JANOME DESKTOP ROBOT
JR2000N Series

Operation Manual
External Control I
(I/O-SYS)

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.

● This manual is written according to IEC 62079.

JANOME

PREFACE

The Janome Desktop Robot JR2000N Series are new low-cost, high-performance robots. With these robots we succeeded in reducing the price while maintaining functionality. The combined use of stepping motors and specialized micro step driving circuits saves both energy and installation space. There are several manuals pertaining to these robots.

JR2000N Series

Setup	Explains how to set up the robot. ■ Make sure you read this manual ■ 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 ■ 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.
Quick Start	Explains the actual operation of the robot by creating and running simple programs.
Teaching Pendant Operation	Explains how to operate the robot via the teaching pendant.
PC Operation	Explains how to use the PC software, JR C-Points.
Functions I	Explains point teaching.
Functions II	Explains commands, variables, and functions.
Functions III	Explains functions such as Run Mode parameters and sequencer programs.
Functions IV	Explains functions in Customizing Mode.
External Control I (I/O-SYS)	Explains I/O-SYS communication control.
External Control II (COM Communication)	Explains COM1 – COM3 communication control.
Camera/Sensor	Explains the functions of the attachable camera and Z position sensor.
Specifications	Outlines general specifications such as the robot's operating range, weight, etc.
Application Specifications	Explains the specialized functions of the various application specifications.

Note: Product specifications are regularly updated; therefore the content of this manual may differ from the robot in your possession. Additionally, the menu items displayed on the TP and PC may vary from those listed in this manual.

The descriptions within this manual are based on standard specifications. The menu item names etc. may vary depending on the model type.

Attention	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 this manual. Do not handle or operate the robot in ways not covered in this manual.

Attention	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.

⚠ **Warning**	Make sure that the **machine is grounded and do not use the machine if it is not grounded**. Make sure that the **ground resistance of the robot power supply is 100Ω or less**. Using the machine without sufficient grounding can cause electric shock, fire, accidental operation and machine breakdown.

⚠ **Warning**	**Make sure that the machine power supply is OFF before connecting the power cord.** Failure to do so could cause electric shock and/or injury.

Note: The operation methods described in this manual are indicated as follows:

TP ▶ Operation via the teaching pendant

PC ▶ Operation via PC (JR C-Points)

RESPONSE TO EC/EU DIRECTIVES

This robot is a semi-finished product, and includes a declaration to the EC/EU directives.

Janome implements its conformity testing through a third certification authority for each of the EMC, LVD, MD directives.

The applicable requirements of the MD and EMC Directives vary depending on the machine settings and systems. We conduct general confirmation tests through a model setup. Conduct your own final confirmation tests and risk assessments of your machine and its setup and make sure that it conforms to the MD and EMC Directives.

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

⚠ **Danger**

🚫	**Do not use where flammable or corrosive gas is present.** Leaked gas accumulating around the unit can cause fire or an explosion.

⚠ **Warning**

❗	**Make sure that you securely install the unit in a place that can withstand both the mass of the machine and the usage conditions.** In addition, **for units with a cooling fan on the back, allow for 30cm or more clearance between the back of the unit and the wall.** If installation is inadequate, the unit may drop or fall over causing injury and/or unit breakdown.
❗	**Make sure to power the unit within its rated current range.** Failure to do so may cause electric shock, fire, or unit malfunction.
❗	**Plug the power cord into the power outlet firmly.** Failure to do so may cause the plug to heat up and may result in fire.
❗	**Be sure to use the unit within its indicated voltage range.** Failure to do so may cause fire or unit malfunction.
🔌	**When 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 cord.** Failure to follow these steps causes electric shock or injury.

FOR YOUR SAFETY

⚠ Warning

	Always **make sure the unit is grounded to avoid possible electrical shocks. Do not use when the unit is not grounded.** Improper grounding may cause electric shock or fire.
	Wipe the power plug with a clean, dry cloth periodically to eliminate dust. Dust accumulation may deteriorate the electrical insulation and cause fire.
	Be sure to unplug the power cord from the power outlet when the unit is not in use for long periods of time. Dust accumulation may cause fire.
	Be sure to turn OFF the unit before inserting or removing cords and cables such as the teaching pendant cable. Failure to do so may result in electric shock, fire, data loss, or unit malfunction.
	Do not attempt to disassemble or modify the unit. Disassembly or modification may cause electric shocks or unit malfunction.
	Do not allow water or oil to come in contact with the unit, control box or the power cord. Contact with water or oil may cause electric shock, fire, or unit malfunction. IP Protection Rating: IP30 (CE specifications : IP40)
	If anything unusual occurs, such as a burning smell or unusual sound, stop operation and unplug the power cord immediately. Contact the dealer from whom you purchased the robot or the office listed on the last page of this manual. Continuing to use the robot without addressing the problem may cause electric shock, fire, or unit breakdown.

FOR YOUR SAFETY

⚠ Caution

🚫	**Do not drop or jar the unit during transport and/or installation.** This could cause injuries or damage the unit.
❗	**Before performing any operation, ensure there is no imminent danger to any of the operators**. Failure to do so may result in injury.
❗	**Use the unit in an environment between 0 and 40°C, with a humidity level of 20 – 90%, and without condensation.** Use outside of these conditions may result in unit malfunction or breakdown. IP Protection Rating: IP30 (CE specifications: IP40)
❗	**Use the unit in an environment where no electrical noise is present.** Failure to do so may result in 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 an enclosure.** 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 for the emergency stop switch. Also, for models with I/O-S circuits, regularly perform an I/O-S circuit function check.** If you perform work without making a circuit check, you or the operator will not be able to immediately and safely stop the robot in an emergency. This is potentially dangerous.

FOR YOUR SAFETY

	⚠ **Caution**
🛈	**When attaching tools 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.** Failure to do so causes injury or breakdown.
🛈	**Be sure to check the connections of the cords and cables to the main unit.** Improper wiring may result in unit malfunction or breakdown.
🛈	**Be sure to secure the movable parts of the unit before transportation.** Failure to do so may result in injury or breakdown.
🛈	**When lifting and transporting the robot, do so with 2 or more people.** Failure to do so causes injury or breakdown.
🛈	**Use the unit in an environment that is not exposed to direct sunlight.** Direct sunlight may cause 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: JR2300N, JR2400N, JR2500N and JR2600N.

1.1 Outlet Location and Shape

JR2300N – JR2600N Series
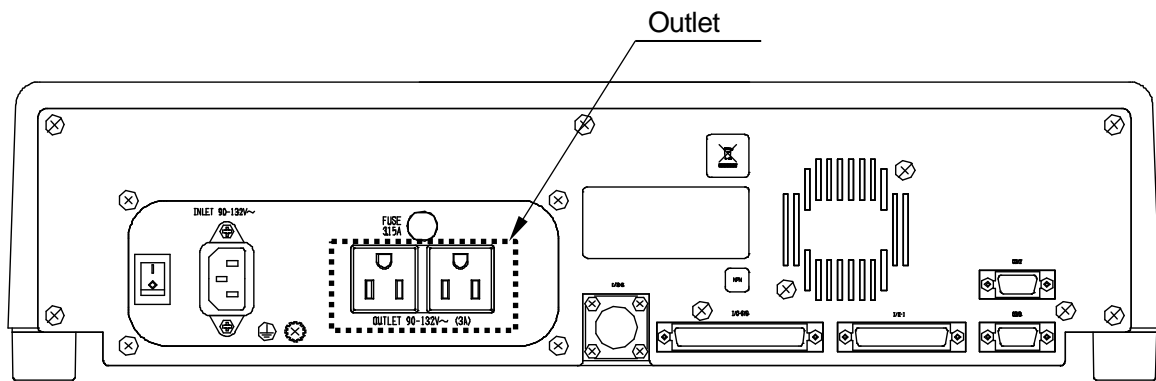
Outlet

1.2 Internal Circuit of the Outlet Output Terminal
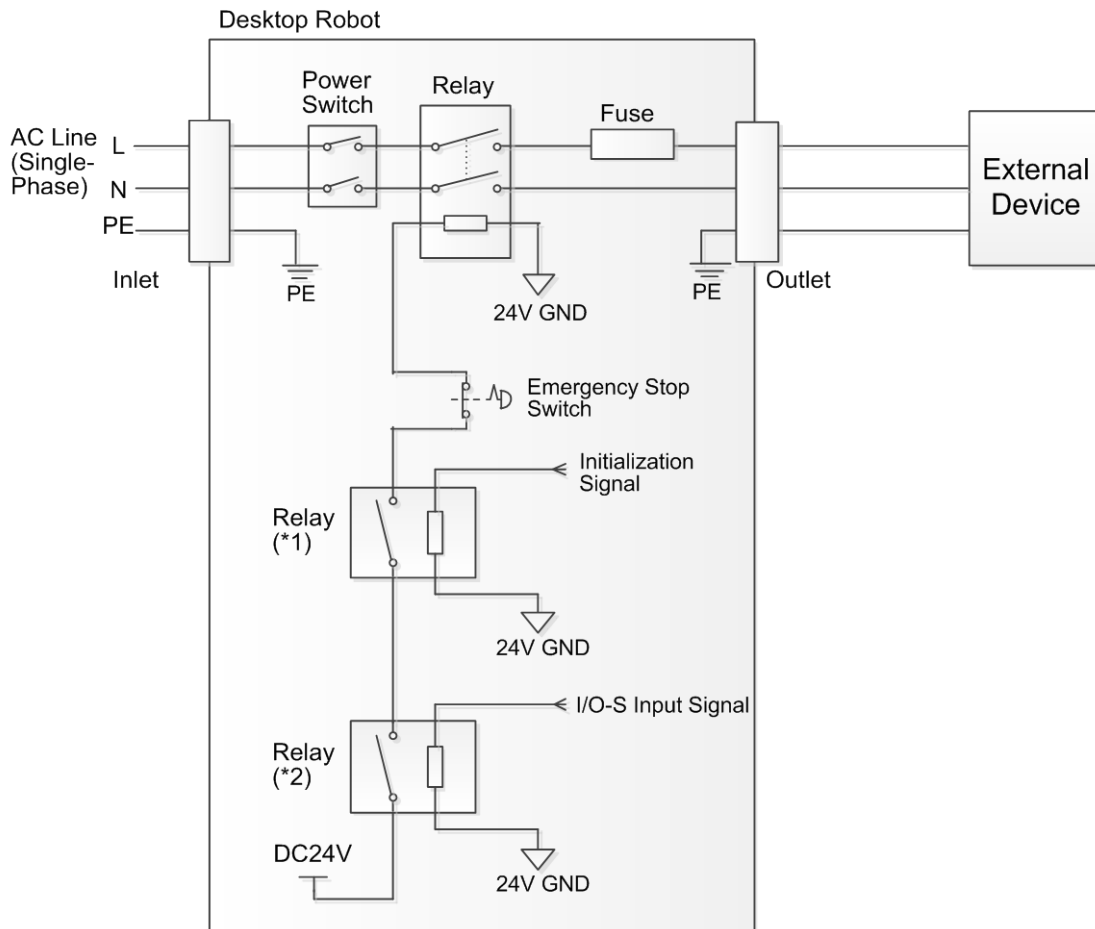
*1 Initialization signal connection relay: the contact is open when the emergency stop switch is pressed, I/O-S is not active, or the power is OFF.

2 I/O-S Input signal connection relay: the contact is closed when I/O-S is shorted.

* I/O-S is an optional terminal. The I/O-S contact is open when the robot is equipped with the I/O-S terminal.

1.3 Timing Chart

| | (1) | (2) | (3) | (4) | (5) | (6) |

Power Switch
Emergency Stop Switch
Start/Stop Switch (*1)
I/O-S Input Signal
Initialization Signal
Outlet Output
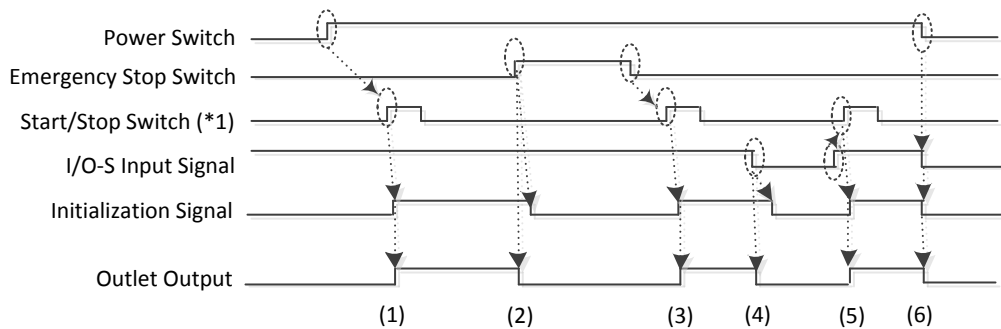
*1   The start/stop switch is operated in Switch Run Mode.

A start operation is performed as follows for the other modes:

- Teaching Mode: $\boxed{F4}$ 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 CONNECTORS

System functions are assigned for I/O-SYS. For information regarding the assigned functions, refer to one of the application operation manuals (*Dispensing Specifications*, etc.).

2.1 Connectors

JR2200N(NE)

I/O-SYS

I/O Polarity Sticker

JR2300N(NE), JR2400N(NE), JR2500N(NE) and JR2600N

2.2 Pin Nos.

19

1

37

20
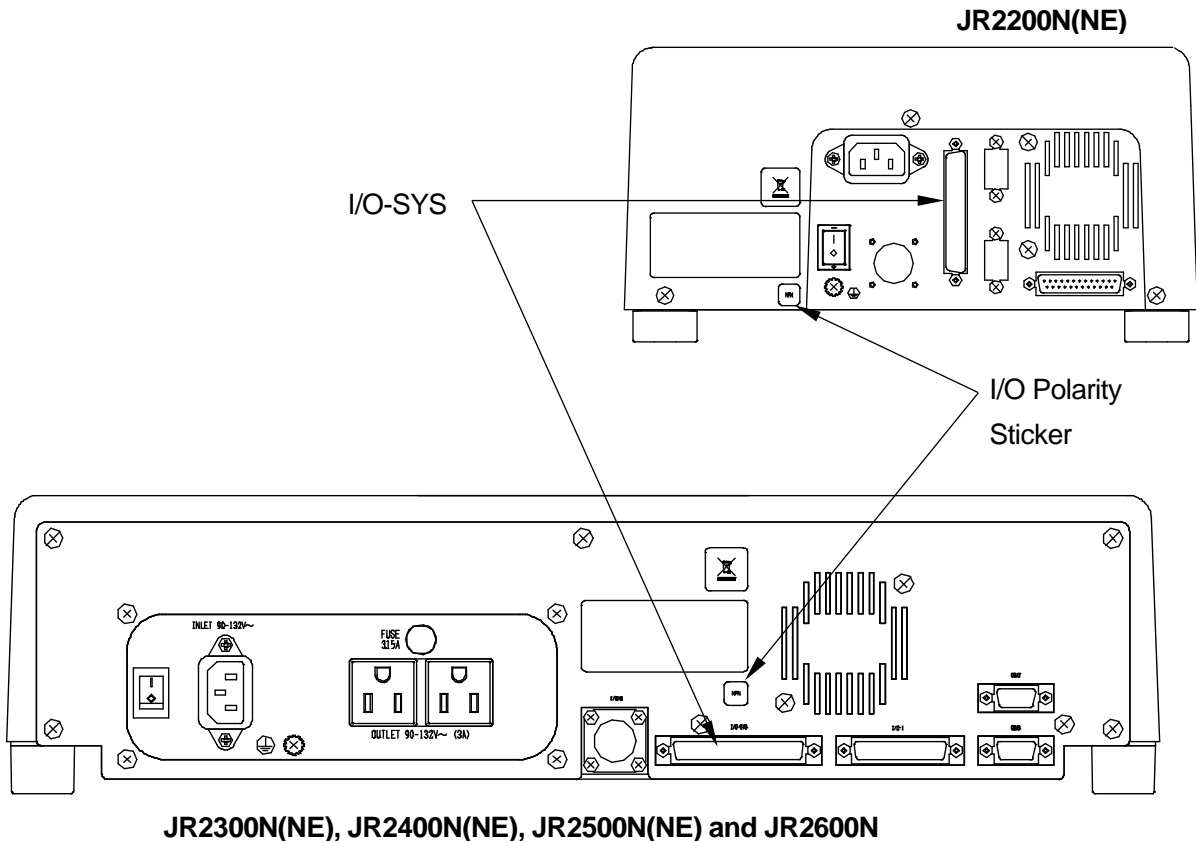
(Connector on the robot)
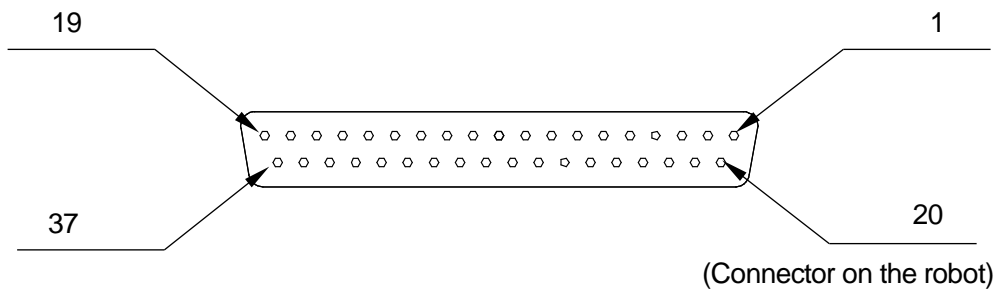
NOTE

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 by checking the I/O polarity sticker.

2.3 I/O-SYS Power Selector

For a device connected to I/O-SYS, you can select to use either an external power source or have the device use the I/O-SYS 36 pin.

Turn the robot's power OFF, remove the robot unit's side panel cover, and select the power source using the switch as shown in the diagram below.

Display Switch	EXT	IN
I/O-SYS Power Switchover	External power	Internal power

Robot Side View

Panel cover

View when panel cover is removed

MODE
OFF [   ] ON
SYS-I/O
EXT [   ] IN
I/O-1
EXT [   ] IN
SPARE
OFF [   ] ON

I/O-SYS power switchover
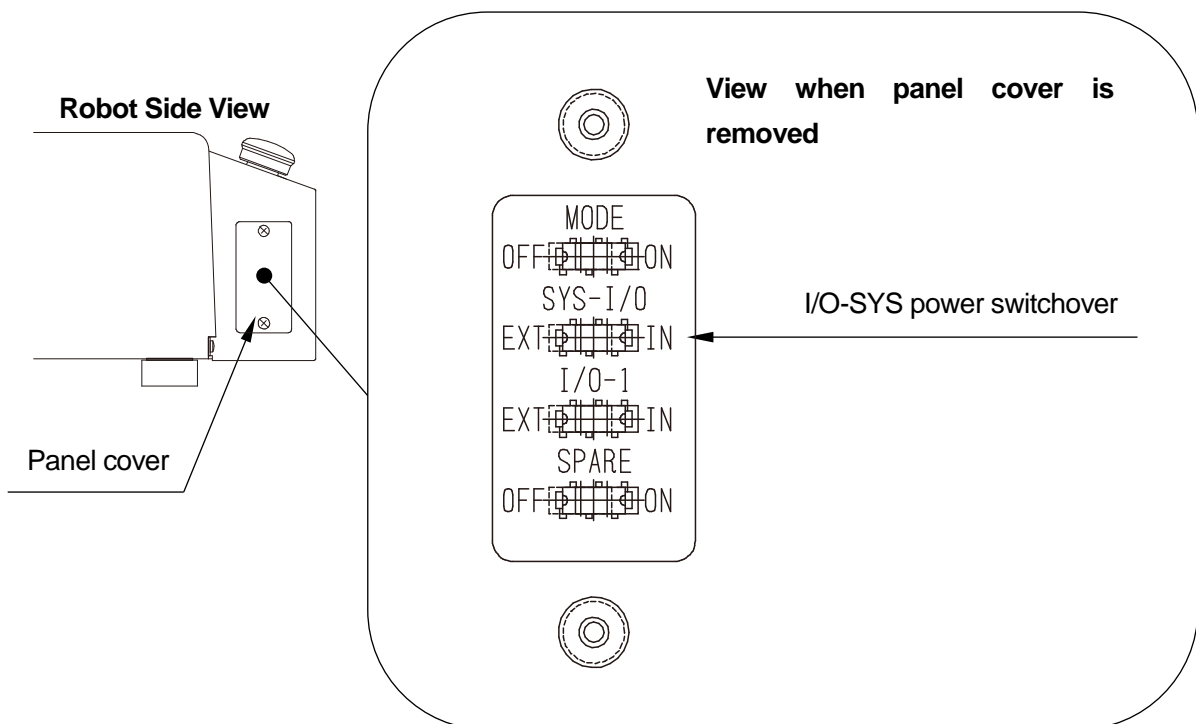
2.4 Wiring Layout Check (NPN)

Once the external device is connected to I/O-SYS, 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 the following page. The robot's I/O polarity can be confirmed by checking the I/O polarity sticker (pasted close to the I/O-SYS connector).

Refer to the diagram below and check each pin to make sure that the **DC24V pin** is not shorted to any of the **GND pins**, and also that the **DC24V pin** is not shorted to any of the **output signal pins**.
Refer to "4.7 Circuit Diagram (NPN)" for further details.

> 🚫 Do not turn ON the power if the **DC24V pin** is shorted to any of the **GND pins**, or if the **DC24V pin** is shorted to any of the **output signal pins**.
> The robot's internal circuits may be damaged when the power is turned ON.
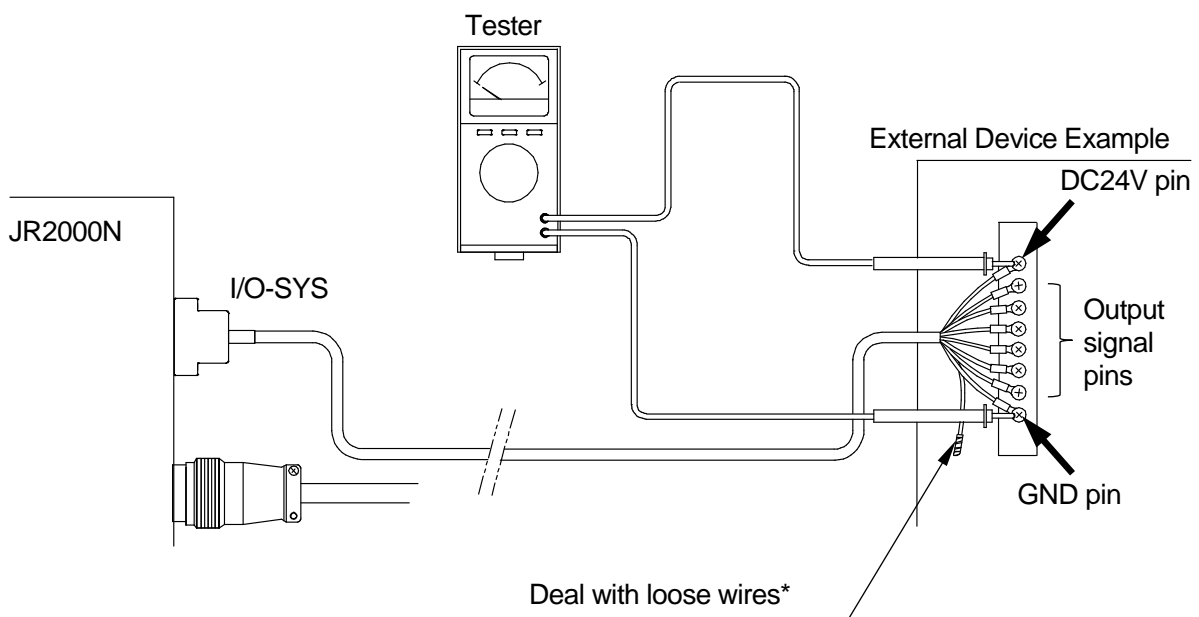
*If there is an unconnected wire amongst the wire connections, make sure you wrap electrical insulating tape over the copper wire parts and on the end of the wire to prevent the wire from touching other wires etc.; shorting them out.

2.5 Wiring Layout Check (PNP)

Once the external device is connected to I/O-SYS, 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 the previous page. The robot's I/O polarity can be confirmed by checking the I/O polarity sticker (pasted close to the I/O-SYS connector).

Refer to the diagram below and check each pin to make sure that none of the **GND pins** are shorted to the **DC24V pin**, and also that none of the **GND pins** are shorted to the **output signal pins**.
Refer to "4.10 Circuit Diagram (PNP)" for further details.

🚫 Do not turn ON the power if any of the **GND pins** are shorted to the **DC24V 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.
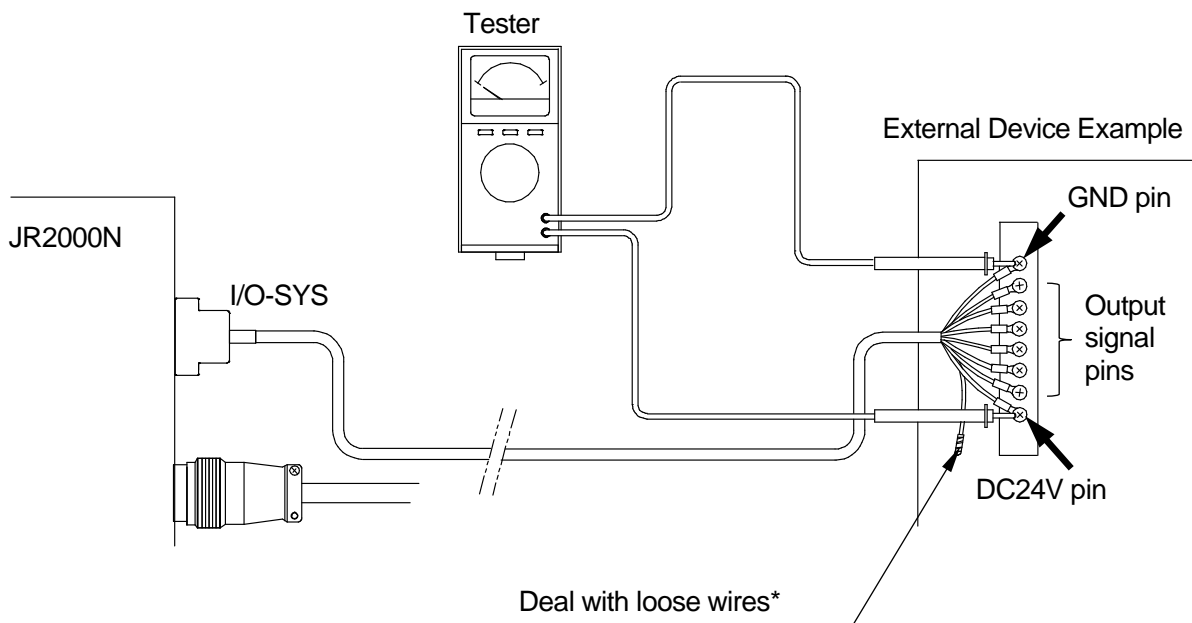
*If there is an unconnected wire amongst the wire connections, make sure you wrap electrical insulating tape over the copper wire parts and on the end of the wire to prevent the wire from touching other wires etc.; shorting them out.

3. FUNCTION ASSIGNMENT LIST

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

		Name	Function	Pin No.	Insulator Color	Spiral Mark
Input	Ext	#sysIn1	Start/Free	1	Black	
		#sysIn2	Free/Start Inhibition/Stop-Start Inhibition/Soft Lock/Emergency Stop	2	White	
		#sysIn3	Program Number LOAD	3	Red	
		#sysIn4	Program Number bit 0 20=1	4	Green	
		#sysIn5	Program Number bit 1 21=2	5	Yellow	
		#sysIn6	Program Number bit 2 22=4	6	Brown	
		#sysIn7	Program Number bit 3 23=8	7	Blue	
		#sysIn8	Program Number bit 4 24=16	8	Gray	
		#sysIn9	Program Number bit 5 25=32	9	Orange	
		#sysIn10	Program Number bit 6 26=64	10	Pink	
		#sysIn11	Last Work/ Program Number bit 7 27=128	11	Light blue	
		#sysIn12	Temporary Stop	12	Purple	
		#sysIn13	Free	13	White	Black
		#sysIn14	Free/Start Inhibition/Stop-Start Inhibition/Soft Lock/Emergency Stop	14	White	Red
		#sysIn15	Free	15	White	Green
		#sysIn16	Free	16	White	Blue
Output	Ext	#sysOut1	Ready for Start/Free	17	Black	White
		#sysOut2	Robot Stopping	18	Black	Red
		#sysOut3	Program Number ACK	19	Black	Green
		#sysOut4	Program Number Error	20	Black	Blue
		#sysOut5	Running	21	Red	White
		#sysOut6	Error	22	Red	Black
		#sysOut7	Emergency Stop	23	Red	Green
		#sysOut8	Position Error	24	Red	Blue
		#sysOut9	Free	25	Green	White
		#sysOut10	Free	26	Green	Black
		#sysOut11	Free	27	Green	Red
		#sysOut12	Free	28	Green	Blue
		#sysOut13	Free	29	Yellow	White
		#sysOut14	Free	30	Yellow	Black
		#sysOut15	Free	31	Yellow	Red
		#sysOut16	Free	32	Yellow	Green
		–	Not used*	33	Yellow	Blue
Others		COM +	DC24V	34	Brown	White
		COM –	GND	35	Brown	Black
		COM –	GND	36	Brown	Red
		COM –	GND	37	Brown	Green

Ext: Activate only in External Run mode.

* Do not connect any wiring to pin number 33.

4. I/O-SYS INPUT/OUTPUT FUNCTIONS

4.1 Input

- Start (#sysIn1)

  Turn ON this signal when you want to start or restart a program in External Run Mode. This signal is also used to start mechanical initialization when turning the power ON as well as when moving to the work home position coordinates.

  This signal is activate when the Ready for Start (#sysOut1) signal is ON.

The #sysIn1 Start signal performs mechanical initialization or starts (restarts) running programs with the robot under any of the following conditions when the I/O-S input is ON and the #sysIn2 Start Inhibition signal is OFF in External Run Mode:

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 momentary stop.
5. Waiting for restart after stopping at the wait start stop point.
6. Waiting for start due to a point job *waitStart* command.

A #sysIn1 Start signal with a pulse of 20msec or less is invalid due to noise elimination.

A pulse width of 30msec or wider can be used, however, rather than using time as a provision, it is recommended to have the #sysIn1 Ready for Start signal go OFF as an acknowledgment signal (ACK signal). When waiting to start as described above, the Ready for Start Signal (#sysOut1) goes ON.

The #sysOut1 Ready for Start turns OFF if the #sysIn1 Start turns ON.
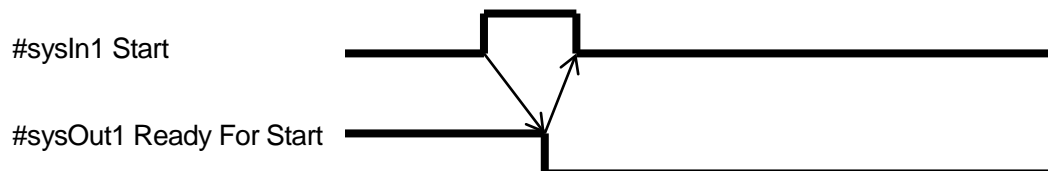
- Free (#sysIn2)

  The default for the #sysIn2 signal is Free.

  This signal can be used as a free signal unless its function is changed in the [I/O-SYS Function Assignment].

- Start Inhibition (#sysIn2)

  The start is inhibited when [Start Inhibit] (#sysIn2) is set in [I/O-SYS Function Assignment]. This signal functions when it is OFF (reverse logic).

  If this signal is OFF and the [Robot Stop] (#sysOut2) signal is ON (while the robot is stopped), the start is inhibited. Even if you try to start the robot, the robot will not work.

  When the Robot Stop (#sysOut2) signal is OFF (when the robot is operating), this signal is invalid.

- Stop-Start Inhibition (#sysIn2)

  This signal becomes a function to temporarily stop operation or inhibit start when [Stop/Start Inhibition] (#sysIn2) is set in [I/O-SYS Function Assignment]. This signal functions when it is OFF (reverse logic).

  If this signal is OFF and the [Robot Stop] (#sysOut2) signal is ON (the robot is stopped), start is inhibited. Even if you try to start the robot, the robot will not work.

  If you turn this signal OFF when the [Robot Stop] (#sysOut2) signal is OFF (when the robot is operating), the robot will move until the PTP operation ends and then stop. To restart turn ON the start signal after this signal is turned ON.

- Soft Lock (#sysIn2)

  If [Soft Lock] (#sysIn2) is set in [I/O-SYS Function Assignment], this becomes a function to inhibit start and make emergency stops during operation.

  This signal functions when it is OFF (reverse logic). If this signal is turned OFF when the [Robot Stop] (#sysOut2) signal is ON (the robot is stopped), then start is inhibited. Even if you try to start the robot, the robot will not operate.

  If this signal is turned OFF when the [Robot Stop] (#sysOut2) signal is OFF, the robot makes an emergency stop.

- Stop (#sysIn2)

  When Stop (#sysIn2) is set in [I/O-SYS Function Assignment], this becomes a function for making emergency stops. This signal functions when it is OFF (reverse logic).

  When you turn OFF this signal in Run Mode, an emergency stop occurs.

- Program Number LOAD (#sysIn3)

  This signal directs the loading of program numbers. When this signal goes ON, 'Program Number bit (#sysIn 4 to 10)' is loaded. This function is valid when "Program Number Change" in the Administration Mode menu is set to [I/O-SYS] and [I/O-LOAD Function] is set to [LOAD/ACK Handshake].

- Program Number bit 0 – 6 (#sysIn4 – #sysIn10)
  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 [Program Number Change] for the External I/O is set to [Valid]. If [I/O LOAD Function] is set to [Loading at Start], start the program after specifying the program number with this signal.

- Last Work (#sysIn11)
  After finishing the last point, the robot shifts to point 01 and repeats the operation when [Cycle Mode] is set to [Continuous Playback]. To end this function, end the program using a point job or turn this signal ON. This function is only valid at the point when the last point is finished (before shifting). You cannot use this signal to terminate a program mid operation.

- Program Number bit 7 (#sysIn11)
  The highest bit number for Program Number bit 0 to 6 (#sysIn4 to #sysIn10) signals. When ON, this signal enables you to specify 128 or more program numbers.

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

- Free (#sysIn14):
  The default status for the sysIn14 signal is [Free]. You can use it as a free signal providing the function is not changed in [I/O-SYS Function Assignment].
  The same as with the #sysIn2 signal, you can select from Free/Inhibit Start/Temporary Hold・Inhibit Start/Soft Lock and Emergency Stop for the signal function.

4.2 Output

- Ready for Start (#sysOut1)
  When the Start (#sysIn1) signal is enabled, this signal goes ON in the following situations:
    - The robot is waiting for mechanical initialization when the power is turned ON.
    - The robot is waiting to begin moving to the work home position.
    - The robot is waiting to start running.
    - The robot is waiting to restart after a temporary stop.

When in External Run Mode and the startup source is I/O-SYS, when I/O-S input is ON and the start is not inhibited by [Start Inhibit (#sysOut1)], [Ready for Start (#sysOut1)] comes ON in the following conditions:

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 restart after stopping at the wait start stop point.
6. Waiting for start due to a point job *waitStart* command.

If the [Running (#sysOut5)] is OFF, it could be due to the conditions stated in 1, 2 or 3 above. In other cases, conditions 4, 5 and 6 cannot be distinguished by the signal alone.

When the [Ready for Start (#sysOut1)] signal is ON, the [Robot Stopping (#sysOut2)] signal is 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 Stopping (#sysOut2)] signal will be ON, but the [Ready for Start (#sysOut1)] signal will not go ON.

- Robot Stopping (#sysOut2)
  When the robot is stopped this signal is ON, when the robot is moving it is OFF. If you turn the [Soft Lock (#sysIn2)] signal OFF when this signal is ON (when the robot is stopped), the start is inhibited. Even if you try to start the robot, the robot will not move.
  If you turn the [Soft Lock (#sysIn2)] signal OFF when this signal is OFF (when the robot is moving), it will make an emergency stop.

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

- Program Number Error (#sysOut4)

  This signal goes ON when you specify an unregistered program number in Run/External Run Mode.

- Running (#sysOut5)

  When you start to run a program this signal goes ON. When the program finishes it goes OFF.

- Error (#sysOut6)

  This signal goes ON when an error has occurred.

- Emergency Stop (#sysOut7)

  This signal goes on when an [Emergency Stop Error] occurs (due to the emergency stop switch being pushed, etc.) When this signal is ON, the [Error (#sysOut6)] signal goes ON at the same time.

- Position Error (#sysOut8)

  If [Position Error Check] is set to [Valid], the position sensor will check the position error just before the robot finishes running (before returning to the work home position.) This signal turns ON if a position error is detected.

4.3 Others

- COM+ (DC24V)

  If the I/O-SYS Internal/External power selector switch is set to [External], connect the COM+ pin to the plus pole of the external power supply (DC24V). If the I/O-SYS Internal/External power selector switch is set to [Internal], DC24V (+) will be output.

- COM– (GND)

  If the I/O-SYS Internal/External power selector switch is set to [External], connect the COM– pin to the ground of the external power supply.
  If the I/O-SYS Internal/External power selector switch is set to [Internal], use the pin as a common ground.

> When I/O-SYS is set to [Internal], do not connect the robot to an external power supply. Doing so causes unit breakdown.

4.4 Capacity

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

JR2200N Series

Use voltage ratings equal to or less than the ones listed below.

Power Supply	Internal	External
Voltage	DC24V	DC24V
1 Pin (when using DC 24C)	100mA	100mA
Total of I/O-SYS and I/O-1	1.6A or less	—

JR2300N, JR2400N, JR2500N and JR2600N Series

Use voltage ratings equal to or less than the ones listed below.

Power Supply	Internal	External
Voltage	DC24V	DC24V
1 Pin (when using DC 24C)	100mA	100mA
Total of I/O-SYS and I/O-1	2A or less	—

4.5 Input Signal (NPN)

■ When using the internal power supply

Input signals are active when the photocoupler is ON.

Using an internal power supply means that the input pin and the COM- pin are shorted.

Internal Power 24V

2.4K

#sysIn1 –
#sysIn16

COM －
(GND)
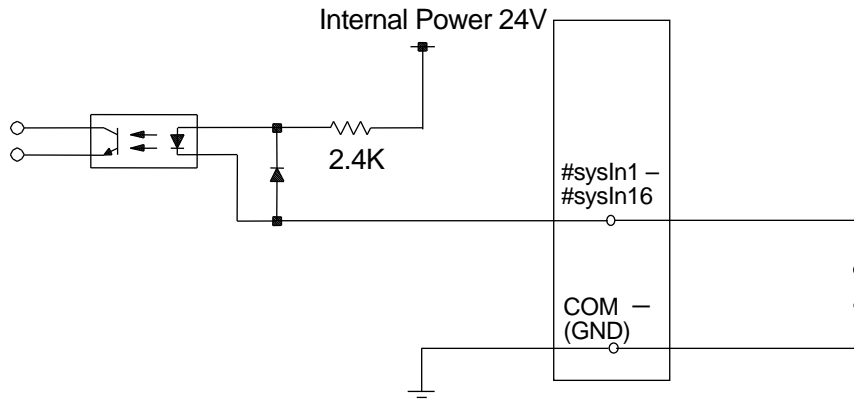
■ When using an external power supply

Using an external power supply means that the input pin and the ground of the external power supply are ON.
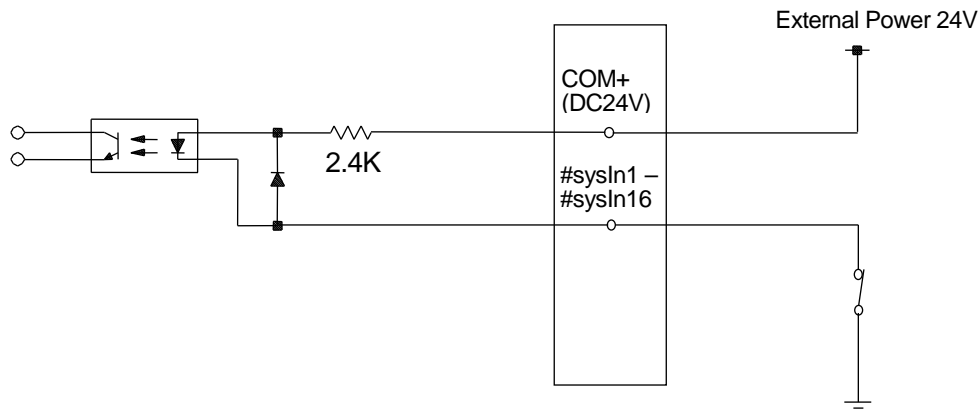
External Power 24V

COM+
(DC24V)

2.4K

#sysIn1 –
#sysIn16

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

Do not assign wiring other than the wiring specified above.

Assigning the wrong wiring can damage the internal circuits.

4.6 Output Signal (NPN)

■ When using the internal power supply

Internal Power Supply 24V

COM +
(DC24V)

+ External

- Device

#sysOut1 –
#sysOut16

■ When using an external power supply

External Power Supply 24V

#sysOut1 –
#sysOut16

+ External

- Device

COM -
(GND)

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

4.7 Circuit Diagram (NPN)

INPUT

OUTPUT

PIN No

PIN No

1	#sysIn1	2.4K
2	#sysIn2	2.4K
3	#sysIn3	2.4K
4	#sysIn4	2.4K
5	#sysIn5	2.4K
6	#sysIn6	2.4K
7	#sysIn7	2.4K
8	#sysIn8	2.4K
9	#sysIn9	2.4K
10	#sysIn10	2.4K
11	#sysIn11	2.4K
12	#sysIn12	2.4K
13	#sysIn13	2.4K
14	#sysIn14	2.4K
15	#sysIn15	2.4K
16	#sysIn16	2.4K

17	#sysout1
18	#sysout2
19	#sysout3
20	#sysout4
21	#sysout5
22	#sysout6
23	#sysout7
24	#sysout8
25	#sysout9
26	#sysout10
27	#sysout11
28	#sysout12
29	#sysout13
30	#sysout14
31	#sysout15
32	#sysout16
35	COM-(GND)
36	COM-(GND)
37	COM-(GND)

24V   Internal
Power Supply

External
Power Supply

33   Not used*

34   COM-
(DC24V)

GND

* Do not connect any wiring to this pin number.

4.8 Input Signal (PNP)

■ When using the internal power supply

Input signals are activate when the photocoupler is ON.

When using the internal power supply, it means the input pins and COM- pin are ON as shown below.
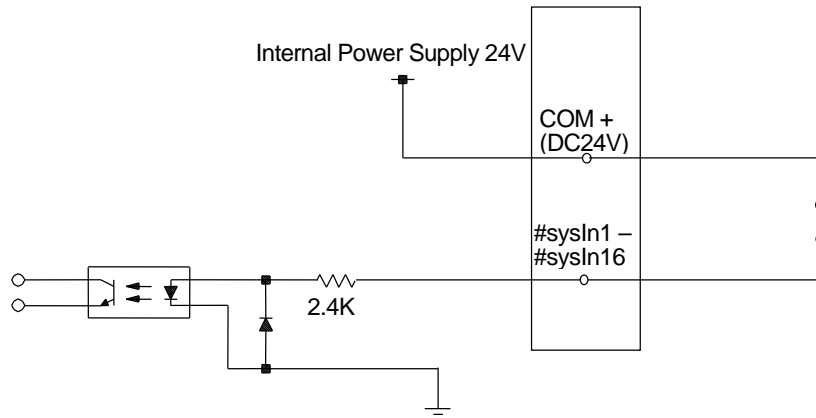
■ When using an external power supply

When using the external power supply, it means the input pins and the external power source are ON as shown below.
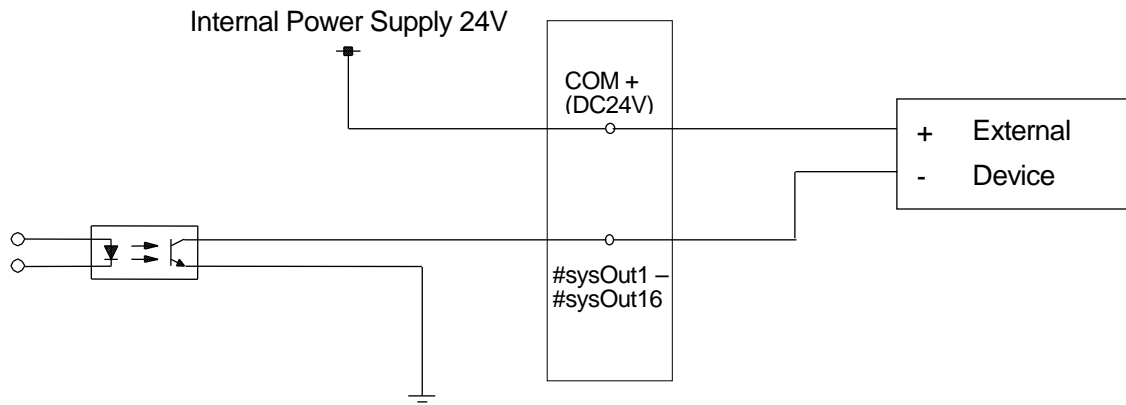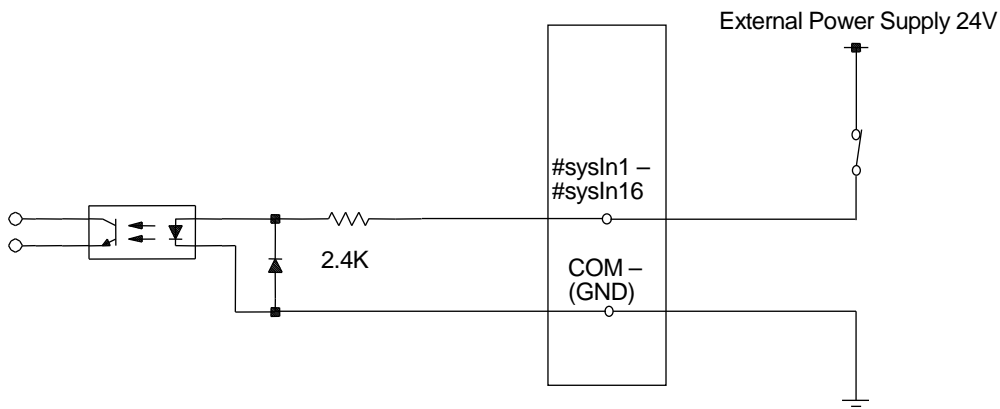

If connecting a two-wire external device, such as a sensor, use one which has a leakage current of no more than 0.3mA. If you use a device with a leakage current of more than 0.3mA, it may not turn OFF.
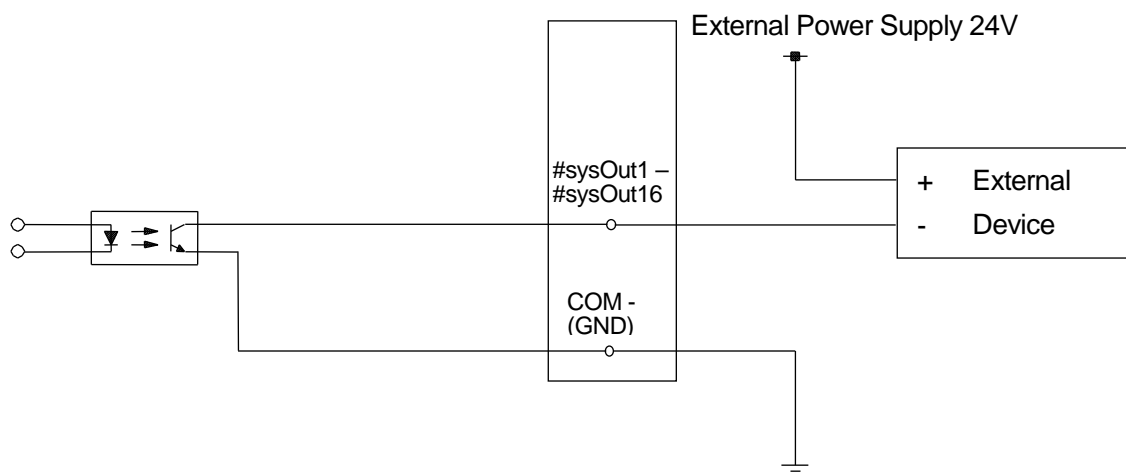
Do not assign wiring other than the wiring specified above.
Assigning the wrong wiring can damage the internal circuits.

4.9 Output Signal (PNP)

■ When using the internal power supply
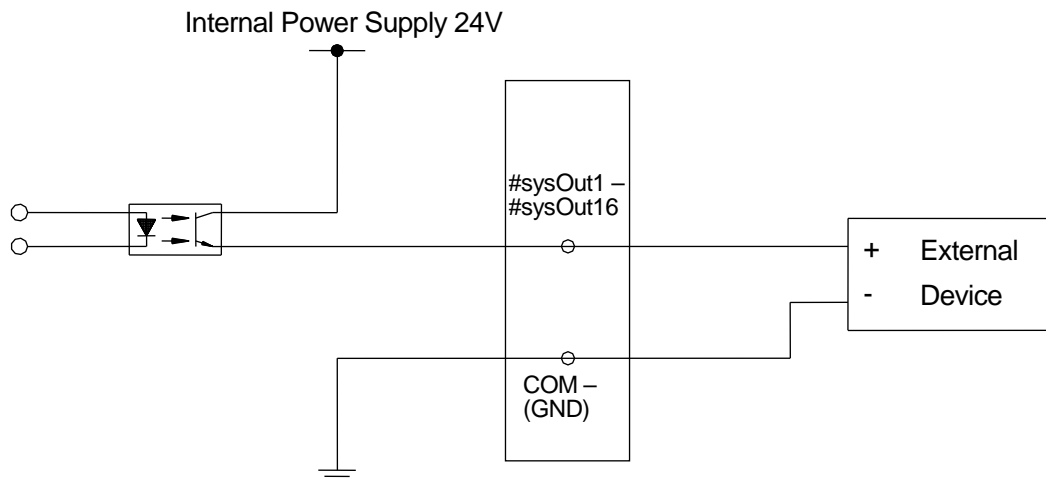
Internal Power Supply 24V

#sysOut1 –
#sysOut16

+ External

- Device

COM –
(GND)

■ When using an external power supply
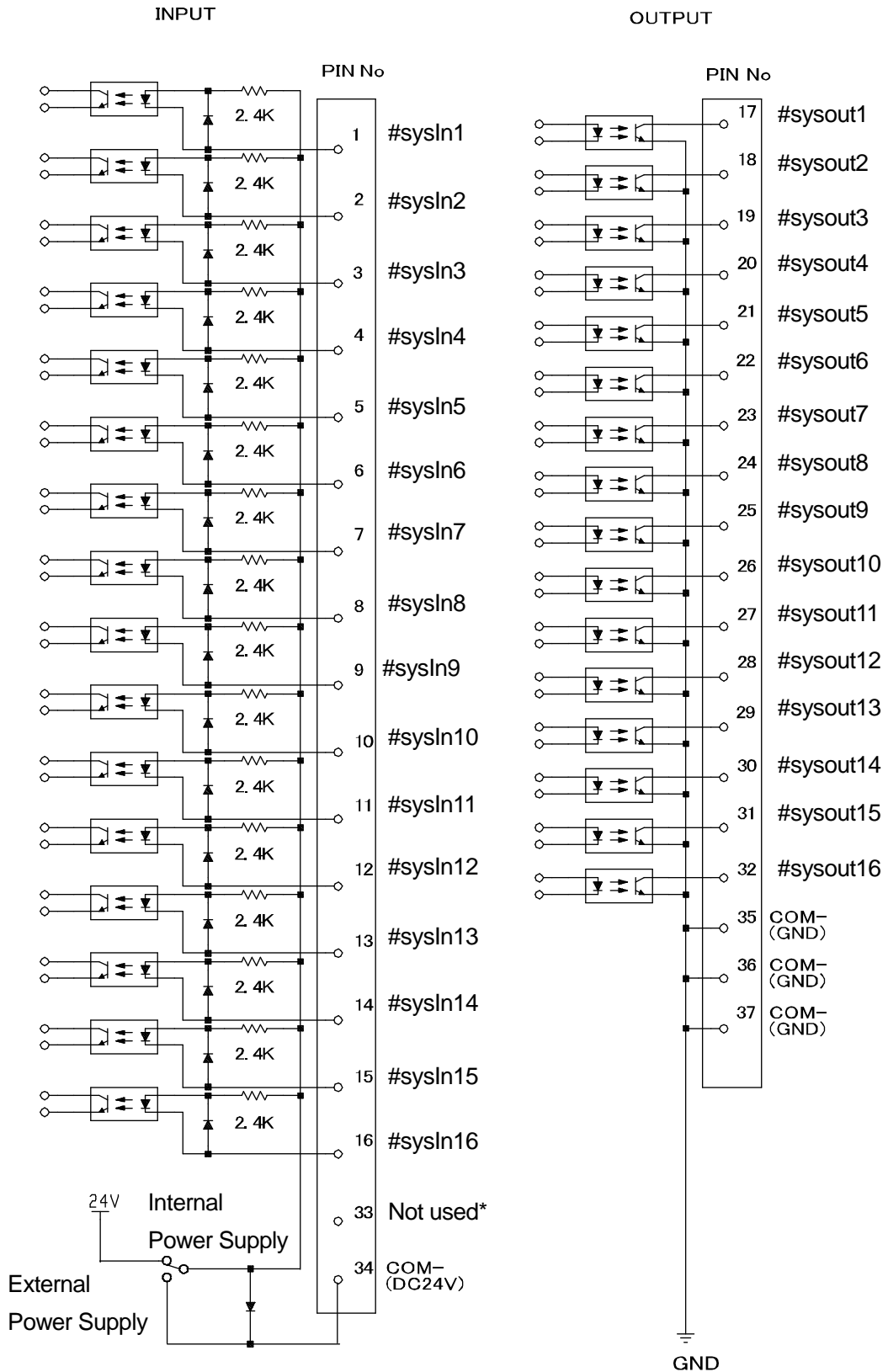
External Power Supply 24V

COM +
(DC24V)

+ External

- Device

#sysOut1 –
#sysOut16

Do not assign wiring other than the wiring specified above.

Assigning the wrong wiring can damage the internal circuits.

4.10 Circuit Diagram (PNP)

INPUT

OUTPUT

PIN No	INPUT
1	#sysIn1
2	#sysIn2
3	#sysIn3
4	#sysIn4
5	#sysIn5
6	#sysIn6
7	#sysIn7
8	#sysIn8
9	#sysIn9
10	#sysIn10
11	#sysIn11
12	#sysIn12
13	#sysIn13
14	#sysIn14
15	#sysIn15
16	#sysIn16
33	Not used*
34	COM− (DC24V)

PIN No	OUTPUT
17	#sysOut1
18	#sysOut2
19	#sysOut3
20	#sysOut4
21	#sysOut5
22	#sysOut6
23	#sysOut7
24	#sysOut8
25	#sysOut9
26	#sysOut10
27	#sysOut11
28	#sysOut12
29	#sysOut13
30	#sysOut14
31	#sysOut15
32	#sysOut16
35	COM− (GND)
36	COM− (GND)
37	COM− (GND)

2.4K

Internal Power Supply

24V

External Power Supply

GND

* Do not connect any wiring to this pin number.

4.11 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.
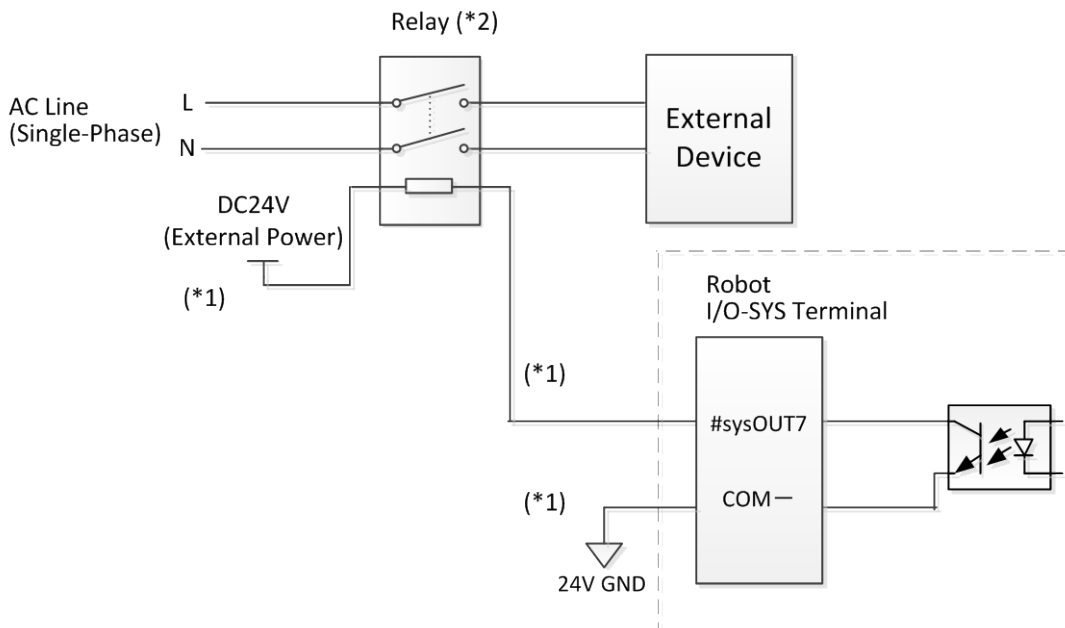
*1   The relay coil and I/O-SYS terminal connections are shown for a robot with an NPN external power supply type.
For all other power supply types, make the connections by referring to the following:
- NPN internal power supply type:
  "4.5 Input Signal (NPN)" – "4.7 Circuit Diagram (NPN)"
- PNP external power supply or PNP internal power supply types:
  "4.8 Input Signal (PNP)" – "4.10 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: 6A

5. TIMING CHARTS

5.1 Power ON, Mechanical Initialization/Work Home After Initialize, Program Execution

This chart shows when [Work Home After Initialize] is set in [Menu] [Run Mode Parameters] [Other Parameters] [Mechanical Initialization]. These are default values.

| Power |
| #sysIn1 Start |
| #sysIn2 Free |
| #sysIn3 Program Number LOAD |
| #sysIn4 – 10 Program Number |
| #sysIn11 Last Work |
| #sysIn12 Temporary Stop |
| #sysOut1 Ready for Start |
| #sysOut2 Robot Stopping |
| #sysOut3 Program Number ACK |
| #sysOut4 Program Number Error |
| #sysOut5 Running |
| #sysOut6 Error |
| #sysOut7 Emergency Stop |

Mechanical Initialization   To Work Home   Program Execution   Program Execution

Time

5.2 Power ON, Mechanical Initialization, Program Execution

This chart shows when [Complete Run Preparation Initialization Position] is set in [Menu] [Run Mode Parameters] [Other Parameters] [Initialize]. These are default values.

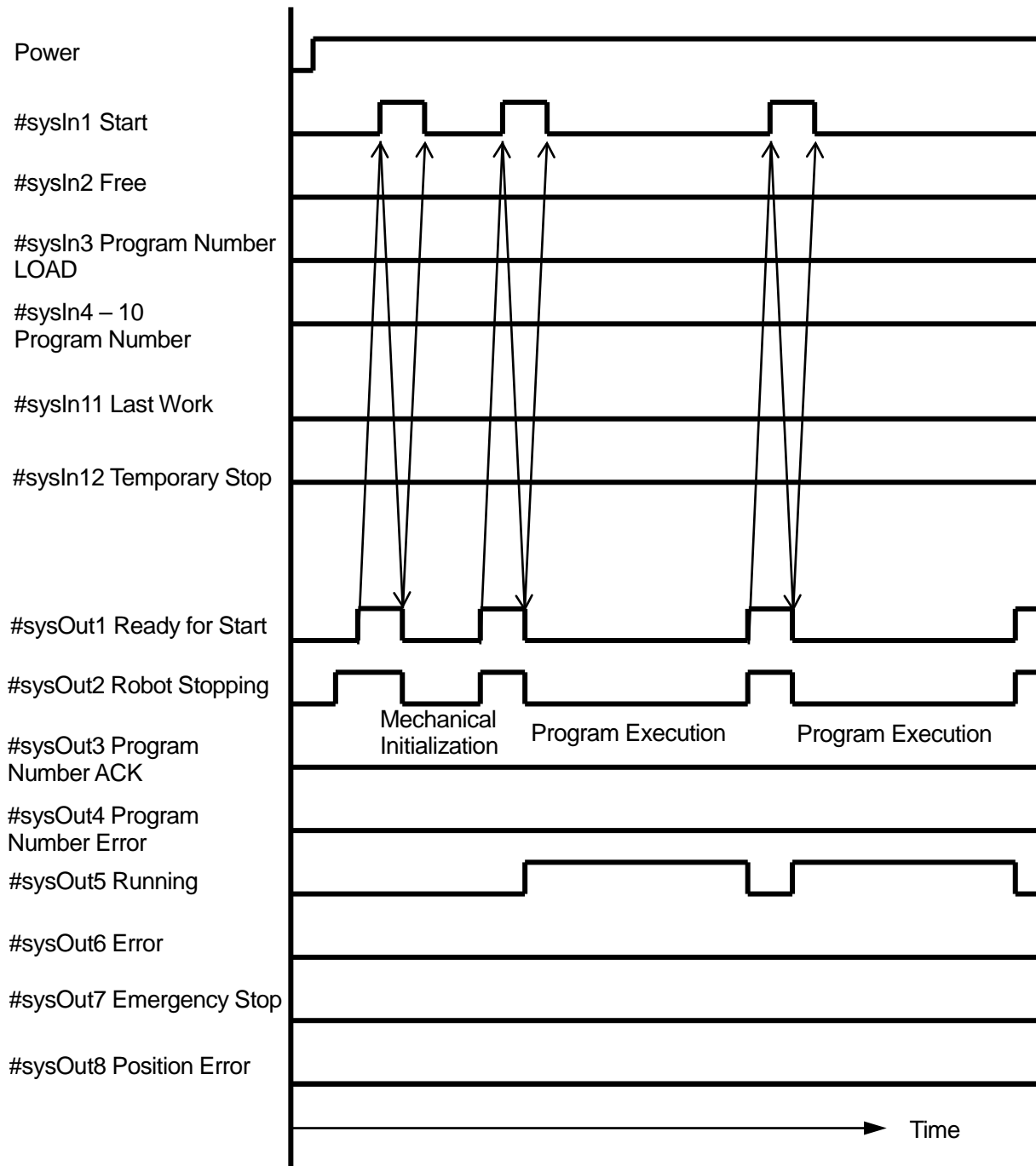|	
Power	
#sysIn1 Start	
#sysIn2 Free	
#sysIn3 Program Number LOAD	
#sysIn4 – 10 Program Number	
#sysIn11 Last Work	
#sysIn12 Temporary Stop	
#sysOut1 Ready for Start	
#sysOut2 Robot Stopping	
#sysOut3 Program Number ACK	Mechanical Initialization Program Execution Program Execution
#sysOut4 Program Number Error	
#sysOut5 Running	
#sysOut6 Error	
#sysOut7 Emergency Stop	
#sysOut8 Position Error	Time

5.3 Power ON, Mechanical Initialization, Work Home After Initialize, Program Execution

This chart shows when [Work Home on Start] is set in [MENU] [Run Mode Parameters] [Other Parameters] [Initialize].

Power

#sysIn1 Start

#sysIn2 Free

#sysIn3 Program Number LOAD

#sysIn4 – 10 Program Number

#sysIn11 Last Work

#sysIn12 Temporary Stop

#sysOut1 Ready for Start

#sysOut2 Robot Stopping

#sysOut3 Program Number ACK

#sysOut4 Program Number Error

#sysOut5 Running

#sysOut6 Error

#sysOut7 Emergency Stop

#sysOut8 Position Error

Mechanical Initialization   To Work Home   Program Execution   Program Execution

Time
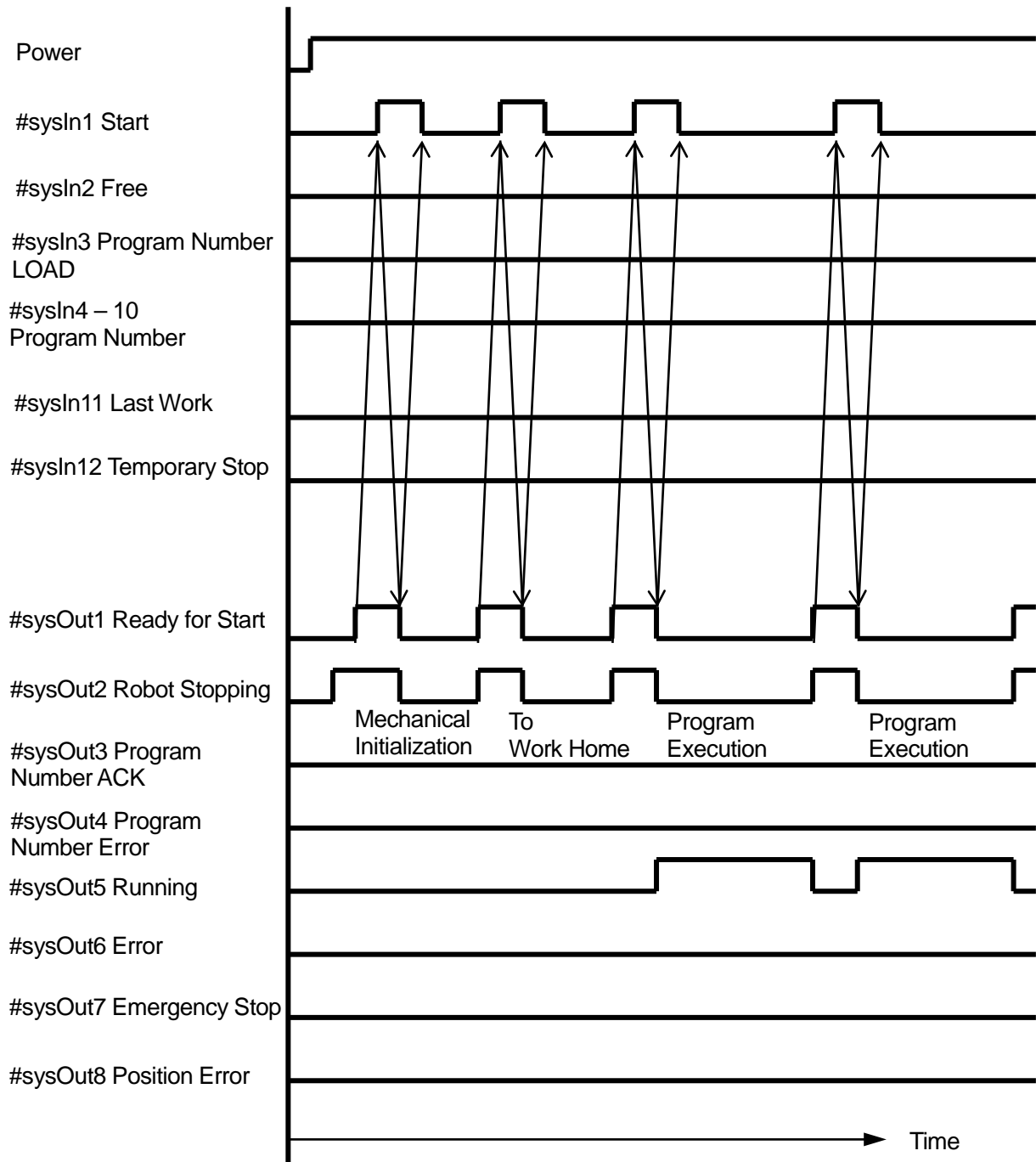
5.4 Changing Program Numbers and Program Execution via Program Number LOAD

This graph shows when I/O-SYS is set to [Enabled] in the Administrative Settings Mode [MENU] [Program Number Change] and the [MENU] [Run Mode Parameter] [I/O Settings] are set to [LOAD/ACK Handshake]; and when [MENU] [Run Mode Parameter] [Other Parameter] [Initialize] is set to [Work Home after First Cycle] or to [Work Home after Initialize].
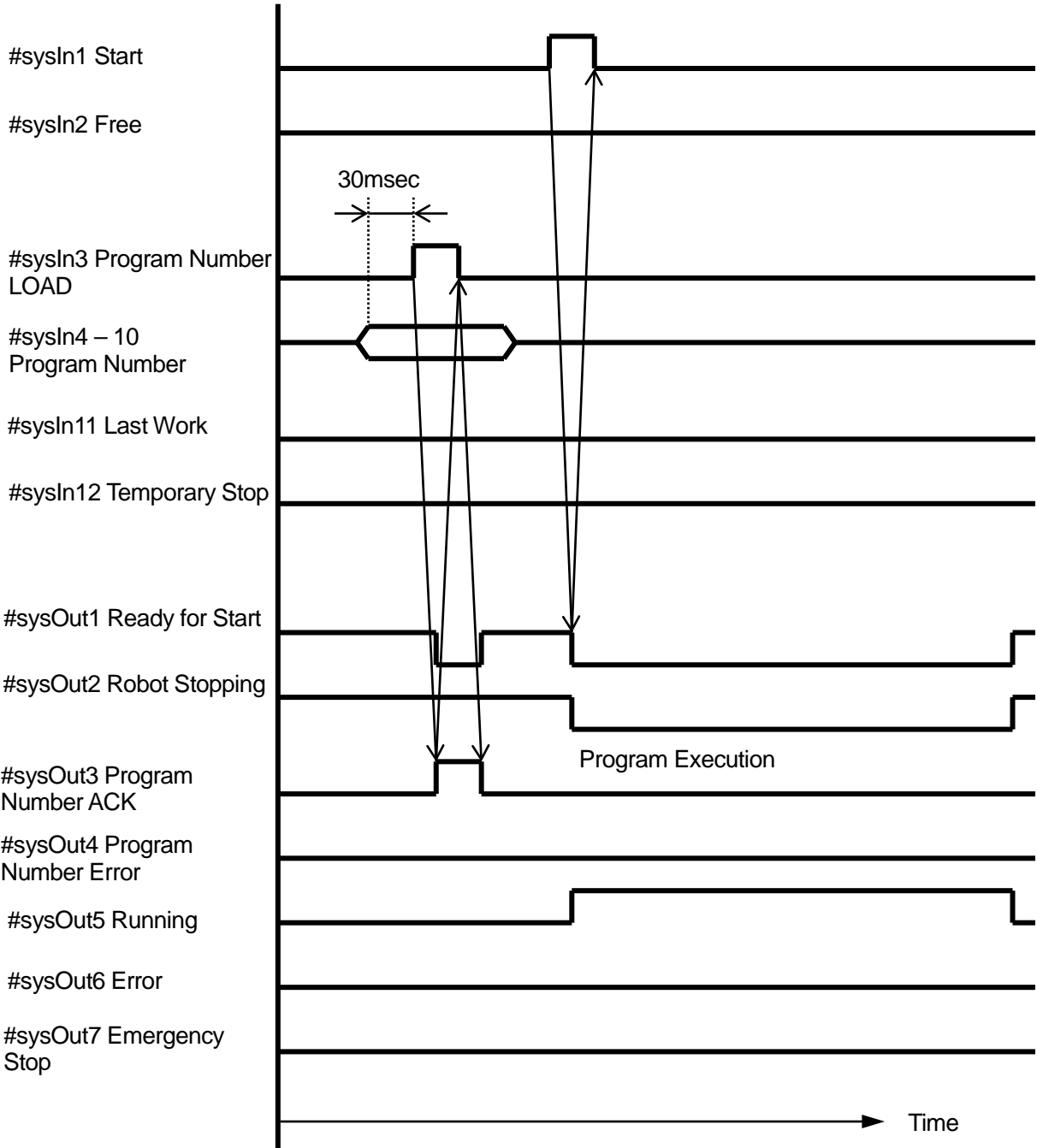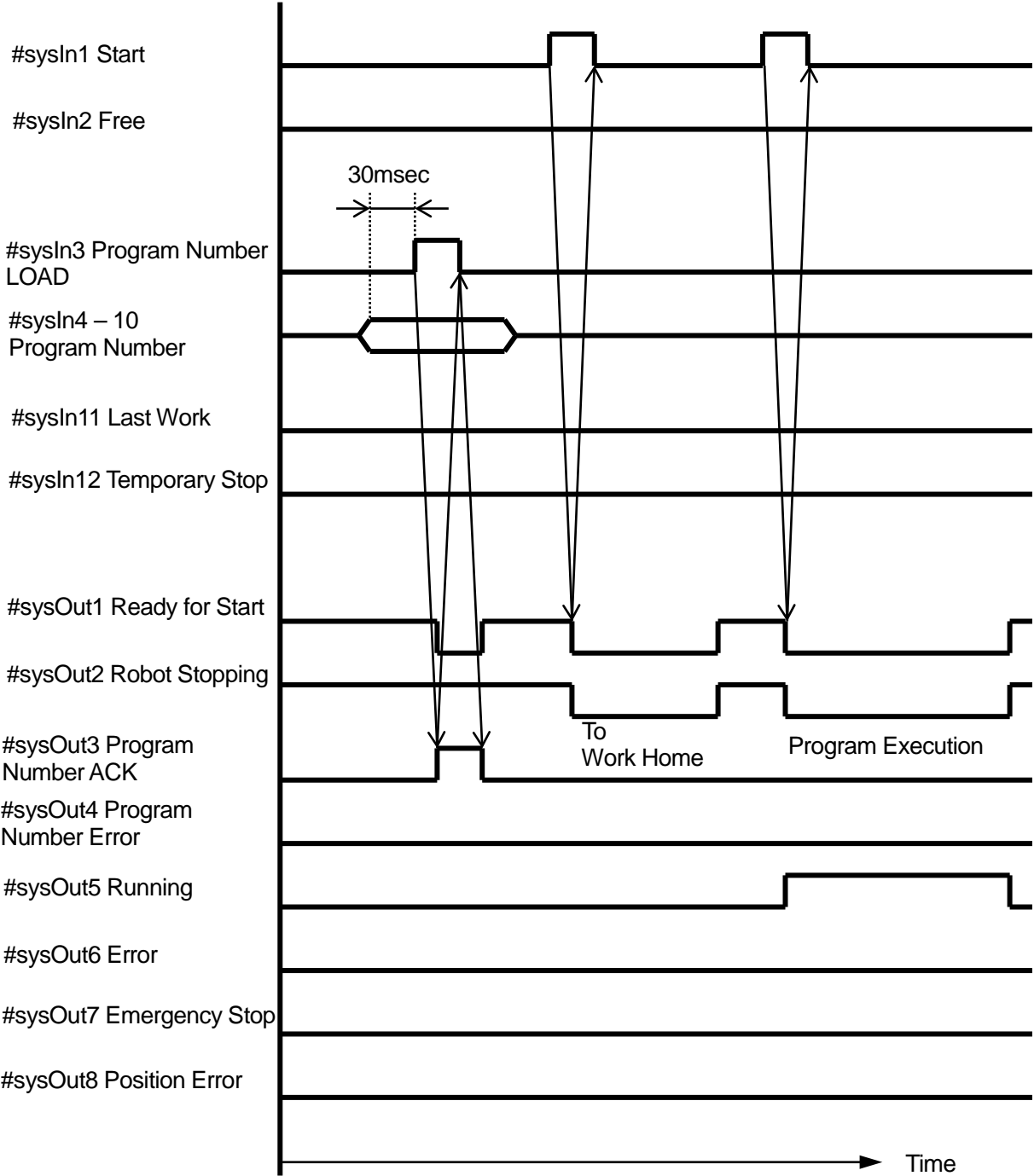
5.5 Changing Program Numbers, Program Execution and Work Home After Initialize via Program Number LOAD.

This chart shows the signal changes when I/O-SYS is [Enabled] in Administration Settings Mode [MENU] [Program Number Change], and the settings in [MENU] [Run Mode Parameter] [I/O Setting] [Program Number Changing Method] are set to [LOAD/ACK Handshake]; and when [Run Mode Parameter] [Initialize] is set to [Work Home on Start].

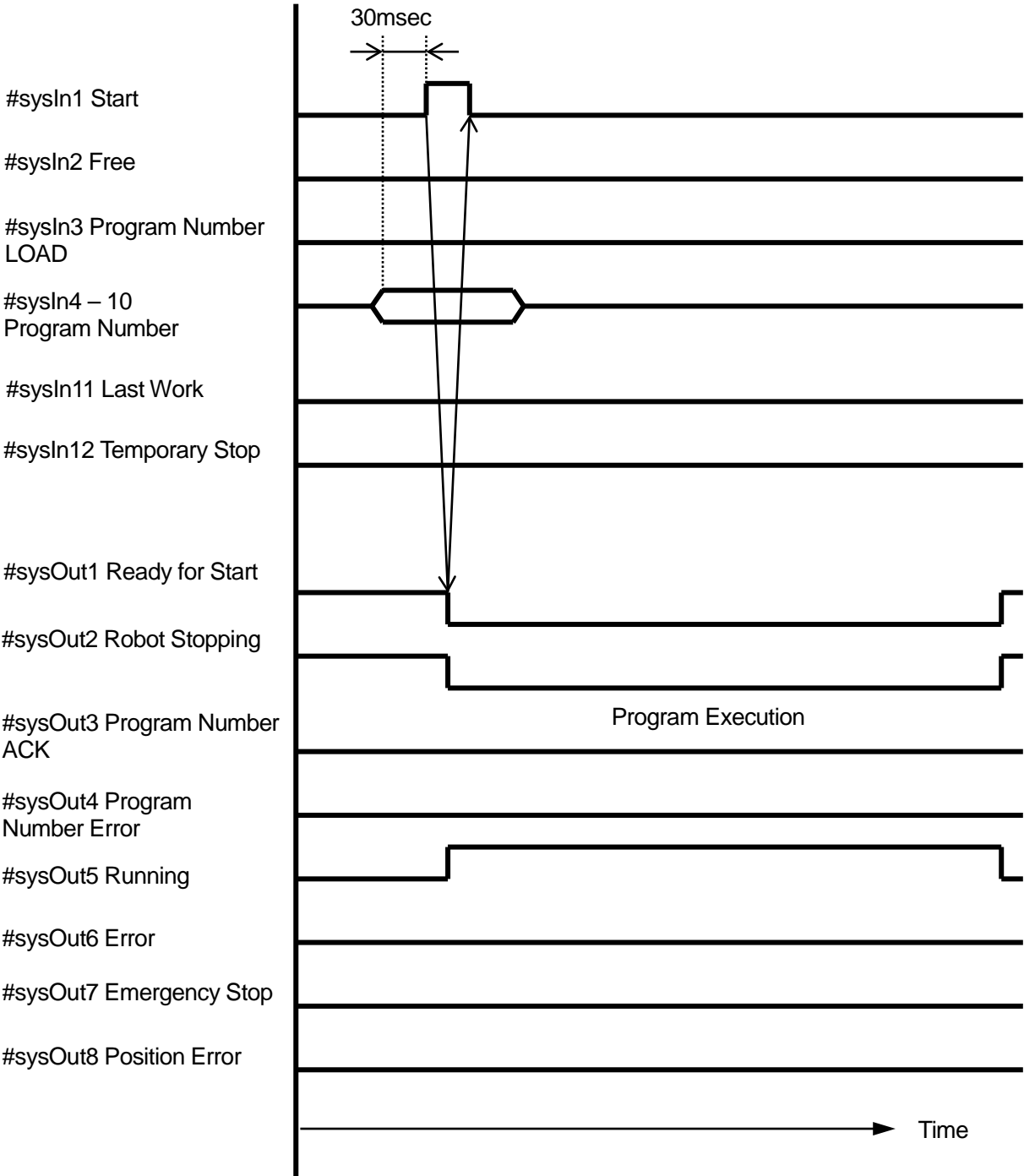## 5.6 Changing Program Numbers via Program Number LOAD and Program Number Error

The chart shows the signal changes when I/O-SYS in Administration Settings Mode [MENU] [Program Number Change] is set to [Enabled] and [Program Number Changing Method] in [MENU] [Run Mode Parameter] [I/O Settings] is set to [LOAD/ACK Handshake] and when there is no program registered to the loaded number.
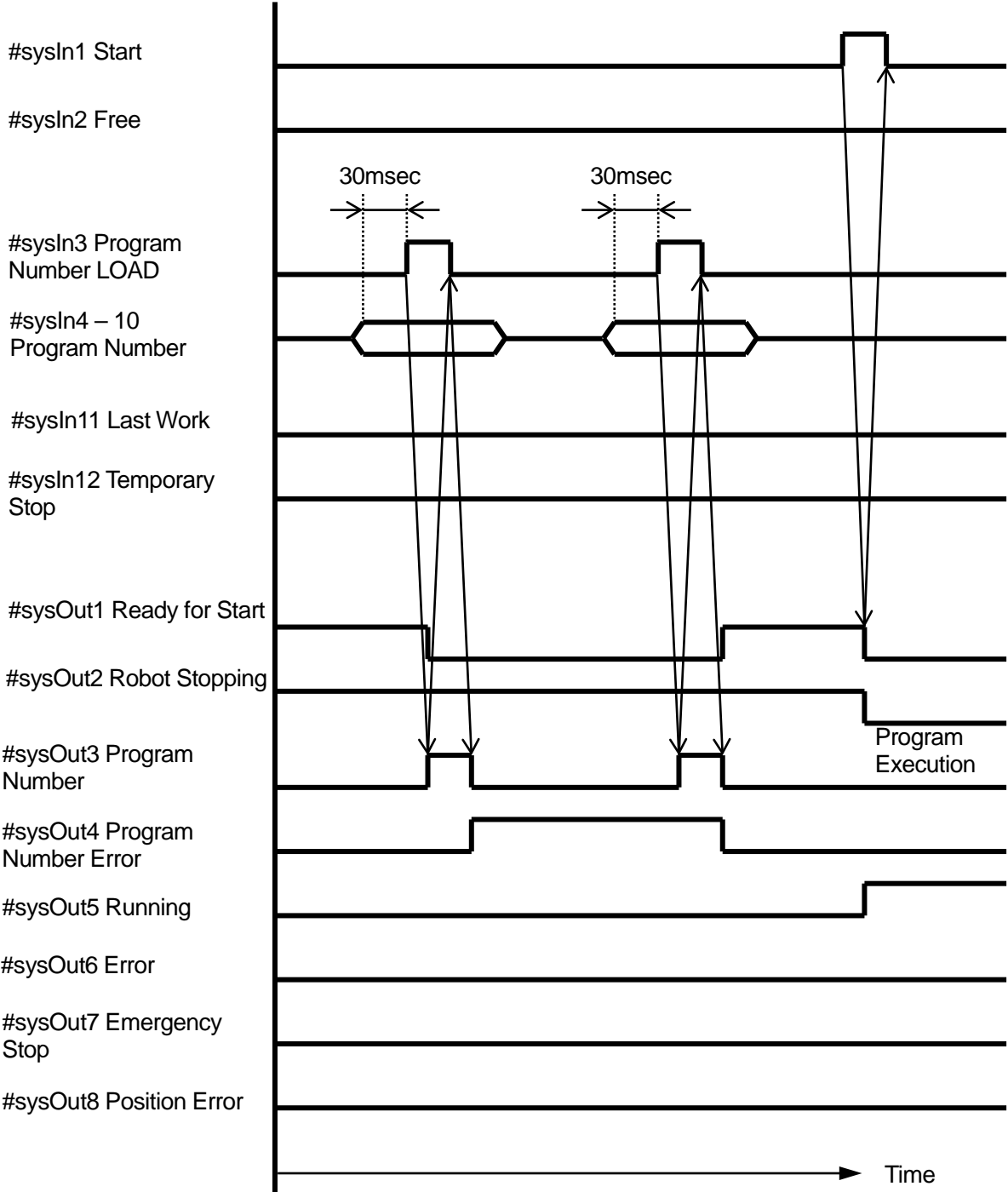
5.7 Changing Program Numbers and Program Execution via Load at Start

This chart shows when I/O-SYS in the Administrative Settings Mode [MENU] [Program Number Change] is set to [Enabled], and [Program Number Changing Method] in [MENU] [Run Mode Parameter] [I/O Settings] is set to [Load at Start].

30msec

#sysIn1 Start

#sysIn2 Free

#sysIn3 Program Number LOAD

#sysIn4 – 10 Program Number

#sysIn11 Last Work

#sysIn12 Temporary Stop

#sysOut1 Ready for Start

#sysOut2 Robot Stopping

Program Execution

#sysOut3 Program Number ACK

#sysOut4 Program Number Error

#sysOut5 Running

#sysOut6 Error

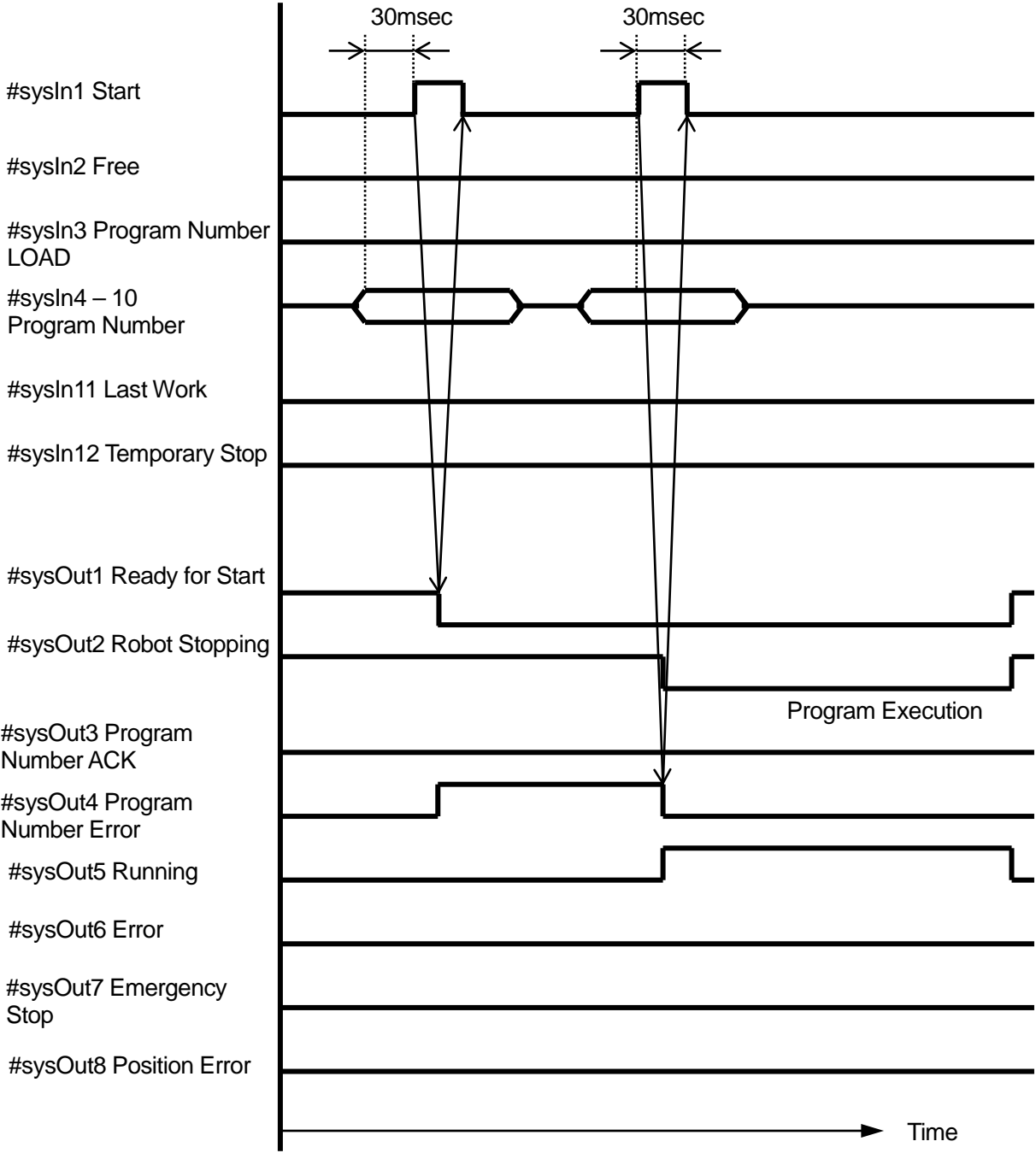#sysOut7 Emergency Stop

#sysOut8 Position Error

Time

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

This chart shows when I/O-SYS in the Administrative Settings Mode [MENU] [Program Number Change] is set to [Enabled], and when [Program Number Changing Method] in [MENU] [Run Mode Parameters] [I/O Settings] is set to [Load at Start] and when a program number error occurs.

5.9 #sysIn2 Start Inhibition

#sysIn1 Start

#sysIn2 Start Inhibition

Start Inhibition

Start Inhibition

Invalid

#sysIn3 Program Number
LOAD

#sysIn4 – 10
Program Number

#sysIn11 Last Work

#sysIn12 Temporary Stop

#sysOut1 Ready for Start

#sysOut2 Robot Stopping

Temporary Stop

#sysOut3 Program
Number ACK

#sysOut4 Program
Number Error

#sysOut5 Running

Program Start

#sysOut6 Error

#sysOut7 Emergency
Stop

#sysOut8 Position Error

Time

5.10 #sysIn2 Start-Stop Inhibition
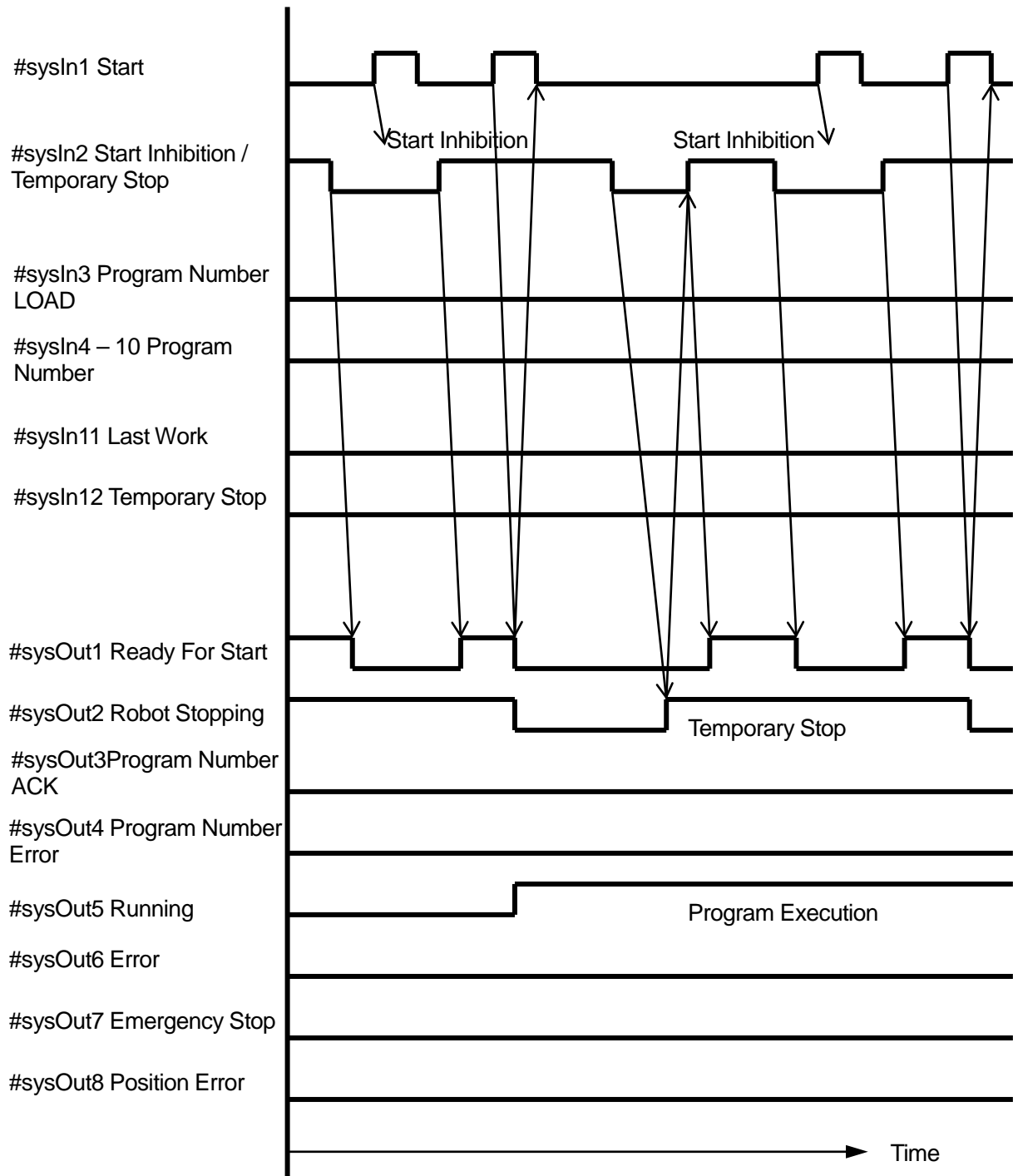
5.11 #sysIn2 Soft Lock

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

From here onwards, this is the same as a job when the power is turned ON.

#sysIn1 Start

#sysIn2 Softlock

Start Inhibition

#sysIn3 Program Number LOAD

#sysIn4 – 10 Program Number

#sysIn11 Last Work

#sysIn12 Temporary Stop

#sysOut1 Ready for Start

#sysOut2 Robot Stopping

Emergency Stop

#sysOut3 Program Number ACK

#sysOut4 Program Number Error

#sysOut5 Running

#sysOut6 Error

#sysOut7 Emergency Stop

#sysOut8 Position Error

Time

5.12 #sysIn2 Emergency Stop

The robot is stopped immediately, 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.

From here onwards, this is the same as a job when the power is turned ON.

From here onwards, this is the same as a job when the power is turned ON.

#sysIn1 Start

#sysIn2 Emergency Stop

#sysIn3 Program Number LOAD

#sysIn4 -10 Program Number

#sysIn11 Last Work

#sysIn12 Temporary Stop

#sysOut1 Ready for Start

#sysOut2 Robot Stopping

#sysOut3 Program Number ACK

Emergency Stop

Emergency Stop

#sysOut4 Program Number Error

#sysOut5 Running

#sysOut6 Error

#sysOut7 Emergency Stop
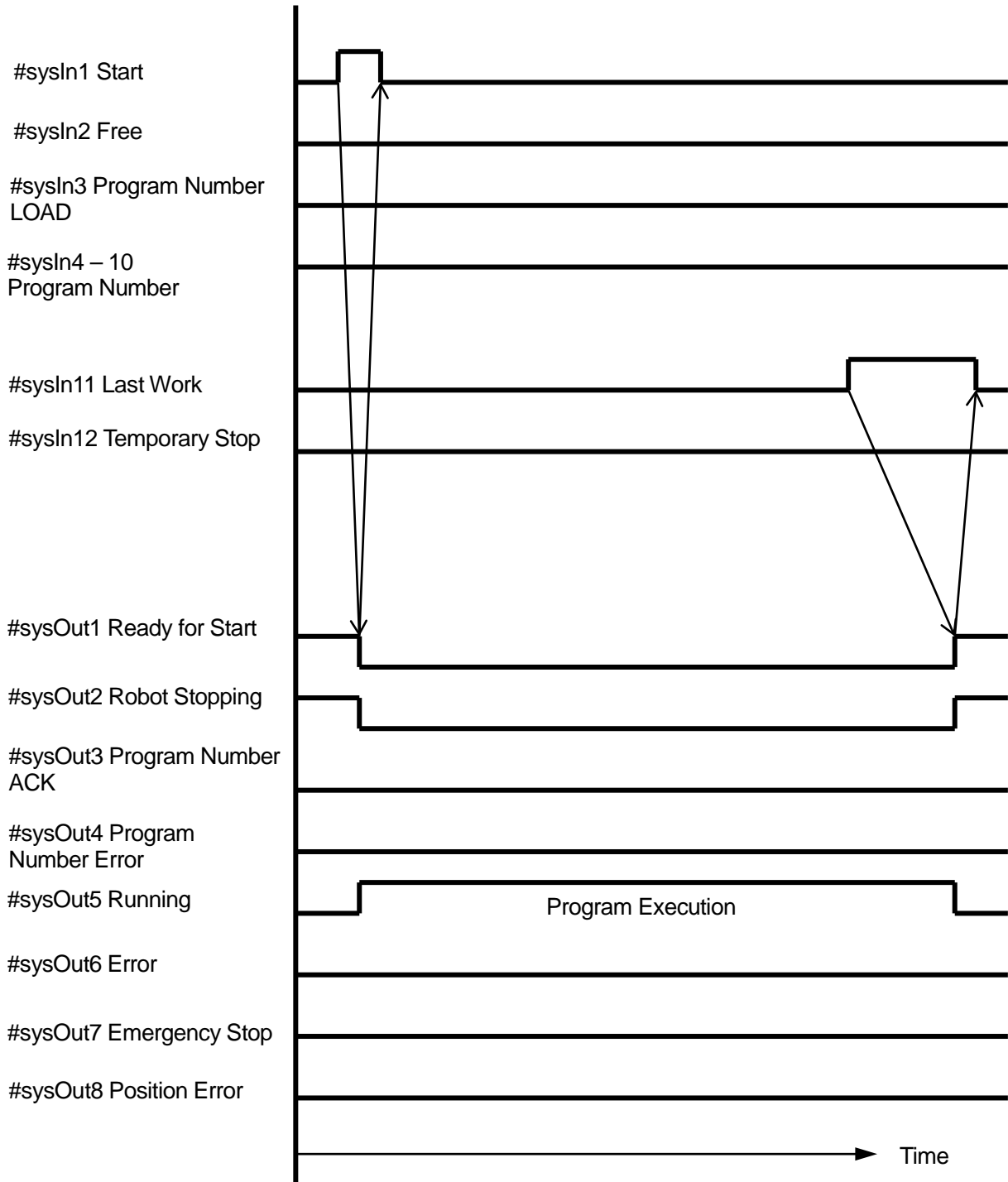
#sysOut8 Position Error

Time

Time

5.13 #sysIn12 Temporary Stop

The #sysIn12 Temporary Stop is positive logic. It also has an inhibit start function.
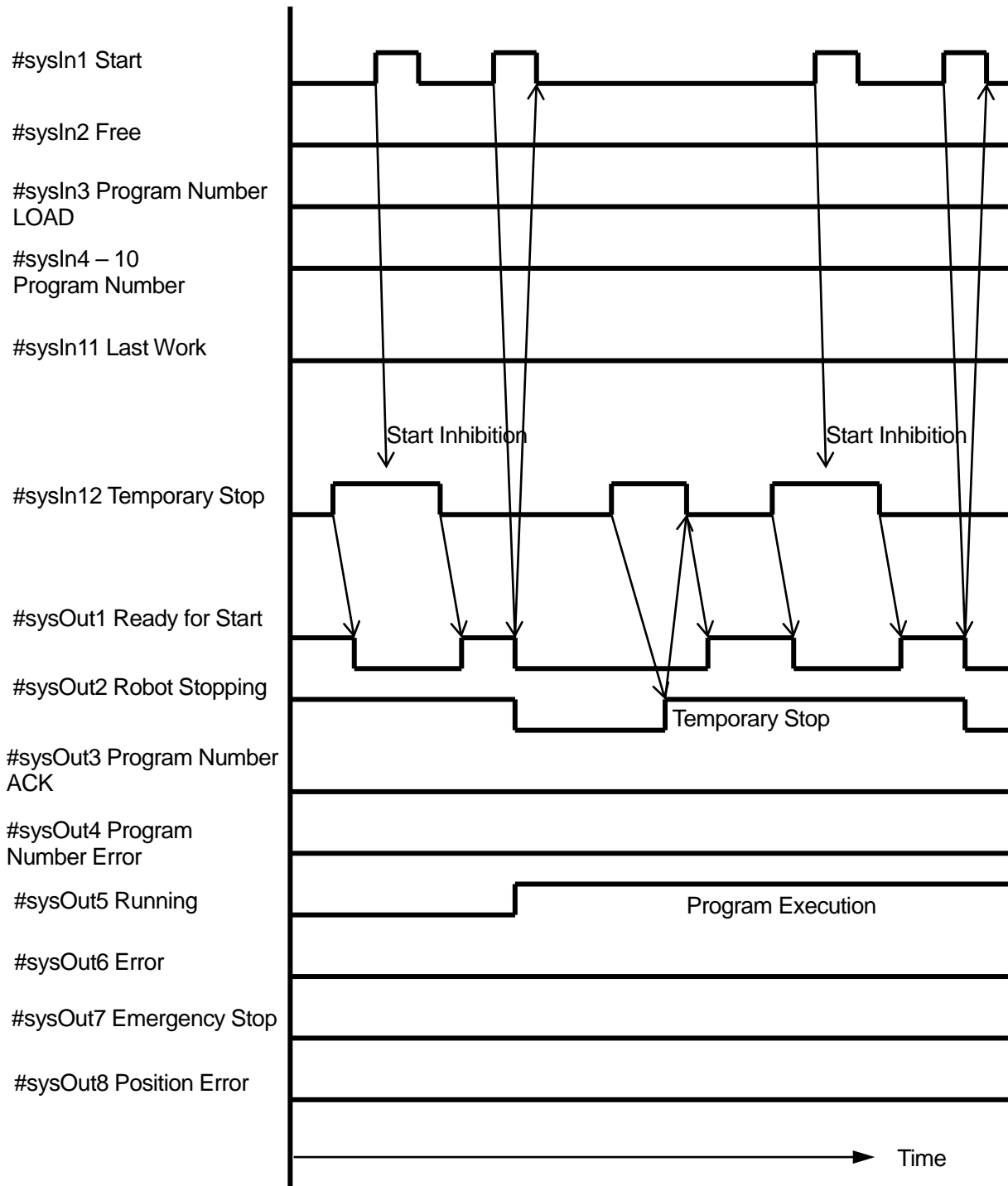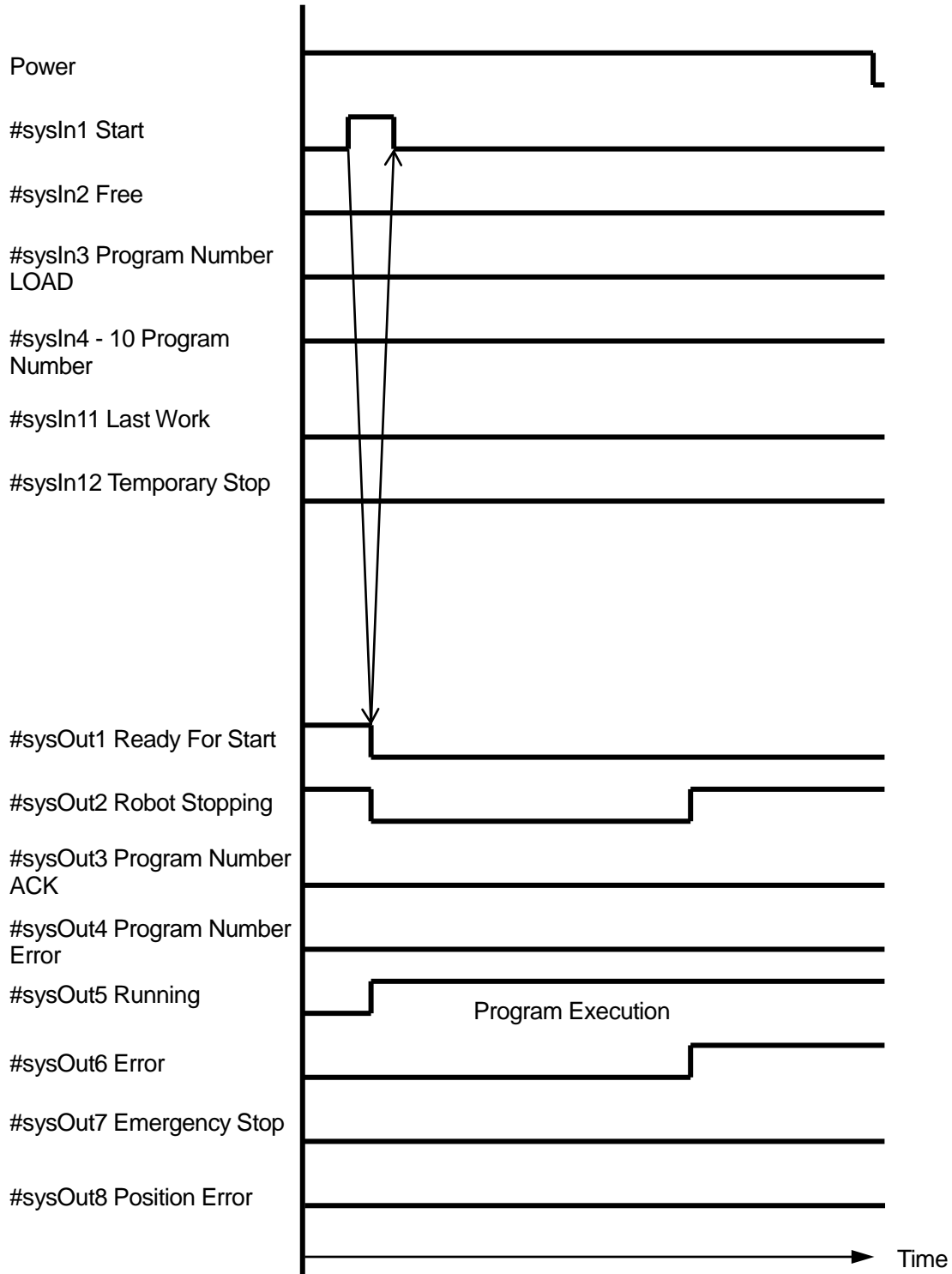
5.14 #sysIn11 Last Work

A program is repeated if [Cycle Mode] is set to [Continuous Playback]. Turning ON the [Last Work] command finishes the program.

#sysIn1 Start	
#sysIn2 Free	
#sysIn3 Program Number LOAD	
#sysIn4 – 10 Program Number	
#sysIn11 Last Work	
#sysIn12 Temporary Stop	
#sysOut1 Ready for Start	
#sysOut2 Robot Stopping	
#sysOut3 Program Number ACK	
#sysOut4 Program Number Error	
#sysOut5 Running	Program Execution
#sysOut6 Error	
#sysOut7 Emergency Stop	
#sysOut8 Position Error	
	Time

5.15 #sysOut6 Error

When an error has occurred, turn OFF the robot and then turn it ON again.

Power
#sysIn1 Start
#sysIn2 Free
#sysIn3 Program Number LOAD
#sysIn4 - 10 Program Number
#sysIn11 Last Work
#sysIn12 Temporary Stop
#sysOut1 Ready For Start
#sysOut2 Robot Stopping
#sysOut3 Program Number ACK
#sysOut4 Program Number Error
#sysOut5 Running
#sysOut6 Error
#sysOut7 Emergency Stop
#sysOut8 Position Error

Program Execution

Time

5.16 #sysOut8 Position Error

A position error is detected at the end of the program.

It is possible to skip the error and start the next program.

#sysIn1 Start	
#sysIn2 Free	
#sysIn3 Program Number LOAD	
#sysIn4 – 10 Program Number	
#sysIn11 Last Work	
#sysIn12 Temporary Stop	
#sysOut1 Ready for Start	
#sysOut2 Robot Stopping	
#sysOut3 Program Number ACK	Program Execution Program Execution
#sysOut4 Program Number Error	
#sysOut5 Running	
#sysOut6 Error	
#sysOut7 Emergency Stop	
#sysOut8 Position Error	

Position Error

Time

963811107 as of 2017-01

Japanese Ver. 2017-01