JANOME DESKTOP ROBOT JR3000 Series JANOME CARTESIAN ROBOT JC-3 Series JANOME SCARA ROBOT JS3 Series

Operation Manual Functions III (All Program Common Settings / PLC Programs)

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.

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 | Manual Details | | 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. | | ~ | V |
| Maintenance Explains maintenance procedures for the robot. ■ Make sure you read this manual when performing maintenance maintenance NOTE: This manual is designed for people who have received safety and maintenance training regarding the robot. | | V | ~ | V |
| Basic Instructions | Provides part names, data configurations, and the basic knowledge necessary to operate the robot. | | nmon) | ~ |
| Quick Start | tart Explains the actual operation of the robot by creating and running simple programs. ✓ (Comm | | nmon) | ~ |
| Teaching Pendant Operation | Explains how to operate the robot via the teaching pendant. | ✓ (Common) ✓ | | ~ |
| Functions I | Explains point teaching. | oint teaching. ✓ (Common) | | |
| Functions II | nctions II Explains commands, variables, and functions. | | Commo | on) |
| Functions III | Explains functions such as All Program Common Settings and PLC programs. | ✓ (Common) | | |
| Functions IV Explains Customizing Functions. | | ✓ (0 | Commo | on) |
| 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 | Explains the specialized functions of the various | Standard model: - | | |
| Specifications | application specifications. | Application model: ✓ | | |

Marning



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.





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.

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. ADMINISTRATION SETTINGS."

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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 •••••

Symbols are also listed alongside the safety note explanations. 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.

| \land Danger | This symbol indicates an imminent risk of serious injury or death. |
|------------------|--|
| Marning | This symbol indicates a risk of serious injury or death. |
| A 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 |
|-------------|--|
| \triangle | Take Caution (General Precaution) |
| | Indicates a forbidden action |
| \bigcirc | Never do this (General Prohibition) |
| | Do not disassemble, modify or repair. |
| | Do not touch (Contact Prohibition) |
| | Indicates a required action |
| 0 | Be sure to follow instructions (General Requirement) |
| | Be sure to unplug the power cord |
| | Make sure the machine is grounded |

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



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.



JR3000 Series

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

\land 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.

| | \triangle | Warning | |
|---|--|---|--|
| 0 | When creating a robot system categorized as an industrial r the laws and guidelines of the | m using auxiliary axis functions, if the system can be robot, make sure to use the robot in accordance with e 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 | : Make sure the I/O-S circuit (interlock) and | |
| | Switch | emergency stop switch(es) are functioning properly. | |
| | It is potentially dangerous to | operate the robot without making these checks first. | |

JR3000 Series

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

| | 🕂 Warning |
|---|---|
| 0 | 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. |
| 0 | 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. |
| 0 | 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. |
| 0 | 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. |

\land Danger



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



JR3000 Series





* 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.

JR3000 Series



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.





JC-3 Series





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.





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.



JC-3 Series



Failure to do so causes injury or breakdown.



Industrial Robot Safety Standards

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

Safety Precautions Regarding Installation

Robot Unit

\land 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.







Marning



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.



JS3 Series





JS3 Series



JS3 Series





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/cm²). 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.

A 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.



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

JS3 Series

Marning



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.



JS3 Series



JS3 Series

Controller

\land 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.



JS3 Series

| | \land 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. |
| 0 | 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. |
| 0 | 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 mm²) Crimped terminal: M4, with a width of 9.5 mm or less |
| 0 | 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. |
| ļ | 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. |

JS3 Series



Safety Precautions Regarding Usage

Robot Unit





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 |
|---|---|
| 0 | Before performing any operation, make sure there is no imminent danger to any of the operators. Failure to do so causes injury. |
| 0 | When attaching tools, etc., make sure they are securely fitted before running the robot. A loose tool can cause injury or breakdown. |
| 0 | 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. |

JS3 Series



JS3 Series

Robot Unit and Controller

| \land Danger | | |
|--------------|---|--|
| \bigcirc | 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. | |
| 0 | 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. | |
| 0 | 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. | |





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

JS3 Series

Controller

\land 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.



Safety Precautions Regarding Maintenance

Robot Unit





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.

Robot Unit and Controller

| \land Danger | | | |
|--------------|--|--|--|
| 0 | 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. | | |
| 0 | 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. | | |

JS3 Series



▲ 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.

JS3 Series

| | ▲ Caution |
|------------|--|
| 0 | 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. |
| 0 | 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. |
| 0 | 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. |
| \bigcirc | Do not charge, dispose of in a fire, or reuse the robot unit battery or controller battery (unit) in any way. |
| 0 | 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. |
| | |

JS3 Series

Controller

\land 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.

Marning



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. ADMINISTRATION SETTINGS

Administration Settings Mode sets the items outlined in this section. Administration Settings data are not included in C&T data transmission. However, through the PC software JR C-Points II Administration Settings can be referred to and modified. Also, the content of these settings are maintained even if C&T data is not saved and the robot is switched OFF.

(✓: settable, blank: not settable)

| Mode | | | Administration Mode: Administration Settings Mode | | |
|---------------|------------|--|--|--|--------------------------|
| | | Performed Item Setting/Data | Clear C&T Data | Reset Teaching Environment Settings | Reset Admin. Settings |
| | | C&T Data | \checkmark | | |
| | | Battery Backup Data | * | | |
| | | Start Channel | | | \checkmark |
| | | COM1 Command Communication Function | | | ~ |
| | | Change Program Numbers | | | ~ |
| | | COM Settings | | | ✓ |
| | | Ethernet Settings | | | ✓ |
| Admin. | Settings | Fieldbus Settings | | | \checkmark |
| Mode | | MEMORY Port Settings | | | \checkmark |
| | | Backlight Auto OFF | | | \checkmark |
| | | Clock Settings | | | \checkmark |
| | | Warmup Settings (JS3 Series only) | | | ~ |
| | | Buzzer Settings of Emergency Stop (JS3 Series only) | | | ~ |
| | S | Brightness Adjustment | | | |
| | setting | Unit of Measurement | | | |
| | | Display Language | | | |
| de | ut (| GO Function | | ~ | |
| Mo | me | JOG Function | | ~ | |
| Teaching | ron | Tool for Teaching | | ✓ | |
| | ivi | Camera for Teaching | | ✓ | |
| | Teaching E | Manual Job Number Settings | | ✓ | |
| | | Key Click | | ~ | |
| | | Save on Changing Mode | | ✓ | |
| | | Coordinates Display | | ~ | |
| Run Mode Menu | | PTP Speed Override | | ✓ | |

* If C&T data is cleared, the values etc., of the built-in keeping variables are erased, however, the time, ON time, run time, and error history are not cleared.

1.1 Start Channel

The "Start Channel" is a channel which sends an instruction telling the robot to start running (the axes make a movement similar to a Go Home movement), and thereby, from a safety point of view, limits the robot so that it cannot be activated from multiple sources.

Administration

| ТР | MODE [Administration] (JR3000/JC-3 Series) |
|----|--|
| | UTILITY [Change Mode] [Administration] (JS3 Series) |
| | [Administration Settings Mode] |
| | [Start Channel] |
| | [I/O-SYS] |
| | [Fieldbus] |
| | [COM1] |
| | [User Definition] |
| | [Ethernet] |
| PC | $[Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [General Setting]$ |
| | |

- I/O-SYS Turn ON #sysIn1 (I/O-SYS) to start a run.
 If using an operation box with the JS3 Series, set the start channel to I/O-SYS.
- Fieldbus

Turn ON #fbIn1000 (Fieldbus) to start a run.

For details regarding Fieldbuses, refer to the operation manual External Control (I/O / Fieldbus).

• COM1

Send a run start command via COM1 to start a run. However, make sure to enable [Administration Settings Mode] \rightarrow [COM1 Command Communication Function]. For further information regarding commands, refer to the operation manual *Communication Control (COM/LAN)*.

User Definition

When set to User Definition, you cannot start runs using I/O-SYS, Fieldbus, COM1, or Ethernet. You also cannot use these external start channels to release the robot from a *waitStart* command.

When set to User Definition, you can use *callProg* and movement commands with run mode jobs and point jobs executed from an external source. This setting is designed not for running programs or making axis movements using system programs, but for running programs and making axis movements via user defined run mode jobs and point jobs executed from an external source.

When using this setting, make sure to use only one start channel. For this reason, with the JR3000/JC-3 Series, do not use the robot in Switch Run Mode, as run starts via the start button also count as a start channel. Also note that there are no restrictions for the movement commands with this setting, so make sure to design a system that can prevent or cancel unexpected movements.

Ethernet

Send the run start command via Ethernet to start a run. The expected port number for communication on the robot side is 10031. For details regarding commands, refer to the operation manual *Communication Control (COM/LAN)*.

NOTE: For robots running system version 5 or lower, if the start channel is set to COM1, the COM1 command communication function is enabled. When the start channel is set to anything other COM1, all command communication functions for COM1 are disabled.

1.2 COM1 Command Communication Function

You can enable/disable command communication for COM1. When set to [Valid], you can enable command communication for COM1; and when set to [Invalid], you can disable command communication for COM1.

To use any optional communications other than command communications, or to communicate with a camera, set this to Invalid.

For details regarding commands, refer to the operation manual Communication Control (COM/LAN).

Administration

ТР

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

1.3 Change Program Number

Units that have this set to [Invalid] cannot change program numbers.

1.4 COM Settings

These are the COM1 – 3 (COM 1 and 2 for the JS3 Series) communication settings.

Administration

 MODE
 [Administration] (JR3000/JC-3 Series)

 UTILITY
 [Change Mode] [Administration] (JS3 Series)

 [Administration Settings Mode]
 [COM Settings]

 [COM Settings]
 [COM 1 Communication Setting]

 [COM 2 Communication Setting]
 [COM 3 Communication Setting]

PC [Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [COM Settings]

1.5 Ethernet Settings

IP Address, Subnet Mask
 Set the robot IP address and subnet mask:

Administration

- TP
 MODE
 [Administration] (JR3000/JC-3 Series)

 UTILITY
 [Change Mode] [Administration] (JS3 Series)

 [Administration Settings Mode]
 [Ethernet Settings]
- PC [Robot] → [Robot IP Address Settings]
- Client Port 1 3
 Set the external device IP address and port number used for communication with the robot.

Teaching Pendant

 TP
 MODE
 [Administration] (JR3000/JC-3 Series)

 UTILITY
 [Change Mode] [Administration] (JS3 Series)

 [Administration Settings Mode]
 [Ethernet Settings]

 [Ethernet Settings]
 [Ethernet Client1]

 [Ethernet Client2]
 [Ethernet Client3]

After the settings are made, exit out of Administration Mode. The robot automatically power cycles and the network address settings are applied.

PC Software

PC [Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [Ethernet Settings]

Click the [Set] button to transfer the settings to the robot. Power cycle the robot to apply the settings.

To communicate with the client, you need to use separate point job commands. For further details, refer to the operation manual *Functions II*.

1.6 Fieldbus Settings

These are Fieldbus settings. You can set parameters for DeviceNet, PROFIBUS, CC-Link, CANopen, PROFINET, and EtherNet/IP.

Administration

MODE [Administration] (JR3000/JC-3 Series) ТР UTILITY [Change Mode] [Administration] (JS3 Series) [Administration Settings Mode] [Fieldbus Settings] [DeviceNet] [Profibus] [CC-Link] [CANopen] [PROFINET] [EtherNet/IP]



PC [Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [Fieldbus Settings]

1.7 MEMORY Port Settings

The memory port is a dedicated USB memory connector on the main unit (JR3000 Series) or on the controller (JC-3/JS3 Series).

You can perform the following settings for the memory port in Administration Mode:

Administration

| ТР | MODE [Administration] (JR3000/JC-3 Series) | | | | | |
|--|--|--|--|--|--|--|
| UTILITY [Change Mode] [Administration] (JS3 Se | | | | | | |
| [Administration Settings Mode] | | | | | | |
| | [MEMORY Port Settings] | | | | | |

PC [Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [General Setting]

| Menu | Settings | Details | |
|---------------|---|--|--|
| | Valid | The MEMORY port becomes valid, and when USB | |
| | | memory is connected, data access is possible. | |
| | Invalid | The MEMORY port becomes invalid. When USB memory | |
| | | is connected, data access is not possible. | |
| | Valid | The robot checks the UPDATE folder, and if there are | |
| Auto Lindoto | | updates, the robot updates automatically. | |
| Auto Opuale | Invalid | The robot starts up normally without checking the | |
| | | UPDATE folder. | |
| | Use this menu ite | em to perform an update. | |
| Manual Update | (This is a teaching pendant only function. There is no manual update function | | |
| | with the PC software.) | | |

NOTE:

- When you want to update automatically, you need to create a specific folder in the USB memory (namely, the UPDATE folder), and place the system program file and/or the robot's model settings file to be updated into this folder.
- For information regarding backing up data and upgrading the system software via USB memory, refer to "1. Backing Up Data and Upgrading System Software via USB Memory" in the operation manual *Maintenance*.

1.8 Backlight Auto OFF

When in Run Mode, this turns the backlight of the teaching pendant LCD ON and OFF (the backlight only; information is still displayed). During Teaching Mode this setting does not work; the backlight is permanently lit.

Administration

| TP MODE [Administration] (JR3000/JC-3 Series) |
|---|
| UTILITY [Change Mode] [Administration] (JS3 Series) |
| [Administration Settings Mode] |
| [Backlight Auto OFF] |
| [Auto OFF Invalid] |
| [ON with Key or at Start] |
| [ON with Key] |
| [ON at Start] |
| [Always OFF] |

• Auto OFF Invalid The backlight does not turn OFF. The backlight is permanently lit.

• ON with Key or at Start

The backlight comes ON with a key push or a run start. The LCD is ON for the duration of the run. Other than the time set* while the robot is in standby, if there are no key pushes or run starts, the backlight is OFF.

• ON with Key

While the robot is in standby, pushing any key turns the backlight ON. Other than the time set* while the robot is in standby, if there are no key pushes, the backlight is OFF. Keys pushed during a run are not recognized.

• ON at Start

If a run is started when the robot is in standby, the backlight comes ON and stays on for the duration of the run. Other than the time set* while the robot is in standby, or if there are no run starts, the backlight is OFF.

• Always OFF

In Run Mode the backlight is always OFF. This is ON to start with; it turns OFF after the set wait time is exceeded.

* Select [ON with Key or at Start], [ON with Key], or [ON at Start], [Always OFF] and a screen for entering a wait time appears.

1.9 Clock Settings

Here you can manually set the current time.



1.10 Clear Error History

This deletes only the error history, and does so by setting the history error nodes to zero.

Administration



1.11 Clear C&T Data

This deletes all of the Robot's C&T Data.



1.12 Reset Teaching Environment Settings

This resets the PTP speed override in the Run Mode menu and the teaching environment settings to their initial values (default values).

1.13 Reset Administration Settings

This resets the settable items in Administration Settings Mode to their initial values (default values). This also resets the administration data for application specifications to their initial values (default values).

1.14 Backup/Restoration

The robot (data) storage area is partitioned as shown by the diagram below. All of the storage area partitions including the robot system software storage partition are subject to backup and data restoration operations.





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.**

NOTE: If using the PC software JR C-Points II, the backup and restore functions are not located in the administration settings menu, instead select [Robot] from the menu bar and click [Robot Data Backup] from the pull-down menu.

For further details, refer to "18. Robot Data Backup" in the operation manual PC Operation.

1.14.1 Backup

The robot system software, C&T data, individual configuration information and model setting files are read and saved as a file. If you do not specify an extension name, the file is saved with the extension "JRB."

Select [Backup] with a USB memory device connected. A screen for entering the backup file name is displayed. The default file name contains the date and time of the backup. You can change the file name should you wish to do so. You can enter up to 40 characters for the file name. Enter the file name and press the ENTR key.

The backup may take several minutes to process. Follow the instructions of the teaching pendant LCD and do not turn OFF the power to the robot or controller.

The BACKUP folder is automatically created and the backup file is saved within this folder.

1.14.2 Restore

This restores the data saved in [Robot Data Backup] to the robot.

Executing robot data restoration deletes all of the data in the robot (robot system software, C&T data, individual configuration information and model setting files) and overwrites it with the backup file.

Select [Restore] with a USB memory device connected. A screen for selecting the file is displayed. Select the file name and press the ENTR key.

Restoration may take several minutes to process. Follow the instructions of the teaching pendant LCD and do not turn OFF the power to the robot or controller.

1.15 Warmup Settings (JS3 Series)

With the JS3 Series, the robot adjusts its acceleration and the servo system to provide the most effective operation in room temperature environments. It does this because when running the robot in low temperatures or after a long period of inactivity, the robot cannot operate at its optimal level due to viscosity changes in the lubricant on the moving parts, reducing the positioning accuracy and causing a servo error or overload error to occur. When operating the robot in such an environment, the robot needs to warm up at low speed before transitioning into the conventional run speed.

Enabling the warmup function reduces the run speed of the robot when it is run directly after it is turned ON. This function gradually increases the run speed during operations until the robot reaches the conventional run speed. This function allows you to easily warm up the robot without the need for a separate warmup program.

Enable the warmup function if a servo error such as Excessive Margin of Error occurs when running the robot in a low temperature or after a long period of inactivity.

Note that this function is only activated during PTP movements in Run Mode.

Administration

| ТР | MODE [Administration] (JR3000/JC-3 Series) | | | | |
|--------------------------------|--|--|--|--|--|
| | UTILITY [Change Mode] [Administration] | | | | |
| [Administration Settings Mode] | | | | | |
| | [Warmup Settings] | | | | |

PC [Robot] \rightarrow [Administration] \rightarrow [Administration Settings] \rightarrow [Warmup Settings]

| Menu | Setting Value | Details |
|---------------------|----------------|--|
| Warmup Settings | Valid, Invalid | Enables/disabled the warmup function. |
| Subject Axes | J1 to J4 Axes: | Enables/disabled the warmup function for the specified axes. |
| | Valid, Invalid | |
| Warmup Duration | 1 to 60 | Specifies the duration to run the robot at the warmup speed. |
| | (minutes) | |
| Duration before | 1 to 1440 | Specifies the duration that the subject axes must be |
| Reactivate | (minutes) | inactive after the warmup function ends before reactivating |
| | | the warmup function. |
| Start Value for | 50 to 99 (%) | Specifies the initial value of the operating speed (warmup |
| Override | | override) for the warmup. |
| Percent of Duration | 0 to 50 (%) | This is the duration of the warmup that the robot operates |
| at Max Warmup | | at the initial override speed. Specify this as a percentage. |

When the warmup function is enabled, the robot activates the warmup function (the robot automatically reduces the operating speed) when the controller is turned ON. The robot reduces its run speed from the speed specified in the program and then gradually increases its speed for the duration of the warmup, until the robot reaches the conventional run speed. The percentage to which the speed is reduced is referred to as the "warmup override." When this value is 100 %, the robot is running at the specified (conventional) speed. The diagram below shows the speed transition to the conventional speed when using the default settings for the warmup function.



*1: Duration at Max Warmup = Warmup Duration x Percent of Duration at Max Warmup

After the warmup ends for the subject axes, the robot runs at the specified (conventional) speed. If the robot is inactive after the warmup ends, the robot joints will get cold in low temperatures. Therefore, if the subject axis is stopped for a long time (the factory default setting for Duration Before Reactivate is 60 minutes), warmup function starts again and the robot moves at reduced speed.



NOTE: When the controller is turned OFF/powered back ON, if the controller is turned OFF for a short time only, the temperature of the robot joints should not drop all that much. Accordingly, if you turn the controller back ON after shutting it down for only a short period, the robot runs at the conventional speed without activating the warmup function.





With the warmup function, the robot runs at a speed lower than the specified conventional speed. Make sure to synchronize with any prepheral devices.



If the subject axes have little work to perform, a servo error such as Excessive Margin of Error may occur even when the warmup function is enabled. Prevent this from happening by reducing the speed/acceleration for the program.

 Run Mode Screen Display During Warmup During warmup, the warmup override value appears on the lower right on the Run mode screen. Also, in order to distinguish from the PTP speed override value, the warmup override value dipslays highlighted during warmup.
 However, when the PTP speed override is other than 100 %, displays the value for "[Warmup Override Value] X [PTP Speed Override Value (When exceeding 100 %, always 100 %)]".

| Run Mode | Program 1 |
|-------------------------|--------------|
| Stopped Top of Cycle | Start Enable |
| | |
| | |
| | |
| | 70 % |

For the PTP speed override, refer to the following manuals:

- JR3000/JC-3 Series : "10.5 PTP Speed Override" in the operation manual, *Basic Functions*.
- JS3 Series : "9.4 PTP Speed Override" in the operation manual, *Basic Functions*.

1.16 Emergency Stop Buzzer Settings (JS3 Series)

This sets whether or not to sound the buzzer from the controller or teaching pendant during emergency stops.

Enable this function to sound the buzzer during emergency stops. Disable this function to silence the buzzer during emergency stops.

2. ALL PROGRAM COMMON SETTINGS

All program common settings are common settings that work for all programs.

You can make settings for the Run Mode environment and functions such as I/O-SYS function settings and/or Run Mode jobs, etc.

Among these settable items are items which can be set for both all program common settings and individual program settings. By specifying [Common/Individual] with these settable items, you can switch between the two and select which one to apply.

| Settable Items | Details | Common/Individual |
|-------------------------|---|-------------------|
| I/O Settings | The following items can be set: | Common only |
| | Program Number Switching Method | |
| | Program Number Reading Format | |
| | I/O-SYS Function Assignment | |
| | Fieldbus Function Assignment | |
| | Fieldbus Expansion I/O Function | |
| | I/O-S Function Settings | |
| | (JR3000 Series only) | |
| | I/O Software Filter | |
| | EMG OUT Function Settings | |
| | (JC-3 Series only) | |
| Job and PLC on Run Mode | The following items can be set: | Common only |
| | Job on Power ON | |
| | Job after Initialize *1 | |
| | (JR3000/JC-3 Series only) | |
| | Job on Emergency Stop | |
| | Job on Playback Error | |
| | Job on System Error | |
| | Job on Start of Run Mode | |
| | Common Job on Start of Cycle | |
| | Job on End of Cycle | |
| | Job on Stopping | |
| | Job on Starting | |
| | Job while Stopping (Cycle Top) | |
| | Job while Stopping (In Cycle) | |
| | PLC Program on Run Mode | |
| Point Reset Settings | Settings related to a point reset. | Common only |

| Settable Items | Details | Common/Individual |
|--------------------------------|---|-------------------|
| Other Parameters | The following items can be set:*2 | Common only |
| (JR3000/JC-3 Series only) | Initialize | |
| | Initialization at Start | |
| | Position Error Check | |
| | Order of Init. | |
| | Stop by Start/Stop Switch | |
| | Initialization Speed (X – R axes) | |
| | • PTP Auto Restart (JR3000E Series only) | |
| Work Adjustment (XY) on CP | You can set the workpiece adjustment | Common only |
| | range for workpiece adjustments during CP | |
| | movements. | |
| PTP Conditon Number for | The same settable items as with individual | Common/Individual |
| Home (JC-3/JS3 Series only) | program settings. | |
| Work Home* ³ | The same settable items as with individual | Common/Individual |
| | program settings. | |
| PTP Conditions*3 | The same settable items as with individual | Common/Individual |
| | program settings. | |
| CP Conditions*3 | The same settable items as with individual | Common/Individual |
| | program settings. | |
| Move Area Limit*3 | The same settable items as with individual | Common/Individual |
| | program settings. | |
| Workpiece Mass*3 | The same settable items as with individual | Common/Individual |
| (not available with the JC-3/ | program settings. | |
| JS3 Series) | | |
| Restart Method After Pos. | The same settable items as with individual | Common/Individual |
| Offset*3 (JR3000E Series only) | program settings. | |
| Valid/Invalid Settings of Move | The same settable items as with individual | Common/Individual |
| Axis*3 (Robots with auxiliary | program settings. | |
| axis functions only) | | |

- *1: With JC-3 absolute encoder models, this is [Job after Drive Unit Initialize].
- *2: With JC-3 absolute encoder models, only [Stop by Start/Stop Switch] is available.
- *3: The settable content for the work home, PTP conditions, CP condition, move area limit, mass of workpiece, restart method after pos. offset, valid/invalid settings of move axis are the same as those from individual program settings. For further information about the setting content, refer to the operation manual *Functions I (Point Teaching)*.

2.1 I/O Settings

The following 7 I/O settings are available:

- Program Number Switching Method
- Program Number Reading Format
- I/O-SYS Function Assignment
- Fieldbus Function Assignment
- Fieldbus Expansion I/O Function
- I/O-S Function Settings (JR3000 Series only)/EMG OUT Function Settings (JC-3 Series only)
- I/O Software Filter

2.1.1 Program Number Switching Method

If you connect a digit switch to an I/O terminal and want to change program numbers from there, you need to setup [Load at Start].

| Selection | Description |
|--------------------------|--|
| LOAD/ACK Handshake | When the "Program Number LOAD Signal" comes ON, the I/O |
| | signal program number 1 – 512 status is read (for the Fieldbus, |
| | the status of the program number register is loaded), the "Program |
| | Number ACK" signal is output, and the program number changes. |
| Load at Start (I/O-SYS) | When the start instruction is received, the I/O signal program |
| | number 1 – 512 status is read, and the program number changes. |
| Load at Start (Fieldbus) | When the start instruction is received, the program number |
| | register status is read, and the program number changes. |



NOTE: The "Program Number 1 – 64" signal is loaded if using the default settings. If you wish to use the "Program Number 128/256/512" signal, you need to change the signal function (I/O-SYS Function Assignment).

2.1.2 Program Number Reading Format

For signals that come under the Program Number 1 - 512 I/O signals, you can select to load them in either [Binary] or [BCD]. If you select [BCD], Program Numbers 1 - 8 are assigned to the ones digit, 16 - 128 to the tens digit, and 256 - 512 to the hundreds digit.

NOTE: If you specify program number 128 or larger with [Binary] or 80 or larger with [BCD] from I/O-SYS, you need to change the "#sysIn11 – #sysIn13" signal functions to "Program Number" (I/O-SYS Function Assignment).

2.1.3 I/O-SYS Function Assignment

If you want to use a pre-assigned I/O-SYS signal function with a different application, change the function of the signal you want to use.

For example, by default "#sysIn1" is assigned as a "Start" signal. If you want to change its function to "Free", you can use this signal for purposes other than starting runs; (however, it can no longer be used to start runs).

2.1.4 Fieldbus Function Assignment

If you want to use the pre-assigned Fieldbus signal functions with a different application, change the function of the signal you want to use.

For example, by default "#fbIn1000" is assigned as a "Start" signal. If you want to change its function to "Free", you can use this signal for purposes other than starting runs; (however, it can no longer be used to start runs).

2.1.5 Fieldbus Expansion I/O Function

You can assign teaching data such as point information and position data information, etc., to Fieldbus I/O empty spaces and select and set whether to enable or disable data viewing and/or settings from an external device.

If you enable this function, you can edit position information and offsets, etc., from an external device via Fieldbus. By doing this you can make robot position adjustments from an external device.

NOTE: The expansion I/O function is already assigned to the Fieldbus I/O; however, depending on your Fieldbus type and I/O settings, you may not be able to completely use this function.

2.1.6 I/O-S Function Settings (JR3000 Series)

If the I/O-S is open when the robot is stopped (during a cycle/when at the cycle top), you can set the robot to interlock or make an emergency stop.

The difference between an emergency stop and an interlock is as follows:

| | Emergency Stop | Interlock |
|---------------------------------|----------------|------------------|
| Output "sysOut7 Emergency Stop" | ON | Not ON |
| Buzzer | Sound | Does not sound |
| Job On Emergency Stop | Execute | Does not execute |

Furthermore, if the I/O-S is opened when the robot is running and not when it is stopped, this is handled as an emergency stop, regardless of your settings.

Also, for a test run or point run, "stopped" is not handled as an emergency stop regardless of your settings.

For the test run located in the test menu, if the I/O-S is opened, the robot makes an emergency stop. (Emergency stop settings). A start cannot be made with the interlock settings.

| Mode | Status | I/O-S Function | Handling |
|----------------------|---------|----------------|-----------------------|
| | | Settings | X: Emergency Stop |
| | | | O: Not emergency stop |
| Teaching Mode | Stopped | Emergency Stop | 0 |
| Administration Mode | | Interlock | 0 |
| (Customizing) | Moving | Emergency Stop | 0 |
| | | Interlock | 0 |
| Run Mode | Stopped | Emergency Stop | × |
| | | Interlock | 0 |
| | Running | Emergency Stop | × |
| | | Interlock | × |
| Test Run & Point Run | Stopped | Emergency Stop | × |
| | | Interlock | 0 |
| | Running | Emergency Stop | × |
| | | Interlock | × |

If set to [Interlock], only while the robot is stopped, the emergency stop function is not activated even if the I/O-S signal becomes OPEN.

For example, if there is an interlock that OPENS the I/O-S signal when a door near the robot (such as the gate of the safety barrier) is opened, the emergency stop function is not activated even if the door/gate is opened as long as the robot is stopped. However, the robot cannot start while the door/gate is open.

The function of the F4 key during a point run is emergency stop.

2.1.7 EMG OUT Function Settings (JC-3 Series)

If the EMG OUT is open when the robot is stopped (during a cycle/when at the cycle top), you can set the robot to interlock or make an emergency stop.

The difference between an emergency stop and an interlock is as follows:

| | Emergency Stop | Interlock |
|---------------------------------|----------------|------------------|
| Output "sysOut7 Emergency Stop" | ON | Not ON |
| Buzzer | Sound | Does not sound |
| Job On Emergency Stop | Execute | Does not execute |

Furthermore, if the EMG OUT is opened when the robot is running and not when it is stopped, this is handled as an emergency stop, regardless of your settings.

Also, for a test run or point run, "stopped" is not handled as an emergency stop regardless of your settings.

For the test run located in the test menu, if the I/O-S is opened, the robot makes an emergency stop. (Emergency stop settings). A start cannot be made with the interlock settings.

| Mode | Status EMG OUT Function | | Handling |
|----------------------|-------------------------|----------------|-----------------------|
| | | Settings | X: Emergency Stop |
| | | | O: Not emergency stop |
| Teaching Mode | Stopped | Emergency Stop | 0 |
| Administration Mode | | Interlock | 0 |
| (Customizing) | Moving | Emergency Stop | 0 |
| | | Interlock | 0 |
| Run Mode | Stopped | Emergency Stop | × |
| | | Interlock | 0 |
| | Running | Emergency Stop | × |
| | | Interlock | × |
| Test Run & Point Run | Stopped | Emergency Stop | × |
| | | Interlock | 0 |
| | Running | Emergency Stop | × |
| | | Interlock | × |

If set to [Interlock], only while the robot is stopped, the emergency stop function is not activated even if the EMG OUT signal becomes OPEN.

For example, if there is an interlock that OPENS the EMG OUT signal when a door near the robot (such as the gate of the safety barrier) is opened, the emergency stop function is not activated even if the door/gate is opened as long as the robot is stopped. However, the robot cannot start while the door/gate is open.

NOTE: The function of the F4 key during a point run is emergency stop.

2.1.8 I/O-S Software Filter

This enables/disables the software filter.

The I/O software filter filters noise from input signals by matching the input from 4 input bits. This filter is used with I/O-SYS and I/O-1 input bits and works by recognizing input bits as ON if the input stays ON for the duration of 4 minimum refresh cycles (one minimum refresh is 5 msec). This is the same for OFF input detection; if the input goes from ON to OFF and stays in this state for the duration of 4 minimum refresh cycles, the robot recognizes the system as OFF.

If the I/O-S software filter is enabled, the robot requires the external input to stay ON (or OFF) for 20 milliseconds.

If the I/O-S software filter is disabled, the robot requires the external input to stay ON (or OFF) for 5 milliseconds.

2.2 Run Mode Jobs and PLC Programs

2.2.1 Run Mode Jobs

A Run Mode job is a setting included in [All Program Common Settings]. Run Mode jobs are point jobs that are performed in Run Mode. Some Run Mode jobs are also performed in Teaching Mode during test runs, etc. The jobs are supplied with certain execution timings, such as Job on Power ON and Job on Start of Cycle. You can set the job you want at a certain timing using the job number. The point job is not executed if the job number is set to 0.

| Menu Item | Execution Timing | | |
|-------------------------|---|--|--|
| | JR3000/JC-3 Series | | |
| | Executed after the robot is turned ON and before the robot stands | | |
| | by for mechanical initialization. If an emergency stop is activated | | |
| | and the power is ON, this point job is executed before [Job on | | |
| Job on Power ON*1 | Emergency Stop]. | | |
| | JS3 Series | | |
| | Executed after the robot is turned ON. If an emergency stop is | | |
| | activated and the power is ON, this point job is executed before [Job | | |
| | on Emergency Stop]. | | |
| | Executed when mechanical initialization is executed when the power is | | |
| Job Before Initialize*2 | turned ON or the emergency stop is released. | | |
| (JR3000/JC-3 only) | Executed when the robot is waiting for start after mechanical initialization is | | |
| | completed from the <i>R0</i> command. | | |
| | This point job is not executed at the initialization in all other situations | | |
| Job After Initialize*3 | (initialization by <i>initMec</i> command, after detecting a position error, | | |
| (JR3000/JC-3 only) | initialization in Teaching Mode, etc.). | | |
| | [Job before initialize] is executed before mechanical initialization and [Job | | |
| | after initialize] is executed after mechanical initialization. | | |
| | Executed when the robot is stopped by an emergency stop in Run | | |
| Job on Emergency Stop | Mode. [Job on Emergency in Teaching Mode] is executed instead of this | | |
| | point job for an emergency stop in a test run. | | |
| Job on Playback Error | Executed when a run error occurs. For details regarding run errors, refer | | |
| | to "10. Error Message List" in the operation manual <i>Maintenance</i> for the | | |
| | JR3000, "11. Error Message List" in the operation manual <i>Maintenance</i> | | |
| | for the JC-3 Series, or "5.6 Error Message List" in the operation manual | | |
| | Maintenance for the JS3 Series. | | |

Jobs in Run Mode

| Menu Item | Execution Timing | | |
|-----------------------------|---|--|--|
| | JR3000/JC-3 Series | | |
| | Executed when a system error occurs. This point job is not executed | | |
| | for system errors such as motor or sensor errors, etc., that occur | | |
| | during mechanical initialization after the power is turned ON or after | | |
| | an emergency stop. For details regarding system errors, refer to | | |
| | "10. Error Message List" in the operation manual Maintenance for | | |
| Joh on System Error | the JR3000 or "11. Error Message List" in the operation manual | | |
| | Maintenance for the JC-3 Series. | | |
| | JS3 Series | | |
| | Executed when a system error occurs. This point job is not executed | | |
| | for system errors such as motor or sensor errors, etc., that occur | | |
| | after the power is turned ON. For details regarding system errors, | | |
| | refer to "5.6 Error Message List" in the operation manual Maintenance | | |
| | for the JS3 Series. | | |
| | JR3000/JC-3 Series | | |
| | Executed when the robot is turned ON and mechanically initialized, | | |
| | but before the robot stands by for start. After turning ON the robot or | | |
| Job on Start of Run Mode | an emergency stop and after [Job after Initialize] for the mechanical | | |
| | initialization. | | |
| | JS3 Series | | |
| | Executed when the robot is turned ON but before the robot stands by | | |
| | for start. When changing modes or performing a test run, the timing | | |
| | varies depending on whether you are using the teaching pendant or | | |
| | JR C-Points II. Refer to the table on the next page. | | |

*1: Precautions for Job on Power ON:

With the JR3000/JC-3 Series, do not assign an endless job to [Job on Power ON] because the robot cannot proceed past this job process. You cannot change the mode or any settings if an endless job (the robot is in an endless loop or waiting for a signal that does not input) is set to [Job on Power ON]. The same job is executed endlessly even after power cycling. Execute [Forced Teaching Mode Startup] if this occurs. You can enter Teaching Mode without the robot performing the Job on Power ON and therefor modify the job content, etc. Refer to "15. Startup Menu" in the operation manual *Basic Instructions* for details regarding [Forced Teaching Mode Startup].

- *2: With the JC-3 absolute encoder models, this is [Job before Drive Unit Initialize].
- *3: With JC-3 absolute encoder models, this job is [Job after Drive Unit Initialize]. Note however that the robot cannot execute a mechanical operation or [Job after Drive Unit Initialize] using the R0 communication command.

| Menu Item | Execution Timing |
|----------------------------------|--|
| Common Job on Start of Cycle *3 | Executed when a start command is received while the robot is waiting for a run start. If the cycle mode is set to [Continuous Playback], it is executed only when there is a start command. This job is not executed when a program is started using the <i>callProg</i> command. [Individual Job on Start of Cycle] in individual program settings is performed after [Common Job on Start of Cycle]. |
| Job on End of Cycle *3 | Executed when a program run is complete. If the cycle mode is set to [Continuous Playback], this job is only executed after the program is completed according to the <i>Last Work</i> command. If the program was called up by the <i>callProg</i> command, this job is not executed after a program is completed and the robot returns to the call source. |
| Job on Stopping | Executed when a temporary stop occurs during a program run. Specifically when a temporary stop occurs due to one of the following: The start switch is pressed while running in Switch Run Mode (when [Stop by Start Switch] is set to valid) with the JR3000/JC-3 Series. A <i>waitStart</i> or <i>waitStartBZ</i> command. An I/O-SYS function ([Temporary Stop], [Stop - Start Inhibition], or [Temporary Stop - Single Point Run]). An <i>R4</i> communication command (Temporary Stop). Not executed when the robot is stopped by an emergency stop, run error, or system error. |
| Job on Starting *3 | Executed when the robot restarts after a temporary stop during a program run. Also executed if the program is completed after a temporary stop. Specifically when the program is completed due to one of the following: An <i>endProg</i> command. An <i>R7</i> communication command (End Program). The program ends after mechanical initialization according to an I/O-SYS function (JR3000/JC-3 Series only). This job is not executed if the program ends because of an emergency stop. |
| Job while Stopping | Executed repeatedly when the robot is in standby for a run start |
| (Cycle Top) | before and after running a program. |
| Job while Stopping (In Cycle) | Executed repeatedly when the robot is temporarily stopped during a program run. |

*4: Restrictions on the *callProg* command and run control commands with Run Mode jobs. The *callProg* command and run control commands are executed only with [Common Job on Start of Cycle], [Job on End of Cycle] and [Job on Starting]. The commands are not executed and ignored for all other Run Mode jobs.

Execution Timing for Job on Start of Run Mode

| Operation | | Executing timing |
|-----------|----------------|--|
| Changing | Teaching | Executed after changing to the base screen of Run Mode from |
| Modes | Pendant | the mode selection screen. |
| | | Executed in Run Mode even if you did not change the mode. |
| | | Only executed when you transition from the mode selection |
| | | screen to the base screen of Run Mode. |
| | JR C-Points II | Executed when changing from Teaching Mode to Run Mode. |
| | | Only executed if the mode was changed. However, with the |
| | | JR3000/JC-3 Series, the Job on Start of Run Mode is not |
| | | executed when changing between Switch Run Mode and |
| | | External Run Mode. |
| Test Run | Teaching | Executed when changing to the test run standby screen. |
| | Pendant | |
| | JR C-Points II | Not executed when performing a test run with JR C-Points II. |

2.2.2 Timing of Run Mode Jobs

The timing for each of the Run Mode jobs are illustrated in the flowchart below.



*1: Refer to "8.2.2 Timing of Teaching Mode Jobs" in the operation manual *Functions IV* (*Customizing*) for the timing of Teaching Mode jobs.

- *2: When changing modes, [Job on Start Run Mode] may not be executed depending on certain conditions. Refer to the details Job on Start Run Mode in "2.2.1 Run Mode Jobs."
- *3: With JC-3 absolute encoder models, this job is [Job before Drive Unit Initialize].
- *4: With JC-3 absolute encoder models, this job is [Job after Drive Unit Initialize]. After the drive unit initialization is complete, the robot executes the point job set to [Job after Drive Unit Initialize].
- *5: With JS3 Series, *5 flow does not exist. With JC-3 absolute encoder models, the robot performs a drive unit initialization instead of a mechanical initialization.
- *6: When a JR3000/JC-3 Series robot is in standby for a run start, the job is executed after mechanical initialization if the initialization is executed by the *R0* command.
- *7: The run mode job executed during program run is shown in the flow chart below.
- *8: Certain run errors cannot be cleared. If such an error occurs, power cycle the robot.



2.2.3 Run Mode Jobs in Test Runs

Certain run mode jobs are not executed for test runs in Teaching Mode or *P.EXEC*. In some cases, Teaching Mode jobs may be executed instead.

| | Teaching Pendant | | | JR C-Points II | |
|---|------------------|------------------------|----------|----------------|-----------|
| Run Mode Job, Teaching Mode Job | Test Run | Test Run F3 (POINT) | P.EXEC | Test Run | Point Run |
| Job on Power ON | | | | | |
| Job before Initialize *3 | | | | | |
| (JR3000/JC-3 only) | | | | | |
| Job after Initialize *4 | | | | | |
| (JR3000/JC-3 only) | | | | | |
| Job after Emergency Stop | × | × | × | × | × |
| Job on Playback Error | 0 | 0 | 0 | 0 | 0 |
| Job on System Error | 0 | 0 | 0 | 0 | 0 |
| Job on Start of Run Mode | 0 | | | | |
| Common Job on Start of Cycle | 0 | O *1 | × | 0 | × |
| Job on Start of Cycle | 0 | O *1 | × | 0 | × |
| Job on End of Cycle | 0 | O *1 | × ⁄ O *2 | 0 | × |
| Job on Stopping | 0 | 0 | 0 | 0 | 0 |
| Job on Starting | 0 | 0 | 0 | 0 | 0 |
| Job while Stopping (Cycle Top) | 0 | | | | |
| Job while Stopping (In Cycle) | 0 | 0 | 0 | 0 | 0 |
| Job on Start of Teaching Mode | × | | | | |
| Job on Emergency Stop in Teaching Mode | 0 | 0 | 0 | 0 | 0 |

O : Executed, \times : Not executed, \checkmark : Not applicable

- *1: Executed when the specified cycle has started or ended in a point test run (F3 (POINT) key is pressed in a test run).
- *2: Executed when [Job on End of Cycle in P.EXEC] is set to valid. Refer to "8.2 Teaching Mode Job, PLC" in the operation manual *Functions IV (Customizing)* for details.
- *3: With JC-3 absolute encoder models, this is [Job before Drive Unit Initialize].
- *4: With JC-3 absolute encoder models, this is [Job after Drive Unit Initialize].

Refer to "8.2 Teaching Mode Job, PLC" in the operation manual *Functions IV (Customizing)* for details regarding [Job on Start of Teaching Mode] and [Job on Emergency Stop in Teaching Mode].

2.3 Point Reset Settings

"Point Reset" is what is called resetting the point number counter. If you set the point number counter to [Valid], the point number returns to 1 and the robot returns to the top of the cycle (status before running a program).

| Menu Item | Contents |
|---------------------|--|
| Reset at Power ON | Specify whether or not to execute the point reset when the power is |
| | turned ON. When set to [Invalid], if the robot was turned OFF due to an |
| | error, etc., the robot can be restarted from the point where it stopped. |
| Reset at Emergency | Specify whether or not to execute the point reset when the robot is |
| | stopped by an emergency stop. |
| | If set to [Invalid], the robot can be restarted from the point where it |
| | was stopped by the emergency stop |
| Reset at Going Home | Specify whether or not to execute the point reset when the robot |
| | moves to the work home. |
2.4 Other Parameters (JR3000/JC-3 Series)

Other settings are as follows:

2.4.1 Initialize

NOTE: JC-3 absolute encoder models do not have this function.

Select from the following three types of mechanical initialization:

Work Home on Start

After the first initialization is complete, press the start button.

The axes move to the work home position of the selected program and the robot is ready to run.

Work Home after First Cycle After initialization, the robot is ready to run at the initialization position (the run starts when the start button is pressed).

From the second run onwards, the robot starts from the work home.

■ Work Home after Initialize After initialization, each axis moves to the work home of the selected program and the robot is ready to run.



2.4.2 Initialize at Start

NOTE: JC-3 absolute encoder models do not have this function.

Select whether to execute (Valid) or not execute (Invalid) the [Initialize at Start] operation when starting to run a program.

2.4.3 Position Error Check

NOTE: JC-3 absolute encoder models do not have this function.

Select whether or not to execute (Valid) or not execute (Invalid) the [Position Error Check] operation when a run ends.

2.4.4 Order of Initialization

NOTE: JC-3 absolute encoder models do not have this function.

Under the default initialization settings, the X- and Y-axes move simultaneously during initialization. If you want to initialize the $Z \rightarrow (R) \rightarrow X \rightarrow Y$, or vice-versa, due to tool or workpiece interference, you can specify " $Z \rightarrow (R) \rightarrow X \rightarrow Y$ or " $Z \rightarrow (R) \rightarrow Y \rightarrow X$ " and then conduct mechanical initialization.

- Initialization Order for Each Axis
- $Z \rightarrow (R) \rightarrow XY$
- $Z \rightarrow (R) \rightarrow X \rightarrow Y$
- $Z \rightarrow (R) \rightarrow Y \rightarrow X$

With JC-3 Series, you can select the followings:

- $Z \rightarrow (R) \rightarrow XY$
- $Z \rightarrow (R) \rightarrow X \rightarrow Y$
- $Z \rightarrow (R) \rightarrow Y \rightarrow X$
- $XY \rightarrow Z \rightarrow (R)$
- $X \rightarrow Y \rightarrow Z \rightarrow (R)$
- $Y \rightarrow X \rightarrow Z \rightarrow (R)$

With 4-axis models, the mechanical initialization order is Z-axis \rightarrow R-axis.

2.4.5 Start/Stop Switch Temporary Stop

Select the robot's movement from the following options when the start/stop switch is pressed mid-run: [Valid]: The run temporarily stops. If the start/stop switch is pressed again, the run restarts. [Invalid]: Even if the start switch is pressed mid-run the robot does not stop.

Use system flag 60 (#FstartSW) to refer to the start/stop switch; if the start/stop switch was pressed, the stopped run's point job data of the program being restarted is treated as being used. In this case, if [Stop by Start/Stop Switch] is set to [Valid], you need to press the start/stop switch twice to restart the run. This is because the first start/stop switch push activates the point job data and restarts the run, but at the same time the [Stop by Start/Stop Switch] function is also activated when the start/stop switch is pressed the first time.

2.4.6 Initialization Speed (X – R axis)

NOTE: JC-3 absolute encoder models do not have this function.

The default speed is set to [100%]. If you want to slow the initialization speed, reduce the percentage of this setting. Alternatively, you can set the speed for each axis.

2.4.7 PTP Auto Restart (JR3000E Series Only)

If this function is set to [Valid], no error occurs when there is a motor step-out during a PTP movement, and the run/movement is restarted (restarted from the same point). If this function is set to [Invalid], the [Overload Error] occurs when the motor steps out, and the run/drive is not automatically restarted. Even when this function is set to [Valid], the [Overload Error] occurs and the run/movement is stopped in the following instances:

- A step out during a CP movement.
- If there are 5 or more step outs in one PTP movement (error occurs on the 5th step out).
 (A PTP movement normally moves in this order: the Z-axis rises → moves horizontally in the XY direction → Z-axis descends. One PTP movement refers to the interval from when the Z-axis rises until the next time the Z-axis descends).
- A step out during a JOG movement
- A step out during a CP movement while in manual operation (according to the *lineMove / upZ / downZ / movetoZ* commands)
 (During an *upZ / downZ / movetoZ* movement, if an axis other than Z steps out, the error does

not occur until after the Z-axis finishes its movement.)

Additionally, if an axis steps out during mechanical initialization (including *initMec* within a point job) and/or diagnostic test, an error will not occur and the drive movement continues out of step. Be aware of this.

If the robot steps out while it is temporarily stopped, perform mechanical initialization to realign the axes. If you do not perform mechanical initialization, when the next run/movement starts, an error occurs, or the run/movement automatically restarts.

| Mode | Run/Movement Restart | Overload Error | No Restart, No Error | |
|----------|---------------------------|----------------------------|---------------------------|--|
| Run Mode | During a PTP Movement | During a CP Movement | Mechanical Initialization | |
| | | In one PTP movement | | |
| | - | where there are 5 or more | - | |
| | | step outs | | |
| | During a PTP movement in | During a CP movement in | Diagnostics | |
| | a test run | a test run | | |
| Teaching | During a PTP point run | During a CP point run | Mechanical Initialization | |
| Mode | During a GO movement | During a JOG movement | - | |
| | During a manual operation | During manual operation in | | |
| | in a PTP movement | a CP movement | - | |
| Power ON | - | - | Mechanical Initialization | |

▲ Caution



If a step out occurs during the Z-axis ascent/decent in a PTP movement, the Z axis momentarily rises to the position of horizontal movement and restarts the run from there. In this situation, the tool, etc., passes through at the height of the horizontal movement; a position where it usually wouldn't go (the run restart pos. per the diagram on the right).



2.5 CP Workpiece Adjustment (XY)

This is the workpiece adjustment range for CP movement.

The default setting is [Apply CP Start Function to All Points]. The adjustment range is grouped from the CP start point to the CP end point, and the coordinates for each point are adjusted according to the workpiece adjustment set for the CP start point. However, when there are points in between with work adjustments registered to them, <u>only the Z coordinates</u> are affected by these workpiece adjustments set to each point.

Even when there is no workpiece adjustment set to the CP start point, the run is executed according to the CP start point settings (without workpiece adjustment), and even if workpiece adjustments are set for points in between, these are ignored. However, <u>only the Z coordinates</u> are affected by the workpiece adjustments set to each point.

| Point Number | 1 | 2 | 3 | 4 |
|---------------------|----------------|-------------------------|-------------------------|--------------|
| Point Type | CP Start Point | CP Passing Point | CP Passing Point | CP End Point |
| Workpiece | 7 | Nene | 0 | Nono |
| Adjustment Settings | 7 | None | 0 | None |
| Workpiece | XYR: 7 | XYR: 7 | XYR: 7 | XYR: 7 |
| Adjustment Applied | Z: 7 | Z: 7 | Z: 8 | Z: 7 |

If you select the setting [Apply Separately to Each Point], the workpiece adjustment registered to the CP start point applies only to the CP start point, and each individual workpiece adjustment registered to the various points up until the CP end point apply. When there are no workpiece adjustments set, the robot runs at the original coordinates (no workpiece adjustment).

Example: P2 P4 P3 P5 P4 P2 P5 P3

When "Apply Separately to Each Point" is set, each individual workpiece adjustment for P1, P2, P4 is used, and P3 and P5 continue to use the original coordinates.



- P3: CP Stop Point:
- P4: CP Arc Point: P5: CP End Point:

P2: CP Passing Point: Workpiece adjustment 2 No workpiece adjustment Workpiece adjustment 3 No workpiece adjustment

3. PLC PROGRAMS

A PLC program is a set of logical operation commands for controlling I/O signals. A PLC program can be activated in normal operation during Run Mode (by default it is deactivated (not executed)).

You can create PLC programs 01 – 50 in Teaching Mode and PLC programs 51 – 100 in Customizing Mode. Both Teaching Mode and Customizing Mode PLC programs are the same, the only difference being, with Customizing Mode you can restrict access to them from the Protect Mode.

3.1 Registering a PLC Program



NOTE: The method for entering and editing commands is exactly the same as that for the point job data.

PC [Data] \rightarrow [PLC]

You can enter up to 1000 steps (lines) per PLC program.

However, the more steps you enter, the longer the scan time (execution interval) becomes as shown below:

10 msec (1 – 200 steps)

20 msec (201 – 400 steps)

30 msec (401 – 600 steps)

40 msec (601 – 800 steps)

50 msec (801 - 1000 steps)

| Category | Command | Necessary Parameter | Command Content |
|------------|---------|---------------------|--|
| Calculate | ld | Boolean variable | Input ON. |
| | ldi | Boolean variable | Input OFF. |
| | and | Boolean variable | Serial input ON. |
| | ani | Boolean variable | Serial input OFF. |
| | or | Boolean variable | Parallel input ON. |
| | ori | Boolean variable | Parallel input OFF. |
| | out | Output Destination | Coil movement |
| | set | Output Destination | Hold operation output |
| Coil | reset | Output Destination | Hold operation release |
| | pls | Output Destination | Rising pulse output |
| | plf | Output Destination | Falling pulse output |
| | anb | - | Serial circuit parallel block connection |
| Connection | orb | - | Parallel circuit serial block connection |
| | mps | - | Mid-calculation result storage |
| | mrd | - | Mid-calculation result readout |
| | mpp | - | Mid-calculation result readout and reset |
| Others | nop | - | No operation |

The commands below can be used for PLC program data.

You cannot use expressions in PLC programs.

The variables below can be used as parameters. (Some variables may not be available for certain commands.)

| Available Parameters | | | | |
|----------------------|----------------------|--|--|--|
| JR3000/JC-3 Series | JS3 Series | | | |
| #mv(1 – 99) | #mv(1 – 99) | | | |
| #mkv(1 – 99) | #mkv(1 – 99) | | | |
| #sysIn1 – 16 | #sysIn1 – 15 | | | |
| #genIn1 – 8 | #genIn1 – 18 | | | |
| | #handIn1 – 8 | | | |
| #fbIn(1000 – 17FF) | #fbln(1000 – 17FF) | | | |
| #sysOut1 – 16 | #sysOut1 – 14 | | | |
| #genOut1 – 8 | #genOut1 – 22 | | | |
| | #handOut1 – 8 | | | |
| #fbOut(1800 - 1FFF) | #fbOut(1800 – 1FFF) | | | |
| #sysFlag(1 – 999) | #sysFlag(1 – 999) | | | |
| #palletFlag(1 – 100) | #palletFlag(1 – 100) | | | |
| #seqT(1 – 99) | #seqT(1 – 99) | | | |
| #seqC(1 – 99) | #seqC(1 – 99) | | | |

3.2 Setting a PLC Program

| ТР | MENU | [All Program Common Settings] |
|----|------|-------------------------------|
| | | [Job and PLC on Run Mode] |

[PLC Program on Run Mode]



PC [Data] \rightarrow [All Program Common Settings]

To execute a registered PLC program, the registered PLC program number needs to be set to [PLC Program on Run Mode].

NOTE:

- By selecting [0] (default), you can deactivate (not perform) the PLC program data.
- The registered PLC program is activated after switching to Run Mode.

3.3 A PLC Program Integral or Non-Integral Timer

#seqT (1 – 50): Integral timer: If it is OFF, the timer value is held. #seqT (51 – 99): Non-integral timer: If it is OFF, the timer is reset.

Example:

```
ld #genIn1
out #seqT(1), 1000
Id #seqT(1)
out #genOut1
ldi #genIn1
reset #seqT(1)
```

NOTE:

- One timer can count 10 999,999,999msec
- You cannot refer to the timer values in the PLC program. They can be referred to as the variable below from the point job data. #seqTCount (1 – 99)

3.4 Viewing Mid-calculation Results

With a PLC program, you can store data that is in the process of being calculated. Also, you can view the stored mid-calculation results.

| Category | Command | Name | Parameter Required | Command Contents |
|----------|---------|-------------|-----------------------|--|
| tion | mps | Memory Push | _ | Mid-calculation result storage |
| Connect | mrd | Memory Read | - | Mid-calculation result readout |
| | mpp | Memory Pop | - | Mid-calculation result readout and reset |



If the *mps* command is executed, the acquired mid-calculation results are piled up in order of the *mps* command execution.

If the stored mid-calculation results are readout with the *mrd* command, the top mid-calculation result is read out. (This would be no. 3 in the example shown to the left)

If the stored mid-calculation results are readout and reset with the *mpp* command, the top mid-calculation result is read out and reset. (This would be no. 3 in the example shown to the left)

Up to 11 mid-calculation results can be piled up and stored.



Ladder View



ld #genIn1 mps and #genIn2 out #genOut2 mrd and #genIn3 out #genOut3 mrd and #genIn4 out #genOut4 mpp and #genIn5 out #genOut5

Commands

3.5 PLC Program Example 1

Self-Hold Circuit

This is an example of making a self-hold circuit sequence with the external I/O-1 input/output functions.

In this example, when the input signal #genIn1 comes in, the output signal #genOut1 is output and is self-maintained. When the input signal #genIn2 comes in, the output signal #genOut1 turns OFF.



Ladder View:



Commands:

| ld #genIn1 | |
|--------------|--|
| or #genOut1 | |
| ani #genIn2 | |
| out #genOut1 | |
| | |

3.6 PLC Program Example 2

Alternating Pulse Output Circuit

This is an example of using the external I/O-1 input/output functions to alternate the output signal ON/OFF each time an input signal comes ON.

In this example, the input signal #genIn1 and the output signal #genOut2 are used. Each time the input: #genIn1 comes ON, the output: #genOut2 turns ON (odd-numbered times) and OFF (even-numbered times).



Ladder View:



Commands:

| ld #genIn1 | |
|--------------|--|
| or #genOut2 | |
| ani #mv(2) | |
| out #genOut2 | |
| ldi #genIn1 | |
| or #mv(1) | |
| and #genOut2 | |
| out #mv(1) | |
| ld #mv(1) | |
| or #mv(2) | |
| and #genIn1 | |
| out #mv(2) | |
| | |

3.7 PLC Program Example 3

Counting the Parts Being Carried on the Conveyor Belt

This is an example of using the external I/O-1 input/output functions to count parts being carried on a conveyor belt. Once the stipulated number of parts is counted, the conveyer is stopped.

The input signal #genIn2 is used to count the carried parts and the input signal #genIn3 is used to reset the counter signal #seqC.

The input signal #genIn1 is used to turn ON the conveyor. When the conveyor is running, #genIn2 detects the carried parts and the counter #seqC counts them. Once 50 parts are counted, #genOut2 comes ON to stop the conveyor.



Ladder View:



Commands:

| ld #genIn1 | |
|------------------|--|
| or #genOut1 | |
| ani #genOut2 | |
| out #genOut1 | |
| ld #genIn3 | |
| reset #seqC(1) | |
| ld #genOut1 | |
| and #genIn2 | |
| out #seqC(1), 50 | |
| ld #seqC(1) | |
| out #genOut2 | |
| | |

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