KOGANEI

Koganei Desktop Robot
Creceed Cell Master

DTRB-AS/AL/CS

Owner's Manual Ver.2.0

Contents

Differences Between DTR (Former) and DTRB (New) Software

1. Change in the number of steps in circular interpolation

DTR employs one-step circular interpolation, while DTRB employs two-step circular interpolation.

Example:

DTR				DTRB			
Step	Command	Second	Data	Step	Command	Second	Data
1	CIRCLE	000	X_1=、Y_1=、X_2=、Y_2=、X_3=、Y_3=、Z=	1	CIRCLE	000	X_1=、Y_1=、Z_1=
				2	CIRCLE	000	X_2=、Y_2=、X_3=、Y_3=

2. JUMP destination in step insertion/deletion

DTR required the re-entry of JUMP destination instructions, while DTRB employs automatic editing.

Example: Step inserted into step 50

DTR				DTRB			
Before execution				Before execution			
Step	Command	Second	Data	Step	Command	Second	Data
1	SEQUENCE	610	J=100	1	SEQ	610	J=100
—	—	—		—	—	—	
100	POINT	200	X=、Y=、Z=	100	POINT	200	X=、Y=、Z=
After execution				After execution			
Step	Command	Second	Data	Step	Command	Second	Data
1	SEQUENCE	610	J=100	1	SEQ	610	**J=101**
—	—	—	—	—	—	—	—
50	SEQUENCE	405		50	SEQ	405	
—	—	—	—	—	—	—	—
101	POINT	200	X=、Y=、Z=	101	POINT	200	X=、Y=、Z=

With DTR, you must change the data J=100 in step 1 to J=101.

3. Change in the operation method of continuous interpolation

DTR stores the interpolation pattern in memory before executing continuous interpolation, while DTRB directly executes the interpolation command information. In addition, there is no limit on the numbers of continuous interpolation. Lines 300 and 500 in DTR are not used. If you use those lines, DTRB will not do anything and simply proceed to the next step.

Example:

DTR				
Step	Command	Second	Data	Comment
0	LINE	100	X=,Y=,Z=	Start of continuous interpolation storage (reference point setting)
1	LINE	000	X=,Y=,Z=	
2	CIRCLE	000	X_1=,Y_1=,X_2=,Y_2=,X_3=,Y_3=,Z=	
3	LINE	000	X=,Y=,Z=	
4	CIRCLE	000	X_1=,Y_1=,X_2=,Y_2=,X_3=,Y_3=,Z=	
5	LINE	200		End of continuous interpolation storage
6	LINE	500	X=,Y=,Z=	Continuous interpolation shift
7	LINE	300		Execution of continuous interpolation (Continuous interpolation of steps 1 through 4 from the reference point shifted in step 6)

DTRB				
Step	Command	Second	Data	Comment
0	LINE	100		Start of continuous interpolation
1	LINE	000	X=,Y=,Z=	
2	CIRCLE	000	X_1=,Y_1=,Z_1=	
3	CIRCLE	000	X_2=,Y_2=,X_3=,Y_3=	
4	LINE	000	X=,Y=,Z=	
5	CIRCLE	000	X_1=,Y_1=,Z_1=	
6	CIRCLE	000	X_2=,Y_2=,X_3=,Y_3=	
7	LINE	200		End of continuous interpolation

4. Removal of SEQ500

Since CPU processing was slow in DTR, the SEQ500 command instruction was required for dispensing operations, but it is no longer required and has been removed in DTRB.

5. Differences in offset input, ZI input, and point input functions

With DTR, you performed teaching input simply by clicking buttons in the teaching box, but with DTRB you can directly input numeric values for teaching input or for parameters.

6. Differences in count reset function

With DTR, you performed operations by clicking buttons in the operation box, but with DTRB you do so using parameters and command PALLET 2＊＊ (the two asterisks represent a pallet number).

7. Differences in main unit RS232C connector

		DTR	DTRB
Connector on main unit of Cell Master		Female	Male
Cable specifications	Connector for the main unit	Male	Female
	Connector for the PC	Female	Female
	Cable	Straight	Cross

8. Main unit compatibility chart for DTR and DTRB

	DTRP-TB (teaching box)	DTRP-SW-HTA (Creceed Editor)	DTRBP-TB (teaching box)	DTRBP-SW-HTA (DTRB Editor)
DTR main unit	○	○	×	×
DTRB main unit	×	×	○	○

Chapter 1 Precautions

Thank you for purchasing Koganei's Cell Master. This manual explains the product's features and how to properly use the unit. Please read the manual carefully and make sure to always handle and operate the product properly. Also, please keep this manual in an easily accessible place, so that you can refer to it whenever necessary. We also request that customers who purchased our PC support software also refer to the manual that came with it.

1-1 Safety Precautions

⚠ DANGER

- Do not use the product for the purposes listed below:
  1. Medical equipment related to maintenance or management of human lives or bodies.
  2. Mechanical devices or equipment designed for the purpose of moving or transporting people.
  3. Critical safety components in mechanical devices.

  This product has not been planned or designed for purposes that require advanced stages of safety. It could cause injury to human life.
- Do not use the product in locations with or near dangerous substances such as flammable or ignitable substances. It could ignite or burst into flames.
- Do not enter the machine's operating area while the product is in operation, or in an operation-ready state. The actuator can move suddenly, possibly resulting in injury.
- Persons who use a pacemaker, etc., should keep a distance of at least 1 meter away from the product. There is a possibility that the pacemaker will malfunction due to the strong magnet built into the product.
- Always place the main unit on a flat, level, and sturdy surface and ensure there is adequate working space around it. Dropping or falling of the product or improper operation could result in injury.
- Never attempt to remodel the product. It could result in abnormal operation leading to injury, electric shock, fire, etc.
- Never attempt inappropriate disassembly, or assembly of the product relating to its basic inner construction, or to its performance or functions. It could result in injury, electric shock, fire, etc.
- Do not splash water on the product. Spraying it with water, washing it, or using it underwater could result in malfunction of the product leading to injury, electric shock, fire, etc.

⚠ WARNING

- Do not use the product in excess of its specification range. Such use could result in product breakdowns, function stop, damage, or drastically reduce the operating life.
- Design safety circuits and equipment systems so as to avoid equipment damage or personal injury when the machine is shut down due to an emergency stop, power outages, or other system abnormalities.
- Always implement D-class grounding work (ground resistance 100Ω or less).
  Current leakage could cause electric shock or erratic operation.
- Before supplying electricity to the device and before starting operation, always conduct a safety check of the area of machine operation. Unintentional supply of electricity could possibly result in electric shock, or in injury caused by contact with moving parts.
- Do not touch the terminals and the miscellaneous switches, etc., while the device is powered on. There is a possibility of electric shock and abnormal operation.
- Avoid scratching the cords of cables, etc.
  Letting the cords be subject to scratching, excessive bending, pulling, rolling up, or being placed under heavy objects or squeezed between two objects, may result in current leaks or defective continuity that could lead to fire, electric shock, or abnormal operation.
- If abnormal noise occurs or vibrations are excessive, immediately cease operation. Continued use in this condition may result in abnormal operation or runaway that could lead to product damage or destruction.
- Do not throw the product into fire. The product could explode and/or release toxic gases.

- Do not sit on the product, place your foot on it, or place other objects on it. Accidents such as falling and tripping over could result in injury. Dropping the product may result in injury, or it might also damage or break it, resulting in abnormal or erratic operation, runaway, etc.
- For inspection, maintenance, replacement, or other kinds of operations related to the product, always completely turn off the power supply before beginning.
- Operate within the recommended loads and specified speeds.
- Always unplug the power cord before making adjustments to the unit or performing maintenance/ inspection work. Failing to heed this warning may result in injuries and electrical shock due to contact with moving parts.
- You can do the following things to prevent someone else from carelessly turning on the power.
  1. Display a sign or other such message stating what is being done in an easy-to-see location.
  2. Reel the power cord in closer to the person performing the work.
  3. Lock the power plug and outlet and leave the key with the person performing the work or provide a safety plug.

⚠ CAUTION

- When transporting or installing the product, support it securely with a lift or support tool, and avoid injuries by having multiple people, etc., do the work.
- Do not use the product in locations that are subject to direct sunlight (ultraviolet rays), dust, salt, iron powder, high humidity, or in the media and/or the ambient atmospheres that include organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, acids, etc. It could lead to an early shutdown of some functions or a sudden degradation of performance, and result in a reduced operating life.
- Do not use the product in atmospheres subject to corrosive gases, flammable gases, flammable liquids, etc. It could lead to a decrease in strength due to rust, or to a risk of the motor igniting or the product exploding.
- If using the product in the locations listed below, implement adequate shielding measures.
  Failure to take these measures may lead to erratic operation:
  1. Locations subject to large electric current or magnetic fields
  2. Locations subject to noise due to static electricity, etc.
  3. Locations with the possibility of exposure to radiation
- Do not bring magnetic media, etc., within 1 meter of the product. There is a possibility that the data in the magnetic media will be destroyed due to the magnetism of the magnet built into the product.
- Install the main unit in locations with as little dust or dirt as possible. Installation in locations subject to lots of dust or dirt can lead to erratic operation.
- Do not install the product in locations subject to heavy vibrations (4.9m/s^2 [0.5G] or more).
  Transmission of heavy vibrations to the product could lead to erratic operation.
- When installing the product, leave room for adequate working space around it. Failure to ensure adequate working space will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- Do not scratch, dent, or deform the driving portion by climbing on the product, using it as a scaffold, or placing objects on it. It could lead to damaged or broken products that result in operation shutdown or degraded performance.
- Always post an “operations in progress” sign for installations, adjustments, or other operations, to avoid unintentional supplying of electrical power, etc. Such accidental supplies may cause electrical shock, or sudden activation of the actuator that could result in physical injury.

⚠ ATTENTION

- When considering the possibility of using this product in situations or environments not specifically noted in the Catalog or Owner's Manual, or in applications where safety is an important requirement such as in an airplane facility, combustion equipment, leisure equipment, safety equipment, and other places where human life or assets may be greatly affected, take adequate safety precautions such as an application with enough margins for ratings and performance or fail-safe measure. Be sure to consult us about such applications.
- Use a protective cover, etc., to ensure that the operating portions of mechanical devices, etc., are isolated and do not come into direct contact with human bodies.
- Do not control the product in a way that would cause a workpiece to fall during a power failure. Take control measures so that they prevent the table and the workpiece, etc., from falling during a power failure or an emergency stop of the mechanical devices.
- Always check the Owner's Manual and other reference materials for product wiring.
- When handling the product, wear protective gloves, safety glasses, safety shoes, etc., to keep safety.
- When the product can no longer be used, or is no longer necessary, dispose of it appropriately as industrial waste.
- For inquiries about the product, consult Koganei Overseas Department. The telephone number is shown on the back cover of this owner's manual.

⚠ OTHERS

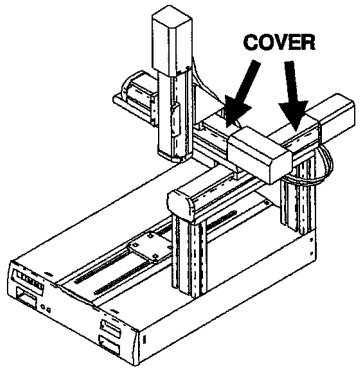
- Always observe the following items.
  1. When using this product into systems, always use genuine KOGANEI parts or compatible parts (recommended parts).
     When conducting maintenance and repairs, always use genuine KOGANEI parts or compatible parts (recommended parts). Always observe the required methods and procedure.
  2. Never attempt inappropriate disassembly or assembly of the product relating to basic construction, or its performance or functions.

  Koganei cannot be responsible if these items are not properly observed.

1-2 Precautions on Transporting and Handling

(1) Handling while product is in a shipping carton
- When moving/handling the product in a shipping carton, be extra careful in order to avoid bumping against or dropping it.
- Always place it horizontally when left at rest.
- Do not climb on top of the shipping carton.
- Do not place heavy objects or objects with a concentrated load on top of the carton or product.

(2) Handling after unpacking the product
- The cover may get bent when unpacking the unit. So do not grasp it at the locations indicated by the arrows in the following illustration when taking it out. Hold the base portion when carrying it.
- Be careful not to bump the unit against anything when moving it. Care should be taken to the arm portion and motor cover portion.
- Be careful not to injure yourself or damage the unit by mistakenly dropping it when unpacking the product.
- Contact us immediately if the unit was damaged during shipping or any accessories are missing.



1-3 Precautions on the Main Unit

(1) The main unit will lose synchronism if tools or workpiece cannot be centered on the mounting surface.

(2) Resolution is not indicating absolute positional accuracy. It is a theoretical movement distance per pulse that is calculated based on the main unit's construction.

(3) Set the speed and acceleration time according to the payload and installation conditions. Failing to do this will result in the main unit's loss of synchronism.

(4) In order for the program number selected on the rotary switch to become effective, make sure you perform return to origin. When changing the rotary switch setting, always execute return to origin, and then overwrite the program and drive the main unit.

(5) Do not touch hot portions of the motor.
The motor will reach high temperatures while the main unit is operating, and touching it may cause burns. When touching the motor, such as during inspections, turn off the power to the main unit and let it cool down for a while. Make sure the motor is cool enough to touch before starting the inspection etc.

(6) Use in areas with electromagnetic interference, static electric discharge, or radio frequency interference is prohibited.
Do not use the unit in such locations. Failing to observe this warning may result in erratic operations.
(7) Protective grounding
Always ground the unit to prevent electric shock.
(8) Be careful when inspecting the unit.
Turn off the power to the main unit and cut off the power supply to prevent electric shock before touching the external terminals or connectors while inspecting the main unit etc.
(9) Connecting the power supply in reverse polarity will result in a short circuit.
Always use a power supply that has a short-circuit protection function.
(10) When restarting the power for the main unit, first switch the power OFF, and then wait at least two seconds before switching the power back ON. Use caution when switching the power on or off.

1-4 Installation Environment

(1) Specifications

Item	Specification
Operating temperature	0 to 40°C
Operating humidity	35 to 90%
Other	(1) Do not expose to direct sunlight. (2) Avoid locations where the unit may come in contact with water or cutting oil. (3) Choose a location with little or no dust or dirt. (4) Choose a vibration-free location. (5) Do not expose to strong electromagnetic waves or UV radiation. (6) Do not expose to radiant heat from large heat sources, such as heat treatment equipment. (7) Do not expose to corrosive gases, such as sulfuric acid or hydrochloric acid.

(2) Location

Install the main unit on a sturdy and rattle-free, level workbench.

(3) Storage

The storage environment must conform to the installation environment, but when storing for a long period of time, be particularly careful of condensation buildup.
The unit is not packaged and shipped with any desiccant. When storing the unit in an environment susceptible to condensation, take anti-condensation measures for the entire outside of the shipping carton or inside the shipping carton.
Maintain a temperature no more than 50°C when storing.

1-5 Warranty

Koganei offers the following warranty in the event the Cell Master you purchased proves defective.

Coverage: We shall repair the Cell Master free of charge in the event of material or structural defects in the original parts comprising the main unit.
(This shall be referred to as “warranty repairs” from hereon.)
Note that warranty repairs as mentioned here means that we replace the delivered product or repair it. We do not offer any compensation whatsoever for consequential loss or property damage.

Warranty period: The warranty period shall end when any of the following conditions exist:

1) Eighteen months have passed from the time of shipment.
2) One year has passed since installation.
3) The unit has been operated for over 2,400 hours.

Warranty exclusions: The following items are excluded from the warranty.

1) Defects arising from changes over time or wear from usage. (Includes natural color fading of coatings and plating, and the deterioration of expendables.)
2) Barely perceptible events that have no effect on the actuator’s quality or functionality. (Includes motor and sliding screw sound.)
3) When moving using either the LINE (linear interpolation and continuous interpolation) or the CIRCLE (circular interpolation) command, you may think there is a strange sound, but it is just the characteristic sound of the motor and is completely normal.
4) We do not guarantee absolute precision for the unit palletizing function. Consequently, the calculated position and actual position of the pallet movement point may deviate depending on conditions such as the size and placement of pallets as well as pallet precision.

We will not provide warranty service for defects caused by the following:

1) Natural disasters, including but not limited to earthquakes, typhoons, water damage, and lightning strikes, as well as accidents and fires.
2) Modifications or alterations not approved by Koganei.
3) Use of non-standard parts or lubricating grease other than the type we designated.
4) Poor maintenance/inspections or other mistakes.
5) Main unit disassembly.

1-6 Procedures from Purchase to Operation

This section describes the basic procedures up to actually operating the main unit after it has been purchased. This manual has been organized into chapters by procedure, making it easy for even first-time users to operate the main unit.

Sequence		What you should know	Reference section
Installation and connection	Installation ↓ Wiring ↓ Power supply on		Chapter 1 Chapter 3 Section 3-3-1
Setting parameters/ programming (using the teaching box or DTRB Editor)	Setting parameters ↓ Setting the rotary switch (switch is set to group 0 at shipment) ↓ Programming	• Set the parameter data in accordance with the operating conditions. • Setting the parameter data using the teaching box. • Setting the parameter data using DTRB Editor. • Make suitabe program for the main unit in accordance with its purpose. • Programming using the teaching box. • Programming using DTRB Editor.	Chapter 8 Chapter 6 Separate manual Chapter 5 Chapter 6 Separate manual
Operation	↓ Return to origin Test operation ↓ Main operation	• Check that it operates normally.	Chapter 7

Chapter 2 Overview

This chapter describes the Cell Master's features and introduces its options. It also lists the product's accessories, so please kindly check them.

2-1 Cell Master's Features

Koganei's Cell Master is so light and compact that it can be placed in the corner of your desk. There is a gantry type and Cartesian type with two or three axes, allowing you to build a versatile system that is suited to your purpose and can expand your creative horizons.

(1) Compactness

The main unit has an A4 footprint, allowing it to be set up almost anywhere 210× 200mm (W×D) of space is available. It is suitable for work environments where space is at a premium, including one-man cell production in which a single worker operates multiple cells as well as full-fledged cell production. Furthermore, it employs precision sliding screws, enabling precise movement with a repeatability of ±0.02mm, and it is lightweight (5.5kg), which makes it easy to carry and move.

(2) Ease of operation

There is no need for advanced skill. The main unit can be easily operated simply by the direct entry of operation points and parameters using the teaching box or DTRB Editor. This allows even beginners to easily use the unit and ensure stable quality. In addition, computer software with special operations programmed in advance is used, allowing you to use the main unit according to your intended purpose, including easily changing the operation program with the rotary switch, as well perform different work concurrently by introducing multiple units.

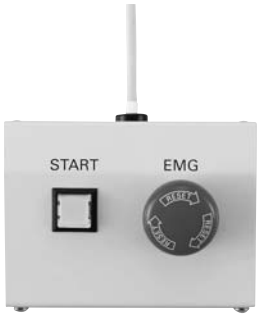
(3) Smooth support for complex work

The main unit is capable of three-dimensional linear interpolation, two-dimensional circular interpolation, and continuous interpolation, and thanks to its smooth support for complex work, it enables effective automation and labor saving at a cost lower than systems configured from separate components.

2-2 Accessories

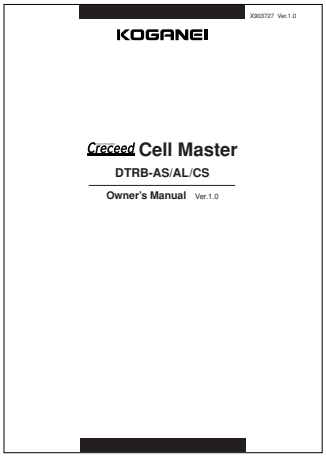
The Cell Master comes with the following accessories. Please check that they are all included at the time of unpacking.

1. Operation box 1 piece
DTRBM-OB



2. I/O connector 1 piece
DTRBM-CT

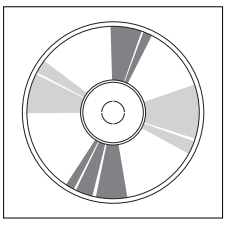
3. One owner's manual



2-3 Options

1. Teaching box
DTRBP-TB

2. DTRB Editor
DTRBP-SW-HTA



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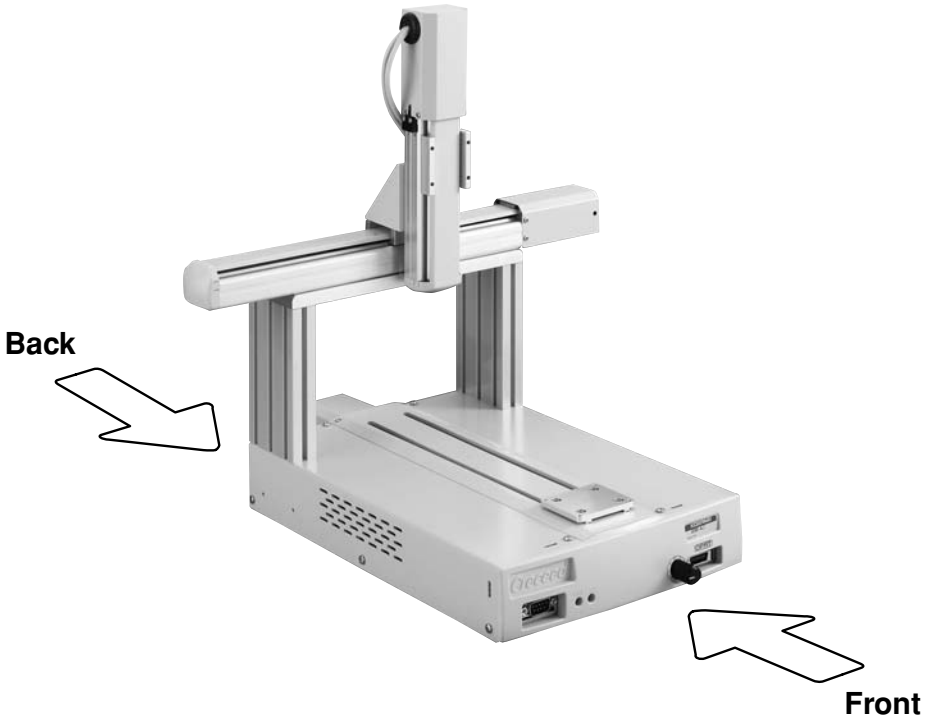
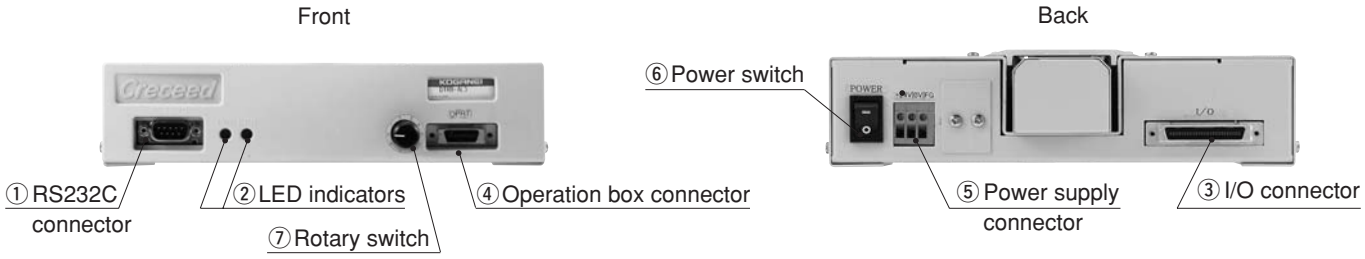
Chapter 3 Parts and Connections

This chapter covers the names, functions, and connection methods of the unit's terminals and connectors.

3-1 Major Parts and Functions

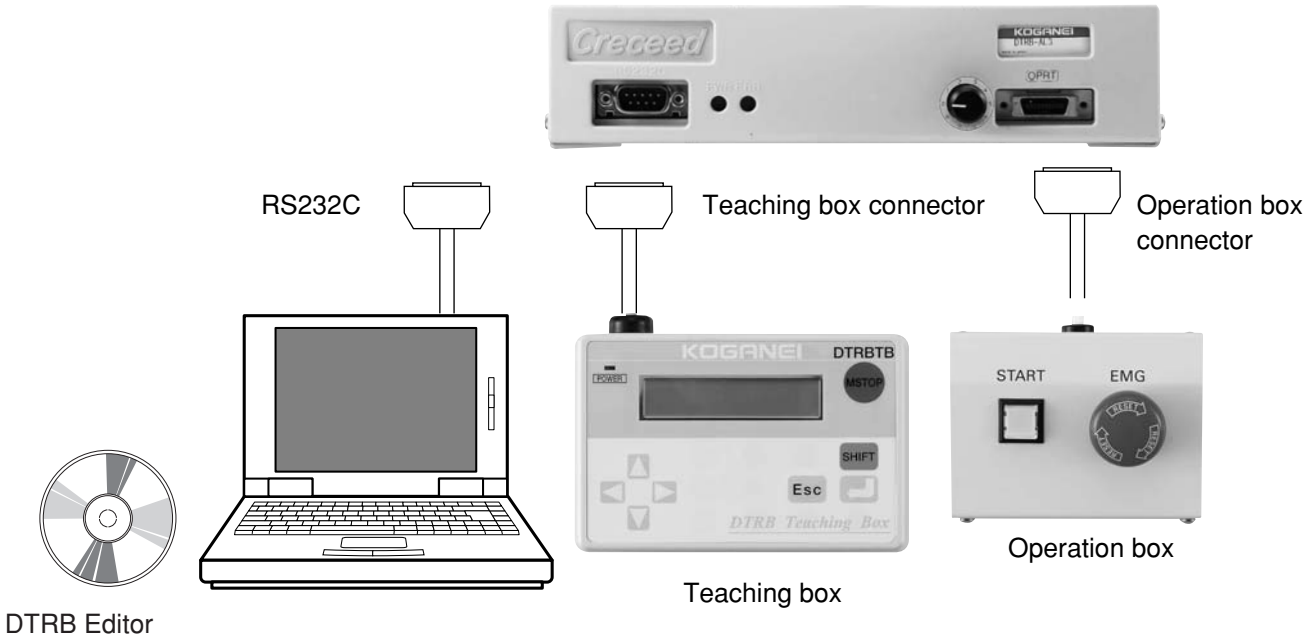




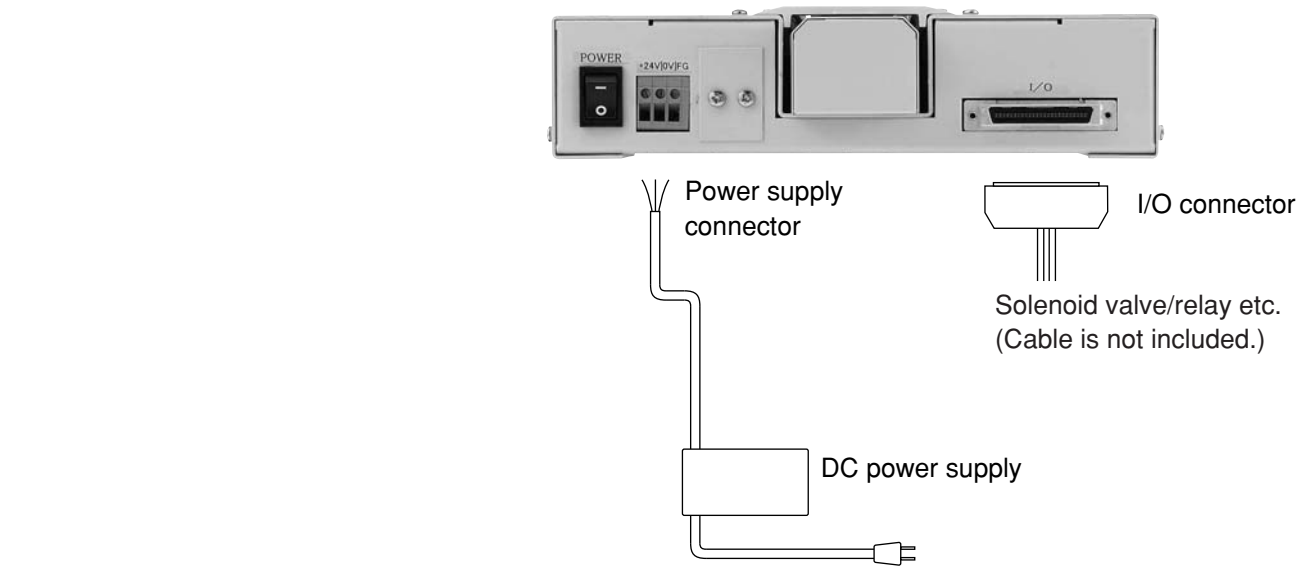
① RS232C connector:	Connects with a computer or a teaching box. (D-sub 9-pin) Note: Mold-type units cannot use an RS232C cable. Use EMI protection or an adapter on mold-type units.
② LED indicators:	Display the unit's control state. (See Section 10-2 "LED Indicators" for more information.)
③ I/O connector:	Connects to an input/output connector.
④ Operation box connector:	Connects to the operation box.
⑤ Power supply connector:	Connects to a +24V power supply/0V and a ground line.
⑥ Power switch:	Switch for turning power on/off.
⑦ Rotary switch:	Switches programs. (Groups 0 through 5 can be set.)

3-2 Connection Method

Front



Back



3-3 Connections

3-3-1 Connecting the Power Supply

Connect the unit to a 24VDC power supply you have provided. (A 24VDC, 3A, 75W external power supply is required.)
The power supply is connected by attaching the wires onto the screw terminal block. Use crimp terminals suited to the terminal block to securely connect the wires.
Connector: FRONT 2, 5-H/3SA5-EX (PHOENIX CONTACT)

Power supply terminal details

No.	Signal name	Description
1	24V	Power supply
2	0V	GND
3	FG	Frame ground

Always ground the FG terminal to prevent electrical shock.

3-3-2 Connecting/Disconnecting the Teaching Box

The teaching box can be connected/disconnected regardless of whether the main unit's power is ON/OFF.
Teaching box power (12VDC) is supplied via pin 4 on the RS232C connector.

3-3-3 Connecting/Disconnecting the Operation Box

(1) Connecting the operation box
Connect the operation box before powering on the main unit. Connecting it after the main unit is powered on results in the emergency stop state.
(2) Disconnecting the operation box
Always leave the operation box disconnected when it is not being used. Disconnecting during operation results in the emergency stop state.

Caution: You cannot use the main unit while the operation box is disconnected. Always connect the operation box before using the main unit.

3-3-4 Connecting the I/O Connector

(1) Connecting with an external control device

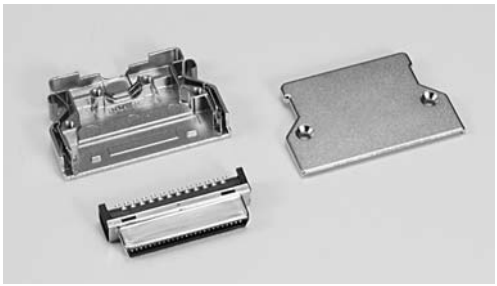
The meaning and operation of the signals allocated to the I/O connector's pins are described in detail in the next chapter.

Connector	PCR-E50FS+	HONDA TSUSHIN KOGYO CO., LTD.
Connector cover	PCS-E50LP	HONDA TSUSHIN KOGYO CO., LTD.

(Soldering type)

Compatible wire size

AWG30, 28, 26, 24 (single core ϕ 0.25 to 0.51)
Securely solder the wire ends to the terminals.



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Chapter 4 I/O Interface

The Cell Master is comprised of 15 general-purpose input points, 13 general-purpose output points, one custom input point, three custom output points, and a 24VDC power supply for I/O. Through this interface, commands are exchanged between the Cell Master and external equipment, and devices such as solenoid valves and relays are controlled. This chapter describes the specifications of the I/O connectors.

4-1 I/O Basic Specifications

Input

Insulation method	Photo-coupler isolation
Input pin	For connecting a relay contact or an NPN open collector transistor between input terminal and 0V terminal
Input response	5ms or less
Input current	3.5 to 5.5mA

Output

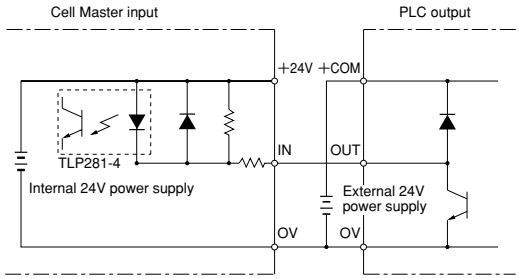
Insulation method	Photo-coupler isolation
Output pin	NPN open collector output with output common terminal (0V side)
Output response	1ms or less
Total output current (16 points)	2A or less
Max. output current per output	250mA or less (However, set at 2A or less of the total output current (16 points).)
Residual ON voltage	2V or less

4-2 I/O Circuit and External Connections

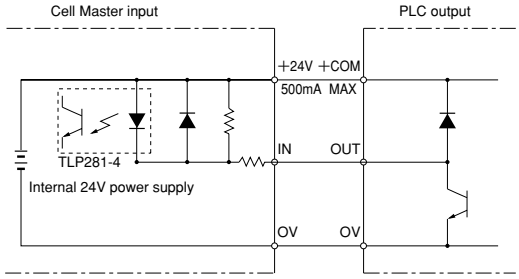
4-2-1 Input Circuit and External Connection Examples

When using an external DC power supply, do not use the Cell Master's internal power supply. Otherwise it may cause unstable operation.
(Always use a 24V external power supply.)

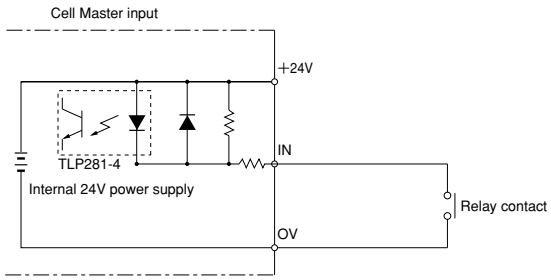
Example 1: Using external power supply for PLC input power



Example 2: Using Cell Master's internal power supply

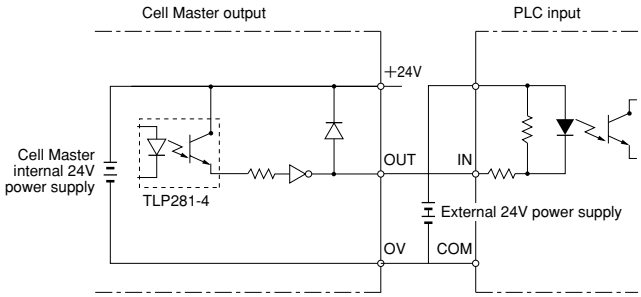


Example 3: Connecting a relay

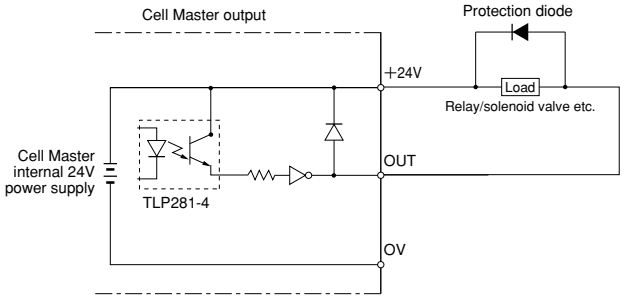


4-2-2 Examples of Output Circuit and Connecting External Devices

Example 1: Using PLC input etc.

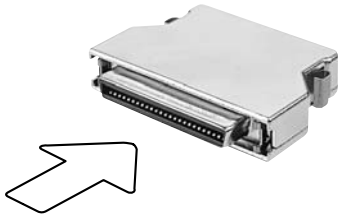


Example 2: Actuating a load

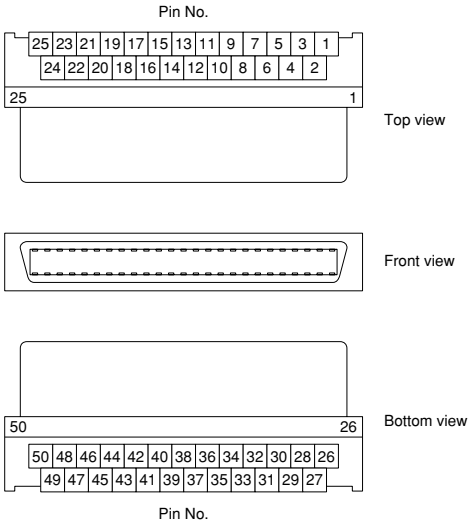


Note: When connecting a load with polarity, do not mistakenly connect the positive and negative polarity. Miswiring will damage the internal transistors.
Internal transistors will also be damaged by I/O short circuits and overcurrents. Pay close attention to wiring and so on.
When powering on, turn Cell Master power on, and then turn on power for externally connected devices.
When powering off, turn off power for externally connected devices, and then turn Cell Master power off.

4-3 I/O Connector Signal Table



Front view



Pin No.	I/O No.	Connection destination name	Pin No.	I/O No.	Connection destination name
1	+24V	+24V output	26	+24V	+24V output
2	+24V	+24V output	27	+24V	+24V output
3	+24V	+24V output	28	+24V	+24V output
4	+24V	+24V output	29	+24V	+24V output
5	NOP	No connection	30	NOP	No connection
6	IN0	General-purpose input	31	IN 8	General-purpose input
7	IN 1	General-purpose input	32	IN 9	General-purpose input
8	IN 2	General-purpose input	33	IN 10	General-purpose input
9	IN 3	General-purpose input	34	IN 11	General-purpose input
10	IN 4	General-purpose input	35	IN 12	General-purpose input
11	IN 5	General-purpose input	36	IN 13	General-purpose input
12	IN 6	General-purpose input	37	IN 14	General-purpose input
13	IN 7	General-purpose input	38	START	Custom input (Start input)
14	OUT 0	General-purpose output	39	OUT 8	General-purpose output
15	OUT 1	General-purpose output	40	OUT 9	General-purpose output
16	OUT 2	General-purpose output	41	OUT10	General-purpose output
17	OUT 3	General-purpose output	42	OUT11	General-purpose output
18	OUT 4	General-purpose output	43	OUT12	General-purpose output
19	OUT 5	General-purpose output	44	PALLET	Custom output (Pallet output)
20	OUT 6	General-purpose output	45	BUSY	Custom output (BUSY output)
21	OUT 7	General-purpose output	46	READY	Custom output (READY output)
22	GND	0V	47	GND	0V
23	GND	0V	48	GND	0V
24	GND	0V	49	GND	0V
25	GND	0V	50	GND	0V

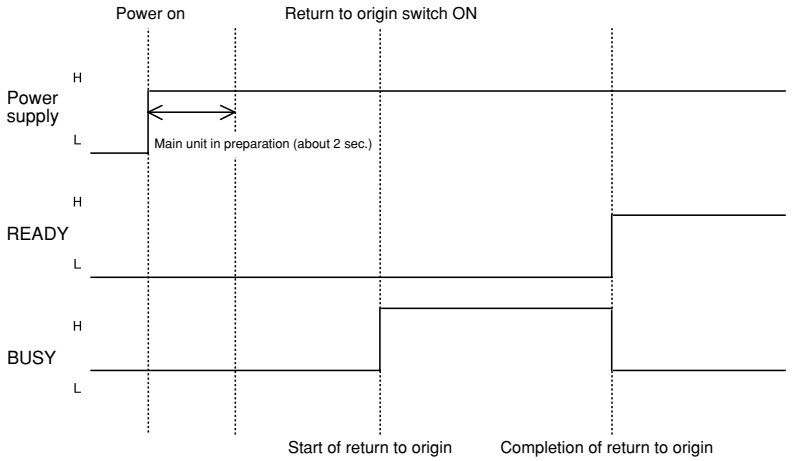
I/O signal details

1. **General-purpose input** (IN 0 to 14: 15 points)
   General-purpose input that can be treated as data within a program.
   Use this to connect with a cylinder sensor switch etc.
2. **Custom input** (1 point)
   Start input
   Same function as the start switch button on the operation box.
3. **General-purpose output** (OUT 0 to 12: 13 points)
   General-purpose output capable of freely controlling ON/OFF within programs.
4. **Custom output** (3 points)Note 1
   (1) READY output Note 2
   When the controller system is operating normally, this output will be ON. When an emergency stop occurs, this output will go OFF, and the motor will enter the servo off state. In addition, when an error occurs, the output will go OFF according to the error content.
   (See Section 10-3 “List of Error Codes” for more information.)
   (2) BUSY output
   When the motor is running, this output will be ON. It will go OFF when the motor stops.
   (3) Pallet output
   Output occurs at incrementing pallet count in pallet operation. For more information, see the explanation in ④ PALLET under Section 5-2.

Notes: 1. States of custom outputs and the motor energizing state differ depending on error content. See Section 10-3 “List of Error Codes” for more information.
2. At power on, READY output will be OFF, and after return to the origin, it will turn to ON.

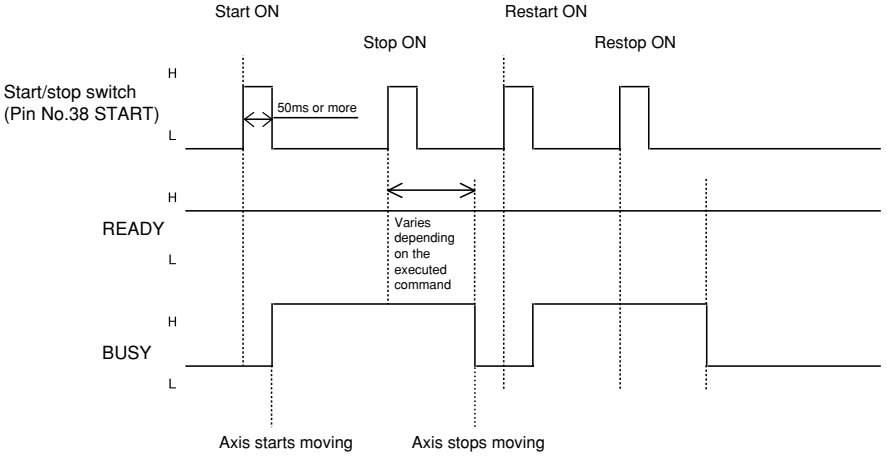
4-4 Timing Chart

① Return to origin operation when turning on power

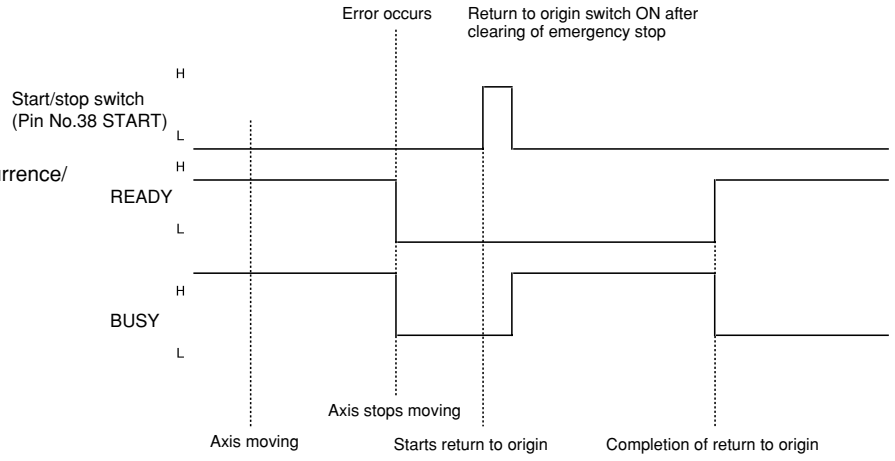


At power on, both READY and BUSY are OFF. Switching on the return to origin switch turns BUSY to ON . When the return to origin completes, READY then comes ON and BUSY turns OFF. Do not perform any communication, I/O, or operation box functions while the main unit is readying.

② Start/stop

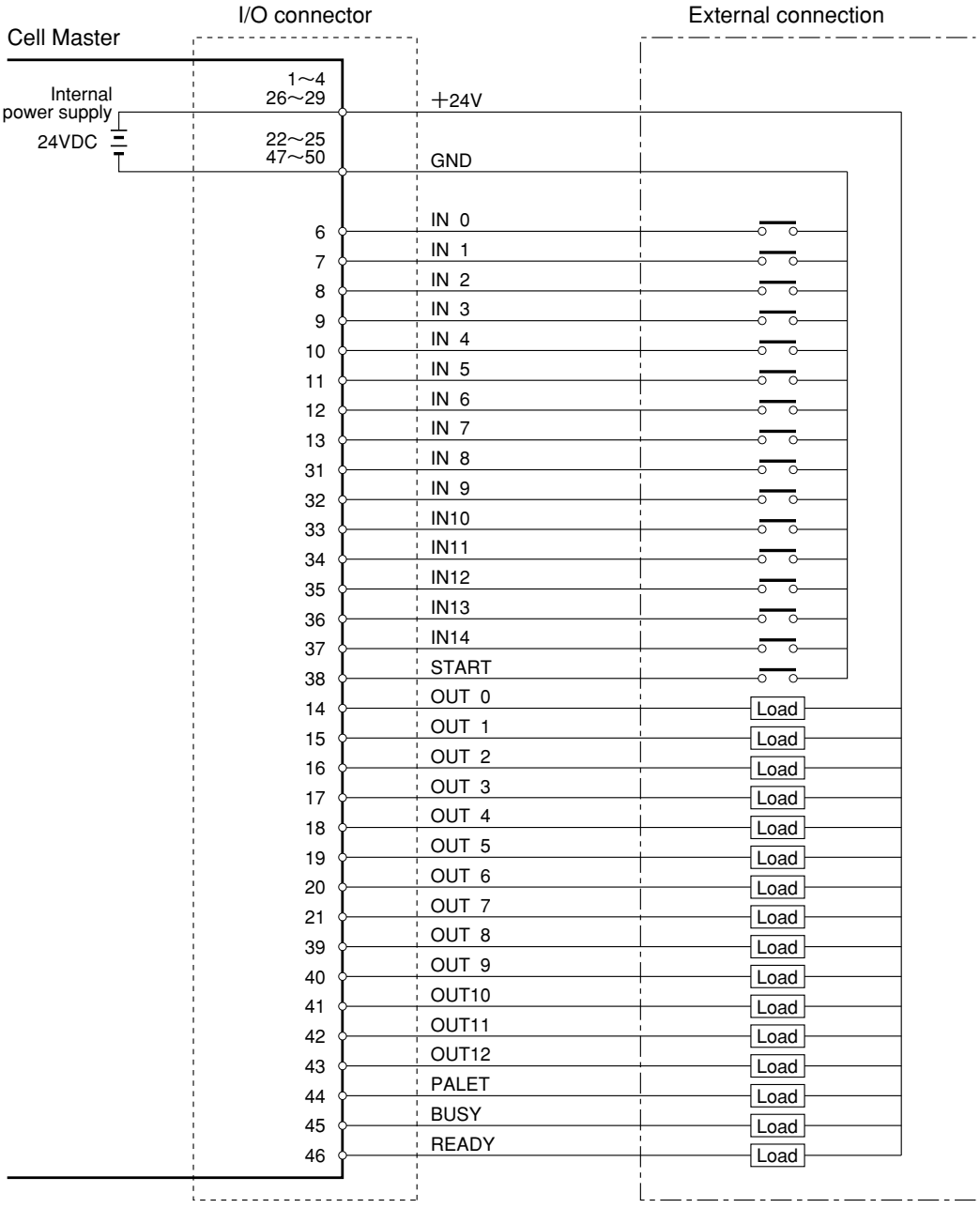


③ Error occurrence/ clearing



If an error occurs, READY and BUSY will turn OFF.
(However, in the case of stop-related errors, only BUSY will turn OFF, and if an error such as “032: Under INTPOLT” occurs, READY and BUSY will both stay ON. See Section 10-3 “List of Error Codes” for more information.)

4-5 I/O Connection Examples



Memo

Chapter 5 Program Commands

5-1 Overview of Program Commands

1. You can create new programs and change existing ones using the Edit Program.
2. You can change parameters (PRM1 to PRM42) by using the parameter settings. (See Chapter 8 for more information on parameters.) You can also change pallet parameter settings.

① POINT (point): Moves the table to the set position.
② LINE (line): Moves the table along the locus of linear interpolation (a straight line between the given starting point and ending point). It is also possible to set continuous interpolation movement combined with CIRCLE which is described later.
③ SEQ (sequential): Performs I/O, timer functions, conditional branching and other functions.
④ PALLET (pallet): Performs sequential movement (palletizing) to each point on a matrix for a workpiece placed on a pallet. The setting of pallets is performed in the PRM setting window.
⑤ CIRCLE (circle): Moves the table to the set position along the locus of circular interpolation (joins the starting point and ending point by a circle).
⑥ END (end): Sets the end state of the program.

Each command sets its content with a number that follows, such as [POINT 700].

5-2 Program Command Details

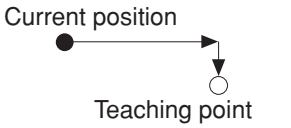
① POINT (Point)

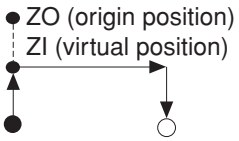
Command for moving the table to the set position.

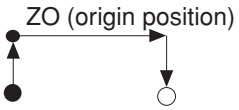
POINT ＊＊＊

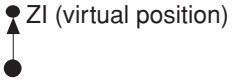
- Represents the movement speed (00 to 99%).
  Note that entering “00” sets 100%.
- Movement details are described below.

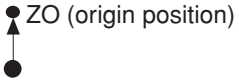
Command	Description
[POINT 0＊＊]	0:XY==>Z move The X, Y, and Z axes move. First the XY axes move, then the Z axis.
[POINT 1＊＊]	1:ZI=>XY=>Z move The X, Y, and Z axes move. First the Z axis moves to ZI (virtual position), then the X and Y axes move, and finally the Z axis moves to the set position.
[POINT 2＊＊]	2:ZO=>XY=>Z move The X, Y, and Z axes move. First the Z axis rises to ZO (origin position), then the X and Y axes move, and finally the Z axis moves to the set position.
[POINT 3＊＊]	3:ZI move Only the Z axis moves. The Z axis moves to ZI (virtual position).
[POINT 4＊＊]	4:ZO move Only the Z axis moves. The Z axis moves to ZO (origin position).
[POINT 5＊＊]	5:Origin return The X, Y, and Z axes move. Executes return to origin.
[POINT 6＊＊]	6:R axis move Only the R axis moves. Note: The R axis is only available on special order models.
[POINT 7＊＊]	7:XYZ absolute The X, Y, and Z axes move. The X, Y, and Z axes move by the set numeric value as an absolute position.
[POINT 8＊＊]	8:XYZ increment The X, Y, and Z axes move. The X, Y, and Z axes perform relative (increment) movement from the current position by only the number that was set.

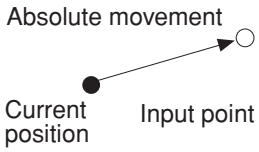


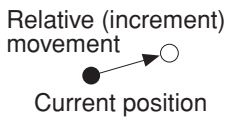










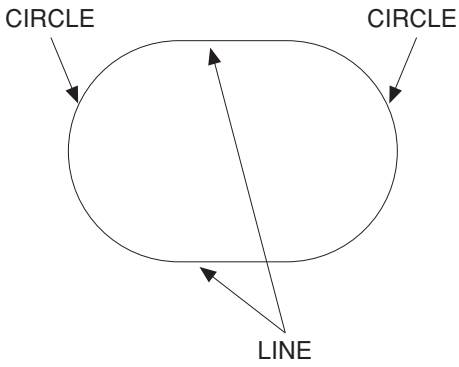


② LINE (line)

Command for moving the table along the locus of linear interpolation (a straight line between the given starting point and ending point) to the set position.

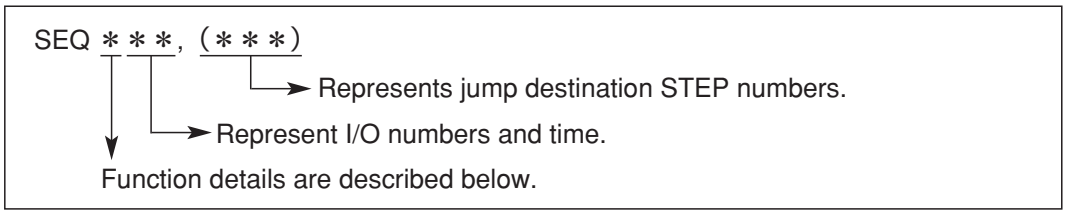
LINE ＊＊＊
- Represents the movement speed (00 to 99%).
  Note that entering “00” sets 100%.
- Movement details are described below.

Command	Description
[LINE 0＊＊]	0:Linear INTP The X, Y, and Z axes move by linear interpolation. (The movement speed is 45mm/s at the 100% setting.) Note: Results in 3D interpolation operation. Note: When using the main unit with a lead of 2mm, the movement speed is 15mm/s at the 100% setting.
[LINE 100]	1:Cont. INTPstart This command continuously interpolates subsequent [LINE 000] and CIRCLE movement. (The movement speed is 15mm/s at the 100% setting.)
[LINE 200]	2:Cont. INTP END This command continuously interpolates [LINE 000] and CIRCLE movement that are sandwiched between this command and [LINE 100]. Note: Continuous interpolation results in 2D interpolation operation. Note: An error occurs when there is a command other than [LINE 000] and CIRCLE between [LINE 100] and [LINE 200]. Note: Even during continuous interpolation operation, the table will not move completely smooth between commands.
[LINE 4＊＊]	4:R linear INTP The X, Y, and R axes move by linear interpolation. Note: The R axis is only available on special order models.



③ SEQ (sequential)

Command for performing I/O, timer functions, conditional branching and other functions.



Command	Description
[SEQ 0＊＊]	0:Input ON wait Stands by until a signal is input to the specified I/O number. Assigns general-purpose I/O input (IN 0 to 14).
[SEQ 1＊＊]	1:Input OFF wait Stands by until the signal of the specified I/O number goes OFF. Assigns general-purpose I/O input (IN 0 to 14).
[SEQ 2＊＊]	2:Output ON Outputs a signal from the specified I/O. Assigns general-purpose I/O output (OUT 0 to 12).
[SEQ 3＊＊]	3:Output OFF Turns off the output signal of the specified I/O. General purpose I/O output (OUT 0 to 12) and OUT13: Assigns the pallet increment signal. Note: You can only turn off the custom output pallet increment signal by SEQ313. OUT 14 and 15 are not possible.
[SEQ 4＊＊]	4:Timer Waits to proceed to the next STEP for only the specified time. (0.1s to 10s) The waiting time is the input value×0.1(s). (Input range: 1 to 100) Note: Entering a time of “000” will result in “100”. (During teaching box operation) Note: When you enter a time between 101 and 999, only the lower two digits will be effective. (During teaching box operation)
[SEQ 6＊＊,＊＊＊]	6:Cond. JMP (ON) Jumps to the desired STEP number when a signal is input from the specified I/O. Assigns general-purpose I/O input (IN 0 to 14) of a branch condition and a jump destination STEP number.
[SEQ 7＊＊,＊＊＊]	7:Cond.JMP (OFF) Jumps to the desired STEP number when a signal is not input from the specified I/O. Assigns general-purpose I/O input (IN 0 to 14) of a branch condition and a jump destination STEP number.

[SEQ 8**,***] 8:Uncond. JMP
Jumps to the desired STEP number.
[SEQ 9**,***] 9:Cond. CALL JMP
[SEQ 917] Jumps to the desired STEP number when general-purpose I/O input (IN 0 to 14) is ON, and returns to the next STEP of the jump source upon execution of the return statement [SEQ 917].
[SEQ 916] Unconditionally jumps to the desired STEP number in the case of an unconditional jump [SEQ 916], and returns to the next STEP of the jump source upon execution of the return statement [SEQ 917].
Note: When jumping by [SEQ 9**,***], always include the return statement [SEQ 917] following the jump destination STEP.

④ PALLET (pallet)

Command for performing sequential movement (palletizing) to an aligned position for workpieces placed on a pallet. Perform the setting of pallets in the teaching box DTRB Editor's PRM setting window.

Pallet setting method

From Section 6-5-3 "Setting Parameters" select the following in the case of the teaching box and then make your settings in each corresponding setting window.

- X/Y axis pallet number
- Pallet 1/2/3 points

Setting pallet matrix number

You can set each of the 20 pallets to 20 columns on the X axis and 20 rows on the Y axis.

- X/Y axis pallet number

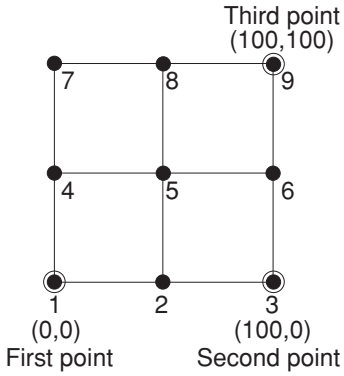
↓

Set the pallet number (0 to 19) to be set.
Set the number of X and Y matrices for the pallets.
(Setting range: X and Y can be set to 1 to 20 each)

↓

Setting complete

Matrix number example:
3 for X and 3 for Y
(Pallet points 3×3=9 points)
First point X: 0mm, Y: 0mm
Second point X: 100mm, Y: 0mm
Third point X: 100mm, Y: 100mm



Setting pallet coordinates

Setting the workpiece positions of the three corner points of a pallet equally divides the area in between into X and Y matrix numbers.

- Pallet 1/2/3 points

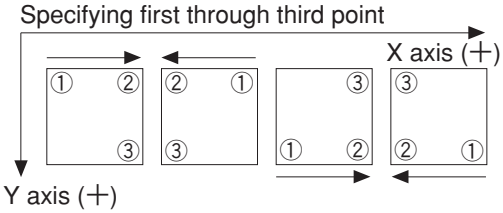
↓

Setting of pallet's first point
Setting of pallet's second point
Setting of pallet's third point

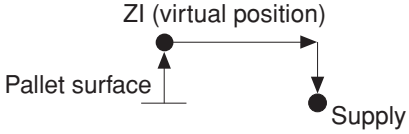
↓

Setting complete

Note: Vertical palletizing is also possible.



- Palletizing moves from the first point toward the second point.



Description of Program Commands

PALLET ＊＊＊
- ↓ Function details are described below.
- → Represents pallet number (0 to 19)

Command	Description
[PALLET 0＊＊]	0:Move pallet Moves the specified number pallet to the position of the pallet count value. Note: The Z axis rises to ZI (virtual position) during pallet movement.
[PALLET 1＊＊]	1:Countup output When you execute this command, the OUT13: pallet increment signal for I/O output is issued when the pallet count value increments and reaches the last value. To use pallet increment output again, switch off the signal using the [SEQ 313] command.
[PALLET 2＊＊]	2:PAL CNT Reset Resets the counter of each pallet (0 to 19). Use when performing palletizing work from the beginning. Note: If there is an emergency stop during palletizing or you turn off main unit power and once again run the program, the program will run from the beginning (the first STEP), but the value of the pallet count will not be reset and the palletizing operation will start from the point following where it was stopped the last time. To reset the value of the pallet count, run “CT: Pallet count initialization” or the [PALLET 2＊＊] command within the program. Note: ・When you change the pallet position and pallet matrix number, the pallet count will be reset to zero. ・After pallet movement, the pallet count will be incremented when stopping.

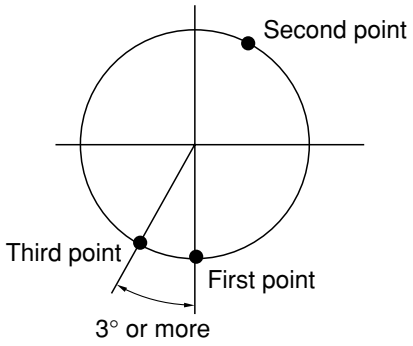
⑤ CIRCLE (circle)

Command for moving the table to the set position along the locus of circular interpolation (joins the starting point and ending point by a circle).

CIRCLE 0＊＊
- → Represents the movement speed (00 to 99%).
  (Maximum speed: 15 mm/s)
  Note that entering “00” sets 100%.

Note: The CIRCLE command uses two STEPS in one operation.

Command	Description
[CIRCLE 0＊＊]	Enter three points to move the table along the locus of the circle that passes through them. Continuous interpolation movement combined with [LINE 000] is also possible by entering this command between [LINE 100] and [LINE 200]. Note: Results in 2D interpolation operation. Note: Even during continuous interpolation operation, the table will not move completely smooth between commands.



⑥ END (end)

This command is for setting the end state of the program.

END ＊00

↓

Function details are described below.

Command	Description
[END 000]	0:Uncond. stop Ends the program. The following steps are required to restart the program: emergency stop → return to origin → restarting the program
[END 100]	1:One cycle stop Ends the program. Press the start switch to restart the program.
[END 200]	2:Repeat action Repeatedly runs the program. Returns to STEP 0 after detecting [END 200].

Chapter 6 Teaching Box Operations

The Cell Master can record programs in 6 groups (1,000 steps).
This chapter describes programming/setting of parameters, initialization (programs/parameters/pallet count), operations (return to origin, automatic operation, and step operation), monitoring (current position display, current program/step display, and error display), and help (error checking, version checking, and forced output of I/O) for when controlling the Cell Master using the teaching box.

6-1 Overview

1. You can create new programs and change existing ones using Edit Program.
2. You can change parameters (PRM1 to PRM42) using the parameter settings. (See Chapter 8 for more information on parameters.)
   You can also change pallet parameter settings.
3. You can initialize 6 types of programs (groups), initialize parameters, and initialize the pallet count using Initialization Settings.
4. You can execute return to origin, automatic operation, and step operation as operation functions. Step operation allows you to run created programs in steps, so use it to check programs.
   For monitoring, you can display the current position during operation, display the current program/step, and view an error display.
5. For help functions, you are able to check the error history (displaying the most recent error), check the version (Cell Master main unit and teaching box), and forcibly output DO for I/O among other things.

Table 1 Function list

Function			Reference
Item 1	Item 2	Item 3	
Before setting function			6-5-1
Setting (EDI)	Program editing (PGM)		6-5-2
		Change/new (CHG)	
		STEP insertion (INS)	
		STEP deletion (DL)	
	Parameter settings (PRM)		6-5-3
		PRM1～42 Pallet matrix / Pallet position (PRM)	
		Offset (OFF)	
		Virtual origin (ZI)	
	Initialization (IN)		6-5-4
		Program (PGM)	
		Parameter (PRM)	
		Pallet count (CT)	
Move (MOV)	Return to origin (ORG)		6-5-5
	Operation (OPR)		6-5-6
		Automatic operation (AUTO)	
		Step operation (STEP)	
	Monitor (MO)		6-5-7
		Current position display	
		Current program/step display	
		Error display	
Help (HE)	Error history (ERR)		6-5-8
	Version check (VER)		6-5-9
		Main microprocessor version (MAI)	
		Sub-microprocessor version (SUB)	
		Teaching box version (TB)	
	DO forced output (DO)		6-5-10

6-2 Specifications

Table 2 Teaching box specifications

Items \ Model		DTRBP-TB
Power supply	Voltage	Supply from the main unit of the Cell Master 12VDC
	Consumption current	50mA MAX
Display	Settings display	16-character×2-line LCD
	Power display	LED (internal 5 V) lights up when power is on.
Setting method		Key control △: UP ▽: DOWN ◁: LEFT ▷: RIGHT ↵: ENTER Esc: ESCAPE SHIFT: SHIFT MSTOP: MOTOR STOP
Communication method		Conform to RS232C
General specifications	Operating temperature	0～40°C
	Operating humidity	35～80%RH (no condensation)
	Storage temperature	－10～65°C
	Noise resistance	IEC61000-4-4 Power line/communication line 1 KV (level 2)
	Mass	200g
Applicable controller		Cell Master: DTRB

• **Wiring specifications**

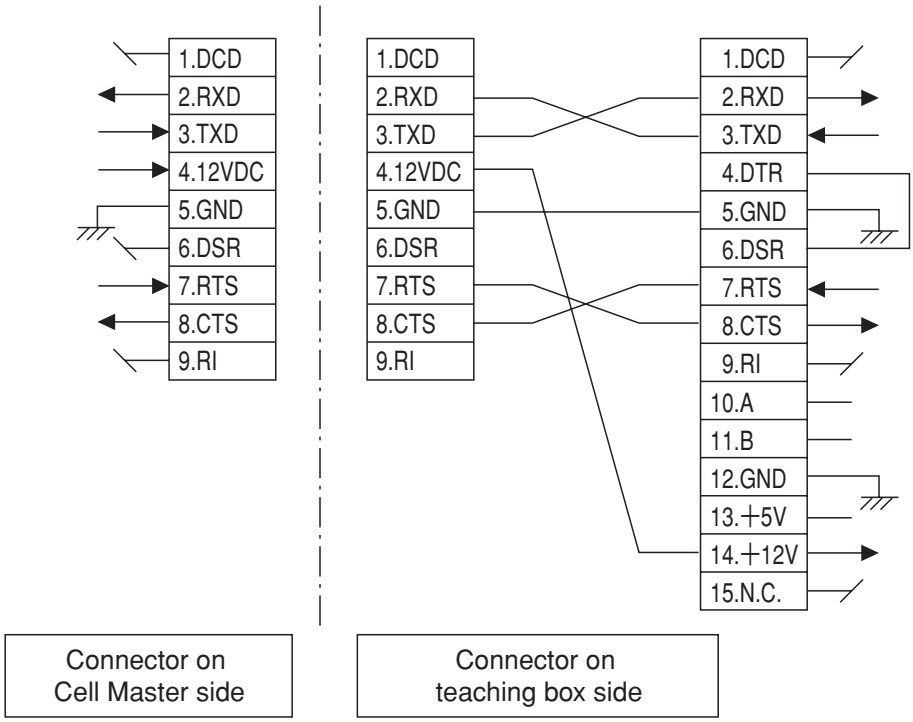


Figure 1 Wiring specifications

• **Communication parameter**

Transmission rate	19200 bps
Data bit length	8 bits
Stop bit length	1 bit
Parity check	On
Parity Setting	Odd parity (ODD)
Control method	XON/XOFF software control method
Communication method	Full duplex
Synchronous method	Asynchronous method
Return key transmission	CR code
CR code reception	For CR/LF reception: Return + line feed CR reception: Return

6-3 Key Layout and Functions

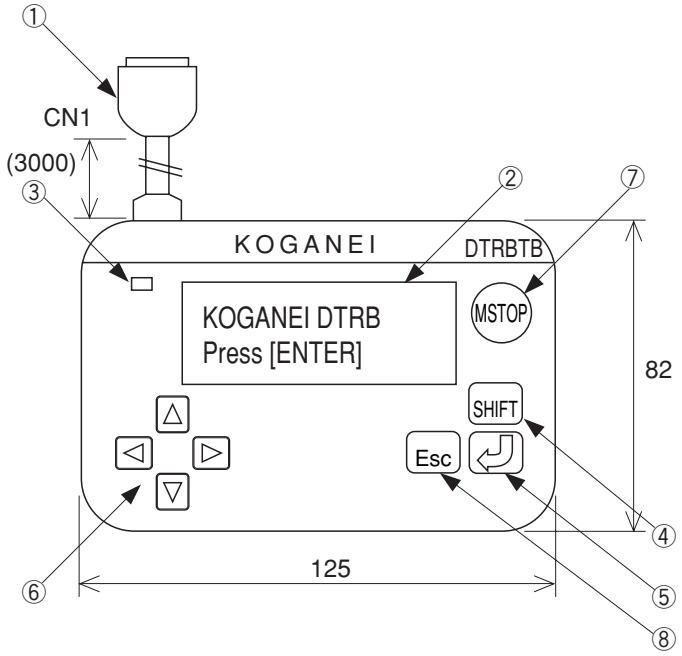


Figure 2 External appearance and functions of each part

① RS232C cable (CN1)
- Connects to the RS232C connector ① on the Cell Master.

② LCD (Liquid Crystal Display): 16 characters×2 lines
- Data is displayed on this screen.

③ Power LED indicator
- The LED lights up when power is being supplied.

④ Shift/⑤ Enter/⑥ Jog (up, down, left, and right))/⑦ Motor stop/⑧ Escape key
- The above-mentioned keys are respectively used for shift, confirmation, cursor operation/number changing, motor stopping, and return for data displayed on the LCD.

Notes: 1. When starting from I/O or the operation box, motor stopping and pausing is not possible from the teaching box. If you want to stop or pause the motor using the teaching box, set the screen to monitor mode. You cannot stop or pause the motor in other screens. When starting from the teaching box, it is possible to stop and pause the motor from that screen.

2. The SHIFT key on the teaching box is used to switch speeds and pause when teaching.
Pressing the SHIFT key switches the teaching speed between LOW ⇔ HI ⇔ STEP.
LOW : Move at the speed set by parameters 28, 30, 32, and 34.
HI : Move at the speed set by parameters 29, 31, 33, and 35.
STEP : Move the distance set by parameters 36 to 39 at the speed set by parameters 28, 30, 32, and 34.

6-4 Basic Operations

6-4-1 Connecting with the Cell Master

- Connect the RS232C cable (CN1) on the teaching box to the RS232C connector on the Cell Master. (In addition, connect the Cell Master's power cable, motor cable, I/O cable, and operation box.)

6-4-2 Supplying Power

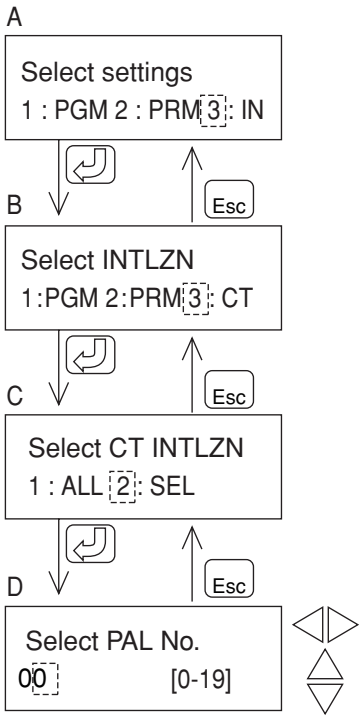
- Next, supply power (24VDC) to the Cell Master.
  (12VDC is supplied to the teaching box from the Cell Master main unit.)
- Power is being supplied normally if the Power LED (number ③ in Figure 2) on the teaching box lights up and stays on.

6-4-3 Control by the Teaching Box

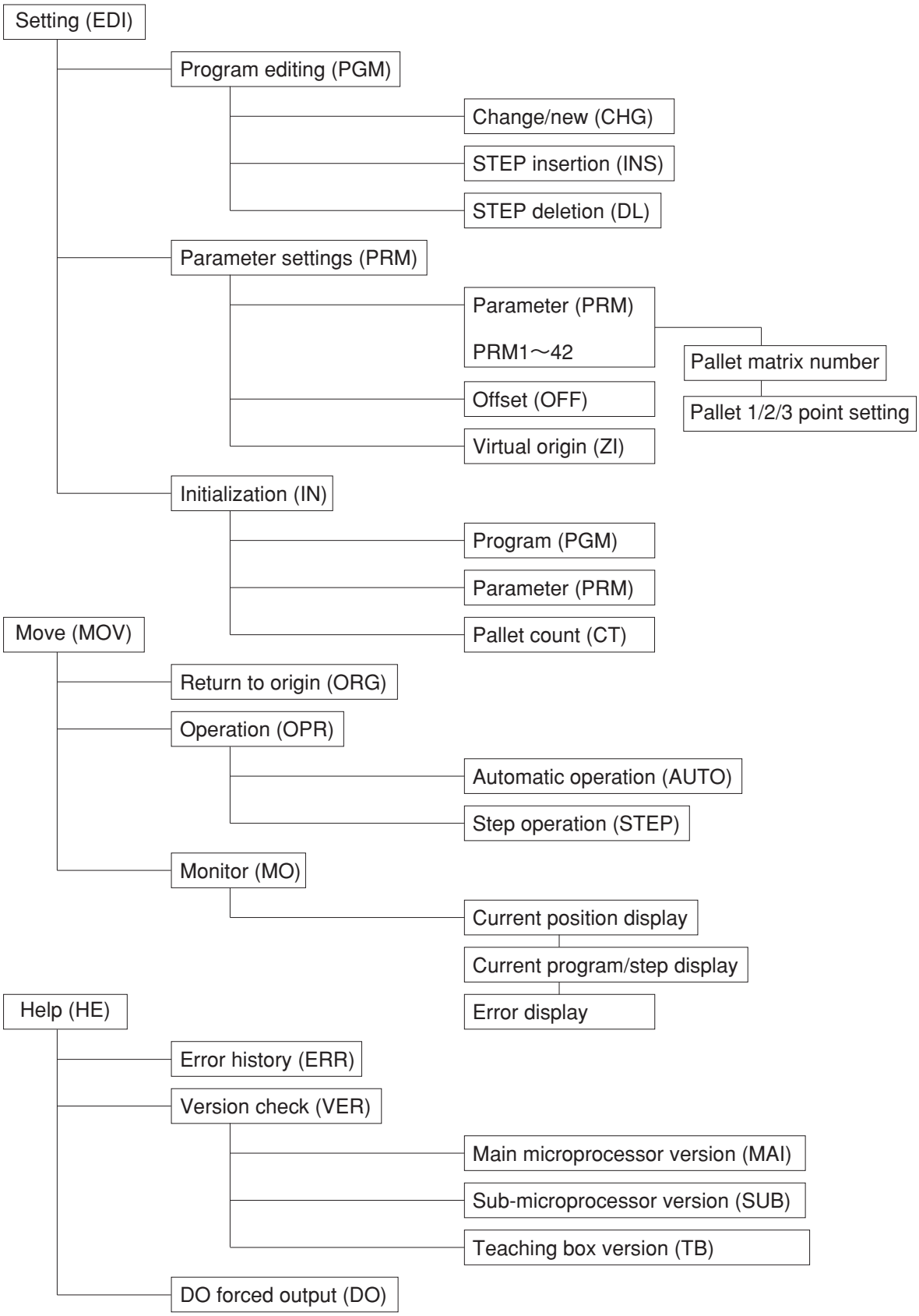
(1) Basic information on key control

- The second line of the screen will show the modes you can select at the moment.
  In example A, the modes you can select are [1:PGM], [2:PRM], and [3:IN].
  Select a mode using the keys ◁ ▷.
  The selected number will start blinking.
- While in screen A, pressing the enter key goes deeper into the screen hierarchy.
  To return one level higher, press the escape key Esc .

- Enter a number in screen D.
  Select a digit with the keys ◁ ▷.
  The selected digit will start blinking.
  Use the keys △ ▽ to increase/decrease the number.



(2) Menu hierarchy

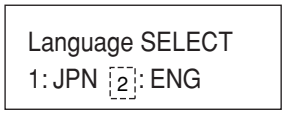


6-5 How to Set Functions

6-5-1 Before You Set Functions

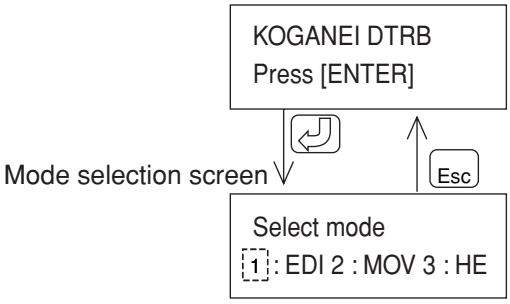
When you turn power on, a language selection screen will appear.
Before setting functions, decide whether the teaching box's LCD will display in Japanese or English.
[1：JPN] (Japanese) [2：ENG] (English)
Use the LEFT/RIGHT keys to make a selection and then press the enter key.

Language selection screen



Next, the initial screen will appear. Pressing the enter key in this screen moves to the mode selection screen.

Initial screen



Hereafter, make settings by referring to the various setting items.
[1: EDI] is for editing programs, setting parameters, and initializing.
(Refer to the following pages 44 and 45 for more information on how to set direct input or teaching input while editing a program.)
[2: MOV] is for executing return to origin, moving, and monitoring.
[3: HE] is for checking the error history, checking the version, and forcibly outputting DO.

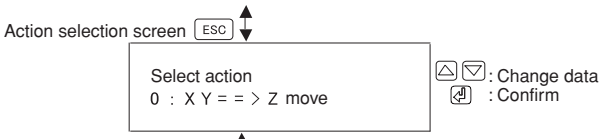
Note: If [WAIT] remains on the screen or the screen does not change, communication has not been established with the Cell Master's main unit. Simultaneously press ENTER and ESC. This will return you to the language selection screen. After checking communication with the Cell Master's main unit, try making your selections again.

• Overview of step data input method using the teaching box (POINT, LINE, CIRCLE, and pallet points 1/2/3)

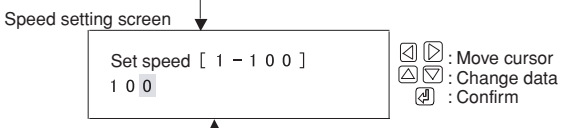
Example: POINT setting by direct input

Directly input numeric values for position data. During operation, the axis will move to the position specified by the numeric data that was entered.

• Select POINT according to 6-5-2 "**Editing Programs: How to create new/change existing programs**" on page 47.
In the action selection screen, use the UP/DOWN keys to select [0:XY ==>Z move] and then press the enter key.

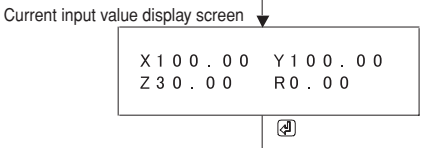


• In the speed setting screen, use the UP/DOWN/LEFT/RIGHT keys to set 100% and then press the enter key.

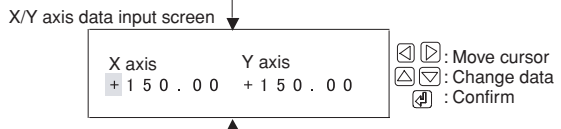


• In the point input screen, use the LEFT/RIGHT keys to select [2:INPUT] and then press the enter key.

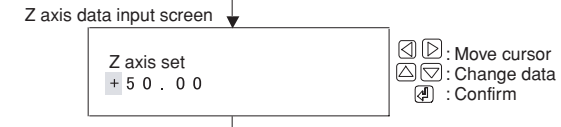
• In the STEP selection screen, the currently entered position data is displayed according to the step content that is selected. Press the enter key. (When the original step data is POINT/LINE and you change POINT/LINE, the current position data will be displayed. In addition, if step data is CIRCLE and you change POINT/LINE, XYZR will be displayed as [0.00.] If there is no original step data, [ERR] will be displayed, but go ahead and press the enter key to go to the next level.)



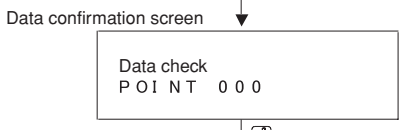
• In the data input screen, use the UP/DOWN/LEFT/RIGHT keys to enter position data for the X and Y axes. After entering the data, press the enter key.



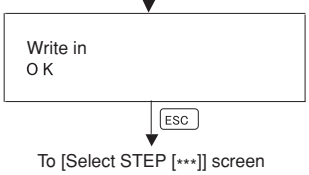
• In the data input screen, use the UP/DOWN/LEFT/RIGHT keys to enter position data for the Z axis. After entering the data, press the enter key.



• In the data confirmation screen, check the data and then press the enter key. The data will be written to the controller.



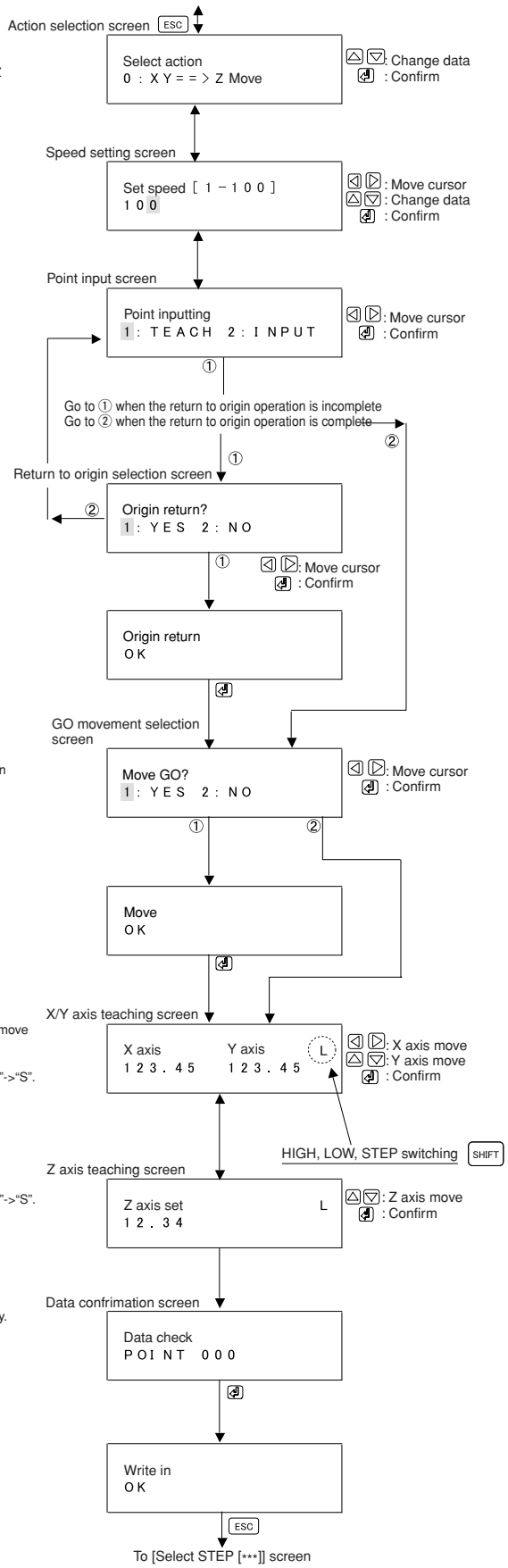
• If the write operation was successful, [OK] will be displayed on screen. Press the escape key to return to one level above.
The write operation failed if an error appears. Press the escape key to return and then try setting the data again.



• In the above setting example, the following data was set for the selected step:
Command: POINT
Operation command: [0:XY==>Z move]
Speed: 100%
X-axis position: 150.00 mm
Y-axis position: 150.00 mm
Z-axis position: 50.00 mm
R-axis position: 0.00 mm

Example: Setting POINT by teaching

Use the UP/DOWN/LEFT/RIGHT keys on the teaching box to move the axis, set that position as position data, and load it to the controller. During operation, the axis will move to the position that was taught.



• Select POINT according to 6-5-2 "**Editing Programs: How to create new/change existing programs**" on page 47.
In the action selection screen, use the UP/DOWN keys to select [0:XY ==>Z move] and then press the enter key.

• In the speed setting screen, use the UP/DOWN/LEFT/RIGHT keys to set 100% and then press the enter key.

• In the point input screen, use the LEFT/RIGHT keys to select [1:TEACH] and then press the enter key.

• If the return to origin operation is incomplete, go to the return to origin selection screen.
If the return to origin operation is already done, go to the GO movement selection screen.

• To execute the return to origin operation, use the LEFT/RIGHT keys to select [1:YES].
Selecting [2:NO] returns to the point input screen.

• In the GO movement selection screen, selecting [1:YES] with the LEFT/RIGHT keys moves to the position of the step data selected which is in one of the upper levels above.
Selecting [2:NO] goes to the X/Y axis teaching screen without moving.

• In the X/Y axis teaching screen, press the LEFT/RIGHT key if you want to move the X axis.
To move the Y axis, press the UP/DOWN keys.
Pressing the shift key changes "L" displayed on the screen as follows: "L"->"H"->"S".
L: Low speed (Axis moves at low speed while the key is pressed.)
H: High speed (Axis moves at high speed while the key is pressed.)
S: Step movement (Axis moves the distance set by parameters 36 and 37.)

• To move the Z axis in the Z-axis teaching screen, press UP/DOWN.
Pressing the shift key changes "L" displayed on the screen as follows: "L"->"H"->"S".
L: Low speed (Axis moves at low speed while the key is pressed.)
H: High speed (Axis moves at high speed while the key is pressed.)
S: Step movement (Axis moves the distance set by parameter 38.)

• In the data confirmation screen, check the data and then press the enter key.
The data will be written to the controller.

• If the write operation was successful, [OK] will be displayed on the screen.
Press the escape key to return to one of the upper levels above.
The write operation failed if an error appears. Press the escape key to return and then try setting the data again.

• In the above setting example, the following data was set for the selected step:
Command: POINT
Operation command: [0:XY==>Z move]
Speed: 100%
X-axis position: 123.45 mm
Y-axis position: 123.45 mm
Z-axis position: 12.34 mm
R-axis position: 0.00 mm

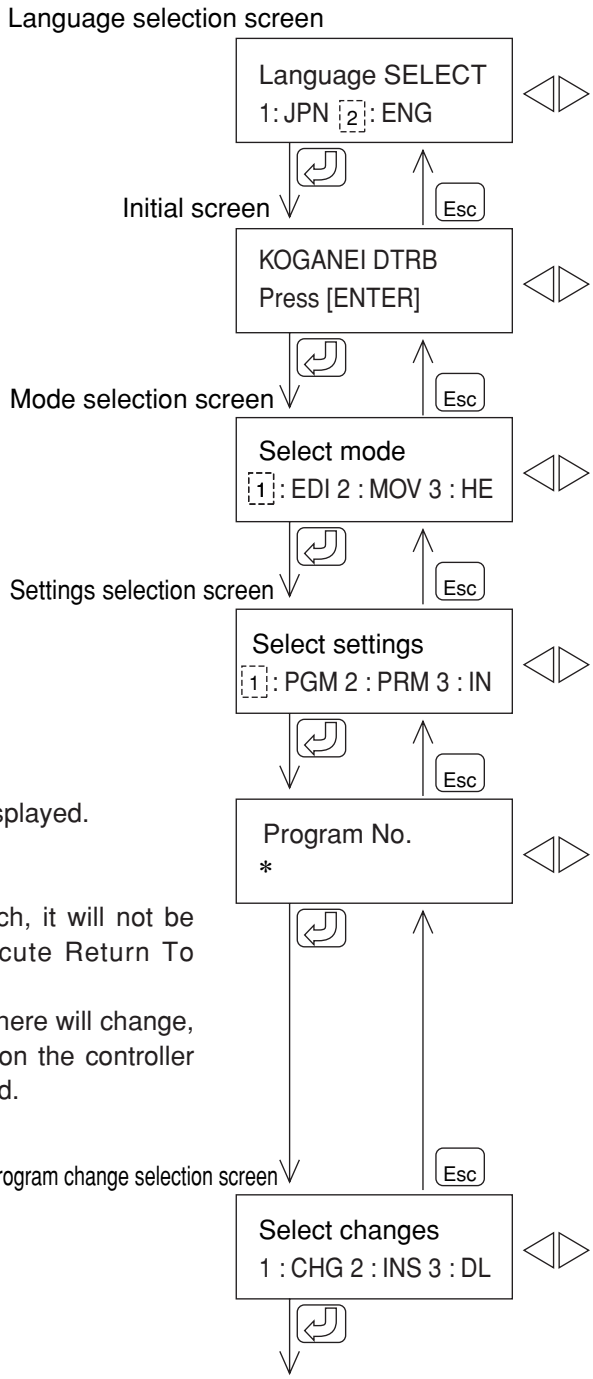
6-5-2 Editing Programs

• In the language selection screen, select whether the display screen will be in Japanese or English.

• In the initial screen, press the enter key to go to the mode selection screen.

• In the mode selection screen, select [1:EDI] and press the enter key.

• In the settings selection screen, select [1:PGM] and press the enter key.



• The current program number will be displayed.

Note: When changing the rotary switch, it will not be effective unless you first execute Return To Origin.
The program number displayed here will change, but it will not become effective on the controller until Return To Origin is executed.

• Select [1:CHG] to create a new program or change an existing one. Press the enter key after selecting.
See "Editing programs: How to create new/change existing programs" on page 47.

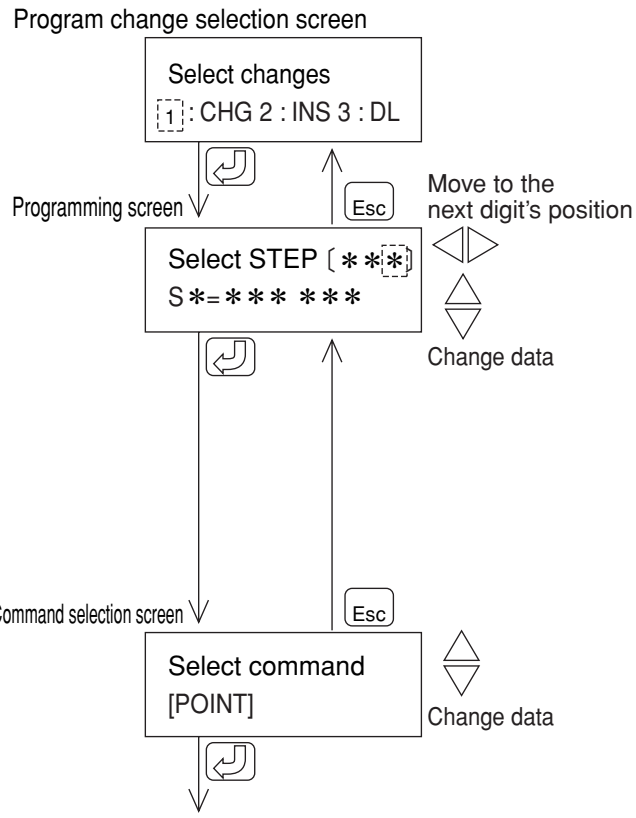
Select [2:INS] to insert a one-line step within a program that has been created. Press the enter key after selecting.
See "Editing programs: How to insert steps" on page 55.

Select [3:DL] to delete a one-line step from a program that has been created. Press the enter key after selecting.
See "Editing programs: How to delete steps" on page 56.

(1) Editing programs: How to create new/change existing programs

When you want to create a new program or change an existing one

- In the program change selection screen, select [1:CHG] and then press the enter key.
- In the programming screen, select the step number using UP/DOWN/LEFT/RIGHT keys and then press the enter key.
  The current step data will appear on the second line. If there is no step data, [57: No step data] will be displayed.
- In the command selection screen, select the command (POINT, LINE, SEQ, PALLET, CIRCLE, or END) with the UP/DOWN keys.



For [POINT] selection: Set the operation information for each axis.
Point settings: See ① POINT (point) on page 48.

For [LINE] selection: Set the linear interpolation operation (3D interpolation) and continuous interpolation operation (2D interpolation) information.
Point settings: See ② LINE (line) on page 49.

For [SEQ] selection: Set input, output, timer time, conditional jump, unconditional jump, conditional call, and unconditional call.
Point settings: See ③ SEQ (sequence) on page 50.

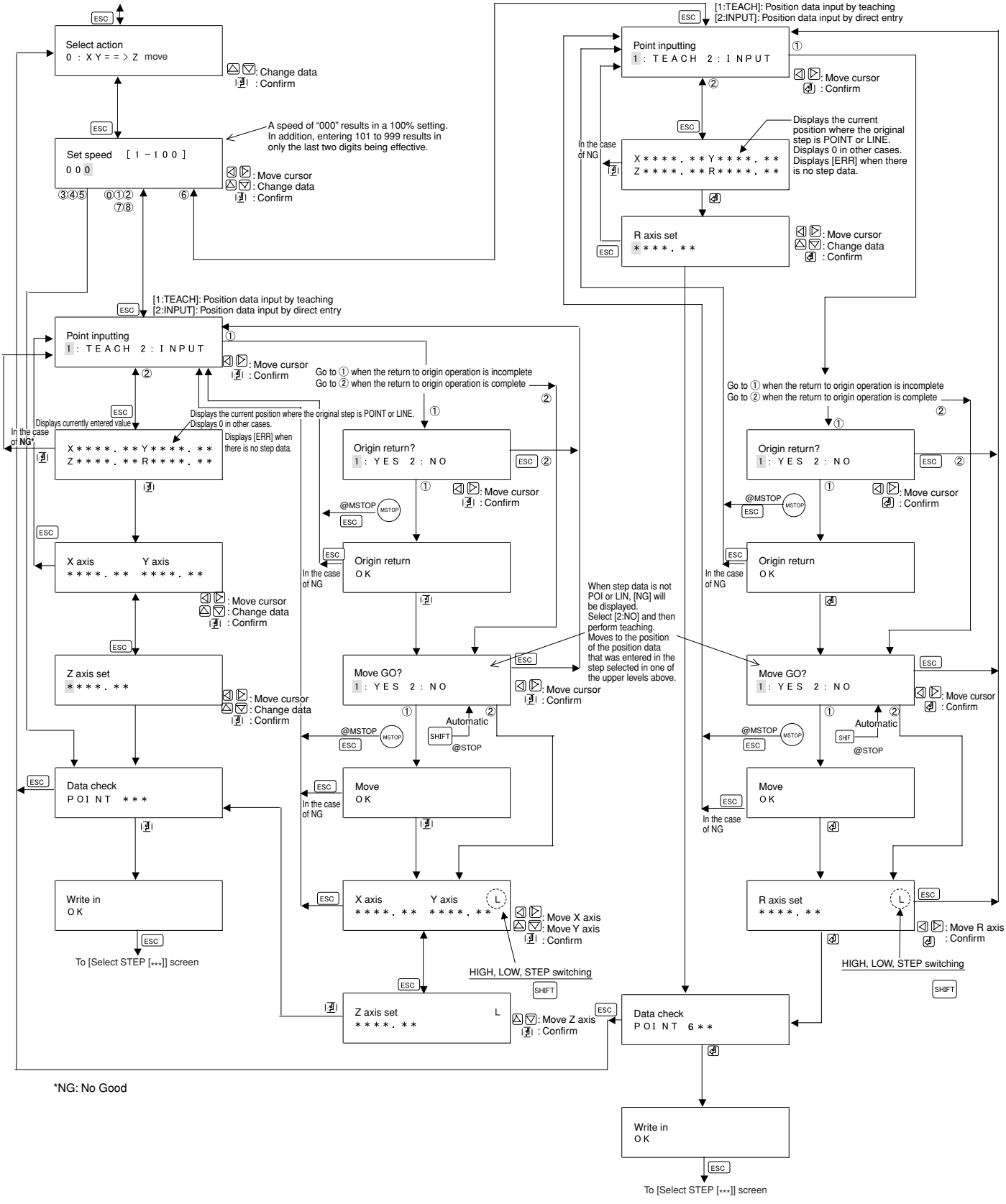
For [PALLET] selection: Execute palletizing and pallet count output.
Point settings: See ④ PALLET (pallet) on page 51.

For [CIRCLE] selection: Set circular interpolation move information.
Point settings: See ⑤ CIRCLE (circle) on page 53.

For [END] selection: Set the program ending.
Point settings: See ⑥ END (end) on page 54.

① POINT (point) input method

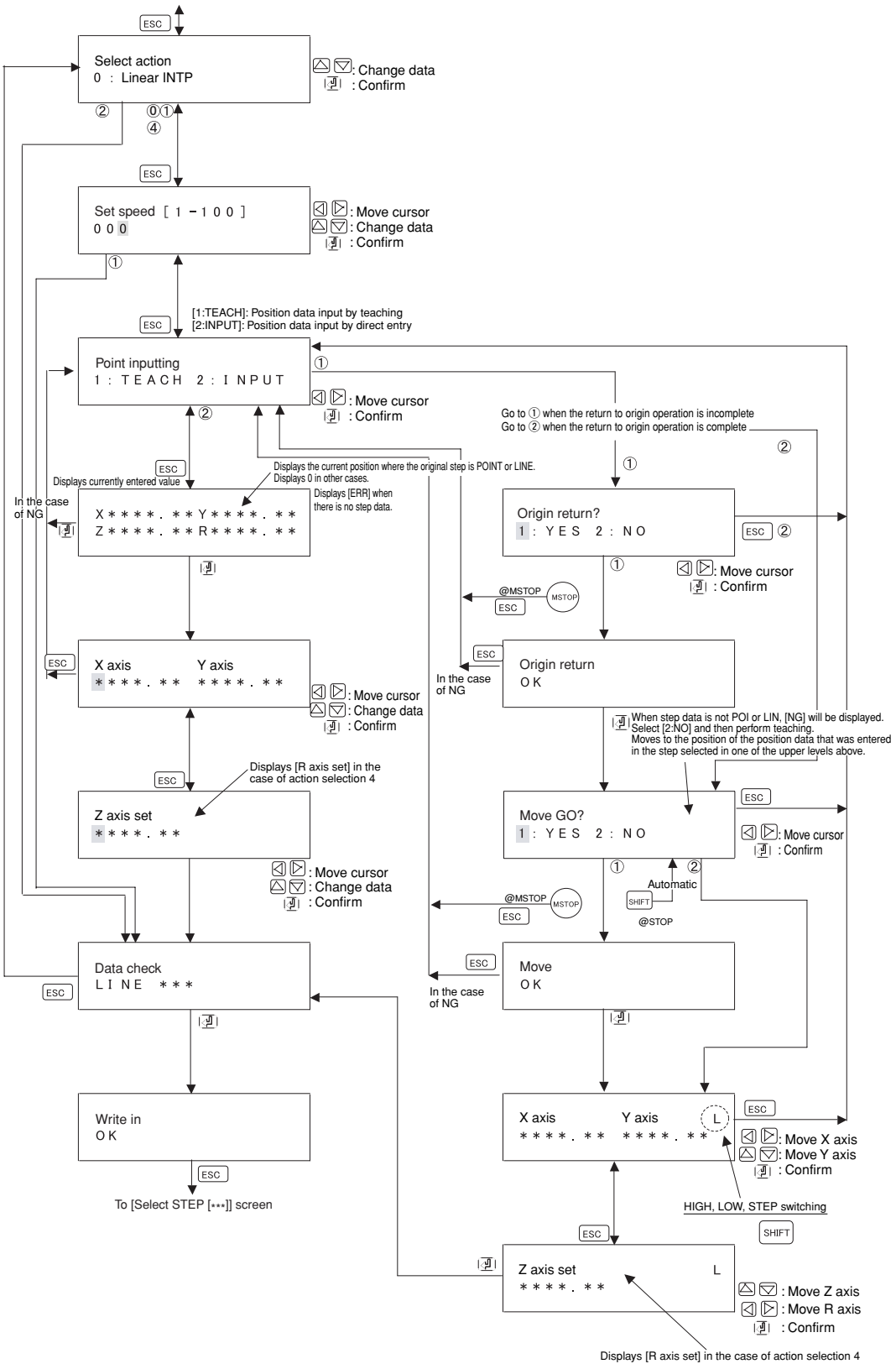
[0:XY==>Z move]
[1:ZI=>XY=>Z move]
[2:ZO=>XY=>Z move]
[3:ZI move]
[4:ZO move]
[5:Origin return⇒STEP move]
[6:R axis move] (Only available on special-order products)
[7:XYZ absolute]
[8:XYZ increment]



*NG: No Good

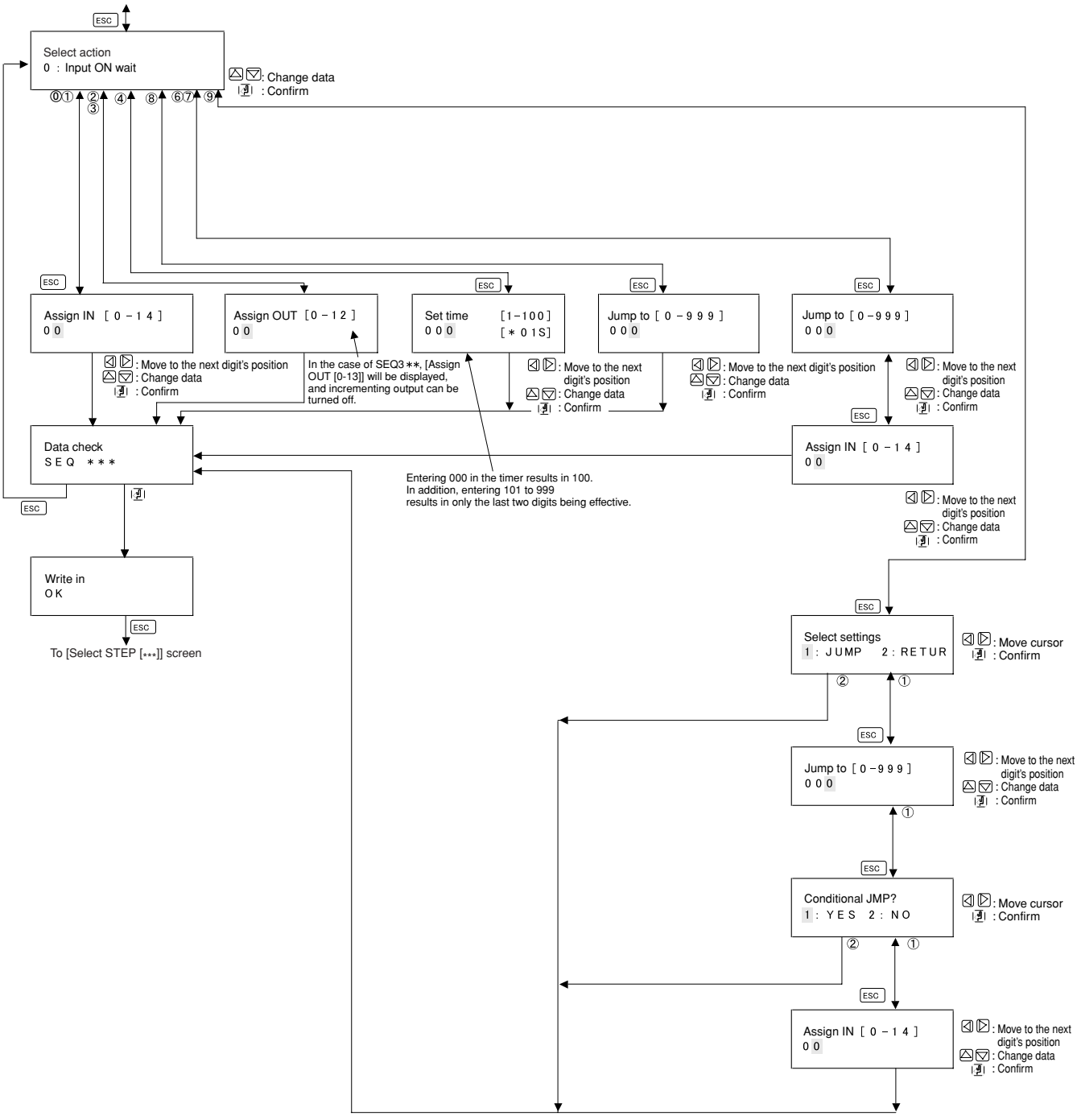
② LINE (line) input method

[0:Linear INTP]
[1:Cont.INTPstart]
[2:Cont.INTP END]
[4:R linear INTP] (Only available on special-order products)



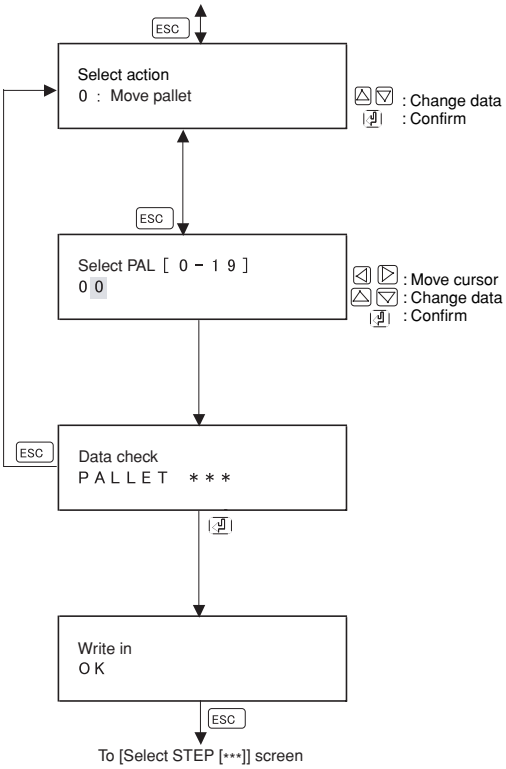
③ SEQ (sequence) input method

[0:Input ON wait] [6:Cond. JMP (ON)]
[1:Input OFF wait] [7:Cond.JMP (OFF)]
[2:Output ON] [8:Uncond. JMP]
[3:Output OFF] [9:Cond. CALL JMP]
[4:Timer]



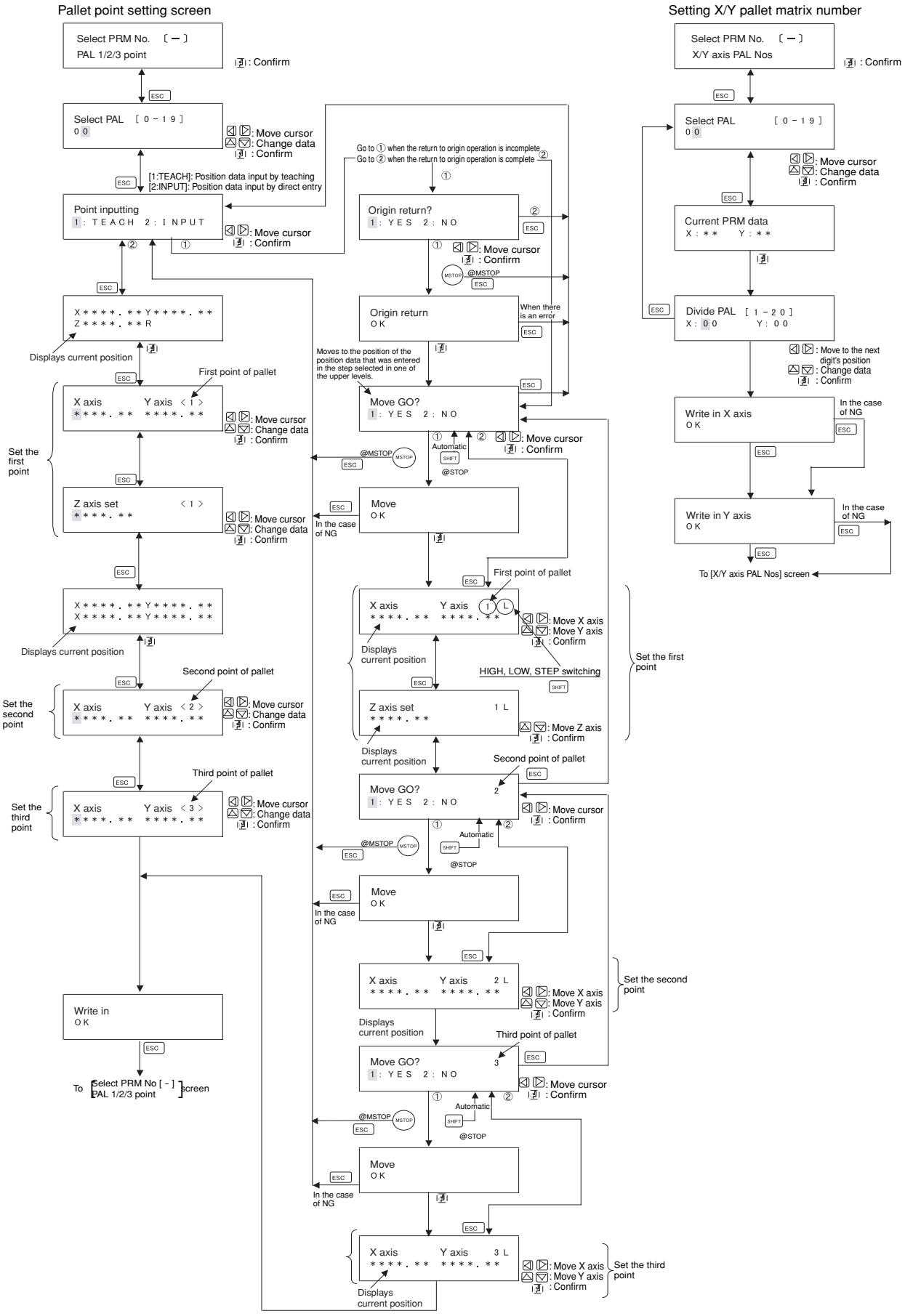
④ PALLET (pallet) input method

[0:Move pallet]
[1:Countup output]
[2:PAL CNT Reset]

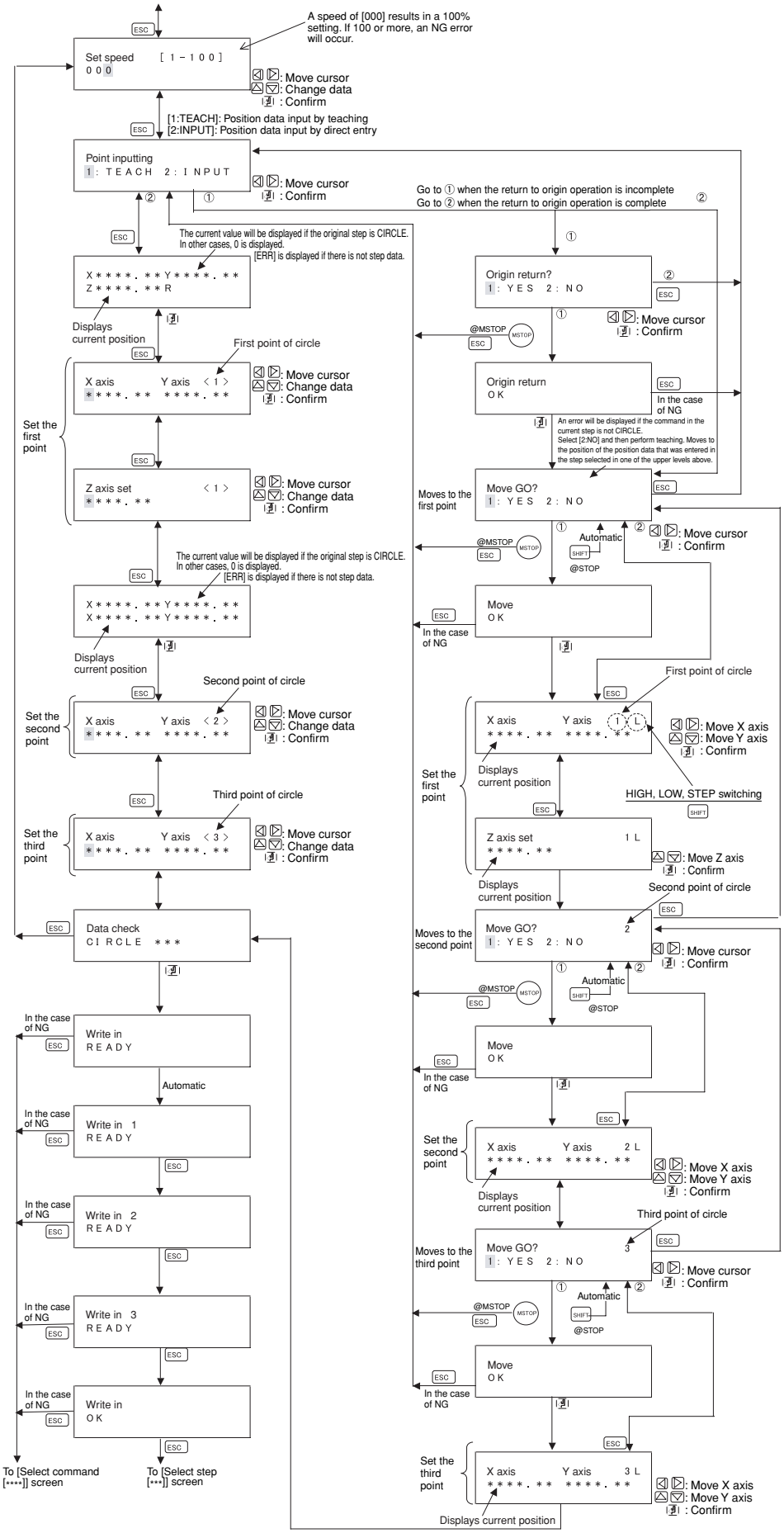


Setting PALLET parameters

From parameter settings, select [PAL 1/2/3 point] and [X/Y axis PAL Nos].

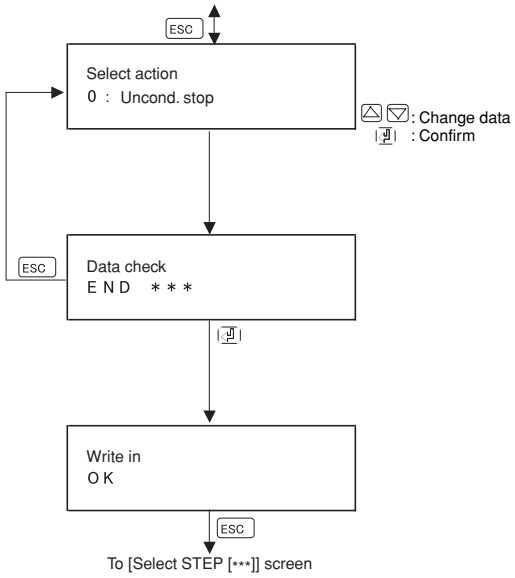


⑤ CIRCLE (circle) input method



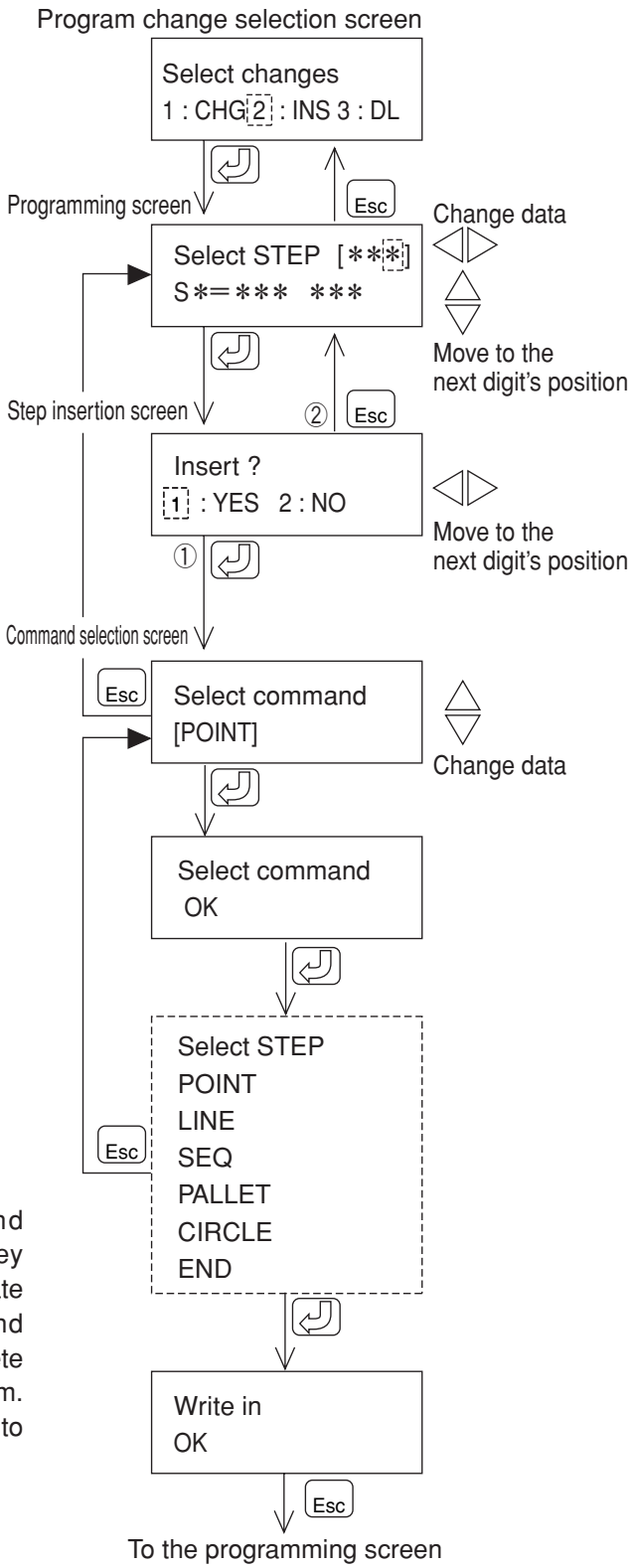
⑥ END (end) input method

[0:Uncond. stop]
[1:One cycle stop]
[2:Repeat action]



(2) Editing programs: How to insert steps
When you want to insert a step within a program that has been created

- In the program change selection screen, select [2:INS] and then press the enter key.
- In the programming screen, select the step you want to insert using UP/DOWN/LEFT/RIGHT keys, and then press the enter key.
- Selecting [1:YES] in the step insertion screen starts insertion.
  Selecting [2:NO] returns to the programming screen.
- Select the command you want to insert, and then press the enter key.
- While the second line is [WAIT], the @SINS command is being sent from the teaching box. (The selected line and the lines after it shift by 1 line.) In the case of CIRCLE, send it 2 times to insert 2 lines.
- See “Editing programs: How to create new/change existing programs” and perform step setup.
  When returning to the command selection screen using the escape key during “Editing programs: How to create new/change existing programs,” send @SDEL from the teaching box to delete 1 line and return to the original program. In the case of CIRCLE, send it 2 times to delete 2 lines.

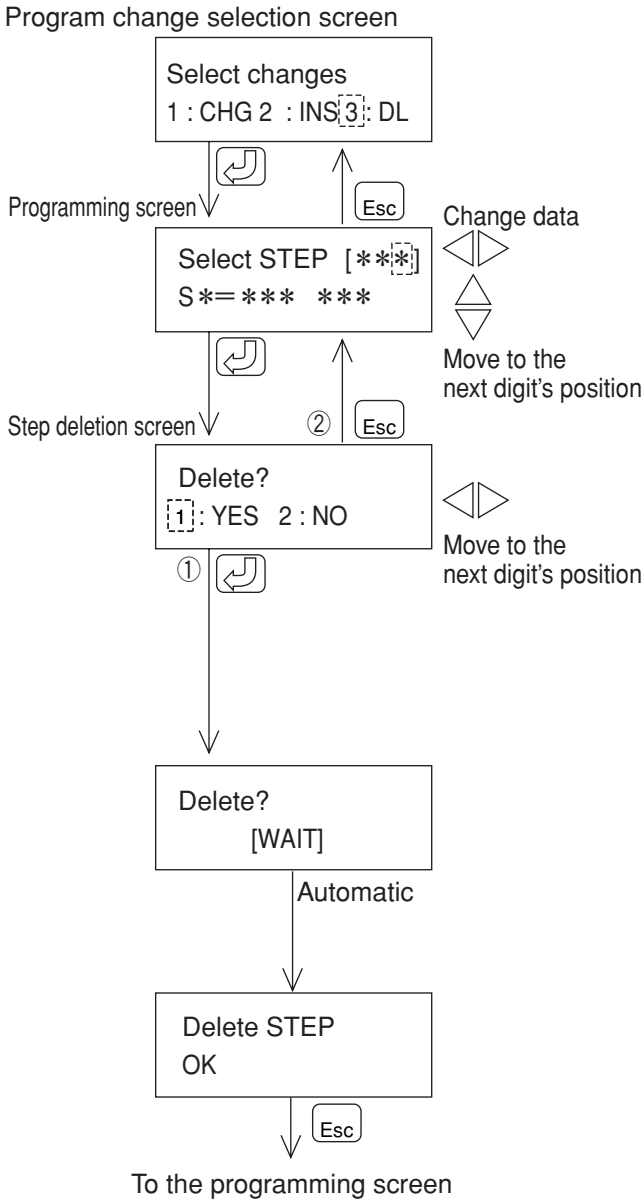


- The program was successfully set up if [OK] appears in the writing screen.
  If there is an error, execute @SDEL and delete the blank step to return to the original program. If the error display appears, the program was not properly set up. In that case set it up again .
  Note: Insertion into the second step of CIRCLE will result in a data error.

(3) Editing programs: How to delete steps
When you want to delete one step from a program that was created

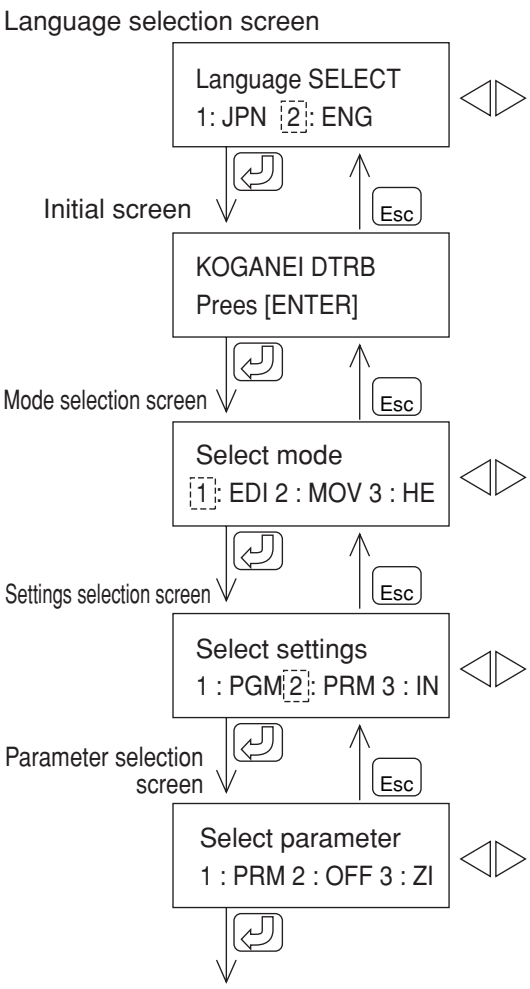
- In the program change selection screen, select [3:DL] and then press the enter key.
- In the programming screen, select the step you want to delete using UP/DOWN/LEFT/RIGHT keys, and then press the enter key.
- Selecting [1:YES] in the step deletion screen starts deletion. (The Selected Step Line is deleted, and the lines after it shift by 1 line.) Selecting [2:NO] returns to the programming screen.
- While the second line displays [WAIT], the @SDEL command is being sent from the teaching box.
- The program was successfully set up if [OK] appears as shown on the screen to the right of the chart. If the error display appears, the program was not properly set up. Set it up again in that case.

  Note: Deletion CIRCLE will delete 2 lines of step.



6-5-3 Setting Parameters

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [1:EDI] and press the enter key.
- In the settings selection screen, select [2:PRM] and press the enter key.
- Select [1:PRM] to change parameters 1 to 42 and pallet parameters.
  Press the enter key after selecting.
  (See Chapter 8 for more information on parameters.)



See "Setting parameters: How to change parameters" on page 58.

Select [2:OFF] to offset all point data that is currently entered.
This is useful for revising by shifting the workpiece position overall.
Press the enter key after selecting.

See "Setting parameters: How to set an offset" on page 59.

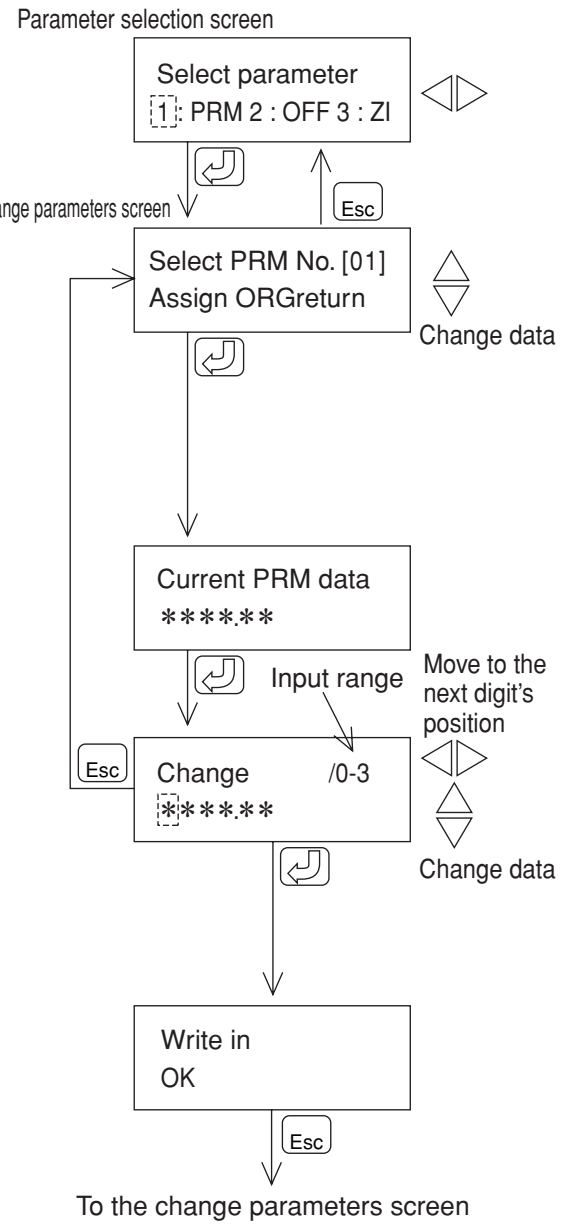
Select [3:ZI] to set a virtual position.
Normally, setting a point (virtual position) helps to avoid contact with the workpiece without returning to the origin position. This leads to shortened tact time.
Press the enter key after selecting.

See "Setting parameters: How to set a virtual position" on page 60.

(1) Setting parameters: How to change parameters
When you want to change parameters 1 to 42 and pallet parameters

- In the parameter selection screen, select [1:PRM] and then press the enter key.
- Select the parameter to change using the UP/DOWN keys.
  See Chapter 8 for a list of parameters.

  See page 52 when changing pallet parameters.
- Display the current value of the selected parameter.
- Use the LEFT/RIGHT keys to select a digit and then change the value with the UP/DOWN keys.
  Press the enter key, once you have set the value to change.
- The program has successfully set up if [OK] appears as shown on the screen to the right of the chart.
  If the error display appears, the program was not properly set up. Set it up again in that case.



Note: A writing error will occur if you try to write data beyond the allowable range. In that case, enter proper data and try writing it again.

(2) Setting parameters: How to set an offset

When you want to offset all point data that is currently entered

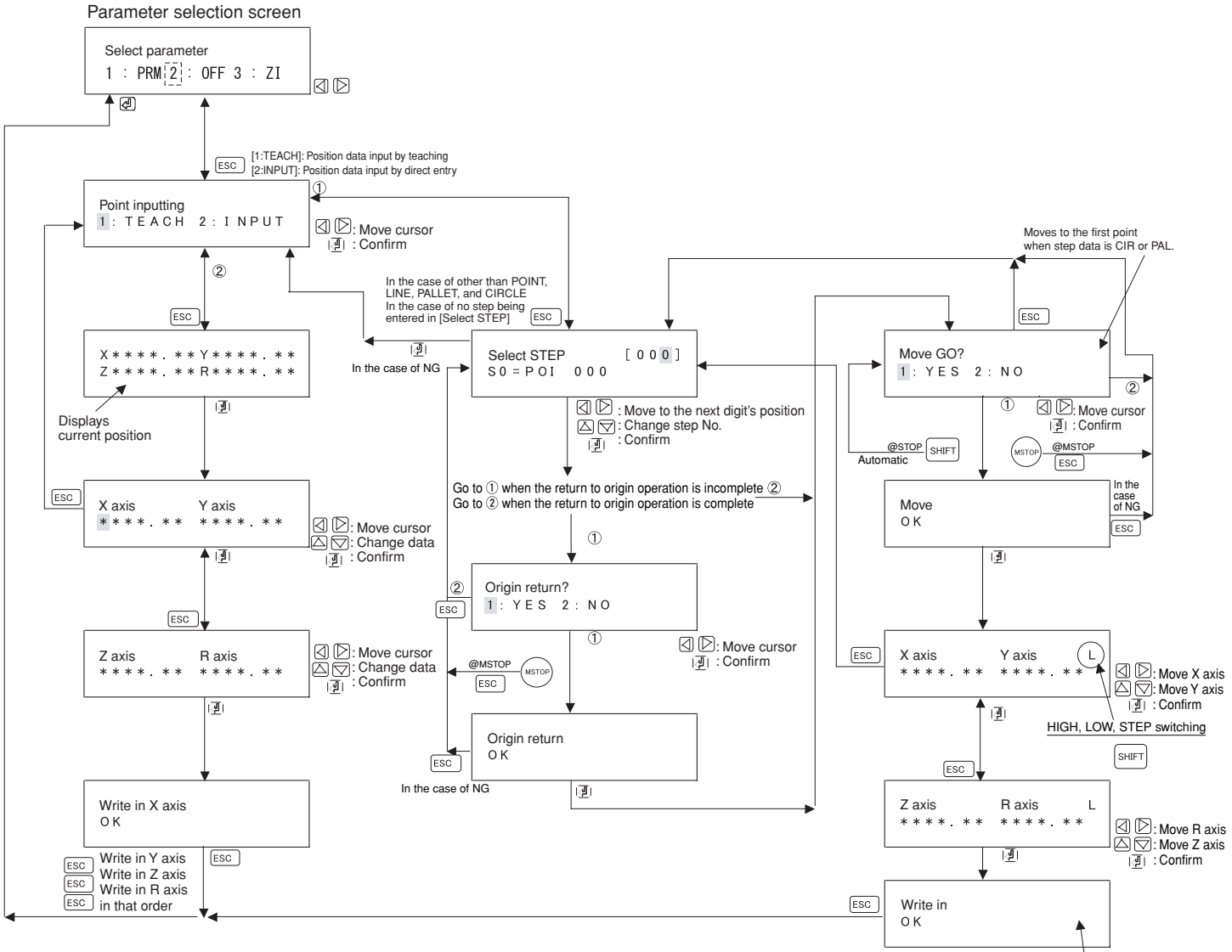
This is useful for revising by shifting the workpiece position overall.

After the GO movement, set offset distance by teaching. You can also enter the offset amount directly in a parameter.

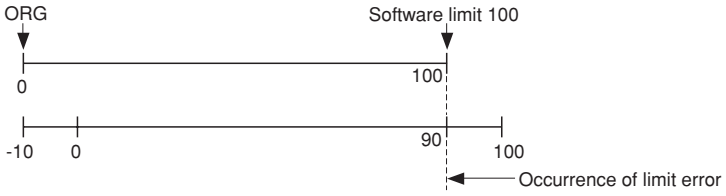
Note: Each offset is set for each program number currently selected by the rotary switch.

Note: In the case of teaching input [1:TEACH], the step data that is selected must have been created in POINT, LINE, PALLET, or CIRCLE command. In the case of PALLET and CIRCLE, executes GO movement to the first point.

• In the parameter selection screen, select [2:OFF] and then press the enter key.



Note: Position of software limit at offset

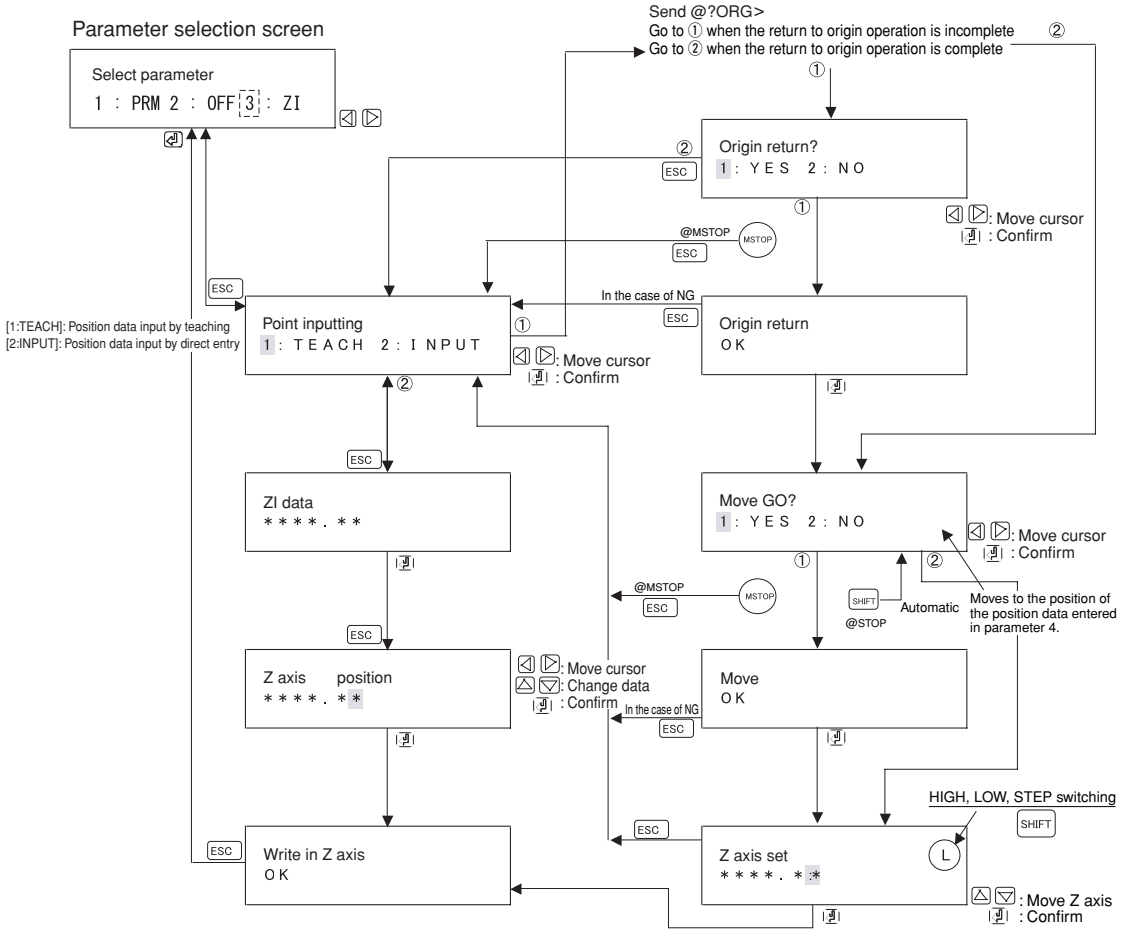


(3) Setting parameters: How to set a virtual position

When you want to set a virtual position

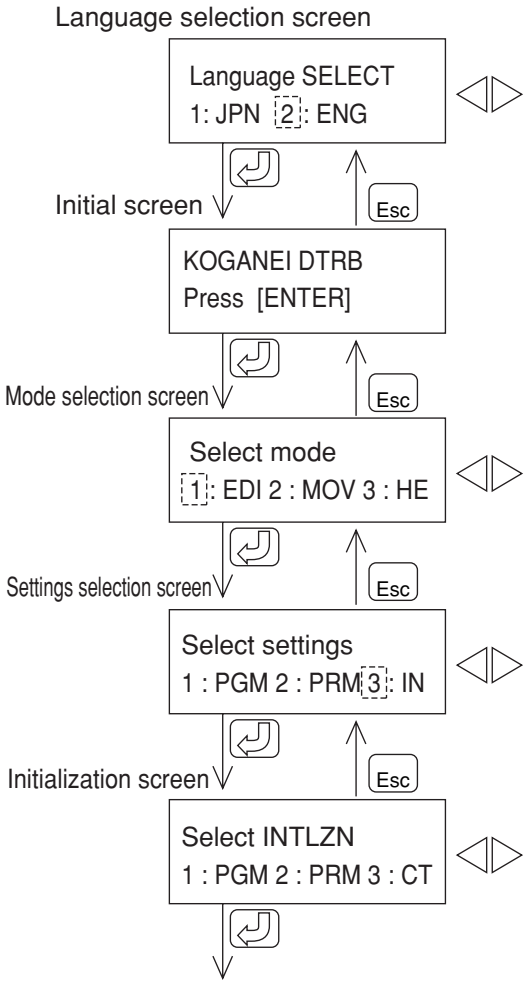
Normally, setting a point (virtual position) helps to avoid contact with the workpiece without returning to the origin position. This leads to shortened tact time.

• In the parameter selection screen, select [3:ZI] and then press the enter key.



6-5-4 Initialization

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [1:EDI] and press the enter key.
- In the settings selection screen, select [3:IN] and press the enter key.



Select [1:PGM] to initialize a program.
Press the enter key after selecting. The program number that is selected by the rotary switch on the main unit will be initialized.
See "Initialization: How to initialize a program" on page 62.

Select [2:PRM] to initialize parameters. Press the enter key after selecting.
The robot number is predetermined for each main unit.
Initialize parameters according to the robot number of the main unit.
See "Initialization: How to initialize parameters" on page 63.

Select [3:CT] to initialize the pallet count. Press the enter key after selecting.
See "Initialization: How to initialize the pallet count" on page 64.

(1) Initialization: How to initialize a program

When you want to initialize a program

- The program number that is selected by the rotary switch on the main unit will be initialized.

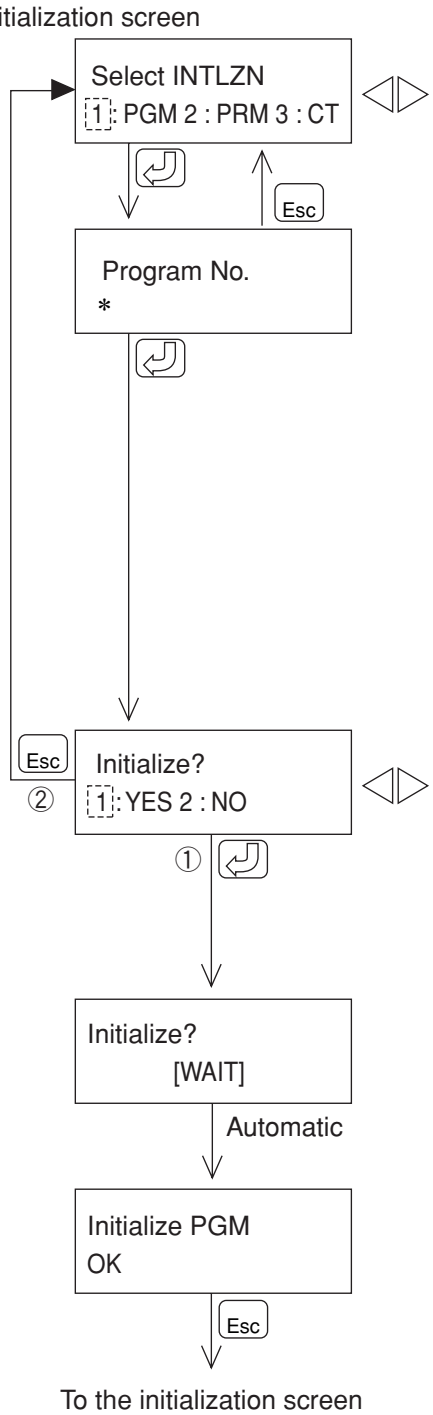
- Select [1:PGM] in the initialization screen and press the enter key.

- The current program number will be displayed.
  Press the enter key.
  Note: When changing the rotary switch position, execute return to origin once, in order for it to take effect. The program number displayed here will change, but it won't take effect on the controller until return to origin is executed.

- To initialize:
  Select [1:YES] and press the enter key.
  Selecting [2:NO] returns to the initialization screen.

- The communication command is being sent while [WAIT] is displayed.

- The program was successfully set up if [OK] appears as shown on the screen to the right of the chart.
  If the error display appears, the program was not properly set up. Set it up again in that case.



(2) Initialization: How to initialize parameters

When you want to initialize parameters

• The robot number is predetermined for each main unit.

Robot number	Main unit	Robot number	Main unit	Robot number	Main unit
10	DTRB-AS2	11	DTRB-AS3	12	DTRB-ASL3
20	DTRB-AL2	21	DTRB-AL3	22	DTRB-ALL3
30	DTRB-CS2	31	DTRB-CS3	32	DTRB-ACL3

Initialize parameters according to the robot number of the main unit.

Note: Executing INIT PRM and WRITE PRM41 * (changes the axis number to use) results in the origin incomplete state. Execute return to origin again.

• Select [2:PRM] in the initialization screen and press the enter key.

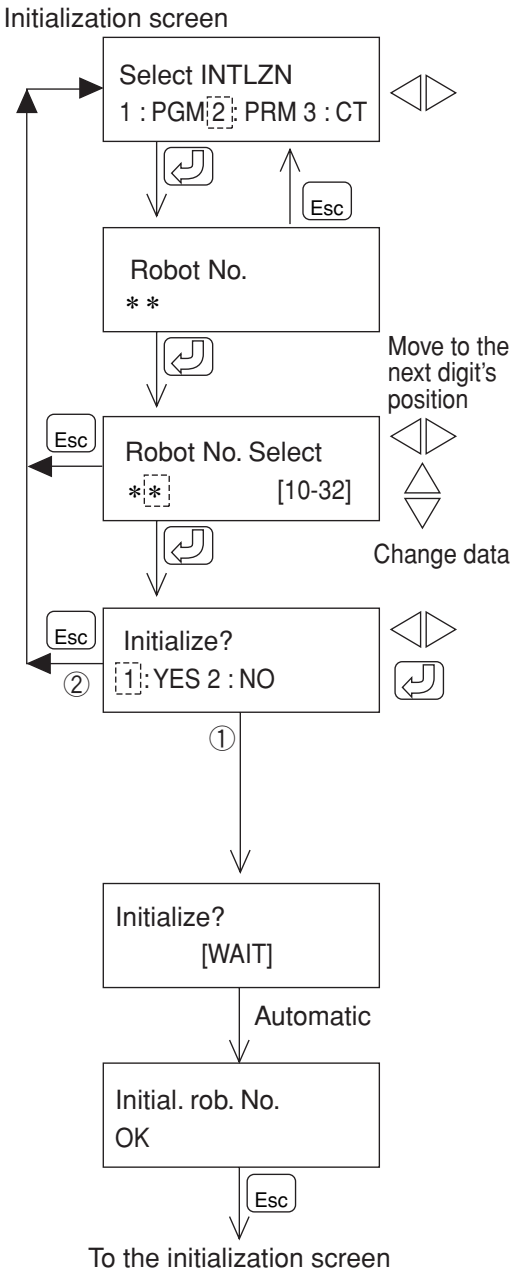
• The current robot number will be displayed.
Press the enter key.

• Select the robot number with the LEFT/RIGHT and UP/DOWN keys and then press the enter key.

• To initialize:
Select [1:YES] and press the enter key.
Selecting [2:NO] returns to the initialization screen.

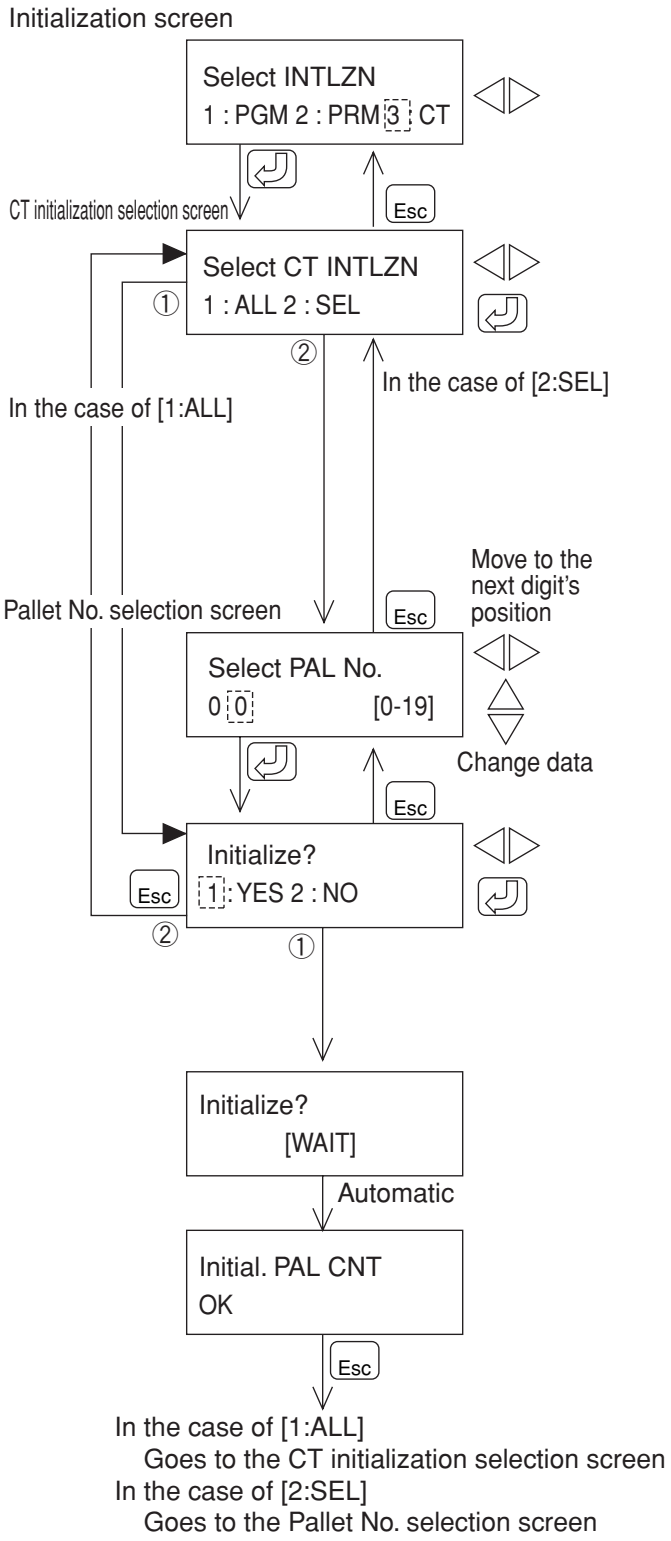
• The communication command is being sent while [WAIT] is displayed.

• The program was successfully set up if [OK] appears as shown on the screen to the right of the chart.
If the error display appears, the program was not properly set up. Set it up again in that case.



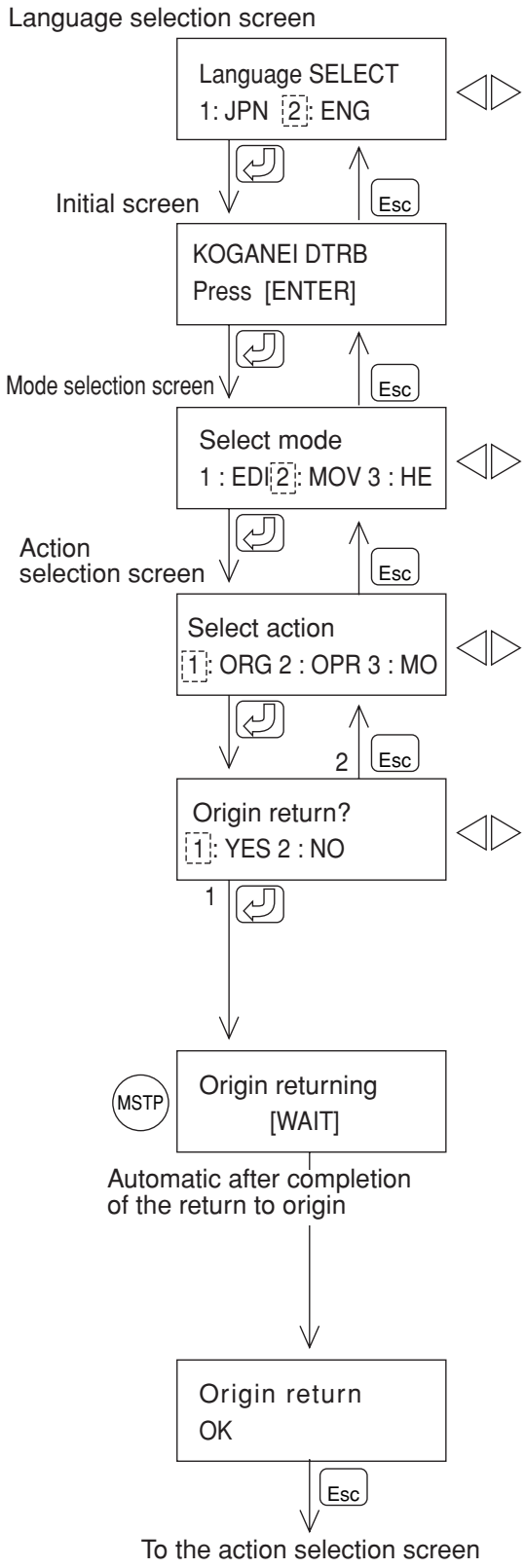
(3) Initialization: How to initialize the pallet count
When you want to initialize the pallet count

- Select [3:CT] in the initialization screen and press the enter key.
- [1:ALL] initializes the pallet count for all pallets (0 to 19).
  [2: SEL] is for selecting a pallet number and initializing its pallet count.
  Select 1 or 2 and then press the enter key.
- Select the pallet number with the LEFT/RIGHT and UP/DOWN keys and then press the enter key.
- To initialize:
  Select [1:YES] and press the enter key.
  Selecting [2: NO] returns to the initialization screen.
- The communication command is being sent while [WAIT] is displayed.
- The program was successfully set up if [OK] appears as shown on the screen to the right of the chart.
  If the error display appears, the program was not properly set up. Set it up again in that case.



6-5-5 Return to Origin

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [2: MOV] and then press the enter key.
- In the action selection screen, select [1: ORG] and then press the enter key.
- To execute return to origin:
  Select [1:YES] and press the enter key.
  Selecting [2:NO] returns to the action selection screen.
- The communication command is being sent while [WAIT] is displayed.
  Pressing the MSTP key while executing return to origin frees the motor.
  Press the escape key to return to the action selection screen.
- The program was successfully set up if [OK] appears as shown on the screen to the right of the chart.
  Return to origin was not completed successfully if an error display appears. Try executing return to origin again.

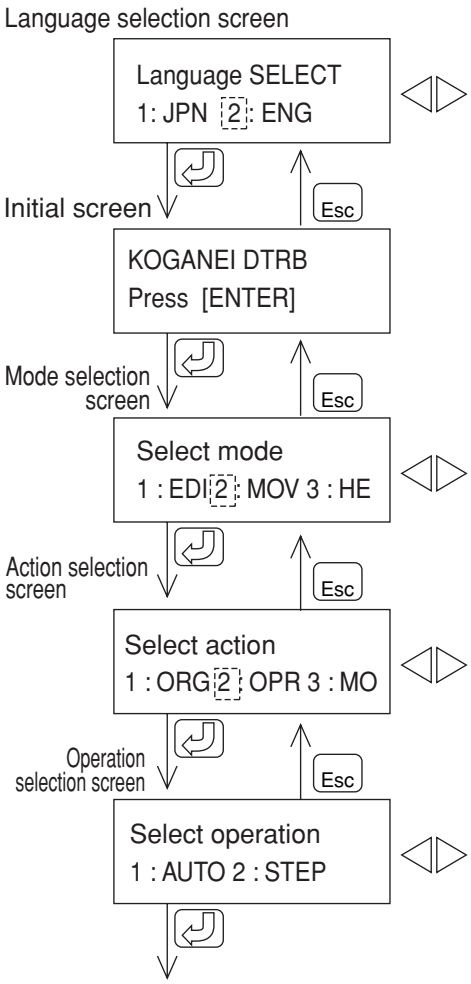


Note: The “no origin” error will occur if the origin sensor does not detect return to origin within 30 seconds. If it occurs, turn off power and check the origin sensor. After checking the sensor, turn the power back on and execute return to origin.

6-5-6 Operation

You can perform automatic operation and step operation. Step operation allows you to run created programs in steps, and use it to check programs.

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [2:MOV] and press the enter key.
- In the action selection screen, select [2:OPR] and then press the enter key.
- [1:AUTO] runs the program automatically.
  See "Operation: How to automatically run a program" on page 67.
- [2:STEP] runs a program one step at a time.
  See "Operation: How to perform step operation" on page 68.

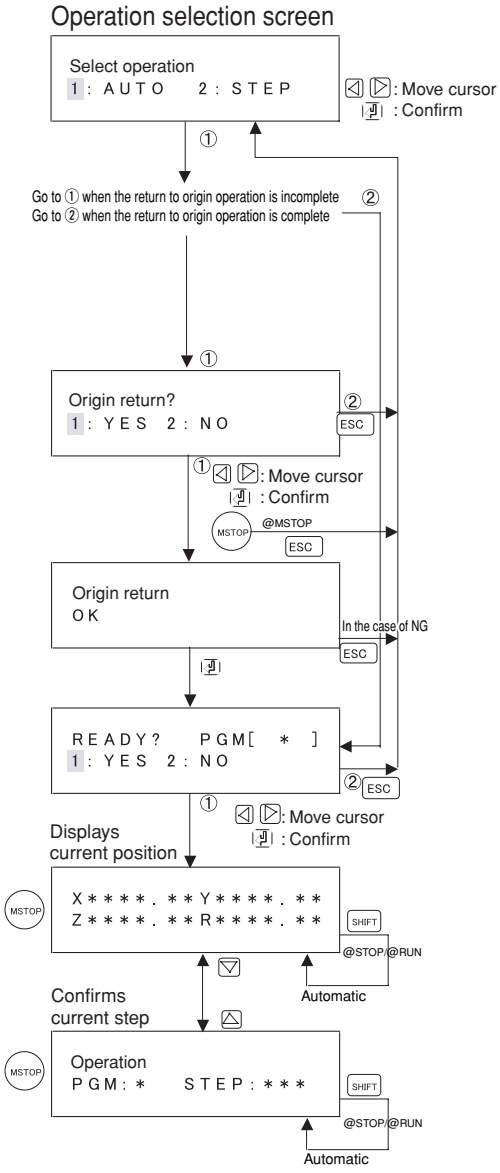


(1) Operation: How to perform automatic operation
When you want to automatically run a program.

- In the operation selection screen, select [1:AUTO] and then press the enter key.

- If the return to origin is incomplete, execute it again. Once it is complete, perform step operation.

- To execute return to origin:
  Select [1:YES] and press the enter key.
  Selecting [2:NO] returns to the operation selection screen.



- During AUTO operation, the current position/current program step will be displayed.You can switch what is displayed with the UP/DOWN keys.
  You can pause AUTO operation with the shift key. Pressing the shift key again resumes operations.

- To stop operation, press the MSTOP key.

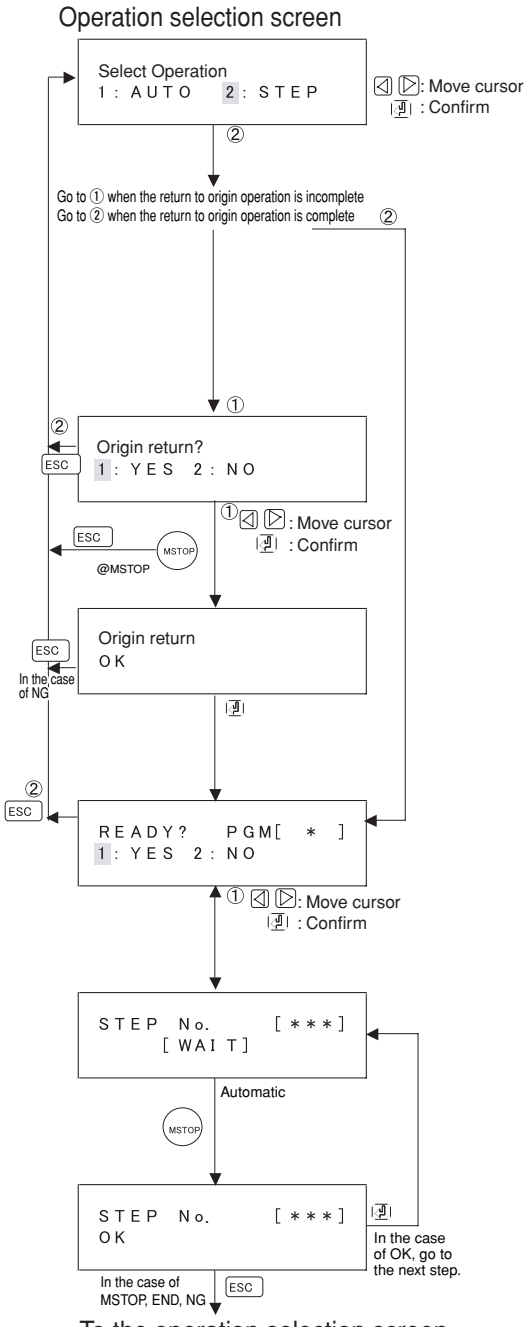
- If the motor free error occurs, a description of the error will be displayed on the first line and the current PGM/STEP on the second line. When the program completes, the message [Program END] will be displayed. Return to the operation selection screen by pressing the escape key.

Note: During continuous interpolation, the current position/current program step will not be displayed.

(2) Operation: How to perform step operation
When you want to run the program in steps

STEP operation runs a program in order starting from STEP0 and ends when END is displayed.

- In the operation selection screen, select [2:STEP] and press the enter key.
- If the return to origin is incomplete, execute it again. Once it is complete, perform step operation.
- To execute return to origin:
  Select [1:YES] and press the enter key.
  Selecting [2:NO] returns to the operation selection screen.
- To perform step operation:
  Select [1:YES] and press the enter key.
  The step operation starts.
  Selecting [2:NO] returns to the operation selection screen.
- The next step is executed each time you press the enter key. Press the escape key, once the program reaches END.



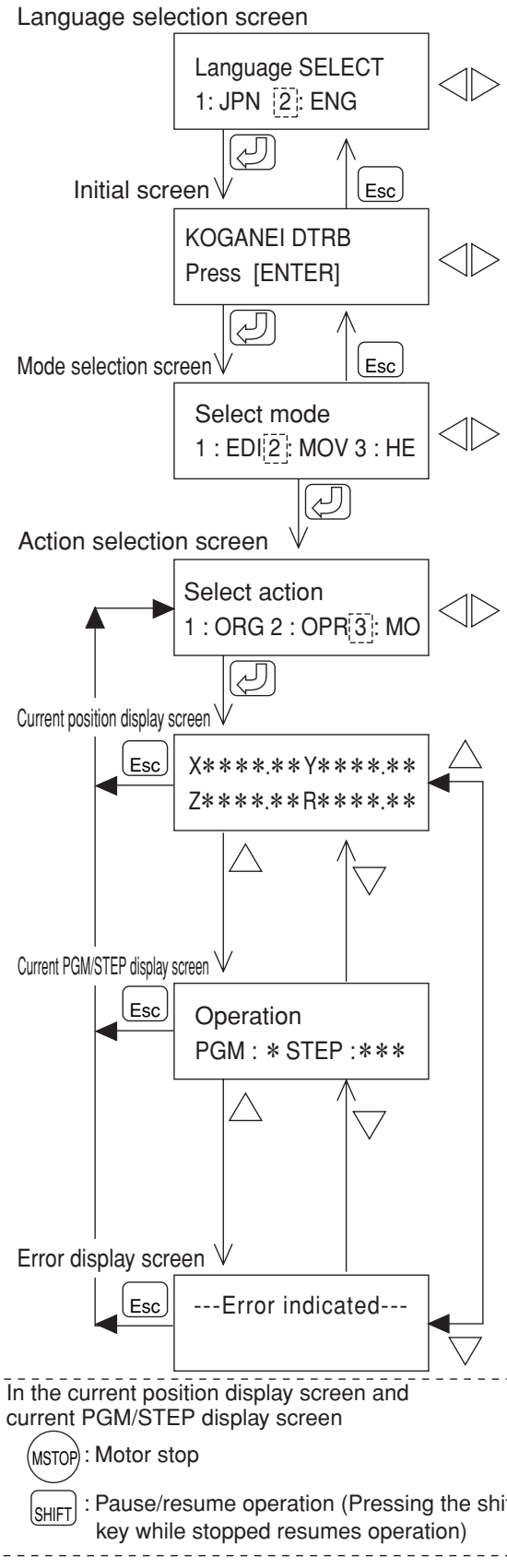
Note: In the case of CIRCLE, pressing the enter key the first time moves it to the starting point, and the second time starts the CIRCLE operation.

Note: Continuous interpolation will stop after continuously running [LINE 100] to [LINE 200].

6-5-7 Monitoring

You can monitor the current positions of the X, Y, Z, and R axes, the current program number/step number, and errors during automatic operation.

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [2:MOV] and press the enter key.
- In the action selection screen, select [3:MO] and then press the enter key.
- The current positions of the X, Y, Z, and R axes are displayed in the current position display screen.
  Use the UP/DOWN keys to switch between the current PGM/STEP display screen and the error display screen.
- The current program number and step number are displayed in the current PGM/STEP display screen.
  Use the UP/DOWN keys to switch between the error display screen and the current position display screen.
- In the error display screen, if errors occur, they will be displayed on the second line.
  Consequently, the second line will be empty in the initial screen.
  Use the UP/DOWN keys to switch between the current position display screen and the current PGM/STEP display screen.



- Pressing the shift key in the current position display screen or current PGM/STEP display screen, pauses operation. Pressing the shift key while the robot paused resumes operation.

- When MSTOP, an emergency stop, error, or other problem appears in the current position display screen or current PGM/STEP display screen, a description of an error will appear on the first line and the current PGM/STEP will appear on the second line. When the program completes, the message [Program END] will appear. Return to the action selection screen by pressing the escape key.

6-5-8 Error History

You can see the description of the latest error in the error history screen.

- In the language selection screen, select whether the display screen will be in Japanese or English.

- In the initial screen, press the enter key to go to the mode selection screen.

- In the mode selection screen, select [3:HE] and press the enter key.

- In the check information selection screen, select [1:ERR] and press the enter key.

- The error history will be displayed on the second line.

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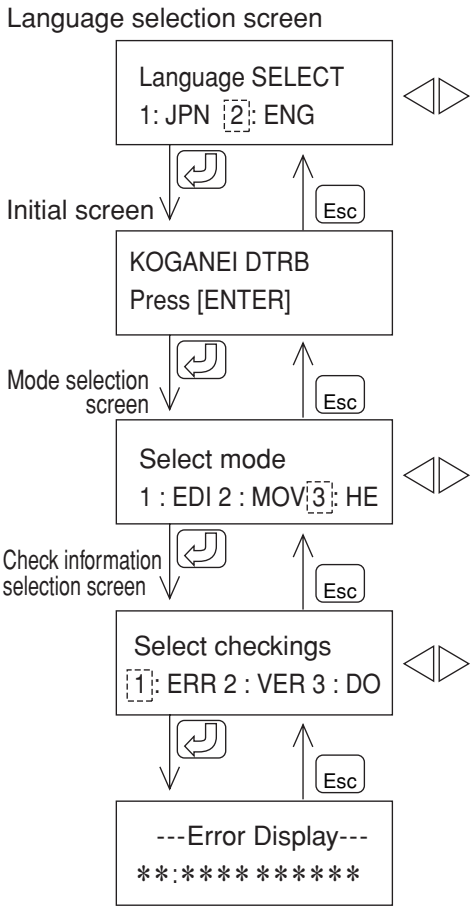
↑ ↑

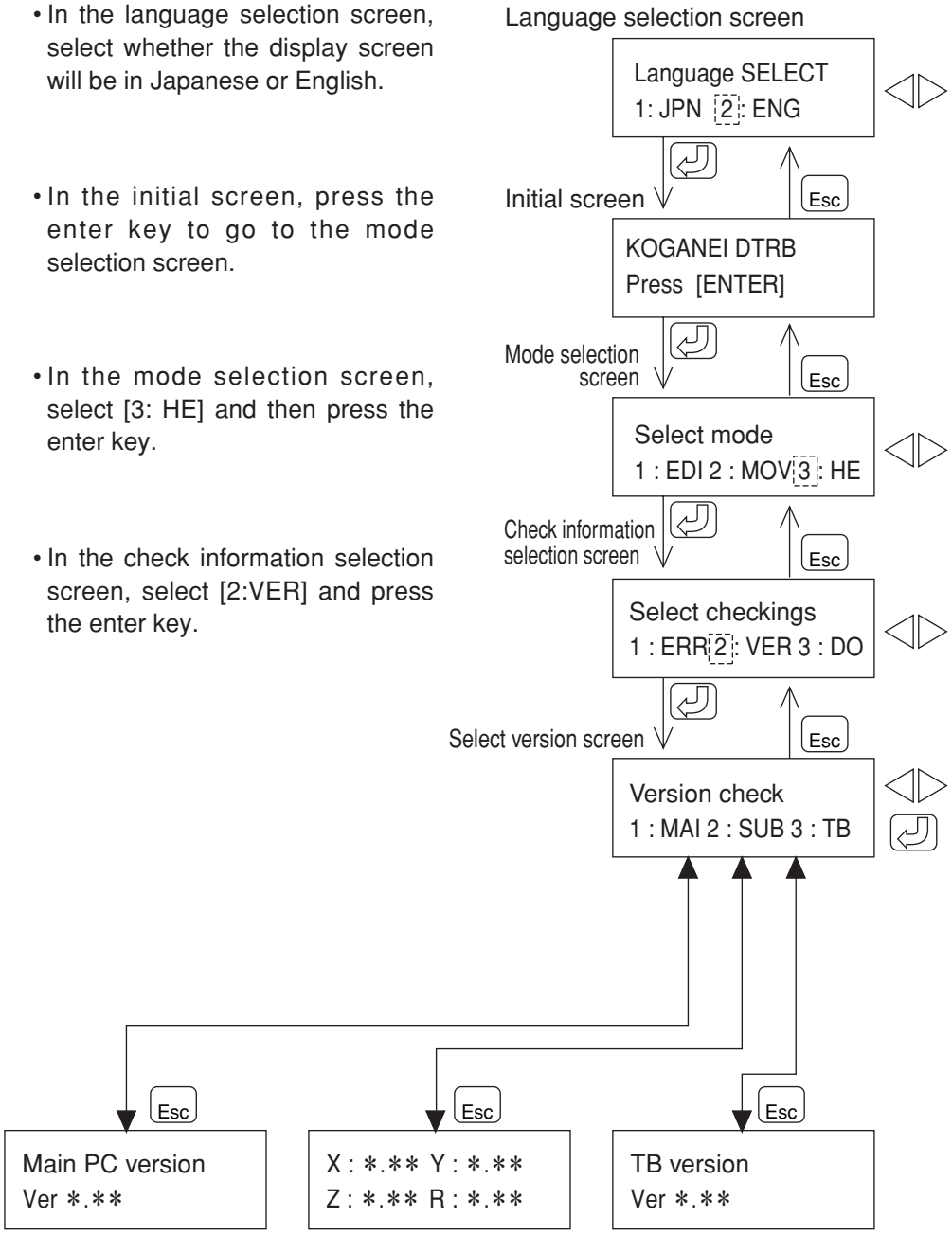
Error No. Error description



6-5-9 Checking Versions

You can see the version of the teaching box and main program/subprogram on the Cell Master main unit.

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [3: HE] and then press the enter key.
- In the check information selection screen, select [2:VER] and press the enter key.

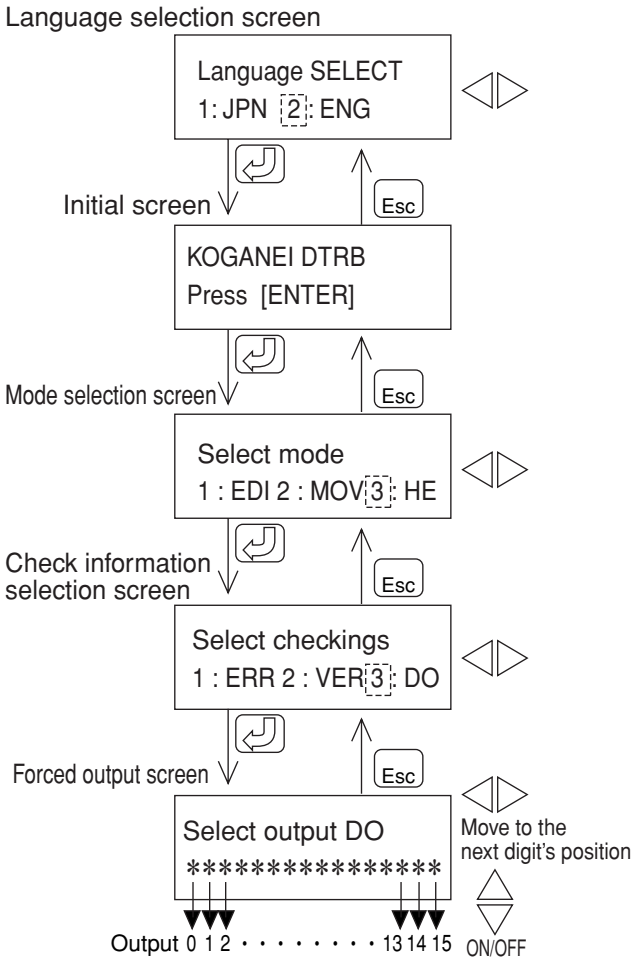


- [1:MAI] displays the version of the main program on the Cell Master's main unit.
  [2:SUB] displays the version of the subprogram of the Cell Master's main unit.
  When PRM41 (number of axes used) is 4 axes, the version of all subprograms will be displayed, but when the number of axes used is less than 4, [NG] will be displayed for the axes that are not used.
  [3:TB] displays the program version of the teaching box.

6-5-10 Forcibly Outputting DO

On systems that control the workpiece, such as grippers and cylinders, using general-purpose output, or manual output is possible on a test basis before running the program.

- In the language selection screen, select whether the display screen will be in Japanese or English.
- In the initial screen, press the enter key to go to the mode selection screen.
- In the mode selection screen, select [3:HE] and press the enter key.
- In the check information selection screen, select [3:DO] and press the enter key.
- In the forced output screen, use the LEFT/RIGHT keys to select the output number (0 to 15), and then turn the output on/off with the UP key (ON) and DOWN key (OFF).
  The initial display on the screen will be the current output state.

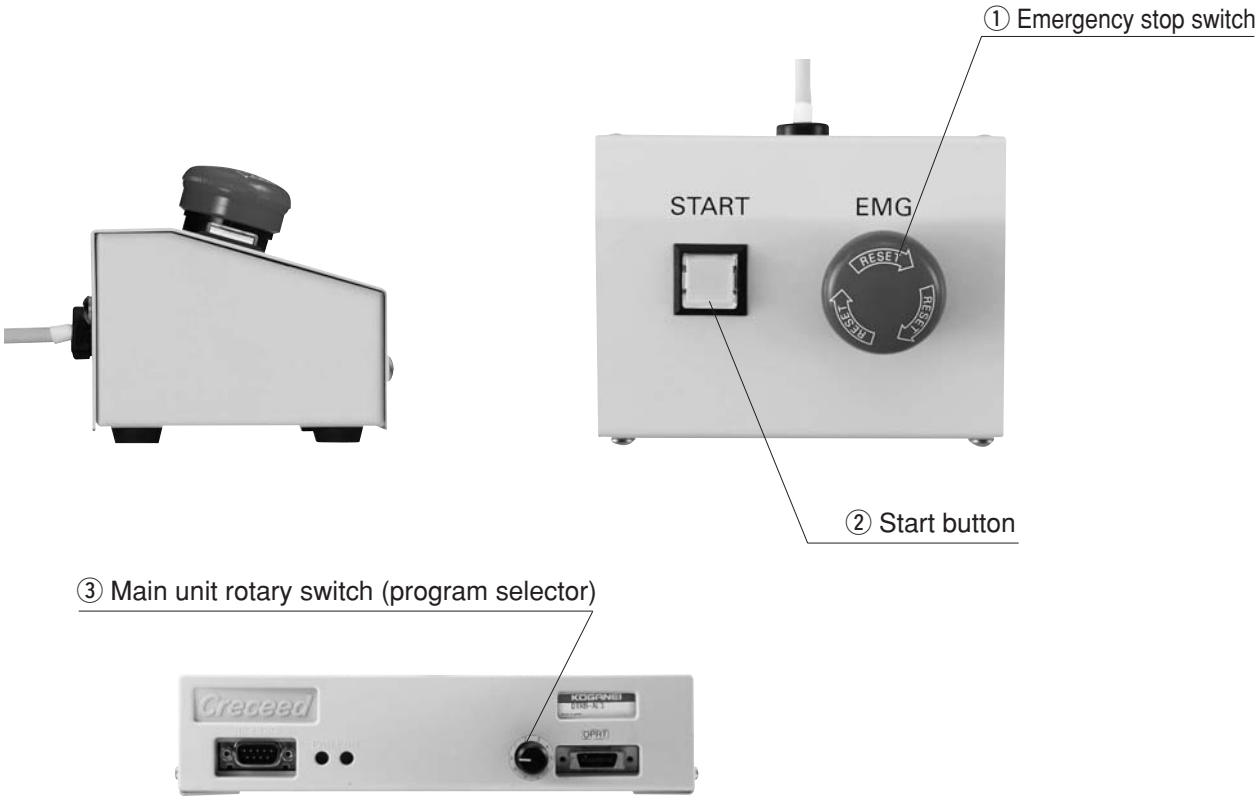


Note: If the operation box is not connected, output will not be issued even if forced output DO is set to 1 (ON) from the teaching box.
Manual control of custom output 14 and 15 is not possible while the program is running.

Chapter 7 Operating the Robot

This chapter describes how to operate the Cell Master. Once you have created a program, you will be able to operate it simply by reading this chapter, which covers the operation of the operation box and switching of groups.

7-1 Functions of Operation Box and Main Unit Rotary Switch



① Emergency stop switch

Press to stop the Cell Master in an emergency. Turning it to the right clears the emergency stop.

② Start button

Functions

- Origin return: Executes return to origin when pressed after powered on or an emergency stop.
- Run: Runs a program when pressed after the return to origin completes.
- Pause: Pauses when pressed while a program is running. To resume the program, press the button again.

LED display

- Return to origin incomplete: Blinks slowly (1Hz)
- Running a program: Lit steadily
- Paused: Blinks quickly (2Hz)

③ Main unit rotary switch (program selector)

This selector is for switching between programs. (You can set program numbers from 0 through 5.)

Note: A program error will occur if you try to run a program after setting the rotary switch to the asterisk (*) position and executing return to origin.
Switch to any number from 0 through 5, and then execute return to origin.

7-2 Switching Programs

The Cell Master allows you to enter programs in 6 groups (types). The switching of programs is possible simply by changing the position of the main unit's rotary switch. After changing the program, always execute an emergency stop, and then perform return to origin.

Caution: If you perform program editing without executing return to origin after changing the position of the rotary switch, the program before the position of the rotary switch was changed will be edited. Always execute return to origin before editing a program.

7-3 What to Do When Executing Return to Origin

(1) Check that the operation box is connected to the main unit.
(2) Power on the Cell Master main unit.
(3) Check that the emergency stop switch on the operation box is in the clear position.
(4) Press the start button or execute return to origin operation with a custom start input, the teaching box, or DTRB Editor. (The Z axis will return to origin first, followed by the X and Y axes.)

7-4 Starting Operation

This section assumes that the return to origin operation has completed.

(1) Check that the rotary switch on the main unit is in the proper position. If you have changed the rotary switch position, make sure to perform an emergency stop and then execute return to origin again.
(2) Press the start button or start with a custom start input, the teaching box, or DTRB Editor.
(The program specified by the main unit's rotary switch will start from step 0.)

7-5 Temporary Stop Operation

This is how to stop the Cell Master operation while the program is running.

- Press the start button. To continue with from the next step, press the start button again. To start from step 0, initiate an emergency stop and then perform return to origin before starting again. (The same operation is also possible when starting with a custom input.)
- When using the teaching box, press the SHIFT key to execute a temporary stop. To continue from the next step, press the SHIFT key again.
- Refer to the Creceed Cell Master Support Software Owner's Manual for information on how to use the DTRB Editor.

7-6 Information on Emergency Stops

(1) For safety purpose, the emergency stop uses a normally closed (B contact) input (executes emergency stop when the connection is cut).
(2) The Cell Master can recover without requiring the power to be turned off, even after an emergency stop occurs.

7-6-1 Emergency Stop from the Operation Box

1) To initiate Emergency Stop: Press the emergency stop switch.
2) To recover from Emergency Stop: Turning the emergency stop switch clockwise to clear the emergency stop. After it is cleared, execute return to origin operation (turn on the start button) and then press the start button again to start the program.

7-6-2 MSTOP from the Teaching Box

1) To initiate MSTOP: Press the MSTOP switch (MSTOP). This will activate the motor free state. (Note that this is limited to operating from the teaching box. When operating from the operation box, you can enter the motor free state from the teaching box by setting the teaching box to the monitor (MO) function. (See Section 6-5-6 for more information.))

7-6-3 MSTOP from the DTRB Editor

Refer to the Creceed Cell Master Support Software Owner's Manual for information on how to use the DTRB Editor.

7-7 About the Sample Programs

Moving between 2 points

Step	Command	Second	Data	Comment
000	POINT	200	X=200: Y=200: Z=50	Move to Point ① at 100% speed
001	SEQ	401		Wait 0.1 second (timer)
002	POINT	250	X=0: Y=0: Z=50	Move to Point ② at 50% speed
003	SEQ	410		Wait 1 second (timer)
004	END	100		1-cycle stop

Moving by linear interpolation

Step	Command	Second	Data	Comment
000	LINE	080	X=200: Y=200: Z=50	Interpolated move to Point ① at 80% speed
001	SEQ	401		Wait 0.1 second (timer)
002	LINE	020	X=0: Y=0: Z=0	Interpolated move to Point ② at 20% speed
003	SEQ	410		Wait 1 second (timer)
004	END	200		Repetitive operation

Moving by circular interpolation

Step	Command	Second	Data	Comment
000	POINT	100	X=40: Y=20: Z=30	Move to circle starting point at 100% speed
001	CIRCLE	000	X_1=40: Y_1=20: Z_1=30	Set first point, 100% speed
002	CIRCLE	000	X_2=40: Y_2=60: X_3=20: Y_3=40	Set second and third point
003	POINT	000	X=0: Y=0: Z=0	Move to standby point at 100% speed
004	END	100		1-cycle stop

Continuous interpolation

Step	Command	Second	Data	Comment
000	POINT	000	X=30: Y=20: Z=0	Move to interpolation ① starting point
001	LINE	100		Start continuous interpolation
002	CIRCLE	000	X_1=30: Y_1=20: Z_1=0	
003	CIRCLE	000	X_2=35: Y_2=25: X_3=30: Y_3=30	
004	LINE	000	X=10: Y=30: Z=0	
005	CIRCLE	000	X_1=10: Y_1=30: Z_1=0	
006	CIRCLE	000	X_2=5: Y_2=25: X_3=10: Y_3=20	
007	LINE	000	X=30: Y=20: Z=0	
008	CIRCLE	000	X_1=30: Y_1=20: Z_1=0	
009	CIRCLE	000	X_2=35: Y_2=15: X_3=30: Y_3=10	
010	LINE	000	X=10: Y=10: Z=0	
011	CIRCLE	000	X_1=10: Y_1=10: Z_1=0	
012	CIRCLE	000	X_2=5: Y_2=15: X_3=10: Y_3=20	
013	LINE	000	X=30: Y=20: Z=0	
014	LINE	200		END continuous interpolation
015	POINT	000	X=130: Y=120: Z=0	Move to interpolation ② starting point
016	LINE	100		Start continuous interpolation
017	CIRCLE	000	X_1=130: Y_1=120: Z_1=0	
018	CIRCLE	000	X_2=135: Y_2=125: X_3=130: Y_3=130	
019	LINE	000	X=110: Y=130: Z=0	
020	CIRCLE	000	X_1=110: Y_1=130: Z_1=0	
021	CIRCLE	000	X_2=105: Y_2=125: X_3=110: Y_3=120	
022	LINE	000	X=130: Y=120: Z=0	
023	CIRCLE	000	X_1=130: Y_1=120: Z_1=0	
024	CIRCLE	000	X_2=135: Y_2=115: X_3=130: Y_3=110	
025	LINE	000	X=110: Y=110: Z=0	
026	CIRCLE	000	X_1=110: Y_1=110: Z_1=0	
027	CIRCLE	000	X_2=105: Y_2=115: X_3=110: Y_3=120	
028	LINE	000	X=130: Y=120: Z=0	
029	LINE	200		END continuous interpolation
030	END	100		

Nesting

Step	Command	Second	Data	Remark
000	SEQ	900	J=003	Jump to 003 when IN0 is ON
001	END	200		
002				
003	SEQ	901	J=006	Jump to 006 when IN1 is ON
004	SEQ	917		Return
005				
006	SEQ	902	J=009	Jump to 009 when IN2 is ON
007	SEQ	917		Return
008				
009	SEQ	917		Return

SEQ 6＊＊: Example of using a conditional jump (ON)

If the input number (IN4) is ON, the output number (OUT1) is turned to ON, and if it is OFF, point movement is performed and the sequence ends.

Step	Command	Second	Data	Comment
000	SEQ	604	J=3	Jump to step 3 if input number (IN4) is ON
001	POINT	100	X=150: Y=200: Z=50	Move to point
002	END	100		1-cycle stop
003	SEQ	201		Output number (OUT1) ON
004	END	100		1-cycle stop

SEQ 8＊＊: Example of using an unconditional jump

The sequence unconditionally performs point movement, turns to ON the output number (OUT2), and then ends.

Step	Command	Second	Data	Comment
000	SEQ	800	J=2	Jump to step 2 unconditionally
001	END	100		1-cycle stop
002	POINT	100	X=150: Y=200: Z=50	Move to point
003	SEQ	202		Output number (OUT2) ON
004	END	100		1-cycle stop

SEQ9＊＊: Example of using a conditional CALL jump

If input number (IN1) is ON, runs step 1 after running steps 3 and 4.
If the input number (IN1) is OFF, runs step 1.

Step	Command	Second	Data	Comment
000	SEQ	901	J=3	If the input number (IN1) is ON, run step 3 and thereafter
001	SEQ	300		Turn the output number (OUT0) OFF
002	END	100		1-cycle stop
003	SEQ	200		Turn the output number (OUT0) ON
004	SEQ	420		Wait 2 seconds (timer)
005	SEQ	917		Return (Ends CALL statement and returns to step 1)

SEQ 916: Example of using an unconditional jump CALL

Runs step 1 after running steps 3 and 4.

Step	Command	Second	Data	Comment
000	SEQ	916	J=3	Run step 3 and thereafter unconditionally
001	SEQ	300		Turn the output number (OUT0) OFF
002	END	100		1-cycle stop
003	SEQ	200		Turn the output number (OUT0) ON
004	SEQ	420		Wait 2 seconds (timer)
005	SEQ	917		Return (Ends CALL statement and returns to step 1)

Palletizing output application program (using conditional jump)

When you run the following program and perform I/O wiring, it will continue until the pallet count ends, allowing you to stop the program when the count ends.

Step	Command	Second	Data	Comment
000	PALLET	000		Move to pallet
001	PALLET	100		Incrementing of pallet count confirmation
002	SEQ	700	J=0	Jump to step 0 if input number (IN0) is OFF
003	END	100		1-cycle stop

Note: The above-mentioned program should be run after connecting I/O output number 13 and input number 00.

Example of palletizing

Divides the 180 workpieces in pallet A into 12 divisions in pallet B with 15 workpieces each.

Step	Command	Second	Data	Comment
000	PALLET	200		Pallet A count reset
001	PALLET	201		Pallet B count reset
002	SEQ	001		Pallet A confirmation
003	SEQ	002		Pallet B confirmation
004	SEQ	313		Count increment output OFF
005	PALLET	000		Move to pallet A
006	PALLET	100		Pallet A count increment check
007	SEQ	916	J=17	Pick up
008	PALLET	001		Move to pallet B
009	SEQ	916	J=21	Place
010	SEQ	600	J=15	End if there is no pallet A
011	PALLET	101		Pallet B count increment check
012	SEQ	600	J=3	Replace if there is no pallet B
013	SEQ	800	J=5	Repeat
014	SEQ	313		Count increment output OFF
015	END	100		1-cycle stop
016				
017	POINT	700	X=0: Y=0: Z=50	Z axis down
018	SEQ	200		Grip operation
019	POINT	300		Move to virtual point
020	SEQ	917		Return
021	POINT	700	X=0: Y=0: Z=50	Z axis down
022	SEQ	300		Grip operation clear
023	POINT	300		Move to virtual point
025	SEQ	917		Return

Example of dispensing application

Step	Command	Second	Data	Comment
000	POINT	100	X=100: Y=100: Z=0	Move to dispensing point ①
001	SEQ	916	J=006	CALL for coating
002	POINT	100	X=120: Y=120: Z=0	Move to dispensing point ②
003	SEQ	916	J=006	CALL for coating
004	END	100		1-cycle stop
005				
006	POINT	700	X=0: Y=0: Z=50	Dispensing point down
007	SEQ	100		Valve box READY
008	SEQ	200		Valve ON
009	SEQ	405		Coating
010	SEQ	300		Valve OFF
011	POINT	300		Move to virtual point
012	SEQ	917		Return

Example of soldering application

Step	Command	Second	Data	Remark
000	SEQ	916	J=011	Cleaning
001	POINT	700	X=200: Y=0: Z=0	Move to soldering point
002	SEQ	916	J=007	Soldering
003	POINT	700	X=200: Y=0: Z=0	Move to soldering point
004	SEQ	916	J=007	Soldering
005	END	100		1-cycle stop
006				
007	POINT	810	X=0: Y=0: Z=50	Move to soldering surface
008	SEQ	405		Preheat soldering surface
009	POINT	600	R=10	Place solder
010	SEQ	410		Finish soldering surface
011	POINT	130	X=200: Y=150: Z=50	Cleaning
012	SEQ	200		Valve ON
013	SEQ	405		Timer
014	SEQ	300		Valve OFF
015	POINT	330		Move up to virtual position
016	SEQ	917		Return

Example of electric screwdriver application

Step	Command	Second	Data	Comment
000	SEQ	916	J=013	CALL for pick up the screw
001	POINT	100	X=100: Y=100: Z=0	Move to the screw fastening point ①
002	SEQ	916	J=007	CALL for start fastening the screw
003	POINT	100	X=120: Y=120: Z=0	Move to the screw fastening point ②
004	SEQ	916	J=007	CALL for start fastening the screw
005	END	100		
006				
007	SEQ	916	J=024	CALL for turn on the driver
008	POINT	700	X=0: Y=0: Z=50	Screw fastening
009	SEQ	000		Finish
010	SEQ	916	J=026	CALL for turn off the driver
011	SEQ	302		Screw suction OFF
012	POINT	300		Move to virtual point
013	POINT	100	X=200: Y=0: Z=0	Move to screw supply point
014	SEQ	004		Valve box READY
015	SEQ	002		Screw feeder READY
016	SEQ	916	J=024	CALL for turn on the driver
017	POINT	700	X=0: Y=0: Z=50	Pick up screw
018	SEQ	202		Screw suction ON
019	SEQ	001		Vacuum switch BUSY
020	POINT	300		Move to virtual point
021	SEQ	916	J=026	CALL for turn off the driver
022	SEQ	917		Return
023				
024	SEQ	200		Spindle motor ON
025	SEQ	917		Return
026	SEQ	300		Spindle motor OFF
027	SEQ	917		Return

Example of air screwdriver application

Step	Command	Second	Data	Comment
000	SEQ	916	J=013	CALL for pick up the screw
001	POINT	100	X=100: Y=100: Z=0	Move to the screw fastening point ①
002	SEQ	916	J=007	CALL for start fastening the screw
003	POINT	100	X=120: Y=120: Z=0	Move to the screw fastening point ②
004	SEQ	916	J=007	CALL for start fastening the screw
005	END	100		1-cycle stop
006				
007	SEQ	916	J=024	CALL for turn on the driver

Step	Command	Second	Data	Comment
008	SEQ	916	J=029	CALL for Z cylinder ON
009	SEQ	000		Finish
010	SEQ	916	J=026	CALL for turn off the driver
011	SEQ	302		Screw suction OFF
012	SEQ	916	J=031	CALL for Z cylinder OFF
013	POINT	100	X=200: Y=0: Z=0	Move to screw supply point
014	SEQ	004		Valve box READY
015	SEQ	002		Screw feeder READY
016	SEQ	916	J=024	CALL for turn on the driver
017	SEQ	916	J=029	CALL for Z cylinder ON
018	SEQ	202		Screw suction ON
019	SEQ	001		Vacuum switch BUSY
020	SEQ	916	J=031	CALL for Z cylinder OFF
021	SEQ	916	J=026	CALL for turn off the driver
022	SEQ	917		Return
023				
024	SEQ	200		Spindle motor ON
025	SEQ	917		Return
026	SEQ	300		Spindle motor OFF
027	SEQ	917		Return
028				
029	SEQ	203		Valve for Z cylinder ON
030	SEQ	917		Return
031	SEQ	303		Valve for Z cylinder OFF
032	SEQ	917		Return

Example of cutting application

Step	Command	Second	Data	Comment
000	POINT	200	X=100: Y=100: Z=30	Move to the cutting point ①
001	SEQ	916	J=009	CALL for start cutting
002	LINE	020	X=110: Y=110: Z=30	Cut while it is moving
003	POINT	200	X=120: Y=120: Z=30	Move to the cutting point ②
004	LINE	020	X=130: Y=130: Z=30	Cut while it is moving
005	SEQ	916	J=012	CALL for end cutting
006	POINT	200	X=0: Y=0: Z=0	Move to the origin
007	END	100		1-cycle stop
008				
009	SEQ	201		Spindle motor ON
010	SEQ	000		Spindle motor BUSY
011	SEQ	917		Return
012	SEQ	301		Spindle motor OFF
013	POINT	300		Move to virtual point
014	SEQ	917		Return

Memo

Chapter 8 Parameters

8-1 Parameters

You can easily set parameters by operating the teaching box or PC (DTRB Editor).
This chapter describes how to set and change parameters and provides detailed information on each parameter.

Safety
Because initial settings for parameters have been carried out in accordance with the main robot unit at the time of shipment, you can start using the product after checking. Please contact Koganei if there is any problem.

Caution: Fatal defects may arise in the robot and controller if you carelessly change parameters other than those described in this manual.

8-2 Setting Parameters

Parameter editing is made through the main unit's RS232C port with the teaching box or PC (DTRB Editor).
Refer to the Creceed Cell Master Support Software Owner's Manual for information on how to use the DTRB Editor.

8-3 Initializing Parameters for Specified Robot Number

When you initialize parameters, the parameters of the robot number specified by PRM0 (specifies the robot number) will return to their default values.

PRM No.	Parameter description	Unit	DTRB-AS2	DTRB-AS3	DTRB-ASL3	DTRB-AL2	DTRB-AL3	DTRB-ALL3	DTRB-CS2	DTRB-CS3	DTRB-CSL3
0	Specified robot number		10	11	12	20	21	22	30	31	32
1	Return to origin specification		3	3	3	3	3	3	3	3	3
2	Start specification		3	3	3	3	3	3	3	3	3
4	Virtual position (ZI)	mm	0	0	0	0	0	0	0	0	0
6	X software limit	mm	150	150	150	200	200	200	100	100	100
7	Y software limit	mm	200	200	200	200	200	200	200	200	200
8	Z software limit	mm	0	50	50	0	50	50	0	50	50
9	R software limit	mm	200	200	200	200	200	200	200	200	200
10	X software limit (–)	mm	-5	-5	-5	-5	-5	-5	-5	-5	-5
11	Y software limit (–)	mm	-2	-2	-2	-2	-2	-2	-5	-5	-5
12	Z software limit (–)	mm	0	-5	-5	0	-5	-5	0	-5	-5
13	R software limit (–)	mm	-5	-5	-5	-5	-5	-5	-5	-5	-5
14	X lead	mm	6	6	6	6	6	6	6	6	6
15	Y lead	mm	6	6	6	6	6	6	6	6	6
16	Z lead	mm	2	6	2	2	6	2	2	6	2
17	R lead	mm	6	6	6	6	6	6	6	6	6
18	X acceleration time	s	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
19	Y acceleration time	s	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
20	Z acceleration time	s	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
21	R acceleration time	s	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
22	X max. speed	mm/s	200	200	200	200	200	200	200	200	200
23	Y max. speed	mm/s	200	200	200	200	200	200	200	200	200
24	Z max. speed	mm/s	70	200	70	70	200	70	70	200	70
25	R max. speed	mm/s	200	200	200	200	200	200	200	200	200
26	Linear interpolation speed	mm/s	45	45	45	45	45	45	45	45	45
27	Circular interpolation speed	mm/s	15	15	15	15	15	15	15	15	15
28	X1, X2 speed	mm/s	5	5	5	5	5	5	5	5	5
29	X3 speed	mm/s	30	30	30	30	30	30	30	30	30
30	Y1, Y2 speed	mm/s	5	5	5	5	5	5	5	5	5
31	Y3 speed	mm/s	30	30	30	30	30	30	30	30	30
32	Z1, Z2 speed	mm/s	5	5	5	5	5	5	5	5	5
33	Z3 speed	mm/s	10	30	10	10	30	10	10	30	10
34	R1, R2 speed	mm/s	5	5	5	5	5	5	5	5	5
35	R3 speed	mm/s	30	30	30	30	30	30	30	30	30
36	X1 movement distance	mm	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
37	Y1 movement distance	mm	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
38	Z1 movement distance	mm	0	0.01	0.01	0	0.01	0.01	0	0.01	0.01
39	R1 movement distance	mm	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
40	S-shape control		0	0	0	0	0	0	0	0	0
41	Number of axes used	axes	2	3	3	2	3	3	2	3	3
42	Selecting English or Japanese		1	1	1	1	1	1	1	1	1
43	Emergency output state		0	0	0	0	0	0	0	0	0

Note: Initializing parameters also initializes offset data and pallet data.

8-4 Description of Parameters

PRM0: Specified robot number
Displays the Robot Type number. This parameter is read only.
You cannot overwrite it using WRITE PRM, you can only overwrite it using INIT PRM.
Setting description 10: DTRB-AS2, 11: DTRB-AS3, 12: DTRB-ASL3
20: DTRB-AL2, 21: DTRB-AL3, 22: DTRB-ALL3
30: DTRB-CS2, 31: DTRB-CS3, 32: DTRB-CSL3

PRM1: Return to origin specification
Specifies the input setting for starting the return to origin operation.
Input range 0～3
Setting description 0: Only operation box is effective
1: Only start input for I/O is effective
2: Only teaching box and communication commands are effective
3: Free (Operation box, I/O start, and communication commands are effective)

PRM2: Start specification
Specifies the input setting for beginning start.
Input range 0～3
Setting description 0: Only operation box is effective
1: Only start input for I/O is effective
2: Only teaching box and communication commands are effective
3: Free (Operation box, I/O start, and communication commands are effective)

PRM4: Virtual position (ZI)
Sets the point to move using a virtual position that does not come in contact with the workpiece without moving to the return-to-origin position.
Input range －999.99～999.99 (mm)

PRM6: X stroke (＋software limit)
Sets the range of movement on the positive side of the X axis.
Input range 0.00～999.99 (mm)

PRM7: Y stroke (＋software limit)
Sets the range of movement on the positive side of the Y axis.
Input range 0.00～999.99 (mm)

PRM8: Z stroke (+ software limit)
Sets the range of movement on the positive side of the Z axis.
Input range 0.00～999.99 (mm)

PRM9: R stroke (+ software limit)
Sets the range of movement on the positive side of the R axis.
Input range 0.00～999.99 (mm)

PRM10: X stroke (− software limit)
Sets the range of movement on the negative side of the X axis.
Input range −999.99～0.00 (mm)

PRM11: Y stroke (− software limit)
Sets the range of movement on the negative side of the Y axis.
Input range −999.99～0.00 (mm)

PRM12: Z stroke (− software limit)
Sets the range of movement on the negative side of the Z axis.
Input range −999.99～0.00 (mm)

PRM13: R stroke (− software limit)
Sets the range of movement on the negative side of the R axis.
Input range −999.99～0.00 (mm)

PRM14: X lead
Sets the lead pitch for the X axis.
Input range 1～99 (mm)

PRM15: Y lead
Sets the lead pitch for the Y axis.
Input range 1～99 (mm)

PRM16: Z lead
Sets the lead pitch for the Z axis.
Input range 1～99 (mm)

PRM17: R lead
Sets the lead pitch for the R axis.
Input range 1～99 (mm)

PRM18: X acceleration time[Note]
Sets the acceleration time of the X axis.
Input range 0.1 to 10.0 (For S-shape control, 0.2 to 10.0) (s)
Note: In the case of S-shape control, entering 0.1 will result in 0.2.

PRM19: Y acceleration time[Note]
Sets the acceleration time of the Y axis.
Input range 0.1 to 10.0 (For S-shape control, 0.2 to 10.0) (s)
Note: In the case of S-shape control, entering 0.1 will result in 0.2.

PRM20: Z acceleration time[Note]
Sets the acceleration time of the Z axis.
Input range 0.1 to 10.0 (For S-shape control, 0.2 to 10.0) (s)
Note: In the case of S-shape control, entering 0.1 will result in 0.2.

PRM21: R acceleration time[Note]
Sets the acceleration time of the R axis.
Input range 0.1 to 10.0 (For S-shape control, 0.2 to 10.0) (s)
Note: In the case of S-shape control, entering 0.1 will result in 0.2.

PRM22: X max. speed
Sets the maximum speed of the X axis.
Input range 1.00～200.00 (mm/s)

PRM23: Y max. speed
Sets the maximum speed of the Y axis.
Input range 1.00～200.00 (mm/s)

PRM24: Z max. speed
Sets the maximum speed of the Z axis.
Input range 1.00～200.00 (mm/s)
Note: 1.00 to 70.00 in the case of an axis lead of 2mm.

PRM25: R max. speed
Sets the maximum speed of the R axis.
Input range 1.00～200.00 (mm/s)

PRM26: Linear interpolation speed
Sets the maximum speed during linear interpolation operation.
Input range 1.00～45.00 (mm/s)
Note: 1.00 to 15.00 in the case of movement that includes an axis lead of 2mm.

PRM27: Circular interpolation speed
Sets the maximum speed during circular interpolation operation.
Input range 1.00～15.00 (mm/s)

PRM28: X1, X2 speed
Sets the speed for X1 (teaching step) and X2 (low speed teaching) on the X axis.
Input range 1.00～200.00 (mm/s)

PRM29: X3 speed
Sets the speed for X3 (high speed teaching) on the X axis.
Input range 1.00～200.00 (mm/s)

PRM30: Y1, Y2 speed
Sets the speed for Y1 (teaching step) and Y2 (low speed teaching) on the Y axis.
Input range 1.00～200.00 (mm/s)

PRM31: Y3 speed
Sets the speed for Y3 (high speed teaching) on the Y axis.
Input range 1.00～200.00 (mm/s)

PRM32: Z1, Z2 speed
Sets the speed for Z1 (teaching step) and Z2 (low speed teaching) on the Z axis.
Input range 1.00～200.00 (mm/s)
Note: 1.00 to 70.00 in the case of an axis lead of 2mm.

PRM33: Z3 speed
Sets the speed for Z3 (high speed teaching) on the Z axis.
Input range 1.00～200.00 (mm/s)
Note: 1.00 to 70.00 in the case of an axis lead of 2mm.

PRM34: R1, R2 speed
Sets the speed for R1 (teaching step) and R2 (low speed teaching) on the R axis.
Input range 1.00～200.00 (mm/s)

PRM35: R3 speed
Sets the speed for R3 (high speed teaching) on the R axis.
Input range 1.00～200.00 (mm/s)

PRM36: X1 movement distance
Sets the step movement distance for X1 (teaching step) on the X axis.
Input range 1.00 ～ 999.99 (mm)

PRM37: Y1 movement distance
Sets the step movement distance for Y1 (teaching step) on the Y axis.
Input range 1.00 ～ 999.99 (mm)

PRM38: Z1 movement distance
Sets the step movement distance for Z1 (teaching step) on the Z axis.
Input range 1.00 ～ 999.99 (mm)

PRM39: R1 movement distance
Sets the step movement distance for R1 (teaching step) on the R axis.
Input range 1.00 ～ 999.99 (mm)

PRM40: S-shape control
Sets axis control.
Input range 0, 1
Setting description 0: Trapezoidal control
1: S-shape control

PRM41: Number of axes used
Sets the number of axes to control.
Input range 1 ～ 4 (axes)
Setting description 1: 1 axis (X)
2: 2 axes (X, Y)
3: 3 axes (X, Y, Z)
4: 4 axes (X, Y, Z, R)

PRM42: Selecting English or Japanese
Sets the language used for response messages in communications.
Input range 0, 1
Setting description 0: ENGLISH
1: JAPANESE

PRM43: Emergency output state
Sets the I/O output state during emergency stop.
Input range 0, 1
Setting description 0: Maintains output state
1: Output reset (all OFF)

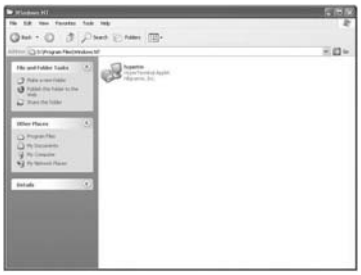
Chapter 9 Communication with Personal Computer

9-1 Communication Parameter Specification

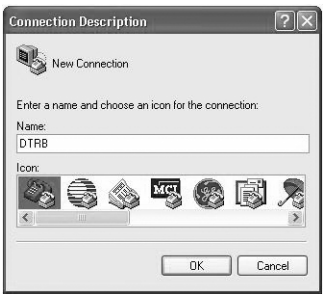
Set the communication parameters for the personal computer and other external devices in the following manner below. See the User's Manual for additional instructions on how to set each device.

■ Transmission rate	19200 bps	
■ Data bit length	8 bits	
■ Stop bit length	1 bit	
■ Parity check	On	
■ Parity setting	Odd parity (ODD)	
■ Control method	XON/XOFF software control method	
■ Communication method	Full duplex	
■ Synchronous method	Asynchronous method	
■ Return key transmission	CR code	
■ CR code reception	For CR/LF reception	Return+ line feed
	CR reception	Return

Setting method for Hyperterminal, as standard with Windows95 and later.

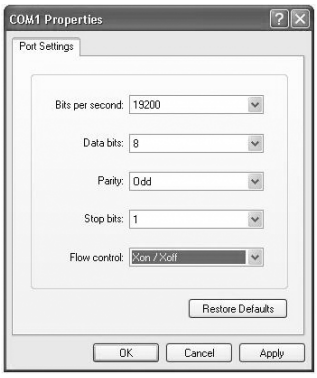


1. Double-click on Hyperterm.exe.

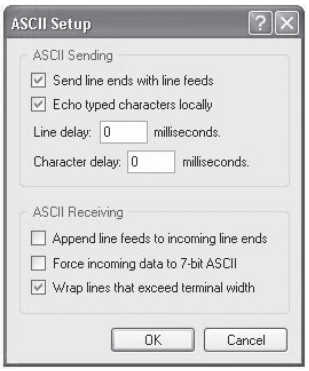


2. Enter a name, select an icon and click "OK."

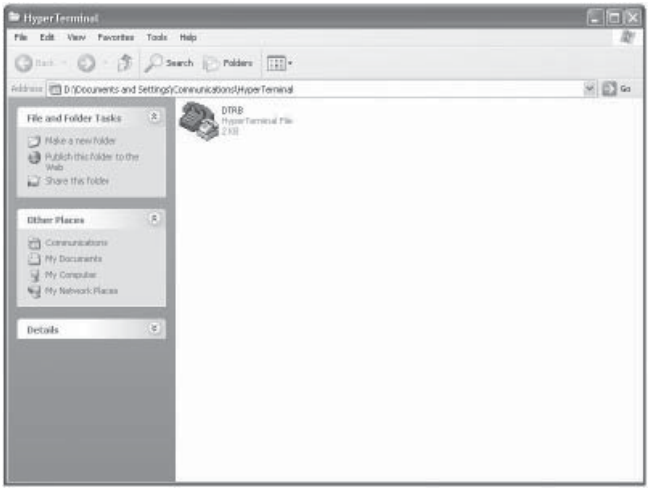
3.For the connection method, select "COM1" and click "OK."



4. Set the port and click "OK."



5. Click the “File” “Properties” and select “ASCII Setup” and select the check boxes as shown in the figure above, and click “OK.”



6. When starting up for the second time or later, double-click on the icon of the newly created file.

9-2 Communication Cable

Cell Master side connector:
DELC-J9PAF-20L6E
D-sub 9-pin
(Japan Aviation Electronics Industry, Ltd.)

Cell Master side (RS232C) — PC side

Signal name	Pin No.	Pin No.	Signal name
RXD	2	2	RXD
TXD	3	3	TXD
RTS	7	7	RTS
CTS	8	8	CTS
GND	5	5	GND
DCD (NC)	1	6	DSR
12V (TB power)	4	1	DCD
DSR (NC)	6	4	DTR
RI (NC)	9	9	RI

Recommended cable
Specifications: D-sub 9-pin female <=> D-sub 9-pin female cross cable
Model: C232R-915 (1.5m) / C232R-930 (3.0m)
Manufacturer: ELECOM Co., Ltd.

Note: Pin 4 is for the teaching box power supply.

9-3 Communication Commands

To facilitate easy communication with external devices, communication commands are standardized.

Communication commands are divided into the following 2 categories.
1. Robot language
2. Special codes

With the exception of the special codes, the format for communication commands is as follows.

@<Operation code>[<Operand1>][,<Operand2>][,<Operand3>][,<Operand4>][,<Operand5>][,<Operand6>][,<Operand7>] c/r l/f

- Basically, communication commands are executed by sending 1 line that begins with the start code '@' (=40H) and ends with the code c/r(=0DH) l/f(=0AH) to the controller. The special codes, however, do not require the start code or c/r l/f.
- Communication commands are composed of operation codes and operands. Depending on the command, either no operand is used or up to a maximum of 7 operands are used.
  The brackets [ ] refer to items that can be omitted.
- The character codes used are the JIS8 level codes (ASCII codes with katakana characters added). Input characters can be either capital letters or lower case letters.
- At least 1 space must be inserted between the operation code and the operand.
- Items with the <> mark (angle brackets) in the operand should be specified by you. Check the details of each communication command, and enter the appropriate data.
- When entering 2 or more operands, insert a comma "," between them.
- The underscore "_" in the format represents a space.

9-4 List of Communication Commands

No.	Command (@operation code)	Operand	Command description
0	@ORG		Returns to origin
1	@MSTOP		Motor free
2	@RUN		Starts the program
3	@SRUN		Runs 1 step
4	@STOP		Stops teaching move/Stops 1 step
5	@GO	<step No.>	GO movement
6	@CIR GO	<step No.>, <circle point>	CIRCLE* GO movement
7	@PAL GO	<pallet No.>, <pallet point>	PALLET* GO movement
8	@OFF		Writes offset value
9	@ZI		ZI movement
11	@X1＋		X1 pulse (+ direction)
12	@X2＋		X low-speed move (+ direction)
13	@X3＋		X high-speed move (+ direction)
14	@Y1＋		Y1 pulse (+ direction)
15	@Y2＋		Y low-speed move (+ direction)
16	@Y3＋		Y high-speed move (+ direction)
17	@Z1＋		Z1 pulse (+ direction)
18	@Z2＋		Z low-speed move (+ direction)
19	@Z3＋		Z high-speed move (+ direction)
20	@R1＋		R1 pulse (+ direction)
21	@R2＋		R low-speed move (+ direction)
22	@R3＋		R high-speed move (+ direction)
23	@X1—		X1 pulse (– direction)
24	@X2—		X low-speed move (– direction)
25	@X3—		X high-speed move (– direction)
26	@Y1—		Y1 pulse (– direction)
27	@Y2—		Y low-speed move (– direction)
28	@Y3—		Y high-speed move (– direction)
29	@Z1—		Z1 pulse (– direction)
30	@Z2—		Z low-speed move (– direction)
31	@Z3—		Z high-speed move (– direction)
32	@R1—		R1 pulse (+ direction)
33	@R2—		R low-speed move (– direction)
34	@R3—		R high-speed move (– direction)
35	@WRITE STEP	<step No.>, <command>, <second display>, (<X>, <Y>, <Z>, <R>)	Writes 1 STEP
36	@WRITE CIR 1= 2= 3= ^Z	<step No.>, <command> <X1>, <Y1>, <Z> <X2>, <Y2> <X3>, <Y3>	Writes circle
37	@READ STEP	<step No.>	Reads 1 STEP
38	@SINS	<step No.>	Inserts 1 STEP

*See page 28.

No.	Command (@operation code)	Operand	Command description
39	@SDEL	<step No.>	Deletes 1 STEP
40	@INIT PGM		Initializes 1 group PGM (group indicated by the rotary switch)
41	@INIT PGM ALL		Initializes all PGM (0 to 5)
42	@WRITE PRM	<parameter No.>, <data>	Writes 1 parameter
43	@READ PRM	<parameter No.>	Reads 1 parameter
44	@INIT PRM	<robot No.>	Initializes parameters
45	@INIT C	<counter No.>	Initializes counter
46	@INIT C ALL		Initializes all counters (0 to 19)
47	@READ ERR		Displays 16 latest error history entries
48	@INIT ERR		Clears error history
49	@?DO	<output destination>	Checks external output
50	@?DI	<input destination>	Checks external input
51	@?VER	<specified microprocessor>	Checks version
52	@?NO		Reads current program
53	@?SNO		Reads current step
54	@?POS	<specified axis>	Displays current position
55	@?ORG		Checks whether return to origin is complete
56	@?ERR		Displays most recent alarm history
57	@?C	<counter No.>	Reads current pallet counter
58	@DO	<output destination>, <ON/OFF specification>	External output

Classification	Code	Command description
Special code	^Z (=1AH)	Ends data transmission (used when writing with CIRCLE)

Classification	Response	Description
Response from the controller	OK	Normal completion of operation
	NG	Error has occurred Error contents are shown on the next line
	STOP	Stop command Reason to stop is shown on the next line
	READY	Completion of writing preparation
	ERR	Error has occurred Error contents are shown on the next line
	CEND	End continuous interpolation Display information is shown on the next line
	MSTOP	Motor free Error contents are shown on the next line
	EMG	Emergency stop Error contents are shown on the next line

Note: After OK and READY, a 4-character half-width alphanumeric string arrives. It is not an error, but just information used by DTRB Editor.

9-5 Details of Communication Commands

(1) @ORG (command No.0)

Function Executes return to origin.

Format @ORG c/r l/f

Example 1:

Transmission @ORG c/r l/f

After axis operation ends

Response OK c/r l/f

(2) @MSTOP (command No.1)

Function Stops motor and enters de-energized state.

Format @MSTOP c/r l/f

Example 1:

Transmission @MSTOP c/r l/f

Response MSTOP c/r l/f

64: Motor free c/r l/f

(3) @RUN (command No.2)

Function Runs the program(s).

Format @RUN c/r l/f

Explanation The program number is determined by the rotary switch.

Example 1:

Transmission @RUN c/r l/f

After the program ends

Response END c/r l/f

(4) @SRUN (command No.3)

Function Runs only 1 step.

Format @SRUN c/r l/f

Explanation The step number is cleared by executing return to origin.

The step number after executing END will be cleared.

Example 1: When executing a command other than END

Transmission @SRUN c/r l/f

After the step ends

Response OK c/r l/f

Example 2: When executing END command

Transmission @SRUN c/r l/f

After the step ends

Response END c/r l/f

(5) @STOP (command No.4)

Function Temporarily stops operation.

Format @STOP c/r l/f

Explanation Stops after ending step operation during program execution.
Immediately stops during teaching or GO operation.

Example 1:

Transmission @STOP c/r l/f

Response STOP c/r l/f
61: Stop command c/r l/f

(6) @GO (command No.5)

Function Moves to the step number of the value that was entered.

Format @GO _<step No.> c/r l/f

Example 1:

Transmission @ GO _000 c/r l/f

Response OK c/r l/f

Example 2: When the step command is not POINT or LINE

Response NG c/r l/f
54: No GO data c/r l/f

(7) @CIR GO (command No.6)

Function Moves to the step number of the value that was entered in the CIRCLE command.

Format @CIR _GO _<step No.>, <circle point> c/r l/f

Explanation <circle point>: Circle passing point number (1 to 3)
1: Starting point, 2: Intermediate passing point, 3: Ending point

Example 1:

Transmission @ CIR _ GO _000, 1 c/r l/f

Response OK c/r l/f

Example 2: When the step command is not CIRCLE

Response NG c/r l/f
54: No GO data c/r l/f

(8) @PAL GO (command No.7)

Function Moves to the value that was entered as the pallet point of the specified pallet number.

Format @PAL _GO _<pallet No.>, <pallet point> c/r l/f

Explanation <pallet No.>: 0～19

<pallet point> : First point to third point

Example 1:

Transmission @ PAL _ GO _00, 1 c/r l/f

After axis operation completes

Response OK c/r l/f

(9) @OFF (command No.8)

Function Writes offset value.

Format @OFF c/r l/f

Explanation Performs teaching operation (command No. 11 to 39) after GO movement (@GO, @CIR GO, @PAL, GO) and the teaching distance will be written as an offset by @ OFF.

Example 1:

Transmission @ OFF c/r l/f

Response OK c/r l/f

Note: Always perform @OFF after GO movement. If you perform only @OFF, the inhibit command will result in an error.

(10) @ZI (command No.9)

Function Moves to a virtual origin.

Format @ZI c/r l/f

Example 1:

Transmission @ ZI c/r l/f

Response OK c/r l/f

(11) @X1＋ (command No.11)
@Y1＋ (command No.14)
@Z1＋ (command No.17)
@R1＋ (command No.20)
@X1－ (command No.23)
@Y1－ (command No.26)
@Z1－ (command No.29)
@R1－ (command No.32)

Function Moves axis by 0.01mm which is the default value.
Format @X1+ c/r l/f
Explanation The distance can be changed using parameters 36 to 39.

Example 1:
Transmission @ X1+ c/r l/f
After axis stops
Response OK c/r l/f

Example 2: When axis exceeds limit
Response NG c/r l/f
03: Limit error c/r l/f

Example 3:
Transmission @ X1+ c/r l/f
While axis is moving @ STOP c/r l/f
Response STOP c/r l/f
61: Stop command c/r l/f

(12) @X2＋ (command No.12)
@Y2＋ (command No.15)
@Z2＋ (command No.18)
@R2＋ (command No.21)
@X2－ (command No.24)
@Y2－ (command No.27)
@Z2－ (command No.30)
@R2－ (command No.33)

Function Moves at low speed.
Format @X2+ c/r l/f

Example 1:
Transmission @ X2+ c/r l/f
After axis stops
Response OK c/r l/f

Example 2: When axis exceeds limit
Response NG c/r l/f
03: Limit error c/r l/f

Example 3:
Transmission @ X2+ c/r l/f

While axis is moving @ STOP c/r l/f
Response STOP c/r l/f
61: Stop command c/r l/f

(13) @X3＋ (command No.13)
@Y3＋ (command No.16)
@Z3＋ (command No.19)
@R3＋ (command No.22)
@X3－ (command No.25)
@Y3－ (command No.28)
@Z3－ (command No.31)
@R3－ (command No.34)

Function Moves at high speed.
Format @X3+ c/r l/f

Example 1:
Transmission @ X3+ c/r l/f
After axis stops
Response OK c/r l/f

Example 2: When axis exceeds limit
Response NG c/r l/f
03: Limit error c/r l/f

Example 3:
Transmission @ X2+ c/r l/f
While axis is moving @ STOP c/r l/f
Response STOP c/r l/f
61: Stop command c/r l/f

(14) @WRITE STEP (command No.35)

Function Writes 1 step.
Format @WRITE_STEP<step No.>, <command>,
<second display>(, <X>, <Y>, <Z>, <R>)
c/r l/f
@WRITE_STEP_ <step No.>, <command>,
<second display> c/r l/f
@WRITE_STEP_ <step No.>, <command>,
<step No. of jump destination> c/r l/f

Example 1: In the case of POINT data

Transmission	@WRITE_STEP_000, POI, 000,
	+000.00, +000.00, +000.00, +000.00 c/r l/f
Response	OK c/r l/f

Example 2: When there is an error in data

Response	NG c/r l/f
	23: Data error c/r l/f

Example 3: In the case of a jump command

Transmission	@WRITE_STEP_000, SEQ, 600, 300 c/r l/f
Response	OK c/r l/f

Example 4: In the case of a return command

Transmission	@WRITE_STEP_000, SEQ, 917 c/r l/f
Response	OK c/r l/f

(15) @WRITE CIR (command No.36)

Function: Writes the circle command.

Format:

Transmission	@WRITE_CIR_<step No.>, <speed> c/r l/f
Response	READY c/r l/f
Transmission	1=<X>, <Y>, <Z> c/r l/f ←First point
Response	READY c/r l/f
Transmission	2=<X>, <Y> c/r l/f ←Second point
Response	READY c/r l/f
Transmission	3=<X>, <Y> c/r l/f ←End point
Response	READY c/r l/f
Transmission	^Z
Response	OK c/r l/f

Explanation: Checks that READY has been returned and sends position data.
If abnormal data is sent midway through, a CIRCLE error will be returned.
Since the command checks ^Z before completing writing, transmission is possible as is, even after a circle error.
If @ is sent midway through, the command will end (23: Data error).
<speed> is 1 to 100[%].

Example 1:

Transmission	@WRITE_CIR_000,100 c/r l/f
Response	READY c/r l/f
Transmission	1=+000.00, +000.00, +000.00 c/r l/f
Response	READY c/r l/f

Transmission 2=+090.00, +090.00 c/r l/f
Response READY c/r l/f
Transmission 3=+000.00, +180.00 c/r l/f
Response READY c/r l/f
Transmission ^Z
Response OK c/r l/f

Example 2: When there is an error in data
Response NG c/r l/f
07: Circle error c/r l/f

Example 3: When @ is sent midway through
Response NG c/r l/f
23: Data error c/r l/f

(16) @READ STEP (command No.37)

Function Reads 1 step.
Format Transmission @READ_STEP_<step No.> c/r l/f
Response S<step No.>=<command>, <second display> (<X>, <Y>, <Z>, <R>) c/r l/f
OK c/r l/f
In the case of the second step of the CIRCLE
S<step No.>=<command>, <X2>, <Y2>, <X3>, <Y3> c/r l/f
OK c/r l/f
Explanation The digits of the position data always display to the second decimal place.

Example 1:
Transmission @READ_STEP_000 c/r l/f
Response S0=POI, 000, 0.00, 0.00, 0.00 c/r l/f

Example 2: When the step is blank
Response ERR c/r l/f
57: No step data c/r l/f

(17) @SINS (command No.38)

Function Inserts 1 step.
Format @SINS_<step No.> c/r l/f
Explanation Shifts 1 line each after the line is inserted. Lines exceeding 1,000 steps will be deleted.

Example 1:

Transmission	@SINS_000 c/r l/f
Response	OK c/r l/f

Note: Sending @SINS in the second step of CIRCLE will result in a data error.

(18) @SDEL (command No.39)

Function	Deletes 1 step.
Format	@SDEL_<step No.> c/r l/f
Explanation	Packs the entire program after deleting 1 line.

Example 1:

Transmission	@SDEL_000 c/r l/f
Response	OK c/r l/f

Note: Deleting CIRCLE packs the entire program by 2 lines.

(19) @INIT PGM (command No.40)

Function	Initializes the program of 1 group
Format	@INIT_PGM c/r l/f
Explanation	The program No. is determined by the rotary switch.

Example 1:

Transmission	@INIT_PGM c/r l/f
Response	OK c/r l/f

(20) @INIT PGM ALL (command No.41)

Function	Initializes all programs (0 to 5).
Format	@INIT_PGM_ALL c/r l/f

Example 1:

Transmission	@INIT_PGM_ALL c/r l/f
Response	OK c/r l/f

(21) @WRITE PRM (command No.42)

Function	Writes 1 parameter.
Format	@WRITE_PRM_<parameter No.>, <data> c/r l/f
Explanation	The robot number (PRM0) cannot be overwritten.
	<parameter No.>: Number assigned to each parameter
	<data>: Data value (−999.99 to +999.99)

Example 1:

Transmission @WRITE_PRM_001, 1 c/r l/f

Response OK c/r l/f

Example 2: When there is an error in data

Response NG c/r l/f

23: Data error c/r l/f

Example 3:

Transmission @WRITE_PRM_000, 10 c/r l/f

Response NG c/r l/f

56: Type protect c/r l/f

(22) @READ PRM (command No.43)

Function Reads 1 parameter.

Format Transmission @READ_PRM_<parameter No.> c/r l/f

Response PRM<parameter No.>=<data> c/r l/f

OK c/r l/f

Explanation <parameter No.>: Number assigned to each parameter

<data>: Data value (−999.99 to +999.99)

Example 1:

Transmission @READ_PRM_001 c/r l/f

Response PRM1 =3 c/r l/f

OK c/r l/f

(23) @INIT PRM (command No.44)

Function Initializes parameters.

Format @INIT_PRM_<robot No.> c/r l/f

Explanation <robot No.>: Number assigned to each robot

Example 1:

Transmission @INIT_PRM_10 c/r l/f

Response OK c/r l/f

Example 2:

Response NG c/r l/f

53: No robot type c/r l/f

(24) @INIT C (command No.45)

Function Initializes the pallet counter of the specified pallet number.

Format @INIT_C_<pallet No.> c/r l/f

Explanation <pallet No.>: 0 to 19

Example 1:

Transmission @INIT_C_0 c/r l/f

Response OK c/r l/f

(25) @INIT C ALL (command No.46)

Function Initializes all pallet counters (pallets: 0 to 19).

Format @INIT_C_ALL c/r l/f

Example 1:

Transmission @INIT_C_ALL c/r l/f

Response OK c/r l/f

(26) @READ ERR (command No.47)

Function Displays the latest 16 errors that have occurred.

Format @READ_ERR c/r l/f

Example 1:

Transmission @READ_ERR c/r l/f

Response 21: Typing error

31: Under OPT

…… . .

OK c/r l/f

Example 2: No history of errors

Transmission @READ_ERR c/r l/f

Response ERR c/r l/f

58: No ERR record c/r l/f

(27) @INIT ERR (command No.48)

Function Clears the error history.

Format @INIT_ERR c/r l/f

Example 1:

Transmission @INIT_ERR c/r l/f

Response OK c/r l/f

(28) @?DO (command No.49)

Function Checks the output state of an external signal.

Format Transmission @?DO_<output destination> c/r l/f

Response 1: When ON

1 c/r l/f

OK c/r l/f

Response 2: When OFF

0 c/r l/f

OK c/r l/f

Explanation <output destination>: Signal output No. (00 to 15)

(29) @?DI (command No.50)

Function Checks the input state of an external signal.

Format Transmission @?DI_<input destination> c/r l/f

Response 1: When ON

1 c/r l/f

OK c/r l/f

Response 2: When OFF

0 c/r l/f

OK c/r l/f

Explanation < input destination>: Signal input No. (00 to 15)

(30) @?VER (command No.51)

Function Checks the DTRB version.

Format Transmission @?VER_<specified microprocessor> c/r l/f

Response <version information> c/r l/f

OK c/r l/f

Explanation <specified microprocessor>: Specify a microprocessor.

(0: Main, 1: X axis, 2: Y axis, 3: Z axis, 4: R axis)

<version information>: Displays the DTRB version.

(∗. ∗∗)

Note: Axes not specified using PRM41 will result in “NG c/r l/f

23: Data error c/r l/f.”

Example 1:

Transmission @VER_0 c/r l/f

Response 1.00 c/r l/f

OK c/r l/f

(31) @?NO (command No.52)

Function: Checks the current program state.

Format
Transmission: @?NO c/r l/f
Response: <current program No.> c/r l/f
OK c/r l/f

Explanation: <current program No.>: Value indicated by the current rotary switch position

Example 1:
Transmission: @?NO c/r l/f
Response: 0 c/r l/f
OK c/r l/f

(32) @?SNO (command No.53)

Function: Displays the step number that is currently executing.

Format
Transmission: @?SNO c/r l/f
Response: <current step No.> c/r l/f
OK c/r l/f

Explanation: <current step No.>: Step that is currently executing
Displays the first step in the case of a circle.

Example 1:
Transmission: @?NO c/r l/f
Response: 15 c/r l/f
OK c/r l/f

Example 2: When it is not executing
Transmission: @?SNO c/r l/f
Response: 0 c/r l/f
OK c/r l/f

(33) @?POS (command No.54)

Function: Displays the current position.

Format
Transmission: @?POS_<specified axis> c/r l/f
Response 1: When 0 is specified as a specified axis
<X>, <Y>, <Z>, <R> c/r l/f
OK c/r l/f
Response 2: When 1 to 4 is specified as a specified axis
<specified axis> c/r l/f
OK c/r l/f

Explanation <specified axis>: Specifies an axis. (0: all, 1: X axis, 2: Y axis, 3: Z axis, 4: R axis) Digits to the second decimal place are always displayed.

Example 1:

Transmission @?POS_0 c/r l/f
Response 0.00, 0.00, 0.00, 0.00 c/r l/f
OK c/r l/f

Example 2:

Transmission @?POS_1 c/r l/f
Response 0.00 c/r l/f
OK c/r l/f

(34) @?ORG (command No.55)

Function Checks the completion of the return to origin.
Format Transmission @?ORG c/r l/f
Response 1: If the return to origin is incomplete
0 c/r l/f
OK c/r l/f
Response 2: If the return to origin is complete
1 c/r l/f
OK c/r l/f

(35) @?ERR (command No.56)

Function Displays the latest alarm information.
Format Transmission @?ERR c/r l/f
Response <alarm> c/r l/f
OK c/r l/f

Example 1:

Transmission @?ERR c/r l/f
Response 01: EMG stop c/r l/f
OK c/r l/f

Example 2 : No history of errors

Transmission @?ERR c/r l/f
Response ERR c/r l/f
58: No ERR record c/r l/f

(36) @?C (command No.57)

Function: Displays the current value of the pallet count for the specified pallet number.

Format:
- Transmission: @?C_<pallet No.> c/r l/f
- Response: <counter value> c/r l/f
  OK c/r l/f

Explanation:
- <pallet No.>: 0 to 19
- <counter value>: Current value of pallet count (X, Y)

Example 1:
- Transmission: @?C_0 c/r l/f
- Response: 0, 0 c/r l/f
  OK c/r l/f

(37) @DO (command No.58)

Function: Controls external general-purpose output.

Format: @DO_<output destination>_<ON/OFF specification> c/r l/f

Explanation:
- <output destination>: General-purpose output No. (00 to 15)
- <ON/OFF specification>: When ON 1
  When OFF 0

Example 1:
- Transmission: @DO_0, 1 c/r l/f
- Response: OK c/r l/f

Chapter 10 Troubleshooting

10-1 If a Problem Occurs

This section describes how to take corrective action if the alarm signal appears on the Cell Master's front panel and also in cases where there are other problems apart from those indicated by the alarm signal.
When informing Koganei of a certain problem, please provide as much detailed information as possible about the following items.

Item	Description (Example)
What?	• Cell Master main unit DTRB-AS3
When?	• Time of purchase (Serial No.) • Period of use, condition of operation, and existence of any external control device • Did it happen when the power was turned on, or 1 hour after the power was turned on?
Under what conditions?	• During automatic operation • During program creation • Actuator position
What happened?	• Motor will not enter an energized state. • Error (No. xx) was output. • A point disappeared. • Strange sound coming from the motor
How frequently?	• All the time • About once an hour • Cannot be reproduced.

10-2 LED Indicators

You can check control information on the main unit by the state of LED indicators on the Cell Master's front panel.

Left LED	Right LED	Description
Green	Red	State when powered on (return to origin incomplete) and programs can be sent/received.
Red	Green	Emergency stop state
Green	Green	Operation preparation complete, operating, and programs can be sent/received.
Red	Red	Error has occurred. (Connect the teaching box and check the details.)
Orange	Orange	Main unit getting ready (at power on) Note

Note: When the main unit LEDs are both orange, communication and reception from I/O and the operation box will not be possible. Try it again when the left and right LEDs turn green and red respectively.

10-3 List of Error Codes

When an error occurs, the LED indicators on the Cell Master's front panel will be as shown in the following table. Whenever you get an error, connect the teaching box, check the error number, and do what is necessary to eliminate the error.

Error No.	Message	Description	Cause	READY (I/O)	BUSY (I/O)	Left LED (main unit)	Right LED (main unit)	Operation box LED	Motor state
001	EMG stop	Emergency stop state	Emergency stop state	OFF	OFF	Red	Green	Blinking at 1Hz	De-energized
002	ORG INCOMP	Return to origin incomplete state	Return to origin has not been executed	OFF	OFF	Green	Red	Blinking at 1Hz	De-energized
003	Limit error	Software limit error (when teaching)	Software limit has been exceeded when teaching	ON	ON	Green	Green	Blinking at 2Hz	Energized
		Software limit error (during step operation)	Software limit has been exceeded during step operation	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
004	PGM error	Program selection error	A program other than 0 to 5 was selected	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
007	Circle error	Circle data error (while communicating)	The entered CIRCLE data is outside the operating range	—	—	—	—	—	—
		Circle data error (during step operation)	The entered CIRCLE data is outside the operating range	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
010	Pallet error	Pallet data error	The value entered for input pallet data count etc. is wrong	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
012	Return error	Kernel stack error	A call was returned without a routine call	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
021	Typing error	Type mistake	Wrong command	—	—	—	—	—	—
023	Data error	Data error (other than a CIRCLE or PALLET)	Error in numeric data	—	—	—	—	—	—
024	Ban command	Prohibited operation executed	When @ORG results while serial return to origin is not allowed When @RUN results while serial operation start is not allowed When @OFF is executed even though GO movement has not been performed When teaching an axis other than the one that was specified	— (OFF during continuous interpolation)	— (OFF during continuous interpolation)	— (Red during continuous interpolation)	— (Red during continuous interpolation)	— (Blinking at 1Hz during continuous interpolation)	— (De-energized during continuous interpolation)
031	Under OPT	Operating	A program start command was sent while a program was just starting up	ON	—	Green	Green	—	Energized
032	Under INTPOLT	Continuous interpolation operation in progress	When a command was received during continuous interpolation operation	ON	ON	Green	Green	Lit	Energized
033	INTPOLT end	End of continuous interpolation	Continuous interpolation operation ended	ON	ON	Green	Green	Lit	Energized
035	No ORG	No origin sensor detection	When the origin sensor could not detect return to origin even after 30 seconds have passed since the start of return to origin operation	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
040	Memory error	Memory error	Memory is damaged	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
041	Overheat	Overheat	Halt due to rise in driver temperature	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
050	System error	System error	Contact Koganei about the situation	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
052	No program	No program	A blank step was executed	OFF	OFF	Red	Red	Blinking at 1Hz	De-energized
053	No robot type	No robot type	Robot number at initialization is out of range	—	—	—	—	—	—
054	No GO data	No GO data	GO is not possible because the step content is not data for which GO is possible	—	—	—	—	—	—
056	Type protect	Robot number protected	An attempt was made to overwrite PRM0 with WRITE PRM	—	—	—	—	—	—
057	No step data	No step data	When a step set by the READ STEP command is blank	—	—	—	—	—	—
058	No ERR record	No history of errors	When there is no error history	—	—	—	—	—	—
061	Stop command	Stop command	Temporarily stops due to acceptance of stop command	ON	OFF	Green	Green	Blinking at 2Hz	Energized
063	Stop input	Stop entry	Temporarily stops due to acceptance of STOP input from I/O or operation box	ON	OFF	Green	Green	Blinking at 2Hz	Energized
064	Motor free	Stop motor and enter in de-energized state	An emergency stop was initiated electrically by the communication command @MSTOP	OFF	OFF	Red → Green	Green → Red	Blinking at 1Hz	De-energized

Note: The hyphens (—) in the above table represent the state before the error.

10-4 Other Problems and Remedies

When a problem occurs while using the Cell Master, take the appropriate remedy as described hereafter. Note that if the problem is not resolved even after taking such remedy, please contact Koganei.

10-4-1 Cell Master Main Unit Operating Abnormally

No.	Symptom	Possible cause	What to check	Remedy
1	Actuator motor remains in free state even after the power is turned on.	1) Return to origin not executed.	Check the operation box.	Execute return to origin.
		2) No power is being supplied.	Check the voltage of the power supply terminals.	Supply power.
		3) The connector for the motor cable is disconnected.	Check the connection of the connector for the motor cable.	Properly connect.
2	Out of alignment.	1) The actuator is improperly attached.	Inspect whether the actuator is in loose mounted.	—
		2) The motor is loss of sync.	Inspect whether too heavy a load was set.	Recheck the actual payload.
		3) Circuit board is defective.	Try to operate another Cell Master main unit by using the circuit board.	Consult us.
		4) Motor cable is defective.	Check each wire with a multimeter etc.	Defective cable or bad connector needs to be repaired/replaced. Consult us.
3	A collision occurs at the stroke end when executing return to origin.	1) The origin sensor is defective.	Remove the cover and check sensor operation with the LED. Blocked : Unlit Not blocked : Lit	The origin sensor must be replaced if it is not normal. Consult us.
		2) The robot cable is defective.	Check each wire with a multimeter etc.	

10-4-2 Input/Output Signal Abnormality

No.	Symptom	Possible cause	What to check	Remedy
1	Output signal cannot be controlled.	1) Improper outside wiring.	Inspect whether a mistake was made when wiring.	Make the proper connection by referring to the connection diagrams in this manual.
		2) Internal photocoupler is damaged.	Whether output is issued between OUT and + 24V in the photcoupler.	Consult us.
2	No response even when a signal is input.	1) Programs cannot be run.	Connect the teaching box and check the status.	—
		2) The signal's pulse width is too narrow.	Set the signal's pulse width to 50ms or more.	Set the signal's pulse width to 50ms or more.

10-4-3 Abnormalities in Parameter Data

No.	Symptom	Possible cause	What to check	Remedy
1	Parameter data initialized to robot number “10”	1) Device design error 2) Power switching error	1) Check whether a device for controlling the power line has been incorporated. 2) Check power switching operation.	1) When restarting the power, set a delay to last for at least two seconds. 2) When restarting the power, wait for at least two seconds, and then switch ON the power.
2	Parameter data changed to abnormal value			

Memo

Chapter 11 Specifications

11-1 Main Unit

11-1-1 Main Unit Specifications

Main unit models		DTRB-AS2	DTRB-AS3	DTRB-ASL3	DTRB-AL2	DTRB-AL3	DTRB-ALL3	DTRB-CS2	DTRB-CS3	DTRB-CSL3
Operating range (mm)	X	150	150	150	200	200	200	100	100	100
	Y	200	200	200	200	200	200	200	200	200
	Z		50	50		50	50		50	50
Drive method	X/Y/Z	2-phase stepping motor (micro-step drive)								
Drive mechanism	X/Y/Z	Sliding screw								
Maximum speed (mm/s)	X/Y	200	200	200	200	200	200	200	200	200
	Z		200	70		200	70		200	70
Repeatability (mm)	X/Y/Z	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02	± 0.02
Maximum payload (kg)	Y	2	2	2	2	2	2	2	—	—
	Z	—	1	2	—	1	2	—	1	1
Lead (mm)	X/Y	6	6	6	6	6	6	6	6	6
	Z		6	2		6	2		6	2
Interpolation speed (Constant speed) (mm/s)	Linear	0.45 ~ 45 Note 1								
	Circular	0.15 ~ 15								
	Continuous	0.15 ~ 15								
Number of control axes		Simultaneous 3-axis control and 1-axis independent control (4th axis)								
Position setting unit		Set in millimeters (mm)								
Operating method		PTP operation and CP operation								
Interpolation functions		3-axis linear interpolation, 2-axis circular interpolation, and 2-axis continuous interpolation								
Position control		Open loop								
Programming method		Coding								
Number of programs		6 groups								
Number of steps in a program		1,000 steps								
Number of points		1 step 1 point Note 2								
Point input method		Manual data input (coordinate input) using the teaching box, teaching playback, and offline programming using a PC								
Input/output	I/O	16 points each for input and output (15 points for general-purpose input, custom input Start, 13 points for general-purpose output, and custom output READY, BUSY, and PALLET)								
	External connection	RS232C connector (for both teaching box and PC), operation box connector, and I/O connector								
	COMM port (transmission rate)	RS232C (19.2kbps)								
General specifications	Power supply	24VDC ± 10% (No DC power supply is provided. A 24VDC 3A 75W or more external power supply is required.) Note 3								
	Operating temperature	0 ~ 40°C								
	Operating humidity	35 ~ 90% (no condensation)								
	Storage temperature	− 10 ~ 50°C								
	Mass	Approx. 5kg	Approx. 5.5kg	Approx. 5.5kg	Approx. 5.2kg	Approx. 5.7kg	Approx. 5.7kg	Approx. 5.4kg	Approx. 5.9kg	Approx. 5.9kg

Notes: 1. Linear interpolation speed is 0.15 to 15mm/s including a 2mm lead.
2. The CIRCLE command is 2 steps and 3 points.
3. Set the power capacity according to the current consumption of external output. (250mA max. per output, but keep the total for 16 points at 2A or less.)

Accessories
- Operation box
  DTRBM-OB
- I/O connector
  DTRBM-CT

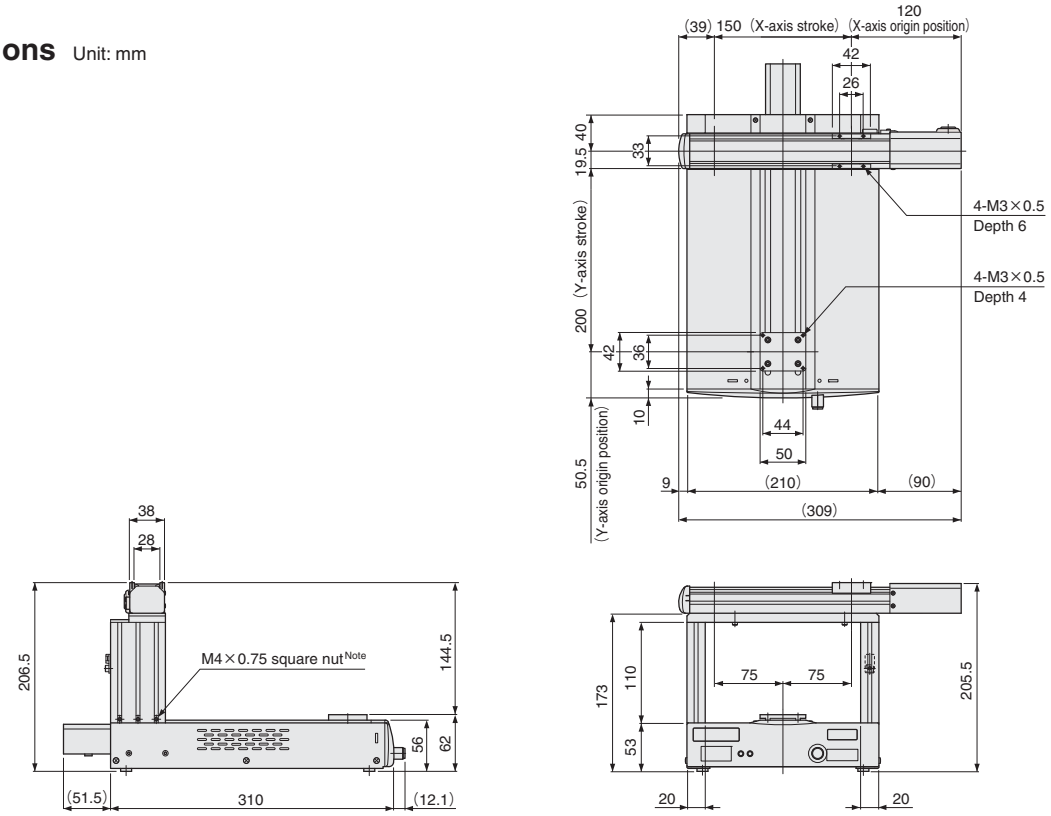
Options
- Teaching box
  DTRBP-TB
- DTRB Editor PC software
  DTRBP-SW-HTC (English version)

11-1-2 Dimensions Unit: mm

Gantry 2-axis

DTRB-AS2

X axis: 150mm

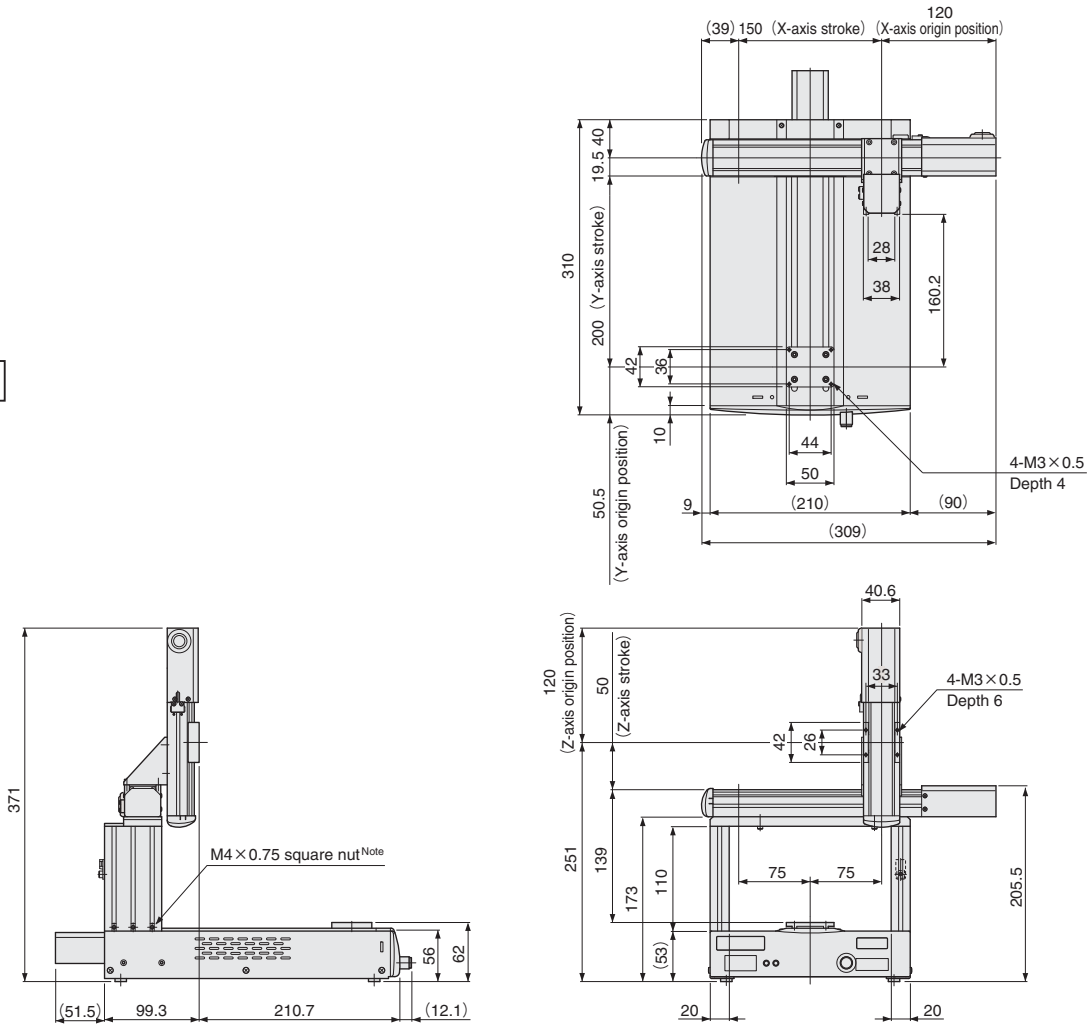


Note: There are a total of 8 square nuts on both sides including the back of the stand.

Gantry 3-axis

DTRB-AS3
DTRB-ASL3

X axis: 150mm

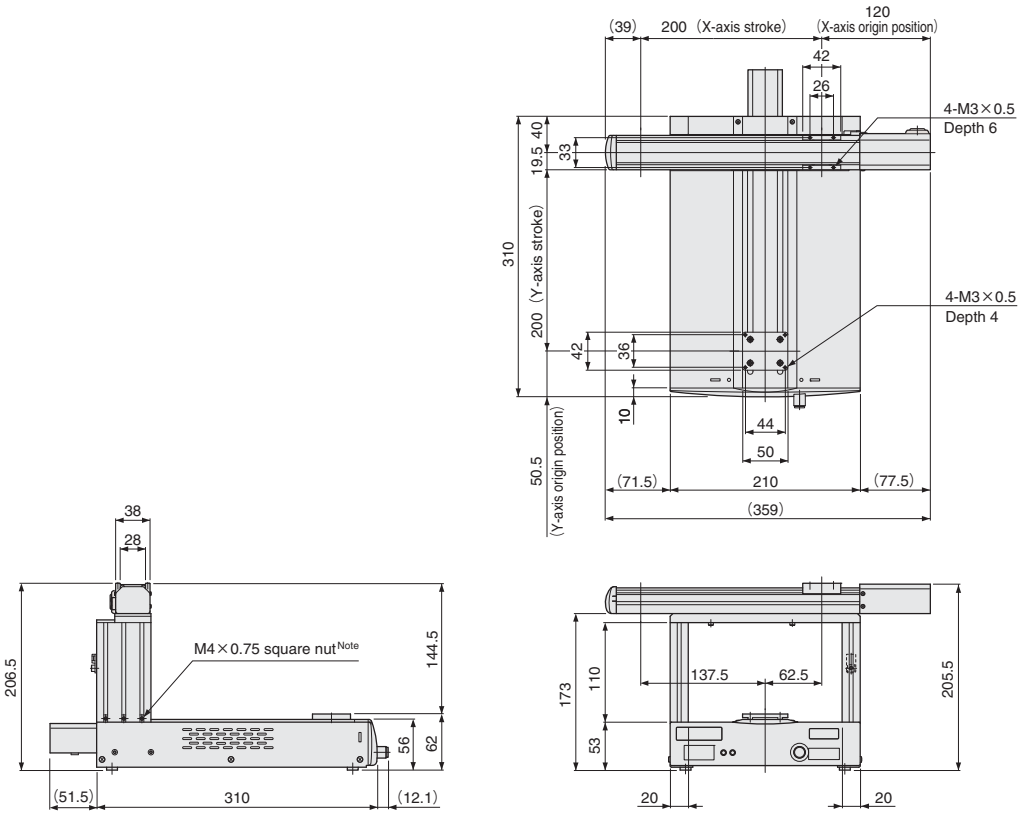


Note: There are a total of 8 square nuts on both sides including the back of the stand.

Gantry 2-axis

DTRB-AL2

X axis: 200mm

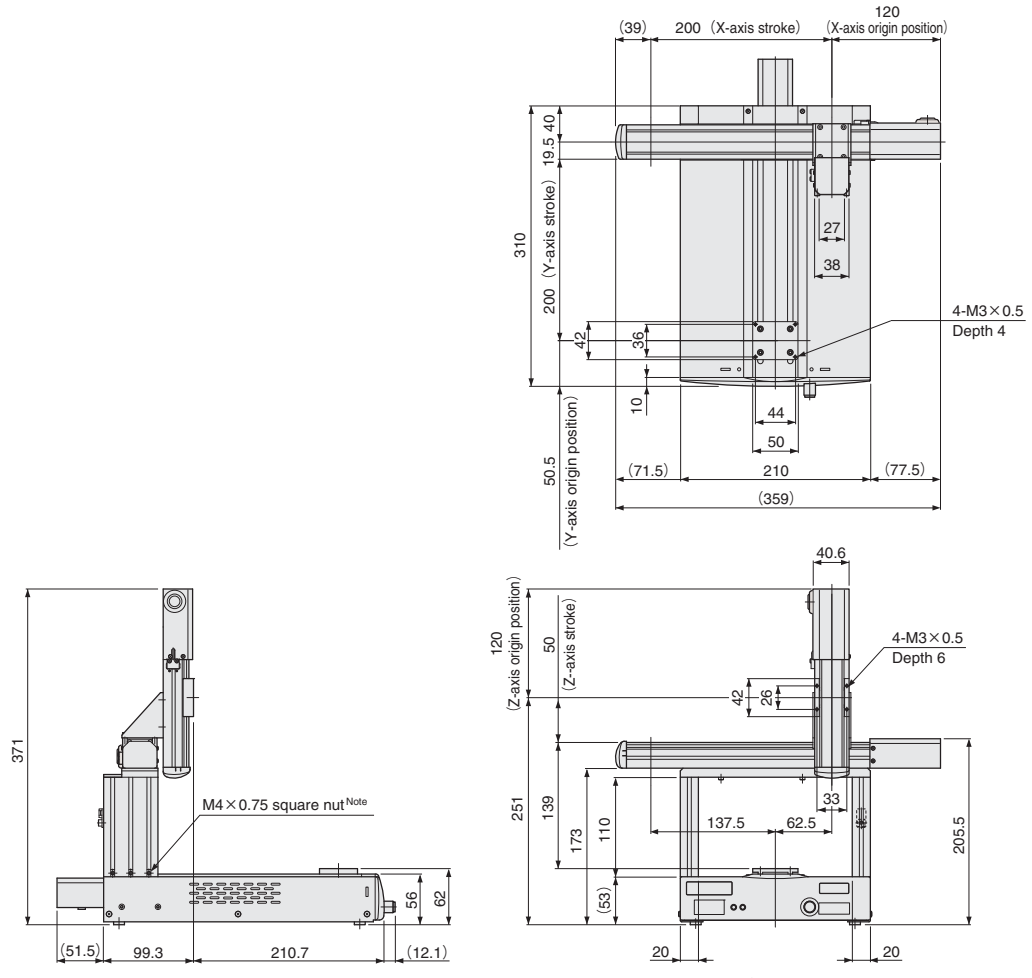


Note: There are a total of 8 square nuts on both sides including the back of the stand.

Gantry 3-axis

DTRB-AL3
DTRB-ALL3

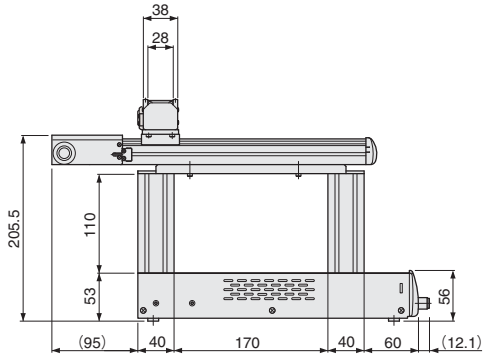
X axis: 200mm

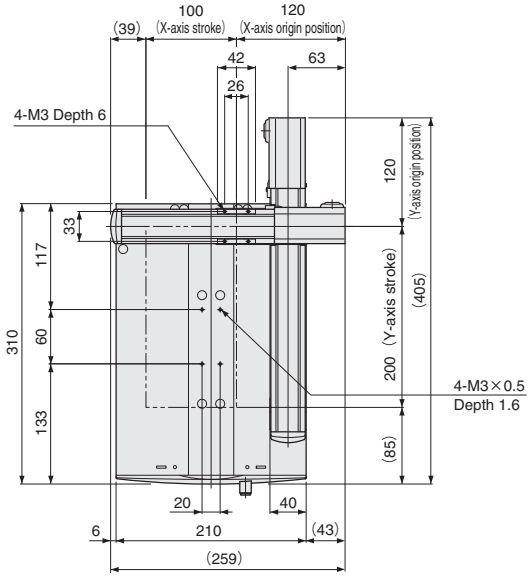


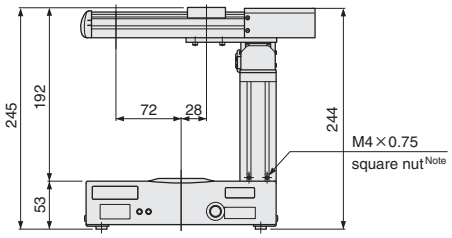
Note: There are a total of 8 square nuts on both sides including the back of the stand.

Cartesian 2-axis

DTRB-CS2



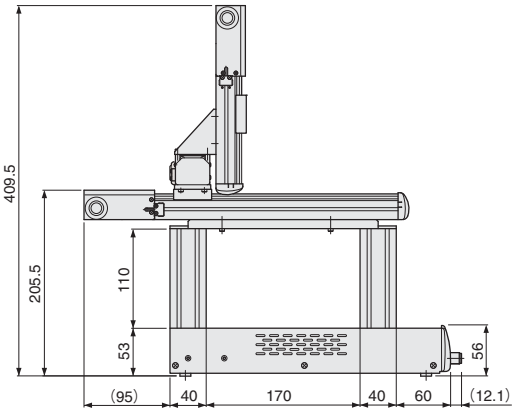


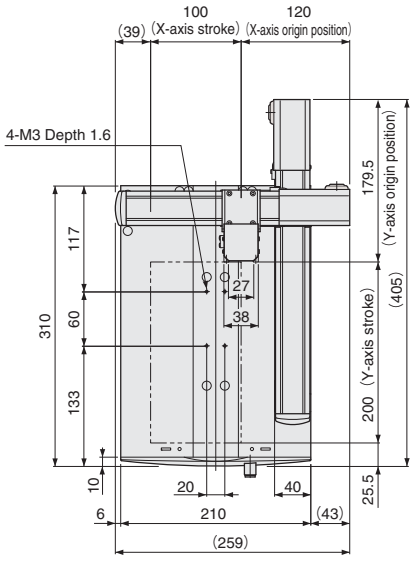


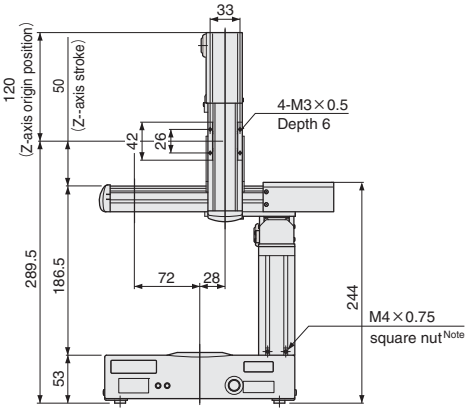
Note: There are a total of 8 square nuts on the front side and the right side including the back of the stand.

Cartesian 3-axis

DTRB-CS3
DTRB-CSL3





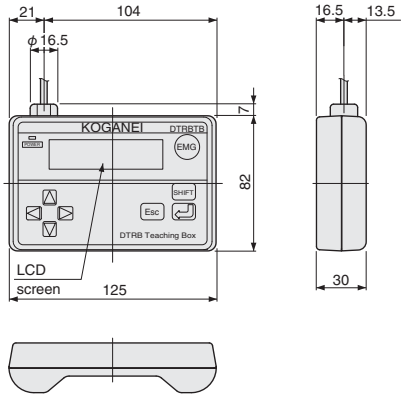


Note: There are a total of 8 square nuts on the front side and the right side including the back of the stand.

11-2 Teaching Box

Dimensions

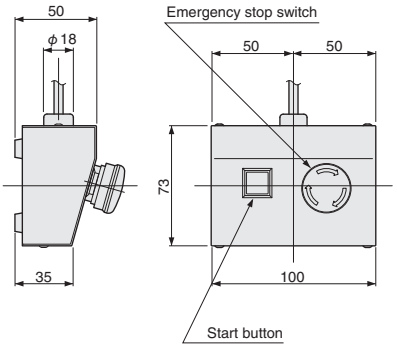
Unit: mm



11-3 Operation Box

Dimensions

Unit: mm



Note: The main unit's warranty does not cover damage caused by the use of devices other than the Cell Master's operation box. In addition, operations may not be stated on the readout if you connect a device other than the operation box. Operations are also not covered under the warranty.

Revision History

Ver.2.0 (Changes to Ver. 2.0)

P.6 Precaution (10) on the main unit added.
P.87 PRM No.43 added to 8-3 Initializing Parameters for Specified Robot Number.
P.92 PRM43 added.
P.95 Recommended cable added to 9-2 Communication Cable.
P.117 10-4-3 Abnormalities in Parameter Data added.

If you have questions about the contents of this manual, or
about other technical issues, please consult the OVERSEAS DEPARTMENT
at the address and telephone number shown below.

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Cell Master
DTRB-AS/AL/CS

Owner's Manual

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