JANOME DESKTOP ROBOT

JR3000 Series

Operation Manual

External Control

(I/O / Fieldbus)

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, and the JR3600 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	Explains I/O and Fieldbus. Refer to this manual if you are using Fieldbus.	✓	✓	✓
Communication Control	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 (information provided 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, these 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*.

- The descriptions within this manual are based on standard specifications. The menu item names etc. may vary depending on the model type.
- For information regarding optional additions, refer to "24. SPECIFICATIONS" in the operation manual *Specifications*. 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. OUTLET."

CONTENTS

FOR YOUR SAFETY

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

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

Symbols are also listed alongside the safety note explanations. Refer to the list below for an explanation of these 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 robot 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 list the nature of the danger and any necessary safety methods 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 cord
	Make sure the machine is grounded

FOR YOUR SAFETY

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

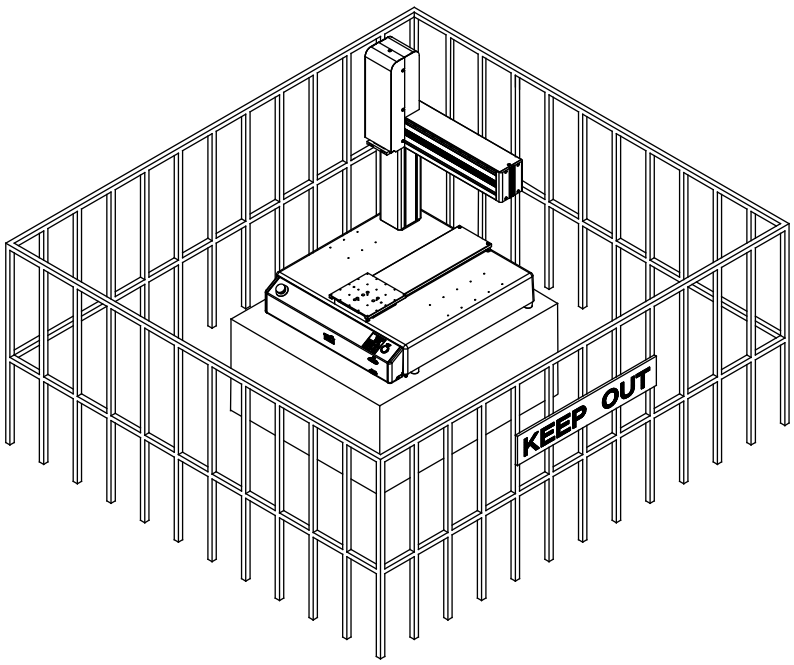
Always set up safety guards around the robot or the auxiliary axes so the moveable parts cannot be touched.

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 stop category 2. 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

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

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

⚠ Danger

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

⚠ Warning

Use protective gear such as a helmet, protective gloves, protective goggles, and safety shoes when installing the robot and performing maintenance.
Failure to do so can cause injury.

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 600 mm or higher above floor level, in the center of the workbench.
In addition, **for units with a cooling fan on the back, allow for 300 mm or more clearance between the back of the unit and the wall.**
Install the switchbox 600 mm 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

⚠ 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

⚠ 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 stop category 2. Make sure to perform a separate risk assessment of the interlock device.

FOR YOUR SAFETY

⚠ 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 connection 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.**

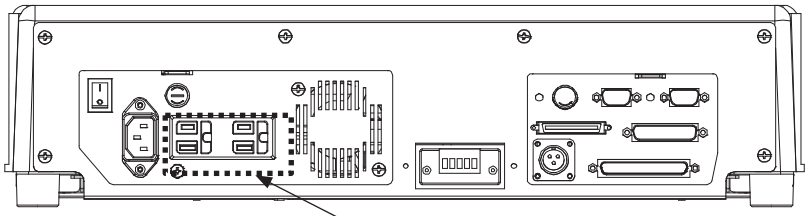
1. OUTLET

The following robot models are equipped with a power outlet: JR3300, JR3400, JR3500 and JR3600.

1.1 Outlet Location and Shape

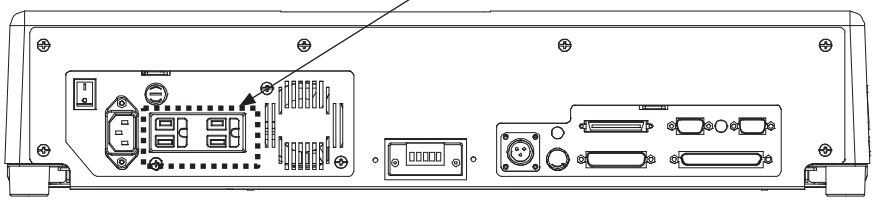
JR3300 Series

Example: JR3303N-AC



JR3400 – JR3600 Series

Example: JR3403N-AC



If you want to stop tool operation when the emergency stop switch is pressed, use one of the following methods:

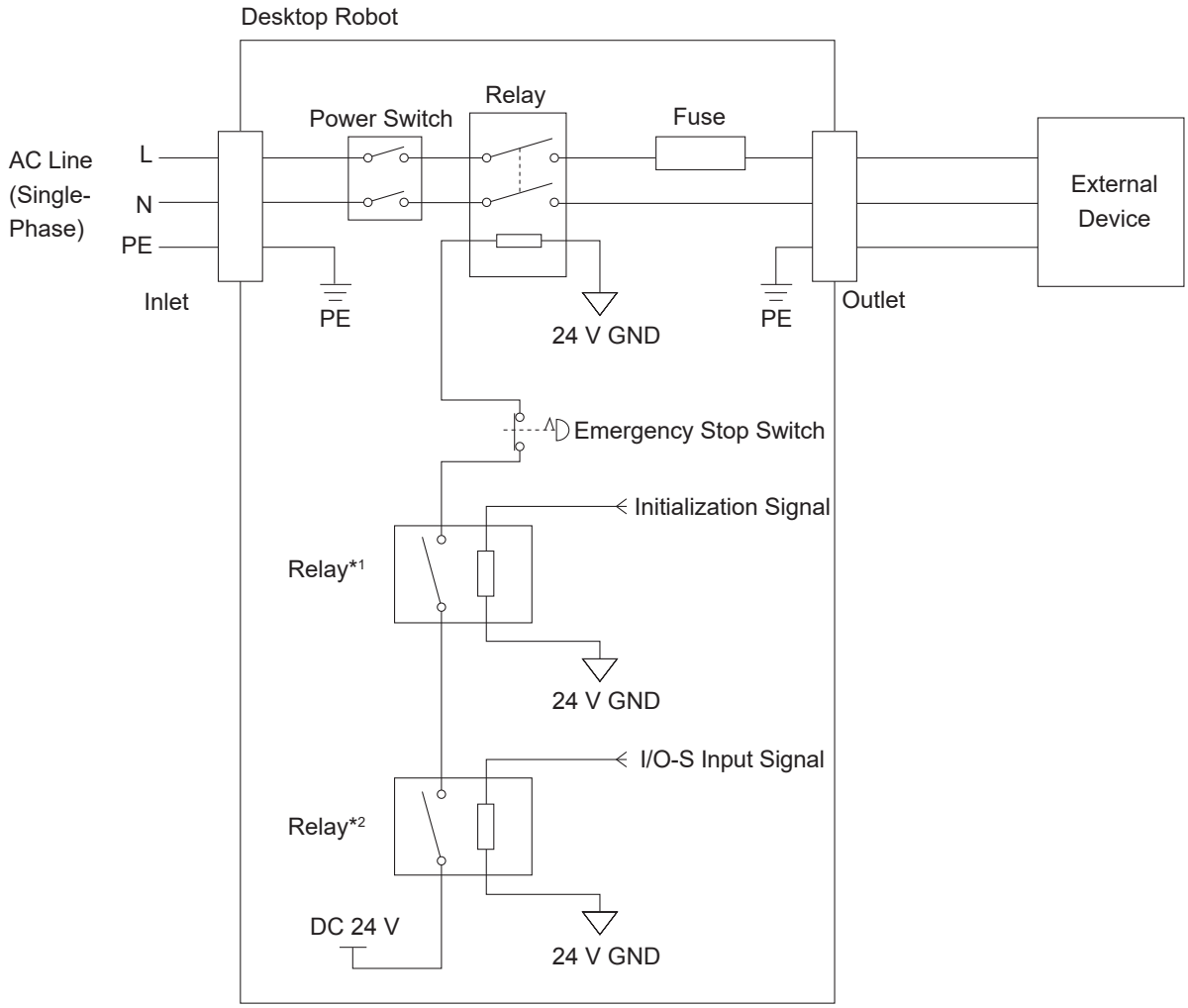
1. When you want to stop the tool by cutting OFF the power supply.
   - With Outlet Specifications:
     Connect the power cord for the tool (or the tool controller) to the outlet on the robot*1
   - Without Outlet Specifications:
     Use the I/O-SYS “#sysOut7 Emergency Stop” signal to construct a system that cuts OFF power to the tool unit when an emergency stop occurs*2

2. The dispenser cannot stop purging the dispensing agent by cutting the power supply OFF:
   Do not connect the dispenser to the robot outlet, but instead use the I/O-SYS “#sysOut7 Emergency Stop” signal to construct a system that inputs a reset signal to the dispenser when an emergency stop occurs*2.

*1: Refer to “1.2 Internal Circuit of the Outlet Output Terminal” and “1.3 Timing Chart” for details regarding the internal circuit and outlet function.

*2: Refer to “2.13 AC Power Control of an External Device during an Emergency Stop” for the I/O-SYS circuitry diagrams.

1.2 Internal Circuit of the Outlet Output Terminal

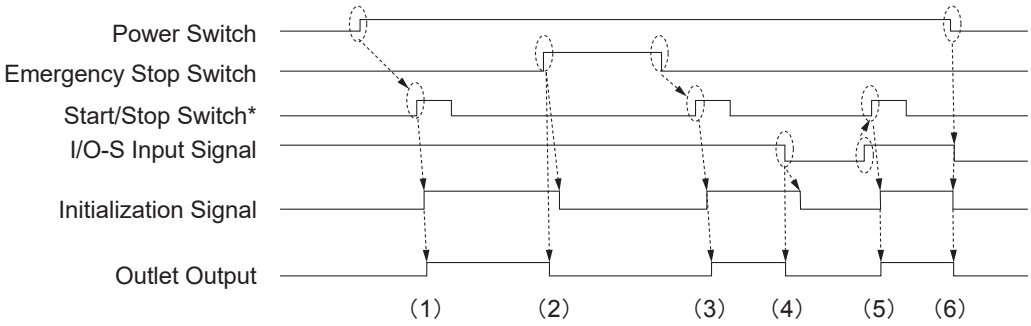


*1: Initialization signal connection relay: the contact is open when the emergency stop switch is pressed, I/O-S is not shorted, or the power is OFF.

*2: I/O-S*3 Input signal connection relay: the contact is open when I/O-S is not shorted.

*3: I/O-S is an optional terminal. The contact is always closed when the robot is not equipped with the I/O-S terminal.

1.3 Timing Chart



* The start/stop switch is operated in Switch Run Mode. A start operation is performed as follows for the other modes:
  - Teaching Mode: F4 key on the teaching pendant.
  - External Run Mode: #sysIn1 (start/free) signal via the I/O-SYS terminal.

(1) Power ON
After the power is ON and the start/stop switch is pressed, AC voltage is output from the outlet.

(2) Emergency Stop Switch Active
Outlet output is cut-off.

(3) Emergency Stop Switch Not Active
After the emergency stop switch is released and the start/stop switch is pressed, AC voltage is output from the outlet.

(4) I/O-S Terminal Not Shorted (optional terminal)
Outlet output is cut-off.

(5) I/O-S Terminal Shorted (optional terminal)
After the start/stop switch is pressed, AC voltage is output from the outlet.

(6) Power Cut-Off
Outlet output is cut-off.

2. I/O-SYS

There are system functions assigned to I/O-SYS. For information regarding the assigned functions, refer to “4. I/O-SYS FUNCTION ASSIGNMENT.”

2.1 Connectors

There are two types of I/O polarity: NPN specifications and PNP specifications. After confirming your robot’s polarity specifications, always connect tools, etc., which are compatible with these specifications.

■ I/O Polarity

If you are connecting external devices, make sure they are compatible with your robot’s I/O polarity. The robot’s I/O polarity can be confirmed on the I/O nameplate. Refer to “3.1 I/O Polarity” in the operation manual *Specifications*.

■ I/O Power Supply Indication

- External

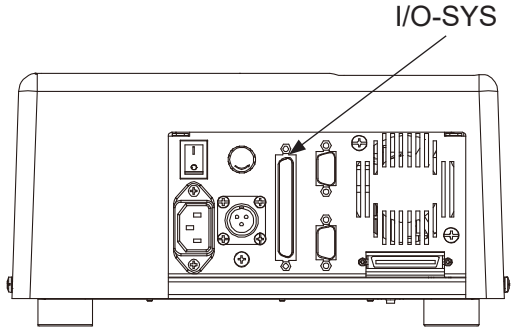
  The power supply (DC 24 V) for an external device connected to the I/O-SYS is supplied externally. Prepare a separate I/O power supply.
- Internal

  The power supply (DC 24 V) for an external device connected to the I/O-SYS is output from the I/O-SYS connector.

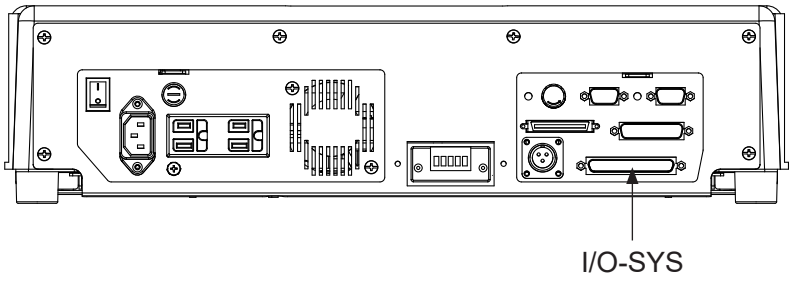
NOTE: I/O power supply type (External/Internal) is selected when you purchase the robot and cannot be changed after doing so.

JR3200 Series

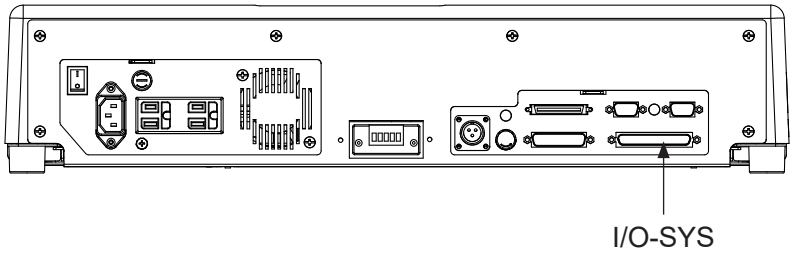
Example: JR3203N-AC



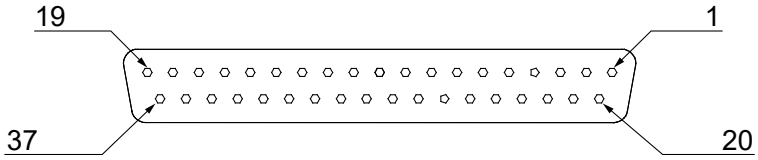
JR3300 Series
Example: JR3303N-AC



JR3400 – JR3600 Series
Example: JR3403N-AC



2.2 Pin No. (Robot Side)



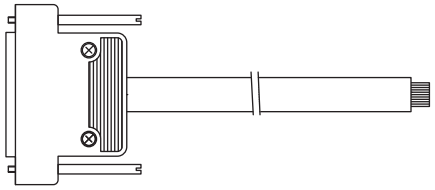
NOTE: When connecting an external device, make sure it is compatible with the robot's I/O polarity. The robot's I/O polarity can be confirmed on the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications*.

2.3 I/O Cable (Unit)

■ I/O Cable (Unit) (optional)

NOTE: The part number varies according to the cable length.

Cable Length [m]	Janome Part No.
2	984937002
3	984937105
5	984937208

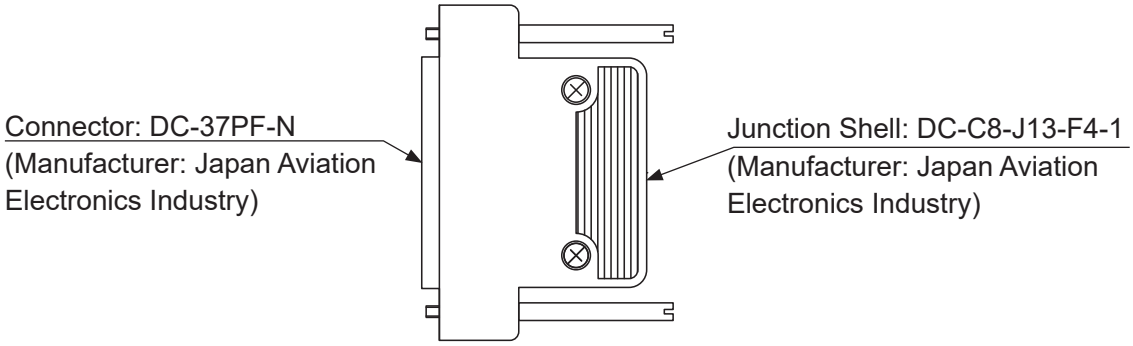


Cable Wiring

Pin No.	Insulator Color	Spiral Marking	Pin No.	Insulator Color	Spiral Marking
1	Black		21	Red	White
2	White		22	Red	Black
3	Red		23	Red	Green
4	Green		24	Red	Blue
5	Yellow		25	Green	White
6	Brown		26	Green	Black
7	Blue		27	Green	Red
8	Gray		28	Green	Blue
9	Orange		29	Yellow	White
10	Pink		30	Yellow	Black
11	Light Blue		31	Yellow	Red
12	Purple		32	Yellow	Green
13	White	Black	33	Yellow	Blue
14	White	Red	34	Brown	White
15	White	Green	35	Brown	Black
16	White	Blue	36	Brown	Red
17	Black	White	37	Brown	Green
18	Black	Red		Brown	Blue
19	Black	Green		Blue	White
20	Black	Blue		Blue	Black

■ Connector (Unit) (I/O1) (optional)

Janome part No.: 960537004



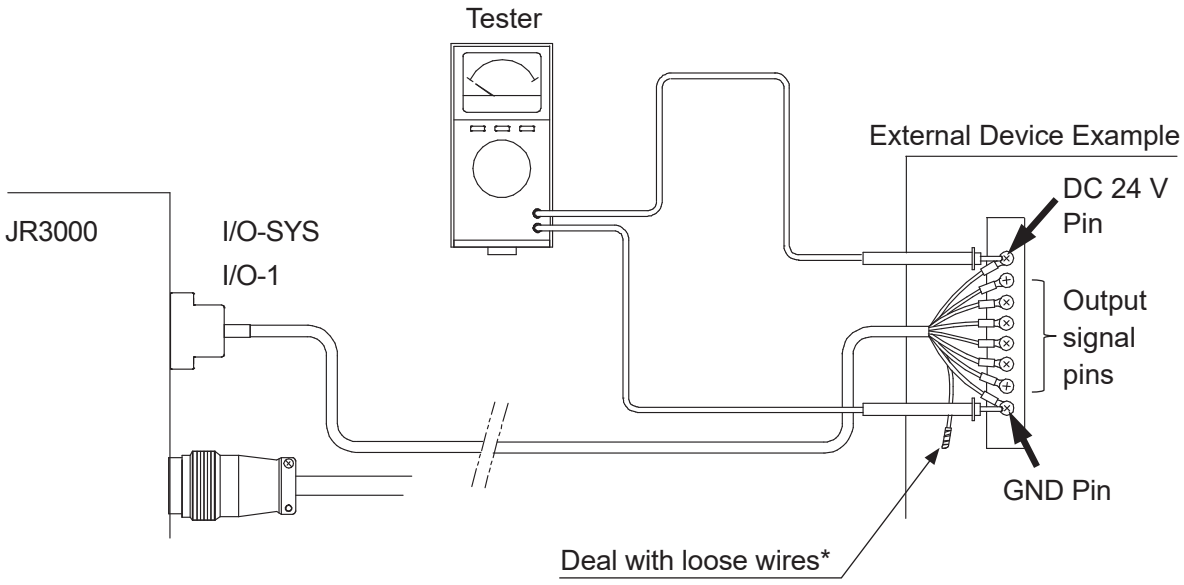
2.4 Wiring Layout Check (NPN)

Once the external device is connected to I/O-SYS or I/O-1, make sure you perform the following checks before turning ON the electricity. This page describes the robot's I/O polarity for NPN specifications. For PNP specifications, refer to "2.5 Wiring Layout Check (PNP)." The robot's I/O polarity can be confirmed by checking the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications* for details about the I/O polarity.

Refer to the diagram below and check each pin to make sure that the **DC 24 V** pin is not shorted to any of the **GND pins**, and also that the **DC 24 V pin** is not shorted to any of the **output signal pins**. Refer to "2.9 Circuit Diagram (NPN)" for details regarding I/O-SYS connections or refer to "8.8 Circuit Diagram (NPN)" for details regarding I/O-1 connections.

⚠ Caution

Do not turn ON the power if the **DC 24 V pin** is shorted to any of the **GND pins**, or if the **DC 24 V pin** is shorted to any of the **output signal pins**.
The robot's internal circuits may be damaged when the power is turned ON.



* If there is an unconnected wire amongst the wire connections, make sure you wrap electrical insulating tape over the copper wire parts and on the end of the wire to prevent the wire from touching other wires and the terminal etc.; thereby shorting them out.

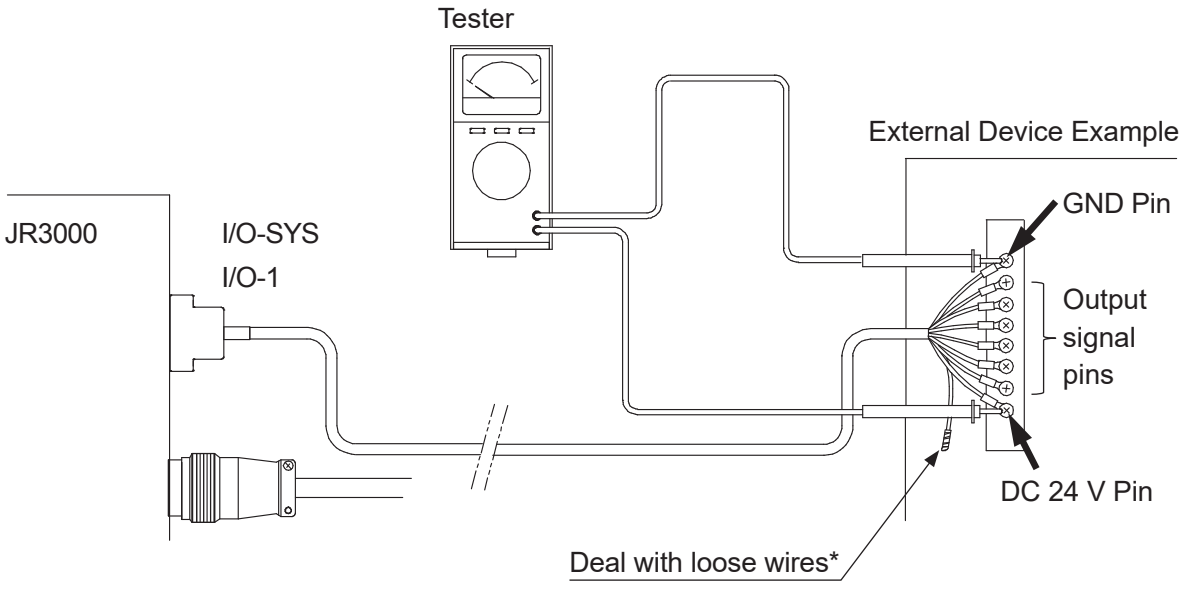
2.5 Wiring Layout Check (PNP)

Once the external device is connected to I/O-SYS or I/O-1, make sure you perform the following checks before turning ON the electricity. This page describes the robot's I/O polarity for PNP specifications. For NPN specifications refer to "2.4 Wiring Layout Check (NPN)." The robot's I/O polarity can be confirmed by checking the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications* for details about the I/O polarity.

Refer to the diagram below and check each pin to make sure that none of the **GND pins** are shorted to the **DC 24 V pin**, and also that none of the **GND pins** are shorted to the **output signal pins**.
Refer to "2.12 Circuit Diagram (PNP)" for details regarding I/O-SYS connections or refer to "8.11 Circuit Diagram (PNP)" for details regarding I/O-1 connections.

⚠ Caution

Do not turn ON the power if any of the **GND pins** are shorted to the **DC 24 V** pin, or if any of the **GND pins** are shorted to the **output signal pins**.
The robot's internal circuits may be damaged when the power is turned ON.



* If there is an unconnected wire amongst the wire connections, make sure you wrap electrical insulating tape over the copper wire parts and on the end of the wire to prevent the wire from touching other wires etc.; thereby shorting them out.

2.6 Power Supply Capacity

⚠ Caution

Adhere to the rated amperage outlined in the table below. If you exceed the values listed below, the internal circuits may be damaged.

Power Supply	Internal	External
Voltage	DC 24 V	DC 24 V
Amperage per pin (when using DC 24 V)	100 mA or less	100 mA or less
Total amperage (I/O-SYS + I/O-1)	1.6 A or less	1.6 A or less

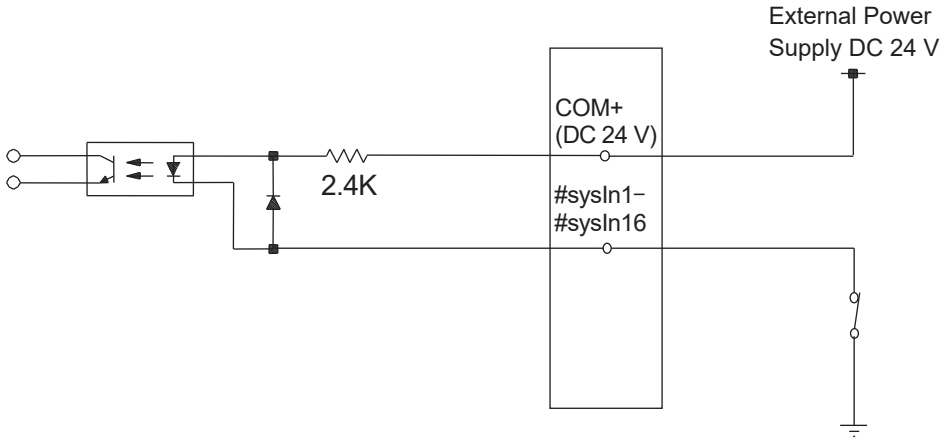
NOTE: Use an IEC/EN 62368-1 certified power supply unit (DC 24 V) for the external power.

2.7 Input Signal (NPN)

■ When using an external power supply

Input signals are treated as active when the photocoupler is ON.

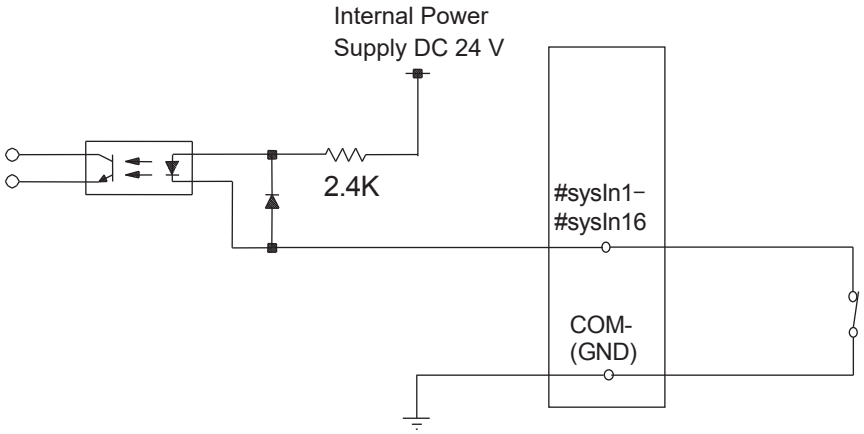
When using an external power, the input signals become active when the input pin and the external power supply ground are ON.



■ When using an internal power supply (optional)

Input signals are treated as active when the photocoupler is ON.

Using an internal power supply, the input signals become active when the input pin and the COM- pin are shorted.



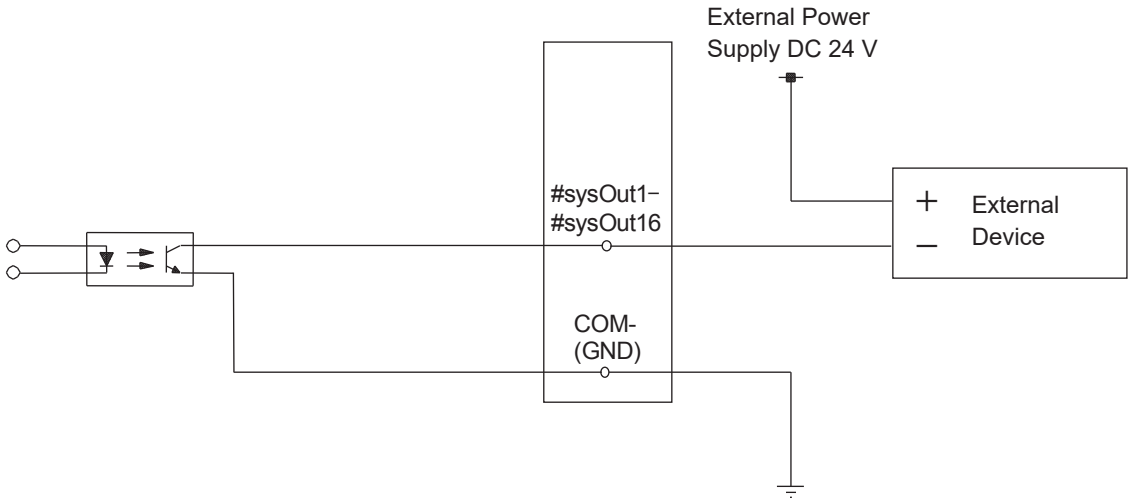
If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3 mA. If you use a device with a leakage current of more than 0.3 mA, it may not turn OFF.

⚠ Caution

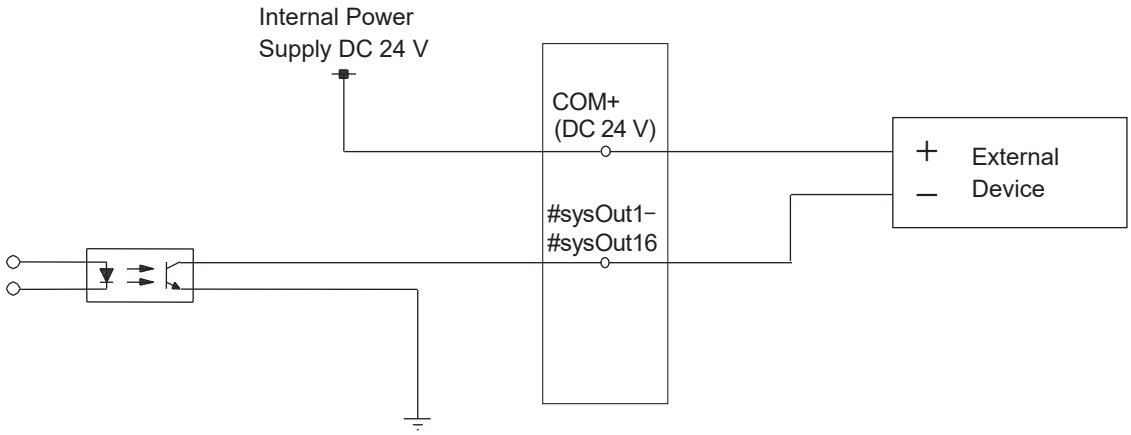
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

2.8 Output Signal (NPN)

■ When using an external power supply



■ When using an internal power supply (optional)

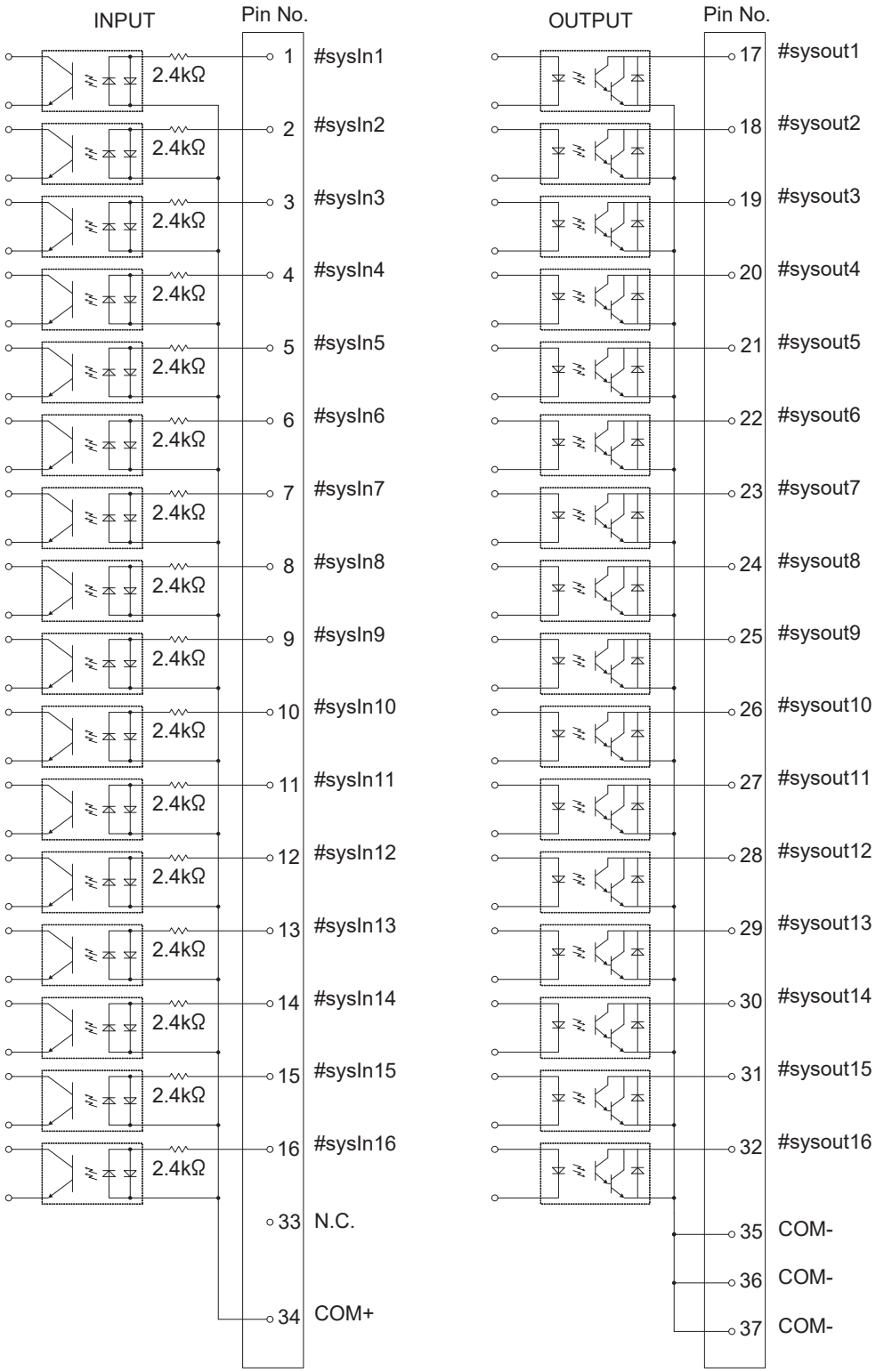


⚠ Caution

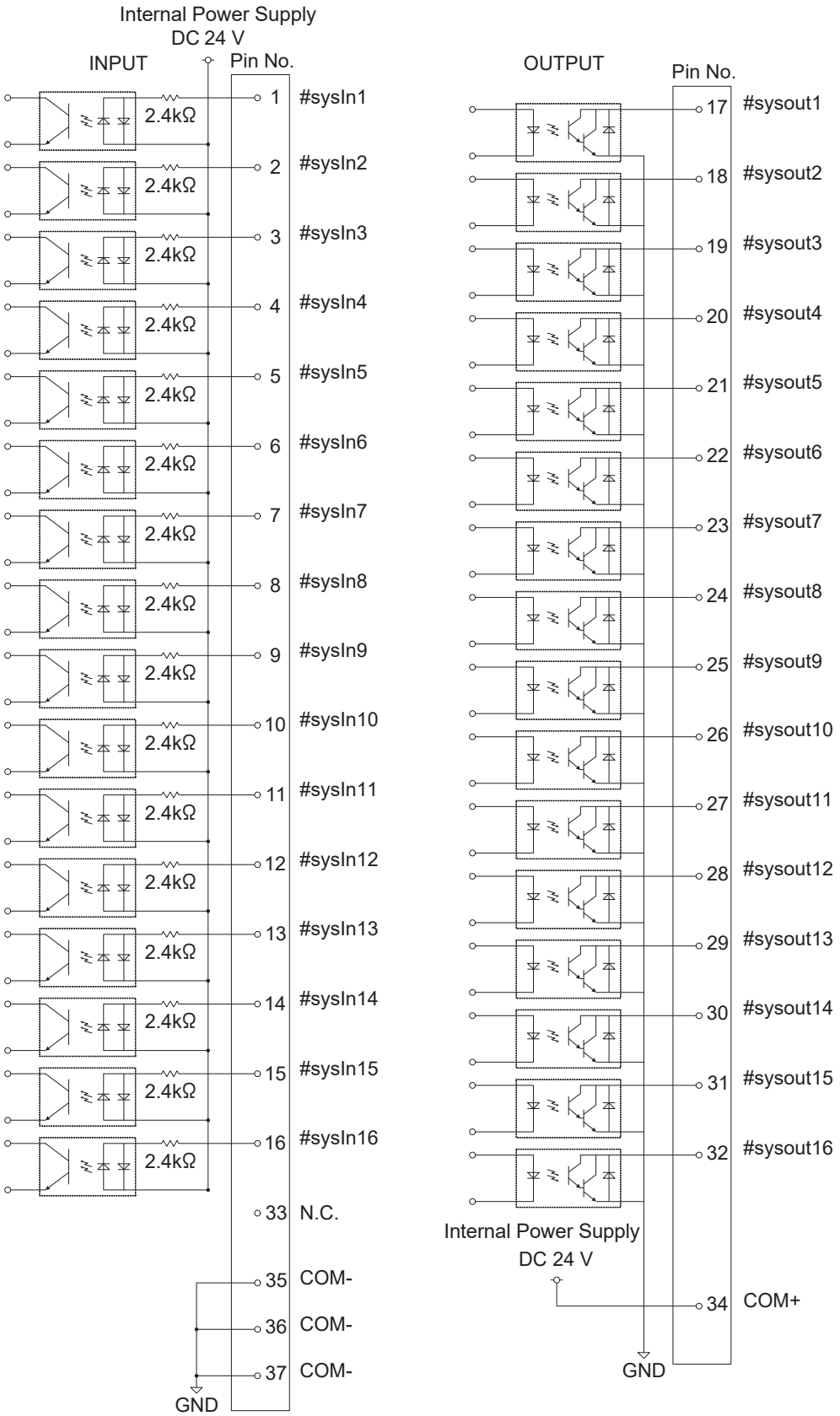
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

2.9 Circuit Diagram (NPN)

■ External Power Supply Specifications

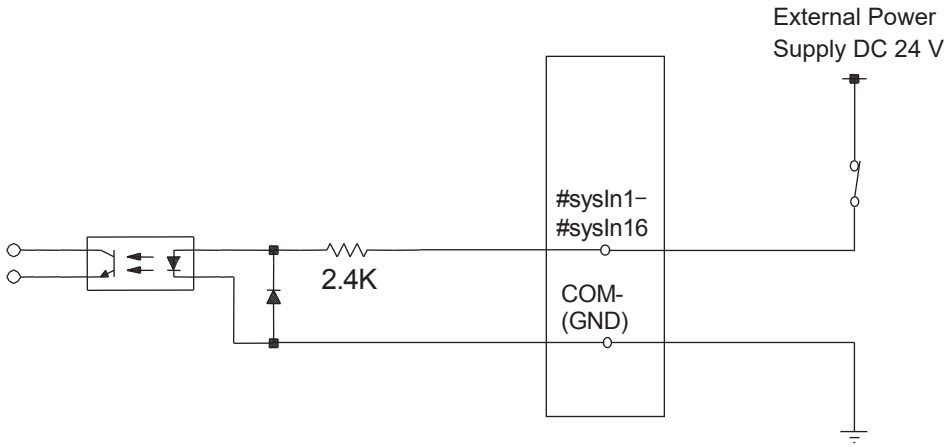


■ Internal Power Supply Specifications (optional)

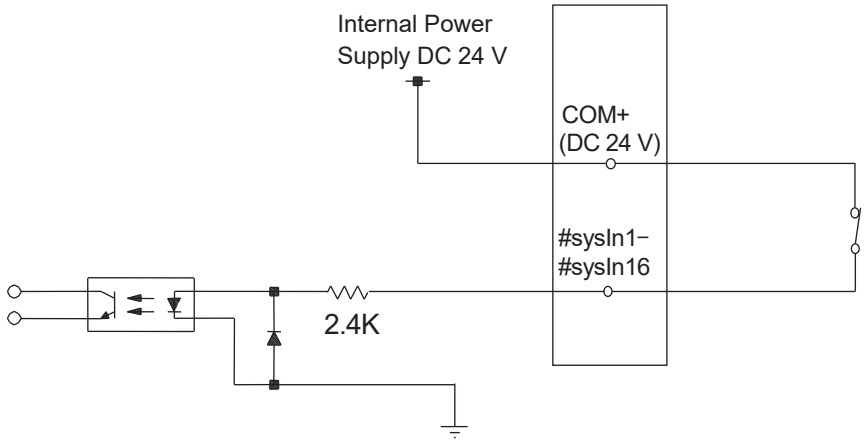


2.10 Input Signal (PNP)

■ When using an external power supply
Input signals are treated as active when the photocoupler is ON.
When using an external power supply, the input signals become active when the input pin and the external power supply are ON.



■ When using an internal power supply (optional)
Input signals are treated as active when the photocoupler is ON.
When using the internal power supply, the input signals become active when the input pin and COM+ pin are ON.



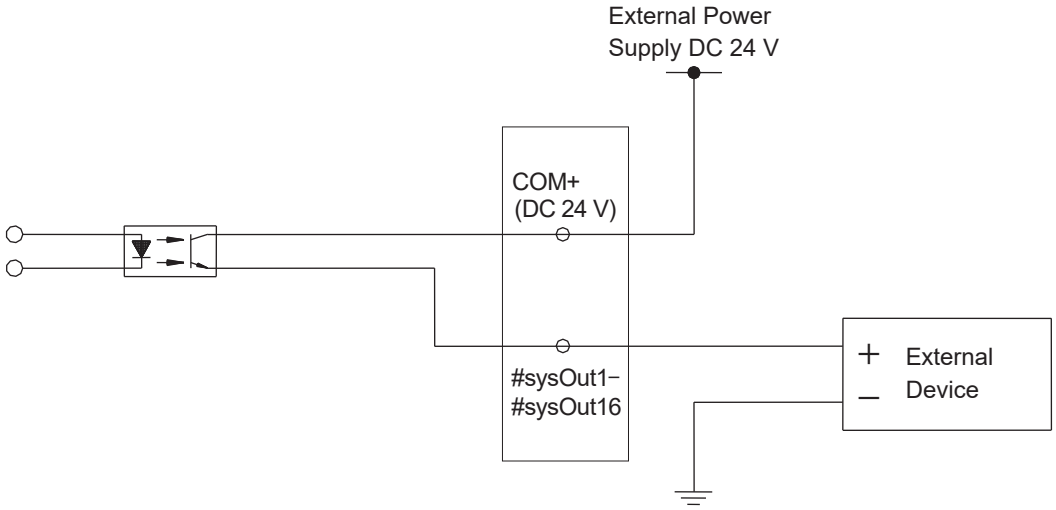
If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3 mA. If you use a device with a leakage current of more than 0.3 mA, it may not turn OFF.

⚠ Caution

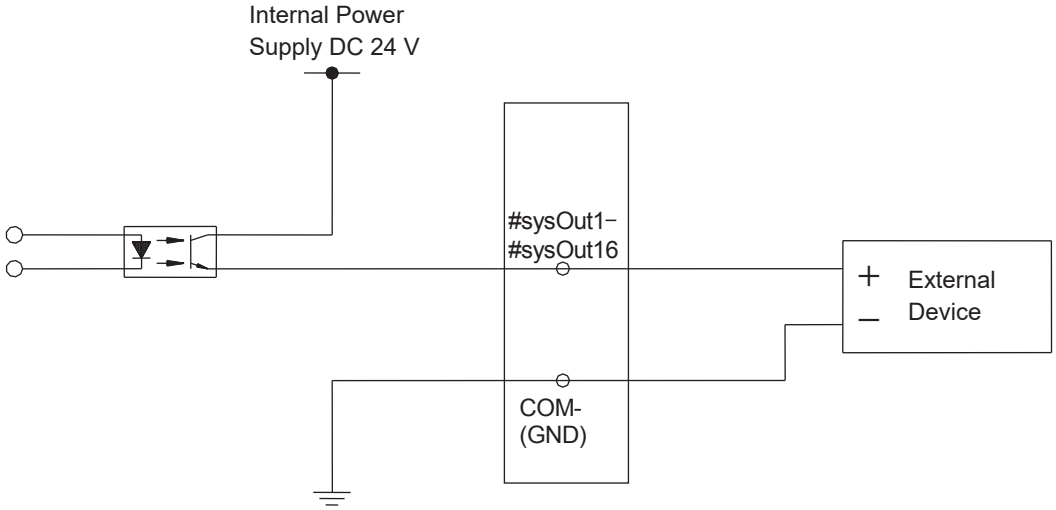
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

2.11 Output Signal (PNP)

■ When using an external power supply



■ When using an internal power supply (optional)

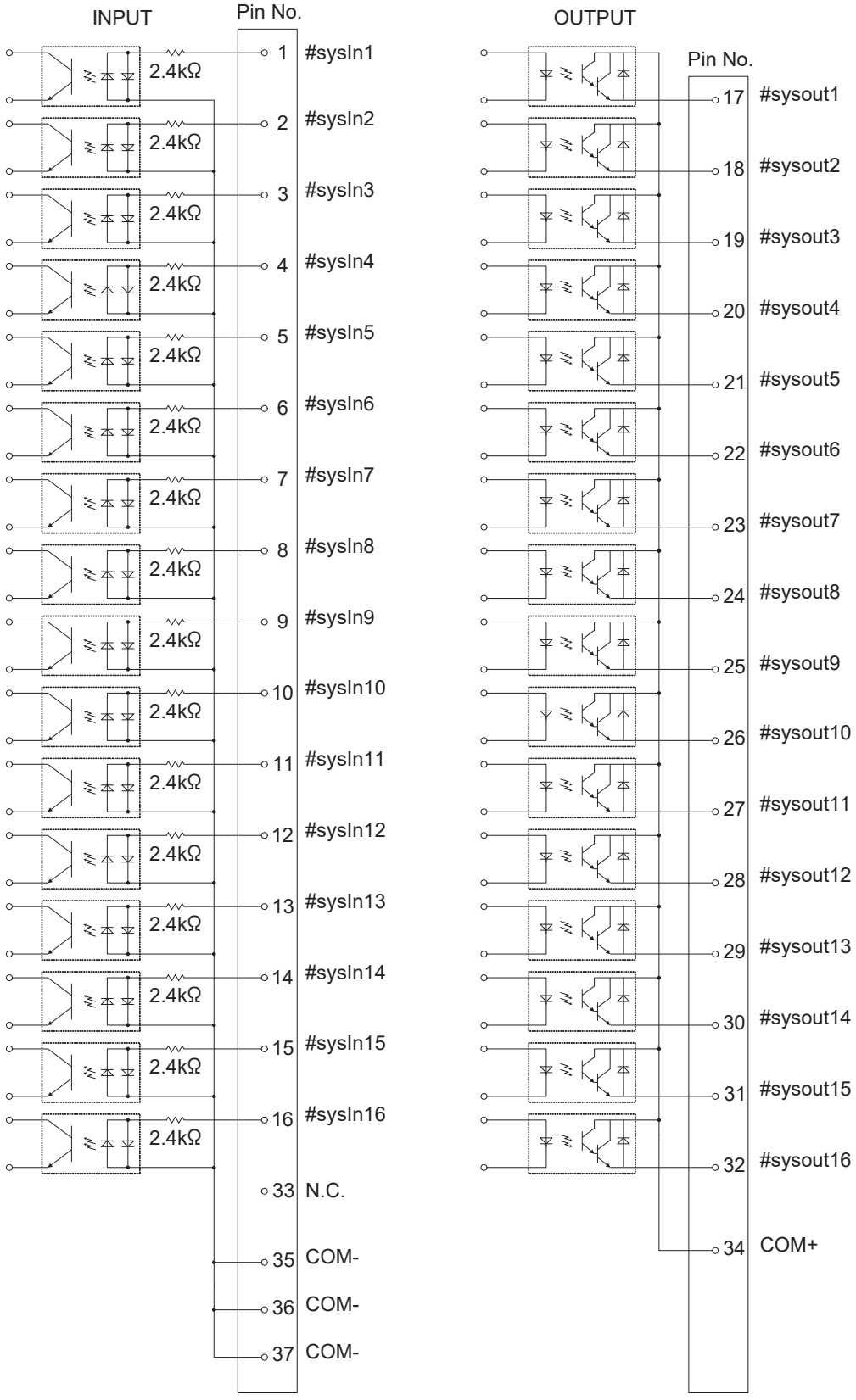


⚠ Caution

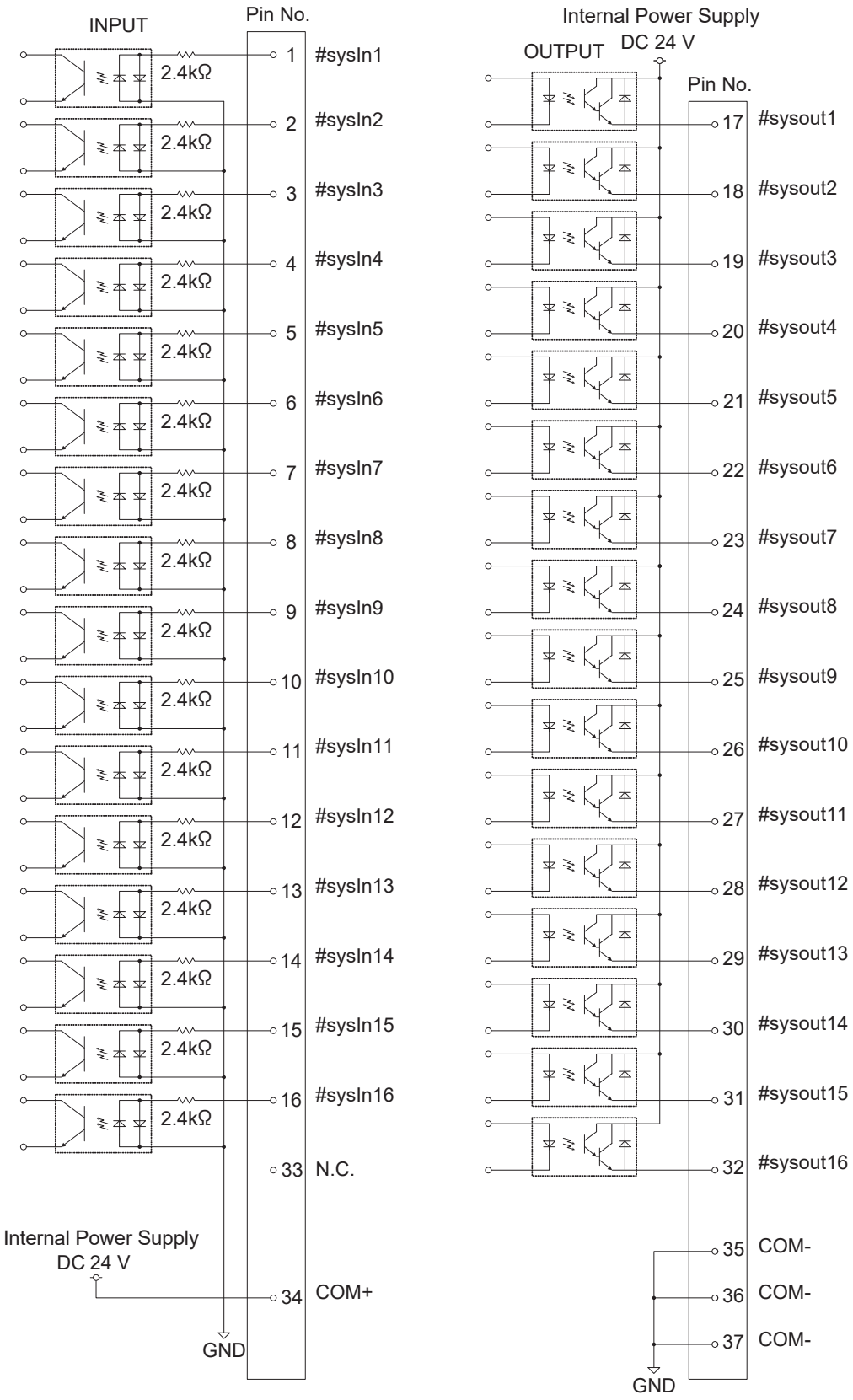
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

2.12 Circuit Diagram (PNP)

■ External Power Supply Specifications

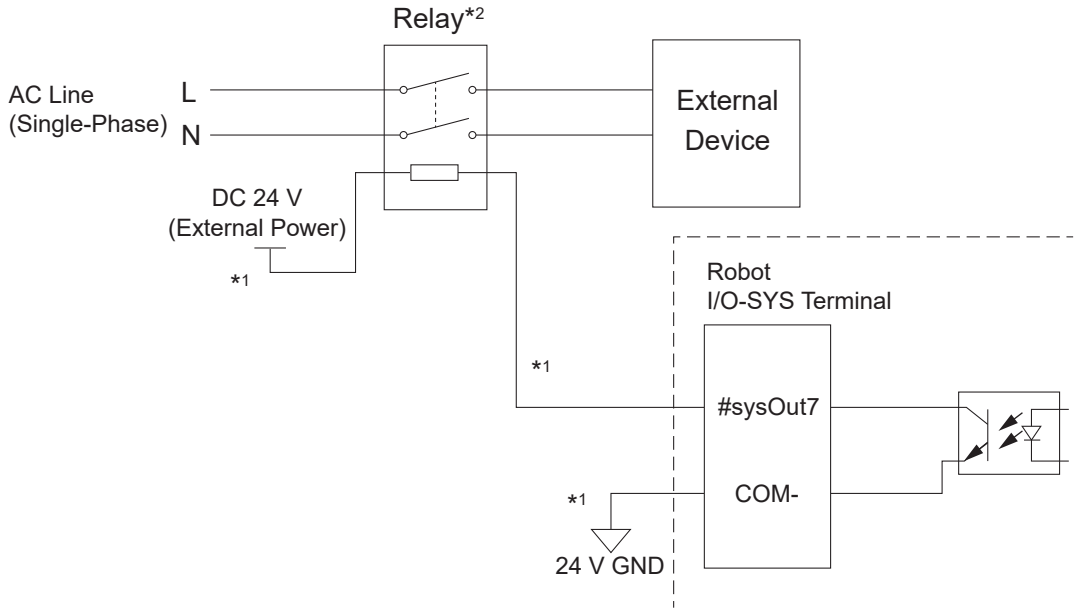


■ Internal Power Supply Specifications (optional)



2.13 AC Power Control of an External Device during an Emergency Stop

If the AC power supply to an external device for the tool attached to the robot is cut during an emergency stop (the emergency stop switch has been pressed, etc.), construct a relay (such as the one below) for the external device AC power supply input and connect the coil of this relay to the #sysOut7 (Emergency Stop Output) signal on the I/O-SYS terminal of the robot.



*1: The relay coil and I/O-SYS terminal connections are shown for a robot with an NPN external power supply type.
For all other power supply types, make the connections by referring to the following:

- NPN internal power supply type:
  "2.7 Input Signal (NPN)" – "2.9 Circuit Diagram (NPN)"
- PNP external power supply or PNP internal power supply types:
  "2.10 Input Signal (PNP)" – "2.12 Circuit Diagram (PNP)"

*2: Make sure to use a relay that adheres to the following:

- Coil voltage: DC 24 V
- Coil current: less than 100 mA

Relay Example: Force guided relay (Manufacturer: IDEC, Product No.: RF1V-2A2B-D24)
Coil voltage: DC 24 V
Coil current: 7.5 mA
Allowable contact voltage: AC 125 V, DC 125 V
Allowable contact current: 6 A

3. SYSTEM INPUT/OUTPUT FUNCTIONS

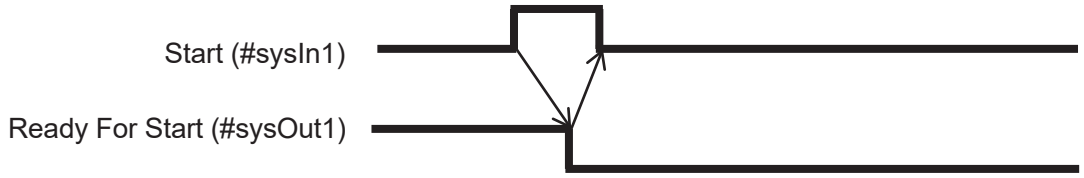
3.1 Input

- Start (#sysIn1)
  Turn ON this signal when you want to start or restart a program in External Run Mode. In addition, this signal is also used for moving to the work home position coordinates. This signal is enabled when Ready for Start (#sysOut1) is ON.

When in External Run Mode, the Start (#sysIn1) signal starts, or restarts running programs with the robot under any of the following conditions when the I/O-S input is ON and start is not inhibited by Start Inhibition (#sysIn2):

1. Waiting for program start at the work home position.
2. Waiting for restart after a temporary stop.
3. Waiting for start according to a point job *waitStart* command.

A Start (#sysIn1) signal with a pulse of 20 msec or less is invalid due to noise elimination.
A pulse width of 30 msec or wider is useable, however, rather than using time to establish the signal, we recommend using the action of the Ready for Start (#sysOut1) signal turning OFF as an acknowledgment signal (ACK signal). When waiting to start as described above, the Ready for Start Signal (#sysOut1) comes ON.
The Ready for Start (#sysOut1) turns OFF when the Start (#sysIn1) turns ON.



- Free (#sysIn2, #sysIn13 – 16)
  The default for the #sysIn2, #sysIn13 – 16 signals is Free.
  These signals are useable as free signals unless their functions are changed in [I/O-SYS Function Assignment].

- Start Inhibition (#sysIn2, #sysIn14)
  This signal becomes a function to inhibit starts when Start Inhibition (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal.
  “(A) Start Inhibition” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Start Inhibition” (#sysIn2, #sysIn14) works when it is OFF (negative logic). For example, starts are inhibited if “(A) Start Inhibition” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (when the robot is stopped). Even if you try to start the robot, it will not move. When the Robot Stopped (#sysOut2) signal is OFF (when the robot is moving), this signal is invalid.

- Stop-Start Inhibition (#sysIn2, #sysIn14)
  This signal becomes a function to temporarily stop operation or inhibit start when Stop/Start Inhibition (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment]. You can select either type A or type B for this signal. “(A) Stop - Start Inhibition” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Stop - Start Inhibition” (#sysIn2, #sysIn14) works when it is OFF (negative logic). For example, start is inhibited if “(A) Stop - Start Inhibition” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move. If you turn this signal ON when the Robot Stopped (#sysOut2) signal is OFF (when the robot is moving), the robot completes its current PTP movement and then holds. To restart, input a start signal after turning OFF this signal.

- Software Interlock (#sysIn2, #sysIn14)
  If Software Interlock (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment], this becomes a function to inhibit starts and make urgent stops during operation. You can select either type A or type B for this signal. “(A) Software Interlock” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Software Interlock” (#sysIn2, #sysIn14) works when it is OFF (negative logic).
  For example, starts are inhibited if “(A) Software Interlock” (#sysIn2) is ON and the Robot Stopped (#sysOut2) signal is ON (the robot is stopped). Even if you try to start the robot, it will not move.
  If this signal is turned ON when the Robot Stopped (#sysOut2) signal is OFF (the robot is moving), the robot makes an urgent stop.

- Urgent Stop (#sysIn2, #sysIn14)
  When Urgent Stop (#sysIn2, #sysIn14) is set in [I/O-SYS Function Assignment], this becomes a function for making urgent stops. You can select either type A or type B for this signal. “(A) Urgent Stop” (#sysIn2, #sysIn14) works when it is ON (positive logic), and “(B) Urgent Stop” (#sysIn2, #sysIn14) works when it is OFF (negative logic).
  For example, the robot makes an urgent stop if “(A) Urgent Stop” (#sysIn13) is ON in Run Mode.

- Program Number Load (#sysIn3)
  This signal directs the loading of program numbers. When this signal comes ON, Program Number (#sysIn 4 – 10) is loaded. This function is enabled when [Administration Settings Mode] → [Program Number Change] → [I/O-SYS] is set to [Valid] and the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake].

NOTE: The program number specification method slightly varies with I/O-SYS and Fieldbus.

- Program Number 1 – 64 (#sysIn4 – #sysIn10) (I/O-SYS)
  You can specify program numbers by turning ON this signal.
  Example: If you want to specify program number [67]:
  67 = 64 (#sysIn10) +2 (#sysIn5) + 1 (#sysIn4) = Turn ON signals #sysIn10, #sysIn5 and #sysIn4.
  This function is valid if [I/O-SYS] is set to [Valid] in [Change Program Number] in [Administration Settings Mode]. If the Teaching Mode menu [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)], start the program after specifying the program number with this signal.
  If [Program Number Reading Format] is set to [Binary Code], specify the program number in binary code to this register.
  If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the program number in BCD to this register. For further information refer to “8.2.2 Program Number Reading Format” in the operation manual *Setup*.

NOTE: Refer to the signal below (Program Number (word) (#fbIn101) (Fieldbus) for how to specify Fieldbus program numbers.

- Program Number (word) (#fbIn101) (Fieldbus)
  You can specify program numbers in this word register.
  This is valid if [Fieldbus] is set to [Valid] in [Change Program Number] in [Administration Settings Mode].
  If [Program Number Switching Method] is set to [Load at Start (Fieldbus)], start the program after specifying the program number to this register.
  If [Program Number Reading Format] is set to [Binary Code], specify the binary code's program number to this register.
  If [Program Number Reading Format] is set to [BCD (Binary Coded Decimal)], specify the BCD code's program number to this register.

- Last Work (#sysIn11)
  When the Teaching Mode menu [Individual Program Settings] → [Cycle Mode] is set to [Continuous Playback], after finishing the last point, the robot moves to point 01 and repeats the operation. To end this function, end the program using a point job or turn this Last Work (#sysIn11) signal ON. This function is only valid at the moment when the last point is finished (before moving). You cannot use this signal to terminate a program mid operation.

- Error Reset (sysIn11, #sysIn15)
  If an error occurs when the robot is making a run, turn this signal ON to do an error reset. The program (run) is then terminated on the spot. In addition, the Error (sysOut6) signal turns OFF when this signal is turned ON, so you can use the Error (#sysOut6) signal as an ACK signal for this signal. Another way to use this signal is when the robot is temporarily stopped or the Ready for Start (#sysOut1) signal is output and the robot is waiting to start, you can turn ON this signal to reset the program's execution and terminate the program on the spot.
  Program termination via this signal is enabled in the following situations:

  (1) The robot is stopped due to an error during a run.
  (2) The robot has stopped due to a temporary stop and is awaiting a restart.
  (3) The robot is awaiting restart from a point job *waitStart* command.

- Initialize (#sysIn11)
  Turn this signal ON to mechanically initialize when the robot is in External Run Mode and waiting to run or temporarily stopped. If this signal is input when the robot is temporarily stopped, the robot mechanically initializes, performs the Job on Starting, and then ends the program.

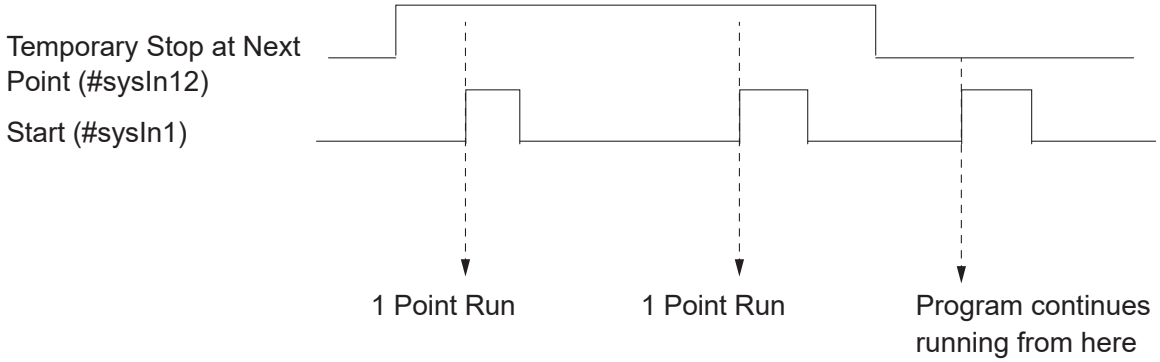
  For details regarding the execution of Run Mode jobs during mechanical initialization for each of the Run Modes, refer to "2.2.1 Run Mode Jobs" in the operation manual *Functions III*.

- Program Number 128 (#sysIn11)
  When ON, this signal enables you to specify program number 128 and higher.

- Temporary Stop (#sysIn12, #sysIn16)
  You can temporarily stop programs that are running by turning this signal ON. However, you cannot stop a CP movement while it is running. You can only temporarily stop at PTP points. Also, when this signal is ON, start is inhibited.

- Temporary Stop at Next Point (#sysIn12)
  When running a program in External Run Mode, you can temporarily stop at the subsequent point by turning this signal ON. However, you cannot stop a CP movement while it is running. You can only stop at PTP points.

  If you turn ON the Start (#sysIn1) signal while the Temporary Stop at Next Point (#sysIn12) signal is ON, 1 point is run.



- Program Number 256 (#sysIn12)
  When ON, this signal enables you to specify program number 256 and higher.

- Program Number 512 (#sysIn13)
  When ON, this signal enables you to specify program number 512 and higher.

3.2 Output

- Ready for Start (#sysOut1)
  When the robot is ready to start, this signal comes ON.
  This occurs in the following situations:

  (1) Mechanical initialization standby when the power is turned ON.
  (2) Mechanical initialization standby after an emergency stop and emergency stop cancellation.
  (3) Waiting for program start at the work home position.
  (4) Waiting for restart after a temporary stop.
  (5) Waiting for start due to a point job *waitStart* command.

  If the Running (#sysOut5) signal is OFF, the robot is under conditions 1, 2 or 3.

  Also, when the Ready for Start (#sysOut1) signal is ON, the Robot Stopped (#sysOut2) signal is always also ON. However, this is not so for the reverse. If the robot is stopped because it is waiting for a signal, then the Robot Stopped (#sysOut2) signal is ON, but the Ready for Start (#sysOut1) signal will not come ON.

- Robot Stopped (#sysOut2)
  When the robot is stopped, this signal is ON, when the robot is moving, it is OFF. If you turn the “(A) Software Interlock” (#sysIn2, #sysIn14) signal ON when this signal is ON (the robot is stopped), start is inhibited. Even if you try to start the robot, it will not move.
  If you turn the “(A) Software Interlock” (#sysIn2, #sysIn14) signal ON when this signal is OFF (the robot is moving), it will make an urgent stop.

- Program Number ACK (#sysOut3)
  This is a response signal for Program Number Load (#sysIn3). When you turn Program Number Load (#sysIn3) ON, this signal comes ON after Program Number (#sysIn4 to #sysIn10) is loaded. If Program Number Load (#sysIn3) goes OFF, this signal also goes OFF.

- Program Number Error (#sysOut4)
  This signal comes ON when you specify an unregistered program number in Switch Run/ External Run Mode.

- Running (#sysOut5)
  When you start to run a program this signal comes ON. When the program finishes it goes OFF.

- Error (#sysOut6)
  This signal comes ON when an error occurs.

- Emergency Stop (#sysOut7)
  This signal comes ON when an “Emergency Stop Error” occurs (the emergency stop switch is pressed, etc.). When this signal is ON, the Error (#sysOut6) signal comes ON at the same time.

- Position Error (#sysOut8)
  If the Teaching Mode menu [All Program Common Settings] → [Other Parameters] → [Position Error Check] is set to [Valid], the position sensor will check for position errors just before the robot finishes running (before returning to the work home position.) This signal comes ON if a position error is detected.

- Free (#sysOut9 – 16)
  The default status for the #sysOut9 – 16 signals is Free.
  These signals are useable as free signals unless their functions are changed in [I/O-SYS Function Assignment].

- Finish Initialize (#sysOut12)
  This signal comes ON when the mechanical initialization is complete. This is always ON except at times when a mechanical initialization is required, such as an emergency stop, etc.

■ Others
  - COM+ (DC 24 V)
    If I/O-SYS is using an external power supply, connect the COM+ pin to the plus pole of the external power supply (DC 24 V).
    If I/O-SYS is using the internal power supply, DC 24 V (+) is output.

  - COM- (GND)
    If I/O-SYS is using an external power supply, connect the COM- pin to the external power supply ground.
    If I/O-SYS is using the internal power supply, use the pin as a common ground.

⚠ Caution

When I/O-SYS is using the internal power supply, do not connect the robot to an external power supply. Doing so causes unit breakdown.

3.3 System Function Assignment Signal Conversion Table

	I/O-SYS	Fieldbus	
		DeviceNet, PROFIBUS, CANopen, PROFINET, EtherNet/IP	CC-Link
Input	#sysIn1	#fbIn1000	#fbIn1400
	#sysIn2	#fbIn1001	#fbIn1401
	#sysIn3	#fbIn1002	#fbIn1402
	#sysIn4	#fbIn1003	#fbIn1403
	#sysIn5	#fbIn1004	#fbIn1404
	#sysIn6	#fbIn1005	#fbIn1405
	#sysIn7	#fbIn1006	#fbIn1406
	#sysIn8	#fbIn1007	#fbIn1407
	#sysIn9	#fbIn1008	#fbIn1408
	#sysIn10	#fbIn1009	#fbIn1409
	#sysIn11	#fbIn100A	#fbIn140A
	#sysIn12	#fbIn100B	#fbIn140B
	#sysIn13	#fbIn100C	#fbIn140C
	#sysIn14	#fbIn100D	#fbIn140D
	#sysIn15	#fbIn100E	#fbIn140E
	#sysIn16	#fbIn100F	#fbIn140F
	- *	#fbIn101	#fbIn101
Output	#sysOut1	#fbOut1800	#fbOut1C00
	#sysOut2	#fbOut1801	#fbOut1C01
	#sysOut3	#fbOut1802	#fbOut1C02
	#sysOut4	#fbOut1803	#fbOut1C03
	#sysOut5	#fbOut1804	#fbOut1C04
	#sysOut6	#fbOut1805	#fbOut1C05
	#sysOut7	#fbOut1806	#fbOut1C06
	#sysOut8	#fbOut1807	#fbOut1C07
	#sysOut9	#fbOut1808	#fbOut1C08
	#sysOut10	#fbOut1809	#fbOut1C09
	#sysOut11	#fbOut180A	#fbOut1C0A
	#sysOut12	#fbOut180B	#fbOut1C0B
	#sysOut13	#fbOut180C	#fbOut1C0C
	#sysOut14	#fbOut180D	#fbOut1C0D
	#sysOut15	#fbOut180E	#fbOut1C0E
	#sysOut16	#fbOut180F	#fbOut1C0F

* If specifying program numbers or using Fieldbus.

4. I/O-SYS FUNCTION ASSIGNMENT

The following functions are assigned to I/O-SYS in advance:

	Name		Function	Pin No.
Input	Ext	#sysIn1	Start/Free	1
		#sysIn2	Free/(B) Start Inhibition/(B) Stop-Start Inhibition/ (B) Software Interlock/(B) Urgent Stop/(A) Start Inhibition/ (A) Stop-Start Inhibition/(A) Software Interlock/(A) Urgent Stop	2
		#sysIn3	Program Number Load/Free	3
		#sysIn4	Program Number 1/Free	4
		#sysIn5	Program Number 2/Free	5
		#sysIn6	Program Number 4/Free	6
		#sysIn7	Program Number 8/Free	7
		#sysIn8	Program Number 16/Free	8
		#sysIn9	Program Number 32/Free	9
		#sysIn10	Program Number 64/Free	10
		#sysIn11	Last Work/Program Number 128/Error Reset/Initialize/Free	11
		#sysIn12	Temporary Stop/Temporary Stop - Single Point Run/ Program Number 256/ Free	12
		#sysIn13	Free/Program Number 512	13
		#sysIn14	Free/(A) Start Inhibition/(A) Stop-Start Inhibition/ (A) Software Interlock/(A) Urgent Stop/(B) Start Inhibition/(B) Stop-Start Inhibition/(B) Software Interlock/(B) Urgent Stop	14
		#sysIn15	Free/Last Work/Error Reset	15
		#sysIn16	Free/Temporary Stop	16

		Name	Function	Pin No.
Output		#sysOut1	Ready for Start/Free	17
		#sysOut2	Robot Stopped/Free	18
		#sysOut3	Program Number ACK/Free	19
		#sysOut4	Program Number Error/Free	20
		#sysOut5	Running/Free	21
		#sysOut6	Error/Free	22
		#sysOut7	Emergency Stop/Free	23
		#sysOut8	Position Error/Free	24
		#sysOut9	Free	25
		#sysOut10	Free	26
		#sysOut11	Free	27
		#sysOut12	Free/Finish Initialize	28
		#sysOut13	Free	29
		#sysOut14	Free	30
		#sysOut15	Free	31
		#sysOut16	Free	32
		N.C.	Not in use	33
Other		COM +	DC 24 V	34
		COM -	GND	35
		COM -	GND	36
		COM -	GND	37

Ext: Functions only in External Run Mode.

A type signals use positive logic and B type signals use negative logic.

5. FIELDBUS FUNCTION ASSIGNMENT

The following input/output functions are assigned to Fieldbus in advance:

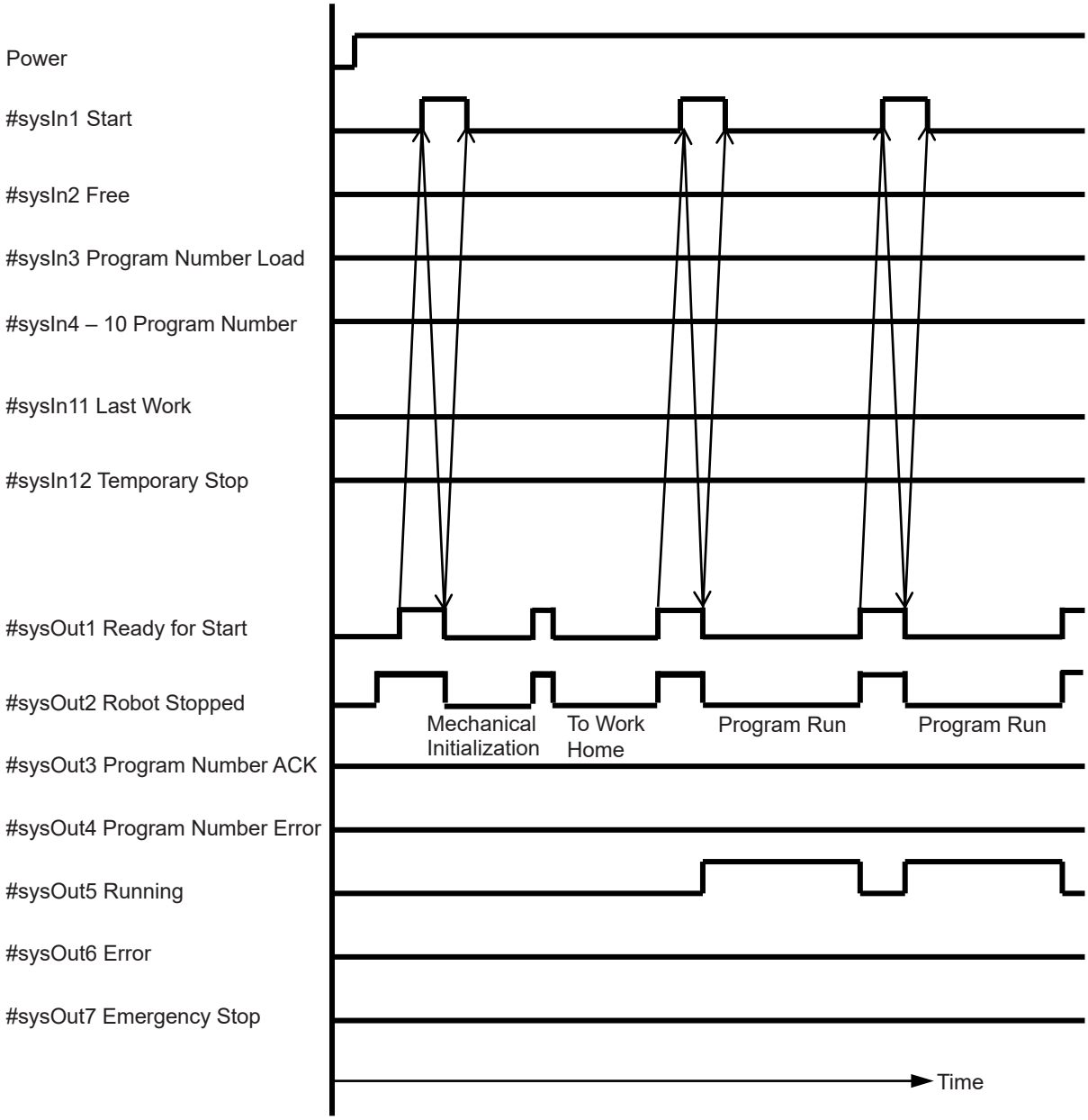
	Name		Relay Number	Function
Input	Ext	fbIn1000	1000	Start/Free
		fbIn1001	1001	Free/Start Inhibition/Stop-Start Inhibition/Software Interlock/ Urgent Stop
		fbIn1002	1002	Program Number Load/Free
		fbIn1003	1003	Free
		fbIn1004	1004	Free
		fbIn1005	1005	Free
		fbIn1006	1006	Free
		fbIn1007	1007	Free
		fbIn1008	1008	Free
		fbIn1009	1009	Free
		fbIn100A	100A	Last Work/Error Reset/Initialize/Free
		fbIn100B	100B	Temporary Stop/Temporary Stop - Single Point Run/Free
		fbIn100C	100C	Free
		fbIn100D	100D	Free/Start Inhibition/Stop-Start Inhibition/Software Interlock/ Urgent Stop
		fbIn100E	100E	Free
		fbIn100F	100F	Free
		fbIn101	1010-101F	Program Number (word)/Free
Output		fbOut1800	1800	Ready For Start/Free
		fbOut1801	1801	Robot Stopped/Free
		fbOut1802	1802	Program Number ACK/Free
		fbOut1803	1803	Program Number Error/Free
		fbOut1804	1804	Running/Free
		fbOut1805	1805	Error/Free
		fbOut1806	1806	Emergency Stop/Free
		fbOut1807	1807	Position Error/Free
		fbOut1808	1808	Free
		fbOut1809	1809	Free
		fbOut180A	180A	Free
		fbOut180B	180B	Free/Finish Initialize
		fbOut180C	180C	Free
		fbOut180D	180D	Free
		fbOut180E	180E	Free
		fbOut180F	180F	Free

Ext: Functions only in External Run Mode.

6. SYSTEM INPUT/OUTPUT SIGNAL TIMING CHARTS

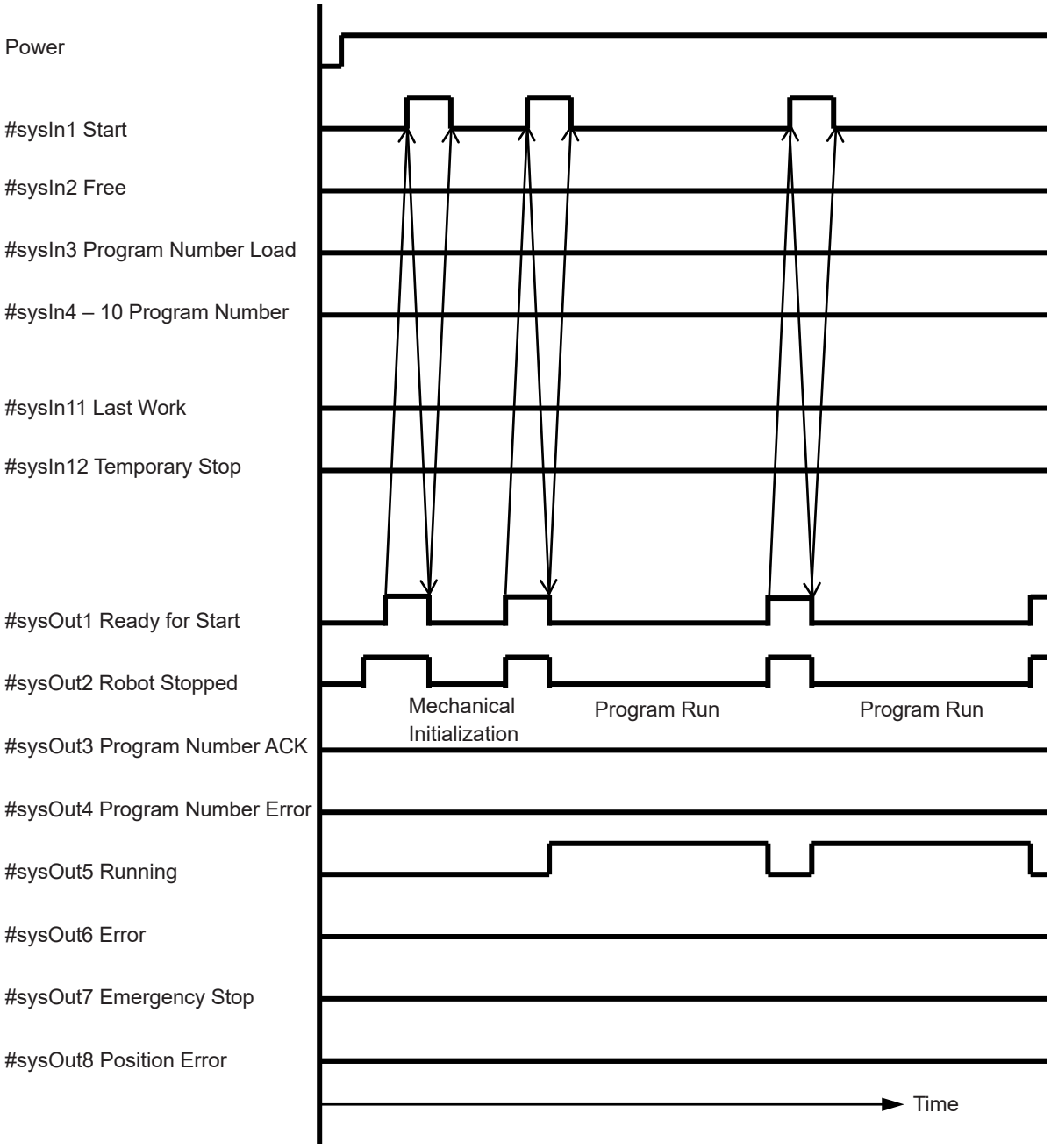
6.1 Power ON, Mechanical Initialization, Go to Work Home and Run Program

This chart shows when [All Program Common Settings] → [Other Parameters] → [Initialize] is set to [Work Home After Initialize]. These are default values.



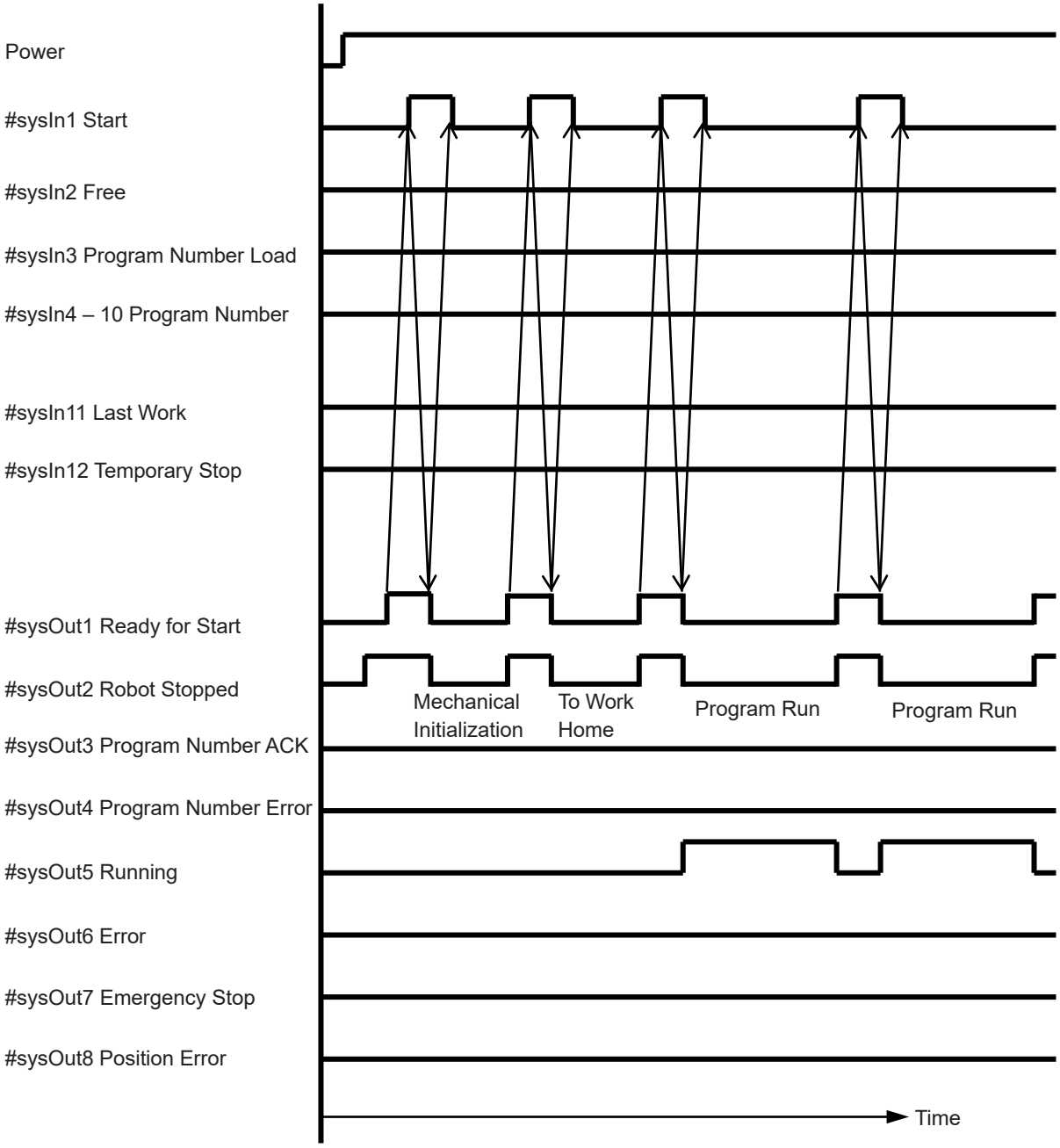
6.2 Power ON, Mechanical Initialization and Run Program

This chart shows when [All Program Common Settings] → [Other Parameters] → [Initialize] is set to [Work Home after First Cycle].



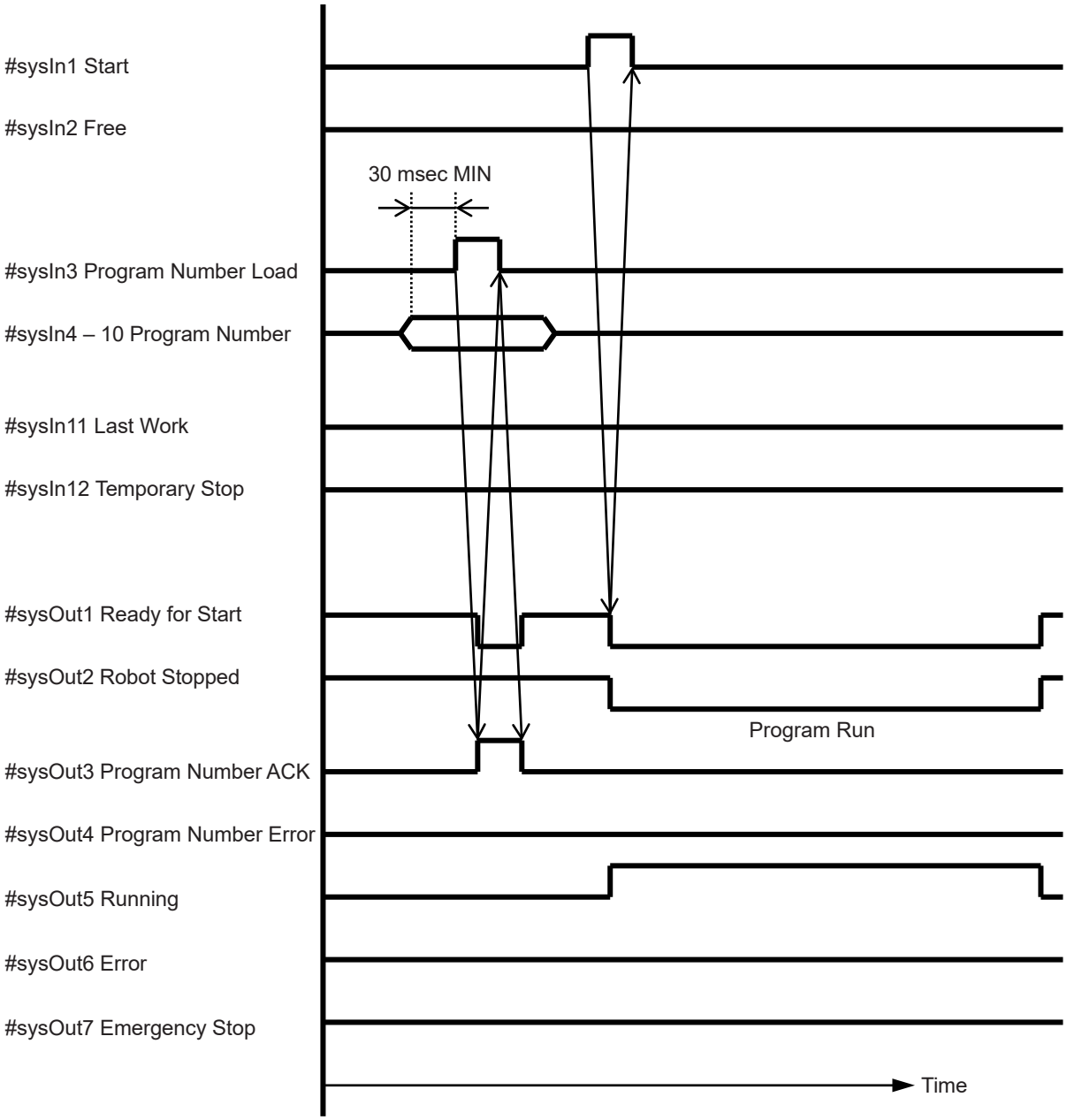
6.3 Power ON, Mechanical Initialization, Go to Work Home and Run Program

This chart shows when [All Program Common Settings] → [Other Parameters] → [Initialize] is set to [Work Home on Start].



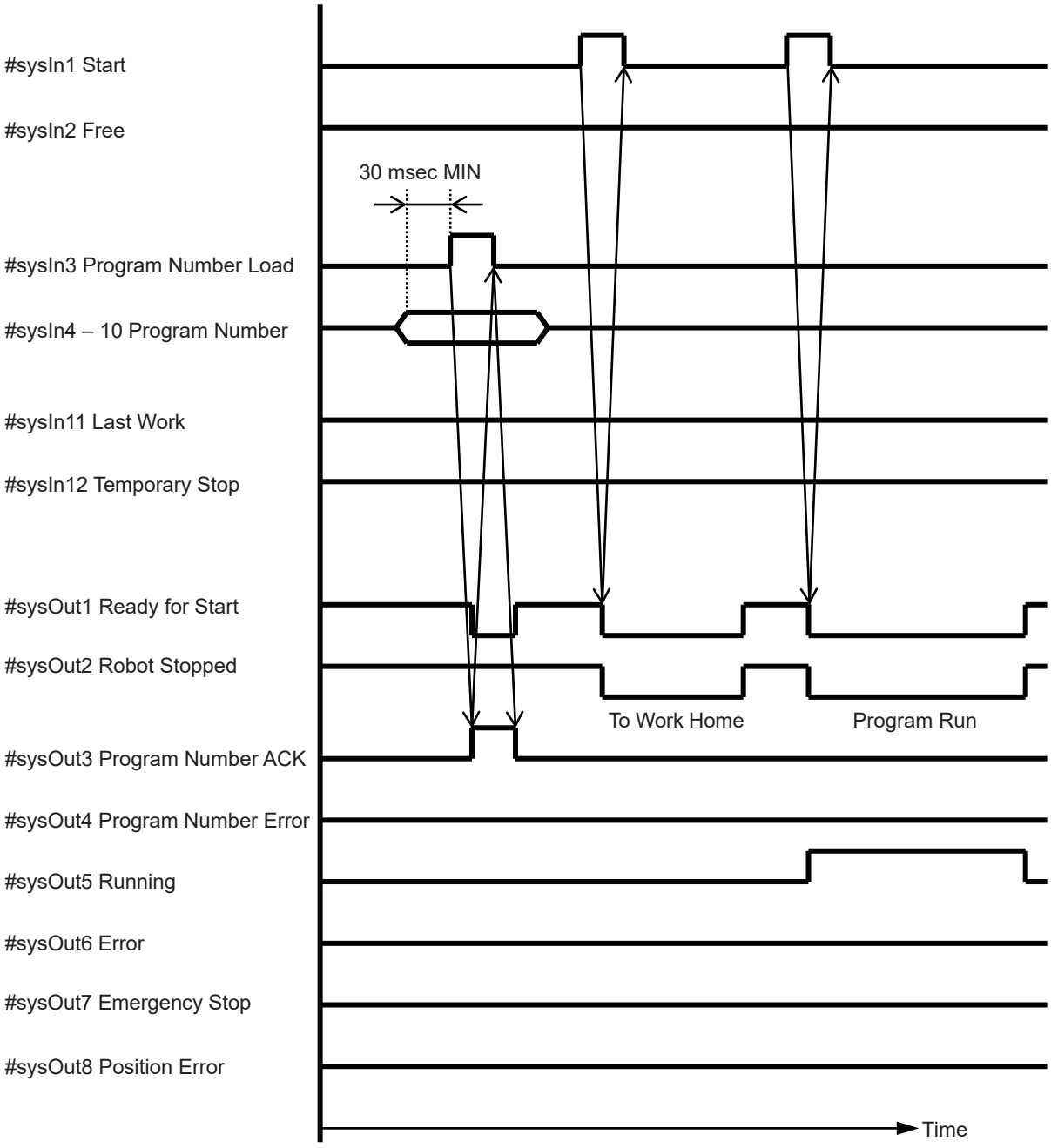
6.4 Change Program Number and Run Program via Program Number Load

This chart shows when [Administrative Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid] and [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake]; and when [All Program Common Settings] → [Other Parameters] → [Initialize] is set to [Work Home after First Cycle] or to [Work Home after Initialize].



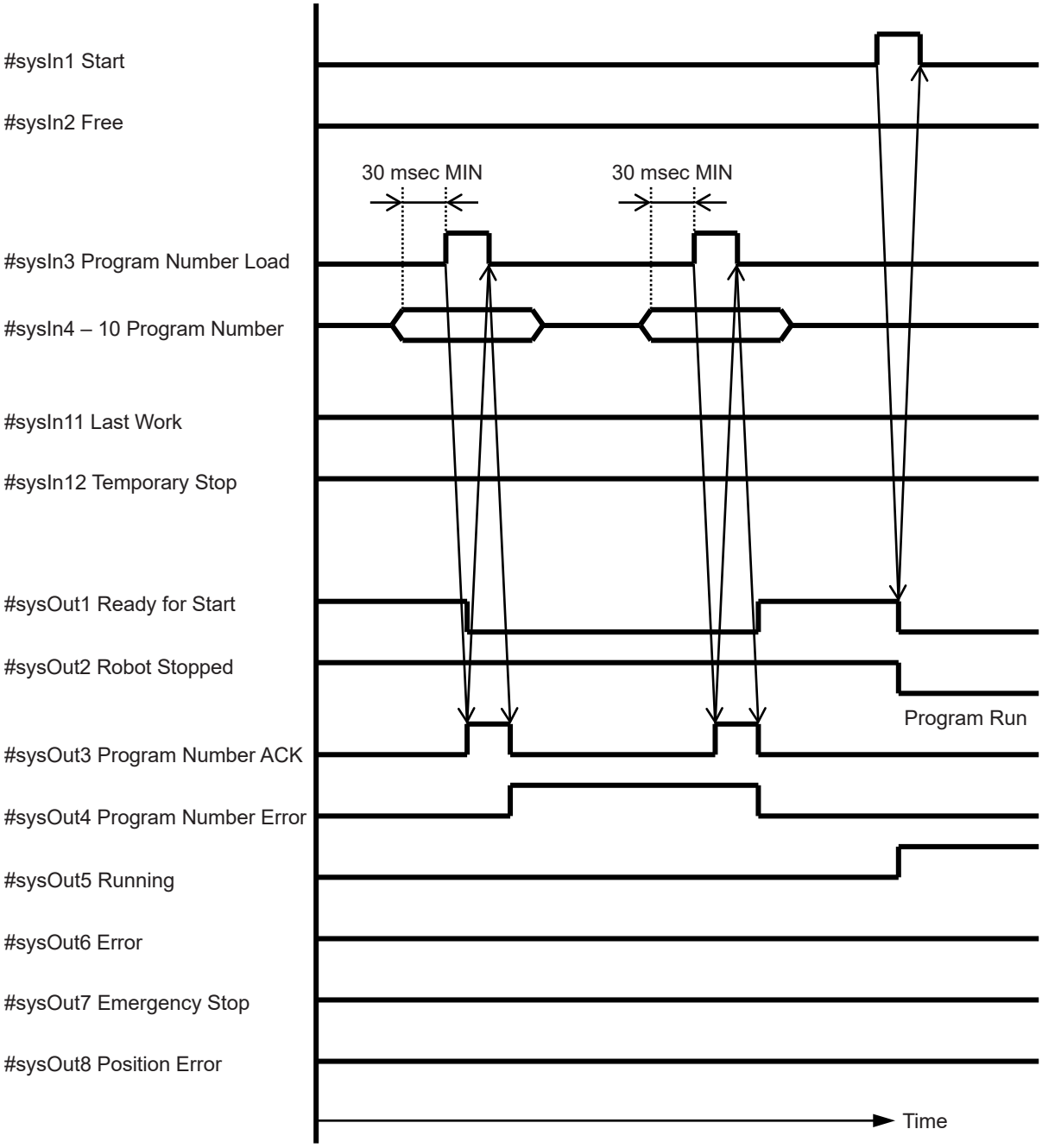
6.5 Change Program Number, Run Program and Go to Work Home via Program Number Load

This chart shows when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid], and [All Program Common Settings] → [I/O Setting] → [Program Number Switching Method] is set to [LOAD/ACK Handshake]; and when [All Program Common Settings] → [Initialize] is set to [Work Home on Start].



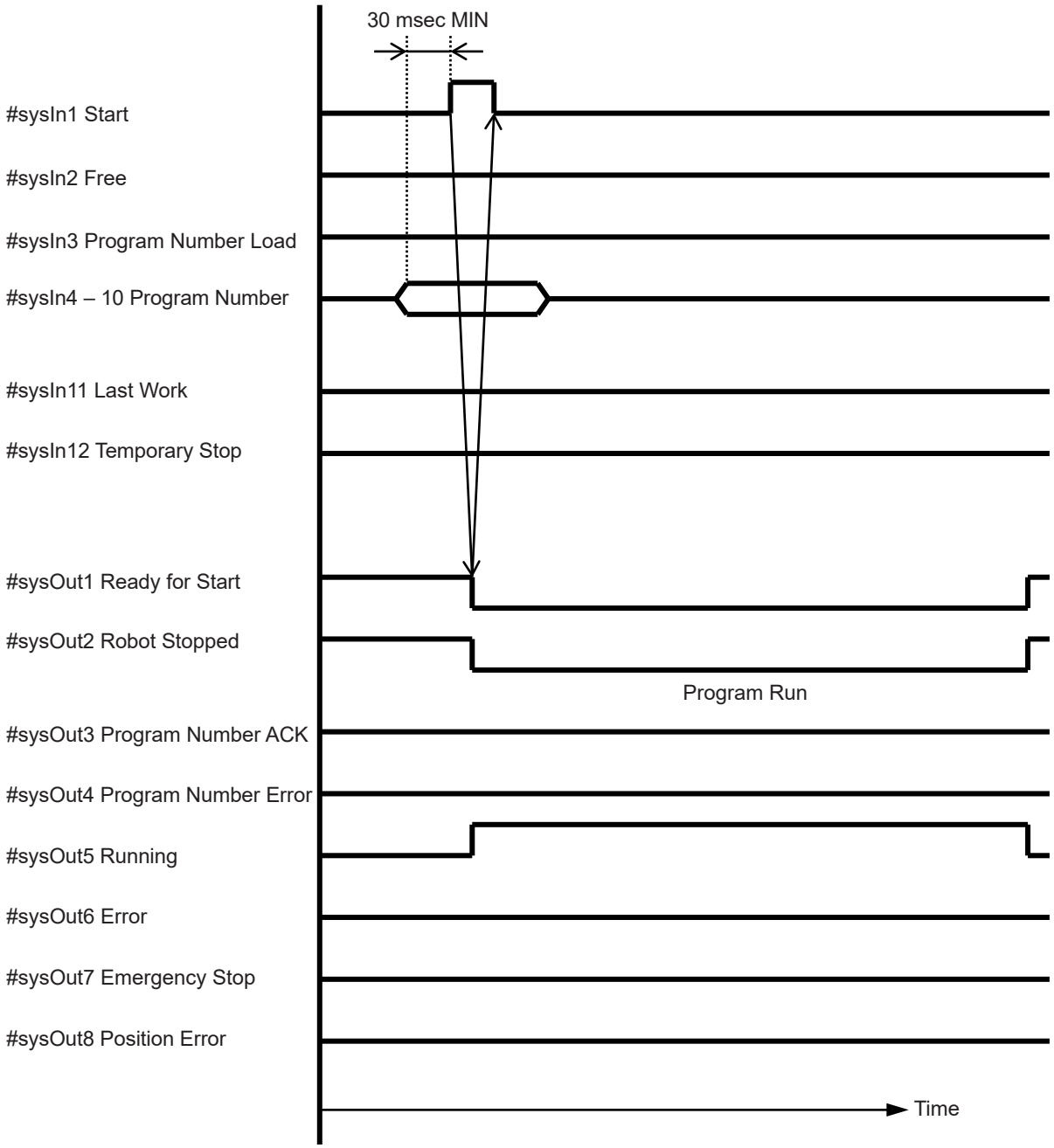
6.6 Change Program Number and Program Number Error via Program Number Load

The chart shows when [Administration Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid], and [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [LOAD/ACK Handshake], and when there is no program registered to the loaded number.



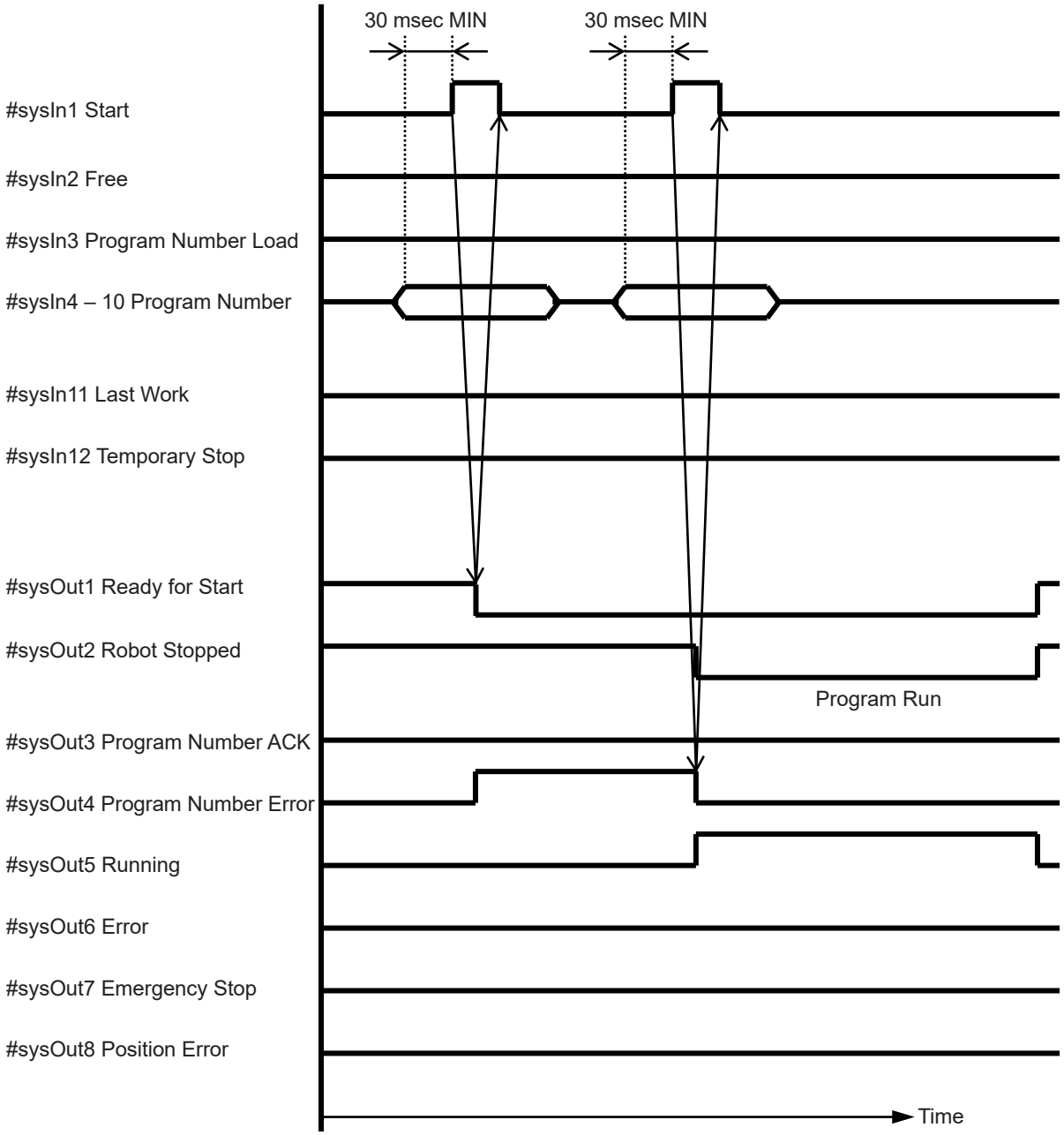
6.7 Change Program Number and Run Program via Load at Start

This chart shows when [Administrative Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid], and [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)].



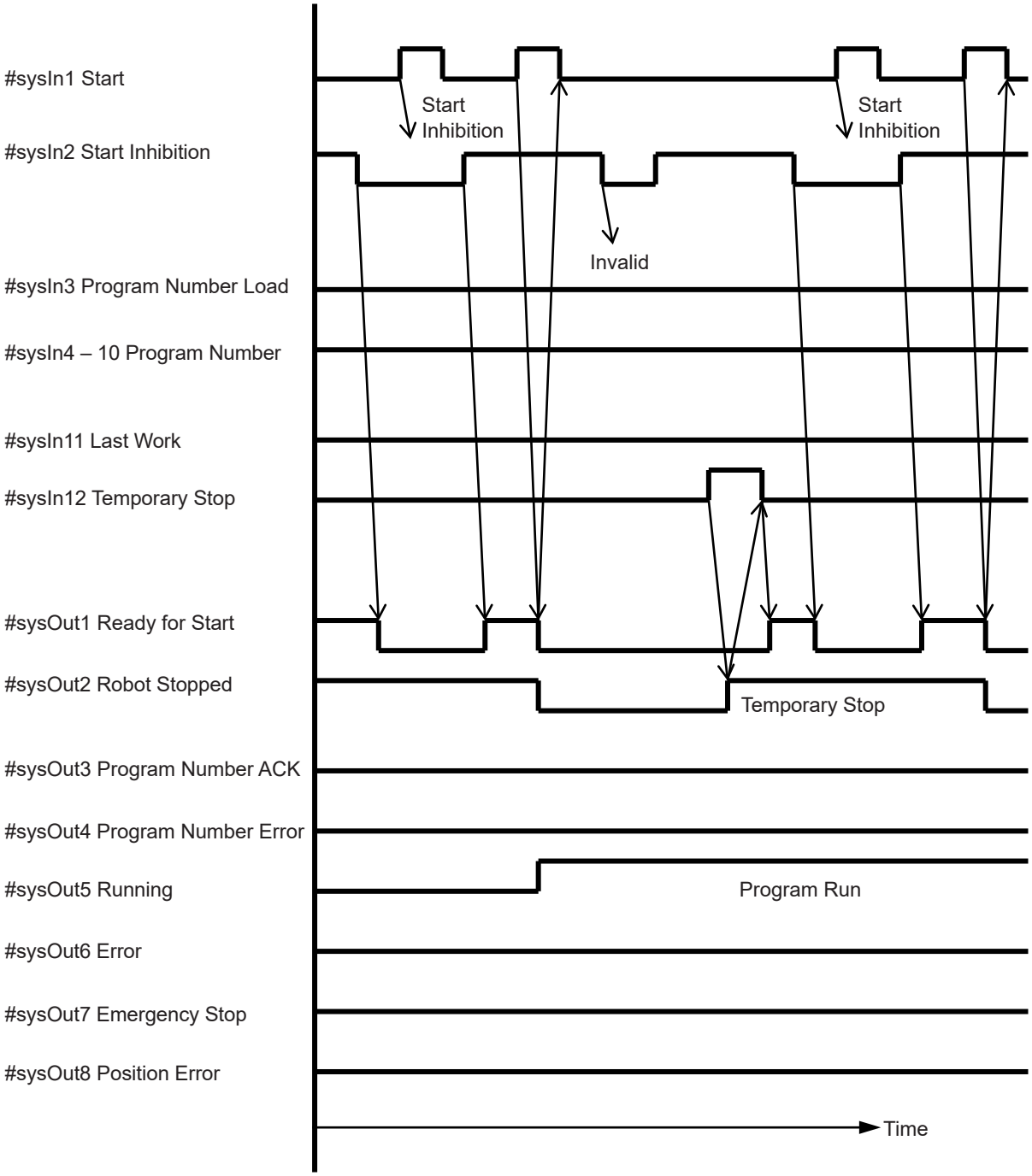
6.8 Program Number Error and Changing Program Numbers via Load at Start

This chart shows when [Administrative Settings Mode] → [Change Program Number] → [I/O-SYS] is set to [Valid], and when [All Program Common Settings] → [I/O Settings] → [Program Number Switching Method] is set to [Load at Start (I/O-SYS)]. When loaded number has no program, a program number error will occur.



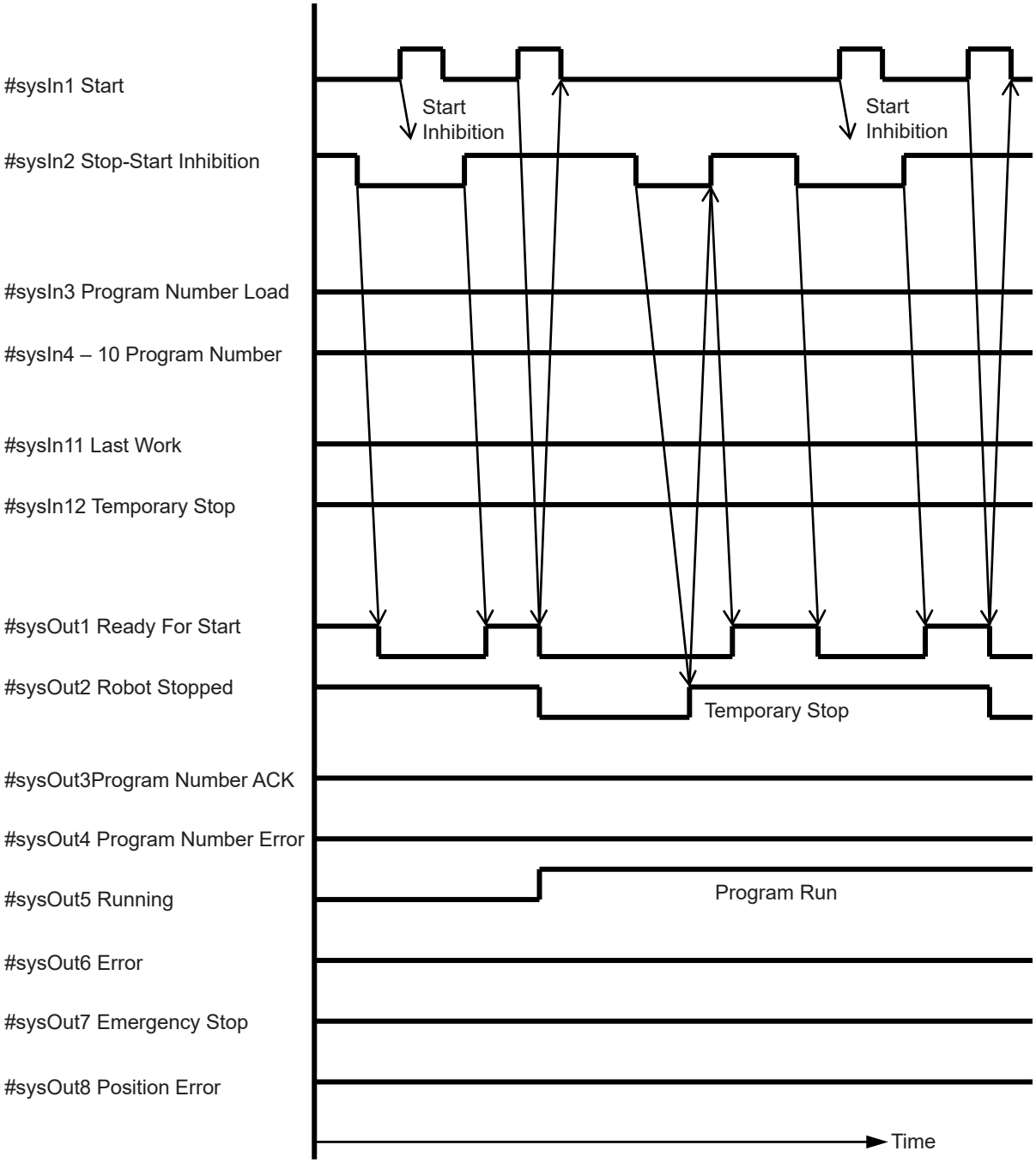
6.9 #sysIn2, #sysIn14 Start Inhibition

The chart below shows (B) Start Inhibition (negative logic).



6.10 #sysIn2, #sysIn14 Stop-Start Inhibition

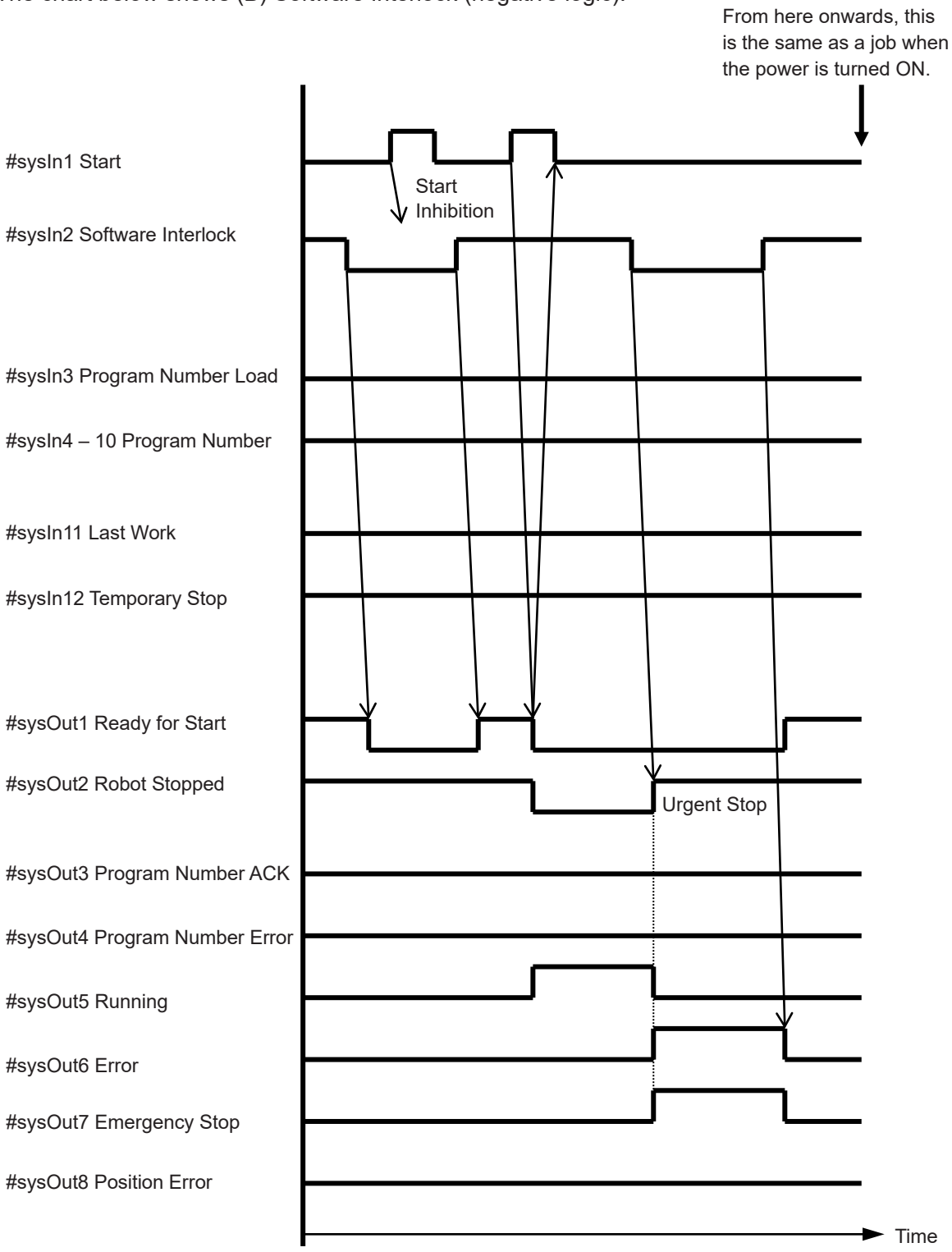
The chart below shows (B) Stop-Start Inhibition (negative logic).



6.11 #sysIn2, #sysIn14 Software Interlock

The same operation occurs if [I/O-S Function Settings] is set to [Interlock].

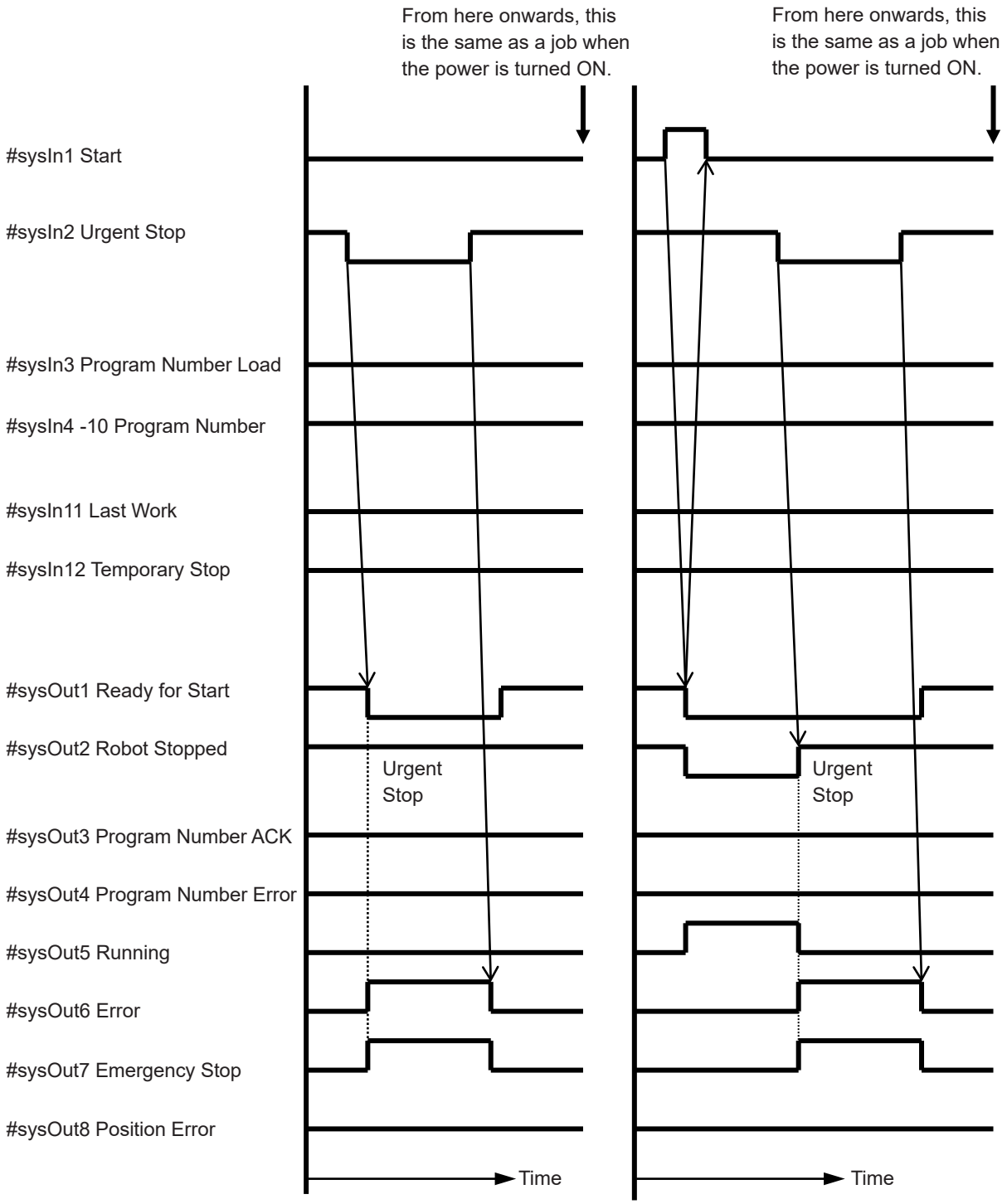
The chart below shows (B) Software Interlock (negative logic).



6.12 #sysIn2, #sysIn14 Urgent Stop

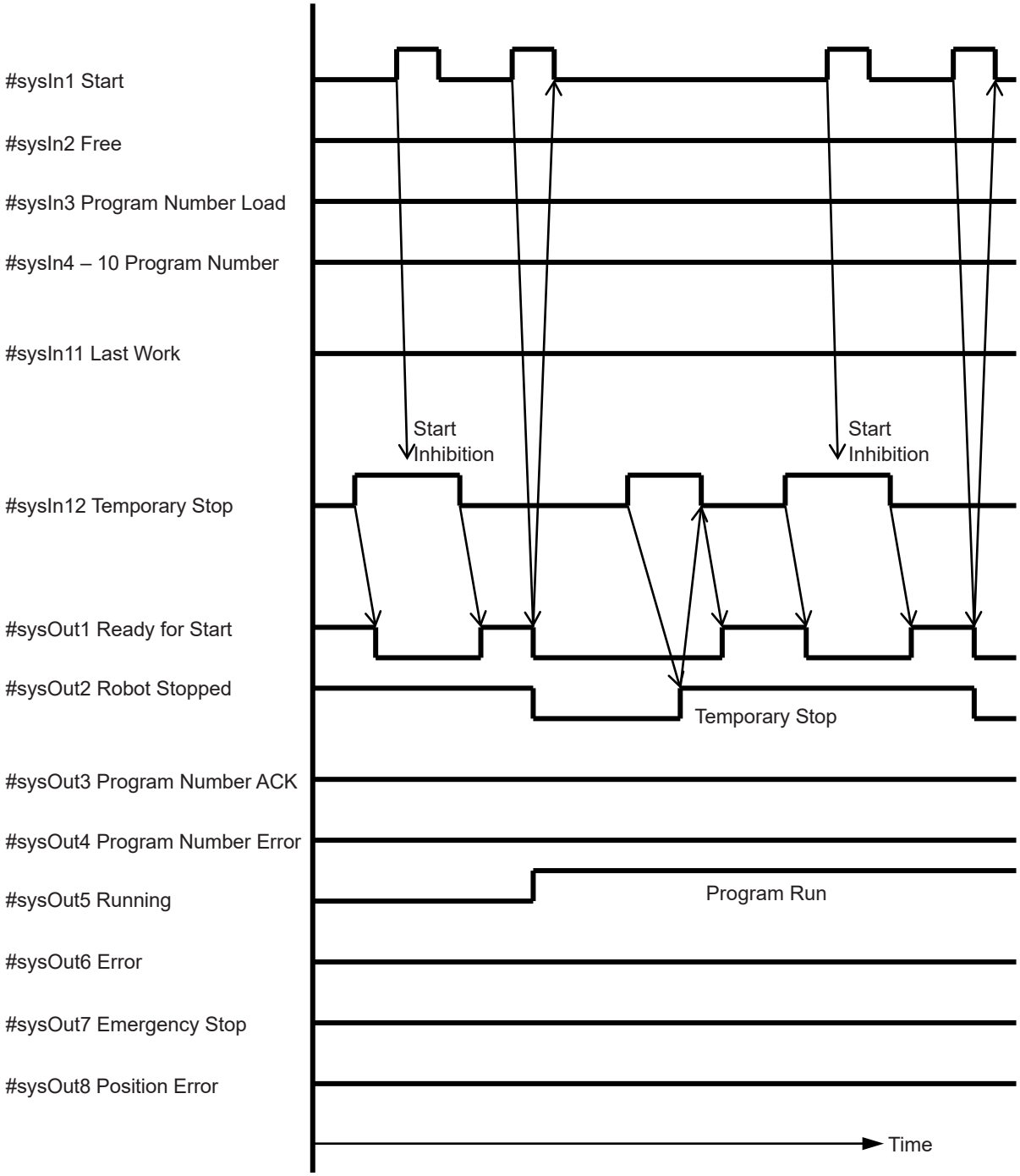
The robot makes an urgent stop regardless of whether it is standing by to start or running at the time. The emergency stop switch or the I/O-S emergency stop function also performs the same operation.

The chart below shows (B) Urgent Stop (negative logic).



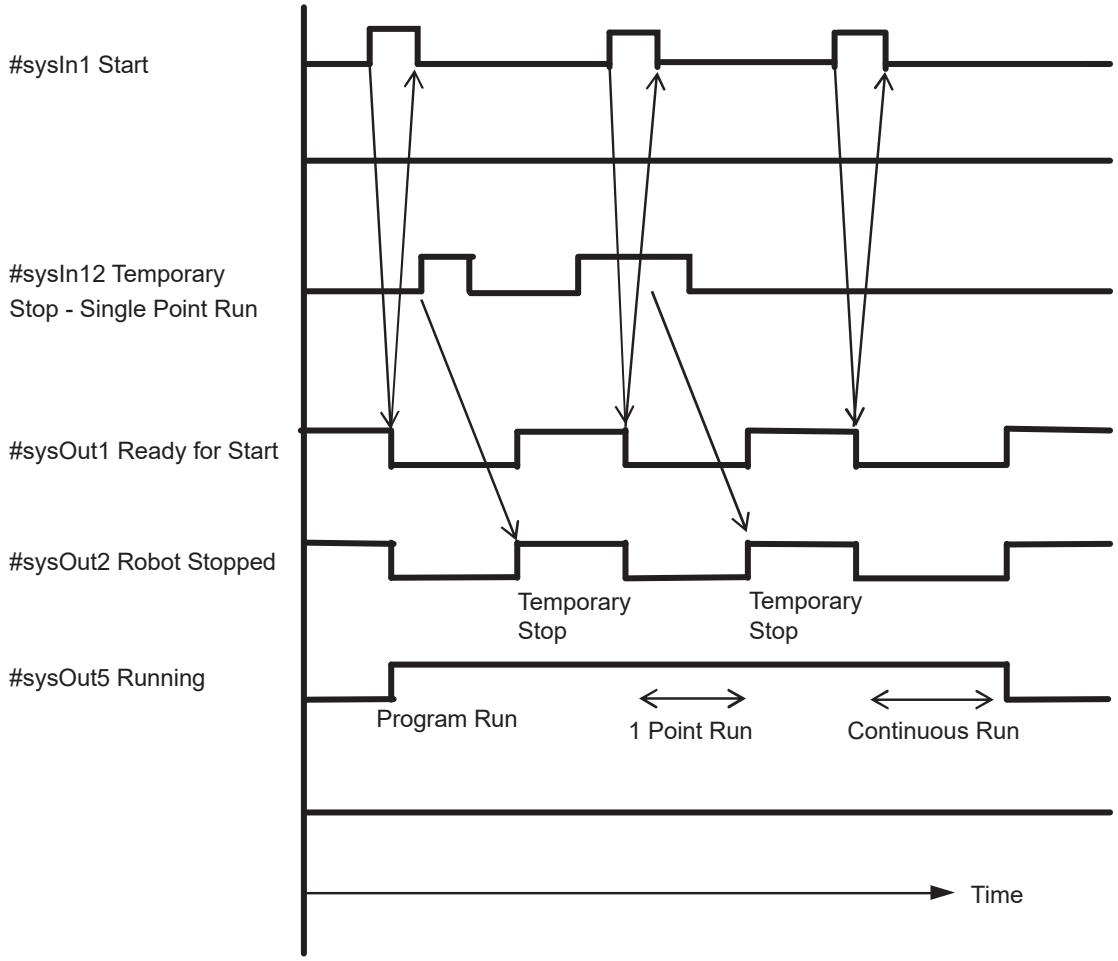
6.13 #sysIn12 Temporary Stop

The #sysIn12 Temporary Stop signal is positive logic. It also has an inhibit start function.

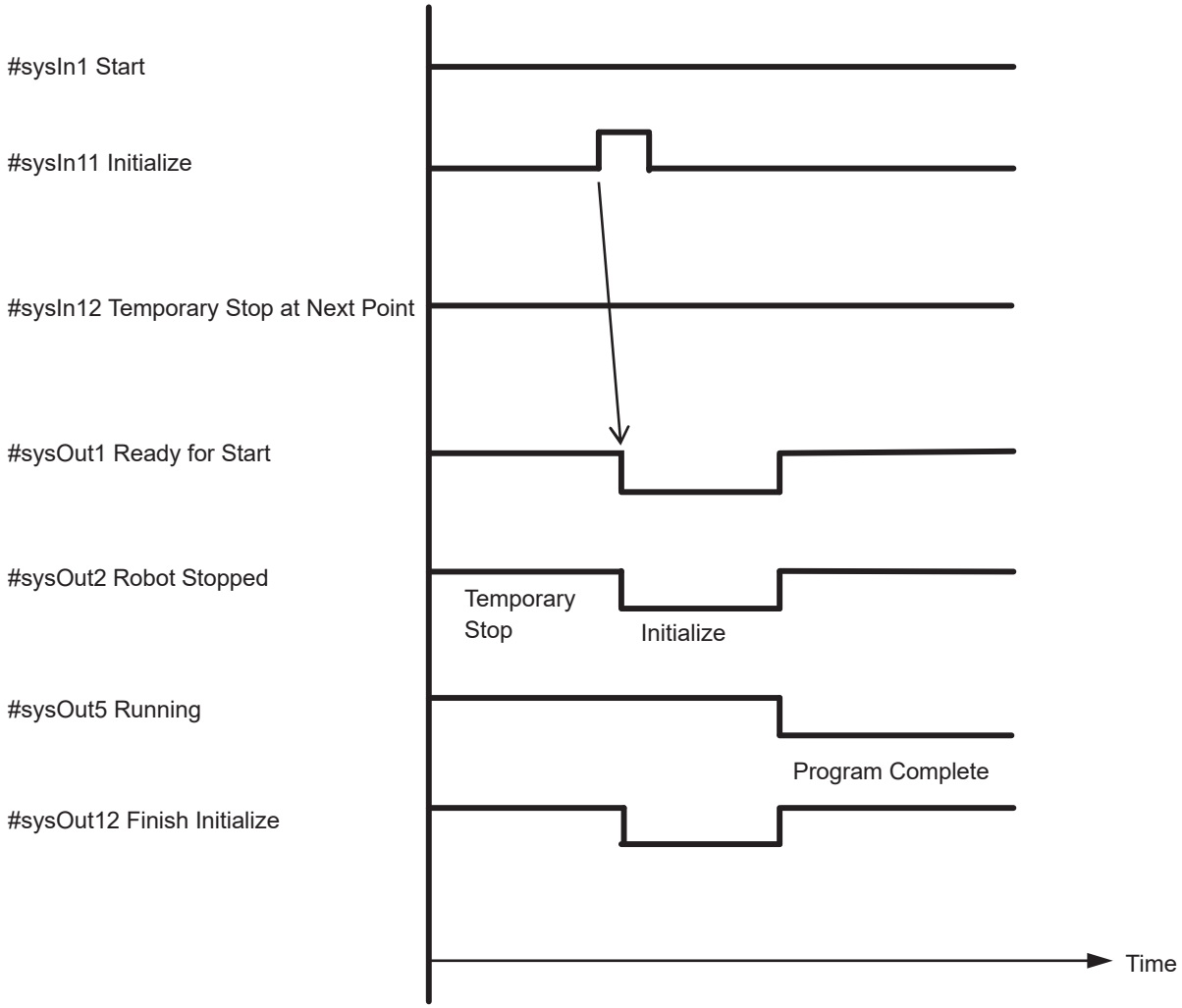


6.14 #sysIn12 Temporary Stop - Single Point Run

The #sysIn12 Temporary Stop - Single Point Run signal is positive logic.

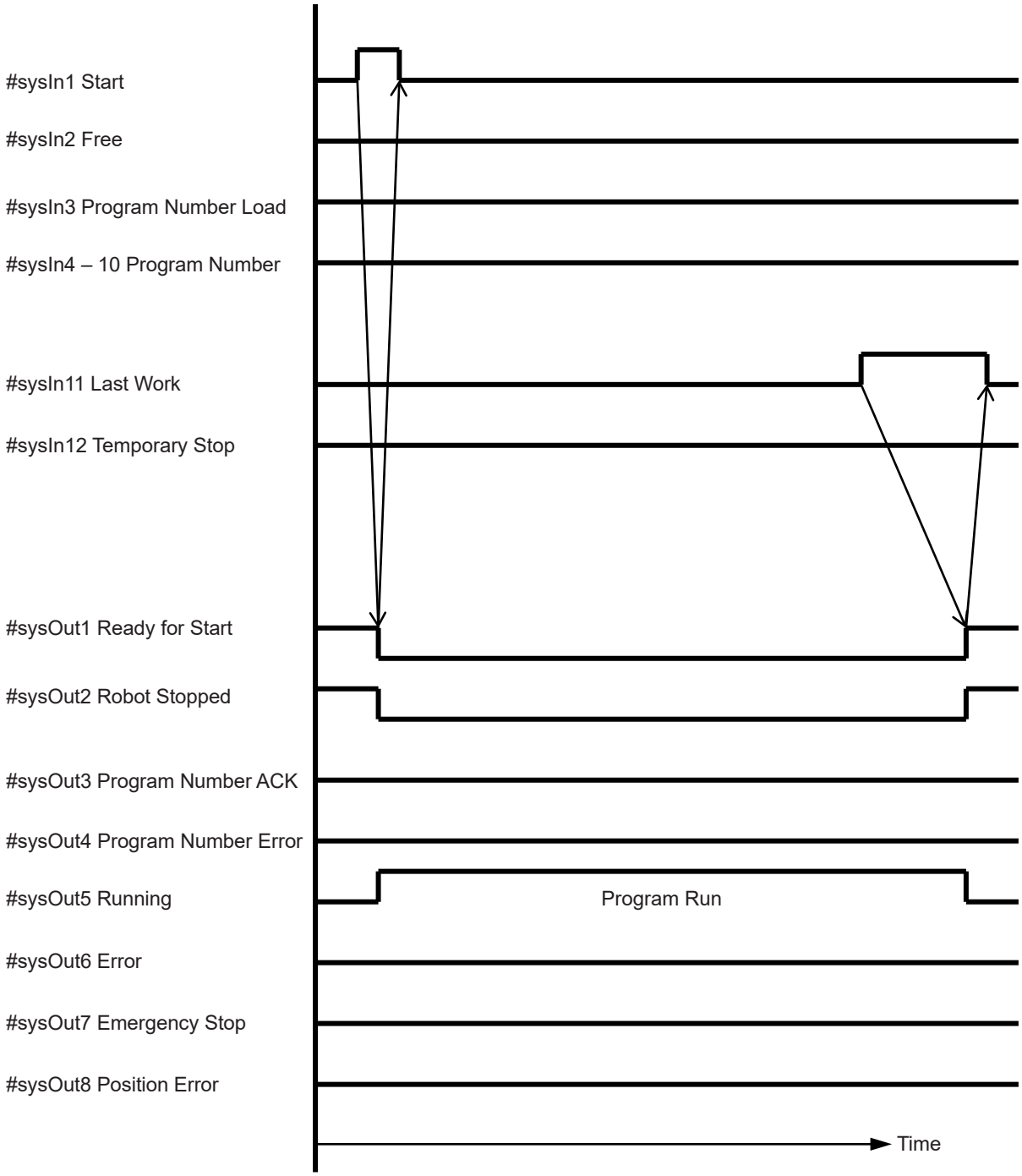


6.15 #sysIn11 Temporary Stop and Initialize



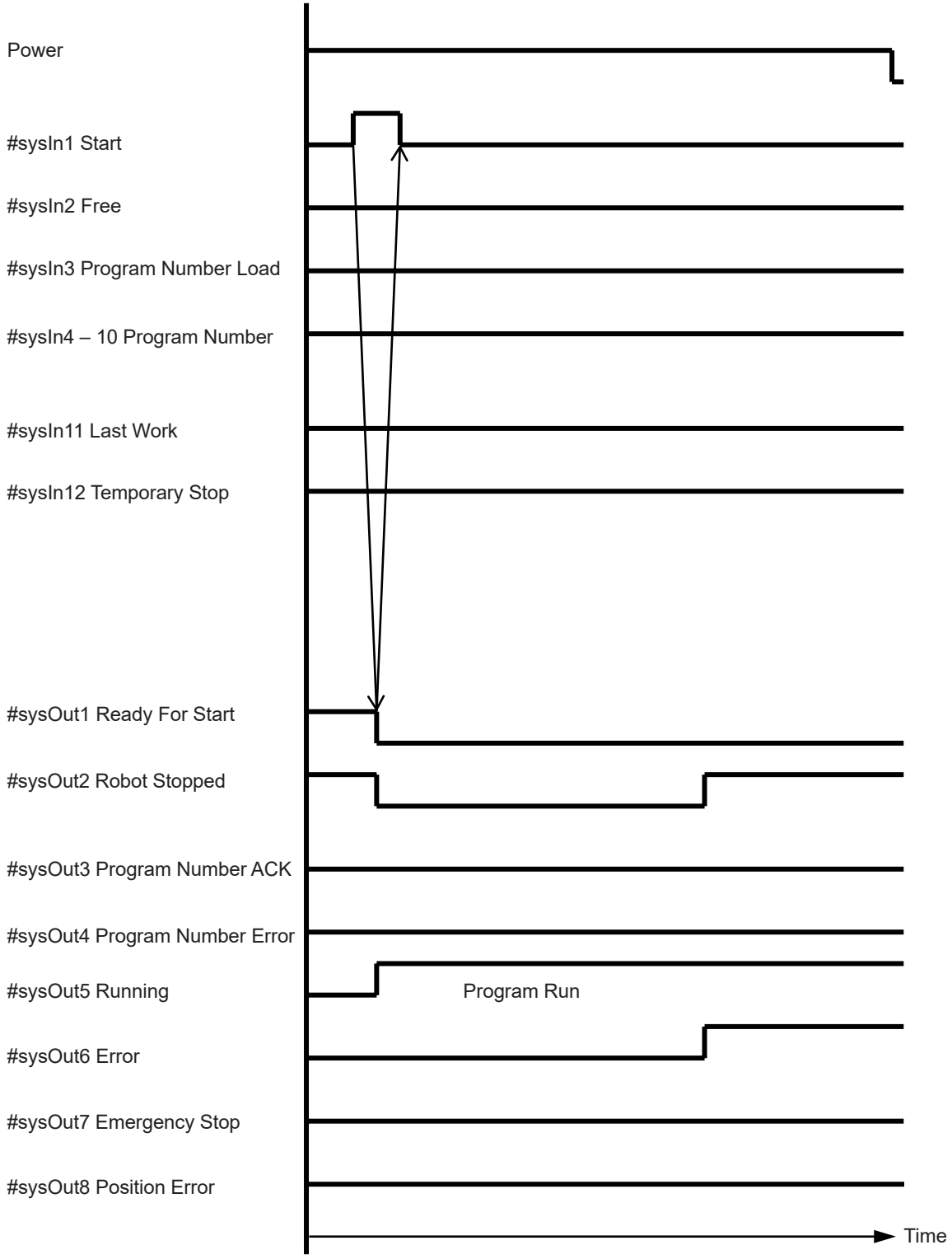
6.16 #sysIn11 Last Work

A program is repeated if [Cycle Mode] is set to [Continuous Playback]. Turn ON the [Last Work] signal to finish the program.



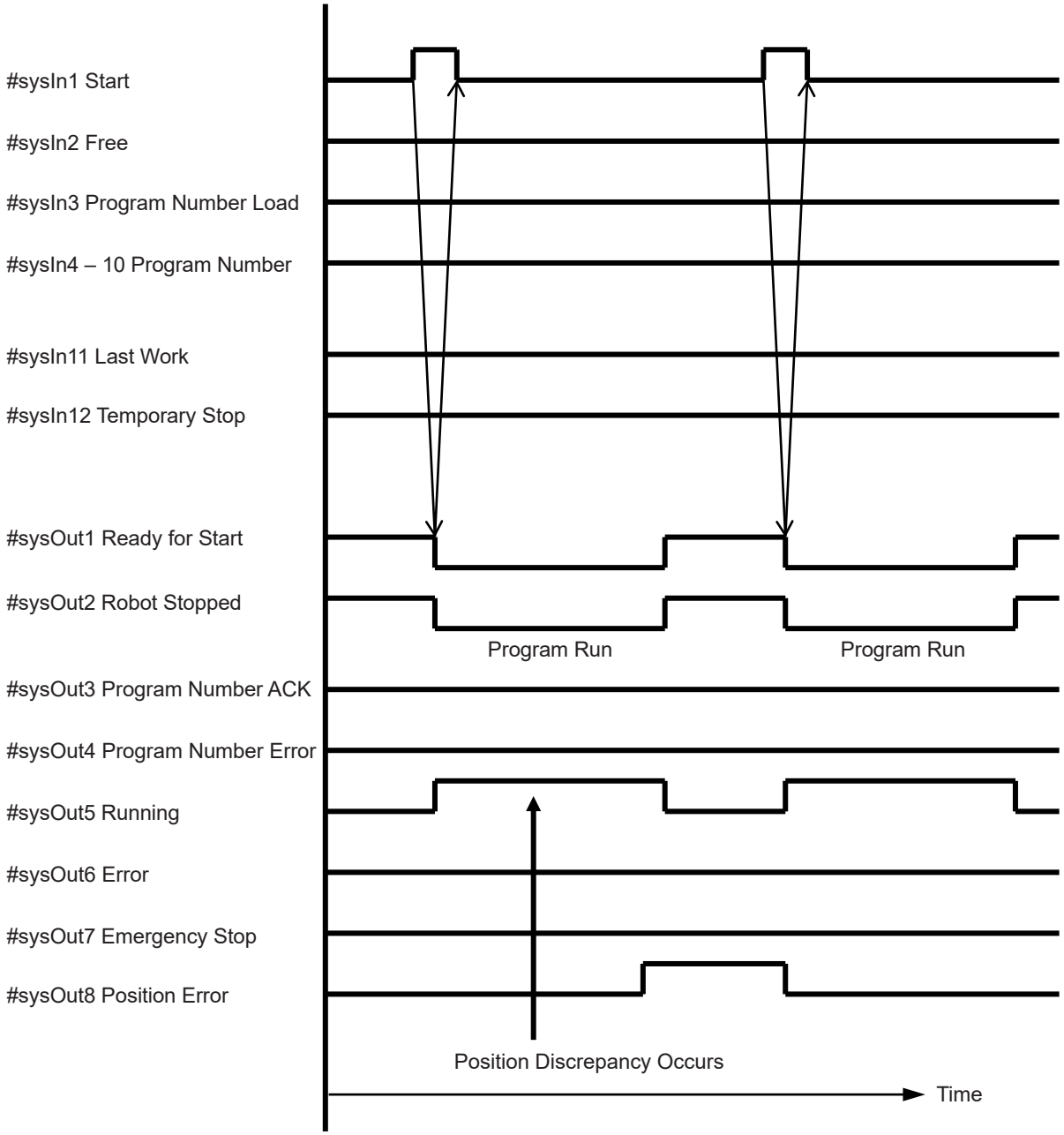
6.17 #sysOut6 Error

As a rule, when an error has occurred, turn OFF the robot and then turn it ON again.



6.18 #sysOut8 Position Error

Position errors are detected at the end of a program.
Even when errors occur it is possible to start the next program.



7. FIELDBUS

Fieldbus is an optional function for the JR3000 Series. (Not compatible with JR3000F models) The compatible Fieldbus module types are DeviceNet, PROFIBUS, CC-Link, CANopen, PROFINET, and EtherNet/IP. Make sure you make the Fieldbus settings correctly because the connector shape and settable items differ according to the Fieldbus module type.

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

⚠ Caution

When you want to communicate using the Fieldbus, turn ON the power to the PLC you are pairing with before turning ON the power to the robot. If power to the robot is turned ON first, internal processing of the communication module cannot be made and communication cannot commence.

If using DeviceNet or CC-Link, attach the included FB cover with the two M4 screws included to prevent damage from static electricity. For further information, refer to “2.6 Cable Connection” in the operation manual *Setup*.

The Fieldbus I/O memory address is as follows:

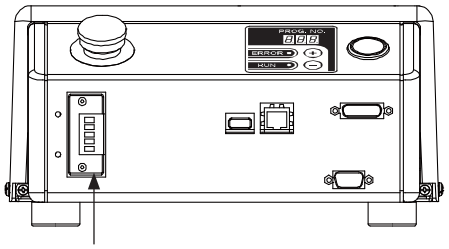
Name	Number of I/O	Relay No. (hex)	Register No. (hex)	Details
Fieldbus (Input)	2048	1000 – 17FF	100 – 17F	Domain for Fieldbus input
Fieldbus (Output)	2048	1800 – 1FFF	180 – 1FF	Domain for Fieldbus output

NOTE:

- Fieldbus (input): external device writes (PLC) / robot reads
- Fieldbus (output): external device reads (PLC) / robot writes

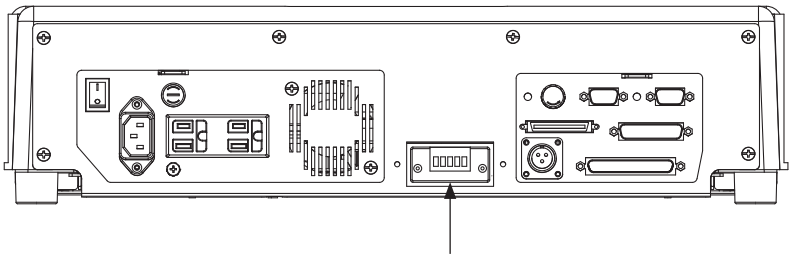
JR3200 Series

Example: JR3203N-AC



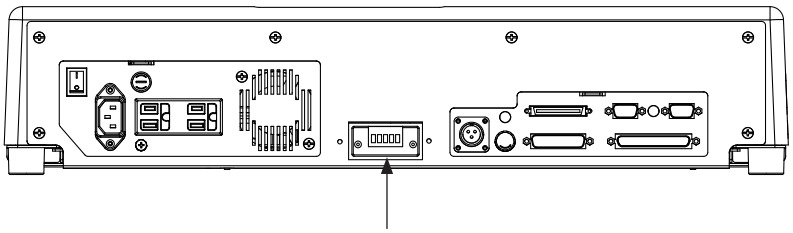
JR3300 Series

Example: JR3303N-AC/BC/CC



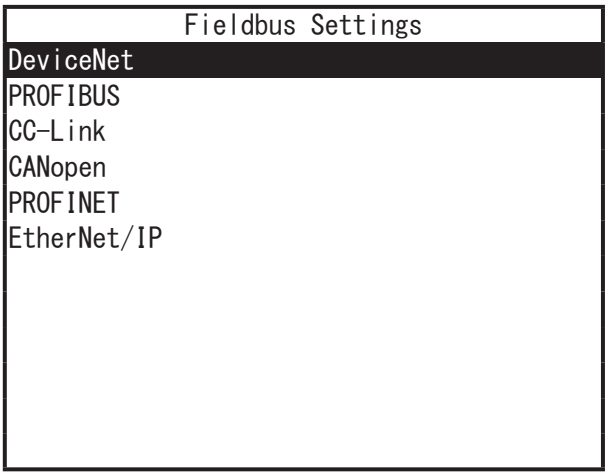
JR3400 – JR3600 Series

Example: JR3403N-AC/BC/CC



7.1 Fieldbus Settings

To set up the Fieldbus module type, use the teaching pendant to perform the procedure below, and select the module you want to set up. For details regarding the settable items for each respective Fieldbus module, refer to that module's methods of setup.
It is possible to set up the Fieldbus module you want to use without attaching it to the robot; however it will not function properly, so do not set it up when it is not attached.



TP MODE [Administration]
[Administration Settings Mode]
[Fieldbus Settings]

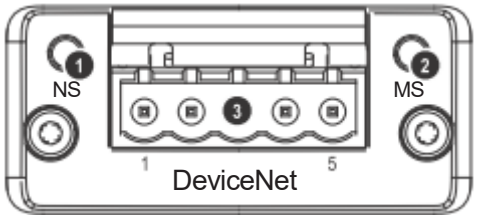
PC [Robot] → [Administration] → [Administration Settings] → [Fieldbus Settings]

7.2 DeviceNet

7.2.1 Connector Diagram

This module has two status LEDs and one DeviceNet connector.

#	Name
1	Network Status (NS) (LED)
2	Module Status (MS) (LED)
3	DeviceNet Connector



7.2.2 Network Status

Status	Details
OFF	Offline or not supplied with power
Green LED	Online, communication connection complete
Green LED blinking (1 Hz)	Online, communication connection incomplete
Red LED	Not able to communicate
Red LED blinking (1 Hz)	Communication timeout
Red and green LEDs alternating	Self-test

7.2.3 Module Status

Status	Details
OFF	Not supplied with power
Green LED	Communicating normally
Green LED blinking (1 Hz)	Settings are incorrect
Red LED	Fatal malfunction
RED LED blinking (1 Hz)	Malfunction; restoration possible. May be possible to restore with re-setup, etc.
Red and green LEDs alternating	Self-test

7.2.4 Connector Pin Assignment

Pin No.	Name	Function
1	V-	Bus power ground
2	CAN_L	Communication data Low (CAN busline L)
3	SHIELD	Shield ground
4	CAN_H	Communication data High (CAN busline H)
5	V+	Bus power (DC 24 V)

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

- Connector
  Manufacturer: Phoenix Contact
  Model Name: TMSTBP 2.5/5-ST5.08
  NOTE: Connector is included. Prepare the cable yourself.

■ EDS File

EDS files include the device characteristics and configuration options. Download the EDS file to the master unit as required.

Use the EDS file on the operation manual CD-ROM or download the latest EDS file from the website of HMS Industrial Networks (Anybus CompactCom manufacturer).

The EDS file identification number for this module is as follows:

Name	File Name
DeviceNet Setting File	ABCC_DEC_V_2_3_JMxxxxxx.EDS

NOTE: The numbers are entered in the “x” of the file name.

7.2.5 Settings

Settable Items	Setting/Selection Range	Function
Read Domain Word Count	0 – 127	Word number input is the amount of data input (external PLC writes/sends, robot reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). For DeviceNet, you can set up to 127 words. As the amount of data increases, so does the amount of time to transfer data, worsening the responsiveness.
Write Domain Word Count	0 – 127	Word number output is the amount of data output (robot writes/sends, external PLC reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). You can set a maximum up to 127 words. As the amount of data increases, so does the amount of time to transfer data, worsening the responsiveness.
Station Number	0 – 63	You can set station numbers 0 – 63. The DeviceNet slave is distinguished by its station number. If you are connecting multiple slaves, choose and set available station numbers.
Transmission Speed	Auto/125/250/500 kbps	You can select and set the transmission from 4 settings: Auto/125 kbps/250 kbps/500 kbps. Set the transmission speed to match the speed used by the network. If you select Auto, the transmission speed is automatically set to match the transmission speed of the mask.

NOTE:

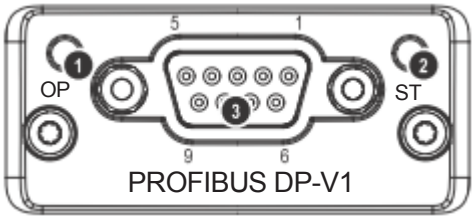
- The communication format is DeviceNet slave.
- The number of possible connections generated is 1.
- The type of possible connection generated is polling.

7.3 PROFIBUS

7.3.1 Connector Diagram

This module has two status LEDs and one PROFIBUS connector.

#	Name
1	Operation Mode (OP) (LED)
2	Status (ST) (LED)
3	PROFIBUS Connector



7.3.2 Operation Mode (OP) / Status (ST)

By looking at the Operation Mode (OP) and Status (ST) LED combinations you can confirm the following statuses:

Data exchange	Status	PROFIBUS Module Front LED	
		OP	ST
Yes	Normal	ON (green)	ON (green)
No	Station number disagreement	OFF	ON (green)
No	Master/Slave address duplication	OFF	ON (green)
No	Input/output word number disagreement	Blinking (red)	ON (green)

7.3.3 Connector Pin Assignment

Pin No.	Name	Function
1	NC	Not connected
2	NC	Not connected
3	B Line	RS485 RxD/TxD (+)
4	RTS	Transmission request
5	GND Bus	Bus ground
6	5 V Bus Output	5 V bus power output
7	NC	Not connected
8	A Line	RS485 RxD/TxD (-)
9	NC	Not connected
Housing	Cable Shield	Shield ground

NOTE: When setting a PROFIBUS unit, you need to make settings according to the specified format otherwise you cannot establish a connection. Enter the data in order of Output-Input for the connection data range settings and assign the data in one word units.

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

■ GSD File

GSD files are files which include the device characteristics and configuration options. Download the GSD file to the master unit as required.

Use the GSD file on the operation manual CD-ROM or download the latest GSD file from the website of HMS Industrial Networks (Anybus CompactCom manufacturer).

The GSD file identification number for this module is as follows:

Name	File Name
PROFIBUS Setting File	xxxxxx.gsd

NOTE: The numbers are entered in the “x” of the file name.

7.3.4 Settings

Settable Items	Setting/Selection Range	Function
Read Domain Word Count	Matchup input and output 0 – 64	Word number input is the amount of data input (external PLC writes/sends, robot reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). For PROFIBUS, you can set up to 64 words. As the amount of data increases, so does the amount of time to transfer data, worsening the responsiveness.
Write Domain Word Count	Matchup input and output 0 – 64	Word number output is the amount of data output (robot writes/sends, external PLC reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). For PROFIBUS, you can set a maximum up to 64 words. As the amount of data increases, so does the amount of time to transfer data, worsening the responsiveness.
Station Number	0 – 125	You can set station numbers 0 – 125. The PROFIBUS slave is distinguished by its station number. If you are connecting multiple slaves, choose and set available station numbers.

NOTE:

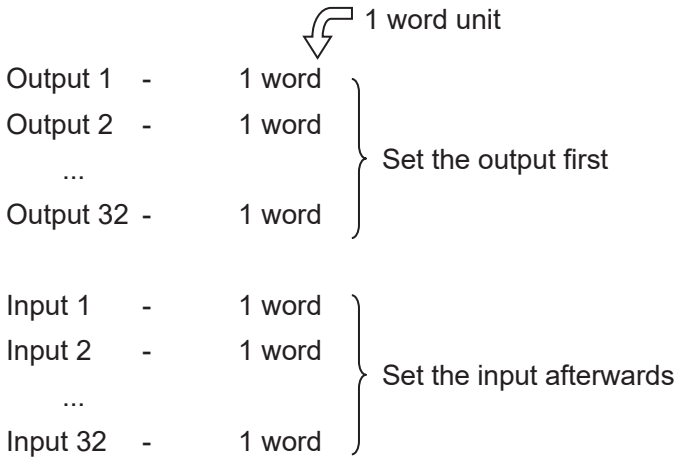
- The communication format is PROFIBUS-DP slave.
- The number of occupied nodes is 1.
- The connection speed is set automatically from the master.

7.3.5 PROFIBUS Master (PLC) Settings

When setting up the slave (robot) configuration for the PROFIBUS master (PLC), fulfill the following conditions:

1. Set the input and output in “1 word” units.
2. Set the data in the sequence, output → input.

■ Example of settings on the master side:



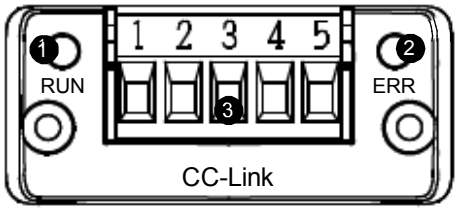
NOTE: Any other conditions will cause a configuration error and data conversions will not function.

7.4 CC-Link

7.4.1 Connector Diagram

This module has two status LEDs and one CC-Link connector.

#	Name
1	Run (RUN) (LED)
2	Error (ERR) (LED)
3	CC-Link Connector



7.4.2 Run (RUN) / Error (ERR)

By looking at the Run (RUN) and Error (ERR) LED combinations you can confirm the following statuses:

	Configuration Settings (Master/Slave Value Settings)		CC-Link Module Front LED	
Data exchange	**Station**	**Expansion Cyclic Setting**	**RUN**	**ERR**
Yes	Agreement	Agreement	ON	OFF
No	Agreement	Disagreement	ON	OFF
No	Disagreement	Agreement	OFF	OFF
No	Disagreement	Disagreement	OFF	OFF
No	–	–	OFF*	ON*

* In this case, CC-Link version is not compatible with the robot, or the fatal error has occurred.

7.4.3 Connector Pin Assignment

PIN No.	Name	Function
1	DA	RS485 RxD/TxD (+)
2	DB	RS485 RxD/TxD (-)
3	DG	Signal ground
4	SLD	Shield ground
5	FG	Frame ground

NOTE:

- CC-Link is a remote device station.
- The last word of the output word area is used by the system area and therefore use is prohibited.
- Before connecting to CC-Link, always make sure that the highest controller (master unit) is useable.

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

■ CSP File

CSP files are files which include the device characteristics and configuration options.
Download the CSP file to the master unit as required.
Use the CSP file on the operation manual CD-ROM or download the latest CSP file from the website of HMS Industrial Networks (Anybus CompactCom manufacturer).
The CSP file identification number for this module is as follows:

Name	File Name
CC-Link Setting File (Station 1)	HMS-ABCC_CCL_1_JMxxxxxx.csp
CC-Link Setting File (Station 2)	HMS-ABCC_CCL_2_JMxxxxxx.csp
CC-Link Setting File (Station 3)	HMS-ABCC_CCL_3_JMxxxxxx.csp
CC-Link Setting File (Station 4)	HMS-ABCC_CCL_4_JMxxxxxx.csp

NOTE: The numbers are entered in the “x” of the file name.

Operation of the CSP file on the operation manual CD-ROM is unconfirmed.
Note that operation is not guaranteed.

There is a CSP file for each of the stations (1 – 4) used.

- Setting Example

  When the occupied station number is set to 4:

  Slave (JR3000) side: occupied station number setting = **4**

  ↕ Match the occupied station

  CSP file downloaded to master unit: HMS-ABCC-CCL**4**.csp

7.4.4 Settings

Settable Items	Setting/Selection Range	Function
Station Number	1 – 64	You can set station numbers 1 – 64. The CC-Link remote device station is distinguished by its station number. If you are connecting multiple slaves, choose and set available station numbers.
Transmission Speed Specification	156 kbps 625 kbps 2.5 Mbps 5 Mbps 10 Mbps	If you increase the transmission speed, the transfer distance is shortened. 156 kbps 1200 m 625 kbps 900 m 2.5 Mbps 400 m 5 Mbps 160 m 10 Mbps 100 m
Version Number	1 2	Compatible with two CC-Link versions: Ver.1 and Ver.2.
Stations Occupied / Expansion Cyclic Settings	1 Station Occupied / Expansion Cyclic Setting x1 2 Stations Occupied / Expansion Cyclic Setting x1 3 Stations Occupied / Expansion Cyclic Setting x1 4 Stations Occupied / Expansion Cyclic Setting x1 1 Station Occupied / Expansion Cyclic Setting x2 2 Stations Occupied / Expansion Cyclic Setting x2 1 Station Occupied / Expansion Cyclic Setting x4 1 Station Occupied / Expansion Cyclic Setting x8	Word number input and word number output are decided the same as the tables below depending on the settings for the occupied stations and the expansion cyclic settings. NOTE: Expansion cyclic settings 2, 4, 8 are only compatible with Ver. 2.

1 Station Occupied/Expansion Cyclic Setting x1

	Number	Register Number	Relay Number
Data Input	4	100 – 103	-
I/O Input	16	-	1400 – 140F
Data Output	3	180 – 182	-
I/O Output	16	-	1C00 – 1C0F

2 Stations Occupied/Expansion Cyclic Setting x1

	Number	Register Number	Relay Number
Data Input	8	100 – 107	-
I/O Input	32	-	1400 – 141F
Data Output	7	180 – 186	-
I/O Output	32	-	1C00 – 1C1F

3 Stations Occupied/Expansion Cyclic Setting x1

	Number	Register Number	Relay Number
Data Input	12	100 – 10B	-
I/O Input	48	-	1400 – 142F
Data Output	11	180 – 18A	-
I/O Output	48	-	1C00 – 1C2F

4 Stations Occupied/Expansion Cyclic Setting x1

	Number	Register Number	Relay Number
Data Input	16	100 – 10F	-
I/O Input	64	-	1400 – 143F
Data Output	15	180 – 18E	-
I/O Output	64	-	1C00 – 1C3F

1 Station Occupied/Expansion Cyclic Setting x2

	Number	Register Number	Relay Number
Data Input	8	100 – 107	-
I/O Input	16	-	1400 – 140F
Data Output	7	180 – 186	-
I/O Output	16	-	1C00 – 1C0F

2 Stations Occupied/Expansion Cyclic Setting x2

	Number	Register Number	Relay Number
Data Input	16	100 – 10F	-
I/O Input	48	-	1400 – 142F
Data Output	15	180 – 18E	-
I/O Output	48	-	1C00 – 1C2F

1 Station Occupied/Expansion Cyclic Setting x4

	Number	Register Number	Relay Number
Data Input	16	100 – 10F	-
I/O Input	32	-	1400 – 141F
Data Output	15	180 – 18E	-
I/O Output	32	-	1C00 – 1C1F

1 Station Occupied/Expansion Cyclic Setting x8

	Number	Register Number	Relay Number
Data Input	32	100 – 11F	-
I/O Input	64	-	1400 – 143F
Data Output	31	180 – 19E	-
I/O Output	64	-	1C00 – 1C3F

NOTE:

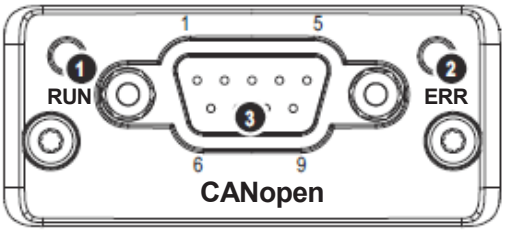
- The station type is a remote device station.
- The last word of the output word area is “used by the system area” and therefore use is prohibited.
- Before connecting to CC-Link, always make sure that the highest controller (master unit) is useable.

7.5 CANopen

7.5.1 Connector Diagram

This module has two status LEDs and one CANopen connector.

#	Name
1	RUN Status (RUN) (LED)
2	ERROR Status (ERR) (LED)
3	CANopen Connector



7.5.2 RUN Status

Status	Details
OFF	Not supplied with power
Green	Online, communication connection complete
Green blinking (1 Hz)	Waiting for communication connection
Green flash (x1)	Stopped
Green blinking (fast)	Automatically detecting baud rate
Red	Not able to communicate

7.5.3 ERROR Status

Status	Details
OFF	Not supplied with power or the bus is functioning properly
Red blinking (fast)	LSS
Red flash (x1)	Multiple communication errors
Red flash (x2)	Event notification received from the network
Red	Number of communication errors exceeded the stipulated amount

7.5.4 Connector Pin Assignment

Pin No.	Name	Details
1, 4, 6, 8, 9	N.C.	
2	CAN_L	Communication data: Low (CAN bus line L)
3	CAN_GND	Communication data: GND
5	SHIELD	Shielded grounding
7	CAN_H	Communication data: High (CAN bus line H)
Housing	SHIELD	Shielded grounding

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

■ EDS File

The EDS file is a text file that includes the device characteristics and configuration options.
Download the EDS file to the master unit and configuration tool as required.
The EDS file is included on the operation manual CD-ROM.
Use the correct EDS file according to the CANopen input/output domains.

EDS File	Setting Range/Selection
EDS_ABCC_COP_JANOME_OUT16_IN16.eds	Fieldbus Input: 256 points (16 Words) Fieldbus Output: 256 points (16 Words)
EDS_ABCC_COP_JANOME_OUT20_IN12.eds	Fieldbus Input: 192 points (12 Words) Fieldbus Output: 320 points (20 Words)
EDS_ABCC_COP_JANOME_OUT24_IN8.eds	Fieldbus Input: 128 points (8 Words) Fieldbus Output: 384 points (24 Words)

7.5.5 Settings

Settable Items	Setting/ Selection Range	Function
Node Addr. Selection Method	Enter Value Specify LSS	Select the method of specifying the node address. The node address is automatically assigned on the CANopen network with [Specify LSS]. Specify the node address when using [Enter Value].
Node Address	1 – 127	You can set the node address between 1 and 127. This cannot be modified when set to [Specify LSS]. Set this to a value which does not conflict with any other device.
Baudrate	10 kbps 20 kbps 50 kbps 100 kbps 125 kbps 250 kbps 500 kbps 800 kbps 1 Mbps AutoBaud Specify LSS	Specify the baud rate. Set this to the same value as your other devices.

NOTE: You can only use LSS (Layer Setting Service) with a 1-to-1 connection. When using this, the node address and baud rate are automatically set according to the master device.

7.5.6 CANopen Assignment

Select and assign the appropriate relays/registers from the Fieldbus domain of the I/O memory. Use the correct EDS file according to the CANopen environment. Also make sure to assign the relays/registers using your master device (PLC, etc.) configuration tool.

The diagram below is an example of when using the following EDS file:
EDS_ABCC_COP_JANOME_OUT16_IN16.eds.
By reading the EDS file supplied by us on the robot, the relays and registers named on CANopen are displayed on the configuration tool.

For example, if you want to use relay number 1000 and register numbers 180, 181, you need to assign the following relays/registers using the configuration tool.

- Reg100/Relay1000_F
- Reg180/Relay1800_F
- Reg181/Relay1810_F

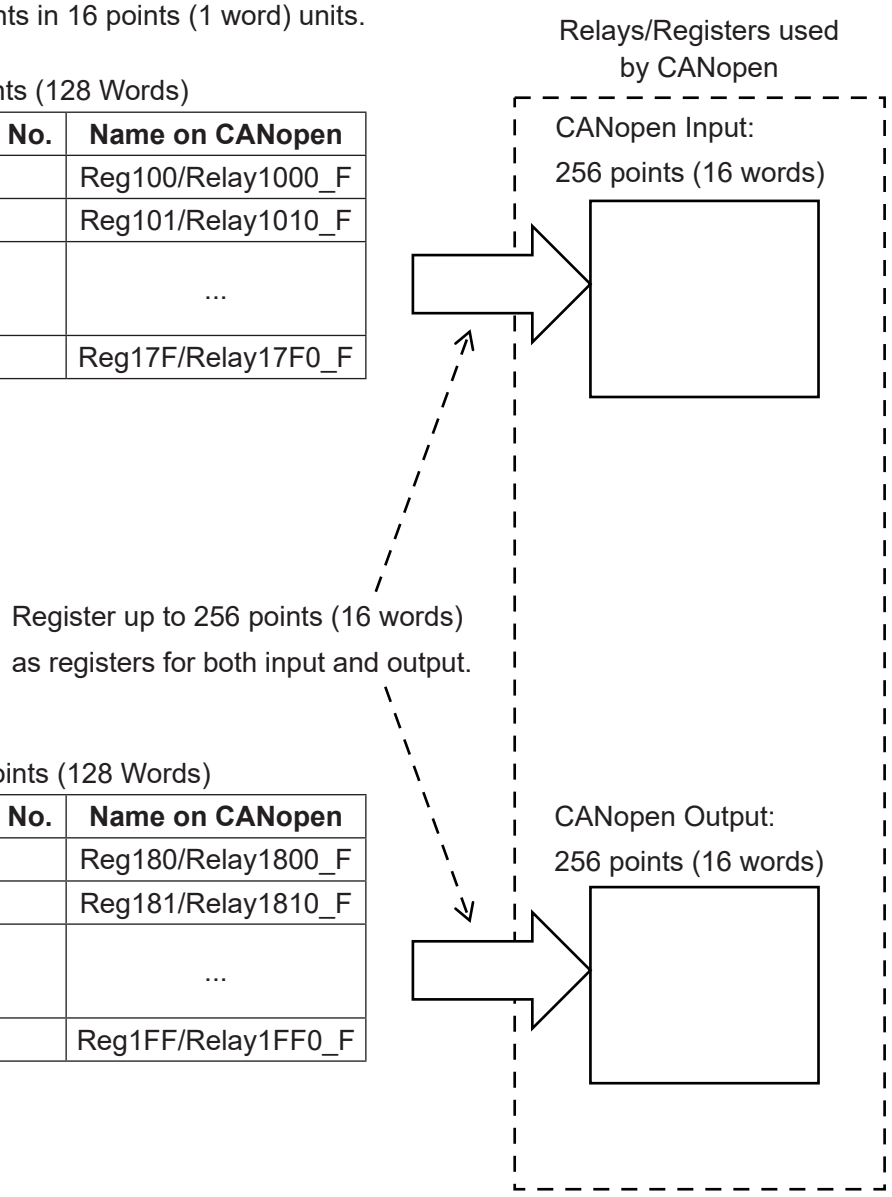
You can make assignments in 16 points (1 word) units.

Fieldbus Input: 2048 Points (128 Words)

Relay No.	Register No.	Name on CANopen
1000 – 100F	100	Reg100/Relay1000_F
1010 – 101F	101	Reg101/Relay1010_F
...	...	...
17F0 – 17FF	17F	Reg17F/Relay17F0_F

Fieldbus Output: 2048 Points (128 Words)

Relay No.	Register No.	Name on CANopen
1800 – 180F	180	Reg180/Relay1800_F
1810 – 181F	181	Reg181/Relay1810_F
...	...	...
1FF0 – 1FFF	1FF	Reg1FF/Relay1FF0_F

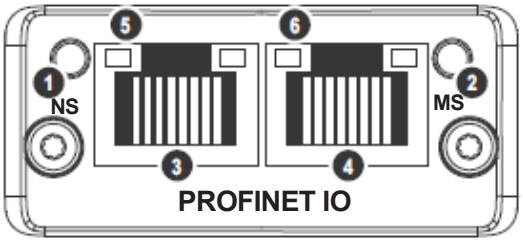


7.6 PROFINET

7.6.1 Connector Diagram

This module has four status LEDs and two Ethernet connectors.

#	Name
1	Network Status (NS) (LED)
2	Module Status (MS) (LED)
3	Ethernet Connector (Port 1)
4	Ethernet Connector (Port 2)
5, 6	Link/Activity (LED)



7.6.2 Network Status

Status	Details
OFF	Not supplied with power
Green	Online (RUN)
Green blinking	Online (STOP)

7.6.3 Module Status

Status	Details
OFF	Module is initializing or not supplied with power
Green	Communicating normally
Green 1 flash	Diagnostic event (s)
Green blinking (1 Hz)	Access from engineering tool
Red	Stopped due to a fatal error
Red 1 flash	Configuration error
Red 2 flash	IP address is not set
Red 3 flash	Station name is not set
Red 4 flash	Internal error

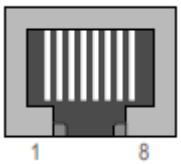
7.6.4 Link/Activity

Status	Details
OFF	Network cable is not connected
Green	Link is established but with no communication
Green blinking	Link and communication are established

NOTE: This is the same for both port 1 and port 2.

7.6.5 Ethernet Connectors

Pin No.	Signal	Details
1	TD+	+ transfer data line
2	TD-	- transfer data line
3	RD+	+ receive data line
4,5,7,8	N.C.	
6	RD-	- receive data line
Housing	SHILD	Shielded ground



NOTE: This is the same for both port 1 and port 2.

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

■ GSD File

The GSD file is a text file that includes the device characteristics and configuration options. The GSD files are included on the operation manual CD-ROM. Use the correct GSD file according to the PROFINET input and output domains.

GSD File	Application
GSDML-2.3V-JANOME-RW8-xxxxxxxx.xml	Fieldbus Input: 128 points (8 Words) Fieldbus Output: 128 points (8 Words)
GSDML-2.3V-JANOME-RW16- xxxxxxxx.xml	Fieldbus Input: 256 points (16 Words) Fieldbus Output: 256 points (16 Words)
GSDML-2.3V-JANOME-RW32- xxxxxxxx.xml	Fieldbus Input: 512 points (32 Words) Fieldbus Output: 512 points (32 Words)
GSDML-2.3V-JANOME-RW64- xxxxxxxx.xml	Fieldbus Input: 1024 points (64 Words) Fieldbus Output: 1024 points (64 Words)
GSDML-2.3V-JANOME-RW127- xxxxxxxx.xml	Fieldbus Input: 2032 points (127 Words) Fieldbus Output: 2032 points (127 Words)

NOTE: The numbers are entered in the “x” of the file name, except for extension.

7.6.6 Settings

Settable Items	Setting Range / Selection	Function
Word Count for Read/Write Domain	8 16 32 64 127	Select the number of words to use in the Fieldbus read/write domain. The read/write domain makes the same number of words available.
Toggle DAP2 Support	Invalid Valid	Specify whether or not your module supports DAP protocol version 2. Set this according to the controller.

NOTE:

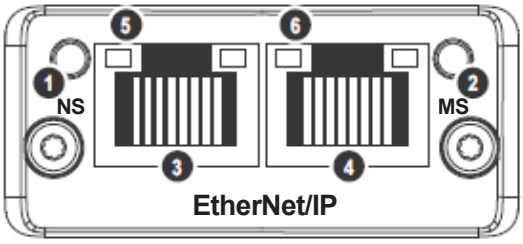
- Make sure the word count for the read/write domain matches that of the GDS file. If these do not match, the PROFINET module cannot function.
- A PROFINET interface can only be operated with 100 Mbps full-duplex.

7.7 EtherNet/IP

7.7.1 Connector Diagram

This module has two status LEDs and two Ethernet connectors.

#	Name
1	Network Status (NS) (LED)
2	Module Status (MS) (LED)
3	Ethernet Connector (Port 1)
4	Ethernet Connector (Port 2)
5,6	Link/Activity (LED)



7.7.2 Network Status

Status	Details
OFF	IP address not set or module is not supplied with power
Green	Online and connection established
Green blinking	Online and waiting for connection
Red	Duplicate of the IP address
Red blinking	Connection timeout

7.7.3 Module Status

Status	Details
OFF	Not supplied with power
Green	Communicating normally
Green blinking	Idle status
Red	Fatal error
Red blinking	Configuration error

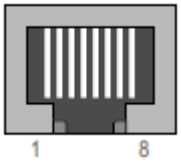
7.7.4 Link/Activity

Status	Details
OFF	Network cable is not connected
Green	Link is established at 100 Mbps but with no communication
Green blinking	Link and communication are established at 100 Mbps
Yellow	Link is established at 10 Mbps but with no communication
Yellow blinking	Link and communication are established at 10 Mbps

NOTE: This is the same for both port 1 and port 2.

7.7.5 Ethernet Connector

Pin No.	Signal	Details
1	TD+	+ transfer data line
2	TD-	- transfer data line
3	RD+	+ receive data line
4,5,7,8	N.C.	
6	RD-	- receive data line
Housing	SHILD	Shielded ground



NOTE: This is the same for both port 1 and port 2.

⚠ Danger

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 directly after it is connected. Improper countermeasures for this can cause injury or unit breakdown.

■ EDS File

The EDS file is a text file that includes the device characteristics and configuration options.
Download the EDS file to the master unit and configuration tool as required.
The EDS file is included on the operation manual CD-ROM.

EDS File	Application
005A0000002E0100_JMxxxxxxxx.eds	EDS file for EtherNet/IP

NOTE: The numbers are entered in the “x” of the file name.

7.7.6 Settings

Settable Items	Setting/ Selection Range	Function
Read Domain Word Count	0 – 128	Word number input is the amount of data input (external PLC writes/sends, robot reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). As the amount of data increases, so does the amount of time to transfer data, reducing the responsiveness.
Write Domain Word Count	0 – 128	Word number output is the amount of data output (robot writes/sends, external PLC reads/receives). Set the necessary amount of data in words (1 word is 2 bytes). As the amount of data increases, so does the amount of time to transfer data, reducing the responsiveness.
IP Address		Specify the IP address.
Subnet Mask		Specify the subnet mask.
Default Gateway		Specify the default gateway. NOTE: This is normally specified as “0.0.0.0”.

NOTE: The configuration tool needs to be set with the same read and write domain word counts specified in these settings.

7.8 Fieldbus Expansion I/O Function

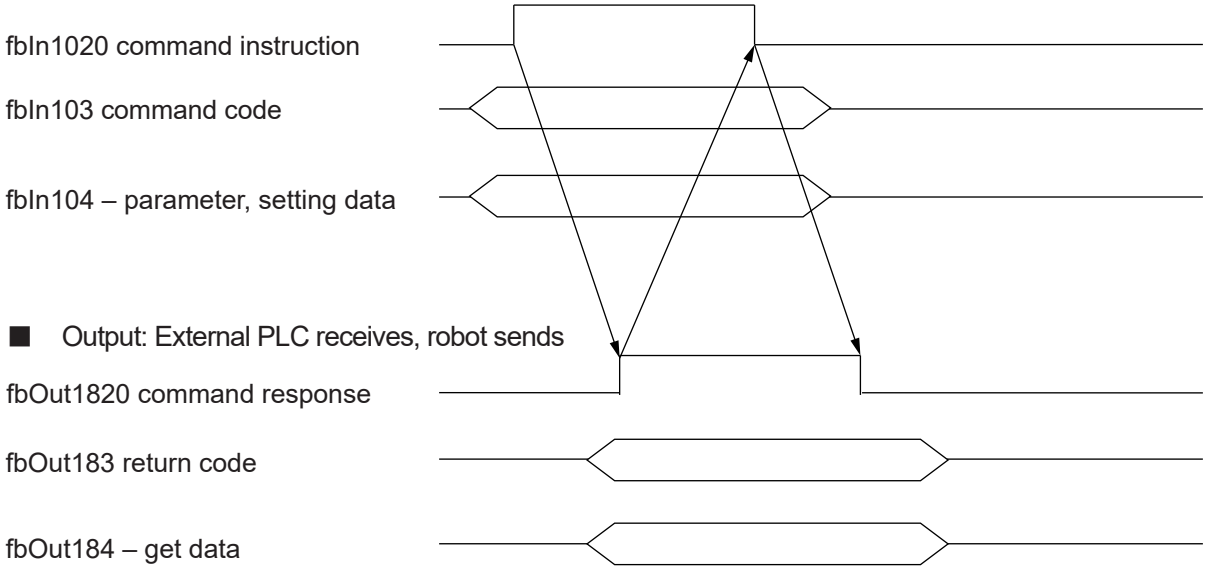
By assigning teaching data such as point information or position data information to the Fieldbus input/output area, you can set and obtain that information from an external PLC.
If you use this function, you can set and make position adjustments (override the settings) of the robot's point information and offset information, etc., from an external PLC, via input from the Fieldbus.

NOTE: Depending on the Fieldbus type or the data amount settings, you may not be able to use this function to its full extent.

7.8.1 Interfacing Protocol

The interfacing protocol between an external PLC and the robot is done by Handshake.

■ Input: External PLC sends, robot receives



The robot loads the command code upon retrieving the "fbIn1020 command instruction" input signal, so you need to set the "fbIn103 command code" and the "fbIn104 – parameter, setting data" signals before the external PLC turns ON the "fbIn1020 command instruction" input signal. Because the robot writes the return code and obtained data at the same time the "fbOut1820 command response" output signal comes ON, load the "fbOut183 return code" and the "fbOut184 get data" signals after confirming the external PLC "fbOut1820 command response" signal is indeed ON. With the decay of the "fbIn1020 command instruction" input signal, the robot turns OFF the "fbOut1820 command response" output signal.

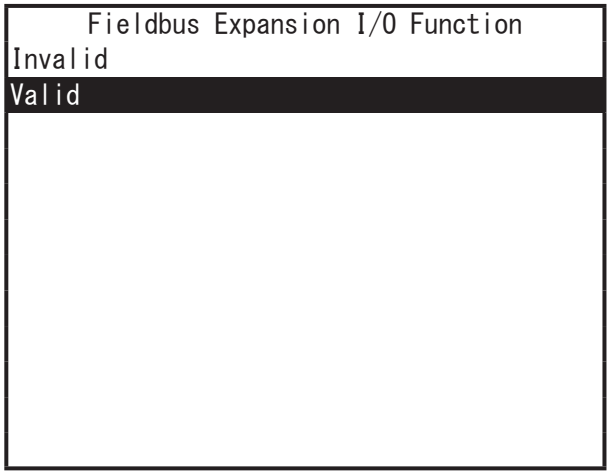
7.8.2 Valid/Invalid Settings

To valid the Fieldbus expansion I/O function, follow the procedure below for the teaching pendant and select [Fieldbus Expansion I/O Function] → [Valid].

Teaching Mode

TP MENU [All Program Common Settings]
[I/O Settings]
[Fieldbus Expansion I/O Function]

PC [Data] → [All Program Common Settings] → [Fieldbus Expansion I/O]



7.8.3 Function Assignment

The Fieldbus expansion I/O function is assigned to certain addresses in advance as shown below. Function selection is made by hexadecimal command codes, so that only registered functions are executed when the command instruction signal (fbIn1020) comes ON. Refer to each of the functions for further details.

NOTE: You cannot execute multiple functions at the same time.

Name	Command Code
Point Data Position Settings	1001h
Workpiece Adjustment Data (Z axis only) Settings	1002h
Workpiece Adjustment Data (X/Y/Z/R/ θ) Settings	1003h
TCP Direct Settings	1004h
Set the TCP by Specifying 2 Points	1005h
Acquire Current Position Coordinates	1010h
Acquire Tool Tip Position	1011h
Acquire TCP Specified Tool Tip Position	1012h
Acquire the Adjustment Amount for the Workpiece Adjustment	1013h

■ Point Data Position Settings (Command Code 1001h)

Specify the program number, point number and position data, and set the teaching data point position.

Example: Setting the position for point number 56, program number 12

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0: OFF→ON: execute command
fbIn103	1001	Command Code
fbIn104	000C	Program Number Example: 12 : 0 Ch
fbIn105	0038	Point Number Example: 56 : 38h
fbIn106 – fbIn107	fbIn106 : 6072 fbIn107 : 0000	X coordinates, 0.0005 mm units Example: 12.345 mm (24690) : 6072h*1
fbIn108 – fbIn109	fbIn108 : 1A80 fbIn109 : 0006	Y coordinates, 0.0005 mm units Example: 200.000 mm (400000) : 61A80h
fbIn10A – fbIn10B	fbIn10A : 6378 fbIn10B : 0001	Z coordinates, 0.0005 mm units Example: 45.500 mm (91000) : 16378h
fbIn10C – fbIn10D	fbIn10C : D828 fbIn10D : FFFF	R coordinates, 0.0005 deg units Example: -5.1 deg (-10200) : FFFFD828h*2

The conversion expressions from the coordinates to the values in parentheses ( ) are as follows:

*1: 12.345 [mm] (coordinates) / 0.0005 [mm] (unit) = 24690 : 6072h (hexadecimal)

*2: 5.1 deg (coordinates) / 0.0005 deg (unit) = -10200 : FFFFD828h (hexadecimal)

Example: Error

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: executing
fbOut183	FFEF	Return Code 0: normal, FFEF: parameter error NOTE: This error occurs when there is no specified point.

■ Workpiece Adjustment Data (Z axis only) Settings (Command Code 1002h)
Specify the workpiece adjustment number and set the workpiece adjustment values. Command Code 1002h is a command that sets only the Z adjustment amount of the workpiece adjustment and can therefore be used for height direction adjustments.

Example: Lower the height of workpiece adjustment number 8 by 2 mm (set a workpiece adjustment amount of +2 mm)

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0: OFF→ON: execute command
fbIn103	1002	Command Code
fbIn104	0008	Workpiece Number
fbIn105 – fbIn106	fbIn105 : 07D0 fbIn106 : 0000	Z adjustment, 0.001 mm units Positive numbers adjust in the down direction, negative numbers adjust in the up direction Example: 2.000 mm (2000) : 7D0h*

The conversion expression from the coordinate to the value in parentheses ( ) is as follows:

* 2.000 [mm] (coordinates) / 0.001 [mm] (unit) = 2000 : 7D0h (hexadecimal)

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0: OFF: execution possible, ON: executing
fbOut183	0000	Return Code 0: normal, FFEF: parameter error NOTE: This error occurs when there is no specified workpiece adjustment.

■ Workpiece Adjustment Data (X/Y/Z/R/ θ) Settings (Command Code 1003h)
Command Code 1003h sets the values for the 5 parameters: X Adjustment, Y Adjustment, Z Adjustment, R Adjustment, Rotate Adjustment.

Example: Set workpiece adjustment number 8 with X Adjustment -2.3 mm, Y Adjustment -20.5 mm, Z Adjustment +2 mm, R Adjustment 0.5 deg, Rotate Adjustment 0.001 deg.

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0: OFF→ON: execute command
fbIn103	1003	Command Code
fbIn104	0008	Workpiece Adjustment Number
fbIn105 – fbIn106	fbIn105 : F704 fbIn106 : FFFF	X adjustment, 0.001 mm units Example: -2.300 mm (-2300) : FFFFF704h*1
fbIn107 – fbIn108	fbIn107 : AFEC fbIn108 : FFFF	Y adjustment, 0.001 mm units Example: -20.50 mm (-20500) : FFFFAFECh
fbIn109 – fbIn10A	fbIn109 : 07D0 fbIn10A : 0000	Z adjustment, 0.001 mm units Positive numbers in the down direction, negative numbers in the up direction Example: 2.000 mm (2000) : 7D0h
fbIn10B – fbIn10C	fbIn10B : 0032 fbIn10C : 0000	R adjustment, 0.01 deg units Example: 0.50 deg (50) : 32h*2
fbIn10D – fbIn10E	fbIn10D : 03E8 fbIn10E : 0000	Rotate adjustment 0.000001 deg units Example: 0.001 deg (1000) : 3E8h

The conversion expressions from the coordinates to the values in parentheses ( ) are as follows:

*1: -2.300 [mm] (coordinates) / 0.001[mm] (unit) = -2300 : FFFFF704h (hexadecimal)

*2: 0.50 deg (coordinates) / 0.01 deg (unit) = 50 : 32h (hexadecimal)

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0: OFF: execution possible, ON: executing
fbOut183	0000	Return Code 0: normal, FFEF: parameter error NOTE: This error occurs when there is no specified workpiece adjustment.

■ TCP Direct Settings (Command Code 1004h)

Use this code if directly setting the TCP.

Example: TCP settings for program number 8

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1004	Command code
fbIn104	0001 : Program data	Setting Destination 0 : All Program Common Settings 1 : Individual Program Settings 2 : Tool data 3 : All TCPs
fbIn105	0008 : Program number	Program Number or Tool Data Number For all program common settings, set to 0. For all TCPs, set to 0.
fbIn106 – fbIn107	fbIn106 : 07D0 fbIn107 : 0000	TCP-X, 0.001 mm units Example: 2.000 mm (2000) : 7D0h*
fbIn108 – fbIn109	fbIn108 : 079E fbIn109 : 0000	TCP-Y, 0.001 mm units Example: 1.950 mm (1950) : 79Eh
fbIn10A – fbIn10B	fbIn10A : 0000 fbIn10B : 0000	TCP-ΔZ, 0.001 mm units Example: 0 mm
fbIn10C – fbIn10D	fbIn10C : 0000 fbIn10D : 0000	TCP-ΔR, 0.001 deg units Example: 0 deg NOTE: Set this as 0.

The conversion expression from the coordinate to the value in parentheses ( ) is as follows:

* 2.000 [mm] (coordinates) / 0.001 [mm] (unit) = 2000 : 7D0h (hexadecimal)

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: executing
fbOut183	0000	Return Code bit0 : 0: normal, FFEF: parameter error NOTE: This error occurs when there is no specified program or tool data.

■ Set the TCP by Specifying 2 Points (Command Code 1005h)

With 4 axis specifications, when you change the R axis and specify the same point as previously specified, the TCP is set from these two positions.

The settings location and method of specifying the program number or tool number are the same as they are for command code 1004h. The 1st point and 2nd point positions are positions displayed in common data.

Example: TCP settings for program number 8

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1005	Command code
fbIn104	0001 : Program data	Setting Destination 0 : All Program Common Settings 1 : Individual Program Settings 2 : Tool data 3 : All TCPs
fbIn105	0008 : Program number	Program Number or Tool Data Number For all program common settings, set to 0. For all TCPs, set to 0.
fbIn106 – fbIn107	fbIn106 : BD30 fbIn107 : 0003	1st point, X coordinates, 0.0005 mm units Example: 122.520 mm (245040) : 3BD30h*1
fbIn108 – fbIn109	fbIn108 : 4340 fbIn109 : 0004	1st point, Y coordinates, 0.0005 mm units Example: 139.680 mm (279360) : 44340h
fbIn10A – fbIn10B	fbIn10A : A4B4 fbIn10B : 0001	1st point, Z coordinates, 0.0005 mm units Example: 53.850 mm (107700) : 1A4B4h
fbIn10C – fbIn10D	fbIn10C : 0000 fbIn10D : 0000	1st point, R coordinates, 0.0005deg units Example: 0 deg
fbIn10E – fbIn10F	fbIn10E : FD44 fbIn10F : 0004	2nd point, X coordinates, 0.0005 mm units Example: 163.490 mm (326980) : 4FD44h
fbIn110 – fbIn111	fbIn110 : A7B4 fbIn111 : 0003	2nd point, Y coordinates, 0.0005 mm units Example: 119.770 mm (239540) : 3A7B4h
fbIn112 – fbIn113	fbIn112 : AC48 fbIn113 : 0001	2nd point, Z coordinates, 0.0005 mm units Example: 54.820 mm (109640) : 1AC48h
fbIn114 – fbIn115	fbIn114 : BF20 fbIn115 : 0002	2nd point, R coordinates, 0.0005 deg units Example: 90.00 deg (180000) : 2BF20h*2

The conversion expressions from the coordinates to the values in parentheses ( ) are as follows:

*1: 122.520 [mm] (coordinates) / 0.0005 [mm] (unit) = 245040 : 3BD30h (hexadecimal)

*2: 90.00 deg (coordinates) / 0.0005deg (unit) = 180000 : 2BF20h (hexadecimal)

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: executing
fbOut183	0000	Return Code 0 : normal, FFEF : parameter error NOTE: This error occurs when there is no specified program or tool data.

■ Acquire Current Position Coordinates (Command Code 1010h)

This requests transmission of the robot's current position coordinates.

The robot returns the current positions (X coordinate, Y coordinate, Z coordinate and R coordinate values) in response to this request.

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1010	Command Code

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: executing
fbOut183	0000	Return Code 0: normal, FFEF: parameter error
fbOut184 – fbOut185	fbOut184 : 6072 fbOut185 : 0000	X coordinates, 0.0005 mm units Example: 12.345 mm (24690) : 6072h*1
fbOut186 – fbOut187	fbOut186 : 1A80 fbOut187 : 0006	Y coordinates, 0.0005 mm units Example: 200.000 mm (400000) : 61A80h
fbOut188 – fbOut189	fbOut188 : 6378 fbOut189 : 0001	Z coordinates, 0.0005 mm units Example: 45.500 mm (91000) : 16378h
fbOut18A – fbOut18B	fbOut18A : D828 fbOut18B : FFFF	R coordinates, 0.0005 deg units Example: -5.100 deg (-10200) : FFFFD828h*2

The conversion expressions from the coordinates to the values in parentheses ( ) are as follows:

*1: 12.345 [mm] (coordinates) / 0.0005 [mm] (unit) = 24690 : 6072h (hexadecimal)

*2: -5.100 deg (coordinates) / 0.0005 deg (unit) = -10200 : FFFFD828h (hexadecimal)

■ Acquire Tool Tip Position (Command Code 1011h)

This requests transmission of the robot's current tool tip position.

The robot returns the current positions (X coordinate, Y coordinate, Z coordinate and R coordinate values) in response to this request.

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1011	Command Code

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: executing
fbOut183	0000	Return Code 0: normal, FFEF: parameter error
fbOut184 – fbOut185	fbOut184 : 7C3E fbOut185 : 0004	X coordinates, 0.0005 mm units Example: 146.975 mm (293950) : 47C3Eh*
fbOut186 – fbOut187	fbOut186 : A3B8 fbOut187 : 0007	Y coordinates, 0.0005 mm units Example: 250.332 mm (500664) : 7A3B8h
fbOut188 – fbOut189	fbOut188 : 0000 fbOut189 : 0000	Z coordinates, 0.0005 mm units Example: 0 mm
fbOut18A – fbOut18B	fbOut18A : 0000 fbOut18B : 0000	R coordinates, 0.0005 deg units Example: 0 deg

The conversion expression from the coordinate to the value in parentheses ( ) is as follows:

* 146.975 [mm] (coordinates) / 0.0005 [mm] (unit) = 293950 : 47C3Eh (hexadecimal)

■ Acquire TCP Specified Tool Tip Position (Command Code 1012h)

This command transmits the TCP values and requests transmission of the tool tip position. The robot returns the current positions (X coordinate, Y coordinate, Z coordinate and R coordinate values) in response to this request.

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1012	Command Code
fbIn104 – fbIn105	fbIn104 : 07D0 fbIn105 : 0000	TCP-X, 0.001 mm units Example: 2.000 mm (2000) : 7D0h*
fbIn106 – fbIn107	fbIn106 : 079E fbIn107 : 0000	TCP-Y, 0.001 mm units Example: 1.950 mm (1950) : 79Eh
fbIn108 – fbIn109	fbIn108 : 0000 fbIn109 : 0000	TCP-ΔZ, 0.001 mm units Example: 0 mm
fbIn10A – fbIn10B	fbIn10A : 0000 fbIn10B : 0000	TCP-ΔR, 0.001 deg units Example: 0 deg NOTE: Set this as 0.

The conversion expression from the coordinate to the value in parentheses ( ) is as follows:

* 2.000 [mm] (coordinates) / 0.001 [mm] (unit) = 2000 : 7D0h (hexadecimal)

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: execution possible, ON: Executing
fbOut183	0000	Return Code 0: normal, FFEF: parameter error
fbOut184 – fbOut185	fbOut184 : 0FA0 fbOut185 : 0000	X coordinates, 0.0005 mm units Example: 2.000 mm (4000) : FA0h
fbOut186 – fbOut187	fbOut186 : 0F3C fbOut187 : 0000	Y coordinates, 0.0005 mm units Examples: 1.950 mm (3900) : F3Ch
fbOut188 – fbOut189	fbOut188 : 0000 fbOut189 : 0000	Z coordinates, 0.0005 mm units Examples: 0 mm
fbOut18A – fbOut18B	fbOut18A : 0000 fbOut18B : 0000	R coordinates, 0.0005 deg units Example: 0 deg

■ Acquire the Adjustment Amount for the Workpiece Adjustment (Command Code 1013h)
This returns the adjustment amount of the workpiece adjustment (1 – 3000) in response to the run information request.
This also returns whether the specified workpiece number is defined (valid) or not (invalid). If the number is out of range, this is also returned as invalid.

Example: Workpiece Adjustment 15, numerical input type, X adjustment -2.3 mm, Y adjustment -20.5 mm, Z adjustment +2 mm, R adjustment 0.5 deg, rotate adjustment 0.001 deg

Register Number	Data (hex)	Function
fbIn102		Command Instruction bit0 : OFF→ON: execute command
fbIn103	1013	Command Code
fbIn104	000F	Workpiece Adjustment Number Example: 15 : 0Fh

Example: Normal

Register Number	Data (hex)	Function
fbOut182		Command Response bit0 : OFF: Execution possible, ON: Executing
fbOut183		Return Code 0: normal, FFEF: parameter error
fbOut184	0001	Valid/Invalid Definition*1 0: Invalid 1: Valid
fbOut185	0000	Workpiece Adjustment Type 0: Numerical Input 1: Camera Adjustment
fbOut186 – fbOut187	fbOut186 : F704 fbOut187 : FFFF	X adjustment, 0.001 mm units Example: -2.300 mm (-2300) : FFFFF704h*2
fbOut188 – fbOut189	fbOut188 : AFEC fbOut189 : FFFF	Y adjustment, 0.001 mm units Example: -20.500 mm (-20500) : FFFFAFECh
fbOut18A – fbOut18B	fbOut18A : 07D0 fbOut18B : 0000	Z adjustment, 0.001 mm units Positive numbers in the down direction, negative numbers in the up direction Example: 2.000 mm (2000) : 7D0h
fbOut18C – fbOut18D	fbOut18C : 0032 fbOut18D : 0000	R adjustment, 0.01deg units Example: 0.50 deg (50) : 32h*3
fbOut18E – fbOut18F	fbOut18E : 03E8 fbOut18F : 0000	Rotate adjustment 0.000001 deg units Example: 0.001 deg (1000) : 3E8h
fbOut190 – fbOut191	fbOut190 : 03E8 fbOut191 : 0000	Z adjustment standard data 0.001 mm units Examples: 1.000 mm (1000) : 3E8h

*1: This returns whether the specified workpiece number is defined (Valid) or not (Invalid). If the number is out of range, this is also returned as invalid.

The conversion expressions from the coordinates to the values in parentheses ( ) are as follows:
*2: -2.300 [mm] (coordinates) / 0.001 [mm] (unit) = -2300 : FFFFF704h (hexadecimal)
*3: 0.50 deg (coordinates) / 0.01 deg (unit) = 50 : 32h (hexadecimal)

8. I/O-1

I/O-1 controls the robot by point jobs/PLC programs.

8.1 Connector

There are two types of I/O polarity: NPN Specifications and PNP specifications. After confirming your robot's polarity specifications, always connect tools, etc., which are compatible with these specifications.

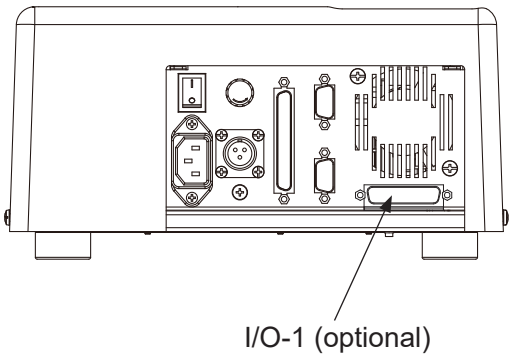
■ I/O Polarity
When connecting an external device, make sure it is compatible with the I/O polarity.
The robot's I/O polarity can be confirmed on the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications*.

■ I/O Power Supply Indication
- External
  The power supply (DC 24 V) for a device connected to the I/O-1 is supplied externally. Prepare a separate I/O power supply.
- Internal
  The power supply (DC 24 V) for a device connected to the I/O-1 is output from the I/O-1 connector.

NOTE:
- I/O power supply type (External/Internal) is selected when you purchase the robot and cannot be changed after doing so.
- If you are using the JR3200 equipped with I/O-MT, you cannot use I/O-1.

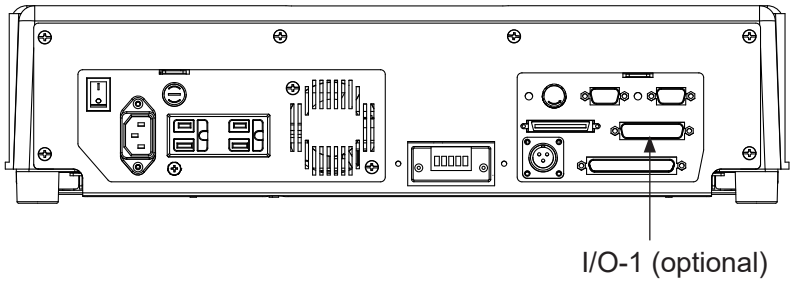
JR3200 Series

Example: JR3203N-AC



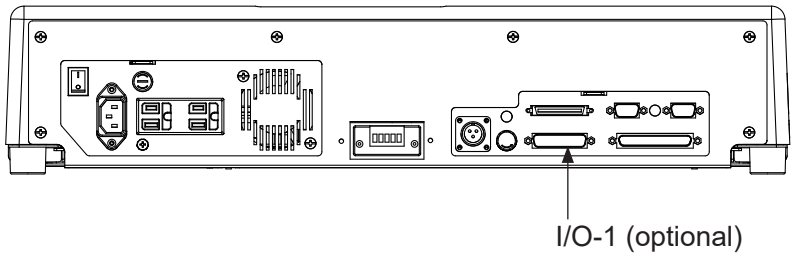
JR3300 Series

Example: JR3303N-AC

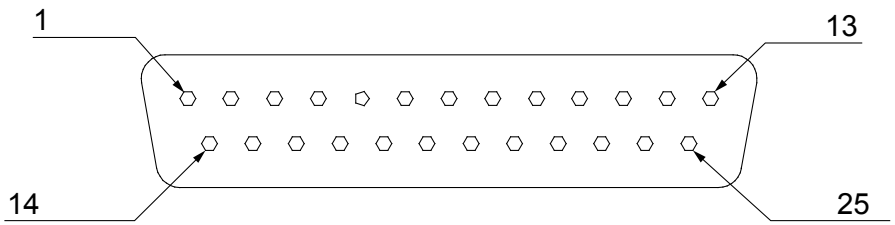


JR3400 – JR3600 Series

Example: JR3403N-AC



8.2 Pin No. (Robot Side)



NOTE: When connecting an external device, make sure it is compatible with the I/O polarity. The robot's I/O polarity can be confirmed on the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications*.

8.3 Function Assignment List

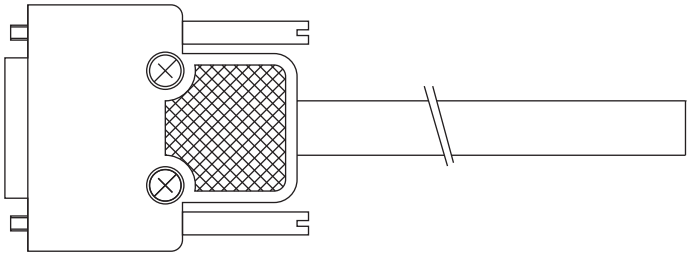
	Name	Function	Pin No.
Input	#genIn1	Free	1
	#genIn2	Free	2
	#genIn3	Free	3
	#genIn4	Free	4
	#genIn5	Free	5
	#genIn6	Free	6
	#genIn7	Free	7
	#genIn8	Free	8
Output	#genOut1	Free	9, 10
	#genOut2	Free	11, 12
	#genOut3	Free	13, 14
	#genOut4	Free	15, 16
	#genOut5	Free	17
	#genOut6	Free	18
	#genOut7	Free	19
	#genOut8	Free	20
Others	COM+	DC 24 V Power Supply	21
	COM+	DC 24 V Power Supply	22
	COM-	GND	23
	COM-	GND	24

8.4 I/O2 Cord (Unit)

■ I/O2 Cord (Unit) (optional)

NOTE: The part number varies according to the cable length.

Cable Length [m]	Janome Part No.
2	982544013
3	982544312
5	982544415



Cable Wiring

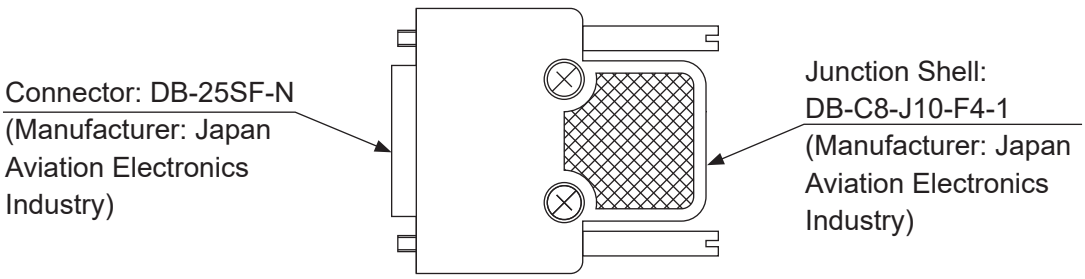
Pin No.	Insulator Color	Mark Color	Number of Marks
1	Blue		
2	Orange		
3	Green		
4	Brown		
5	Gray		
6	Red		
7	Black		
8	Yellow		
9	Pink		
10	Purple		
11	White		
12	Blue	Red	1
13	Orange	White	1

Pin No.	Insulator Color	Mark Color	Number of Marks
14	Green	White	1
15	Brown	White	1
16	Gray	White	1
17	Red	White	1
18	Black	White	1
19	Yellow	Black	1
20	Pink	Black	1
21	Purple	White	1
22	White	Blue	1
23	Blue	Red	2
24	Orange	White	2
25	Not connected		

If you connect an external device to I/O-1, make sure to check the wiring before turning ON the electricity.
Refer to “2.4 Wiring Layout Check (NPN)” or “2.5 Wiring Layout Check (PNP).”

■ Connector (Unit) (I/O2) (optional)

Janome part No.: 961513007



8.5 Power Supply Capacity

⚠ Caution

Adhere to the rated amperage outlined in the table below. If you exceed the values listed below, the internal circuits may be damaged.

Use the following capacities for both the internal and external power sources:

		Type	Output/Input Rated Value
Output Pins	I/O-1(#genOut1 – #genOut4)	Relay	DC 30 V, 1 A/pin
	I/O-1(#genOut5 – #genOut8)	Photocoupler	DC 24 V, 100 mA/pin
Input Pins		Photocoupler	DC 24 V, 10 mA/pin

I/O-1 (#genOut1 – #genOut4) are relay outputs (no-voltage contact output).

If using an external power supply (DC 24 V), prepare on the user's end.

If using an internal power supply, use a power capacity no higher than the following:

DC 24 V, 1.6 A (I/O-SYS+I/O-1 composite total)

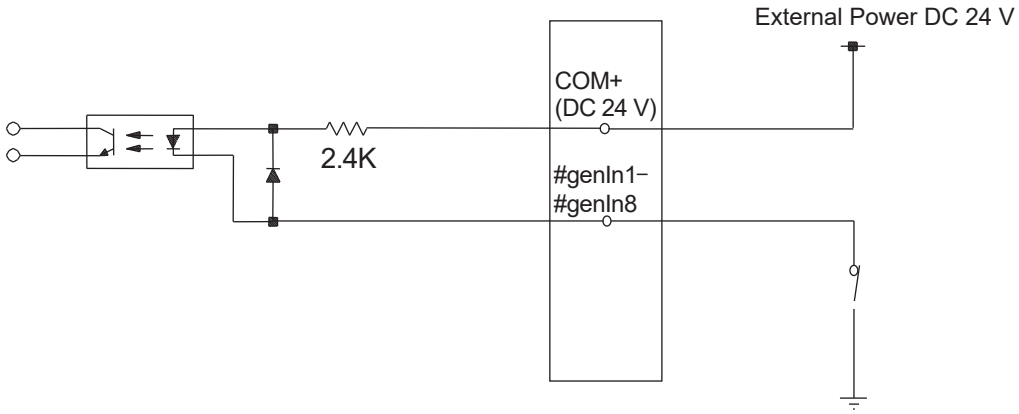
NOTE: The capacity of the internal power supply fuses is 1.6 A. If you use and exceed 1.6 A, the fuses will blow. If a fuse blows, refer to "5. REPLACING FUSES" in the operation manual *Maintenance*.

8.6 Input Signal (NPN)

■ When using an external power supply

Input signals are treated as active when the photocoupler is ON.

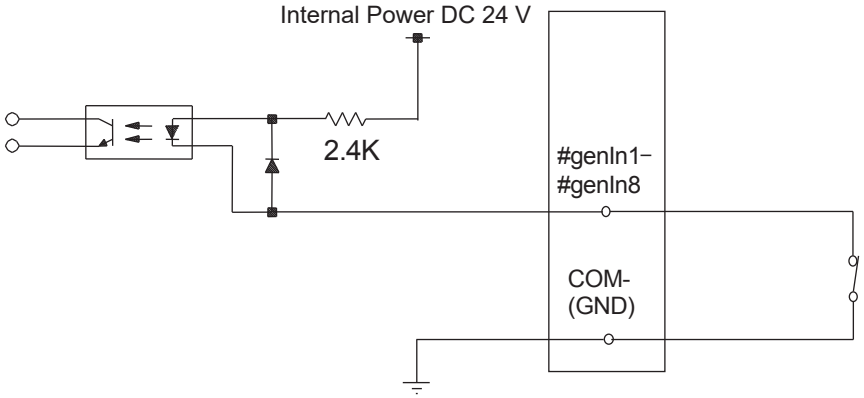
When using an external power supply, the input signals become active when the input pin and the external power supply ground are ON.



■ When using an internal power supply (optional)

Input signals are treated as active when the photocoupler is ON.

When using an internal power supply, the input signals become active if the input pin and the COM- pin are shorted.



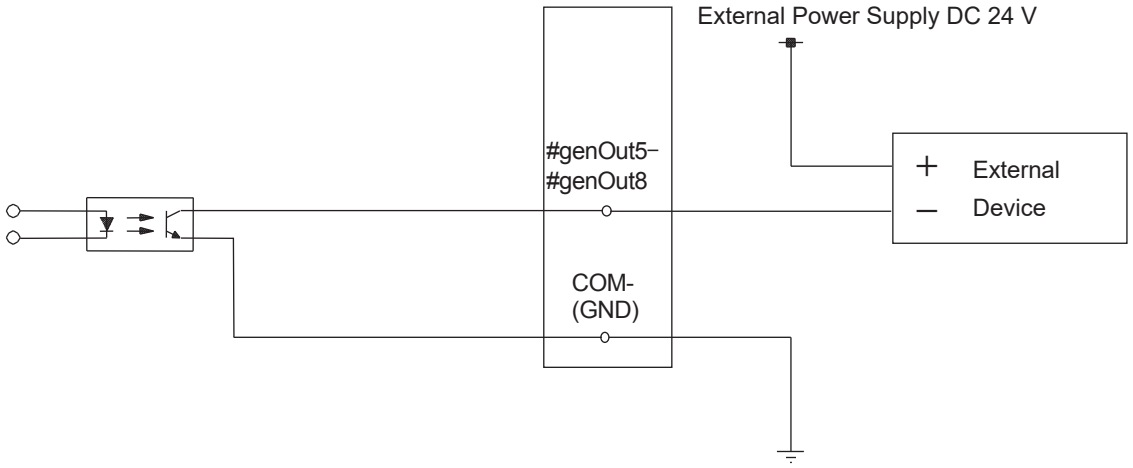
If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3 mA. If you use a device with a leakage current of more than 0.3 mA, it may not turn OFF.

⚠ Caution

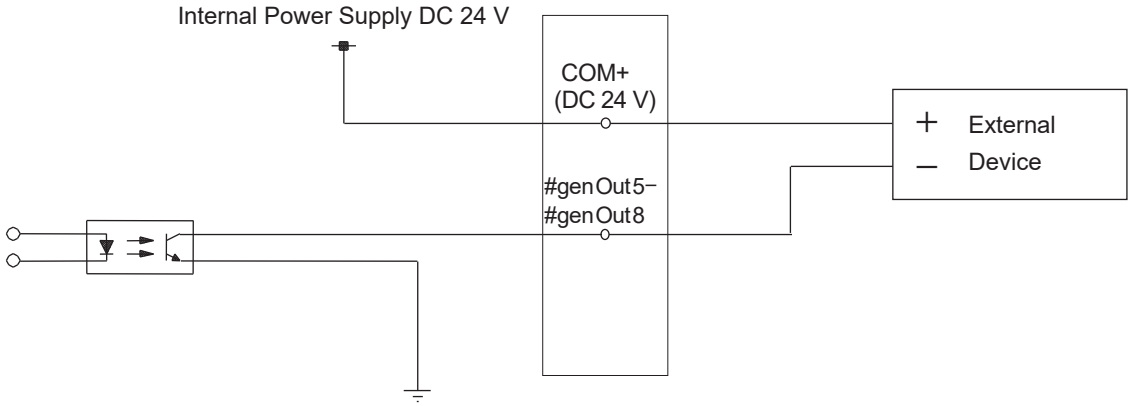
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

8.7 Output Signal (NPN)

■ When using an external power supply



■ When using an internal power supply (optional)

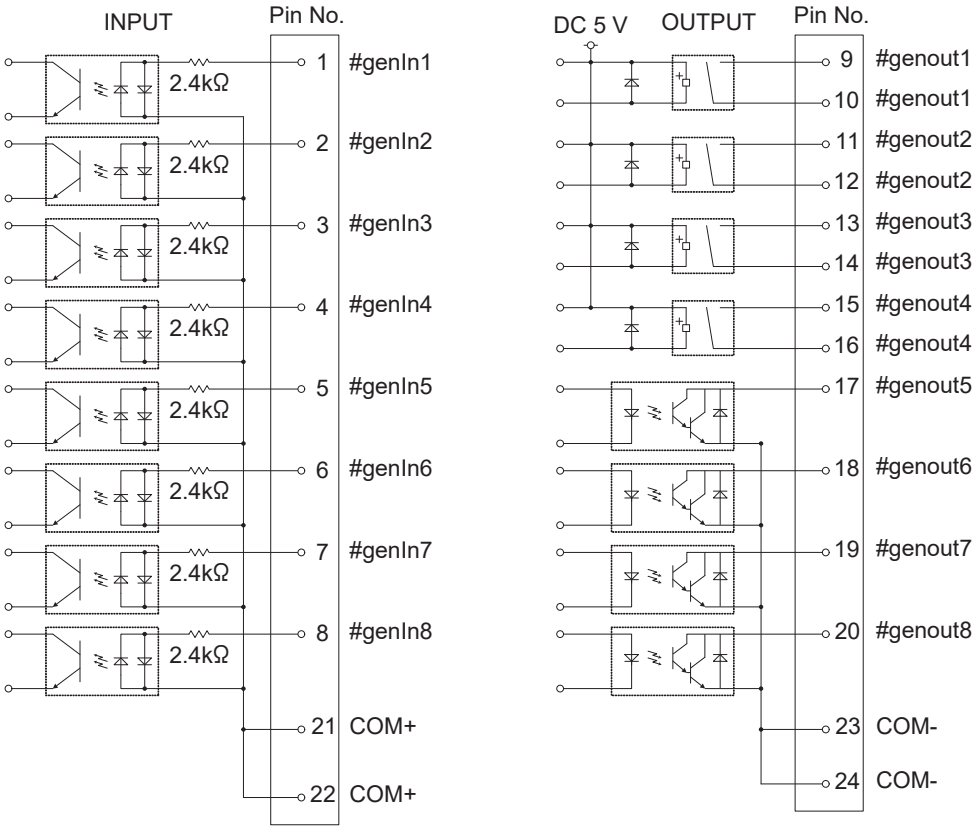


⚠ Caution

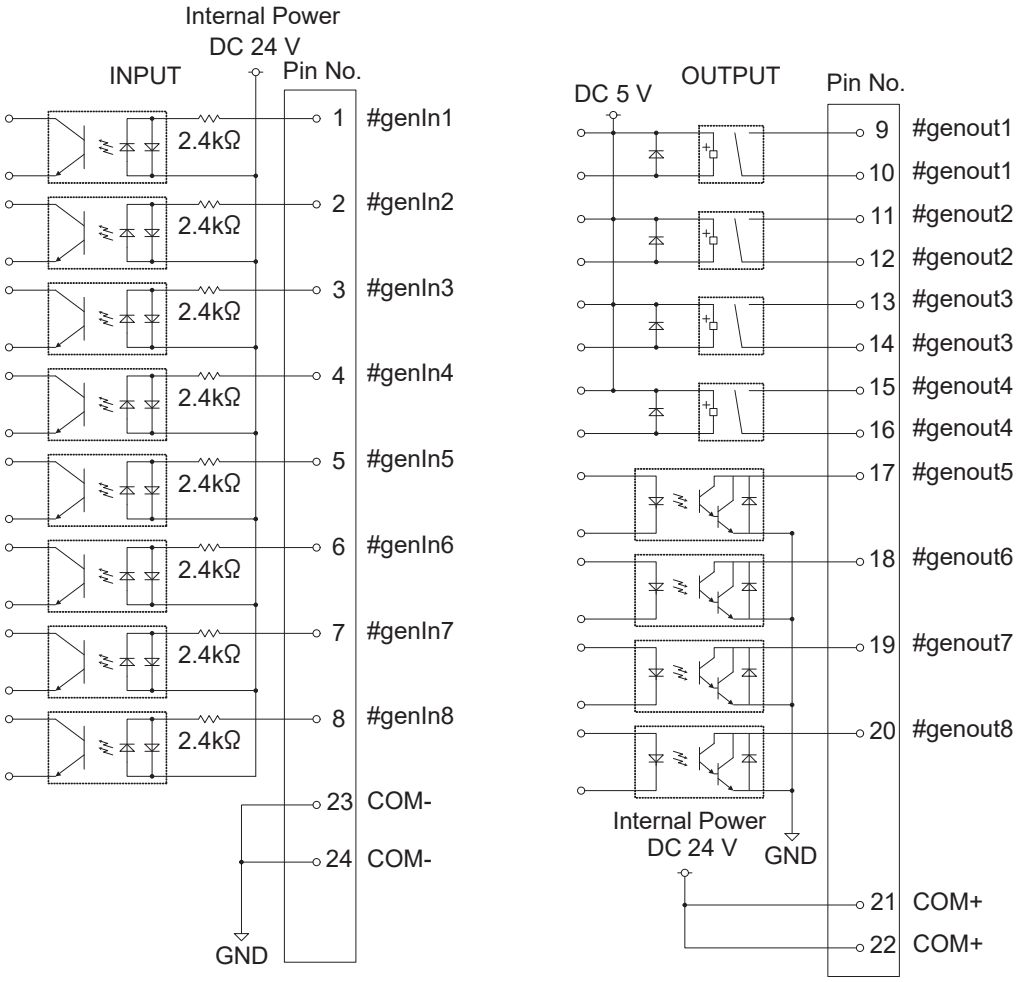
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

8.8 Circuit Diagram (NPN)

■ External Power Supply Specifications



■ Internal Power Supply Specifications (optional)

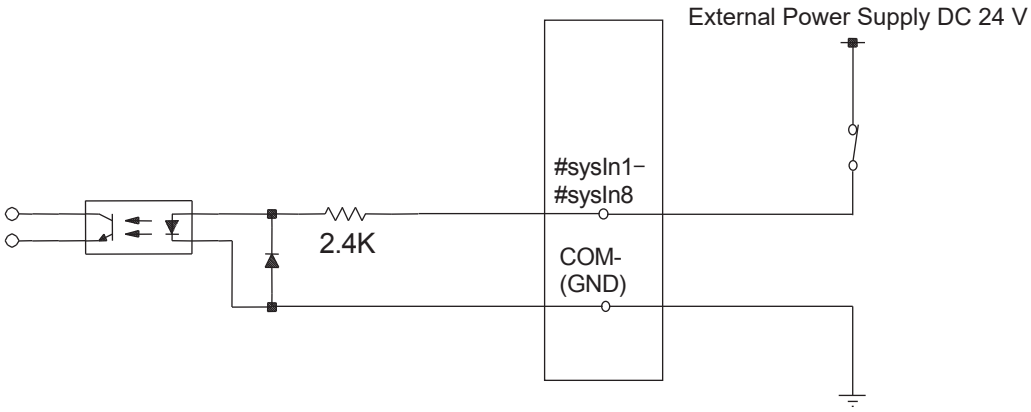


8.9 Input Signal (PNP)

■ When using an external power supply

Input signals are treated as active when the photocoupler is ON.

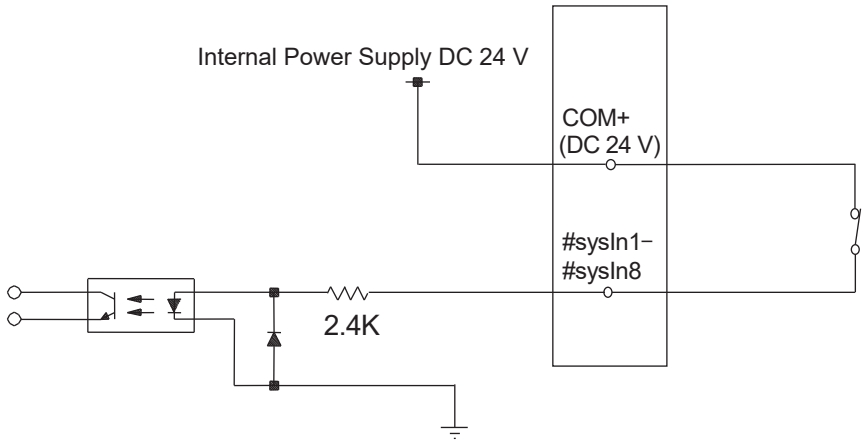
When using an external power supply, the input signals become active if the input pin and the external power supply are ON.



■ When using an internal power supply (optional)

Input signals are treated as active when the photocoupler is ON.

When using an internal power supply, the input signals become active if the input pin and the COM+ pin are ON.



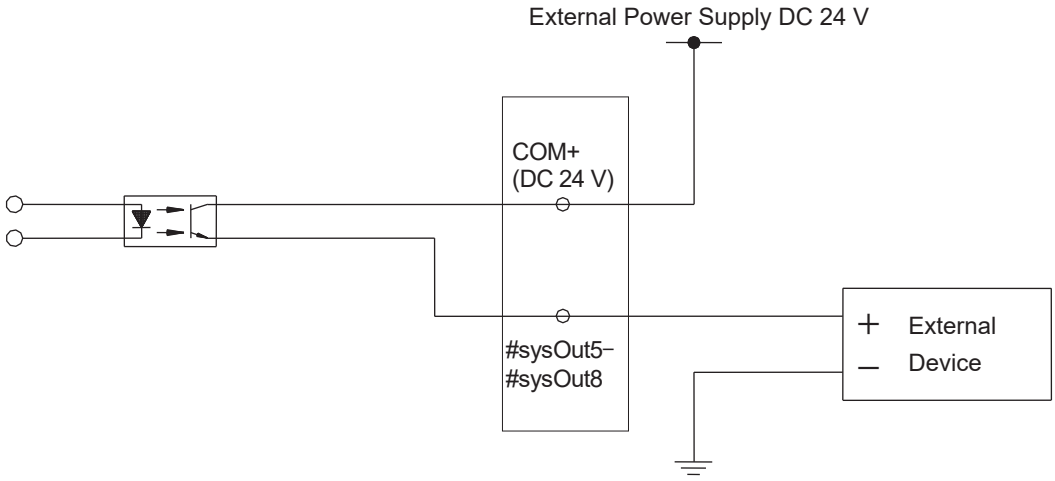
If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3 mA. If you use a device with a leakage current of more than 0.3 mA, it may not turn OFF.

⚠ Caution

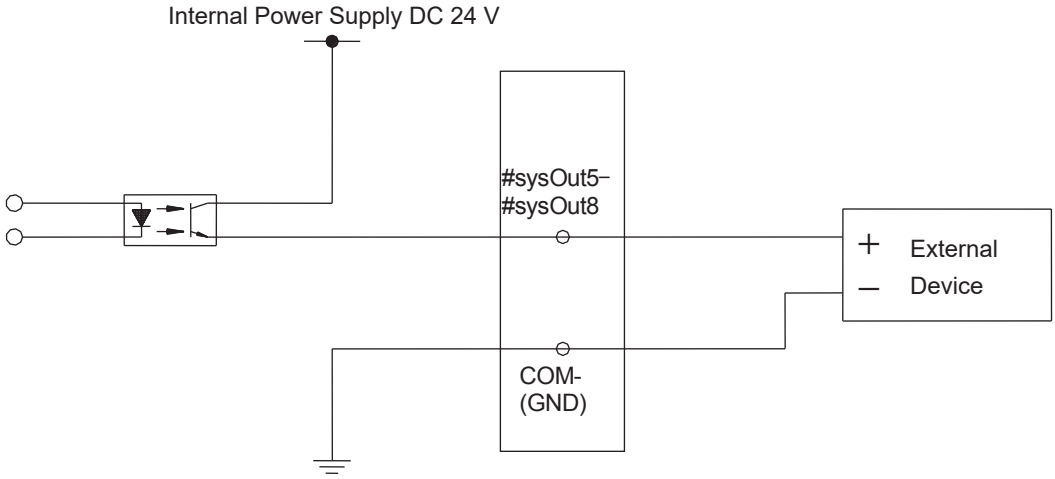
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

8.10 Output Signal (PNP)

■ When using an external power supply



■ When using an internal power supply (optional)

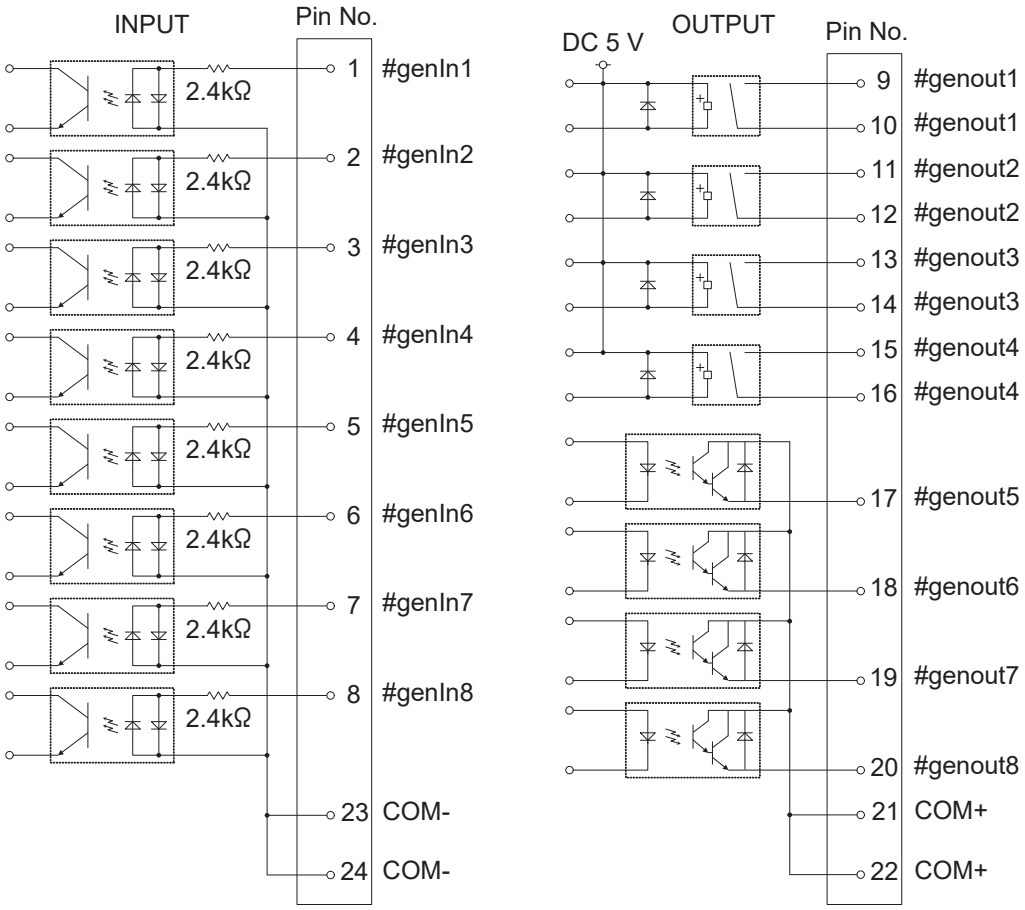


⚠ Caution

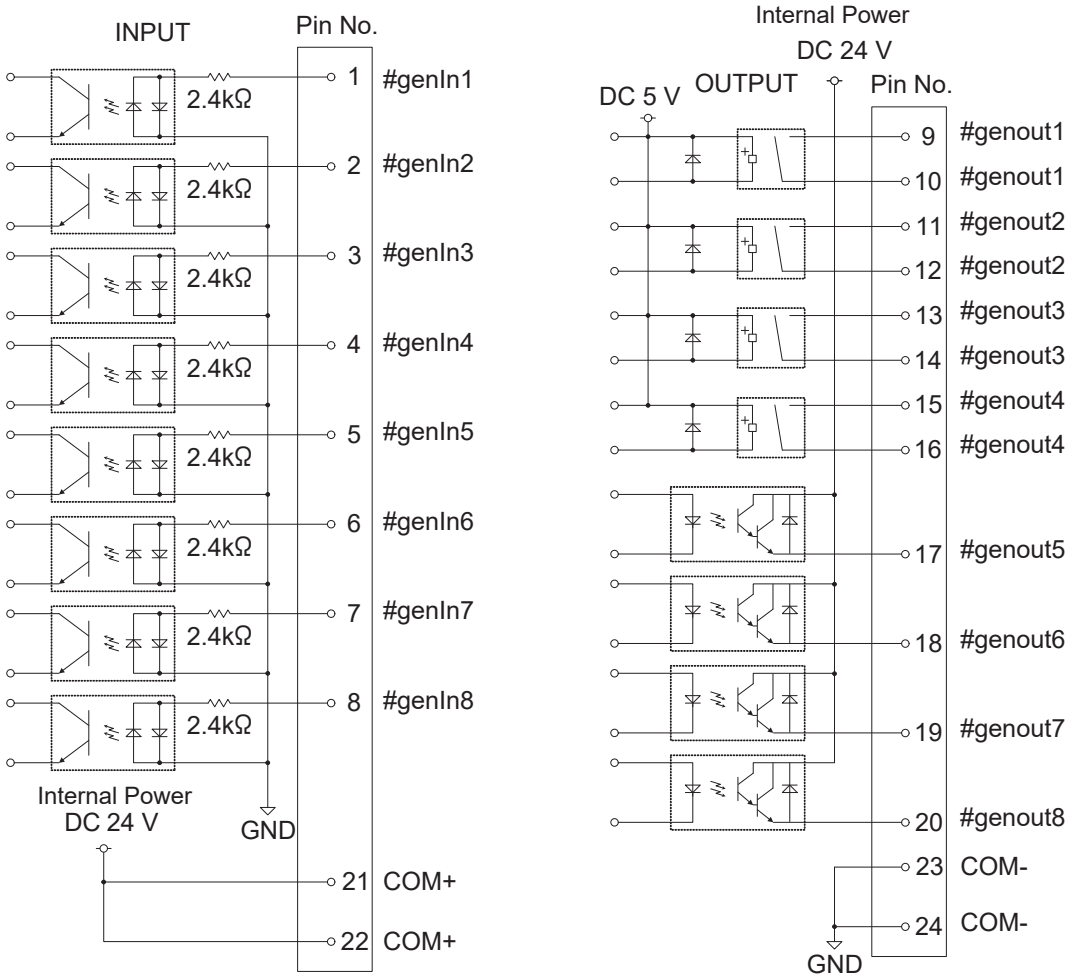
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

8.11 Circuit Diagram (PNP)

■ External Power Supply Specifications



■ Internal Power Supply Specifications (optional)

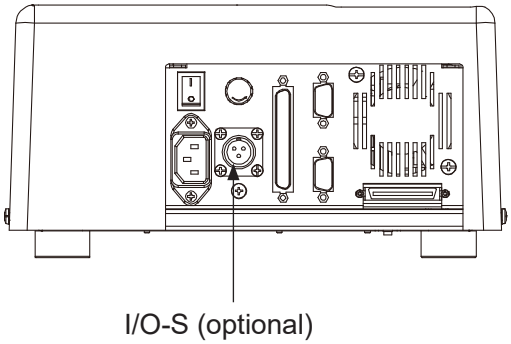


9. I/O-S

9.1 Connector

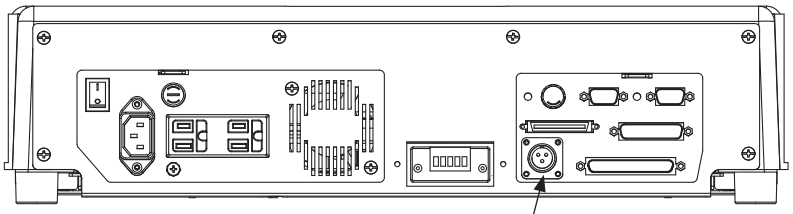
JR3200 Series

Example: JR3203N-AC/BC/CC



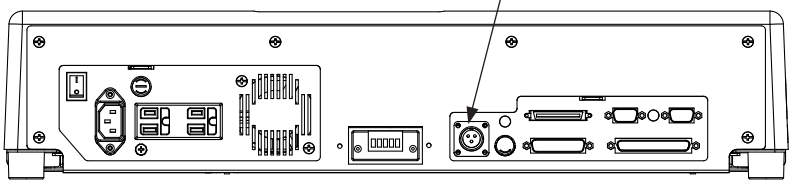
JR3300 Series

Example: JR3303N-AC/BC/CC

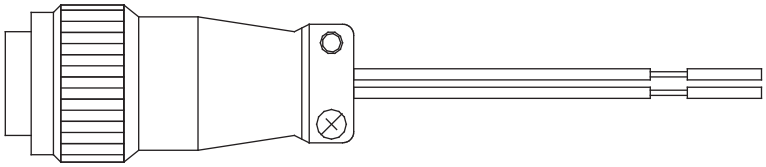


JR3400 – JR3600 Series

Example: JR3403N-AC/BC/CC



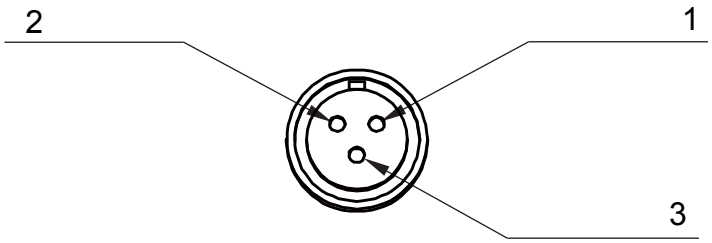
The I/O-S connector attachment is included for connecting a safety device, such as an area sensor, to the robot. Correctly connect the lead wires from the safety device to the I/O-S connector.
For further information, refer to “9.3 Safety Device” and the safety device’s instruction manual.



Connector type: SRCN6A13-3P (Manufacturer: Japan Aviation Electronics Industry)

NOTE: If you are not connecting a safety device, connect the I/O-S connector with the two lead wires short-circuited.

9.2 Pin No. (Robot Side)



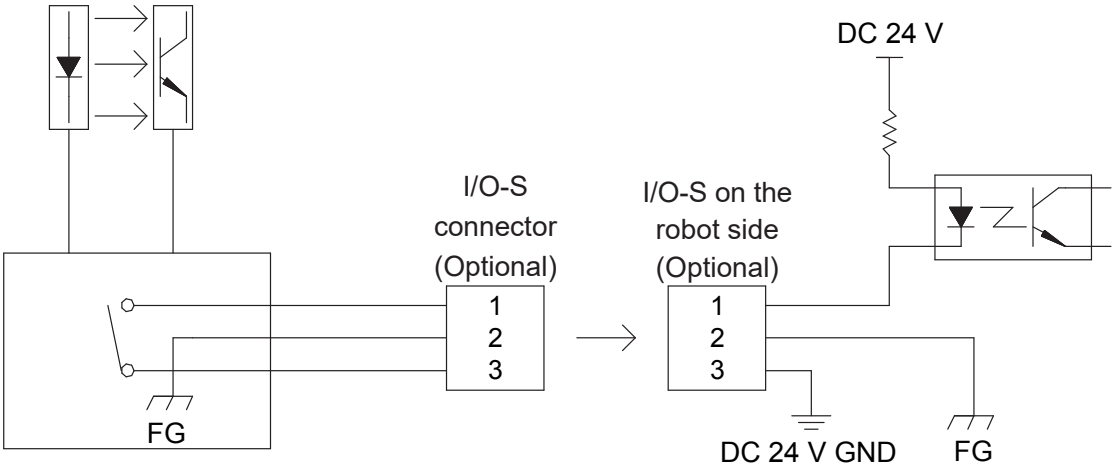
⚠ Caution

A person entering the operating range of the robot may be injured.
Install an area sensor, etc., interlock using the I/O-S connector and maintain safety precautions at all times.

9.3 Safety Device

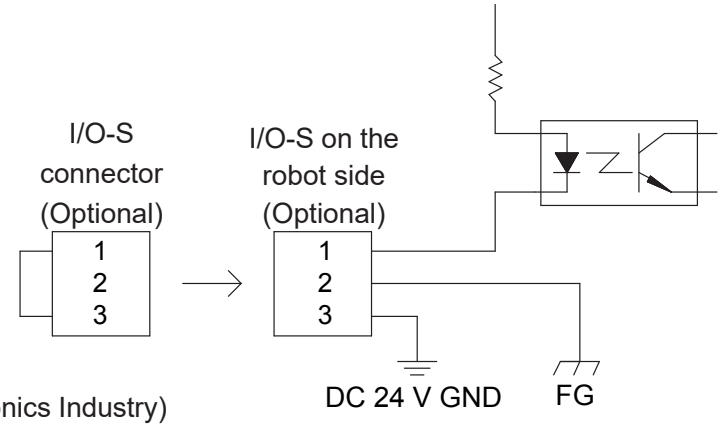
With this desktop robot the end user can connect a safety device such as an area sensor or door switch, etc., when there is a risk of danger due to some part of the body entering the robot's work area.
I/O-S is an interface for connecting such a safety device. If you want to connect a safety device, do so as shown in the diagram below, and perform the risk assessment on your side. A stop performed via a safety device connected to the robot is classified as an emergency stop category 2.

■ When setting up a safety device (Example: Area Sensor)
Connect the safety device to the robot with the I/O-S connector by attaching the lead wires properly to the corresponding terminals of the I/O-S connector. For further information, refer to "9.2 Pin No. (Robot Side)" and the safety device's instruction manual.



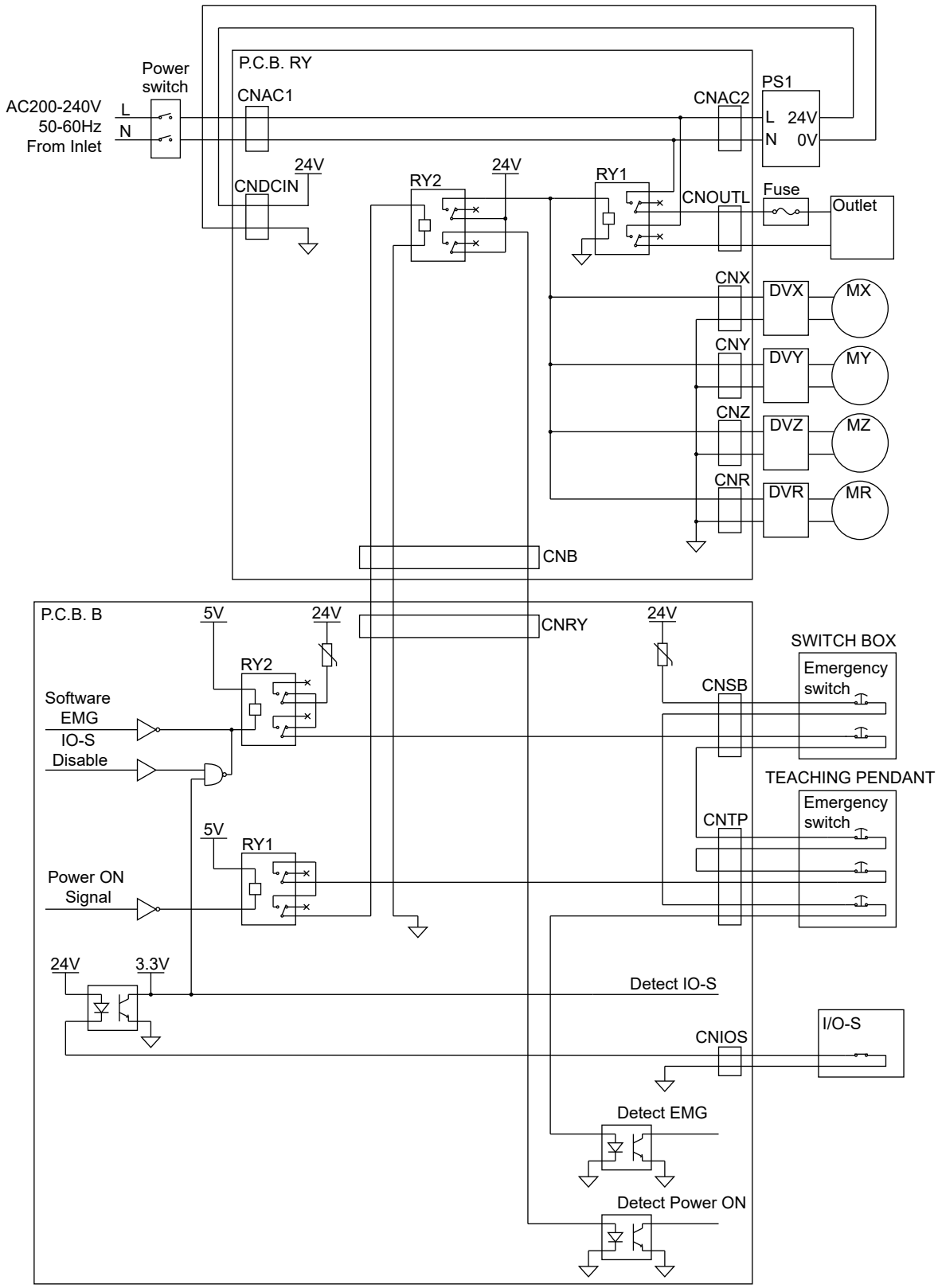
Connector type
SRCN6A13-3P (Manufacturer: Japan Aviation Electronics Industry)
NOTE: For the configuration of the internal safety circuit, refer to "Safety Circuit" on the next page.

■ When not connecting a safety device
Connect the I/O-S connector with the two lead wires short-circuited.



Connector type: SRCN6A13-3P
(Manufacturer: Japan Aviation Electronics Industry)

■ Safety Circuit



10. I/O-MT

I/O-MT is a connector that connects and controls externally attached devices such as a motor driver for the motor etc. You can set up I/O functions and resolution etc. according to the devices you have. For further details, refer to the operation manual *Auxiliary Axis Functions*.

10.1 Connector

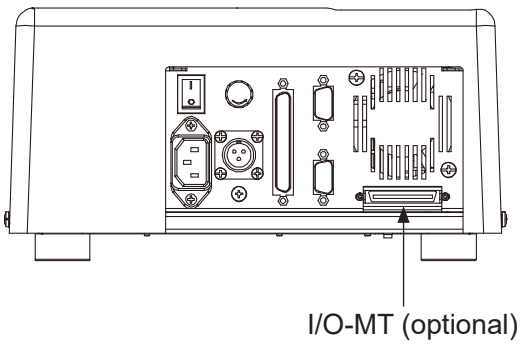
There are two types of I/O polarity: NPN specifications and PNP specifications. After confirming your robot's polarity specifications, always connect tools, etc., which are compatible with these specifications.

■ I/O Polarity
If you are connecting external devices, make sure they are compatible with your robot's I/O polarity. The robot's I/O polarity can be confirmed on the I/O nameplate. Refer to "3.1 I/O Polarity" in the operation manual *Specifications*.

■ I/O Power Supply
The power supply (DC 24 V) for an external device connected to the I/O-MT is supplied externally. Prepare a separate I/O power supply.

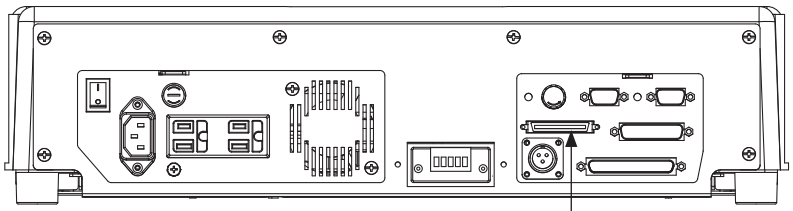
NOTE: If you are using a JR3200 equipped with I/O-MT, you cannot use I/O-1.

JR3200 Series
Example: JR3203N-AC/BC/CC



JR3300 Series

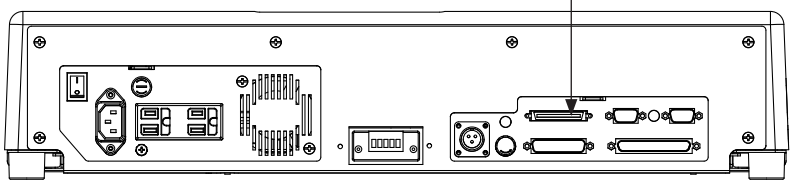
Example: JR3303N-AC/BC/CC



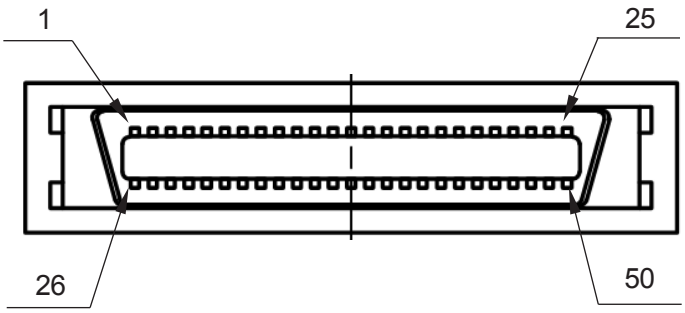
I/O-MT (optional)

JR3400 – JR3600 Series

Example: JR3403N-AC/BC/CC



10.2 Pin No. (Robot Side)



Connector Model Number: PCR-E50PMC (Manufacturer: Honda Tsushin Kogyo)

10.3 Function Assignment (NPN)

		Name	Function	Pin No.
MT1	Input	MT1 Input 1	Refer to the operation manual *Auxiliary Axis Functions*.	13
		MT1 Input 2		12
		MT1 Input 3		11
		MT1 Input 4		10
		MT1 Input 5		9
		MT1 Input 6		8
		MT1 Input 7		7
		MT1 Input 8		6
		MT1 Input COM+		20
	Sensor Input	MT1 Sensor Input 2		4
		MT1 Sensor Input 1		22
		MT1 Sensor COM-		23
		MT1 Sensor COM+		25
	Output	MT1 Output 1		14
		MT1 Output 2		15
		MT1 Output 3		16
		MT1 Output 4		17
		MT1 Output 5		18
		MT1 Output 6		19
		MT1 Output COM-		21
	Pulse Output	MT1 Pulse Output 1		1
		MT1 Pulse Output 2		2
		MT1 Pulse Output COM-		3
		MT1 Pulse Output COM+		24
	Other	GND	GND	5

		Name	Function	Pin No.
MT2	Input	MT2 Input 1	Refer to the operation manual *Auxiliary Axis Functions*.	38
		MT2 Input 2		37
		MT2 Input 3		36
		MT2 Input 4		35
		MT2 Input 5		34
		MT2 Input 6		33
		MT2 Input 7		32
		MT2 Input 8		31
		MT2 Input COM+		45
	Sensor Input	MT2 Sensor Input 2		29
		MT2 Sensor Input 1		47
		MT2 Sensor COM-		48
		MT2 Sensor COM+		50
	Output	MT2 Output 1		39
		MT2 Output 2		40
		MT2 Output 3		41
		MT2 Output 4		42
		MT2 Output 5		43
		MT2 Output 6		44
		MT2 Output COM-		46
	Pulse Output	MT2 Pulse Output 1		26
		MT2 Pulse Output 2		27
		MT2 Pulse Output COM-		28
		MT2 Pulse Output COM+		45
	Other	GND	GND	30

10.4 Function Assignment (PNP)

		Name	Function	Pin No.
MT1	Input	MT1 Input 1	Refer to the operation manual *Auxiliary Axis Functions*.	13
		MT1 Input 2		12
		MT1 Input 3		11
		MT1 Input 4		10
		MT1 Input 5		9
		MT1 Input 6		8
		MT1 Input 7		7
		MT1 Input 8		6
		MT1 Input COM-		20
	Sensor Input	MT1 Sensor Input 2		4
		MT1 Sensor Input 1		22
		MT1 Sensor COM-		23
		MT1 Sensor COM+		25
	Output	MT1 Output 1		14
		MT1 Output 2		15
		MT1 Output 3		16
		MT1 Output 4		17
		MT1 Output 5		18
		MT1 Output 6		19
		MT1 Output COM+		21
	Pulse Output	MT1 Pulse Output 1		1
		MT1 Pulse Output 2		2
		MT1 Pulse Output COM-		3
		MT1 Pulse Output COM+		24
	Other	GND	GND	5

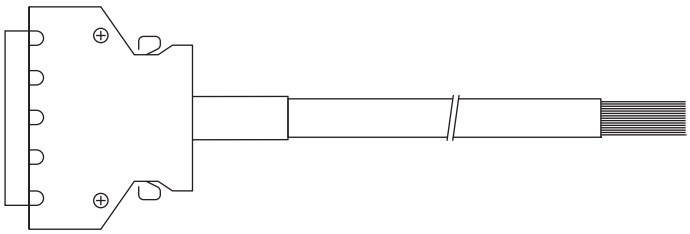
		Name	Function	Pin No.
MT2	Input	MT2 Input 1	Refer to the operation manual *Auxiliary Axis Functions*.	38
		MT2 Input 2		37
		MT2 Input 3		36
		MT2 Input 4		35
		MT2 Input 5		34
		MT2 Input 6		33
		MT2 Input 7		32
		MT2 Input 8		31
		MT2 Input COM-		45
	Sensor Input	MT2 Sensor Input 2		29
		MT2 Sensor Input 1		47
		MT2 Sensor COM-		48
		MT2 Sensor COM+		50
	Output	MT2 Output 1		39
		MT2 Output 2		40
		MT2 Output 3		41
		MT2 Output 4		42
		MT2 Output 5		43
		MT2 Output 6		44
		MT2 Output COM+		46
	Pulse Output	MT2 Pulse Output 1		26
		MT2 Pulse Output 2		27
		MT2 Pulse Output COM-		28
		MT2 Pulse Output COM+		49
	Other	GND	GND	30

10.5 I/O-MT Option Cord (Unit)

■ I/O-MT Option Cord (Unit) (optional)

NOTE: The part number varies according to the cable length.

Cable Length [m]	Janome Part No.
0.5	170551104
1	170551207
3	170551001
5	170551300

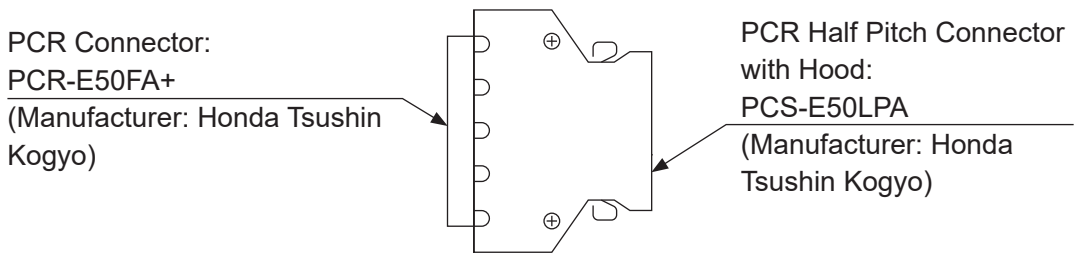


Cable Wiring

Pin No.	Cord Color (Dot)	Pin No.	Cord Color (Dot)	Pin No.	Cord Color (Dot)
1	Orange (Black 1)	18	Yellow (Red 2)	35	White (Black 4)
2	Orange (Red 1)	19	Pink (Black 2)	36	White (Red 4)
3	Gray (Black 1)	20	Pink (Red 2)	37	Yellow (Black 4)
4	Gray (Red 1)	21	Orange (Black 3)	38	Yellow (Red 4)
5	White (Black 1)	22	Orange (Red 3)	39	Pink (Black 4)
6	White (Red 1)	23	Gray (Black 3)	40	Pink (Red 4)
7	Yellow (Black 1)	24	Gray (Red 3)	41	Orange (Black continuous)
8	Yellow (Red 1)	25	White (Black 3)	42	Orange (Red continuous)
9	Pink (Black 1)	26	White (Red 3)	43	Gray (Black continuous)
10	Pink (Red 1)	27	Yellow (Black 3)	44	Gray (Red continuous)
11	Orange (Black 2)	28	Yellow (Red 3)	45	White (Black continuous)
12	Orange (Red 2)	29	Pink (Black 3)	46	White (Red continuous)
13	Gray (Black 2)	30	Pink (Red 3)	47	Yellow (Black continuous)
14	Gray (Red 2)	31	Orange (Black 4)	48	Yellow (Red continuous)
15	White (Black 2)	32	Orange (Red 4)	49	Pink (Black continuous)
16	White (Red 2)	33	Gray (Black 4)	50	Pink (Red continuous)
17	Yellow (Black 2)	34	Gray (Red 4)		

■ I/O-MT Connector (Unit) (optional)

Janome Part No.: 170554004



10.6 Power Supply Capacity

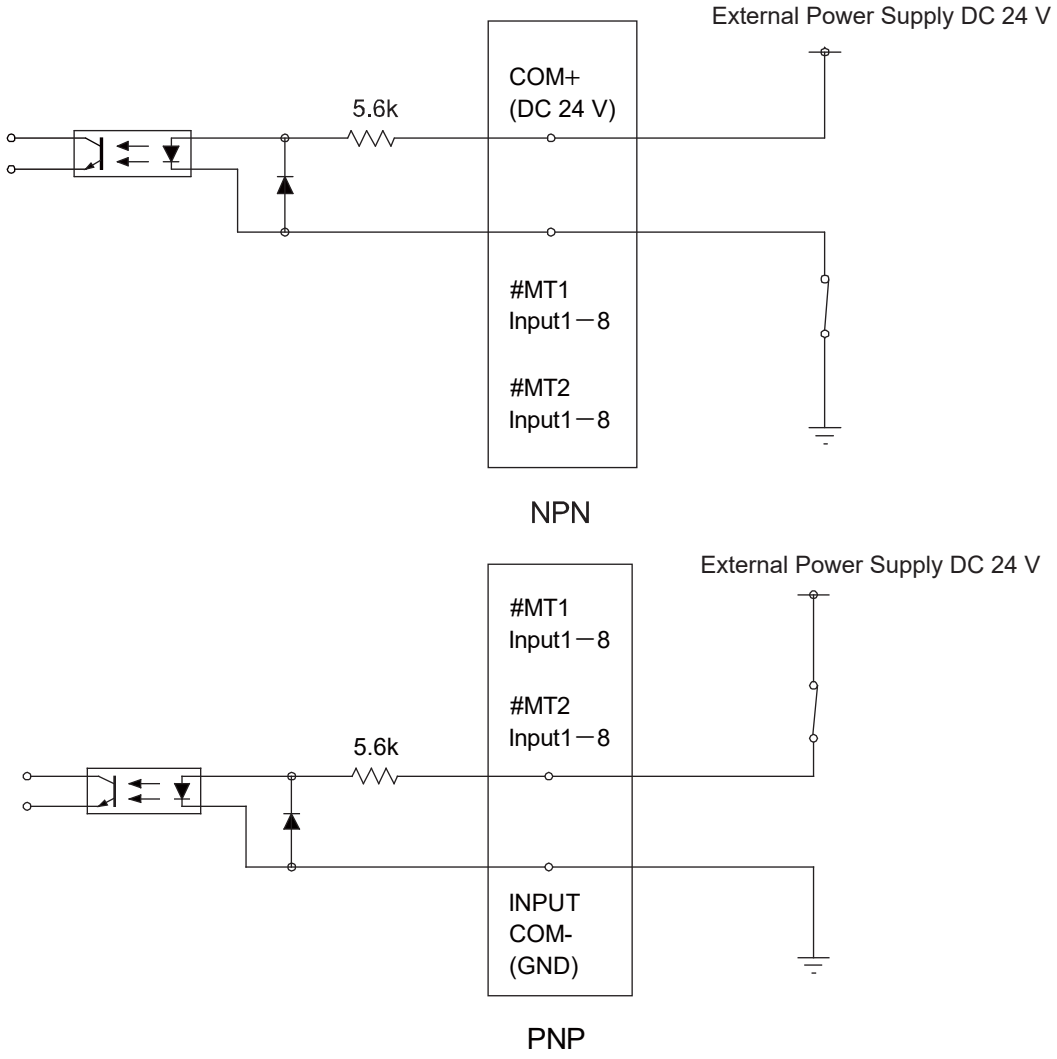
⚠ Caution

Adhere to the voltage capacities outlined in the table below. If you exceed the values listed below, the internal circuits may be damaged.

		Type	Rated Output/Input
Output Pin	MT1 Output 1 – 6	Photocoupler	DC 24 V, 100 mA/pin
	MT1 Output COM+	Photocoupler	DC 24 V, 600 mA/pin
	MT1 Pulse Output 1 – 2	FET	DC 24 V, 30 mA/pin
	MT1 Pulse Output COM+	FET	DC 24 V, 100 mA/pin
	MT2 Output 1 – 6	Photocoupler	DC 24 V, 100 mA/pin
	MT2 Output COM+	Photocoupler	DC 24 V, 600 mA/pin
	MT2 Pulse Output 1 – 2	FET	DC 24 V, 30 mA/pin
	MT2 Pulse Output COM+	FET	DC 24 V, 100 mA/pin
Input Pin	MT1 Input 1 – 8	Photocoupler	DC 24 V, 100 mA/pin
	MT1 Sensor Input 1 – 2	Photocoupler	DC 5 V, 50 mA/pin
	MT2 Input 1 – 8	Photocoupler	DC 24 V, 100 mA/pin
	MT2 Sensor Input 1 – 2	Photocoupler	DC 5 V, 50 mA/pin

For the external power supply, prepare a power supply (DC 24 V) on your side.

10.7 Input Signals

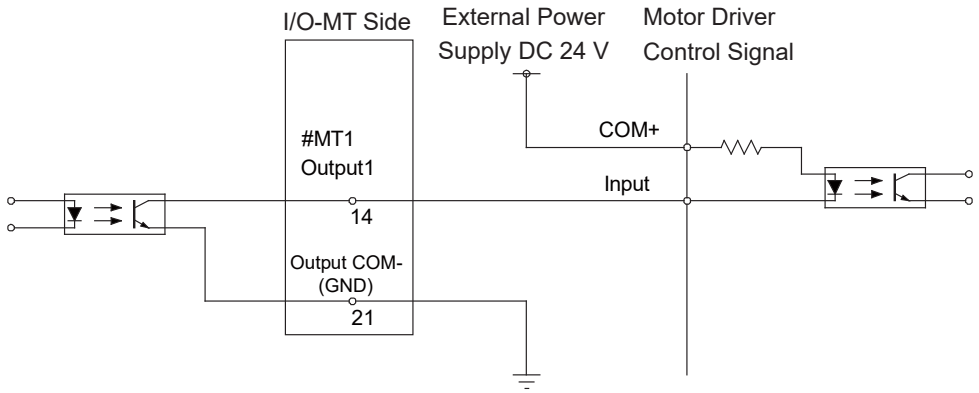


If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3 mA. If you use a device with a leakage current of more than 0.3 mA, it may not turn OFF.

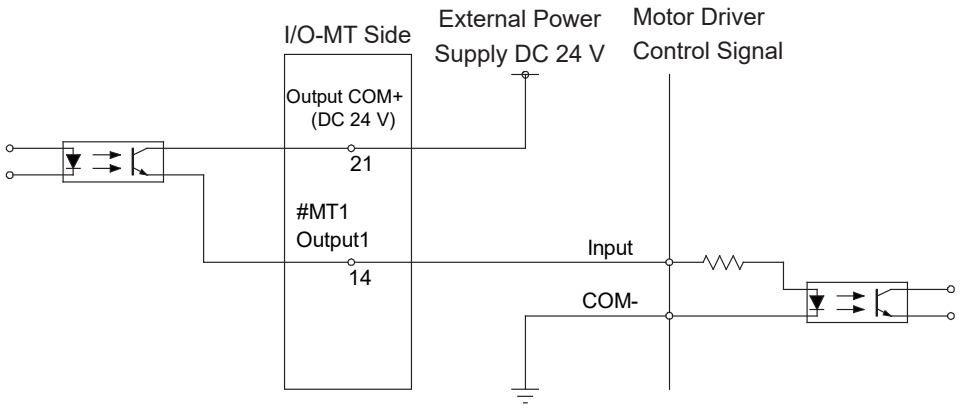
⚠ Caution

Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

10.8 Output Signals



NPN

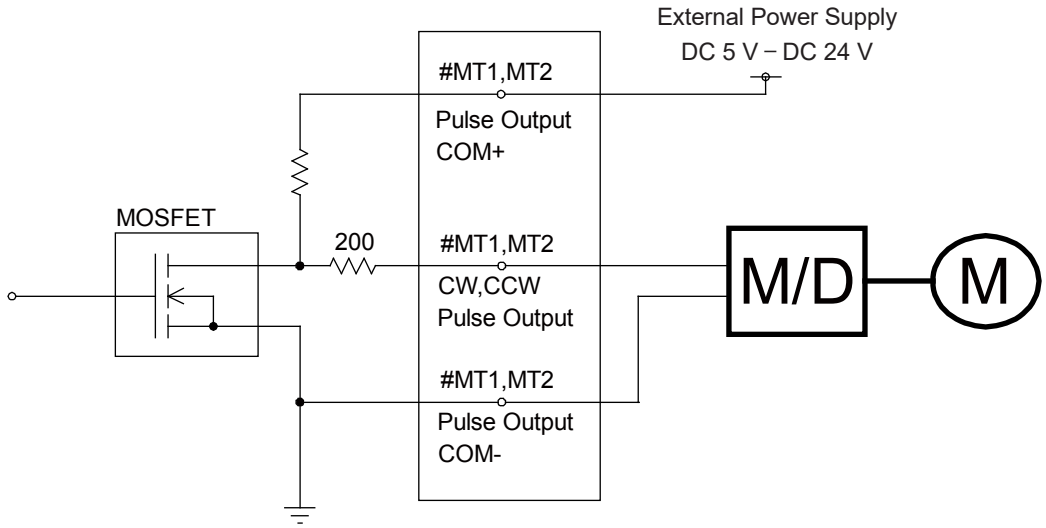


PNP

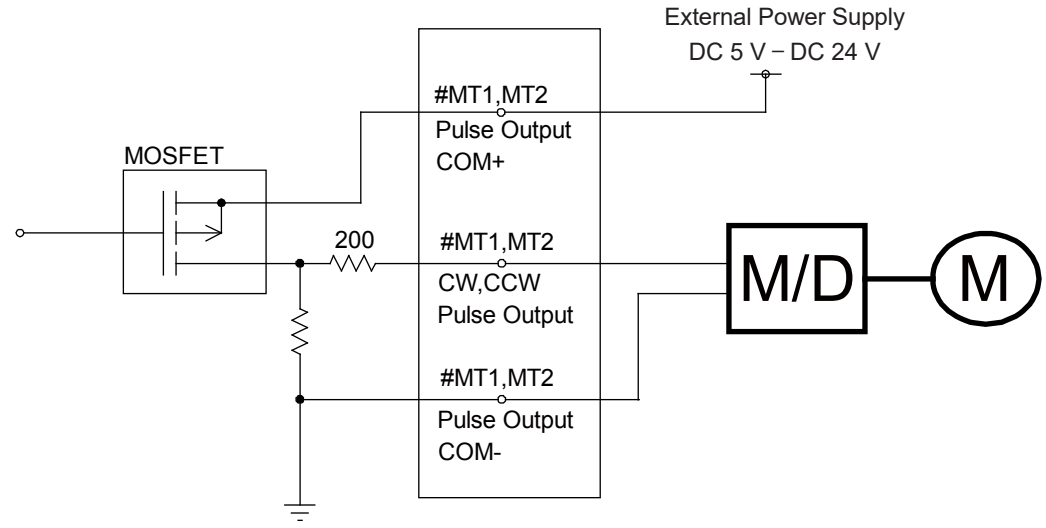
⚠ Caution

Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

10.9 Pulse Output Signals



NPN



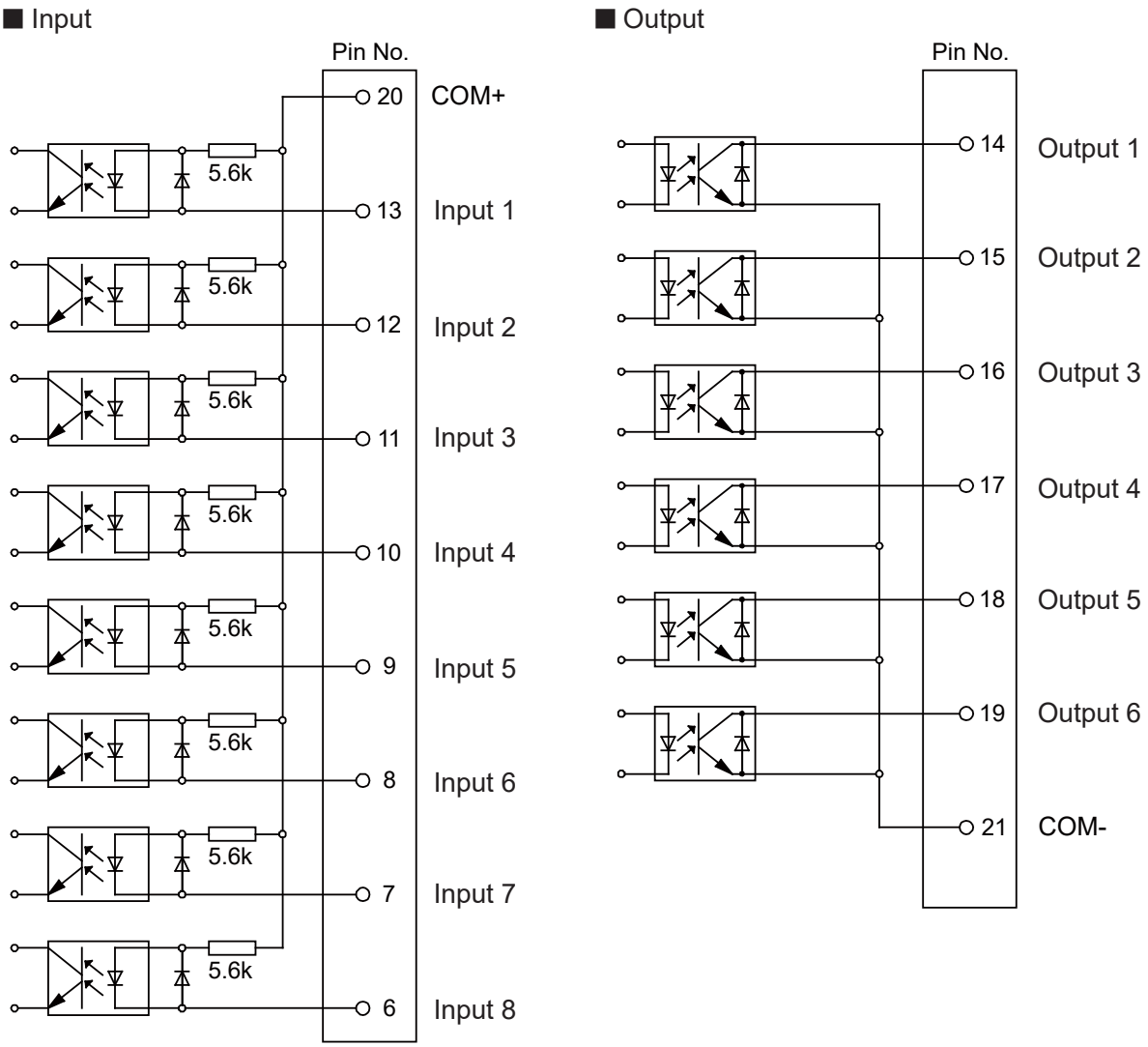
PNP

NOTE: This is a representation of the internal circuits.

MT1 and MT2 each have pulse output signal channel; one for CW and one for CCW (a total of 2).
With an NPN circuit, connect the pulse output COM- terminal to the motor driver ground terminal.
With a PNP circuit, connect the pulse output COM- terminal to the motor driver ground terminal.
MT1 and MT2 are both equipped with an individual pulse output COM+ terminal. Make sure to wire the MT1/MT2 pulse output COM+ terminals separate from each other.
Connect external current limiting resistors to the output terminals (CW, CCW) as necessary to ensure the electric current does not exceed 30 mA.
Make sure the external power supply connected to the pulse output COM+ terminal uses a voltage appropriate for the pulse input voltage of the external device.

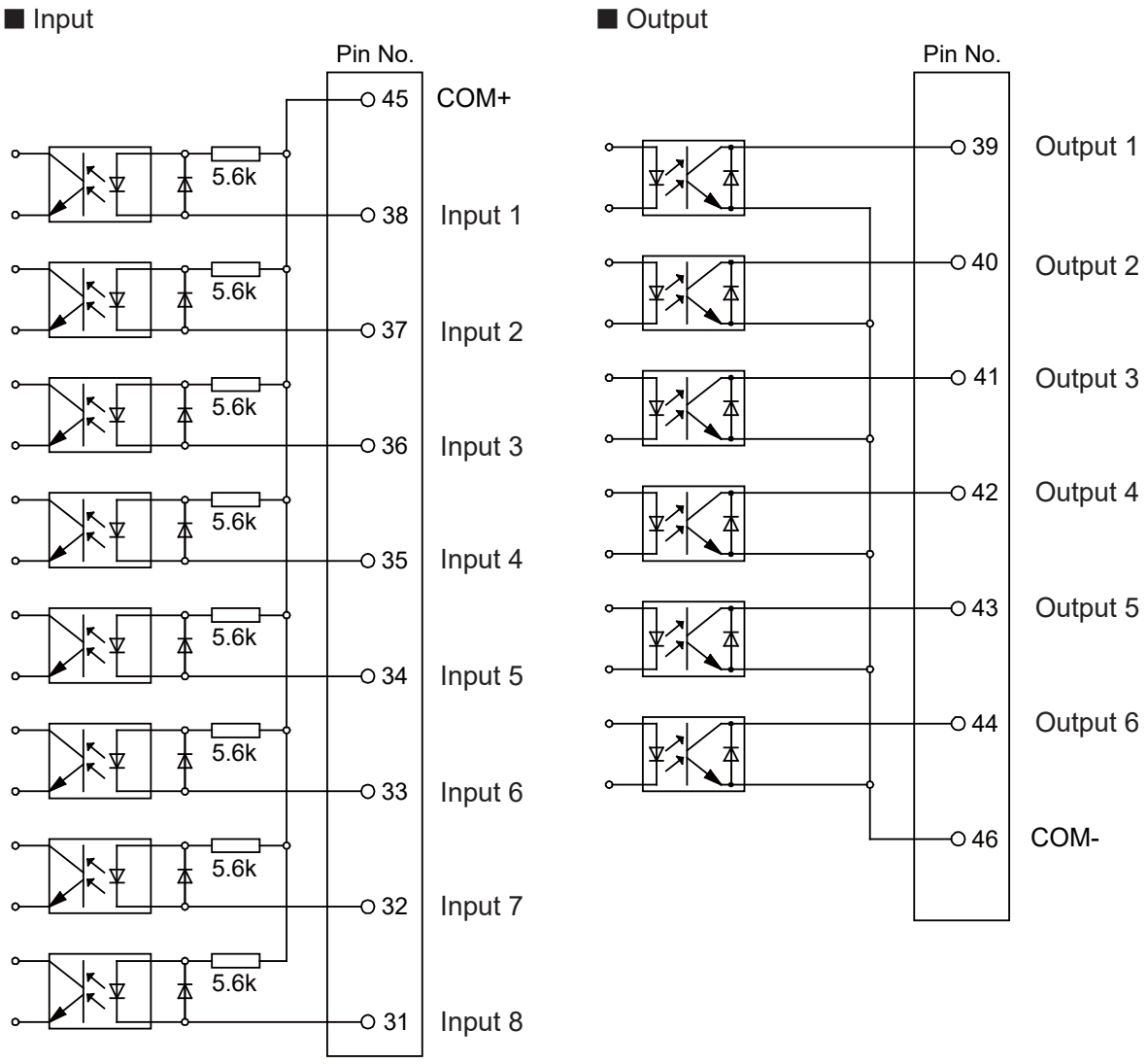
10.10 Circuit Diagram (NPN)

MT1 Circuit Diagram NPN



NPN

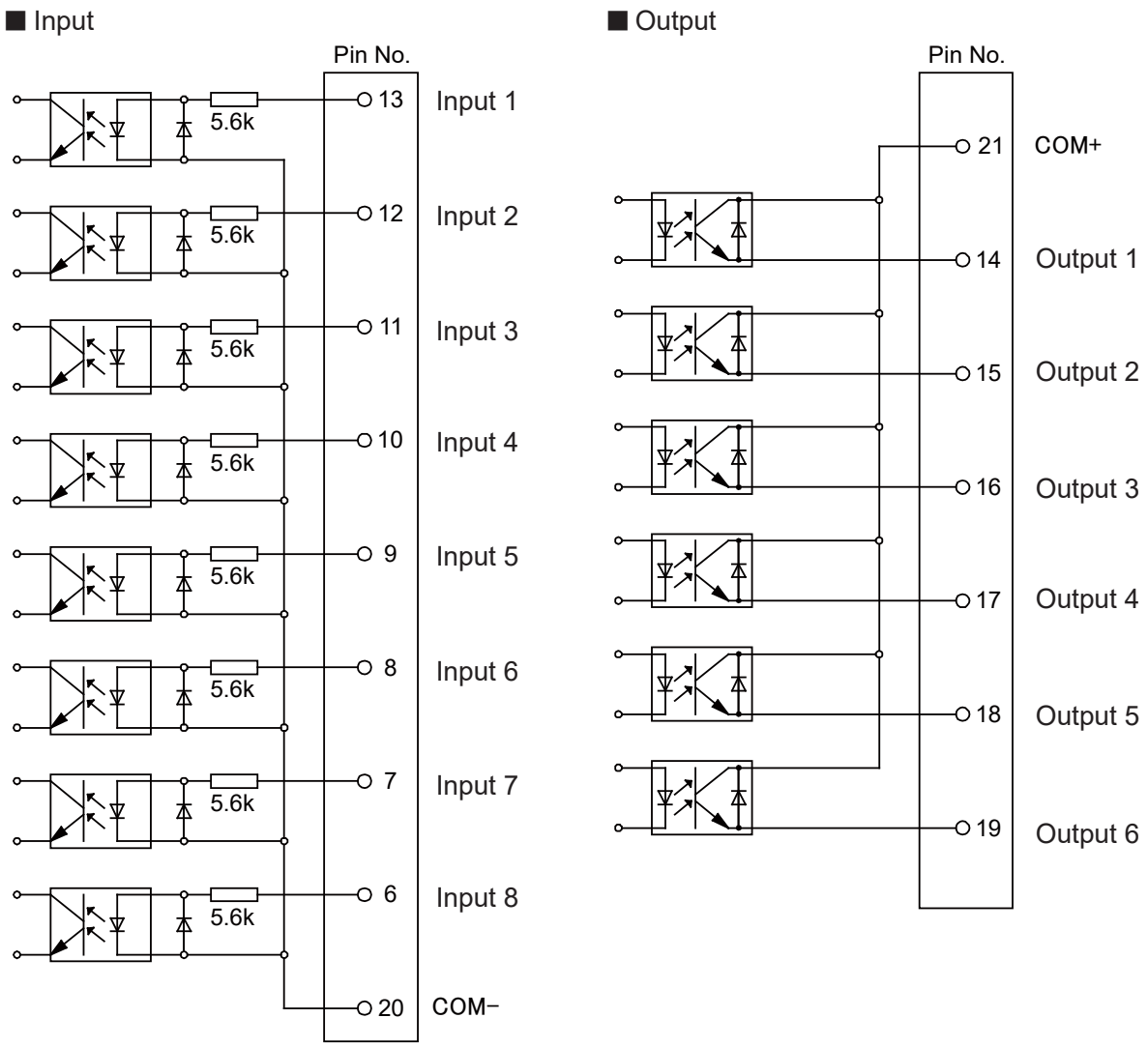
MT2 Circuit Diagram NPN



NPN

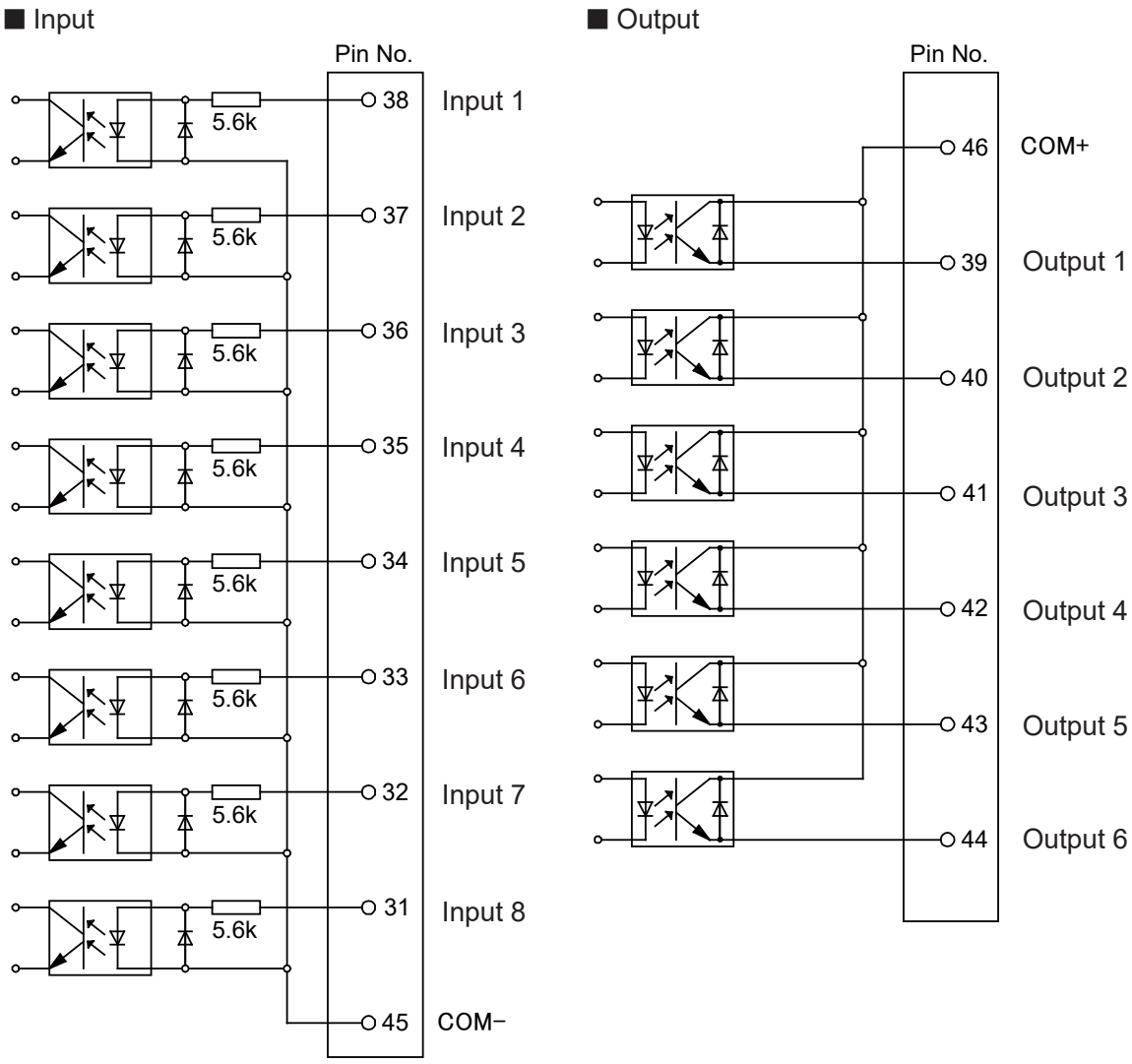
10.11 Circuit Diagram (PNP)

MT1 Circuit Diagram PNP



PNP

MT2 Circuit Diagram PNP



PNP

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170810104 / 202101-E2 (202011-J2)