin of Error.
	Take care when affixing tape that has a strong adhesive, such as gummed tape, to the painted surfaces on the robot. The tape may damage the painted surfaces when it is peeled off.

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Robot Unit and Controller

⚠ Danger	
	**When power to the robot is ON, never enter the safety guard or put your head, hands, or any part of your body inside.** Entering the safety guards could result in injury.
	When changing modes or starting a run, first confirm there are **no people inside of the safety guard and there are no obstacles that could interfere with the run.** Entering the safety guards could result in injury.
	**Before performing a run or operation, always check the following:** • **Obstacles** Make sure there are no obstacles or people within the safety guard. • **Installation** Make sure the robot is installed properly, that there are no abnormalities with the robot and the surrounding devices, and that the teaching pendant and tools are in the appropriate places. • Emergency Stop Function Check Make sure the I/O-S circuit (interlock) and emergency stop switch(es) are functioning properly. It is potentially dangerous to operate the robot without making these checks first.
	If entering the safety guards without cutting off the power, **always make sure the select switch on the teaching pendant is set to TEACH (Teaching Mode).** If the select switch is set to AUTO (Run Mode), external commands can start the robot while you are inside the safety guards. Failure to adhere to this can cause injury or breakdown.
	If there are any safety devices that you disable while teaching, make sure to enable them after teaching to reestablish full functionality. Example: Enable the interlock device on the safety guard entrance, etc. Failure to do so can result in injury.

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⚠ Warning	
	**Make sure to use a power source that is in accordance with the range indicated on the rating identification plate.** Failure to do so causes electric shock, fire, or unit breakdown.
	**Do not allow water or oil to come in contact with the unit or power cord.** Contact with water or oil causes electric shock, fire, or unit breakdown. IP Protection Rating: IP20.
	**Make sure that no foreign objects can enter the robot or controller.** In particular, a conductive or flammable foreign matter, such as a screw, metal shard or oil, can cause an explosion or damage the unit, etc.
	**Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable or LAN cable.** Failure to do so can cause electric shock, data loss, unit breakdown, or malfunction.
	**Firmly connect and secure the power cord after checking that the connection area is not covered with dust, etc.** If the power cord is not firmly plugged in, the connectors may heat up and cause a fire.
	**Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time.** Dust accumulation may cause fire.
	**If anything unusual occurs, such as a burning smell or unusual sound, stop operation and turn the power supply circuit breaker OFF. Unplug the power cord after confirming there is no power supplied to the robot and then contact Janome or a Janome dealer.** Continuing to use the robot without addressing the problem causes electric shock, fire, or unit breakdown.

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⚠ Caution	
	**Be sure to check the connections of the cords and cables to the main unit.** Improper wiring may result in unit malfunction or breakdown.
	Make sure to save if you modify any settings or data. If you turn OFF the power after making changes to robot settings or data without saving, those changes are lost and the robot will revert to its original settings.
	Diagnostic Mode and Mechanical Adjustment Mode are for maintenance personnel* use only.

* Maintenance personnel are individuals who have received maintenance training from Janome or from a Janome dealer.

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Controller

⚠ Warning

Do not touch the terminal block when there is an electrical current present. Touching the terminal block can result in electric shock or injury.

⚠ Caution

Keep the emergency stop switch within reach of the operator when running or operating the robot.
If you operate the robot without the emergency switch in reach, you may not be able to stop the robot immediately and safely. This is potentially dangerous.

Individual Configuration Information varies for each individual unit even if they are the same model.
Do not use backup data with a different robot.
The robot cannot function normally with backup data from a different robot.

Do not turn OFF the power while the robot is running.
Turning OFF the power during a run can cause the arm to drop down or coast to a stop, which may result in the arm hitting a peripheral device.

When an error occurs, the error code that appears on the 7 segment LED and the teaching pendant display are useful indicators for finding the source of the error. Record the error number and then refer to the operation manual *Maintenance* for the countermeasure.

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Safety Precautions Regarding Maintenance

Robot Unit

⚠ Warning	
	Do not touch or come in contact with any potentially hot components on the robot. Doing so can result in burns and serious accidents. The servomotor may get hot. Do not touch or come in contact with the servomotor while the power is ON, only do so when the power is OFF and after it has cooled down.

⚠ Caution	
	**Check that the mounting screws are always firmly tightened with a periodic inspection (every 3 months or 750 hours of use, depending on how often the robot is in use).** A loose tool can cause injury or breakdown.
	**Periodically replace the robot battery.** Failure to do so can cause malfunction or breakdown. Replace the battery approximately every 1 year.

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Robot Unit and Controller

⚠ Danger	
	**If entering the safety guards, turn the power source circuit breaker OFF, lock and tag it, and then make sure there is no power supplied to the robot before continuing.** Failure to do so can cause electric shock, injury, or the robot may move unexpectedly.
	**If entering the safety guards, perform your own risk assessment and establish "work regulations," as outlined below, with thorough planning for safety.** • Work regulations should be relevant and appropriate for the type of work, and consist of details such as robot operating procedures and signs to be used between operators. • When creating work regulations, incorporate the opinion of operators and work safety specialists. Make sure to review and update the contents of the work regulations regularly.
	**When setting the home position or other such work that requires you to enter the safety guards with the power ON, make sure to activate the emergency stop switch before entering the safety guards and to perform the work with the robot in this state.** Failure to do so can result in injury.

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⚠ Warning

When inspecting or performing maintenance on the controller, **make sure there is no electrical current and perform the following:**

- **Lockout/tagout with the power source circuit breaker in the OFF position, and remove the power cords from the terminal block.**
- Do not touch the terminal block within 5 seconds of removing the power cords.

Failure to adhere to this may cause electric shock, injury, data loss or breakdown.

If disassembling this machine, follow the instructions in the operation manual *Maintenance*, and do not dissemble in any ways other than as specified. Do not modify the machine in any way.
Inappropriate disassembly or modification causes electric shock or unit breakdown.

For your safety, **do not modify the machine in any way.**
Inappropriate disassembly or modification causes electric shock or unit breakdown.
We cannot accept any responsibility for machines that malfunction due to modification.

After cutting OFF power to the system, energy stored by the devices is potentially dangerous, so make sure to establish means to reduce this risk.

- Controller
  Make sure the energy stored by the controller is discharged before opening the controller.
- Hand
  Use a hose connected to the solenoid valve to expel compressed air from a pneumatic chuck hand.

⚠ Caution

Perform daily and periodic inspections to check and make sure there are no abnormalities with the robot or peripheral devices. Additionally, keep records of the inspections and store them for 3 years or more so that the details can be referred to for future inspections.

Place a sign such as “Robot Inspection in Progress” in the necessary locations and establish means so as to prevent operation of the robot by those who may be unaware of the maintenance work. Whenever possible, also perform maintenance with at least one other person present so as to stop any unexpected robot movements.

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⚠ Caution	
	For a smooth and long operating life, **lubricate the shaft once for every 2,000 km the robot is run.** If the robot is run for 24 hour periods, lubricate the machine more frequently because the running time between lubrication periods is longer. The lubrication periods are calculated based on runs at maximum speed.
	Make sure to use the specified grease. Use of grease other than the specified grease can adversely affect the robot's performance or cause breakdown.
	If the arm joints or the Z-axis is subject to only minute operational angles or distances, fretting may occur in the internal robot bearings. Fretting refers to wear that occurs when minute operation angles do not allow the lubricant within the bearings to fully coat the working parts as required. This is also applies to axes that are inactive, as the counterforce from other axis operations or vibrations from the robot mounting surface cause minute movements in the inactive axes, which may result in fretting damage. To prevent fretting damage, we recommend running the arm joints more than 30 degrees and the Z-axis more than 20 mm per day.
	Do not charge, dispose of in a fire, or reuse the robot unit battery or controller battery (unit) in any way.
	The robot unit battery and controller battery (unit) are considered industrial waste. Make sure they are disposed of in accordance with the national and/or local authority laws and legislations.

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Controller

⚠ Danger

Before entering the safety guard because of something wrong with the robot or a peripheral device, or to **inspect or lubricate the machine etc., always make sure to turn the controller and power source circuit breakers OFF, lock and tag them, and make sure there is no electrical current.**
Failure to follow these steps can cause electric shock or injury.

⚠ Warning

When replacing fuses, or inspecting or lubricating the unit, turn OFF the power supply, then remove the cord from the main unit and make sure there is no power supplied to the robot before continuing.
Also, **do not touch the terminal block within 5 seconds of removing the power cords.** Failure to follow these steps can cause electric shock or injury.

1. OVERVIEW

This operation manual explains the interfacing protocol (transmission procedures and interfacing commands) for controlling the robot via the serial port (COM1) and Ethernet (LAN).
This manual explains interfacing between the robot and the higher order devices (a PC or PLC) that control the robot, but not about interfacing between the robot and the lower order devices that the robot controls.

The protocol in this manual explains how to convert data into a hexadecimal ASCII code character string for the transmission and receiving of such data.

Firstly, the preparation procedures such as the settings for the cable/connector and baud rate are explained. Followed by the transfer format for the command/data. After this, each interfacing command is explained.

Transfer commands include items such as the following:

1. Robot information acquisition and status acquisition.
2. Run commands such as robot start, program number switching and temporary stop commands.
3. I/O status acquisition and I/O output control.
4. Movement control (PTP, straight line movement, arc movement, JOG movement and CP continuous movement) and current position acquisition.
5. Operation information acquisition and error information acquisition.
6. Data settings (registering, adding, and deleting, etc., point data) and saving data.

⚠ Caution

If you command an urgent stop via the serial port (COM 1) or Ethernet (LAN), a small amount of time is needed for the robot to actually stop after the command is sent.

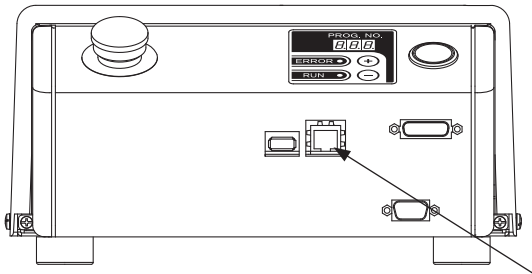
2. COMMUNICATION ENVIRONMENT FRAMEWORK

2.1 Ethernet Connection

The JR3000/JC-3/JS3 Series are fitted with an Ethernet connector (10 BASE-T/100BASE-TX) as standard equipment. The LAN port is on the front of the robot for the JR3000 Series and on the front of the controller for the JC-3/JS3 Series.

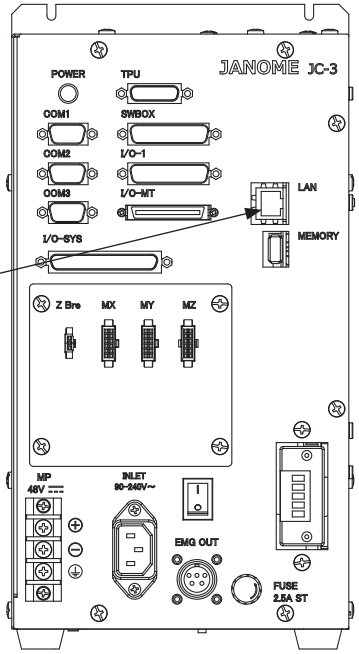
JR3000 Series: Robot Front

Example: JR3203N-AC



JC-3 Series: Controller Front

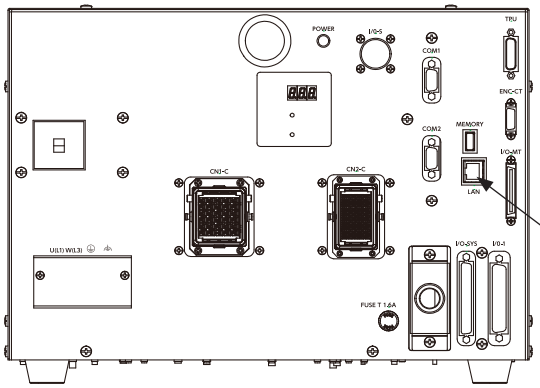
Example: JC-3C-3 (3 axes specs)



LAN Port

JS3 Series: Controller Front

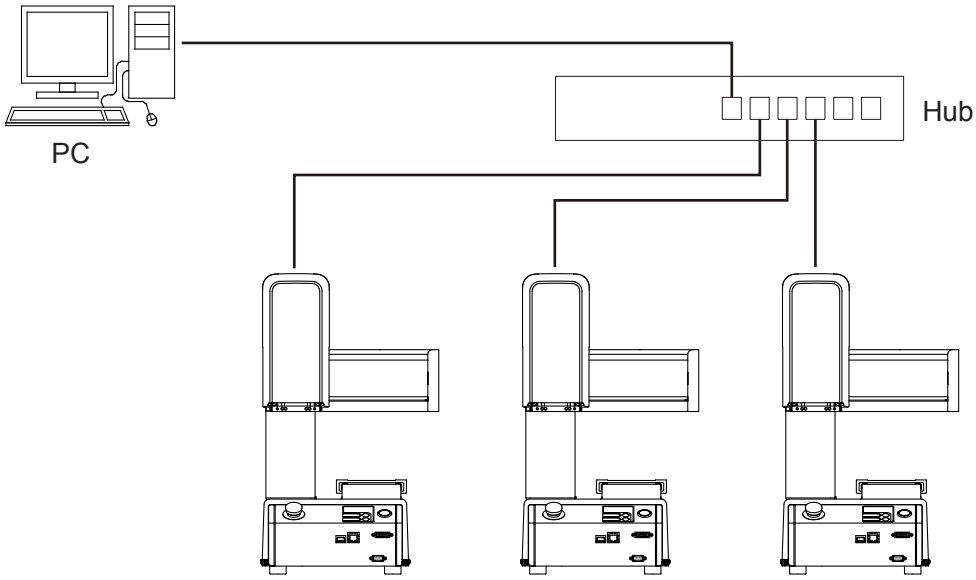
Example: JSC3-3520



LAN Port

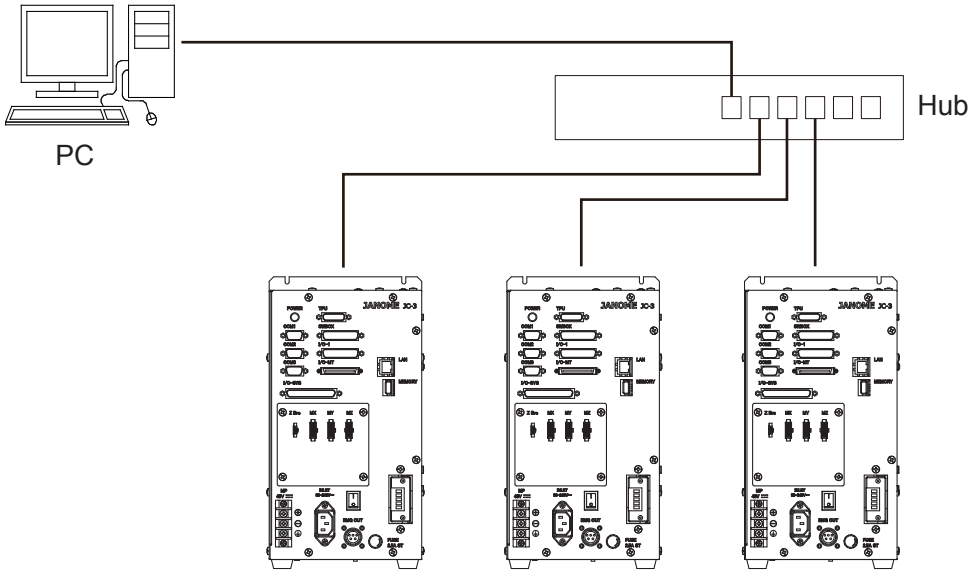
To back up the robot's C&T data (customizing and teaching data) and upgrade the robot's system software, connect the robot to a PC and make sure they are able to interface.
When using Ethernet, you can connect to and use multiple robots with one PC through a hub.
If you are using JR C-Points II to operate the robot from the PC, remove the teaching pendant. You cannot operate the robot with the teaching pendant connected. After removing the teaching pendant, connect a short connector to the teaching pendant connector if the teaching pendant has an emergency stop switch. Otherwise, you cannot use JR C-Points II to operate the robot.

■ JR3000 Series Connection Example



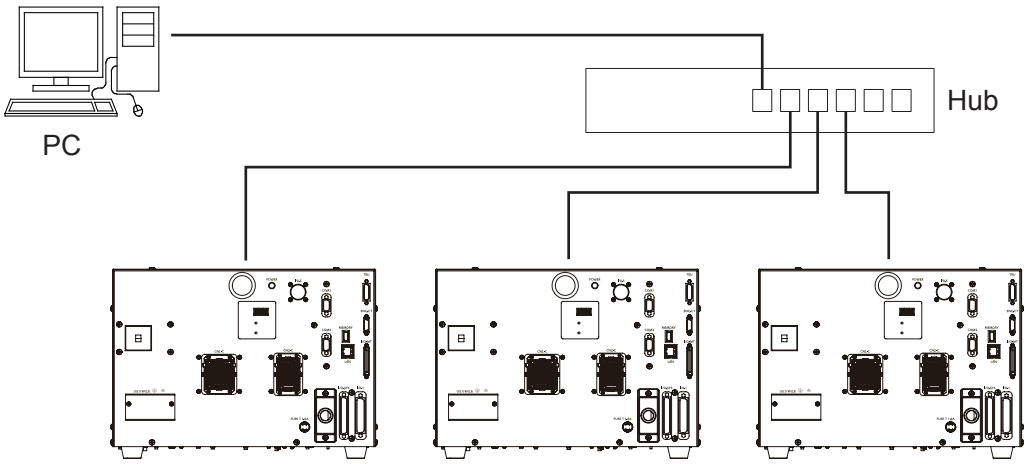
Robots (Example: JR3203N-AC)

■ JC-3 Series Connection Example



Controller (Example: JC-3C-3)

■ JS3 Series Connection Example

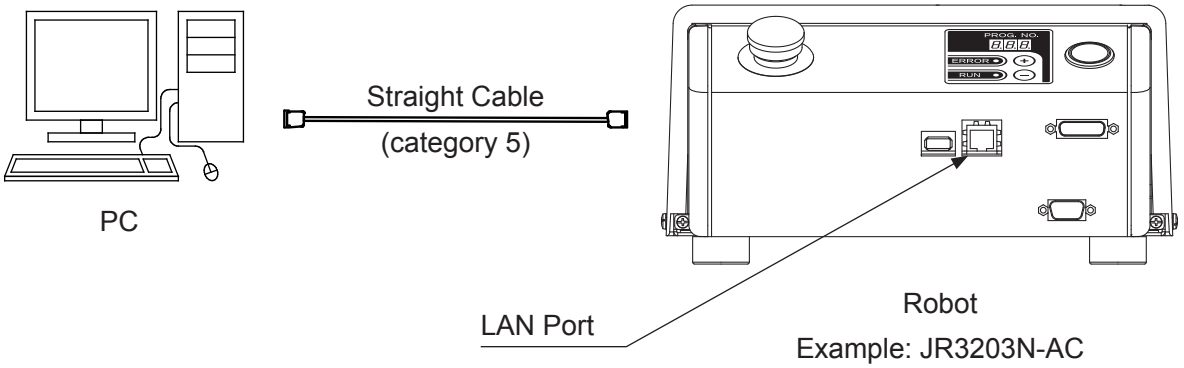


Controller (Example: JSC3-3520)

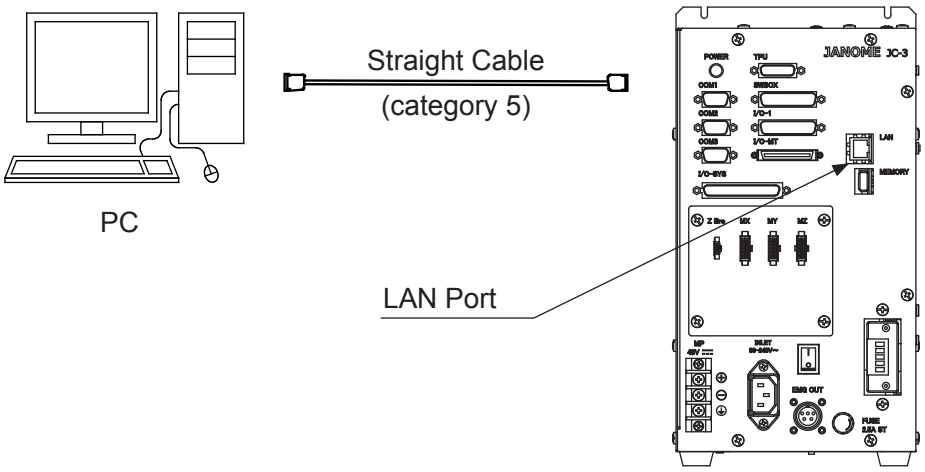
2.1.1 LAN Cable

Use a straight LAN cable (category 5) compatible with the 10BASE-T/100BASE-TX standard to connect the Robot or controller and PC. Insert one end of the LAN cable into the robot or controller LAN port and the other into the PC LAN port.

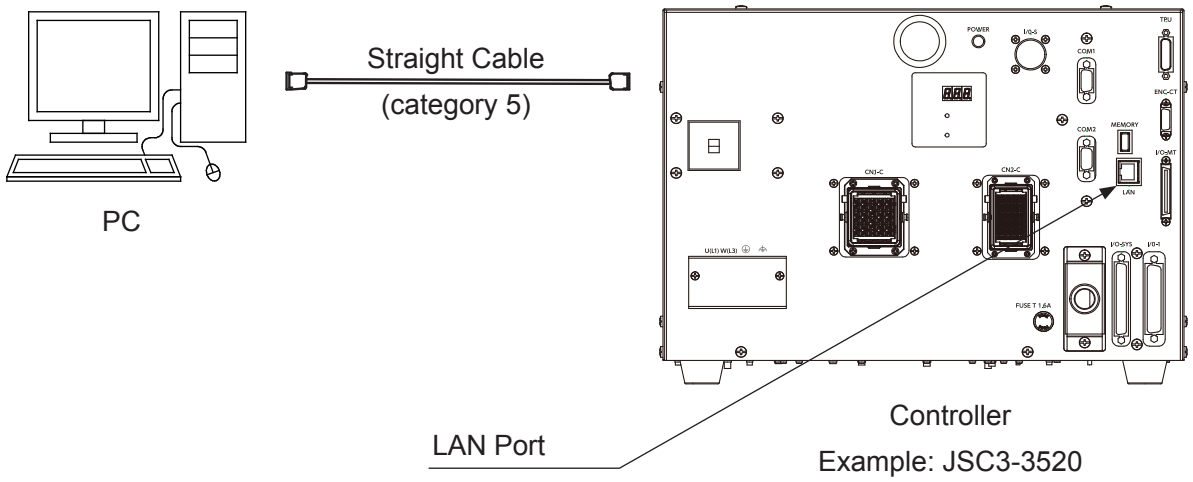
■ JR3000 Series



■ JC-3 Series

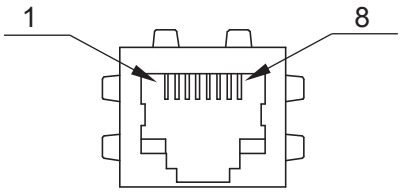


■ JS3 Series



2.1.2 LAN Port

Diagram: RJ-45



LAN Port Pin Assignment

Pin No.	Name	Function
1	TD+	Transmit signal+
2	TD-	Transmit signal-
3	RD+	Receive signal+
4	NC	Not connected
5	NC	Not connected
6	RD-	Receive signal-
7	NC	Not connected
8	NC	Not connected

2.1.3 LAN Communication Settings (IP Address Settings)

Ethernet communication uses “TCP/IP protocol”. For this reason, you need to set the IP address, subnet mask, and default gateway as preparations for Ethernet connection.
These settings are done using the teaching pendant or PC software (JR C-Points II Limited Edition). JR C-Points II Limited Edition is included on the Operation Manual CD-ROM. Also, for JR C-Points II Limited Edition operation explanations, refer to the operation manual *PC Operation*.
You can use a PC via Ethernet to set the IP address.

To set the IP address via Ethernet, you need to have communication settings (TCP/IP settings) set up on the PC side. Take note of the following points for PC communications settings (TCP/IP).

- To use Ethernet functions, you need a TCP/IP network environment.
- If you have a default network, you do not need to set a new IP address on the PC.
- Do not use a DHCP server (automatic assignment of the IP address), as the robot uses a fixed IP address.
- If you are setting a new IP address on the PC, consult your network administrator.

You can set up the robot’s IP address from the teaching pendant or PC software (JR C-Points II Limited Edition).

Follow the steps below if using the teaching pendant.

T P MODE [Administration] (JR3000/JC-3 Series)
UTILITY [Change Mode] [Administration] (JS3 Series)
[Administration Settings Mode]
[Ethernet Settings]

The settable items consist of the following two types:
- IP Address
- Subnet Mask

Once you complete the settings and end Administration Mode, the robot automatically restarts to set the network address settings.

Perform the following if using the PC software:
Start up JR C-Points II Limited Edition, click [Robot] on the menu-bar, and then click [IP Address Settings] on the pull-down menu. The IP Address dialog is displayed.

PC [Robot] → [Robot IP Address Settings]

The settable items consist of the following three types:
- IP Address
- Subnet Mask
- Default Gateway

Enter values for these items and click the [Setting] button to send the settings to the robot. Initially the IP address settings dialog makes settings for a robot with the IP address "192.168.200.180." This is the IP address initially set to the robot. If you want to change the IP address of a robot already set with an IP address, click the [Set] button and specify the robot. To apply the new settings, turn the power to the robot OFF and then ON again.

The following values are set to the robot by default:

- P Address: 192.168.200.180
- Subnet Mask: 255.255.255. 0
- Default Gateway: 0. 0. 0. 0

2.1.4 Expected Port Number for Command Communication

The port for robot command communication is port: 10031.

NOTE: 10030 is a dedicated port for the PC software JR C-Points II. Do not use this port, as doing so can cause unit breakdown.

For information regarding external device connection setup, contact the external device's manufacturer.

2.2 COM Connection

2.2.1 RS-232C Connectors and Cables

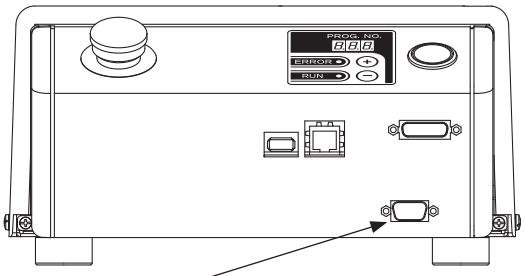
To connect, you need an RS-232C Straight Cable as shown below.
Use a straight cable with COM 1 (RS-232C Port). You cannot use a reverse type or cross type.

PC Side
Refer to the operation manual included with your PC

Robot or Controller Side
9 pin

Insert each of the two ends of the RS-232C cable into the COM1 connector on the robot or controller and the COM port on the PC or PLC (serial connector/RS-232C). In the connection example below, the connector on the robot or controller side is a 9pin D-SUB connector.

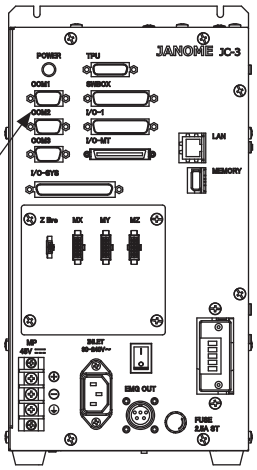
■ JR3000 Series



COM1:RS-232C

Robot
Example: JR3203N-AC

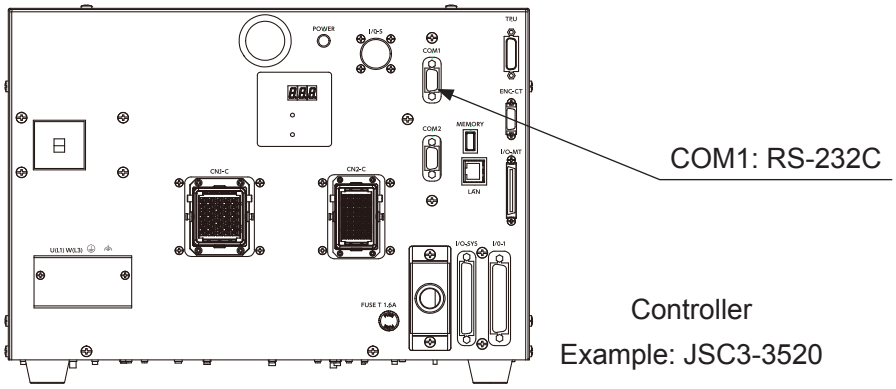
■ JC-3 Series



COM1:RS-232C

Controller
Example: JC-3C-3 (3 axes specs)

■ JS3 Series



⚠ Caution

Make sure the power to both the robot or controller and the PC or PLC is OFF before attaching or removing the cable. Failure to do so causes malfunction.

■ D-Sub 9 Pin on the Host Side
COM1 (RS-232C Port)

Robot				Host (PC or PLC)		
Pin No.	**Terminal Name**	**Function**		**Pin No.**	**Terminal Name**	**Function**
3	RxD	Receive Data	←	3	TxD	Transmit Data
2	TxD	Transmit Data	→	2	RxD	Receive Data
5	GND	Ground	—	5	GND	Ground
Connector: D-Sub 9 Pin				Connector: D-Sub 9 Pin		

■ D-Sub 25 Pin on the Host Side
COM1 (RS-232C Port)

Robot				Host (PC or PLC)		
Pin No.	**Terminal Name**	**Function**		**Pin No.**	**Terminal Name**	**Function**
3	RxD	Receive Data	←	2	TxD	Transmit Data
2	TxD	Transmit Data	→	3	RxD	Receive Data
5	GND	Ground	—	7	GND	Ground
Connector: D-Sub 9 Pin				Connector: D-Sub 25 Pin		

On the host side (PC or PLC), use cables which are suitable for each of the PCs or the PLC you are using.
Normally a D-SUB, 9 pin is connected to the serial port marked “|O|O|” on the back of the PC or PLC.

2.2.2 COM Communication Settings

To get the robot and PC or PLC to interface, select the COM port on the PC or PLC side, and make sure that the parameters for both the robot side and PC or PLC side match.

PC [Robot] → [Administration] → [Administration Settings] → [COM Settings]

Refer to “16. APPENDIX-D: JR C-POINTS II LIMITED EDITION” and install and start up JR C-Points II Limited Edition (included on the Operation Manual CD-ROM).
Also follow the instructions in “2.1 Ethernet Connection” and establish Ethernet communication.
Startup JR C-Points II Limited Edition and after selecting [Robot] from the menu bar, select [Administration Settings] from the pull down menu.

NOTE: The PC software JR C-Points II can also do this operation.

TP MODE [Administration] (JR3000/JC-3 Series)
UTILITY [Change Mode] [Administration] (JS3 Series)
[Administration Settings Mode]
[COM Settings]
[COM 1 Communication Setting]

Start up Administration Mode. Follow the procedure above and select [COM Settings]. Confirm/set each parameter so they match up with the communication parameters on the host (PC or PLC) side.

In the JR C-Points II Limited Edition menu bar select [Robot] and then from the pull down menu bar click [SystemInfo]. If the information is displayed, the connection is successful.

2.2.3 Baud Rate

The default values for the communication settings are as follows:

Baud rate	9600
Character length	8 bit
Stop bit	1 bit
Parity	None

With the robot in Administration Mode, select [Administration Mode] [COM Settings] [COM 1 Communication Setting]. The current settings for baud rate, character length, stop bit and parity are displayed. These can be changed to the following values:

Baud rate:	2400/4800/9600/19200/38400/57600/76800/115200
Character length:	8 bit/7 bit
Stop bit:	1 bit/2 bit
Parity:	None/Even parity/ Odd parity

2.2.4 COM1 Command Communication Function Settings

If you want to enable transfer of commands using COM1, enable COM1 Command Communication Function from Administration Mode.

(Administration Mode)

T P MODE [Administration] (JR3000/JC-3 Series)
UTILITY [Change Mode] [Administration] (JS3 Series)
[Administration Settings Mode]
[COM1 Command Communication Function]

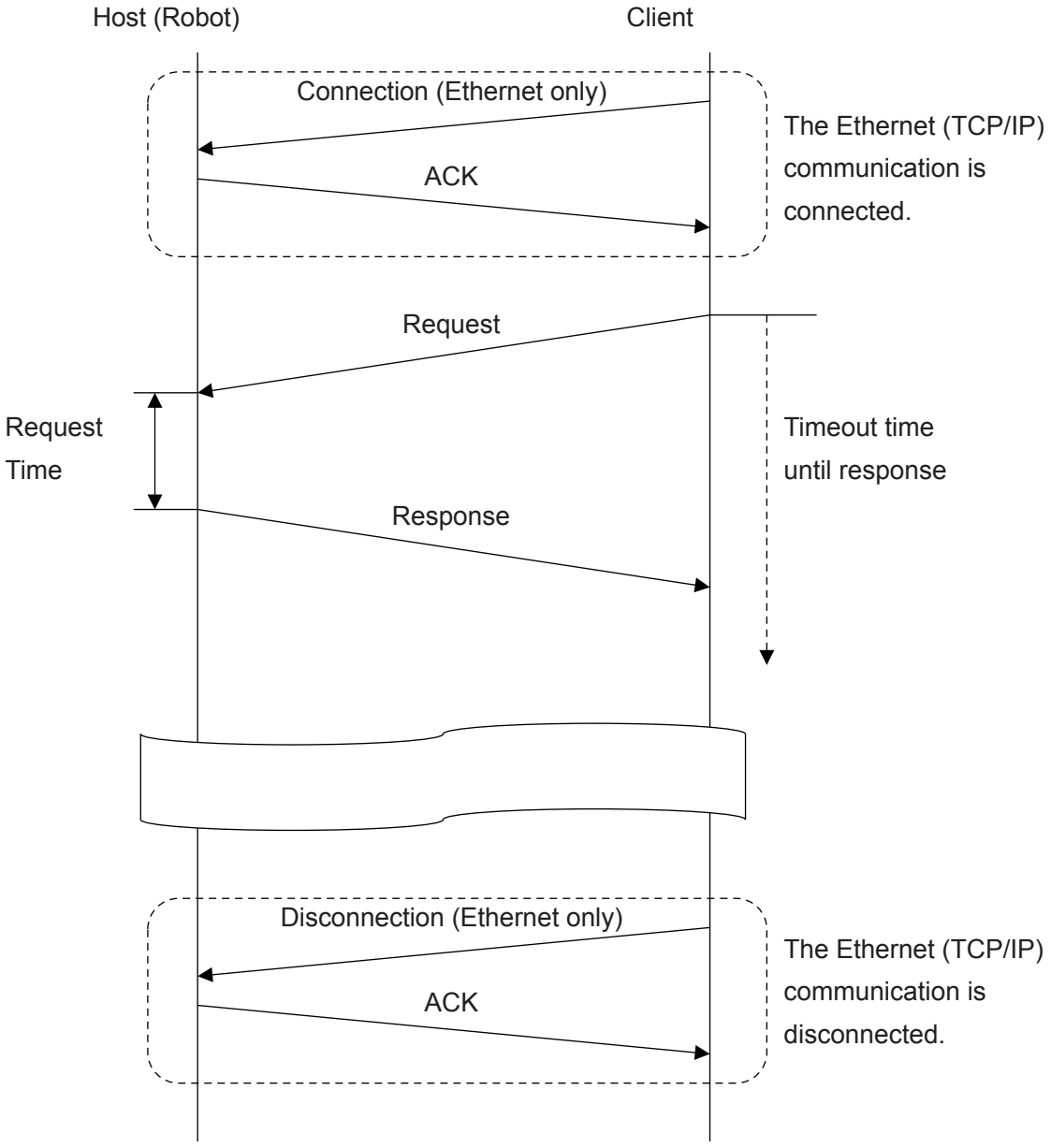
Start up Administration Mode. Follow the procedure above to enable/disable this function by selecting [COM1 Command Communication Function].

3. COMMUNICATION DATA

The JR3000/JC-3/JS3 Series communication system is stipulated as follows:

- The host and client connection is done as pair to pair (1 to 1) communication.
  The host is stipulated as the robot side, and the client as the PC application or controller device.
- Using a request + response system, the host and client reciprocally handshake.
- Ethernet requires a separate connection/disconnection sequence.

The standard sequence is as follows:



Communication starts from the client side (PC software etc.). After operation starts, it is assumed that the host (robot side) is in standby when receiving the request from the client. With Ethernet you need to handle the communication start/end with a definite procedure (TCP/IP session connect).
Also, sets of multiple byte data are lined up in big-endian format.

The numerical representation format of ASCII data is as follows:

- Numerical values are always converted to hexadecimal character string representations.
- Negative numerical values are expressed as two's complement representations.
- Data is converted as follows: 1 byte = 2 characters, 2 bytes = 4 characters, 4 bytes = 8 characters.
- Roman capitals (A – F) are used in HEX character strings.

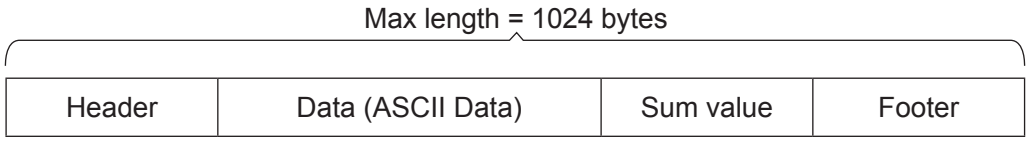
■ Data Representation

With transmission data, binary data is converted and transmitted as ASCII character strings (hexadecimal (HEXASCII)). You can select the data size as 1 byte, 2 bytes, or 4 bytes. The following example shows how to convert the 2-byte data 76 (decimal representation).The 2 byte data, 76 (decimal representation) can be expressed in hexadecimal as 004C.

HEX	ASCII	Description
30	0	76 = 004C (hexadecimal)
30	0	
34	4	
43	C	

3.1 COM Communication

The standard frame composition of COM communication is shown in the diagram below.



Item	Details	Reference
Header	An identifier to determine the frame head. Fixed as $ (dollar).	
Data	The transferred data. ASCII data.	This is called “ASCII data” in this manual.
Sum value	The sum value (2 lines) to determine the data area validity.	
Footer	An identifier to determine the frame end. Fixed as CR (carriage return).	

The sum value calculation rules are as follows:

- The applicable range is limited to ASCII data areas (from the area after the header to the area before the sum).
- The lower order 1 bytes which are unsigned and added 1 character (1 byte) at a time in the data area after ASCII conversion are converted and added to the calculation according to the data representation format.

This is shown in the example below:

Data	$	R	1	0	0	4	C	5	A	¥r
Hex	24	52	31	30	30	34	43	35	41	0D

0x52 + 0x31 + 0x30 + 0x30 + 0x34 + 0x43=0x015A

3.1.1 COM Transmission Example

Here, the transmission format is explained using a command to change the robot's program number.

Example: Switching to Program Number 76

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	52	R	Command Code
3	31	1	Subcommand Code (1: Change Program Number)
4	30	0	Program Number: 76 = 004CH
5	30	0	
6	34	4	
7	43	C	
8	35	5	SUM: 52H+31H+30H+30H+34H+43H=15AH
9	41	A	
10	0D		CR: Transmission End Code

Put "$" as a 1-byte transmission start code at the head of the command. Put "return (CR)" as a transmission end code at the end of the command. When the robot receives the command, it handles the entire content, from start code to end code, as a single batch.
Put a Roman alphabetical letter as a (single byte) command code after the transmission start code. As a rule, capital letters are used for transmission from the controller (PLC, etc.) to the robot and small letters are used for transmission from the robot to the controller (PLC etc.).
The command code is followed by a 1 byte "subcommand code". An Arabic numeral or Roman alphabetical letter is used for this.

The rest is data (parameters) which are converted and handled in hexadecimal format.
In this example, program number 76 to which you are switching is represented as 004C in hexadecimal format. Originally, 2-byte data is represented in a 4-byte transmission code.

NOTE: Just as with this example, data larger than 2 bytes is transmitted in order from upper layer to lower layer.

The number of data bytes is already fixed according to the command (subcommand). Therefore there is no guarantee the operation will be made if the number is different.
Put an error check sum code at the end of the parameter string.
Put a return (CR) code at the end as a terminator.

3.1.2 Error Check Code

Use SUM as an error check code.
In this example, “SUM” is the value (only the last byte is isolated) added to the transmission content from the command code to the end of data which is also converted into hexadecimal format.

3.1.3 Communication Error

If the robot detects a communication error, it returns an “e” command.
If a communication error is returned, no operation is performed.

Example: Communication Error Response (2: Command Code Error)

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	65	e	Command Code
3	32	2	Subcommand Code (communication error description): 0: Other Communication Error 1: Receive Timeout 2: Command (Subcommand) Code Error 4: Check Sum Error
4	30	0	If a “4. Check Sum Error” occurs, value of the check code (SUM) calculated by the robot is returned. Otherwise, 0 is returned.
5	30	0	
4	46	F	SUM 65H+32H+30H+30H=F7H
5	37	7	
6	0D		CR: Transmission End Code

0 : Other Communication Error
A subcommand code 0 (Other Communication Error) is returned if a parity error, overrun error, frame error, or receive buffer overflow occurs.
Check the parity, character length, and stop bit length settings.

1 : Receive Timeout
When the robot is receiving commands, if there is more than a two-second lag between each character after receiving the start transmit code, a “1:Receive Timeout” error is returned and any subsequent data is ignored.
Take caution, because if transmission of the return code (CR) is omitted, the robot continues to wait for a CR code, causing a “1: Receive Timeout” error.
As a rule, the robot does not wait when it is running. Each character needs to be transmitted in continuous sequence. If there is a lag, a “1: Receive Timeout” error occurs and any subsequent data is ignored.

2 : Command (Subcommand) Code Error

After data from the transmission start code to the return code (CR) is received successfully, the robot analyzes the received commands and subcommands. If the received command code is one that the robot cannot process (an invalid command is received), a subcommand code “2: Command (Subcommand) Code Error” is returned.

4 : Check Sum Error

If the SUM value does not match, a “4: Check Sum Error” is returned.

For a “4: Check Sum Error”, the SUM value calculated by the robot is added to the end of the subcommand code as data. This means that the SUM value and the check sum code included with the received data were different.

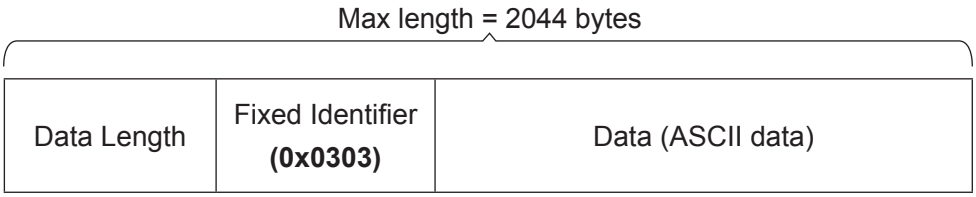
Check Sum Error

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	65	e	Command Code
3	34	4	Subcommand Code (4: Check Sum Error)
4	35	5	Check sum code calculated by the robot (SUM)
5	33	3	
6	30	0	SUM
7	31	1	65H+34H+35H+33H=101H
8	0D		CR: Transmission End Code

Even if the check sum code sent from the robot does not match, you cannot send a retransmission request command to the robot. For a command response to information acquisition, you can resend an information acquisition command in place of retransmission.

3.2 Ethernet Communication

The standard frame composition of Ethernet communication is shown in the diagram below.



Item	Content	Reference
Data length	The transfer data total length (un-signed 4 byte length)	Maximum 65535 bytes
Fixed Identifier	The identifier for performing a general classification of the data (2 bytes) Fixed with the value 0x0303	
Data	The transferred data. ASCII data.	This is referred to as “ASCII data” from here onwards in this manual

There is no problem with dividing up and transferring data packets amongst multiple TCP/IP packets, but, use the data number shown in the data length as the maximum total data amount. However, for actual data handling, use a maximum data length of 2044 (2048 – 4).
The B0 command (refer to “4.1 Acquire Robot Information (B0)”) is shown below.

Robot Information Request (Client → Robot)

Data Length **(0x00000008)**	Identifier **(0x0303)**	Data (ASCII data) (0x4230)

Robot Information Transfer (Robot → Client)

Data Length	Identifier **(0x0303)**	Data (ASCII data) (0x6230.....)

NOTE: The explanations within this manual describe a COM connection.
If using an Ethernet connection, the head code “$” (transfer start code: dollar symbol) and the data end SUM and/or CR codes (new paragraph code) needed for COM communication are not necessary.

3.2.1 Transmission Example of Ethernet Communication

Here, the transmission format is explained using a command to change the robot's program number.

Example: Switching to Program Number 76

N	HEX	ASC	Description
1	00		Data Length (N=12=0000000CH)
2	00		
3	00		
4	0C		
5	03		Fixed Identifier
6	03		
7	52	R	Command Code
8	31	1	Subcommand Code (1: Change Program Number)
9	30	0	Program Number 76=0004CH
10	30	0	
11	34	4	
12	43	C	

Put the data length and fixed identifier at the head of the command. When the robot receives the command, it handles the entire content, from start code to end code, as a single batch.
Put a Roman alphabetical letter as a (single byte) command code after the transmission start code. As a rule, capital letters are used for transmission from the controller (PLC, etc.) to the robot and small letters are used for transmission from the robot to the controller (PLC etc.).
The command code is followed by a 1 byte "subcommand code". An Arabic numeral or Roman alphabetical letter is used for this.

The rest is data (parameters) which are converted and handled in hexadecimal format.
In this example, program number 76 to which you are switching is represented as 004C in hexadecimal format. Originally, 2-byte data is represented in a 4-byte transmission code.

NOTE: Just as with this example, data larger than 2 bytes is transmitted in order from upper layer to lower layer.

The number of data bytes is already fixed according to the command (subcommand). Therefore there is no guarantee the operation will be made if the number is different.

3.2.2 Communication Error through Ethernet Communication

If the robot detects a communication error, it returns an “e” command.
If a communication error is returned, no operation is performed.

Example: Communication Error Response (2: Command Code Error)

N	HEX	ASC	Description	
1	00		Data Length	
2	00			
3	00			
4	0A			
5	03		Fixed Identifier	
6	03			
7	65	e	Command Code	
8	32	2	CR: Transmission End Code	1: Receive Timeout 2: Command (Subcommand) Code Error
9	30	0	Reserved (0)	
10	30	0		

1 ： Receive Timeout

When the robot is receiving commands, if there is more than a two-second lag between each character after receiving the start transmit code, a “1:Receive Timeout” error is returned and any subsequent data is ignored.

As a rule, the robot does not wait when it is running. Each character needs to be transmitted in continuous sequence. If there is a lag, a “1: Receive Timeout” error occurs and any subsequent data is ignored.

2 ： Command (Subcommand) Code Error

If the received command code is one that the robot cannot process (an invalid command is received), a subcommand code “2: Command (Subcommand) Code Error” is returned.

4. ROBOT INFORMATION AND ROBOT STATUS ACQUISITION

4.1 Acquire Robot Information (B0)

This is a command for the host to request robot information from the robot. Robot information is the robot model (axis configuration) and software version, etc.

N	HEX	ASCII	Description
1	24	$	$: Transmission Start Code
2	42	B	Command Code
3	30	0	Subcommand Code
4	37	7	SUM:
5	32	2	42H+30H=72H
6	0D		CR: Transmission End Code

If the robot receives a robot information request command (B0) from the host, the robot returns the robot information (b0).

Example: JR3304 (4 axes XYZR configuration, 300mm type, X axis 300 mm, Y axis 320 mm, Z axis 50 mm, R axis ±360°, auxiliary axis synchronized with 2 axes, CC-Link module equipped)
Detailed Model Code: JR3304(XYZR)-00-A303205020000-21CC00000000

N	HEX	ASCII	Description	
1	24	$	$ Transmission Start Code	
2	62	b	Command Code	
3	30	0	Subcommand Code	
4-63			Hardware/mechanical configuration information (60 characters) Refer to “4.1.1 Hardware and Mechanical Configuration Information.” 000300000102032020000000001E2005020000000003000000000000000000	
64	30	0	Robot system software version Example: Ver.12.34-56	12=0CH
65	43	C		
66	32	2		34=22H
67	32	2		
68	33	3		56=38H
69	38	8		
70	30	0	Not in use (expansion purposes)	
71	30	0		

N	HEX	ASCII	Description		
72	30	0	Application Models Example: Standard	1. Standard 2. Screw Tightening 4. Dispensing 14. Dispensing with Camera 15. Depaneling 16. Pick and Place	1 = 0001H 2 = 0002H 4 = 0004H 14 = 000EH 15 = 000FH 16 = 0010H
73	30	0			
74	30	0			
75	31	1			
76	30	0	Not in use (expansion purposes)		
77	30	0			
78	30	0			
79	30	0			
80	30	0	Robot teaching data version Example: Ver.1000 → 1000 = 03E8H		
81	33	3			
82	45	E			
83	38	8			
84	30	0	Robot teaching data sub1 version		
85	30	0			
86	30	0			
87	31	1			
88	30	0	Robot teaching data sub2 version		
89	30	0			
90	30	0			
91	31	1			
92	30	0	Detailed stroke information: X axis/J1 axis stroke limit for positive direction. J1 axis upper limit 0.01 (deg) units. X axis upper limit 0.001 (mm) units. 150 mm: 150000 = 249F0H		
93	30	0			
94	30	0			
95	32	2			
96	34	4			
97	39	9			
98	46	F			
99	30	0			
100	30	0	Detailed stroke information: Y axis/J2 axis stroke limit for positive direction. J2 axis upper limit 0.01 (deg) units. Y axis upper limit 0.001 (mm) units. 160 mm: 160000 = 27100H		
101	30	0			
102	30	0			
103	32	2			
104	37	7			
105	31	1			
106	30	0			
107	30	0			

N	HEX	ASCII	Description
108	30	0	Detailed stroke information: Z axis/J3 axis stroke limit for positive direction. Z axis (J3 axis) upper limit 0.001 (mm) units. 50 mm : 50000 = C350H
109	30	0	
110	30	0	
111	30	0	
112	43	C	
113	33	3	
114	35	5	
115	30	0	
116	30	0	Detailed stroke information: R axis/J4 axis stroke limit for positive direction. R axis (J4 axis) upper limit 0.01 (deg) units. 360 degrees: 36000 = 8CA0H
117	30	0	
118	30	0	
119	30	0	
120	38	8	
121	43	C	
122	41	A	
123	30	0	
124-131			Reserved
132-139			Reserved
140	30	0	Detailed stroke information: X axis/J1 axis stroke limit for negative direction. J1 axis lower limit 0.01 (deg) units. X axis lower limit 0.001 (mm) units. 0 mm: 0 = 0H
141	30	0	
142	30	0	
143	30	0	
144	30	0	
145	30	0	
146	30	0	
147	30	0	
148	30	0	Detailed stroke information: Y axis/J2 axis stroke limit for negative direction. J2 axis lower limit 0.01 (deg) units. Y axis lower limit 0.001 (mm) units. 0 mm: 0 = 0H
149	30	0	
150	30	0	
151	30	0	
152	30	0	
153	30	0	
154	30	0	
155	30	0	

N	HEX	ASCII	Description
156	30	0	Detailed stroke information: Z axis/J3 axis stroke limit for negative direction. Z axis (J3 axis) lower limit 0.001 (mm) units. 0 mm: 0 = 0H
157	30	0	
158	30	0	
159	30	0	
160	30	0	
161	30	0	
162	30	0	
163	30	0	
164	46	F	Detailed stroke information: R axis/J4 axis stroke limit for negative direction. R axis (J4 axis) lower limit 0.01 (deg) units. -360 degrees: -36000 = FFFFF736H
165	46	F	
166	46	F	
167	46	F	
168	46	F	
169	37	7	
170	33	3	
171	36	6	
172-179			Reserved
180-187			Reserved
188	30	0	X axis/J1 axis initial speed (PPS) Specified in 1 pps units 2000 pps: 2000 = 7D0H
189	30	0	
190	30	0	
191	30	0	
192	30	0	
193	37	7	
194	44	D	
195	30	0	
196	30	0	Y axis /J2 axis initial speed (PPS) Specified in 1 pps units 2000 pps: 2000 = 7D0H
197	30	0	
198	30	0	
199	30	0	
200	30	0	
201	37	7	
202	44	D	
203	30	0	

N	HEX	ASCII	Description
204	30	0	Z axis/J3 axis initial speed (PPS) Specified in 1 pps units 2000 pps: 2000 = 7D0H
205	30	0	
206	30	0	
207	30	0	
208	30	0	
209	37	7	
210	44	D	
211	30	0	
212	30	0	R axis/J4 axis initial speed (PPS) Specified in 1 pps units 2000 pps: 2000 = 7D0H
213	30	0	
214	30	0	
215	30	0	
216	30	0	
217	37	7	
218	44	D	
219	30	0	
220	30	0	X axis/J1 axis PTP speed (mm/s) Specified in 1 mm/s units 700 mm/s: 700 = 2BCH
221	30	0	
222	30	0	
223	30	0	
224	30	0	
225	32	2	
226	42	B	
227	43	C	
228	30	0	Y axis/J2 axis PTP speed (mm/s) Specified in 1 mm/s units 700 mm/s: 700 = 2BCH
229	30	0	
230	30	0	
231	30	0	
232	30	0	
233	32	2	
234	42	B	
235	43	C	
236	30	0	Z axis/J3 axis PTP speed (mm/s) Specified in 1 mm/s units 250 mm/s: 250 = FAH
237	30	0	
238	30	0	
239	30	0	
240	30	0	
241	30	0	
242	46	F	
243	41	A	

N	HEX	ASCII	Description
244	30	0	R axis/J4 axis PTP speed (deg/s) Specified in 1 deg/s units 600 deg/s: 600 = 258H
245	30	0	
246	30	0	
247	30	0	
248	30	0	
249	32	2	
250	35	5	
251	38	8	
252	30	0	X axis/J1 axis PTP acceleration (mm/s^2) Specified in 1 (mm/s^2) units 2500 mm/s^2: 2500 = 9C4H
253	30	0	
254	30	0	
255	30	0	
256	30	0	
257	39	9	
258	43	C	
259	34	4	
260	30	0	Y axis/J2 axis PTP acceleration (mm/s^2) Specified in 1 (mm/s^2) units 2500 mm/s^2: 2500 = 9C4H
261	30	0	
262	30	0	
263	30	0	
264	30	0	
265	39	9	
266	43	C	
267	34	4	
268	30	0	Z axis/J3 axis PTP acceleration (mm/s^2) Specified in 1 (mm/s^2) units 1800 mm/s^2:1800 =708H
269	30	0	
270	30	0	
271	30	0	
272	30	0	
273	37	7	
274	30	0	
275	38	8	
276	30	0	R axis/J4 axis PTP acceleration (deg/s^2) Specified in 1 deg/s^2 units 5000 deg/s^2: 5000 = 1388H
277	30	0	
278	30	0	
279	30	0	
280	31	1	
281	33	3	
282	38	8	
283	38	8	

N	HEX	ASCII	Description
284	30	0	R axis CP revolution speed limit (deg/s) Specified in 1 deg/s units 600 deg/s: 600 = 258H
285	30	0	
286	30	0	
287	30	0	
288	30	0	
289	32	2	
290	35	5	
291	38	8	
292	30	0	X axis/J1 axis CP acceleration (mm/s^2) Specified in 1 mm/s^2 units 2500 mm/s^2: 2500 = 9C4H
293	30	0	
294	30	0	
295	30	0	
296	30	0	
297	39	9	
298	43	C	
299	34	4	
300	30	0	Y axis/J2 axis CP acceleration (mm/s^2) Specified in 1 mm/s^2 units 2500 mm/s^2 : 2500 = 9C4H
301	30	0	
302	30	0	
303	30	0	
304	30	0	
305	39	9	
306	43	C	
307	34	4	
308	30	0	Z axis/J3 axis CP acceleration (mm/s^2) Specified in 1 (mm/s^2) units 2000 mm/s^2: 2000 = 7D0H
309	30	0	
310	30	0	
311	30	0	
312	30	0	
313	37	7	
314	44	D	
315	30	0	
316	30	0	R axis/J4 axis CP acceleration (deg/s^2) Specified in 1 deg/s^2 units 5000 deg/s^2: 5000 = 1388H
317	30	0	
318	30	0	
319	30	0	
320	31	1	
321	33	3	
322	38	8	
323	38	8	

N	HEX	ASCII	Description
324,325			Reserved
326,327			Reserved
328			Reserved
329			Reserved
			SUM
	0D		CR Transmission End Code

4.1.1 Hardware and Mechanical Configuration Information

The hardware/mechanical configuration information is represented in 60 characters, and shows information such as model type (mechanical type, size classification, and motor classification) and the axes that the robot has/does not have etc.

N	HEX	ASCII	Description
4	30	0	Mechanical Type
5	30	0	Desktop Robot JR3000 Series
6	30	0	Size Classification/Axis Assembly
7	33	3	300 mm type
8	30	0	Motor Classification
9	30	0	Standard
10	30	0	Axis Function of 1st Axis
11	30	0	X axis configuration
12	30	0	Axis Function of 2nd Axis
13	31	1	Y axis configuration
14	30	0	Axis Function of 3rd Axis
15	32	2	Z axis configuration
16	30	0	Axis Function of 4th Axis
17	33	3	R axis configuration
18	32	2	Axis Function of 5th Axis
19	30	0	Auxiliary axis (synchronized control)
20	32	2	Axis Function of 6th Axis
21	30	0	Auxiliary axis (synchronized control)
22	30	0	Not in use (expansion purposes)
23	30	0	
24	30	0	Not in use (expansion purposes)
25	30	0	
26	30	0	Specialized Axis Configuration
27	30	0	
28	30	0	Specialized Stroke Flag
29	30	0	Standard

N	HEX	ASCII	Description
30	31	1	1st Axis (X Axis) Stroke
31	45	E	300 mm (300 → 1EH)
32	32	2	2nd Axis (Y Axis) Stroke
33	30	0	320 mm (320 → 20H)
34	30	0	3rd Axis (Z1 Axis) Stroke
35	35	5	50 mm (50 → 05H)
36	30	0	4th Axis (R Axis) Stroke
37	32	2	±360° (360 = 180 x 2 → 02H)
38	30	0	5th Axis (MT1) Stroke
39	30	0	N/A
40	30	0	6th Axis (MT2) Stroke
41	30	0	N/A
42	30	0	Not in use (expansion purposes)
43	30	0	
44	30	0	Not in use (expansion purposes)
45	30	0	
46	30	0	Fieldbus Information (FFH = Invalid, 00H = DeviceNet, 01H = PROFIBUS, 02H = CC-Link, 03H=CANopen, 04H=PROFINET, 05H=EtherNet/IP) If using CC-Link and the connection with the master device is not established, the Fieldbus is FFH (invalid.)
47	33	3	
48	30	0	Not in use (expansion purposes)
49	30	0	
50	30	0	Not in use (expansion purposes)
51	30	0	
52	30	0	Not in use (expansion purposes)
53	30	0	
54	30	0	Not in use (expansion purposes)
55	30	0	
56	30	0	Additional Information
57	30	0	Standard
58	30	0	Not in use (expansion purposes)
59	30	0	
60	30	0	Not in use (expansion purposes)
61	30	0	
62	30	0	Not in use (expansion purposes)
63	30	0	

■ Mechanical Type (N = 4 – 5)

This shows the robot model type.

ASCII	Meaning
00	Desktop Robot JR3000 Series
01	SCARA Robot JS3 Series
02	Cartesian Robot JC-3 Series

■ Size Classification (N = 6 – 7)

This shows the category of the robot's size and moveable range.

JR3000 Series

ASCII	Meaning
02	JR3200 Series (moveable range X=200 mm, Y=200 mm)
03	JR3300 Series (moveable range X=300 mm, Y=320 mm)
04	JR3400 Series (moveable range X=400 mm, Y=400 mm)
05	JR3500 Series (moveable range X=510 mm, Y=510 mm)
06	JR3600 Series (moveable range X=510 mm, Y=620 mm)

JS3 Series

ASCII	Meaning
03	JS3-3520 (350 mm maximum arm length)
04	JS3-4520 (450 mm maximum arm length)
05	JS3-5520 (550 mm maximum arm length)

■ Axis Assembly (N = 6 – 7)

JC-3 Series

ASCII	Meaning
00	T: Single sided
01	H: Double sided

■ Motor Classification (N = 8 – 9)

This shows the type of motor control.

ASCII	Meaning
00	Standard (open loop control stepping motor) (JR3000N/JC-3 Series)
01	Step-out detection stepping motor (JR3000E Series)
02	Feedback control stepping motor (JR3000F Series)
03	AC Servo motor (JS3 Series) Feedback control stepping motor (JC-3 Absolute Encoder Models)

■ The axis functions of the 1st Axis – 6th Axis (N = 10 – 21)

This shows the axis functions of the 1st axis – 6th axis.

The ASCII codes indicating the axis functions are as shown below.

• Desktop Robots/Cartesian Robots

ASCII	Meaning
FF	No axis
00	X axis mechanism
01	Y axis mechanism
02	Z axis mechanism
03	R axis mechanism
20	Auxiliary axis (synchronous control)
21	Auxiliary axis (asynchronous control)

• SCARA Robots

ASCII	Meaning
FF	No axis
00	J1 axis mechanism
01	J2 axis mechanism
02	J3 axis mechanism
03	J4 axis mechanism
20	Auxiliary axis (synchronous control)
21	Auxiliary axis (asynchronous control)

The 1st axis – 4th axis are displayed as follows:

• JR3xx2 (2 axis specifications)

N	HEX	ASCII	Description
7	30	0	1st axis = X axis mechanism
8	30	0	
9	30	0	2nd axis = Y axis mechanism
10	31	1	
11	46	F	No 3rd axis
12	46	F	
13	46	F	No 4th axis
14	46	F	

- 3 axis specifications

N	HEX	ASCII	Description
7	30	0	1st axis = X axis mechanism
8	30	0	
9	30	0	2nd axis = Y axis mechanism
10	31	1	
11	30	0	3rd axis = Z axis mechanism
12	32	2	
13	46	F	No 4th axis
14	46	F	

- 4 axis specifications

N	HEX	ASCII	Description
7	30	0	1st axis = X axis mechanism / J1 axis mechanism
8	30	0	
9	30	0	2nd axis = Y axis mechanism / J2 axis mechanism
10	31	1	
11	30	0	3rd axis = Z axis mechanism / J3 axis mechanism
12	32	2	
13	30	0	4th axis = R axis mechanism / J4 axis mechanism
14	33	3	

The 5th axis and 6th axis are displayed as follows:

- No auxiliary axis (no I/O-MT)

N	HEX	ASCII	Description
18	46	F	No 5th axis
19	46	F	
20	46	F	No 6th axis
21	46	F	

- Auxiliary axis robots (I/O-MT robots), 2 axis synchronization specifications

N	HEX	ASCII	Description
18	32	2	5th axis = auxiliary axis (synchronized control)
19	30	0	
20	32	2	6th axis = auxiliary axis (synchronized control)
21	30	0	

■ Specialized Axis Configuration (N = 26 – 27)

N	HEX	ASCII	Description
26	30	0	Specialized axis configuration: 00: Standard 01: High precision model 02: Configuration consisting of a Z slider and brake attached to the 1st axis
27	30	0	

■ Specialized Stroke Flags (N = 28 – 29)

N	HEX	ASCII	Description
28	30	0	Specialized stroke flags: 00: Standard 01: Specialized stroke
29	30	0	

■ 1st axis stroke – 6th axis stroke (N = 30 – 41)

This shows the stroke (moveable range) of each axis.

• X axis mechanism, Y axis mechanism, Z axis mechanism, J3 axis mechanism

The ASCII codes are displayed in 10mm numerical units.

ASCII	Meaning
00	No axis
05	50 mm
0A	100 mm
14	200 mm
1E	300 mm
20	320 mm
28	400 mm
33	510 mm
3E	620 mm
FF	User Definition (specialized stroke settings)

• J1 axis mechanism, J2 axis mechanism

ASCII	Meaning
00	No axis
91	±145˚
AA	±170°

• R axis mechanism

ASCII	Meaning
00	No axis
02	±360°

■ Additional Information (N = 56 – 57)

N	HEX	ASCII	Description
56	30	0	Additional information 00: Standard model 01: CE compliant model 02: Cleanroom model 03: CE complaint cleanroom model
57	30	0	

4.2 Acquire Robot Status (B1)

Send this command from the host to the robot to order it to transmit its current status.

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	42	B	Command Code
3	31	1	Subcommand Code
4	37	7	SUM
5	33	3	42H+31H=73H
6	0D		CR: Transmission End Code

If the robot receives a robot status request command (B1) from the host, it generates a robot status transfer (b1) as follows:

N	HEX	ASCII	Description
1	24	$	$ Transmit start code
2	62	b	Command code
3	31	1	Subcommand code
4	30	0	Operation Mode 0: Teaching Mode 1: Reserved 2: Run Mode 3: Undefined 4: Test Run Mode 5: Point Run Mode 6: Administration Mode 7: Customizing Mode
5	30	0	
6	30	0	TP Connection Status 0: Teaching (TP) 1: Teaching (PC)
7	30	0	
8	30	0	Start Channel 0: I/O-SYS 1: Fieldbus 2: COM1 3: User definition 4: Ethernet
9	32	2	
10	30	0	Not in use (expansion purposes)
11	30	0	
12	30	0	Currently selected program number Example: program number 12 = 0CH (expressed in hexadecimal)
13	30	0	
14	30	0	
15	31	1	

N	HEX	ASCII	Description	
16	30	0	Robot Status 0002H Waiting mechanical initialize 0003H Performing mechanical initialize 0004H Teaching Mode 0008H Waiting run 0028H Running (waiting start due to temporary stop) 0029H Running (moving) 0068H Running (waiting condition) 1000H Administration Mode 1100H Emergency stop	
17	30	0		
18	30	0		
19	30	0		
20	30	0		
21	30	0		
22	30	0		
23	32	2		
24	30	0	ON time (cumulative power ON time) in [minutes]	
25	30	0		
26	30	0		
27	30	0		
28	30	0		
29	36	6		
30	36	6		
31	43	C		
32	30	0	Playback time (cumulative run time) [min] unit increments	
33	30	0		
34	30	0		
35	30	0		
36	30	0		
37	30	0		
38	30	0		
39	39	9		
40	30	0	Not in use (expansion purposes)	
41	30	0		
42	30	0	Reserved	
43	30	0		
44	43	C	IP Address Example: 192.168.200.40	192=C0H
45	30	0		
46	41	A		168=A8H
47	38	8		
48	43	C		200=C8H
49	38	8		
50	32	2		40=28H
51	38	8		

N	HEX	ASCII	Description	
52	30	0	Reserved	0
53	30	0		
54	30	0		0
55	30	0		
56	30	0		0
57	30	0		
58	30	0		0
59	30	0		
60	46	F	Subnet Mask Example: 255.255.255.0	255=FFH
61	46	F		
62	46	F		255=FFH
63	46	F		
64	46	F		255=FFH
65	46	F		
66	30	0		0
67	30	0		
68	32	2	Standby Port Number Example: 10031 = 272FH	
69	37	7		
70	32	2		
71	45	F		
72	30	0	Not in use (expansion purposes)	
73	30	0		
74	30	0	Not in use (expansion purposes)	
75	30	0		
76	30	0	Not in use (expansion purposes)	
77	30	0		
78	30	0	Not in use (expansion purposes)	
79	30	0		
80	30	0	SUM	
81	31	1		
82	0D		CR transmission end code	

5. RUN CONTROL

5.1 Run Control (R)

Perform program starts and other robot run controls from a host.
R0 – R5 are functions that specifically correspond to the I/O-SYS system input signals. Instead of using I/O-SYS, you can start runs, etc., with commands sent from COM 1 or Ethernet*.

* Start Channel Information
  Mechanical initializations (JR3000/JC-3 Series only) and run starts can be enabled from one of the following only: [I/O-SYS] / [Fieldbus] / [COM1] / [Ethernet]. First, set the connector connecting the device which outputs the start instruction as [Start Channel].

  If using communication control with any of the Run Control (R) or Movement Control (M) commands that move the axes, you need to set the [Start Channel] to [COM1] or [Ethernet].

  Perform one of the operations below to start a program which uses communication control in Run Mode. However, you will need to select a program which has complete teaching data to make a program run.

■ COM1 Starts
  Send a “Start” communication command to the robot from the external device (PLC etc.) connected to the COM1 port.

■ Ethernet Starts
  Send a “Start” communication command to the robot from the external device (PLC etc.) connected to the Ethernet port.

Example: Switching to Program Number 12

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	52	R	Command Code
3	31	1	Subcommand Code 0: Mechanical Initialization 1: Change Program Number 2: Return to Work Home 3: Start 4: Temporary Stop 5: Last Work 6: Reserved 7: Program End 8: Start Designated Program Number 9: Execute Single Point Job
4	30	0	Program Number (Point Job Number)
5	30	0	Only for 1: Change Program Number, 8: Designated Program Number Start,
6	30	0	and 9: Single Point Job Execution
7	43	C	Example: Program Number 12: 0CH
8	35	5	SUM
9	36	6	156H
10	0D		CR: Transmission End Code

Normally, as a run control response (r) to the run control command, the robot returns whether or not the operation was successful. The subcommand code returns the instruction code as is.

Example: The robot could not start

N	HEX	ASC	Description
1	24	$	$: Transmission Start Command
2	72	r	Command Code
3	33	3	Subcommand Code
4	46	F	Normal/Error Code
5	46	F	0: Normal, -1: Error
6	46	F	With a program number change, if the number is changed successfully, the
7	46	F	new program number is returned. If not, -1 (error code) will be returned.
8	42	B	SUM
9	44	D	1BDH
10	0D		CR: Transmission End Code

However, if commands that take some time to complete (R0, R2, R3, R8, and R9) are used, the robot returns a special start response (temporary response).
The start response is a temporary response that indicates that the command has been interpreted, and therefore unlike regular responses, the robot returns the same command code (Roman capital letters). No parameter is attached to the temporary response.

Example: Start Response (temporary response)

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	52	R	Command Code
3	38	8	Subcommand Code 0: Mechanical Initialization 2: Return to Work Home 3: Start (Program Start) 8: Start Designated Program Number 9: Execute Individual Point Job
4	38	8	SUM
5	41	A	
6	0D		CR: Transmission End Code

After the robot returns the start response (temporary response), the actual operation is executed. A normal response is returned once the operation is complete (regardless of whether it was a successful operation or not). However, if the robot recognizes beforehand that it does not have the conditions to execute the commands (not in Run Mode for example), an error code (“-1”) is returned instead of a temporary response.

5.1.1 R0: Mechanical Initialization: JR3000/JC-3 Series, Power ON (including Servo ON): JS3 Series

■ JR3000/JC-3 Series

This performs mechanical initialization. If the robot is not in Run Mode, the robot returns the error code “-1: Error.” If the robot is in Run Mode, the robot returns the temporary response (R0) and performs the mechanical initialization. If the robot initializes normally, the robot returns the “0: Normal” code. If the robot did not initialize normally, the robot returns the “-1: Error” code.

NOTE: JC-3 absolute encoder models cannot execute a mechanical initialization. The robot returns the “-1: Error” code.

■ JS3 Series

This turns ON the motor power and the servomotors for all axes. This command is valid when the robot is standing by or waiting to start in the middle of a run. If the robot is not in Run Mode, the robot returns the error code “-1: Error.” If the robot is in Run Mode, the robot returns the temporary response (R0) and then turns ON the motor power and the servomotors. If these all turn ON normally, the robot returns the “0: Normal” code. If these do not turn on normally, the robot returns the “-1: Error” code.

5.1.2 R1: Change Program Number

This changes the program number. This command is valid when the robot is waiting to run (on standby). If the program number is changed successfully, the robot returns the new program number instead of an error code. If an unregistered program (number) is selected etc., the error code “-1: Error” is returned.

5.1.3 R2: Return to Work Home

This command moves the robot to the registered work home position for the currently selected program number.
If the robot is not in Run Mode, the error code “-1 Error” is returned. In any other case, the robot returns a temporary response (R2) and the robot starts moving to the work home position. If the robot reaches the work home position successfully, the “0 normal” code is returned, if not, the “-1 Error” code is returned.

5.1.4 R3: Start

If the robot receives this command when it is waiting to run, the robot starts running. If the robot is stopped temporarily (such as a stop when an error occurs), the run restarts.
If the robot is not waiting or has not stopped, it returns the error code “-1 Error”. If the robot is not in Run Mode, it also returns “-1 Error”. The error code “-1 Error” is also returned if the robot is stopped by an emergency stop or start is inhibited.
If the robot is standing by and ready for start, it returns a temporary response (R3) and starts running. After it finishes running, the robot returns a normal response.
On the other hand, if the robot is stopped temporarily, it restarts operation and at the same time returns a normal response, not a temporary response.

5.1.5 R4: Temporary Stop

When the robot receives this command, the robot operates until it reaches a breakpoint (such as a PTP point; a point where the robot moves to the next point via PTP movement) and then stops temporarily. At the movement when the robot makes the temporary stop, it returns a response. This command is valid when the robot is running.

5.1.6 R5: Last Work

The robot returns a response immediately after receiving this command.
If the robot receives this command during a cycle run, the robot returns to the work home position at the moment when the cycle of operation ends (after running the last point) and the program ends normally. This command is valid when the robot is running.

5.1.7 R7: Program End

When the robot receives this command during operation, it moves to a breakpoint (such as a PTP point; a point where the robot moves to the next point via PTP movement) and cancels the program. The robot goes on start standby and does not return to the work home position. If you want the robot to return to the work home position, use the R2 (Return to Work Home) command after ending the program. This command is valid when the robot is running.

5.1.8 R8: Start Specified Program Number

If the robot receives this command when it is waiting to start and is able to start, it returns a temporary response (R8) and starts running. After running, the robot returns a normal response. The robot returns an error code if it cannot start running.

5.1.9 R9: Execute Single Point Job

After receiving this command, the robot executes the designated point job. This command is valid when the robot is in Run Mode and waiting to start or waiting to start in the middle of a run (due to a temporary stop or error signal).
If the start channel (Administration Mode) is not set to [User Definition], the *Move* commands and *callProg* command become invalid and are not executed. (No error is returned.)

6. I/O CONTROL

With I/O control, input/output signals, auxiliary relays, system flags and other such Boolean variables are expressed in types and numbers, and are handled collectively.
The variable types are listed below: The “type values (0 – E)” designate to which type the input/output signals belong.

Type	Symbol	Type Value	Number
System I/O Input	#sysIn	0	JR3000/JC-3 Series: 1 – 16 JS3 Series: 1 – 15
General I/O Input	#genIn	1	JR3000/JC-3 Series: 1 – 8 JS3 Series:1 – 18
Hand I/O Input	#handIn	2	1 – 8
System I/O Output	#sysOut	3	JR3000/JC-3 Series: 1 – 16 JS3 Series: 1 – 14
General I/O Output	#genOut	4	JR3000/JC-3 Series: 1 – 8 JS3 Series:1 – 22
Hand I/O Output	#handOut	5	1 – 8
Internal Relay	#mv	6	1 – 99
Keep Relay	#mkv	7	1 – 99
System Flag	#sysFlag	8	1 – 999
Pallet Flag	#palletFlag	9	1 – 100
PLC Timer Flag	#seqT	A	1 – 100
PLC Counter Flag	#seqC	B	1 – 50
Fieldbus I/O Input	#fbIn	D	1000H – 17FFH
Fieldbus I/O Output	#fbOut	E	1800H – 18FFH

These are available for current status readout and output. The following variations are available:

0. I/O Readout
1. Designated Number Readout
2. Set (Turn ON)
3. Reset (Turn OFF)
4. DelaySet (Turn ON after the designated time)
5. DelayReset (Turn OFF after the designated time)
6. Pulse (Turn ON and then turn OFF after outputting the designated pulse.)
7. InvPulse (Turn OFF and then turn ON after outputting the designated pulse.)
8. DelayPlusSet (Turn ON after the designated time and then turn OFF after outputting the designated pulse.)
9. DelayinvPulseSet (Turn OFF after the designated time and then turn ON after outputting the designated pulse.)
10. Data Output (outputs the specified data by the specified output width)
11. BCD Data Output (outputs the specified BCD data by the specified output width)

6.1 I/O Readout (K0, K1)

The readout request command (K0) specifies the I/O type. When the robot receives this command, it returns the I/O type status as a bit flag alignment. On the other hand, a specified number readout request command (K1) specifies the I/O type and number and only that number's status is readout.

Readout Request (K0)

Example: System I/O Input (#sysIn)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4B	K	Command Code
3	30	0	Subcommand Code
4	30	0	Type Value (0 – E)
5	30	0	
6	30	0	
7	30	0	
8	33	3	SUM
9	42	B	
10	0D		CR:Transmission End Code

The robot returns the status in response to the IOM status readout request command (K0).

Example: #sysIn

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	6B	k	Command Code
3	30	0	Subcommand Code
4	30	0	Type Value (0 – E) (The robot returns the value with the request command value attached.)
5	30	0	
6	30	0	
7	30	0	
8	32	2	No.1 – No.8 status; bit0: No.1 ... bit7: No.8; ON: 1, OFF:0 00100001: 21H
9	31	1	
10	30	0	No.9 – No.16 status; bit0: No.9 ... bit7: No.16; ON: 1, OFF:0 00000100:04H
11	30	4	
12	30	0	No.17 – No.18 status; bit0: No.17 ... bit1: No.18; ON: 1, OFF:0
13	30	0	
14	38	8	SUM
15	32	2	
16	0D		CR: Transmission End Code

Specified Number Readout Request (K1)

Example: General-Purpose I/O Input, No. 3 (#genIn3)

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	4B	K	Command Code
3	31	1	Subcommand Code
4	30	0	Type Specified Value (0 – E)
5	30	0	
6	30	0	
7	31	1	
8	30	0	IOM Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	33	3	
16	43	C	SUM
17	30	0	
18	0D		CR: Transmission End Code

With a specified number readout request, the robot returns the type value and IOM number as the same numbers as sent from the request. This is followed by a status response.

Specified Number Readout Response (k1)

Example: General I/O Input, No. 3 (#genIn3)

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	4B	K	Command Code
3	31	1	Subcommand Code
4	30	0	Type Specified Value (0 – E)
5	30	0	
6	30	0	
7	31	1	

N	HEX	ASC	Description
8	30	0	IOM Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	33	3	
16	30	0	Status 0: OFF 1: ON
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	30	0	
23	31	1	
24	36	6	SUM
25	31	1	
26	0D		CR: Transmission End Code

6.2 I/O Output: Set, Reset (K2, K3)

These commands set (turn ON) and reset (turn OFF) the I/O signals. The robot cannot output from system I/O input, general I/O input, hand I/O input and Fieldbus I/O input and so type value 0 – 1 and D are ignored (an error is not returned but the type values are not applied).

Example: set, #genOut2

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	4B	K	Command Code
3	32	2	Subcommand Code (2 or 3)
4	30	0	Type Specified Value (3 – B, E)
5	30	0	
6	30	0	
7	30	4	

N	HEX	ASC	Description
8	30	0	Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	32	2	
16	43	C	SUM
17	33	3	
18	0D		CR: Transmission End Code

The robot returns a normal/error response. In actuality, errors are not returned as IOM output processing does not make any special parameter checks, etc.

Response; example: set

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	4B	k	Command Code
3	32	2	Subcommand Code (2 or 3)
4	30	0	Normal/Error
5	30	0	
6	30	0	0: Normal
7	30	0	-1: Error
8	35	5	SUM
9	44	D	
10	0D		CR: Transmission End Code

6.3 I/O Output: delaySet, delayReset (K4, K5)

These commands set (turn ON) and reset (turn OFF) the I/O signals after a designated time. The delay time is specified in units of milliseconds. The robot cannot output from system I/O input, general I/O input, hand I/O input and Fieldbus I/O input and so type values 0 – 1 and D are invalid (an error is not returned but they are inapplicable). The robot responds to these commands before the delay time expires.

Example:

N	HEX	ASC	Description
1	24	$	$:Start Transmission Code
2	4B	K	Command Code
3	30	4	Subcommand Code (4 or 5)
4	30	0	Type Specified Value (3 – B, E)
5	30	0	
6	30	0	
7	34	4	
8	30	0	Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	31	1	
16	30	0	Delay Time [msec] Example: 100msec = 64H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	36	6	
23	34	4	
24	34	4	SUM
25	45	E	
26	0D		CR:Transmission End Code

The response parameters return a normal or error code in the same form as those for K2 and K3.

6.4 I/O Output: pulse, invPulse (K6, K7)

Positive pulse signals or negative pulse signals are output. A positive pulse output is the same as a signal coming ON immediately and then a delay reset being output. Also, a negative pulse output is the same as a signal going OFF immediately and then a delay reset being output. The pulse width is specified in units of milliseconds. The robot cannot output from system I/O input, general I/O input, hand I/O input, and Fieldbus I/O input and so type values 0 – 1 and D are invalid (an error is not returned but they are inapplicable). The robot responds to these commands before the delay time expires.

Example:

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4B	K	Command Code
3	36	6	Subcommand Code (6 or 7)
4	30	0	Type Specified Value (3 – B, E)
5	30	0	
6	30	0	
7	34	4	
8	30	0	Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	31	1	
16	30	0	Pulse Width [msec] Example: 100msec = 64H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	36	6	
23	34	4	
24	35	5	SUM
25	30	0	
26	0D		CR:Transmission End Code

The response parameters return a normal or error code in the same form as those for K2 and K3.

6.5 I/O Output: delayPulseSet, delayinvPulseSet (K8, K9)

These commands output the positive pulse signals or negative pulse signals after a designated delay time. The delay time and pulse width are specified in units of milliseconds. The robot cannot output from system I/O input, general I/O input, hand I/O input, and Fieldbus I/O input and so type values 0 – 1 and D are invalid (an error is not returned but they are inapplicable). The robot responds to these commands before the delay time expires.

Example:

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4B	K	Command Code
3	38	8	Subcommand Code (8 or 9)
4	30	0	Type Specified Value (3 – B, E)
5	30	0	
6	30	0	
7	34	4	
8	30	0	Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	31	1	
16	30	0	Delay Time [msec] Example: 100 msec = 64H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	36	6	
23	34	4	
24	30	0	Pulse Width [msec] Example: 100 msec = 64H
25	30	0	
26	30	0	
27	30	0	
28	30	0	
29	30	0	
30	36	6	
31	34	4	

N	HEX	ASC	Description
32	44	D	SUM
33	43	C	
34	0D		CR:Transmission End Code

The response parameters return a normal or error code in the same form as those for K2 and K3.

6.6 I/O Output: Data Output, BCD Data Output (KA, KB)

Output the specified data by the specified width. The robot cannot output from system I/O, general I/O, hand I/O input, and Fieldbus I/O and so type values 0 – 1 and D are invalid (an error is not returned but they are inoperable).

Example:

N	HEX	ASC	Description
1	24	$	$Transmission start code
2	4B	K	Command code
3	38	A	Subcommand code (A or B)
4	30	0	Type specified value (3 – B, E)
5	30	0	
6	30	0	
7	34	3	
8	30	0	Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	31	1	
16	30	0	Output width Example: 16 = 10H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	36	1	
23	34	0	

N	HEX	ASC	Description
24	30	0	Output data Example: 123 = 7BH
25	30	0	
26	30	0	
27	30	0	
28	30	0	
29	30	0	
30	36	7	
31	34	B	
32	45	E	SUM
33	41	A	
34	0D		CR transmission end code

The response parameters are returned as normal/error; the same format as K2, K3.

7. MOVEMENT CONTROL

Movement control commands are valid only when the robot is stopped in Run Mode (Start channel: COM or Ethernet*).
These commands look at the I/O-S and start inhibition signals and if they are inhibited the robot does not operate. Also, when the robot is moving, External I/O output control is used (the signals [Ready for Start] and [Robot Stopping] are OFF).

* Start Channel Information
  Mechanical initializations (JR3000/JC-3 Series only) and run starts can be enabled from one of the following only: [I/O-SYS] / [Fieldbus] / [COM1] / [Ethernet]. In advance, set the connector connecting the device which outputs the start instruction as [Start Channel].

  If using communication control with any of the Run Control (R) or Movement Control (M) commands that move the axes, you need to set the [Start Channel] to [COM1] or [Ethernet].

  Perform one of the operations below to start a program which uses communication control in Run Mode. However, you will need to select a program which has complete teaching data to make a program run.

■ COM1 Starts
  Send a “Start” communication command to the robot from the external device (PLC etc.) connected to the COM1 port.

■ Ethernet Starts
  Send a “Start” communication command to the robot from the external device (PLC etc.) connected to the Ethernet port.

The robot is prepared with the following movement variations:
1. PTP Movement Control (M1)
2. CP Linear Movement Control (M2)
3. CP Arc Movement Control (M3)
4. JOG Movement (M4, M5, M6)
5. CP Continuous Movement (M7)

7.1 PTP Movement Control (M1)

This specifies the destination and executes a PTP movement.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	31	1	Subcommand Code
4-59			Destination Positions Refer to “13.3 Position (56 Byte Format).”
60			SUM
61			
62	0D		CR:Transmission End Code

For the PTP Conditions and Move Area Limit, the program data values of the currently selected program apply. If there is no registered program for the selected program number, the Default All Program Common Settings apply.
The tool data for the [Main Tool] is applied.

The robot returns a start response (temporary response) to this command. The start response is a temporary response indicating that the command has been interpreted and therefore unlike a regular response, the robot returns a designated command code (in Roman capital letters). No parameters are attached to the temporary response.

Example: Start Response (temporary response)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	31	1	Subcommand Code
4	37	7	SUM
5	45	E	
6	0D		CR:Transmission End Code

After returning the start response, the robot executes the operation. It then sends a regular response (regardless of whether the operation was normal or in error) when the operation is complete.
However, if the robot recognizes in advance that the movement cannot be made under the current conditions (e.g. the robot is not in Run Mode etc.), the temporary response is not returned and an error response is returned instead.

If the PTP movement is successfully executed, a normal response is returned after the robot has reaches its destination. If it did not execute the operation successfully due to an out-of-range movement, etc., then an error response is returned.

Example: Error

N	HEX	ASC	Description
1	24	$	$ Transmission Start Code
2	6D	m	Command Code
3	31	1	Sub Command Code
4	46	F	Result Code 0: Normal -1: Error
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM
9	36	6	1B6
10	0D		CR Transmission End Code

The following can cause an error:

- The robot is not in standby in External Run Mode
- Stop due to overload error
- The position is out of range

7.2 CP Linear Movement Control (M2)

This specifies the destination and speed and then executes a CP linear movement.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	32	2	Subcommand Code
4	30	0	CP Speed in increments of 0.1 [mm/s] Example: 15.5 [mm/s] (represented as 155): 9BH
5	30	0	
6	39	9	
7	42	B	
8-63			Destination Positions Refer to “13.3 Position (56 Byte Format).”
64			SUM
65			
66	0D		CR:Transmission End Code

For the CP Conditions and Move Area Limit, the program data values of the currently selected program apply. If there is no registered program for the selected program number, then the program data default values apply.

The tool data for the [Main Tool] is applied.

The robot returns a start response (temporary response) to this command. The start response is a temporary response indicating that the command has been interpreted and therefore unlike a regular response, the robot returns a designated command code (in Roman capital letters). No parameters are attached to the temporary response.

Example: Start Response (temporary response)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	32	2	Subcommand Code
4	37	7	SUM
5	46	F	
6	0D		CR:Transmission End Code

After returning the start response, the robot executes the operation. It then sends a regular response (regardless of whether the operation was normal or in error) when the operation is complete. However, if the robot recognizes in advance that the movement cannot be made under the current conditions (e.g. the robot is not in Run Mode etc.), the temporary response is not returned and the “-1 Error” response is returned.

If movement is made successfully, the robot returns a normal code after reaching its destination. If the robot exceeds the move area limit etc., the robot returns an error response.

Example: Error

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6D	m	Command Code
3	32	2	Subcommand Code
4	46	F	Result Code Normal: 0 Error: -1
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM: 1B7H
9	37	7	
10	0D		CR: Transmission End Code

The following can cause an error:

- The robot is not on standby in External Run Mode.
- A stop due to an overload error.
- The move area limit is exceeded.
- The CP speed is exceeded.
- A CP righty/lefty error. (JS3 Series)

7.3 CP Arc Movement Control (M3)

This specifies the [CP Arc Point], the destination position and the movement speed of each axis, and then executes a CP arc movement.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	33	3	Subcommand Code
4	30	0	CP Speed: In increments of 0.1 mm/s CP Speed to [CP Arc Point] Example: 20.0 mm/s (represented as 200): C8H
5	30	0	
6	43	C	
7	38	8	
8-63			CP Arc Point Positions Refer to “13.3 Position (56 Byte Format).”
64	30	0	CP Speed: In increments of 0.1 mm/s CP speed from [CP Arc Point] to the destination Example: 20.0 mm/s (represented as 200): C8H
65	30	0	
66	43	C	
67	38	8	
68-123			Destination Positions Refer to “13.3 Position (56 Byte Format).”
124			SUM
125			
126	0D		CR: Transmission End Code

For the CP Conditions and Move Area Limit, the program data values of the currently selected program apply. If there is no registered program for the selected program number, then the program data default values apply.
The tool data for the [Main Tool] is applied.

The robot returns a start response (temporary response) to this command. The start response is a temporary response indicating that the command has been interpreted and therefore unlike a regular response, the robot returns a designated command code (in Roman capital letters). No parameter is attached to the temporary response.

Example: Start Response (temporary response)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	33	3	Subcommand Code
4	38	8	SUM
5	30	0	
6	0D		CR:Transmission End Code

After returning the start response, the robot executes the operation. It then sends a regular response (regardless of whether the operation was normal or in error) when the operation is complete. However, if the robot recognizes in advance that the movement cannot be made under the current conditions (e.g. the robot is not in Run Mode etc.), the temporary response is not returned and an error response is returned.

If the movement is completed successfully, the robot returns a normal response after reaching its destination position. If the movement is not completed successfully, that is, the robot exceeds the move area limit etc., the robot returns an error response.

Example: Error

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6D	m	Command Code
3	33	3	Subcommand Code
4	46	F	Result Code 0: Normal -1: Error
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM 1B8H
9	38	8	
10	0D		CR:Transmission End Code

The following can cause an error:

- The robot is not on standby in External Run Mode.
- A stop due to an overload error.
- The move area limit is exceeded.
- The CP speed is exceeded.
- A CP righty/lefty error. (JS3 Series)

7.4 JOG Movement (M4, M5, M6)

When moving the robot in JOG Mode, use these three commands: JOG Start (M4), JOG Moving (M5), and JOG End (M6).
First, send a JOG Start (M4) command. Specify the distance and tool data here. The robot returns a JOG Start response (m4) and starts JOG movement.
After receiving the response, a JOG Moving (M5) command must be sent continuously at 100msec intervals. The robot suspends the JOG movement if it does not receive the JOG Moving (M5) command within 150msec. This is for safety (to stop quickly) in case of circuit connection or communication error.
The robot does not return a response (m5) to the JOG Moving (M5) command.
Send a JOG End (M6) command to stop the robot. The robot returns a JOG End response (m6) to this command.

The data needed for JOG Movements are the following robot-side data:

- JOG Speed (a value registered in the Teaching Environment Settings)
- Move Area Limit (the move area limit for the currently selected program; if there is no move area limit registered, the default values apply.)

Tool data for JOG movement are attached to a JOG Start command and designated as follows:

JOG Start Instruction (M4)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	34	4	Subcommand Code: 4 (JOG Start)
4	30	0	Reserved
5	30	0	NOTE: Make sure you set 0
6	30	0	Moving Axis Specification 0: X (J1) 1: Y (J2) 2: Z (J3) 3: R (J4) 4: MT1 5: MT2
7	31	1	
8	30	0	Moving Direction Specification 0: Positive Direction 1: Negative Direction
9	30	0	

<table>
<tr><th>N</th><th>HEX</th><th>ASC</th><th>Description</th></tr>
<tr><td>10</td><td>30</td><td>0</td><td>Speed Specification
0: Low Speed
1: Medium Speed
2: High Speed
The speeds specified with the M4 command are modified as follows when sent in sequence with the M5 command:</td></tr>
<tr><td>11</td><td>31</td><td>1</td><td><table><tr><th>M4 Specification</th><th>Speed Variation</th></tr><tr><td>0:Low Speed</td><td>Low Speed → Medium Speed
(accelerate with medium speed as the upper limit)</td></tr><tr><td>1:Medium Speed</td><td>Medium Speed (move at constant speed)</td></tr><tr><td>2:High Speed</td><td>High Speed (move at constant speed)</td></tr></table></td></tr>
<tr><td>12-67</td><td></td><td></td><td>Tool Data (56-byte)</td></tr>
<tr><td>68</td><td></td><td></td><td rowspan="2">SUM</td></tr>
<tr><td>69</td><td></td><td></td></tr>
<tr><td>70</td><td>0D</td><td></td><td>CR:Transmission End Code</td></tr>
</table>

In response to a JOG Start instruction (M4), the robot returns a JOG Start response (m4). If the robot cannot start the JOG movement because it is in a different mode etc., it returns an error code (-1).

JOG Start Response (m4)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6D	m	Command Code
3	34	4	Subcommand Code: 4 Movement Start Response
4	30	0	Normal/Error Code 0: Normal -1: Error (the robot is in a different mode etc.)
5	30	0	
6	30	0	
7	30	0	
8	36	6	SUM 161H
9	31	1	
10	0D		CR:Transmission End Code

JOG Moving Request (M5)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	35	5	Subcommand Code, 5: instruction to continue
4	30	0	Speed Specification
5	30	0	
6	45	E	SUM
7	32	2	E2H
8	0D		CR:Transmission End Code

Normally the robot does not respond to M5, however if the robot receives an M5 command without receiving a JOG Start command (M4), it returns an error code (m5).

JOG Moving Error Response (m5)

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	6D	m	Command Code
3	35	5	Subcommand Code: 5 (JOG Moving Error)
4	46	F	Error Code -1: Error (the robot receives this command without receiving a start command)
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM
9	41	A	1BAH
10	0D		CR:Transmission End Code

JOG End Request (M6)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	36	6	Subcommand Code, 6: end instruction
4	38	8	SUM
5	33	3	83H
6	0D		CR:Transmission End Code

JOG End Response (m6)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6D	m	Command Code
3	36	6	Subcommand Code, 6: Movement complete report
4	30	0	Normal/Error 0: Normal, -1: Error (The robot receives this command without receiving a start command.)
5	30	0	
6	30	0	
7	30	0	
8	36	6	SUM 163H
9	33	3	
10	0D		CR:Transmission End Code

If the robot does not receive a JOG End request (M6), it may return a JOG End response (m6) when reaching the maximum moving limit. This is a normal end to movement.
Also, in special circumstances, if the robot receives an M6 command without receiving a JOG Start request (M4), it returns an m6 command as an error code.

7.5 CP Continuous Movement (M7)

Use this command for continuous CP linear or arc movements.
You can use up to 250 points.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	37	7	Subcommand Code
4	30	0	Number of Points
5	30	0	
6	30	0	
7	36	6	
8	30	0	Point 1 → Point 2, Line Speed: 0.1 [mm/s] increments (Example: 20.0[mm/s])
9	30	0	
10	43	C	
11	38	8	
12	30	0	Point 2, Point Type 0: CP Passing Point 1: CP Arc Point 2: CP End Point
13	30	0	
14	30	0	
15	30	0	
16-71			Point 2 Position Refer to “13.3 Position (56 Byte Format).”

N	HEX	ASC	Description
72	30	0	Point 2 → Point 3, Line Speed: 0.1 [mm/s] increments (Example: 20.0 mm/s)
73	30	0	
74	43	C	
75	38	8	
76	30	0	Point 3, Point Type 0: CP Passing Point 1: CP Arc Point 2: CP End Point
77	30	0	
78	30	0	
79	30	0	
80-135			Point 3 Position Refer to “13.3 Position (56 Byte Format).”
136	30	0	Point 3 → Point 4, Line Speed: 0.1 [mm/s] increments Example: 20.0 [mm/s]
137	30	0	
138	43	C	
139	38	8	
140	30	0	Point 4, Point Type 0: CP Passing Point 1: CP Arc Point 2: CP End Point
141	30	0	
142	30	0	
143	30	0	
144-199			Point 4 Position Refer to “13.3 Position (56 Byte Format).”
200	30	0	Point 4 → Point 5, Line Speed: 0.1 [mm/s] increments Example: 20.0 [mm/s]
201	30	0	
202	43	C	
203	38	8	
204	30	0	Point 5, Point Type 0: CP Passing Point 1: CP Arc Point 2: CP End Point
205	30	0	
206	30	0	
207	30	0	
208-263			Point 5 Position Refer to “13.3 Position (56 Byte Format).”
264	30	0	Point 5 → Point 6, Line Speed: 0.1 [mm/s] increments Example: 20.0 [mm/s]
265	30	0	
266	43	C	
267	38	8	
268	30	0	Point 6, Point Type 0: CP Passing Point 1: CP Arc Point 2: CP End Point
269	30	0	
270	30	0	
271	32	2	
272-327			Point 6 Position Refer to “13.3 Position (56 Byte Format).”

N	HEX	ASC	Description
328			SUM
329			
330	0D		CR Transmission End Code

The program data values of the currently selected program apply to the CP Conditions and Move Area Limit. If there is no registered program for the selected program number, the Default All Program Common Settings are applied.
The tool data for the [Main Tool] is applied.

This command looks at the I/O-S and start inhibition signals and if they are inhibited, the robot does not operate. Also, when the robot is moving, external I/O output control is used (the signals [Ready for Start] and [Robot Stopping] are OFF).

The robot returns a start response (temporary response) to this command. The start response is a temporary response indicating that the command has been interpreted and therefore, unlike a regular response, the robot returns a designated command code (in Roman capital letters). No parameters are attached to the temporary response.

Example: Start Response (temporary response)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4D	M	Command Code
3	37	7	Subcommand Code
4	38	8	SUM
5	34	4	
6	0D		CR:Transmission End Code

After returning the start response, the robot executes the operation. It sends a regular response (regardless of whether the operation was normal or in error) when the operation is complete.

However, if the robot recognizes in advance that the movement cannot be made under the current conditions (e.g. the robot is not in Run Mode etc.), the temporary response is not returned and an error response is returned.

If the movement is completed normally, the robot returns a normal response after reaching the end position. If the movement was not completed successfully (the robot exceeds the move area limit etc.), it returns an error response.

Example: Error

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	6D	m	Command Code
3	37	7	Subcommand Code
4	46	F	Result Code 0: Normal, -1: Error
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM
9	43	C	
10	0D		CR:Transmission End Code

The following can cause an error:

- The robot is not on standby in External Run Mode.
- A stop due to an overload error.
- The move area limit is exceeded.
- The CP speed is exceeded.
- A CP righty/lefty error. (JS3 Series)

8. POSITION INFORMATION ACQUISITION

8.1 Axis Position Request (N0), Tool Tip Position Request (N1)

Use these commands to request the robot to send the positions of its axes (N0) and tool tip position (N1). In response, the robot returns its current position (lefty/righty, X coordinate, Y coordinate, Z coordinate, R coordinate, P coordinate, and Q coordinate values).

Axis Position Request (N0), Tool Tip Position Request (N1)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4E	N	Command Code
3	31	1	Subcommand Code 0: Axis Position 1: Tool Tip Position
4	37	7	SUM
5	46	F	7FH
6	0D		CR:Transmission End Code

■ Axis Position Response (n0), Tool Tip Position Response (n1)
When the robot receives these commands (N0 and N1), it returns the current robot arm position (lefty/righty, X coordinate, Y coordinate, Z coordinate, R coordinate, P coordinate, and Q coordinate values).

Axis Position Response (n0), Tool Tip Position Response (n1)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6E	n	Command Code
3	31	1	Subcommand Code 0: Axis Position 1: Tool Tip Position
4-59			X, Y, Z, R, MT1, MT2 Positions Refer to “13.3 Position (56 Byte Format).”
60			SUM
61			
62	0D		CR:Transmission End Code

The axis position is equivalent to the tool tip position when the TCP values are 0, 0.
The tool tip position acquires the current tool tip position of the robot.

8.2 TCP Specified Tool Tip Position Information Acquisition (N2)

This transfers the TCP values and requests transfer of the tool tip position.
As a response to this request, the robot returns its current position (lefty/righty, X coordinate, Y coordinate, Z coordinate and R coordinate values).

TCP Specified Tool Tip Position Request (N2)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4E	N	Command Code
3	32	2	Subcommand Code
4-51			TCP (Tool Center Point) Refer to “13.1 TCP (Tool Center Point) (48 Byte Format).”
52			SUM
53			
54	0D		CR:Transmission End Code

Tool Tip Position Response (n2)
The robot returns its current position (lefty/righty direction, X coordinate, Y coordinate, Z coordinate and R coordinate values) in response to the transfer request command (N2).

Tool Tip Position (n2)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6E	n	Command Code
3	31	2	Subcommand Code
4-59			X, Y, Z, R, MT1, MT2 Positions Refer to “13.3 Position (56 Byte Format).”
60			SUM
61			
62	0D		CR:Transmission End Code

The specified tool data (TCP) are used to calculate the tool tip coordinates at this time,

9. RUN INFORMATION ACQUISITION

9.1 Run Information Request (I)

This command requests the robot to send run information.
Run information is sent as a response to a host command.

Executed Point Information Request

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	49	I	Command Code
3	38	0	Subcommand Code (0)
4	37	7	SUM
5	39	9	
6	0D		CR:Transmission End Code

Example: I8: Pallet No. 12 Counter Value Request

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	49	I	Command Code
3	38	8	Subcommand Code 6: Counter Value (1 – 50) 7: Timer Value (1 – 99) 8: Pallet Counter Value (1 – 100) 9: Workpiece Adjustment Amount (1 – 3000)
4	30	0	Counter Number / Timer Number / Pallet Number / Work Adjustment Number Example: Number 12 → 0C
5	30	0	
6	30	0	
7	43	C	
8	35	5	SUM
9	34	4	
10	0D		CR:Transmission End Code

Although this command is called “Run Information”, it can be activated in any mode or operating condition.

9.2 Executed Point Request (i0)

When the robot receives a run information request (I0), the robot returns information about the point it is running (program number, point number, and point type).

Example: Program Number 12, Point Number 1521, Point Type

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	69	i	Command Code
3	30	0	Subcommand Code
4	30	0	Program Number Example: Number 12: 000CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Point Number Example: 1521: 05F1H
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	35	5	
14	46	F	
15	31	1	
16	30	0	Point Type Code Refer to “13.4 Point Type Code.” Example: PTP Point → 21H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	32	2	
23	31	1	
24	38	8	SUM 48BH
25	42	B	
26	0D		CR:Transmission End Code

9.3 Counter Value (i6)

When the robot receives a run information request (I6), it returns the counter (1 – 50) status and counter value.
If the specified timer number is not within range (outside of 1 – 99), the robot returns no number.

Example: Counter Number 12: ON, Counter Value: 856

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	69	i	Command Code
3	36	6	Subcommand Code
4	30	0	Counter Number (1 – 50) Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	1: Number Available, 0: No Number Available (If the counter number is not within range, the robot returns 0 and the subsequent items are represented as 0.)
9	31	1	
10	30	0	Status ON: 1, OFF: 0
11	31	1	
12	30	0	Reserved (0)
13	30	0	
14	30	0	
15	30	0	
16	30	0	Counter Value Example: 856: 0358H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	33	3	
22	35	5	
23	38	8	
24	35	5	SUM 454H
25	34	4	
26	0D		CR:Transmission End Code

9.4 Timer Value (i7)

When the robot receives an operation information request (I7), it returns the timer (1 – 99) status and timer value.
If the specified timer number is not within range (outside of 1 – 99), the robot returns no number.

Example: Timer Number 25: OFF, Timer Value: 742

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	69	i	Command Code
3	37	7	Subcommand Code
4	30	0	Timer Number (1 – 99) Example: 25: 19H
5	30	0	
6	31	1	
7	39	9	
8	30	0	1: Number Available, 0: No Number Available (If the timer number is not within range, the robot returns 0 and the subsequent items are represented as 0.)
9	31	1	
10	30	0	Status ON: 1, OFF: 0
11	30	0	
12	30	0	Reserved (0)
13	30	0	
14	30	0	
15	30	0	
16	30	0	Timer Value Example: 742: 2E6H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	32	2	
22	45	E	
23	36	6	
24	38	8	SUM 488H
25	38	8	
26	0D		CR:Transmission End Code

9.5 Pallet Counter Value (i8)

When the robot receives an operation information request (I8), it returns the pallet (1 – 100) status and the pallet counter value.
The robot also returns to report whether or not the specified pallet number is defined. If the pallet number is outside the range, the robot also returns no number in this case.

Example: Pallet Number 15, Plane Pallet, Reset, First Row, Hundredth Column
(Total: 2 Rows, 5123 Columns)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	69	i	Command Code
3	38	8	Subcommand Code
4	30	0	Pallet Number Example: 15: 0FH
5	30	0	
6	30	0	
7	46	F	
8	30	0	1: Defined, 0: Undefined
9	31	1	
10	30	0	Status 0: Reset (initial condition, now counting) 1: Set (The counter reached full and returned to 0.)
11	30	0	
12	30	0	Pallet Type 0: 1 Point Repeat 1: Row 2: Plane Pallet 3: Cubic Pallet 4: Repeat by Camera 5: Circle Pallet
13	30	0	
14	30	0	
15	32	2	
16	30	0	Full Pallet Counter Value Example: row 5123x2 = 10246 → 2806H
17	30	0	
18	30	0	
19	30	0	
20	32	2	
21	38	8	
22	30	0	
23	36	6	

N	HEX	ASC	Description
24	30	0	Current Pallet Counter Value Example: row 100 → 64H
25	30	0	
26	30	0	
27	33	3	
28	30	0	
29	30	0	
30	36	6	
31	34	4	
32			SUM 78AH
33			
34	0D		CR:Transmission End Code

9.6 Workpiece Adjustment Amount (i9)

When the robot receives an operation information request (I9), it returns the workpiece adjustment amount (1 – 3000).

The robot also returns (to report) whether or not the workpiece adjustment number is defined. If the workpiece adjustment number is outside the range, the robot also returns no number in this case.

Example: Workpiece Adjustment Number 15, Numeric Adjustment, X Adjustment: -2.3 mm, Y Adjustment: -20.5 mm, Z Adjustment: +2 mm, R Adjustment: 0.05 deg, Rotate Adjustment: 0.001 deg, Z Standard Data: 1 mm

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	69	i	Command Code
3	39	9	Subcommand Code
4	30	0	Work Adjustment Number Example: 15: 0FH
5	30	0	
6	30	0	
7	46	F	
8	30	0	1: Defined, 0: Undefined
9	31	1	
10	30	0	Not in use (0)
11	30	0	
12	30	0	Workpiece Adjustment Type 0: Numeric Adjustment 1: Camera Adjustment
13	30	0	
14	30	0	
15	30	0	

N	HEX	ASC	Description
16	46	F	
17	46	F	
18	46	F	
19	46	F	X Adjustment: In increments of 0.001 mm
20	46	F	Example: -2300: FFFFF704H
21	37	7	
22	30	0	
23	34	4	
24	46	F	
25	46	F	
26	46	F	
27	46	F	Y Adjustment: In increments of 0.001 mm
28	41	A	Example: -20500: FFFFAFECH
29	46	F	
30	45	E	
31	43	C	
32	30	0	
33	30	0	
34	30	0	Z Adjustment: In increments of 0.001 mm
35	30	0	Positive Numbers: Downward Direction Adjustment
36	30	0	Negative Numbers: Upward Direction Adjustment
37	37	7	Example: 2000: 7D0H
38	44	D	
39	30	0	
40	30	0	
41	30	0	
42	30	0	
43	30	0	R Adjustment: 0.01deg unit increments
44	30	0	Example: 50: 32H
45	30	0	
46	33	3	
47	32	2	
48	30	0	
49	30	0	
50	30	0	
51	30	0	Rotate Adjustment: 0.000001deg unit increments
52	30	0	Example: 1000: 3E8H
53	33	3	
54	45	E	
55	38	8	

N	HEX	ASC	Description
56	30	0	
57	30	0	
58	30	0	
59	30	0	Z Standard Data: 0.001 mm unit increments
60	30	0	Example: 1000: 3E8H
61	33	3	
62	45	E	
63	38	8	
64	37	7	SUM
65	39	9	D79H
66	0D		CR:Transmission End Code

10. ERROR INFORMATION ACQUISITION

The error information sent here is system error information and run error information.
When the robot is operating without a teaching pendant and if an error occurs, the error content cannot be displayed and so therefore the error information is stored on the robot.
You can obtain this stored error information with commands from COM.

10.1 System Error Information Acquisition (F1)

System errors include hardware errors, mechanical initialization errors (JR3000/JC-3 Series only), teaching data mismatches, logic errors, and CPU trap errors etc.

System Error Information Request (F1)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	46	F	Command Code
3	31	1	Subcommand Code
4	37	7	SUM
5	37	7	77H
6	0D		CR:Transmission End Code

System Error Information Response (f1)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4E	f	Command Code
3	31	1	Subcommand Code
4	30	0	System Error Code
5	30	0	
6	36	6	
7	35	5	
8-64			When a logic error (Error Code 100) occurs : The error function identifier is returned. When an error other than logic error (other than Error Code 100) occurs : all 0 (HEX:30, ASC:0) is returned.
65			SUM
66			
67	0D		CR:Transmission End Code

NOTE: For error handling, refer to “10. Error Message List” in the operation manual *Maintenance* for the JR3000 Series , “11. Error Message List” in the operation manual *Maintenance* for the JC-3 Series, or “5.6 Error Message List” in the operation manual *Maintenance* for the JS3 Series.

10.2 Run Error Information Acquisition (F2)

A run error includes the point job syntax error, CP speed over error, and move area limit error etc. The robot returns the error code together with the program number, point number, point job number, operation number, and pallet number etc., where the error occurred.

Run Error Information Request (F2)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	46	F	Command Code
3	32	2	Subcommand Code
4	37	7	SUM
5	38	8	78H
6	0D		CR:Transmission End Code

Run Error Information Transfer (f2)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4E	f	Command Code
3	32	2	Subcommand Code
4	30	0	Error Code
5	30	0	
6	30	0	
7	30	0	
8	30	0	Program Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	0
13	30	0	
14	30	0	
15	30	0	
16	30	0	Point Number (Pn)
17	30	0	
18	30	0	
19	30	0	
20	30	0	Point Job Number (Job) or Condition Number (Cn)
21	30	0	
22	30	0	
23	30	0	

N	HEX	ASC	Description
24	30	0	Point Job, Command Number (Op)
25	30	0	
26	30	0	
27	30	0	
28	30	0	The proceeding number (No) specified by point job command Pallet Number (Pal) or Label Number (Lab)
29	30	0	
30	30	0	
31	30	0	
32	44	D	SUM
33	38	8	
34	0D		CR:Transmission End Code

11. DATA SETTINGS

With data settings, point number acquisitions (S0), point data position rewriting (S1), point data settings (S2), workpiece adjustment data settings (S3, S4) and TCP settings (S5, S6) are made. Also, it is possible to obtain program presence information (S7), add and delete programs (S8, S9), acquire/add/insert/delete point data and delete data blocks (SA, SB, SC, SD, and SE).

11.1 Point Data Number Acquisition (S0)

Send this command to specify a program number and request the robot to send the teaching data point number.

Example: Program Number 12 Point Number Request

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	30	0	Subcommand Code
4	30	0	
5	30	0	Program Number
6	30	0	Example: 12: 0CH
7	43	C	
8	35	5	SUM
9	36	6	156H
10	0D		CR:Transmission End Code

This is a response to the S0 command. The robot returns the numbers of point in the specified program. If the specified program is not registered, it returns 0.

Example: Program Number 12, 452 Point Numbers

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	30	0	Subcommand Code
4	30	0	
5	30	0	Program Number
6	30	0	Example: 12: 0CH
7	43	C	

N	HEX	ASC	Description
8	30	0	
9	30	0	
10	30	0	
11	30	0	Number of Points
12	30	0	Example: 452: 1C4H
13	31	1	
14	43	C	
15	34	4	
16	30	0	SUM
17	45	E	30EH
18	0D		CR:Transmission End Code

11.2 Point Data Position Settings (S1)

This command sets the teaching data point position for the specified program number, point number and position data.

Example: Request for Setting Position of Point Number 56 in Program Number 12

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	31	1	Subcommand Code
4	30	0	
5	30	0	Program Number
6	30	0	Example: 12: 0CH
7	43	C	
8	30	0	
9	30	0	
10	30	0	
11	30	0	Point Number
12	30	0	Example: 56: 38H
13	30	0	
14	33	3	
15	38	8	
16-71			X, Y, Z, R, MT1, MT2 Positions Refer to “13.3 Position (56 Byte Format).”
72			SUM
73			
74	0D		CR:Transmission End Code

This is a response to the settings. The robot returns a result to show whether or not the settings were made successfully.

Example: Error

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	31	1	Subcommand Code
4	46	F	Result Code 0: Normal, -1: Error If robot returns an error, the specified point may not exist.
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM 1BCH
9	43	C	
10	0D		CR:Transmission End Code

11.3 Point Data Settings (S2)

This command sets the teaching data points for specified program numbers, point numbers, and point data.

Example: Program Number 12, Point Number 56 Point Settings.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	32	2	Subcommand Code
4	30	0	Program Number Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Point Number Example: 56: 38H
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	33	3	
15	38	8	
16-143			Refer to “13.5 Points (128 Byte Format).”
144			SUM
145			
146	0D		CR:Transmission End Code

This is a response to the point settings. The robot returns whether the settings are normal or not.

Example: Normal

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	32	2	Subcommand Code
4	30	0	Result Code: 0: Normal, -1: Error If the robot returns an error, the specified point may not exist.
5	30	0	
6	30	0	
7	30	0	
8	36	6	SUM 165H
9	35	5	
10	0D		CR:Transmission End Code

11.4 Workpiece Adjustment Data Settings (S3, S4)

This sets the workpiece adjustment values for the specified workpiece adjustment number.
The S3 command is used only to set the Workpiece Adjustment Z Adjustment and so you can use this to make height directional adjustments.
The S4 command is used to set the five values: X Adjustment, Y Adjustment, Z Adjustment, R Adjustment, and Rotate Adjustment:

Δ X: X Adjustment
Δ Y: Y Adjustment
Δ Z: Z Adjustment
Δ R: R Adjustment
Δ θ : Rotate Adjustment

Thereby, if you set a workpiece adjustment additional function to the registered point coordinates P (X, Y, Z, R), the robot makes a run at the P' (X', Y', Z' and R') coordinates according to the following adjustment calculations:

X' = X*cos (Δ θ) - Y*sin (Δ θ) + Δ X
Y' = X*sin (Δ θ) + Y*cos (Δ θ) + Δ Y
Z' = Z + Δ Z
R' = R + Δ R

The above formulas show the XY coordinates rotational (Δ θ rotation) and translational (Δ X, Δ Y, Δ Z, Δ R) conversions. If you set only the Z Adjustment, the X, Y, and R positions are unchanged and so only the Z axis is increased/decreased by the exact amount for the Z adjustment, allowing you to use this to make height directional adjustments.

Example: Lower Workpiece Adjustment Number 8 Point Position by 2 mm.
(Setting a +2 mm adjustment amount.)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	33	3	Subcommand Code
4	30	0	Workpiece Adjustment Number
5	30	0	
6	30	0	
7	38	8	
8	30	0	Z Adjustment: 0.001 mm unit increments. Positive Numbers: Downward Direction Adjustment Negative Numbers: Upward Direction Adjustment Example: 2 mm: 07D0H
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	37	7	
14	44	D	
15	30	0	
16	45	E	SUM 2E9H
17	39	9	
18	0D		CR:Transmission End Code

Example: Workpiece Adjustment Number 8 (setting the X Adjustment: -2.3 mm, Y Adjustment: -20.5 mm, Z Adjustment: +2 mm, R Adjustment: 0.05 deg, Rotate Adjustment: 0.001 deg)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	34	4	Subcommand Code
4	30	0	Workpiece Adjustment Number
5	30	0	
6	30	0	
7	38	8	
8	46	F	X Adjustment: 0.001 mm unit increments Example: -2.3 mm (-2300): FFFFF704H
9	46	F	
10	46	F	
11	46	F	
12	46	F	
13	37	7	
14	30	0	
15	34	4	

N	HEX	ASC	Description
16	46	F	
17	46	F	
18	46	F	
19	46	F	Y Adjustment: 0.001 mm unit increments
20	41	A	Example: -20.5 mm (-20500): FFFFAFECH
21	46	F	
22	45	E	
23	43	C	
24	30	0	
25	30	0	
26	30	0	Z Adjustment: 0.001 mm unit increments
27	30	0	Positive Numbers: Downward Direction Adjustment
28	30	0	Negative Numbers: Upward Direction Adjustment
29	37	7	Example: 2 mm (2000): 7D0H
30	44	D	
31	30	0	
32	30	0	
33	30	0	
34	30	0	
35	30	0	R Adjustment: 0.01 deg unit increments
36	30	0	Example: 0.50 deg (50): 32H
37	30	0	
38	33	3	
39	32	2	
40	30	0	
41	30	0	
42	30	0	
43	30	0	Rotate Adjustment: 0.000001 deg unit increments
44	30	0	Example: 0.001 deg (1000): 3E8H
45	33	3	
46	45	E	
47	38	8	
48	32	2	SUM
49	46	F	A2FH
50	0D		CR:Transmission End Code

11.4.1 Workpiece Adjustment Data Settings Response (s3, s4)

This is a response to the S3 or S4 command. The robot responds as to whether the work adjustment settings are normal or not.

Example: s3, Normal

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	33	3	Subcommand Code
4	30	0	Result Code:
5	30	0	0: Normal, -1: Error
6	30	0	If the robot returns an error, the specified workpiece adjustment number
7	30	0	may not exist
8	36	6	SUM
9	36	6	166H
10	0D		CR:Transmission End Code

11.5 Direct TCP Settings (S5)

Use the S5 command to set the TCP directly.

Example: Setting TCP for Program Number 8.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	35	5	Subcommand Code
4	30	0	Setting Position:
5	30	0	0: All Program Common Settings
6	30	0	1: Individual Program Settings
7	31	1	2: Tool Data 3: All TCP
8	30	0	
9	30	0	
10	30	0	
11	30	0	Program Number or Tool Data Number:
12	30	0	If [All Program Common Settings] or [All TCP] is selected, 0 is returned.
13	30	0	
14	30	0	
15	38	8	

N	HEX	ASC	Description
16	30	0	TCP-X: 0.001 mm unit increments Example: 2.000 mm 2000 = 7D0H
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	37	7	
22	44	D	
23	30	0	
24	30	0	TCP-Y: 0.001 mm unit increments Example: 1.950 mm 1950 = 79EH
25	30	0	
26	30	0	
27	30	0	
28	30	0	
29	37	7	
30	39	9	
31	45	E	
32	30	0	TCP- Δ Z: 0.001 mm unit increments Example: 0
33	30	0	
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30		Reserved. Register 0 for the setting commands.
41	30	0	
42	30	0	
43	30	0	
44	30	0	
45	30	0	
46	30	0	
47	30	0	
48	30	0	Not in use (0)
49	30	0	
50	30	0	
51	30	0	
52	30	0	
53	30	0	
54	30	0	
55	30	0	

N	HEX	ASC	Description
56	30	0	Not in use (0)
57	30	0	
58	30	0	
59	30	0	
60	30	0	
61	30	0	
62	30	0	
63	30	0	
64	31	1	SUM
65	31	1	53H+35H+·····+30H=C11H
66	0D		CR:Transmission End Code

11.5.1 Direct TCP Setting Response (s5)

This is a response to the settings. The robot responds by returning whether the work adjustment settings are normal or not.

Example: Error. $s5FFFFC0

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	35	5	Subcommand Code
4	46	F	Result Code: 0: Normal, -1: Error If the robot returns an error, the designated program or tool data may not exist.
5	46	F	
6	46	F	
7	46	F	
8	43	C	SUM
9	30	0	1C0H
10	0D		CR:Transmission End Code

11.6 2-Point TCP Settings when changing the 4th axis/R axis (S6)

Set the TCP by specifying the same point from two positions when changing the 4th axis/R axis. The methods for specifying the setting location, program number, and tool number are the same as those for the S5 command. The first and second point positions are the positions shown in “13.3 Position (56 Byte Format).”

Example: Program 8 TCP Settings

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	36	6	Subcommand Code
4	30	0	Position Settings 0: All Program Common Settings 1: Individual Program Settings 2: Tool Data 3: All TCP
5	30	0	
6	30	0	
7	31	1	
8	30	0	Program Number or Tool Data Number If [All Program Common Settings] or [All TCP] is selected, 0 is returned.
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	38	8	
16-71			Position Data for the 1st point Specify 0 for the MT1 and MT2 coordinates. Refer to “13.3 Position (56 Byte Format)” about the data format.
72-127			Position Data for the 2nd point Specify 0 for the MT1 and MT2 coordinates. Refer to “13.3 Position (56 Byte Format)” about the data format.
128	43	C	SUM 18C9
129	39	9	
130	0D		CR:Transmission End Code

11.6.1 Response (s6)

This is a response to the settings. The robot responds as to whether the settings are normal or not.

Example: Normal $s6000069

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	36	6	Subcommand Code
4	30	0	Result Code 0: Normal, -1: Error If the robot returns an error, the specified program or tool data may not exist.
5	30	0	
6	30	0	
7	30	0	
8	36	6	SUM
9	39	9	
10	0D		CR:Transmission End Code

11.7 Program Presence Information Request (S7)

You can use this command to obtain program presence information about programs.

Program Presence Information Request (S7)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	37	7	Subcommand Code
4	38	8	SUM
5	41	A	8AH
6	0D		CR:Transmission End Code

Program Presence Information (s7)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	37	7	Subcommand Code
4	30	0	Reserved (0)
5	30	0	
6	30	0	
7	30	0	
8	32	2	No.1-No.8 presence, bit0: No. 1. bit7: No. 8 Present: 1, Absent: 0 00100001: 21H
9	31	1	
10	30	0	No. 9 – No. 16 status, bit0: No. 9. bit7: No.16 Present: 1, Absent: 0 00000100: 04H
11	30	4	
12	30	0	No. 17 – No. 24 status, bit0: No. 17. bit7: No. 24 Present: 1, Absent: 0
13	30	0	
			...
256	30	0	No. 993 – No. 999 status, bit0: No. 249. bit6: No.999 Present: 1, Absent: 0
257	30	0	
258	41	A	SUM
259	31	1	
260	0D		CR:Transmission End Code

11.8 Program Creation, Deletion (S8, S9)

Specify the program number and create or delete the program. With program creation, a program with 0 point numbers is created. The initial values for individual program settings abide by the default all program common settings.

Example: Program Creation

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	38	8	Subcommand Code (8 or 9)
4	30	0	Program Number
5	30	0	
6	30	0	
7	30	4	
8	34	4	SUM
9	46	F	
10	0D		CR:Transmission End Code

The robot returns a normal code or an error code.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	38	8	Subcommand Code (8 or 9)
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	
8	36	6	SUM
9	42	B	
10	0D		CR:Transmission End Code

When creating a program, an error occurs if a program with the specified number already exists.
An error also occurs if there is not enough memory available for creating a new program.
When deleting a program, an error occurs if the specified program number does not exist.

11.9 Point Data Acquisition (SA)

This command obtains point data from a point number in a specified program.

Example: Point Data Acquisition

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	41	A	Subcommand Code
4	30	0	Program Number
5	30	0	
6	30	0	
7	34	4	
8	30	0	Point Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	36	6	
16	44	D	SUM
17	45	E	
18	0D		CR:Transmission End Code

The robot returns the point data after sending a normal code/error code.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	41	A	Subcommand Code
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	
8-135			Point (128 byte) Refer to “13.5 Points (128 Byte Format).”
136			SUM
137			
138	0D		CR:Transmission End Code

If the specified program or point does not exist, the robot returns an error.

11.10 Point Data Addition (SB)

This command adds point data to the tail end of a specified program.

Example: Point Data Addition

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	42	B	Subcommand Code
4	30	0	Program Number
5	30	0	
6	30	0	
7	30	4	
8-135			Point (128 byte) Refer to “13.5 Points (128 Byte Format).”
136			SUM
137			
138	0D		CR:Transmission End Code

The robot returns a normal code/error code.

Response, example: Normal

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	42	B	Subcommand Code
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	
8	37	7	SUM
9	35	5	
10	0D		CR:Transmission End Code

An error is returned if the specified program does not exist or if there is not enough available memory to add new point data.

11.11 Point Data Insertion (SC)

This command inserts point data into a specified point in a specified program. The specified data becomes the data for that specified point number. The original point data of that specified point number and the data of all points that come after each shift to the subsequent point number accordingly.

Example: Point Data Insertion

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	53	S	Command Code
3	43	C	Subcommand Code
4	30	0	Program Number
5	30	0	
6	30	0	
7	34	4	
8	30	0	Point Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	34	6	
16-143			Point (128 byte) Refer to “13.5 Points (128 Byte Format).”
144			SUM
145			
146	0D		CR:Transmission End Code

The robot returns a normal code/error code.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$: Transmission Start Code
2	73	s	Command Code
3	43	C	Subcommand Code
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	
8	37	7	SUM
9	36	6	

N	HEX	ASC	Description
10	0D		CR:Transmission End Code

The robot returns an error if the specified program or point does not exist or if there is not enough available memory to insert new point data.

11.12 Point Data Deletion (SD)

This command deletes the point data of a specified point in a specified program.

Example: Point Data Deletion, Program Number 4, Point Number 6

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	44	D	Subcommand Code
4	30	0	Program Number
5	30	0	
6	30	0	
7	34	4	
8	30	0	Point Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	36	6	
16	45	E	SUM
17	31	1	
18	0D		CR:Transmission End Code

The robot returns a normal code/error code.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	44	D	Subcommand Code
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	

N	HEX	ASC	Description
8	37	7	SUM
9	37	7	
10	0D		CR:Transmission End Code

An error is returned if the specified program or point does not exist.

11.13 Point Data Block Deletion (SE)

This command deletes point data for multiple points from a specified start point to a specified end point in a program.

Example: Point Data Block Deletion, Program Number 4, Points 1 – 14

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	45	E	Subcommand Code
4	30	0	Program Number
5	30	0	
6	30	0	
7	34	4	
8	30	0	Block Start Number
9	30	0	
10	30	0	
11	30	0	
12	30	0	
13	30	0	
14	30	0	
15	31	1	
16	30	0	Block End Number
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	30	0	
23	45	E	
24	37	7	SUM
25	32	2	
26	0D		CR: Transmission End Code

The robot returns a normal response/error response.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	45	E	Subcommand Code
4	30	0	Normal/Error 0: Normal -1: Error
5	30	0	
6	30	0	
7	30	0	
8	37	7	SUM
9	38	8	
10	0D		CR:Transmission End Code

11.14 Setting Individual Program Settings (SH)

This command makes data settings for a specified program number, data type, and data alignment.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	48	H	Subcommand Code
4	30	0	Program Number Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Data Type (hexadecimal expression) 0: Program Name 6: CP Condition 1: Work Home 7: Workpiece Mass (not available for the JC-3/JS3 Series) 2: Cycle Mode 8: Position Data Type 3: PTP Condition 9: Individual Job on Start of Cycle 4: Tool Data A: PTP Condition Number for Home (JC-3/JS3 Series only) 5: Move Area Limit B: Restart Method After Pos. Offset
9	30	0	
10	30	0	
11	33	3	
12	30	0	(Reserved: Subdata Type) Fixed to 0
13	30	0	
14	30	0	
15	30	0	
			Data Refer to “13. APPENDIX-A: COMMON DATA ELEMENTS.”
			SUM
	0D		CR:Transmission End Code

The robot returns a normal response/error response.

Example: Error Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	48	H	Subcommand Code
4	46	F	Result Code: Normal:0, Error: -1
5	46	F	Error cause could be :
6	46	F	• The corresponding program does not exist
7	46	F	• Data Type Error
8	44	D	SUM
9	33	3	1D3H
10	0D		CR:Transmission End Code

11.15 Individual Program Setting Acquisition (SI)

This command obtains data from a specified program number and data type.

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	53	S	Command Code
3	49	I	Subcommand Code
4	30	0	Program Number Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Data Type (hexadecimal expression) 0: Program Name 6: CP Condition 1: Work Home 7: Workpiece Mass (not available for the JC-3/JS3 Series) 2: Cycle Mode 8: Position Data Type 3: PTP Condition 9: Individual Job on Start of Cycle 4: Tool Data A: PTP Condition Number for Home (JC-3/JS3 Series only) 5: Move Area Limit B: Restart Method After Pos. Offset
9	30	0	
10	30	0	
11	33	3	
12	33	3	SUM
13	32	2	232H
14	0D		CR:Transmission End Code

The robot returns a normal response/error response.

Example: Normal Response

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	73	s	Command Code
3	49	I	Subcommand Code
4	30	0	Result Code Normal:0, Error: -1
5	30	0	
6	30	0	
7	30	0	
			Data Refer to “13. APPENDIX-A: COMMON DATA ELEMENTS” Result code -1: if an error is returned, the data does not exist
			SUM
	0D		CR:Transmission End Code

11.16 Pallet Count Value (J0)

This command sets the count value (1 – 6 5535) for the pallet number (1 – 100).

The pallet number is set to 15 and the count number is set to 10. (PC → robot)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	4A	J	Command Code
3	30	0	Subcommand Code
4	30	0	Pallet Number
5	30	0	
6	30	0	
7	46	F	
8	30	0	Count Setting Value
9	30	0	
10	30	0	
11	41	A	
12	32	2	SUM 4Ah+30h+·····+40h=220h
13	31	1	
14	0D		CR:Transmission End Code

The robot returns a normal response/error response. (robot → PC)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	6A	j	Command Code
3	30	0	Subcommand Code (0)
4	46	F	Result Code
5	46	F	Normal:0, Error: -1
6	46	F	Error cause: Pallet number, count value error
7	46	F	The specified pallet number is not defined.
8	41	B	SUM
9	32	2	6Ah+30h+・・・・・・+46H=1B2h
10	0D		CR:Transmission End Code

NOTE: Command Transmission Timing

When sending a “J command” in Run Mode you need to take note of the following:

1. Make sure to set points that require a point reset setting to “Invalid”.
2. If you are not applying the above settings, send a temporary stop command after starting.

11.17 Skip Missing Job (J3, J4)

You can set or delete the missing points (points determined as missing by specifying the point in a specified program, or specifying the pallet count in a specified pallet routine) specified by the host.
If this operation is set to “clear all”, all registered information is cleared.
If this operation is set to “clear”, you can clear only the items that match the specified program number or pallet number by setting those items for the respective point number or pallet count to “FFFFFFFFH”.

■ Skip Missing Point (J3)
Specified by program number and point number.

Example: Point 3 in program 10 is registered and skipped.

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	4A	J	Command Code
3	33	3	Subcommand Code
4	30	0	Specified Operation 0: Confirm status, 1: Register, 2: Clear, 3: Clear All
5	30	0	
6	30	0	
7	31	1	
8	30	0	Program Number Valid when the specified operation is set to anything other than “3: Clear All”. The specified value is ignored when set to “3: Clear All”. Example: Program number 10: 0AH
9	30	0	
10	30	0	
11	40	A	
12	30	0	Point Number Valid when the specified operation is set to anything other than “3: Clear All”. The specified value is ignored when set to “3: Clear All”. Example: Point number 3: 03H
13	30	0	
14	30	0	
15	30	0	
16	30	0	
17	30	0	
18	30	0	
19	33	3	
20	38	8	SUM 38FH
21	46	F	
22	0D		CR:Transmission End Code

■ Skip Missing Pallet (J4)

Specified by the pallet number and pallet count.

Example: Pallet count 9 in pallet number 50 is registered and skipped.

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	4A	J	Command Code
3	34	4	Subcommand Code
4	30	0	
5	30	0	Specified Operation
6	30	0	0: Confirm status, 1: Register, 2: Clear, 3: Clear All
7	31	1	
8	30	0	Pallet Number
9	30	0	Valid when the specified operation is set to anything other than “3: Clear
10	33	3	All”. The specified value is ignored when set to “3: Clear All”.
11	32	2	Example: Pallet number 50: 032H
12	30	0	
13	30	0	
14	30	0	Pallet Count
15	30	0	Valid when the specified operation is set to anything other than “3: Clear
16	30	0	All”. The specified value is ignored when set to “3: Clear All”.
17	30	0	Example: Pallet count 9: 09H
18	30	0	
19	39	9	
20	43	C	SUM
21	45	E	2CEH
22	0D		CR:Transmission End Code

■ Skip Missing Workpiece Response (j3/j4)

The robot returns the results of the command execution.

The subcommand code returns the instruction code unmodified.

Example: An error occurred

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	4A	j	Command Code
3	33	3	Subcommand Code
4	30	F	Normal/Error 0: Normal, -1: Error If the program number, point number, or pallet number does not exist, “-1: Error” is returned.
5	30	F	
6	30	F	
7	31	F	
20	43	C	SUM
21	45	E	

-1: Error occurs under the following conditions:

- The program number, point number, or pallet number does not exist or they are out of the settable range.
- The job exceeds the number of allowable registered entries.
- The specified conditions determine the job cannot be registered (when the specified operation is specified as “0”).

11.18 Common/Individual Settings (SL)

■ Transmission to the robot (SL)

You can switch between common/individual settings for the individual program settings. However, the program name, cycle mode, position data classification, and individual job on start of cycle are fixed as [Individual] and cannot be switched over to [common].

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	53	S	Command Code
3	4C	L	Subcommand Code
4	30	0	Program Number Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Data Type (hexadecimal expression) 0: Reserved 6: CP Condition 1: Work Home 7: Workpiece Mass (not available for the JC-3/JS3 Series) 2: Reserved 8: Reserved 3: PTP Condition 9: Reserved 4: Tool Data A: PTP Condition Number for Home (JC-3/JS3 Series only) 5: Move Area Limit B: Restart Method After Pos. Offset
9	30	0	
10	30	0	
11	33	3	
12	30	0	(Reserved, sub data classification) Fixed at 0
13	30	0	
14	30	0	
15	30	0	
16	30	0	Common/Individual designation 0: Common, 1: Individual
17	30	0	
18	30	0	
19	31	1	
20	42	B	SUM
21	36	6	
22	0D		CR:Transmission End Code

■ Response from the robot (sL)

The robot returns the operation results as a response.

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	73	s	Command Code
3	4C	L	Subcommand Code
4	30	0	Result Code 1: set to [Individual], 0: set to [Common] -1 (FFFFH): an invalid program number is specified (program number 0, or a non-existent program) -2 (FFFEH): an invalid data type is specified (data fixed as Individual, or a non-existent data-type) -3 (FFFDH): an error with the individual/common settings
5	30	0	
6	30	0	
7	31	1	
8	38	8	SUM
9	30	0	
10	0D		CR:Transmission End Code

11.19 Common/Individual Acquisition (SM)

■ Transmission to the robot (SM)

This acquires the common/individual status of the individual program settings.

However, the program name, cycle mode, position data classification, and individual job on start of cycle are fixed as [Individual] and therefore are always acquired as [Individual].

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	53	S	Command Code
3	4D	M	Subcommand Code
4	30	0	Program Number Example: 12: 0CH
5	30	0	
6	30	0	
7	43	C	
8	30	0	Data Type (hexadecimal expression) 0: Program Name 6: CP Condition 1: Work Home 7: Workpiece Mass (not available for JC-3/JS3 Series) 2: Cycle Mode 8: Position Data Type 3: PTP Condition 9: Individual Job on Start of Cycle 4: Tool Data A: PTP Condition Number for Home (JC-3/JS3 Series only) 5: Move Area Limit B: Restart Method After Pos. Offset
9	30	0	
10	30	0	
11	33	3	

N	HEX	ASCII	Description
12	30	0	(Reserved, sub data classification) Fixed at 0
13	30	0	
14	30	0	
15	30	0	
16	46	F	SUM
17	36	6	
18	0D		CR:Transmission End Code

■ Response from the robot (sM)

The robot returns the status of the common/individual settings.

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	73	s	Command Code
3	4D	M	Subcommand Code
4	30	0	Result Code 1: set to [Individual] (also for settings fixed as Individual) 0: set to [Common] -1 (FFFFH): an invalid program number is specified (program number 0, or a non-existent program) -2 (FFFEH): an invalid data type is specified (a non-existent data-type)
5	30	0	
6	30	0	
7	31	1	
8	38	8	SUM
9	31	1	
10	0D		CR:Transmission End Code

11.20 Setting the IP Address (F8)

Set the IP address.

To apply the IP address, you need to power cycle the robot.

Power cycle the robot by using the Power cycle command (T3). (Refer to “11.21 Power cycle (T3)”)

The IP address will not be applied unless the robot is power cycled.

■ Transmission to the robot (F8)

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	46	F	Command Code
3	38	8	Subcommand Code

N	HEX	ASCII	Description	
4	43	C	IP address Example: 192.168.200.40	192 = C0H
5	30	0		
6	41	A		168 = A8H
7	38	8		
8	43	C		200 = C8H
9	38	8		
10	32	2		40 = 28H
11	38	8		
12	30	0	(Reserved, sub data classification) Fixed at 0	
13	30	0		
14			SUM	
15				
16	0D		CR:Transmission End Code	

■ Response from the robot (f8)

N	HEX	ASCII	Description	
1	24	$	Transmission Start Code	
2	66	f	Command Code	
3	38	8	Subcommand Code	
4			Result Code 0000h = Normal FFFFh = Error (Unavailable address. Change to other IP address.)	
5				
6				
7				
8	43	C	The set IP address. Example: 192.168.200.40 Regardless of the result code, return the IP address currently set.	192 = C0H
9	30	0		
10	41	A		168 = A8H
11	38	8		
12	43	C		200 = C8H
13	38	8		
14	32	2		40 = 28H
15	38	8		
16			SUM	
17				
18	0D		CR:Transmission End Code	

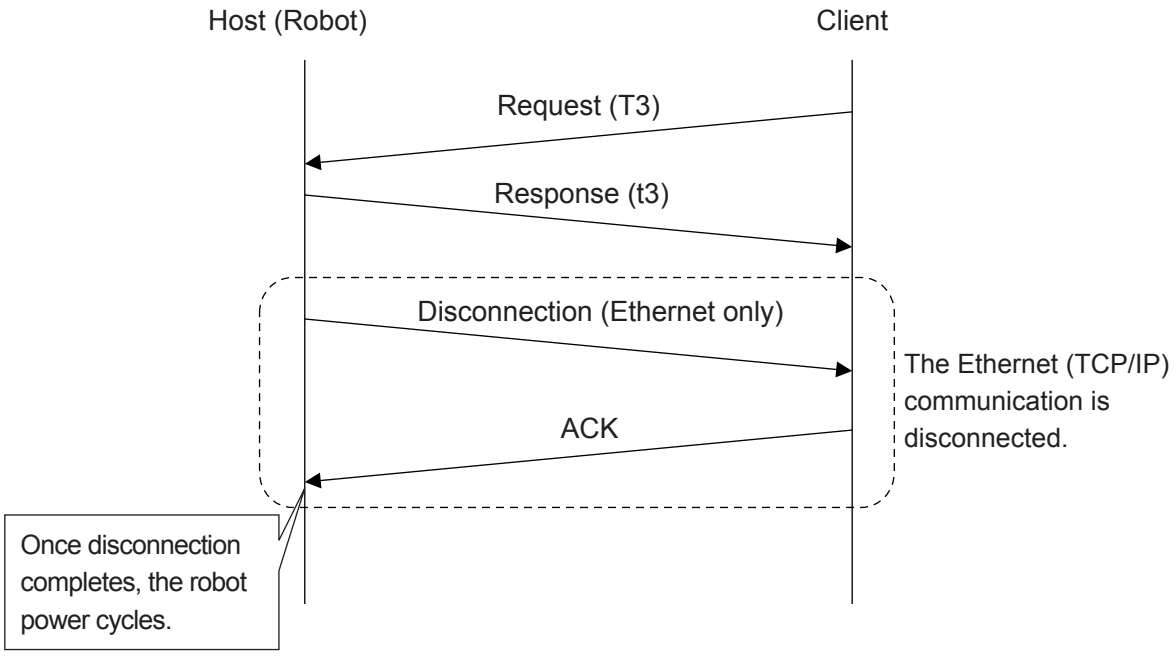
11.21 Power cycle (T3)

Power cycle the robot.
This command is valid only when the robot is stopped.
In some cases, the robot may not be power cycled depending on the mode and the presence of the Teaching Pendant.
The table below shows the details.

(✓: Can reboot, − : Cannot reboot)

	External Run Mode Switch Run Mode	**Teaching Mode Customizing Mode Administration Mode**
Teaching Pendant is connected	✓	−
Teaching Pendant is not connected	✓	✓

When this command is received, disconnect the connected Ethernet before power cycling.
The sequence is as follows.



■ Transmission to the robot (T3)

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	54	T	Command Code
3	33	3	Subcommand Code
4			SUM
5			
6	0D		CR:Transmission End Code

■ Response from the robot (t3)

N	HEX	ASCII	Description
1	24	$	Transmission Start Code
2	74	t	Command Code
3	33	3	Subcommand Code
4			Result Code 0000h = Normal (Can be restarted if restarting is possible.) FFFFh = Error (Can not be restarted.)
5			
6			
7			
8			SUM
9			
10	0D		CR:Transmission End Code

12. DATA SAVE

12.1 Data Save (T0), Data Readout (T1)

This is an instruction from the host to the robot to save C & T data (customizing and teaching data). If you rewrite data using the setting command (S), this only overwrites the data stored in the RAM and therefore when the robot is turned OFF, the robot reverts to its former state. To save overwritten data in the robot's data storage area you need to use the T0 data save command. Only C & T data can be saved here. You cannot save customizing data by itself or teaching data by itself.
Saved data can be readout using the T1 command.

Data Save (T0)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	54	T	Command Code
3	30	0	Subcommand Code
4	38	8	SUM
5	34	4	84H
6	0D		CR:Transmission End Code

Data Readout (T1)

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	54	T	Command Code
3	31	1	Subcommand Code
4	38	8	SUM
5	35	5	85H
6	0D		CR:Transmission End Code

The robot responds as to whether the data save/readout is saved correctly.

Example: Data Save Error

N	HEX	ASC	Description
1	24	$	$:Transmission Start Code
2	74	t	Command Code
3	30	0	Subcommand Code
4	46	F	Result Code: 0: Normal, -1: Error
5	46	F	
6	46	F	
7	46	F	
8	42	B	SUM
9	43	C	1BCH
10	0D		CR:Transmission End Code

13. APPENDIX-A: COMMON DATA ELEMENTS

This section explains the configurations of common data elements used in movement control commands and data settings.

13.1 TCP (Tool Center Point) (48 Byte Format)

SN	HEX	ASC	Description
1	30	0	TCP-X or L1: 0.001 [mm] unit increments
2	30	0	
3	36	0	
4	30	0	
5	30	0	
6	30	0	
7	37	7	
8	32	2	
9	30	0	TCP-Y or L2: 0.001 [mm] unit increments
10	30	0	
11	33	3	
12	30	0	
13	30	0	
14	35	5	
15	30	0	
16	30	0	
17	30	0	TCP- Δ Z: 0.001 [mm] unit increments
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	30	0	
23	30	0	
24	30	0	
25	30	0	Reserved. Register 0 for the setting commands.
26	30	0	
27	30	0	
28	30	0	
29	30	0	
30	30	0	
31	30	0	
32	30	0	

SN	HEX	ASC	Description
33	30	0	Not in use (0)
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30	0	
41	30	0	Not in use (0)
42	30	0	
43	30	0	
44	30	0	
45	30	0	
46	30	0	
47	30	0	
48	30	0	

13.2 Tool Data (56 Byte Format)

<table>
<tr><th>SN</th><th>HEX</th><th>ASC</th><th>Description</th></tr>
<tr><td>1</td><td>30</td><td>0</td><td rowspan="8">Tool Mass Selection:

0/1/2...
The actual tool mass values vary depending on the model.
The selection numbers 0/1/2 are sent in place of the actual mass values.
<table>
<tr><th></th><th>JR3200</th><th>JR3300 – JR3600</th><th>JR3303F JR3403F</th><th>JC-3 (3 axes single sided)</th><th>JC-3 (3 axes double sided)</th><th>JC-3 (4 axes double sided)</th><th>JS3</th></tr>
<tr><td>0</td><td>1 kg</td><td>1 kg</td><td>1 kg</td><td>4 kg</td><td>8 kg</td><td>3 kg</td><td>1 kg</td></tr>
<tr><td>1</td><td>3.5 kg</td><td>4 kg</td><td>5 kg</td><td>-</td><td>-</td><td>-</td><td>3 kg</td></tr>
<tr><td>2</td><td>-</td><td>7 kg</td><td>10 kg</td><td>-</td><td>-</td><td>-</td><td>6 kg</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>15 kg</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
NOTE: Selections indicated by “-“ cannot be set with a tool mass value.
If a tool mass value is set, the axis may stop functioning.</td></tr>
<tr><td>2</td><td>30</td><td>0</td></tr>
<tr><td>3</td><td>36</td><td>0</td></tr>
<tr><td>4</td><td>30</td><td>0</td></tr>
<tr><td>5</td><td>30</td><td>0</td></tr>
<tr><td>6</td><td>30</td><td>0</td></tr>
<tr><td>7</td><td>36</td><td>0</td></tr>
<tr><td>8</td><td>30</td><td>0</td></tr>
<tr><td>9</td><td>30</td><td>0</td><td rowspan="8">TCP-X or L1:

0.001 [mm] unit increments

Example: TCP-X = 0.114mm = 114 = 00000072H</td></tr>
<tr><td>10</td><td>30</td><td>0</td></tr>
<tr><td>11</td><td>36</td><td>0</td></tr>
<tr><td>12</td><td>30</td><td>0</td></tr>
<tr><td>13</td><td>30</td><td>0</td></tr>
<tr><td>14</td><td>30</td><td>0</td></tr>
<tr><td>15</td><td>37</td><td>7</td></tr>
<tr><td>16</td><td>32</td><td>2</td></tr>
<tr><td>17</td><td>30</td><td>0</td><td rowspan="8">TCP-Y or L2:

0.001 [mm] unit increments

Example: TCP-T = 0.114mm = 114 = 00000072H</td></tr>
<tr><td>18</td><td>30</td><td>0</td></tr>
<tr><td>19</td><td>36</td><td>0</td></tr>
<tr><td>20</td><td>30</td><td>0</td></tr>
<tr><td>21</td><td>30</td><td>0</td></tr>
<tr><td>22</td><td>30</td><td>0</td></tr>
<tr><td>23</td><td>37</td><td>7</td></tr>
<tr><td>24</td><td>32</td><td>2</td></tr>
<tr><td>25</td><td>30</td><td>0</td><td rowspan="8">TCP- ∆ Z:

0.001 [mm] unit increments</td></tr>
<tr><td>26</td><td>30</td><td>0</td></tr>
<tr><td>27</td><td>30</td><td>0</td></tr>
<tr><td>28</td><td>30</td><td>0</td></tr>
<tr><td>29</td><td>30</td><td>0</td></tr>
<tr><td>30</td><td>30</td><td>0</td></tr>
<tr><td>31</td><td>30</td><td>0</td></tr>
<tr><td>32</td><td>30</td><td>0</td></tr>
</table>

SN	HEX	ASC	Description
33	30	0	Reserved. Register 0 for the setting commands.
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30	0	
41	30	0	Not in use (0)
42	30	0	
43	30	0	
44	30	0	
45	30	0	
46	30	0	
47	30	0	
48	30	0	
49	30	0	Not in use (0)
50	30	0	
51	30	0	
52	30	0	
53	30	0	
54	30	0	
55	30	0	
56	30	0	

13.3 Position (56 Byte Format)

SN	HEX	ASC	Description
1	30	0	Coordinate System 1: Righty -1: Lefty For the JR3000/JC-3 Series, be sure to register “1” (righty) for the setting command. The acquire command acquires “1” (righty).
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	30	0	
8	31	1	
9	30	0	X coordinates, 0.0005 [mm] unit increments Example: X=12.345 : 6072H
10	30	0	
11	36	0	
12	30	0	
13	30	6	
14	30	0	
15	37	7	
16	32	2	
17	30	0	Y coordinates, 0.0005 [mm] unit increments Example: Y=400.000 : C3500H
18	30	0	
19	36	0	
20	30	C	
21	30	3	
22	30	5	
23	37	0	
24	32	0	
25	30	0	Z coordinates, 0.0005 [mm] unit increments Example: Z=45.500 : 16378H
26	30	0	
27	36	0	
28	30	1	
29	30	6	
30	30	3	
31	37	7	
32	32	8	
33	30	F	R coordinates, 0.0005 [deg] unit increments Example: R=-5.1 : FFFFD828H
34	30	F	
35	36	F	
36	30	F	
37	44	D	
38	38	8	
39	32	2	
40	38	8	

SN	HEX	ASC	Description
41	30	0	MT1 coordinates, 0.0005 [mm] unit increments
42	30	0	
43	36	0	
44	30	0	
45	30	0	
46	30	0	
47	37	0	
48	32	0	
49	30	0	MT2 coordinates, 0.0005 [mm] unit increments
50	30	0	
51	36	0	
52	30	0	
53	30	0	
54	30	0	
55	37	0	
56	32	0	

You need to multiple the value of each axis (X, Y, Z, R, MT1, MT2) by 2000 to convert real number X (J1), Y (J2), Z (J3), R (J4), MT1, MT2 coordinates into the formats described above.

To change the above converted data format to real number data, use the following operation: Divide the X, Y, Z, R, MT1 or MT2 coordinate by 2000.

13.4 Point Type Code

13.4.1 Standard Specifications

	Type	HEX
General Point	PTP Point	00000021
	CP Start Point	00000022
	CP Passing Point	00000024
	CP Stop Point	00000026
	CP Arc Point	00000016
	CP End Point	00000023
	PTP Evasion Point	00000011
	CPStartCirclePoint	0000001C
	CPCenterCirclePoint	0000001D
Specialized Point	JSMC_DSP_SCameraShotPoint	25290121
	JSMC_DSP_MCameraShotPoint	D71D0121
	JSMC_DSP_WCameraShotPoint_1	840C0121
	JSMC_DSP_WCameraShotPoint_2	B46F0121
	JSMC_WaitStart	D2970121

13.4.2 Dispensing Specifications

The gray shaded part of the table below indicates the point types which will be added for the dispensing application model.

	Type	HEX
Standard Points	PTP Point	00000021
	CP Start Point	00000022
	CP Passing Point	00000024
	CP Stop Point	00000026
	CP Arc Point	00000016
	CP End Point	00000023
	PTP Evasion Point	00000011
	CPStartCirclePoint	0000001C
	CPCenterCirclePoint	0000001D
Dispense Points	JSMC_PointDispense	697F0121
	JSMC_StartLineDispense	67350122
	JSMC_PassingDispense	A7930124
	JSMC_CPEndDispense	F0300123
	JSMC_StartCircleDispense	158A011C
	JSMC_CenterCircleDispense	D6FA011D
Dispense Filling	JSMC_ZigzagPaint	D07C0132
	JSMC_RectSpiralPaint	90A80134
	JSMC_HollowRectSpiralPaint	76550134
	JSMC_RectPaintEnd	B76F0135
	JSMC_SpiralPaint	B52C0142
	JSMC_HollowSpiralPaint	EB630142
	JSMC_SpiralAreaPassing1	4AA60144
	JSMC_SpiralAreaPassing2	7AC50145
Special Points	JSMC_DSP_SCameraShotPoint	25290121
	JSMC_DSP_MCameraShotPoint	D71D0121
	JSMC_DSP_WCameraShotPoint_1	840C0121
	JSMC_DSP_WCameraShotPoint_2	B46F0121
	JSMC_WaitStart	D2970121
	JSMC_NAA_XMeasurePoint	79B80121
	JSMC_NAA_YMeasurePoint	3CDB0121

13.4.3 Dispensing with Camera Specifications

The gray shaded part of the table below indicates the point types which will be added for the dispensing with camera application model.

	Type	HEX
Standard Points	PTP Point	00000021
	CP Start Point	00000022
	CP Passing Point	00000024
	CP Stop Point	00000026
	CP Arc Point	00000016
	CP End Point	00000023
	PTP Evasion Point	00000011
	CPStartCirclePoint	0000001C
	CPCenterCirclePoint	0000001D
Dispense Points	JSMC_PointDispense	697F0121
	JSMC_StartLineDispense	67350122
	JSMC_PassingDispense	A7930124
	JSMC_CPEndDispense	F0300123
	JSMC_StartCircleDispense	158A011C
	JSMC_CenterCircleDispense	D6FA011D
Dispense Filling	JSMC_ZigzagPaint	D07C0132
	JSMC_RectSpiralPaint	90A80134
	JSMC_HollowRectSpiralPaint	76550134
	JSMC_RectPaintEnd	B76F0135
	JSMC_SpiralPaint	B52C0142
	JSMC_HollowSpiralPaint	EB630142
	JSMC_SpiralAreaPassing1	4AA60144
	JSMC_SpiralAreaPassing2	7AC50145
Special Points	JSMC_DSP_SCameraShotPoint	25290121
	JSMC_DSP_MCameraShotPoint	D71D0121
	JSMC_DSP_WCameraShotPoint_1	840C0121
	JSMC_DSP_WCameraShotPoint_2	B46F0121
	JSMC_WaitStart	D2970121
	JSMC_NAA_XMeasurePoint	79B80121
	JSMC_NAA_YMeasurePoint	3CDB0121
	JSMC_DSP_ZSenStartLineDispense	23730122
	JSMC_DSP_ZSensePoint	0ACE0121
	JSMC_DSP_MZSensePoint	78BF0121

13.4.4 Screw Tightening Specifications

The gray shaded part of the table below indicates the point types which will be added for the screw tightening application model.

	Type	HEX
Standard Points	PTP Point	00000021
	CP Start Point	00000022
	CP Passing Point	00000024
	CP Stop Point	00000026
	CP Arc Point	00000016
	CP End Point	00000023
	PTP Evasion Point	00000011
	CPStartCirclePoint	0000001C
	CPCenterCirclePoint	0000001D
Screw Tightening Points	JSMC_TGHRTightScrew	DDC80121
	JSMC_TGHCTightScrew	50BC0121
	JSMC_TGHFeeder	CB810121
	JSMC_TGHLeavePoint	BF220121
	JSMC_TGHEvasionBefore	975B0121
	JSMC_TGHEvasionAfter	EAE60111
Special Points	JSMC_DSP_SCameraShotPoint	25290121
	JSMC_DSP_MCameraShotPoint	D71D0121
	JSMC_DSP_WCameraShotPoint_1	840C0121
	JSMC_DSP_WCameraShotPoint_2	B46F0121
	JSMC_WaitStart	D2970121
	JSMC_TGHWaitStart	1B710121

13.4.5 Depaneling Specifications

The gray shaded part of the table below indicates the point types which will be added for the depaneling application model.

	Type	HEX
Standard Points	PTP Point	00000021
	CP Start Point	00000022
	CP Passing Point	00000024
	CP Stop Point	00000026
	CP Arc Point	00000016
	CP End Point	00000023
	PTP Evasion Point	00000011
	CPStartCirclePoint	0000001C
	CPCenterCirclePoint	0000001D
Depaneling Points	JSMC_BC_LineStart	F1CB0122
	JSMC_BC_LineStop	D6190126
	JSMC_BC_ArcPoint	8C8F0116
	JSMC_BC_LineEnd	E6510123
	JSMC_PC_CircleStart	8EFB011C
	JSMC_BC_CircleCenter	3443011D
Special Points	JSMC_DSP_SCameraShotPoint	25290121
	JSMC_DSP_MCameraShotPoint	D71D0121
	JSMC_DSP_WCameraShotPoint_1	840C0121
	JSMC_DSP_WCameraShotPoint_2	B46F0121
	JSMC_WaitStart	D2970121

13.5 Points (128 Byte Format)

SN	HEX	ASC	Description
1	30	0	Point Type Code Example: CP Start Point: 22H Refer to "13.4 Point Type Code."
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	32	2	
8	32	2	
9-64			X, Y, Z, R, MT1, MT2 position coordinates Refer to "13.3 Position (56 Byte Format)."
65	30	0	Line speed: 0.1 [mm/sec] unit increments Example: Line speed 10 [mm/sec] (100): 64H
66	30	0	
67	30	0	
68	30	0	
69	30	0	
70	30	0	
71	36	6	
72	34	4	
73	30	0	Condition Number
74	30	0	
75	30	0	
76	30	0	
77	30	0	Job Before Moving
78	30	0	
79	30	0	
80	30	0	
81	30	0	Job While Moving
82	30	0	
83	30	0	
84	30	0	
85	30	0	Job After Moving
86	30	0	
87	30	0	
88	30	0	
89	30	0	Job While CP Moving
90	30	0	
91	30	0	
92	30	0	

SN	HEX	ASC	Description
93	30	0	Work Adjustment Number
94	30	0	
95	30	0	
96	30	0	
97	30	0	PTP Condition Number
98	30	0	
99	30	0	CP Condition Number
100	30	0	
101	30	0	Tool Number
102	30	0	
103	30	0	Pallet Number
104	30	0	
105	30	0	Execute Condition Number
106	30	0	
107	30	0	Tag Code
108	30	0	
109	30	0	Setting Variable 1
110	30	0	
111	30	0	
112	30	0	
113	30	0	Setting Variable 2
114	30	0	
115	30	0	
116	30	0	
117	30	0	Setting Variable 3
118	30	0	
119	30	0	
120	30	0	
121	30	0	Setting Variable 4
122	30	0	
123	30	0	
124	30	0	
125	30	0	Setting Variable 5
126	30	0	
127	30	0	
128	30	0	

13.6 Program Name (SH-0)

SN	HEX	ASC	Description
1	35	5	
2	34	4	
3	36	6	
4	35	5	
5	37	7	
6	33	3	
7	37	7	
8	34	4	
9	35	5	
10	30	0	
11	37	7	
12	32	2	
13	36	6	Program Name
14	46	F	
15	36	6	Example: TestProg = 54H,65H,73H,74H,50H,72H,6FH,67H
16	37	7	
17	30	0	
18	30	0	
19	30	0	
20	30	0	
21	30	0	
...			
237	30	0	
238	30	0	
239	30	0	
240	30	0	

13.7 Work Home (SH-1)

SN	HEX	ASC	Description
1	30	0	Point Type Code example: CP Start Point: 22H Refer to “13.4 Point Type Code.”
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	32	2	
8	32	2	
9-64			X, Y, Z, R, MT1, MT2 position coordinates Refer to “13.3 Position (56 Byte Format).”
65	30	0	Line speed: 0.1 [mm/sec] unit increments Example: Line speed 10 [mm/sec] (100): 64H
66	30	0	
67	30	0	
68	30	0	
69	30	0	
70	30	0	
71	36	6	
72	34	4	
73	30	0	Condition Number
74	30	0	
75	30	0	
76	30	0	
77	30	0	Job Before Moving
78	30	0	
79	30	0	
80	30	0	
81	30	0	Job While Moving
82	30	0	
83	30	0	
84	30	0	
85	30	0	Job After Moving
86	30	0	
87	30	0	
88	30	0	
89	30	0	Job While CP Moving
90	30	0	
91	30	0	
92	30	0	

SN	HEX	ASC	Description
93	30	0	Work Adjustment Number
94	30	0	
95	30	0	
96	30	0	
97	30	0	PTP Condition Number
98	30	0	
99	30	0	CP Condition Number
100	30	0	
101	30	0	Tool Number
102	30	0	
103	30	0	Pallet Number
104	30	0	
105	30	0	Execute Condition Number
106	30	0	
107	30	0	Tag Code
108	30	0	
109	30	0	Setting Variable 1
110	30	0	
111	30	0	
112	30	0	
113	30	0	Setting Variable 2
114	30	0	
115	30	0	
116	30	0	
117	30	0	Setting Variable 3
118	30	0	
119	30	0	
120	30	0	
121	30	0	Setting Variable 4
122	30	0	
123	30	0	
124	30	0	
125	30	0	Setting Variable 5
126	30	0	
127	30	0	
128	30	0	

13.8 Cycle Mode (SH-2)

SN	HEX	ASC	Description
1	30	0	Cycle Mode 0: 1 Cycle Playback 1: Continuous Playback
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	30	0	
8	31	1	

13.9 PTP Condition (SH-3)

SN	HEX	ASC	Description
1	30	0	X (J1) Limit Speed: 0.01 [%] unit increments 100 [%]: 10000 = 2710H
2	30	0	
3	30	0	
4	30	0	
5	32	2	
6	37	7	
7	31	1	
8	30	0	
9	30	0	X (J1) Limit Acceleration: 0.01 [%] unit increments 100[%]: 10000 = 2710H
10	30	0	
11	30	0	
12	30	0	
13	32	2	
14	37	7	
15	31	1	
16	30	0	
17	30	0	Y (J2) Limit Speed: 0.01 [%] unit increments 100 [%]: 10000 = 2710H
18	30	0	
19	30	0	
20	30	0	
21	32	2	
22	37	7	
23	31	1	
24	30	0	

SN	HEX	ASC	Description
25	30	0	
26	30	0	
27	30	0	Y (J2) Limit Acceleration:
28	30	0	0.01 [%] unit increments
29	32	2	
30	37	7	100 [%]: 10000 = 2710H
31	31	1	
32	30	0	
33	30	0	
34	30	0	
35	30	0	Z (J3) Limit Speed:
36	30	0	0.01 [%] unit increments
37	32	2	
38	37	7	100 [%]: 10000 = 2710H
39	31	1	
40	30	0	
41	30	0	
42	30	0	
43	30	0	Z (J3) Limit Acceleration:
44	30	0	0.01 [%] unit increments
45	32	2	
46	37	7	100 [%]: 10000 = 2710H
47	31	1	
48	30	0	
49	30	0	
50	30	0	
51	30	0	R (J4) Limit Speed:
52	30	0	0.01 [%] unit increments
53	32	2	
54	37	7	100 [%]: 10000 = 2710H
55	31	1	
56	30	0	
57	30	0	
58	30	0	
59	30	0	R (J4) Limit Acceleration:
60	30	0	0.01 [%] unit increments
61	32	2	
62	37	7	100 [%]: 10000 = 2710H
63	31	1	
64	30	0	

SN	HEX	ASC	Description
65	30	0	
66	30	0	
67	30	0	MT1 Limit Speed:
68	30	0	0.01 [%] unit increments
69	32	2	
70	37	7	100 [%]: 10000 = 2710H
71	31	1	
72	30	0	
73	30	0	
74	30	0	
75	30	0	MT1 Limit Acceleration:
76	30	0	0.01 [%] unit increments
77	32	2	
78	37	7	100 [%]: 10000 = 2710H
79	31	1	
80	30	0	
81	30	0	
82	30	0	
83	30	0	MT2 Limit Speed:
84	30	0	0.01 [%] unit increments
85	32	2	
86	37	7	100 [%]: 10000 = 2710H
87	31	1	
88	30	0	
89	30	0	
90	30	0	
91	30	0	MT2 Limit Acceleration:
92	30	0	0.01 [%] unit increments
93	32	2	
94	37	7	100 [%]: 10000 = 2710H
95	31	1	
96	30	0	
97	30	0	
98	30	0	
99	30	0	Arch Motion
100	30	0	
101	30	0	0: Relative Mode
102	30	0	1: Absolute Mode
103	30	0	
104	30	0	

SN	HEX	ASC	Description
105	30	0	Z Move Height 0.001 [mm] unit increments from 0 50 [mm]: 50000 = C350H
106	30	0	
107	30	0	
108	30	0	
109	43	C	
110	33	3	
111	35	5	
112	30	0	
113	30	0	Z Up Distance 0.001 [mm] unit increments 20 [mm]: 20000 = 4E20H
114	30	0	
115	30	0	
116	30	0	
117	34	4	
118	45	E	
119	32	2	
120	30	0	
121	30	0	Z Down Distance 0.001 [mm] unit increments 20 [mm]: 20000 = 4E20H
122	30	0	
123	30	0	
124	30	0	
125	34	4	
126	45	E	
127	32	2	
128	30	0	
129	30	0	Horizontal Move Position 0.001 [mm] unit increments
130	30	0	
131	30	0	
132	30	0	
133	30	0	
134	30	0	
135	30	0	
136	30	0	
137	30	0	Start Horizontal 0.001 [mm] unit increments
138	30	0	
139	30	0	
140	30	0	
141	30	0	
142	30	0	
143	30	0	
144	30	0	

SN	HEX	ASC	Description
145	30	0	Start Down Position 0.001 [mm] unit increments
146	30	0	
147	30	0	
148	30	0	
149	30	0	
150	30	0	
151	30	0	
152	30	0	
153	30	0	Finish Mode 0: Driver Signal 1: Area 3 2: Area 2 3: Area 1 4: Pulse Output
154	30	0	
155	30	0	
156	30	0	
157	30	0	
158	30	0	
159	30	0	
160	30	0	
161	30	0	Reserved. Register 0 for the setting commands.
162	30	0	
163	30	0	
164	30	0	
165	30	0	
166	30	0	
167	30	0	
168	30	0	
169	30	0	Reserved. Register 0 for the setting commands.
170	30	0	
171	30	0	
172	30	0	
173	30	0	
174	30	0	
175	30	0	
176	30	0	
177	30	0	Acceleration Mode 0: S-Form 1: Constant
178	30	0	
179	30	0	
180	30	0	
181	30	0	
182	30	0	
183	30	0	
184	30	0	

SN	HEX	ASC	Description
185 -272	30	0	Reserved. Register 0 for the setting commands. 88 bytes

13.10 Tool Data (SH-4)

<table>
<tr><th>SN</th><th>HEX</th><th>ASC</th><th>Description</th></tr>
<tr><td>1</td><td>30</td><td>0</td><td rowspan="8">Tool Mass
0 – 4 (varies depending on the model)
<table>
<tr><th></th><th>JR3200</th><th>JR3300 –
JR3600</th><th>JR3303F
JR3403F</th><th>JC-3
(3 axes single sided)</th><th>JC-3
(3 axes double sided)</th><th>JC-3
(4 axes double sided)</th><th>JS3</th></tr>
<tr><td>0</td><td>1 kg</td><td>1 kg</td><td>1 kg</td><td>4 kg</td><td>8 kg</td><td>3 kg</td><td>1 kg</td></tr>
<tr><td>1</td><td>3.5 kg</td><td>4 kg</td><td>5 kg</td><td>-</td><td>-</td><td>-</td><td>3 kg</td></tr>
<tr><td>2</td><td>-</td><td>7 kg</td><td>10 kg</td><td>-</td><td>-</td><td>-</td><td>6 kg</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>15 kg</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
NOTE: Selections indicated by “-“ cannot be set with a tool mass value.
If a tool mass value is set, the axis may stop functioning.</td></tr>
<tr><td>2</td><td>30</td><td>0</td></tr>
<tr><td>3</td><td>30</td><td>0</td></tr>
<tr><td>4</td><td>30</td><td>0</td></tr>
<tr><td>5</td><td>30</td><td>0</td></tr>
<tr><td>6</td><td>30</td><td>0</td></tr>
<tr><td>7</td><td>30</td><td>0</td></tr>
<tr><td>8</td><td>30</td><td>0</td></tr>
<tr><td>9</td><td>30</td><td>0</td><td rowspan="8">TCP-X:
0.001 [mm] unit increments

1.150 [mm]: 1150 = 47EH</td></tr>
<tr><td>10</td><td>30</td><td>0</td></tr>
<tr><td>11</td><td>30</td><td>0</td></tr>
<tr><td>12</td><td>30</td><td>0</td></tr>
<tr><td>13</td><td>30</td><td>0</td></tr>
<tr><td>14</td><td>34</td><td>4</td></tr>
<tr><td>15</td><td>37</td><td>7</td></tr>
<tr><td>16</td><td>45</td><td>E</td></tr>
<tr><td>17</td><td>30</td><td>0</td><td rowspan="8">TCP-Y:
0.001 [mm] unit increments

2.500 [mm]: 2500 = 9C4H</td></tr>
<tr><td>18</td><td>30</td><td>0</td></tr>
<tr><td>19</td><td>30</td><td>0</td></tr>
<tr><td>20</td><td>30</td><td>0</td></tr>
<tr><td>21</td><td>30</td><td>0</td></tr>
<tr><td>22</td><td>39</td><td>9</td></tr>
<tr><td>23</td><td>43</td><td>C</td></tr>
<tr><td>24</td><td>34</td><td>4</td></tr>
</table>

SN	HEX	ASC	Description
25	30	0	TCP- Δ Z 0.001 [mm] unit increments
26	30	0	
27	30	0	
28	30	0	
29	30	0	
30	30	0	
31	30	0	
32	30	0	
33	30	0	Reserved. Register 0 for the setting commands.
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30	0	
41	30	0	Reserved. Register 0 for the setting commands.
42	30	0	
43	30	0	
44	30	0	
45	30	0	
46	30	0	
47	30	0	
48	30	0	
49	30	0	Reserved. Register 0 for the setting commands.
50	30	0	
51	30	0	
52	30	0	
53	30	0	
54	30	0	
55	30	0	
56	30	0	

13.11 Move Area Limit (SH-5)

SN	HEX	ASC	Description
1	30	0	Reserved. Register 0 for the setting commands.
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	30	0	
8	30	0	
9	30	0	J1 Upper Limit: 0.01 [deg] or X Upper Limit: 0.001 [mm] unit increments 150 [mm]: 150000 = 249F0H
10	30	0	
11	30	0	
12	32	2	
13	34	4	
14	39	9	
15	46	F	
16	30	0	
17	30	0	J1 Lower Limit: 0.01 [deg] or X Lower Limit: 0.001 [mm] unit increments Register 0 for the setting commands with desktop robots or Cartesian robots.
18	30	0	
19	30	0	
20	30	0	
21	30	0	
22	30	0	
23	30	0	
24	30	0	
25	30	0	J2 Upper Limit: 0.01 [deg] or Y Upper Limit: 0.001 [mm] unit increments 160 [mm]: 160000 = 27100H
26	30	0	
27	30	0	
28	32	2	
29	37	7	
30	31	1	
31	30	0	
32	30	0	

SN	HEX	ASC	Description
33	30	0	J2 Lower Limit: 0.01 [deg] or Y Lower Limit: 0.001 [mm] unit increments Register 0 for the setting commands with desktop robots or Cartesian robots.
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30	0	
41	30	0	Z (J3) Upper Limit: 0.001 [mm] unit increments 50 [mm]: 50000 = C350H
42	30	0	
43	30	0	
44	30	0	
45	43	C	
46	33	3	
47	35	5	
48	30	0	
49	30	0	Z (J3) Lower Limit: 0.001 [mm] unit increments Register 0 for the setting commands with desktop robots or Cartesian robots.
50	30	0	
51	30	0	
52	30	0	
53	30	0	
54	30	0	
55	30	0	
56	30	0	
57	30	0	R (J4) Upper Limit: 0.01 [deg] unit increments 360 [deg]: 36000 = 8CA0H
58	30	0	
59	30	0	
60	30	0	
61	38	8	
62	43	C	
63	41	A	
64	30	0	
65	46	F	R (J4) Lower Limit: 0.01 [deg] unit increments -360 [deg]: -36000 = FFFF7360H
66	46	F	
67	46	F	
68	46	F	
69	46	F	
70	37	7	
71	33	3	
72	36	6	

SN	HEX	ASC	Description
73	30	0	MT1 Upper Limit: 0.001 [mm] unit increments
74	30	0	
75	30	0	
76	30	0	
77	30	0	
78	30	0	
79	30	0	
80	30	0	
81	30	0	MT1 Upper Limit: 0.001 [mm] unit increments
82	30	0	
83	30	0	
84	30	0	
85	30	0	
86	30	0	
87	30	0	
88	30	0	
89	30	0	MT2 Upper Limit: 0.001 [mm] unit increments
90	30	0	
91	30	0	
92	30	0	
93	30	0	
94	30	0	
95	30	0	
96	30	0	
97	30	0	MT2 Upper Limit: 0.001 [mm] unit increments
98	30	0	
99	30	0	
100	30	0	
101	30	0	
102	30	0	
103	30	0	
104	30	0	

13.12 CP Condition (SH-6)

SN	HEX	ASC	Description
1	30	0	CP Acceleration: 0.01 [%]unit increments 100 [%]: 10000 = 2710H
2	30	0	
3	30	0	
4	30	0	
5	32	2	
6	37	7	
7	31	1	
8	30	0	
9	30	0	CP Limit Rotate Speed: 0.01 [%]unit increments 100 [%]: 10000 = 2710H
10	30	0	
11	30	0	
12	30	0	
13	32	2	
14	37	7	
15	31	1	
16	30	0	
17	30	0	CP Limit Rotate Acceleration: 0.01 [%]unit increments 100 [%]: 10000 = 2710H
18	30	0	
19	30	0	
20	30	0	
21	32	2	
22	37	7	
23	31	1	
24	30	0	
25	30	0	Reserved. Register 0 for the setting commands.
26	30	0	
27	30	0	
28	30	0	
29	30	0	
30	30	0	
31	30	0	
32	30	0	
33	30	0	Reserved. Register 0 for the setting commands.
34	30	0	
35	30	0	
36	30	0	
37	30	0	
38	30	0	
39	30	0	
40	30	0	

13.13 Workpiece Mass (SH-7)

<table>
<tr><th>SN</th><th>HEX</th><th>ASC</th><th>Description</th></tr>
<tr><td>1</td><td>30</td><td>0</td><td rowspan="8">Workpiece Mass

0 - 4 (varies depending on the model)
<table>
<tr><th></th><th>JR3200</th><th>JR3300 – JR3600</th><th>JR3303F, JR3403F</th></tr>
<tr><td>0</td><td>7 kg</td><td>5 kg</td><td>5 kg</td></tr>
<tr><td>1</td><td>-</td><td>10 kg</td><td>10 kg</td></tr>
<tr><td>2</td><td>-</td><td>15 kg</td><td>15 kg</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>20 kg</td></tr>
<tr><td>4</td><td>-</td><td>-</td><td>-</td></tr>
</table>
NOTE: Selections indicated by “-“ cannot be set with a workpiece mass value.
If a workpiece mass value is set, the axis may stop functioning.</td></tr>
<tr><td>2</td><td>30</td><td>0</td></tr>
<tr><td>3</td><td>36</td><td>0</td></tr>
<tr><td>4</td><td>30</td><td>0</td></tr>
<tr><td>5</td><td>30</td><td>0</td></tr>
<tr><td>6</td><td>30</td><td>0</td></tr>
<tr><td>7</td><td>30</td><td>0</td></tr>
<tr><td>8</td><td>30</td><td>0</td></tr>
</table>

NOTE: Not available for the JC-3/JS3 Series.

13.14 Position Data Type (SH-8)

SN	HEX	ASC	Description
1	30	0	Position Data Type 0: Absolute 1: Relative 2: Moving Amount
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	30	0	
8	30	0	

13.15 Individual Job number on Start of Cycle (SH-9)

SN	HEX	ASC	Description
1	30	0	Individual Job number on Start of Cycle (0 – 200) 24 = 18H
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	31	1	
8	38	8	

13.16 PTP Condition Number for Home (SH-10)

NOTE: This is only settable with the JC-3/JS3 Series.

SN	HEX	ASC	Description
1	30	0	PTP Condition Number for Home (0 – 100) 36 = 24H
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	32	2	
8	34	4	

13.17 Restart Method After Position Offset (SH-11)

NOTE: This is only settable with JR3000E (desktop robot equipped with an encoder)

SN	HEX	ASC	Description
1	30	0	0: None 1: Same point 2: Next point 1 = same point is set
2	30	0	
3	30	0	
4	30	0	
5	30	0	
6	30	0	
7	30	0	
8	31	1	

14. APPENDIX-B: COMMAND SAMPLE LIST

Commands: alphabetical order

	Function	Transmission example
B0	Robot Information	$B072 $b000020000010203FFFF000000001414050200000000200000000000000001010900000400000001000100019 7
B1	Robot Status	$B173 $b10200020000060000000800000CBB000002830000C0A8C8B400000000FFFFFF00272E000000002A
F1	System Error	$F177 $f10000000000000000000000000000000000000000000000000000000000000D7
F2	Run Error	$F278 $f200000000000000000000000000D8
I0	Execute Point Information	$I079 $i0000F000000000000002172 Prog=15,Pn=0,PTP
I6	Counter Value	$I6000140 $i6000101000000000000061 No.1,OFF,Count=0
I7	Timer Value	$I7000343 $i7000301000000000000064 No.3,OFF,Timer=0
I8	Pallet Count Value	$I8000142 $i8000101000002000000190000000EF No.1,Plane Pallet,OFF,Full Count=25,Count=0
I9	Workpiece Adjustment Amount	$I9000143 $i900010100000000003E8000007D000000BB800000FA00098968000001770A9 No.1,X=1,Y=2,Z=3,R=4,Rotate=10,SZ=6
K0	I/O Readout	$K000003B #sysIn $k000005555008F No.1,3, 5, 7, 9 ,11,13,15=ON
K1	Specified I/O Number Readout	$K1000000000003BF #sysIn3 $k1000000000030000000160 ON

	Function	Transmission example
K2	I/O Output: set	$K200030000000AD1 set #sysOut10 $k200005D
K3	I/O Output: reset	$K300030000000AD2 reset #sysOut10 $k300005E
K4	I/O Output: delaySet	$K400030000000A000003E873 delaySet #sysOut10 1000 $k400005F
K5	I/O Output: delayReset	$K500030000000A000003E874 delayReset #sysOut10 1000 $k5000060
K6	I/O Output: pulse	$K600030000000A000007D070 pulse #sysOut10 2000 $k6000061
K7	I/O Output: invPulse	$K700030000000A000007D071 invPulse #sysOut10 2000 $k7000062
K8	I/O Output: delayPulse	$K800030000000A000003E8000007D012 delayPulse #sysOut10 1000,2000 $k8000063
K9	I/O Output: invDelayPulse	$K900030000000A000003E8000007D013 invDelayPulse #sysOut10 1000,2000 $k9000064
KA	Data Out	$KA0003000000010000001000000000AE2 dataOut #sysOut1 16,10 $kA00006C
KB	Data Out BCD	$KB0003000000010000001000000000AE3 dataOutBCD #sysOut1 16,10 $kB00006D
M1	PTP Control	$M10000000100004E2000004E2000004E200001 5F90000000010000000177 X=10,Y=10,Z=10,R=45 $M17E $m100005E

	Function	Transmission example
M2	CP Line Control	$M200C80000000100030D40000493E00000753000004E2000000010000000147 20mm/s,X=100,Y=150,Z=15,R=10 $M27F $m200005F
M3	CP Arc Control	$M3006400000000100004E2000004E200000000000004E20000000010000000100640000000100186A0000186A000000000FFFFB1E000000001000000012B 10mm/s,X=10,Y=10,Z=0,R=10,10mm/s,X=50,Y=50,Z=0,R=-10 $M380 $m3000060
M4 M5 M6	JOG Movement	$M40000000200000000000000000000000000000000000000000000000000000000000083 $m4000061 $M502E4 ・・・・・ $M683 $m6000063
M7	CP Continuous Movement	$M7000601F400000000000100030D400000000000004E2000004E2000000001000000101F400000000000100030D4000030D4000009C40FFFFB1E000000001000000101F400000000000100000000030D400000753000004E200000000100000001 01F400000000000100000000000000007530FFFFB1E000000001000000101F40002000000010000000000000000000000000000000000000000000100000001DD $M784 $m7000064
N0	Axis Position Cartesian Coordinates	$N07E $n00000000100004E2000004E2000004E2000015F907FFFFFFF0000000036
N1	Tool Tip Position Current Valid TCP	$N17F $n10000000100004E2000004E2000004E2000015F90800000008000000A6
N2	Tool Tip Position Specified TCP	$N200001388000013880000138800000000000000000000000000BC $n20000000100004E200000855E0000753000015F90800000008000000A7

	Function	Transmission example
R0	JR3000/JC-3 Series: Mech. Initialization JS3 Series: Power ON	$R082 $R082 $r0000062
R1	Change Program Number	$R1000649 $r1000669
R2	Return to Work Home	$R284 $R284 $r2000064
R3	Start	$R385 $R385 $r3000065
R4	Temporary Stop	$R486 $r4000066
R5	Last Work	$R587 $r5000067
R7	Program End	$R789 $r7000069
R8	Start (Specified No.)	$R800054F $R88A $r800006A
R9	Execute Point Job	$R900014C $R98B $r900006B
S0	Acquire Point Data Number	$S0000144 $s000010000000CF7 Prog=1,Num of Points=12
S1	Point Position Coordinate Settings	$S1000E00000001000000100004E2000004E2000004E200002BF2 00000000100000001DA Prog=14,Pn=1,X=10,Y=10,Z=10,R=90 $s1000064

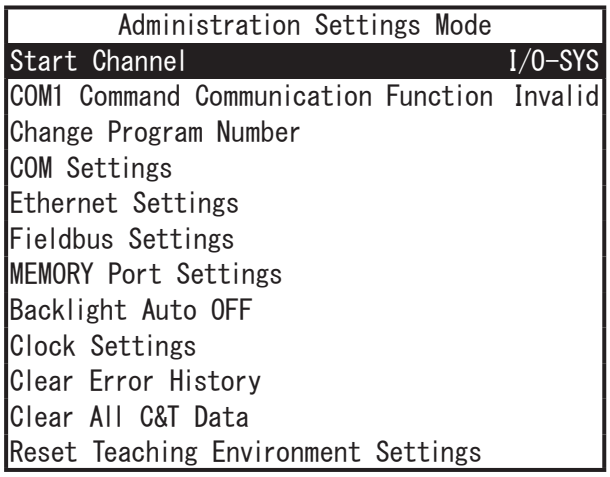
	Function	Transmission example
S2	Point Settings	$S2000E00000001000000210000000100007530000075300000753000007530 FFFF8AD00000000100000001000000000000000000000000010000 00000000000000030000000000000000000097 Prog=14,Pn=1,X=15,Y=15,Z=15,R=-15,PTP,AJob=1 $s2000065
S3	Workpiece Z Adjustment Settings	$S30001000007D0E2 No.1,Z=2mm $s3000066
S4	Workpiece Adjustment Settings	$S400010000271000002710000027100000271000002710FA No.1,X=10,Y=10,Z=10,R=10,rot=0.01 $s4000067
S5	Direct TCP Settings	$S500000000000000001388000013880000138800001388000000000 0000000018 Type=Program Data,X=5,Y=5,Z=5,R=5 $s5000068
S6	2-Point TCP Settings when changing the 4th axis/R axis	$S60000000000000000000010007A1200007A12000061A8000004E2 00000000000000000000000010007EF400007530000061A80000000 00000000000000000A1 Position Settings=All Program Common Settings, 1st Point :X=250,Y=250,Z=200,R=10 2nd Point :X=260,Y=240,Z=200,R=0 $s6000069
S7	Program Presence Information Request	$S78A $s700003F3E00000000200000000000800000000000000000000000 00000000000000000000000000000000000000000000000000000000 00000000000000000000000000000000000000000000000000000000 00000000000000000000000000000000000000000000000000000000 00000000000000000000000000000000000000085 No.1,2,3,4,5,6,10,11,12,13,14,50,100
S8	Program Creation	$S8000853 ProgNo=8 $s800006B
S9	Delete Program	$S9000854 ProgNo=8 $s900006C

	Function	Transmission example
SA	Acquire Point	$SA000E00000001EA Prog=14,Pn=1 $sA000000000021000000010000753000007530000075300000FFFF8 AD000000001000000010000000000000000000000010000000000000 000000030000000000000000000030 PTP,X=15,Y=15,Z=15,R=-15,AJob=1
SB	Add Point	$SB000E000000210000000100018 6A0000186A0000186A0FFFF3 CB000000001000000010000000000000000000000010000000000000 000000000000000000000000000051 Prog=14,PTP,X=50,Y=50,Z=50,R=-25,AJob=1 $sB000075
SC	Insert Point	$SC000E000000010000002100000010000C35000030D400000 EA60000075300000000100000001000000000000000000000001000 000000000000000000000000000000000000064 Prog=14,Pn=1,PTP,X=25,Y=100,Z=30,AJob=1 $sC000076
SD	Delete Point	$SD000E00000002EE Prog=14,Pn=2 $sD000077
SE	Delete Point Block	$SE000E000000020000000675 Prog=14,Pn=2~6 $sE000078
T0	Save Data	$T084 $t0000064
T1	Readout Data	$T185 $t1000065

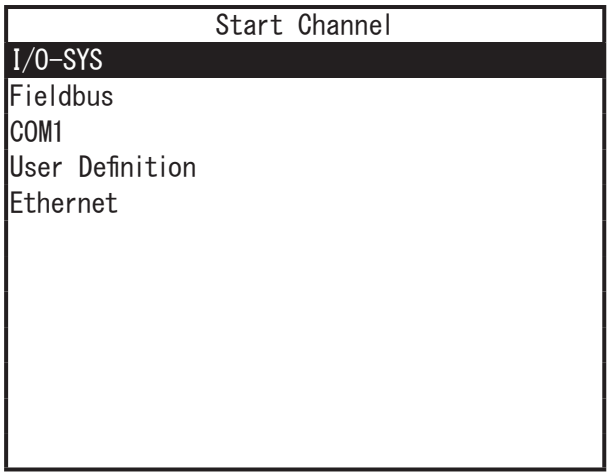
15. APPENDIX-C: START CHANNEL

When using commands to move the axes, such as Movement Control (M), Return to Work Home (R2) and Start (R3), you need to set [Start Channel] to [COM1] or [Ethernet].
The following explains how to set the start channel using the teaching pendant:

Select [Administration Settings Mode] from the Administration Mode menu to display the screen to the right.
(The start channel is set to I/O-SYS in the screen to the right (default)).



Select [Start Channel] to display the screen to the right.
Select [COM1]. The screen returns to the previous screen (the screen above).
(I/O-SYS in the screen above changes to COM1.)



NOTE: Commands to move the axes, such as Movement Control (M), Return to Work Home (R2) and Start (R3), are only valid in Run Mode when the start channel is set to COM1 or Ethernet.

16. APPENDIX-D: JR C-POINTS II LIMITED EDITION

■ JR C-Points II Limited Edition Requirements

To operate JR C-Points II Limited Edition (included in the Operation Manual CD-ROM), the following system configurations are required:

Computer	A PC capable of running Windows® 7 / 8.1 / 10
Memory capacity	512 MB or more
OS	Microsoft Windows® 7 / 8.1 / 10 Compatible with both 32 bit/64 bit systems
Hard disk capacity	2 GB or more free disk space with Windows® 7 / 8.1 / 10 set up.
Video Card	Capable of displaying 32 bit color with a resolution of 1280×800 or 1366×768. However, we recommend a video card with a resolution of 1920×1080 if displaying images using a robot with the USB camera (optional).
LAN (Ethernet)	To connect to the robot, a LAN cable with the following specifications are required: • Straight cable (CAT5) The connectable Ethernet specifications (on the PC side) are as follows: • 10BASE-T/100BASE-TX • LAN Port: RJ-45

The required memory capacity and hard disk capacity can vary depending on the PC's system requirements.

Also, be careful when using the PC because if there is not enough free hard disk space, it can result in insufficient memory during operation or other such problems.

■ If screen resolution exceeds 1920 × 1080, or if the monitor is small.

On a monitor with resolution exceeding 1920 × 1080, or on a Laptop PC with a small screen,the layout of text and icons in "Limited Edition" may be disrupted.

In such cases, adjust and set the following two points in theWindows® screen settings.

- Lower to resolution setting to "1920 × 1080" or lower
- Set text size to "100%"

Use the following values as guidelines for the right resolution for each monitor size.

Monitor size	Resolution
Desktop monitor of 20 inches or more	1920 × 1080 - 1600 × 900
Laptop PC monitor of around 12 inches	1600 × 900 - 1280 × 720

■ How to install JR C-Points II Limited Edition

1. Startup Windows® and confirm it is operating properly. Also, close down any other open applications.
2. Insert the operation manual CD-ROM into the CD drive. In the [JCP*E***L] folder (* = specifications, *** = version number) double click [¥SETUP.EXE]. The installer starts up.
3. Follow the instructions on the screen and proceed with the installation.

NOTE:

- If the installer is started up when the software is already installed, it will begin the uninstallation process. To uninstall JR C-Points II Limited Edition follow the same procedure as above to startup the installer.

- The installation may not complete if the following error occurred during installation.
  - “Error applying transforms. Verify that the specified transform paths are valid.”
  - “Error2254 : Database : Transform : Cannot update row that doesn’t exist.Table”

  These errors appear when the installer starts up in the environment JR C-Points II already installed and tries to uninstall, but could not uninstall the JR C-Points II.
  Uninstall the JR C-Points II already installed. After the uninstallation, reinstall the JR C-Points II by the following procedure:

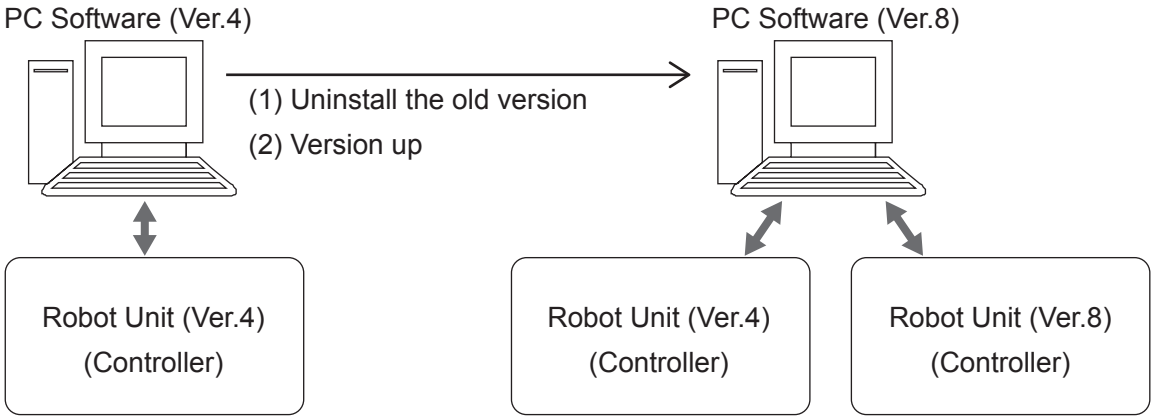
  1) From the “Start” menu in Windows®, select “Control Panel”.
  2) When “View by” is “Category”, select “Uninstall a program”.
     When “View by” is “Large icons” or “Small icons”, select “Programs and Features”.
  3) When the programs are appeared, select the program you want to uninstall.
  4) Right-click on the mouse to display the menu and select “Uninstall”.
  5) The selected program is uninstalled.

■ Version Up From Ver.3 or Lower to Ver.5 or Higher

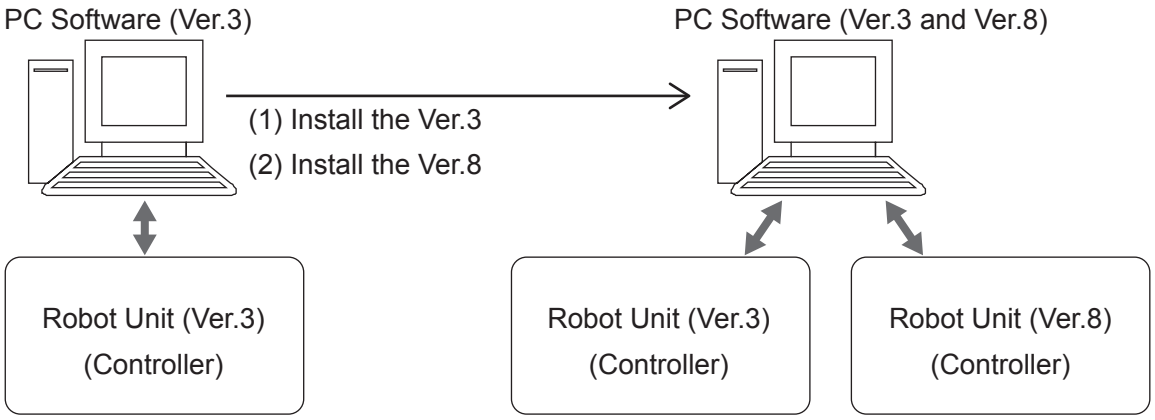
When upgrading from an older version, the older version is automatically uninstalled. Teaching data is compatible to and from different versions of robot system software. However, teaching data from a robot (or JR C-Points II) running version 3 or older is not compatible with JR C-Points II (or robot system software) version 5 or newer. To maintain compatibility between the robot and PC software, JR C-Points II version 3 or older is not automatically uninstalled when you install version 5 or newer. Make sure to use the applicable version when transferring data to and from the robot.

NOTE: After the uninstallation is complete, the shortcut may remain on the desktop and/or start menu. If this happens, please delete the shortcut yourself.

Upgrading the Ver.4 - Ver.7 software to Ver.8



Upgrading the Ver.3 software or lower to Ver.8



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