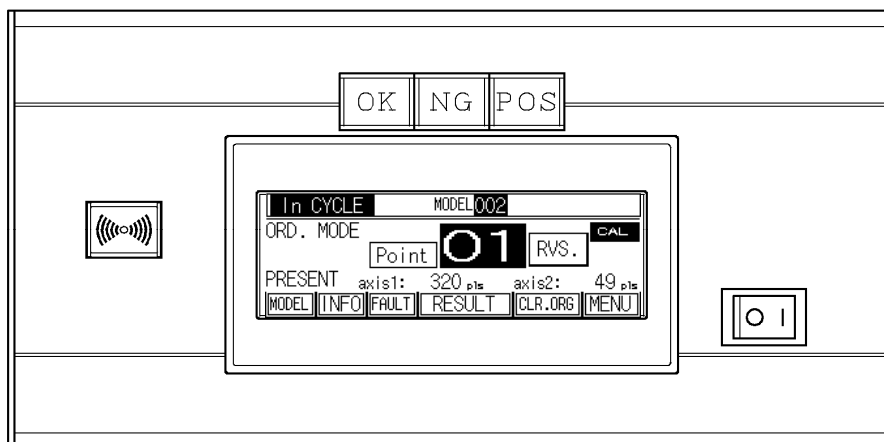

**Control Box for Arm Driver
with Position Check Function
<HC100>**

OPERATION MANUAL Ver. 1.21b
(For System Ver. 4.00a)





Safety precautions

Before using this machine, fully read the safety precautions shown below for correct use.



- ◆ This machine is designed and manufactured for the purpose of use for general industrial machinery.
- ◆ Installation of the equipment and setup of the system must be carried out by technicians only.
- ◆ When moving or selling this machine, have the owner fully read this manual for correct use.

To prevent hazards to operators or other persons and damages to properties, be sure to observe the instructions in this operation manual shown below.

Marks indicating possible hazards and damages

	WARNING	Noncompliance with the instructions adjacent to this mark may lead to a loss of life or serious injury.
	CAUTION	Noncompliance with the instructions adjacent to this mark may lead to injury or physical damages.

Marks showing points to be observed

	This mark is accompanied with acts to be prohibited.
	This mark is accompanied with acts to be performed absolutely.

 **WARNING**

[Installation]

Be sure to ground grounding cables.



Otherwise, you may suffer electric shocks.

DO NOT use this machine near combustibles, inflammables, and explosive substances, or in the corrosive or flammable atmosphere.



Otherwise, combustion, inflammation, or explosion may occur.

Do not use this product in a place where water or oil drops on the main unit of the equipment and the control box.



Failure to observe this instruction causes a fault, fire or electric shock.

Do not modify the main unit of the equipment and the control box. Do not connect the control box to equipment other than the specified model.



Failure to observe this instruction causes damage to the control box and/or malfunction of the equipment, resulting in a fire or other serious accident.

Do not install the main unit of the equipment and the control box in an unstable place, or in a place where vibration may occur.



Failure to observe this instruction causes the equipment to move or overturn, resulting in an accident or damage to the equipment.



WARNING

[Installation]

Correctly carry out wiring, referring to “Operation Manual”.



Be sure to connect cables and connectors securely to prevent any looseness or disconnection. Otherwise, malfunctions or fires may occur.

DO NOT damage cables.



NEVER damage, forcibly bend or pull, wind, pinch them, nor put heavy objects on them. Otherwise, fires, electric shocks, or malfunctions due to leakage or disconnection may be caused.

 **WARNING**

[Operation]

When you find any heating, fume, or odor, immediately turn off the power switch, and disconnect the power plug.



Otherwise, the machine may be damaged, or fires may occur.

Before operating the equipment, make sure that there is no person around the equipment.



Failure to observe this instruction causes a serious accident, resulting in injury or death. Secure a space to ensure safe access for maintenance and inspection work, in addition to the actual operation space.

Do not use the equipment or the control box, if it has dropped, or if water has intruded in the main unit of the equipment or the control box.



Otherwise, malfunctions or electric shocks due to faults or damages may occur.

[Maintenance and check]

Turn off the power switch, disconnect the power plug to shut off the power completely, and wait for ten minutes or longer before moving, wiring, or checks. Wiring must be provided by electrical technicians only.



Provision of these measures helps prevention of electric shocks.

Be sure to read operation manual before maintenance and check.



Otherwise, accidents may occur in case of mis-operation.

 **CAUTION**

[Installation]

Completely provide electric shielding measures before using this machine in the locations shown below. Otherwise, malfunctions may occur.



1. Where there are high tension current or great magnetic field.
2. Where welding is being performed and arc discharge may occur.
3. Where noises due to static electricity are generated.
4. Where exposure to radio activity may occur.

DO NOT hold moving parts or cables when installing the machine.



Otherwise, you may suffer injuries.

DO NOT use this machine outdoors exposed to direct sunlight.



Otherwise, malfunctions or faults may occur.

 **CAUTION**

[Operation]

Be sure to use this machine in locations where ambient temperature is within the range between 0°C and 40°C and humidity is within the range between 30% and 80%, free from dew condensation.



Otherwise, malfunctions, fires, or electric shocks may occur.

Be sure to use this machine with the specified power supply and voltage only.



Otherwise, malfunctions, fires, or electric shocks may occur.

1. Introduction	8
1.1 Outline of this product	8
1.2 Configuration of this product.....	8
1.3 Outline of HC100 main unit	9
1.4 Specifications of HC100	10
2. Description on operation	11
2.1 Starting equipment.....	12
2.1.1 Equipment origin calibration.....	13
3. Description on functions	15
3.1 Operation	15
I. Operating procedure (Position check: ENABLE)	17
(1) Enabling position check	17
(2) Operating procedure	17
(2-1) When workpiece detection is disabled (“HOME POSITION” is enabled)	17
(2-2) When workpiece detection is enabled (“HOME POSITION” is disabled)	20
(3) Using the reverse rotation switch	23
II. Operating procedure (Position check: DISABLE)	24
(1) Disabling position check	24
3.1.1 Model selecting function	25
3.1.2 Counter (Production count setting function)	27
3.1.3 Counter (REJECT/GOOD/TOTAL/SHOT counter clear function).....	29
3.1.4 1 cycle information.....	31
3.1.5 I/O monitor.....	32
3.1.6 Fault detail / Fault display function.....	33
3.1.7 Tightening result display function.....	35
3.1.8 Origin calibration function	37
3.2 Teaching	38
3.2.1 Home position teaching function.....	40
3.2.2 Tightening point teaching function.....	43
3.3 Setup menu.....	51
3.3.1 Operating condition setting function	53
3.3.2 Number of models registration setting function	57
3.3.3 Operating mode selecting function.....	59
3.3.4 Changing action at tightening fault	60
3.3.5 Data management function.....	61
3.3.6 Machine configuration function	62
3.4 Language selection funciton	63
3.5 External input/output signals	64
(1) External input signals	64
(2) External output signals	65
<Revision history>.....	66

1. Introduction

1. Introduction

This chapter describes the product configuration of the arm driver with position check function.

1.1 Outline of this product

The HC100 control box uses a PLC as a main control unit. For the operation unit, a touch panel is used. The control box incorporates the software dedicated to control of screens of the arm driver with the position check function, intended for simplified control of this arm driver.

For details of the touch panel (GT1030-HBLW, Mitsubishi Electric) and PLC (FX3G-40MT/DS, Mitsubishi Electric), refer to the instruction manuals for individual products.

1.2 Configuration of this product

Accessories

1) Origin calibration rod	1 pc
2) Bit	1 pc
3) Driver controller	1 pc
4) Control box (HC100)	1 pc
5) Driver cable	1 pc
[For KX driver]	
Motor cable	1 pc
External I/O cable	1 pc
AC input power supply cable	1 pc
[For NX driver]	
Motor cable	1 pc
External I/O cable	1 pc
AC input power supply cable	1 pc
Resolver cable	1 pc
Sensor cable	1 pc

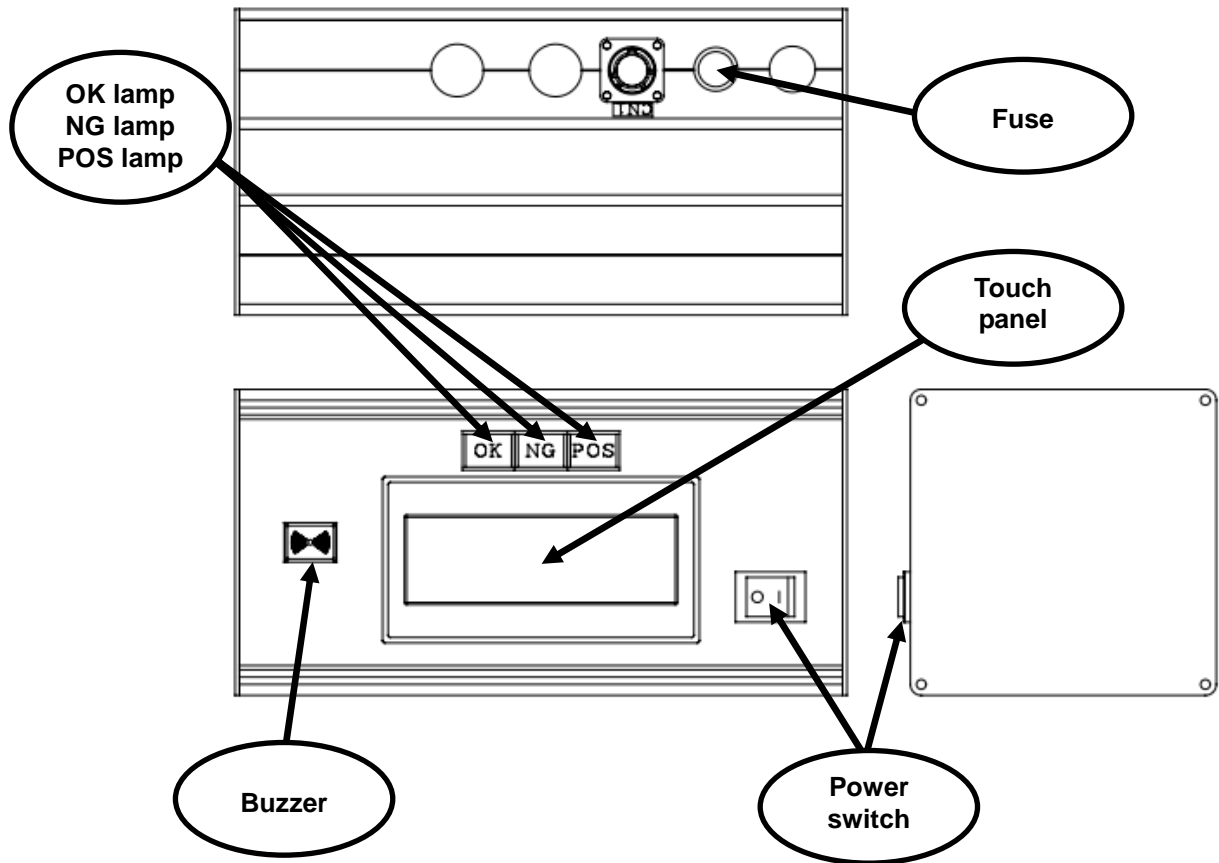
- A set of the above items are included in our standard model.

Optional equipment

Workpiece detection sensor (Any manufacturer's product is acceptable. DARK-ON type is recommended.)	1 pc
Protection sheet (GT10-30PSCB, Mitsubishi Electric)	5 sheets/set

- For optional equipment, place an order when you purchase the product.

1.3 Outline of HC100 main unit



1. Introduction

1.4 Specifications of HC100

Power supply voltage	Single-phase AC 100 to 115 [V]/50 to 60 [Hz]	Single-phase AC 200 to 230 [V]/50 to 60 [Hz]
Position detection method	Incremental rotary encoder	
External storage device	Using a PC	
Teaching method	Direct teaching, MDI	
Point control	Fixed area (Home position) : 1 point	
	Work area: 12 to 50 points (The number of points in the work area varies depending on the number of models specified in "SETUP NUMBER OF MODELS". For details, refer to Section 3.3.2 "Number of models registration setting function").	
Point work information	4 sets per point (Driver Ch., Free setting data, Torque Waveform Judge.Setting, Angle Judge. setting) *Note : Making of the sequences is required when using the free setting data.	
Outer dimensions (W × H × D)	284 × 140 × 140 [mm] *Note : Size is different at the time of the PLC unit addition	

<<NOTE>> For the purpose of performance improvement, the above specifications are subject to change without prior notice.

2. Description on operation

This chapter describes general operations of HC100.

The touch panel mounted to HC100 provides a teaching function and various parameter setting functions. With these functions, you can operate your equipment through position control.

The following description applies to a case where the touch panel is securely connected to a PLC, and the system normally operates with the power supplies for HC100 and the driver controller turned ON (a condition where teaching and various parameter settings are completed).

(Conditions where the system is not normal)

- There is a problem with the touch panel or the control screen software.
- The HC100's built-in control unit is not in RUN status, or has a fault.

***Note: Unless otherwise noted, the touch panel display shows the 2-axes type.
In the case of 3-axes type, there is a screen that display different content.**

2. Description on operation

2.1 Starting equipment

To use the arm driver with position check function, start up the equipment.

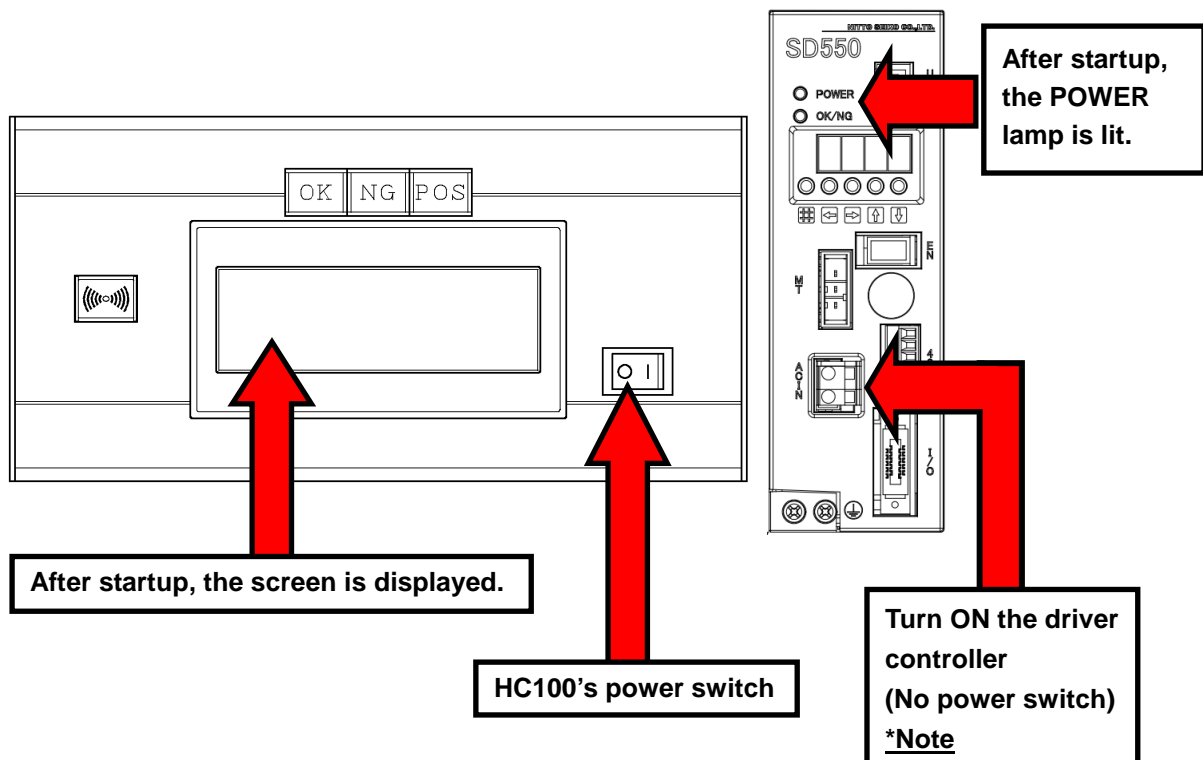
<Start-up procedure>

1) Connect the power supply cables of the driver controller and HC100 to outlets.

2) Turn ON the driver controller and turn ON the power switches of HC100.

In this step, you should turn ON the driver controller's power switch first, and then turn ON the HC100 power switch, in order to prevent you from forgetting to turn ON the driver controller's power switch.

If you press the start switch without turning ON the driver controller's power switch, only with the HC100's power switch turned ON, it results in the "NOT POWER ON D.CNT" fault (indicating driver controller's power supply is not turned ON)". If this fault occurs, turn ON the driver controller's power switch, and press the reset switch to reset the fault.



*Note: The driver controller shows the case of type SD550.

For other than types of SD550, configuration is slightly different, and power SW is mounted.

3) After HC100 starts up, the screen is displayed.
After the driver controller starts up, the POWER lamp is lit.
This completes the equipment startup procedure.

2. Description on operation

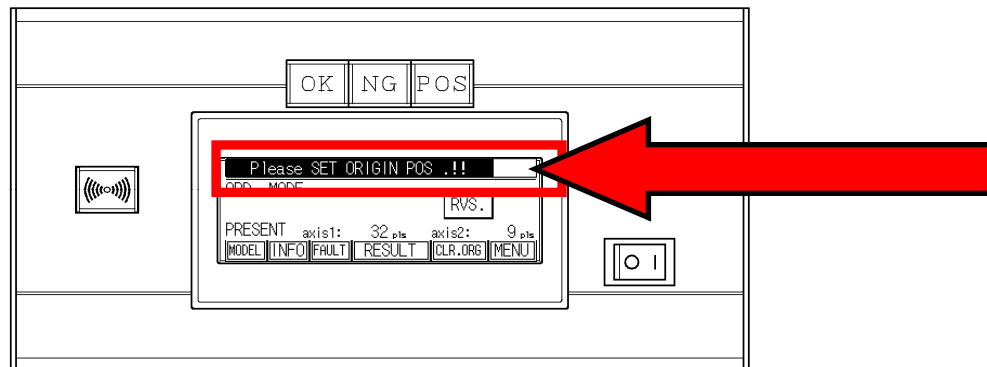
2.1.1 Equipment origin calibration

Execute origin calibration.

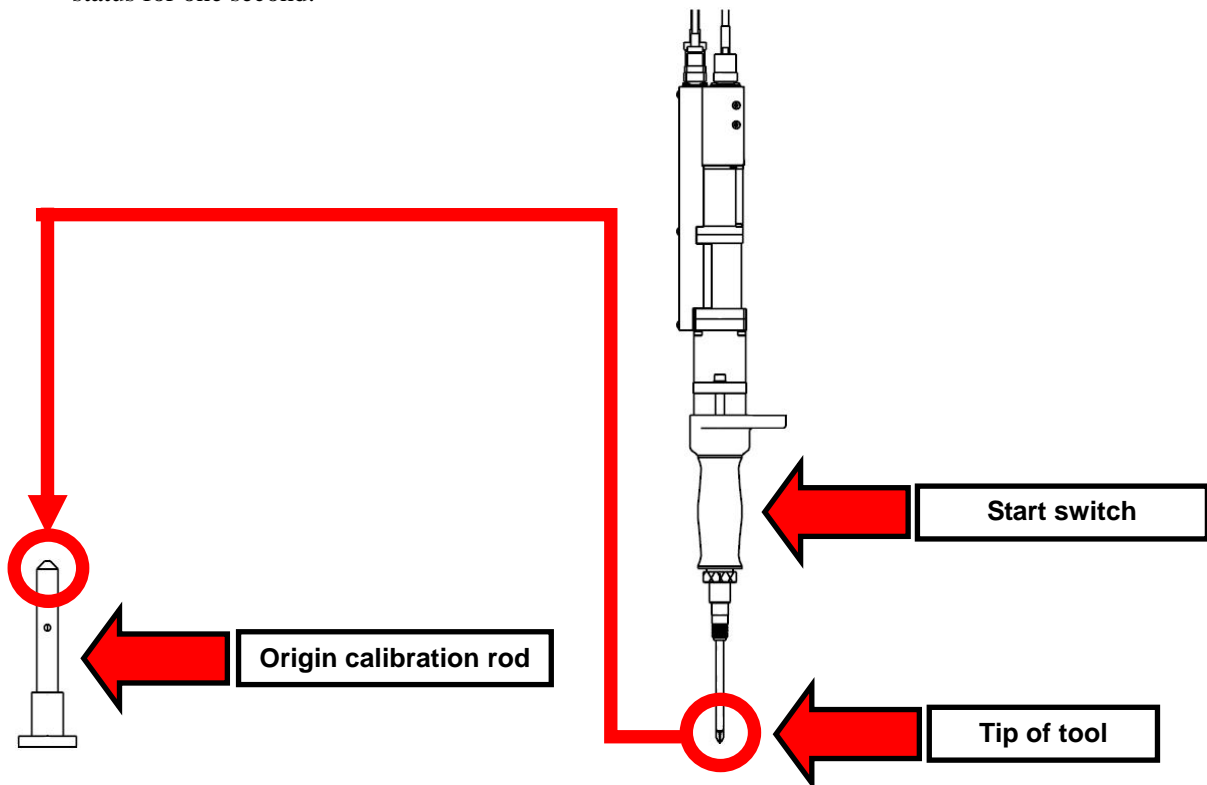
Note: If you use the POSITION CHECK INVALIDITY MODE only, origin calibration is not required.

<Origin calibration procedure>

- 1) After the equipment startup is completed, a message that prompts you to execute origin calibration is blinking on the initial screen.

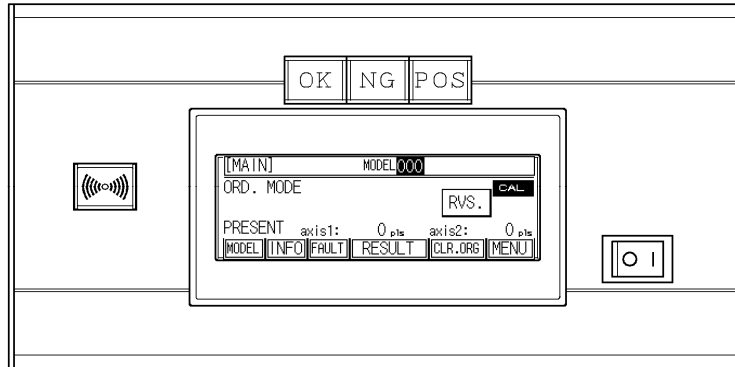


- 2) After aligning the tip of the tool with the origin calibration rod, press the start switch, and keep this status for one second.



2. Description on operation

- 3) You hear a “pip” buzzer sound, and the message prompting you to execute origin calibration disappears.



This completes the origin calibration procedure.

<<REFERENCE>> Shapes of the origin calibration rod, tool and start switch vary depending on the specifications. However, the origin calibration procedure is the same as the above.

3. Description on functions

3. Description on functions

This chapter describes functions of the touch panel.

3.1 Operation

This section describes the procedure for operating the arm driver with position check function.

<NOTE> The operating procedure varies depending on whether the position check function is enabled or disabled.

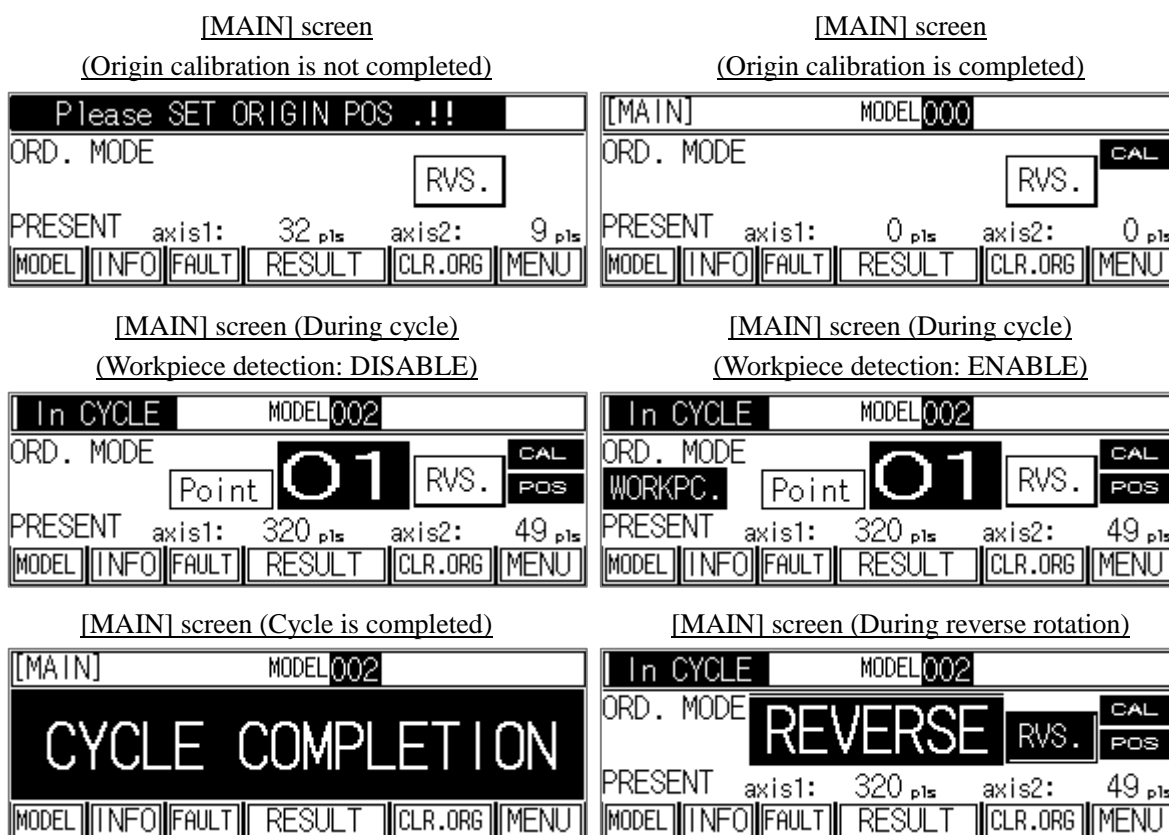
<Major functions (Position check: ENABLE)>

- Starting and ending a cycle
- Model selection
- Counter setup
- Fault check
- Tightening result check
- Origin calibration
- Forced cycle stop, etc.

*Note:

Unless otherwise specified, the screens are "workpiece detection is disabled" and "2-axes type". In the case of "3-axes type", height display will be added to the MAIN screen or the like.

The following description applies to the switches on the [MAIN] screen and the operating procedure in the case where position check is enabled. For a case where position check is disabled, refer to "II. Operating procedure (Position check: DISABLE)" (p. 24).



3. Description on functions

<Switches>

- [MODEL]

This switch is used to show the [MODEL SELECT] screen.

To change a production model, select this switch. During operation (during cycle) or external model type setting specification(optional), the operation of this switch is disabled, and the switch will be gray.

For details, refer to Section 3.1.1 “Model selecting function” (p. 25).

- [INFO]

This switch is used to show the [INFO. MENU] screen.

To change a production count setting, to clear each counter, and to check 1-cycle information and I/O monitor status, select this switch.

For details, refer to Section 3.1.2 “Counter (Production count setting function)” to Section 3.1.5 “I/O monitor” (p. 27 to p. 32).

- [Fault]

This switch is used to show the [FAULT] screen.

To check for a fault, select this switch.

For details, refer to Section 3.1.6 “Fault detail / Fault display function” (p. 33).

- [RESULT]

This switch is used to show the [RESULT] screen.

To check a tightening result at each point, select this switch.

For details, refer to Section 3.1.7 “Tightening result display function” (p. 35).

- [CLR.ORG]

This switch is used to show the [CLEAR ORG.] screen.

To execute origin calibration again, select this switch.

For details, refer to Section 3.1.8 “Origin calibration function” (p. 37).

- [MENU]

This switch is used to show the [MENU] screen.

To execute teaching, and to set up various parameters (authorized for system manager), select this switch.

For details, refer to Section 3.2 “Teaching” (p. 38), and Section 3.3 “Setup menu” (p. 51).

- [RVS.]

This switch is used to run the driver in reverse direction to execute loosening work.

To execute loosening work during operation, select this switch. Every time you touch this switch, the rotating direction changes between normal rotation and reverse rotation.

For details, refer to “(3) Using the reverse rotation switch” (p. 23).

3. Description on functions

I. Operating procedure (Position check: ENABLE)

(1) Enabling position check

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “3. OPERATING MODE” on the [SETUP MENU] screen.

⇒ If you select “1. ORDER MODE”, “2. RANDOM MODE” or “3. FREE MODE” on the [OPERATING MODE SELECT] screen, position check is enabled.

(For details of the operating modes, refer to Section 3.3.3 “Operating mode selecting function” (p. 59).

(2) Operating procedure

When position check is enabled, the following two patterns of operating procedures ((2-1) and (2-2)) are available.

(2-1) When workpiece detection is disabled (“HOME POSITION” is enabled)

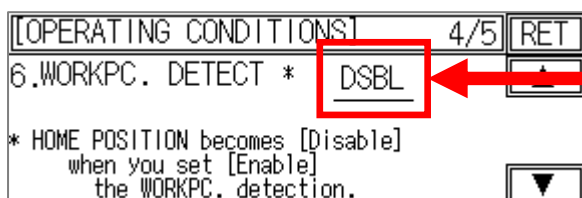
i) “3. SETUP MENU (MANAGER)” on the [MENU] screen

⇒ Select “1. OPERATING CONDITIONS” on the [SETUP MENU] screen.

⇒ Set “6. WORKPC. DETECT”(3-axes type is '9.') to “DSBL” on the [OPERATING CONDITIONS] screen.

⇒ After the above setting, press the [RET] switch on each screen to return to the [MAIN] screen.

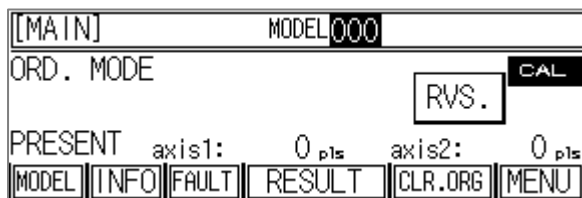
[OPERATING CONDITIONS] screen



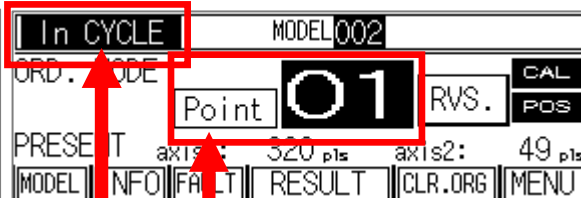
Touch this field to set “WORKPC. DETECT” to “DSBL”.
In this case, “HOME POSITION” is enabled.
(The figure is a 2-axes type. 3-axes type is '9. WORKPC. DETECT'.)

ii) Move the arm to the home position range that has been taught in advance, and then displace the arm from the home position range. Then, the following screen appears, and cycle operation starts. (For the teaching procedure and home position range setting, refer to Section 3.2 “Teaching” (p. 38).)

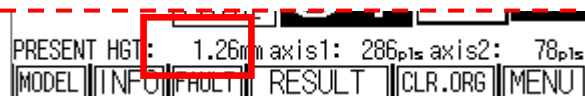
[MAIN] screen (Before cycle start)



[MAIN] screen (During cycle)



In the case of 3-axis type, if the “functional height detection” is valid, the value of the height is displayed during operation cycle.



The above items appear on the screen, which are not displayed before cycle start.

3. Description on functions

iii) After HC100 becomes the cycle execution status (as shown in Step ii)), you can start operation.

(Tightening)

Move the arm driver to a tightening point that has been taught, and turn ON the start switch (grip) to start rotation. Note that, even if the same operation is conducted with the arm driver located at any position other than a teaching point, the driver will not rotate, and the cycle will not progress.

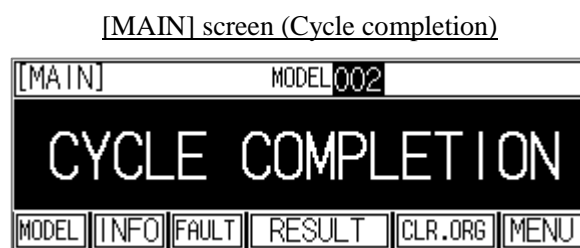
(Loosening)

If you execute loosening work at a certain point during tightening work, you can run the driver in reverse direction to execute loosening work regardless of the current position, by pressing the [RVS.] switch on the [MAIN] screen and then turning ON the start switch at a desired position. If you press the [RVS.] switch on the [MAIN] screen again, you can return to tightening work. (For details of the [RVS.] switch, refer to “(3) Using the reverse rotation switch” (p. 23).)

(Stopping forcibly operation)

If you intend to stop operation forcibly in the middle of cycle execution, you can clear the current cycle. If you keep the [MENU] switch on the [MAIN] screen pressed for one second, the buzzer sounds (“pip”), you will go to the [MENU] screen, and the current cycle is forcibly stopped. However, if a fault has occurred before the cycle is forcibly stopped, the alarm sounds after the forced cycle stop. In this case, select “1. FAULT” on the [MENU] screen, and confirm and reset the fault.

After all teaching points registered for a selected model are tightened as described above, the “COMPLETE CYCLE” message appears as shown below. This message indicates that the current cycle is completed. At the time when the cycle is completed, the indications that have not been displayed before cycle start (“In CYCLE” and “Point”) will disappear.

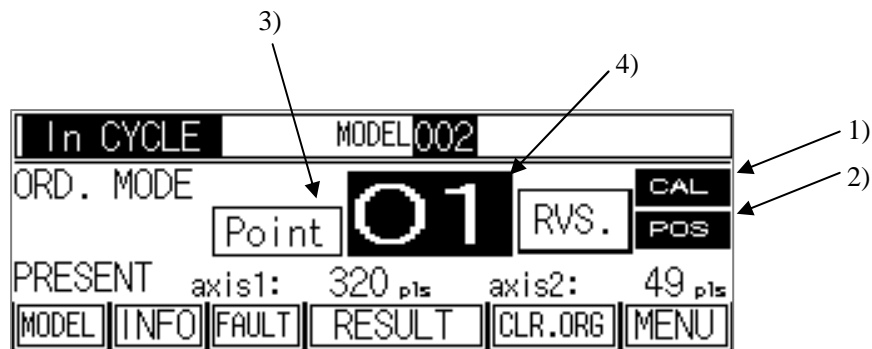


iv) Now, the cycle is completed.

To start the next cycle after completion of the cycle, repeat the above procedure from Step ii).

3. Description on functions

[Description on display items]



- 1) [CAL]: Displayed when origin calibration is completed.
- 2) [POS]: Displayed when position check is judged OK. In this status, the “POS” lamp is lit.
- 3) [Point]: Displayed when the machine is “In CYCLE”.
- 4) [01]: Indicates a point number currently under verification.
The point number blinks in the “In CYCLE” status. When “POS” is indicated in this status, the point number stops blinking, and remains still.

[Description on buzzer sound]

“pip”: Tightening at each point is OK.

“pip, pip, pip”: Tightening fault

“peep, peep, peep”: Occurrence of fault

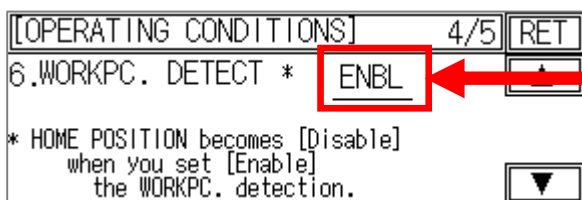
3. Description on functions

(2-2) When workpiece detection is enabled (“HOME POSITION” is disabled)

- i) Connect the workpiece detection sensor to the X20 terminal of the PLC in HC100, and connect the common terminal to the terminal block.
- ii) “3. SETUP MENU (MANAGER)” on the [MENU] screen
 - ⇒ Select “1. OPERATING CONDITIONS” on the [SETUP MENU] screen.
 - ⇒ Set “6. WORKPC. DETECT” (3-axes type is '9.') to "ENBL" on the [OPERATING CONDITIONS] screen.
 - ⇒ After the above setting, press the [RET] switch on each screen to return to the [MAIN] screen.
(For details of the operating condition settings, refer to Section 3.3.1 “Operating condition setting function” (p. 53).)

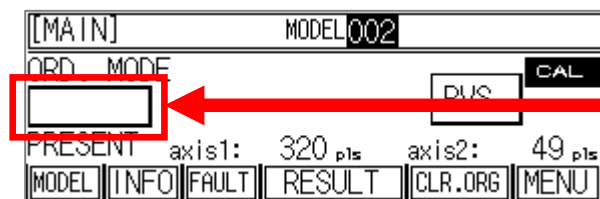
Even if the sensor is connected as described in i), workpiece detection cannot be enabled unless the following item is set to "ENBL". When this item is enabled, a black frame appears on the [MAIN] screen, as shown below.

[OPERATING CONDITIONS] screen



Touch this field to set “WORKPC. DETECT” to “ENBL”. In this case, “HOME POSITION” is disabled. (The figure is a 2-axes type. 3-axes type is '9. WORKPC. DETECT'.)

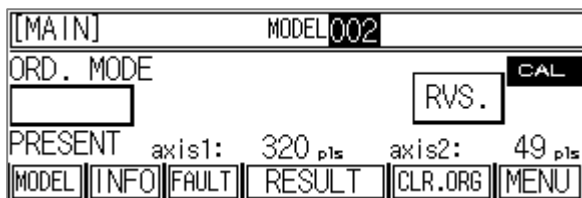
[MAIN] screen



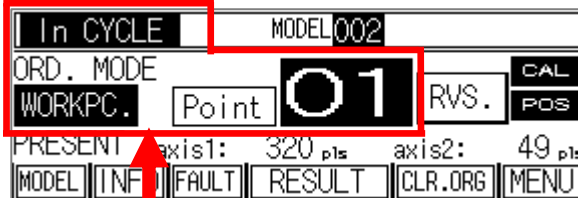
When “WORKPC. DETECT” is enabled, a black frame appears as shown here.

- iii) After the [MAIN] screen is displayed, mount a workpiece. Then, the following screen appears, and cycle operation starts.
If the workpiece detection sensor is turned OFF before all teaching points are tightened, the “NOT COMPLETE CYCLE” fault occurs. In this case, reset the fault, and re-mount the workpiece. In this case, the cycle will be repeated from the first point.
(For description on teaching, refer to Section 3.2 “Teaching” (p. 38).)

[MAIN] screen (Before cycle start)



[MAIN] screen (During cycle)



In the case of 3-axis type, if the "functional height detection" is valid, the value of the height is displayed during operation cycle.



The above items appear on the screen, which are not displayed before cycle start.

3. Description on functions

iv) After HC100 becomes the cycle execution status (as shown in Step iii)), you can start operation.

(Tightening)

Move the arm driver to a tightening point that has been taught, and turn ON the start switch (grip) to start rotation. Note that, even if the same operation is conducted with the arm driver located at any position other than a teaching point, the driver will not rotate, and the cycle will not progress.

(Loosening)

If you execute loosening work at a certain point during tightening work, you can run the driver in reverse direction to execute loosening work regardless of the current position, by pressing the [RVS.] switch on the [MAIN] screen and then turning ON the start switch at a desired position. If you press the [RVS.] switch on the [MAIN] screen again, you can return to tightening work. (For details of the [RVS.] switch, refer to “(3) Using the reverse rotation switch” (p. 23).)

(Stopping forcedly operation)

If you intend to stop operation forcedly in the middle of cycle execution, you can clear the current cycle. If you keep the [MENU] switch on the [MAIN] screen pressed for one second, the buzzer sounds (“pip”), you will go to the [MENU] screen, and the current cycle is forcedly stopped. However, if a fault has occurred before the cycle is forcedly stopped, the alarm sounds after the forced cycle stop. In this case, select “1. FAULT” on the [MENU] screen, and confirm and reset the fault.

After all teaching points registered for a selected model are tightened as described above, the “COMPLETE CYCLE” message appears as shown below. This message indicates that the current cycle is completed. At the time when the cycle is completed, the indications that have not been displayed before cycle start (“In CYCLE”, “Point” and “WORKPEC.”) will disappear.

[MAIN] screen (Cycle completion)

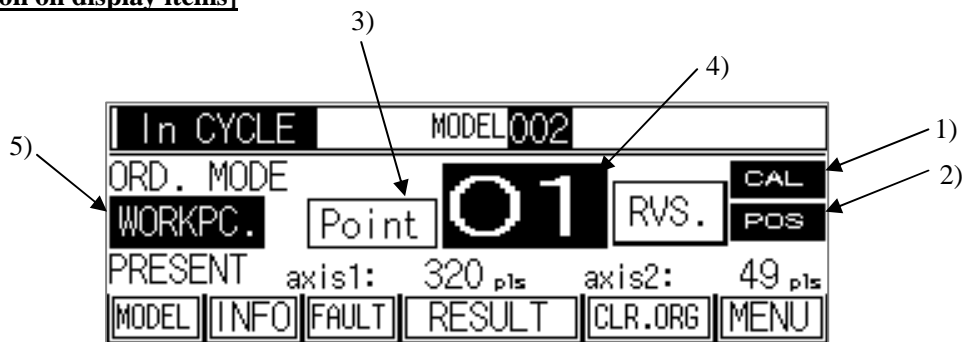


v) Now, the cycle is completed.

To start the next cycle after completion of the cycle, repeat the above procedure from Step ii).

3. Description on functions

[Description on display items]



- 1) [CAL]: Displayed when origin calibration is completed.
- 2) [POS]: Displayed when position check is judged OK. In this status, the "POS" lamp is lit.
- 3) [Point]: Displayed when the machine is "In CYCLE".
- 4) [01]: Indicates a point number currently under verification.
The point number blinks in the "In CYCLE" status. When "POS" is indicated in this status, the point number stops blinking, and remains still.
- 5) [WORKPEC.]: Displayed when a workpiece is detected in the "In CYCLE" status.

[Description on buzzer sound]

"pip": Tightening at each point is OK.

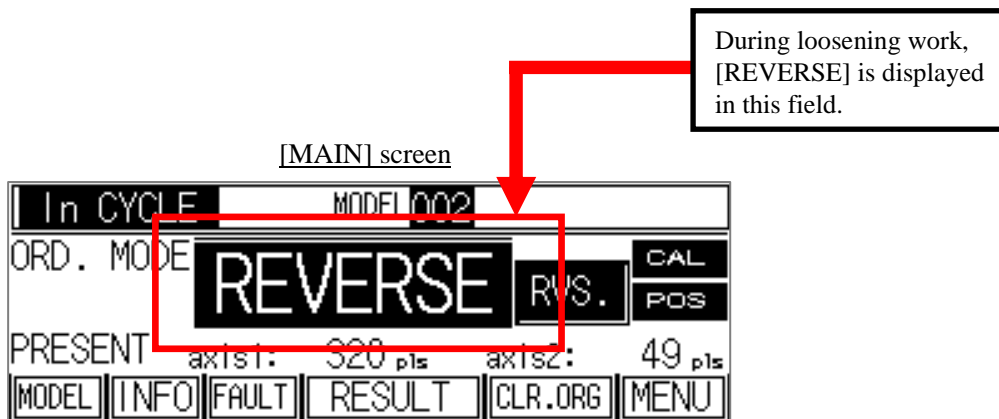
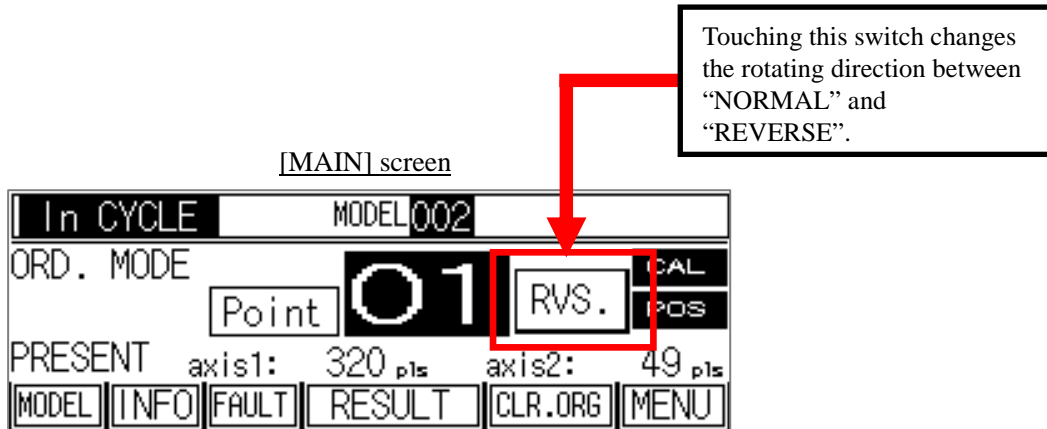
"pip, pip, pip": Tightening fault

"peep, peep, peep": Occurrence of fault

3. Description on functions

(3) Using the reverse rotation switch

When position check is enabled, you can execute loosening work at a desired position by using the reverse rotation switch on the screen.



3. Description on functions

II. Operating procedure (Position check: DISABLE)

(1) Disabling position check

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

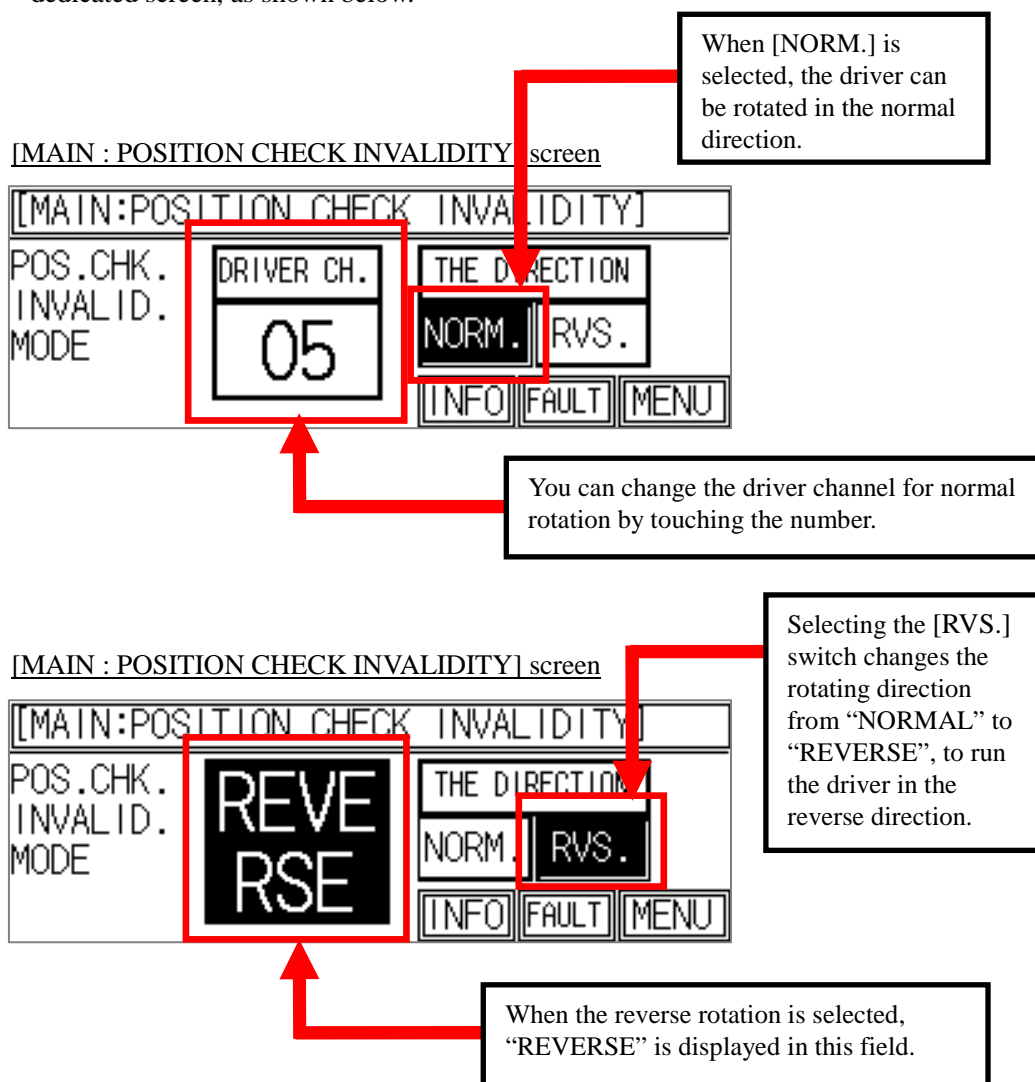
⇒ Select “3. OPERATING MODE” on the [SETUP MENU] screen.

⇒ If you select “4. POSITION CHECK INVALIDITY MODE” on the [OPERATING MODE SELECT] screen, position check is disabled.

(For details of the operating modes, refer to Section 3.3.3 “Operating mode selecting function” (p. 59).

When position check is disabled, cycle start is not executed. Also, when position check is disabled, origin calibration, teaching, various settings and model selection are not required. You can execute tightening (loosening) work regardless of the current position, by turning ON the start switch at a desired position on the dedicated screen.

Driver channel selection, and switching between normal and reverse rotations can be executed on the dedicated screen, as shown below.



3. Description on functions

3.1.1 Model selecting function

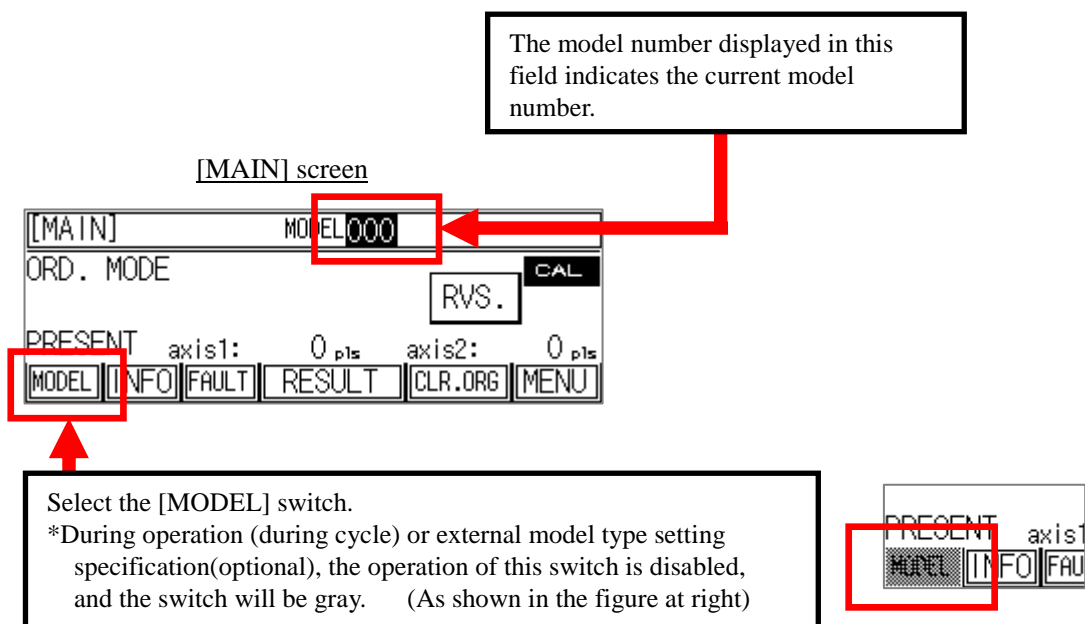
This function enables you to specify the number of models that can be registered.

<Selectable models>

- You can select models in a range of a number of models specified in “SETUP NUMBER OF MODELS”. (For details of the “SETUP NUMBER OF MODELS” setting, refer to Section 3.3.2 “Number of models registration setting function” (p. 57).)

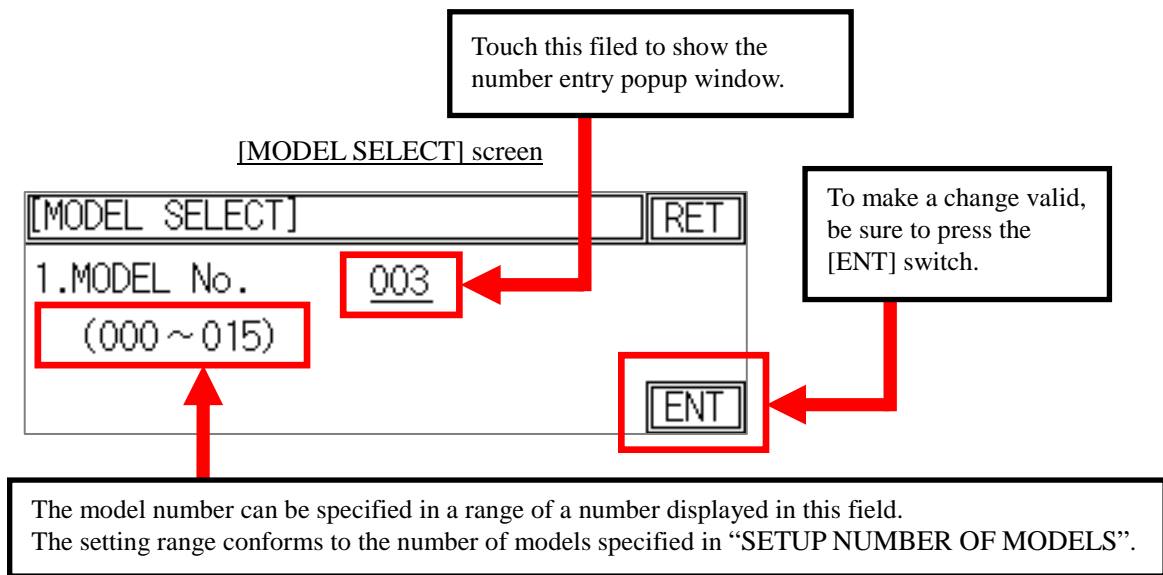
This section describes operations and functions of the switches on the [MODEL SELECT] screen.

<Operation flow to [MODEL SELECT] screen>



3. Description on functions

This section describes operations and functions of the switches on the [MODEL SELECT] screen.



<Setting procedure>

Select the [MODEL] switch on the [MAIN] screen.

⇒ The [MODEL SELECT] screen appears.

First, touch the current model number beside "MODEL No." ("012" in the above figure) on the [MODEL SELECT] screen, to show the number entry popup window. Then, enter a desired model number, and press the [ENT] key in the popup window.

Then, the popup window disappears, and the new model number is displayed. After that, press the [ENT] switch on the screen to register the changed model No.

This completes the model selection procedure.

<<NOTE>> Model selection cannot be executed during cycle execution. Make sure that the "In CYCLE" indicator on the [MAIN] screen is off.

To turn off the "In CYCLE" indicator, or to bring the machine into non-cycle status, the following two methods are available:

- 1) Proceed with the current cycle until it is completed.
- 2) Keep the [MENU] switch on the [MAIN] screen pressed for one second to stop the cycle forcibly, and go to the [MENU] screen. Then, press the [RET] switch on the [MENU] screen to return to the [MAIN] screen.

<Switches>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

- [ENT]

This switch is used to register a changed model No.

3. Description on functions

3.1.2 Counter (Production count setting function)

This function is used to specify a target production count under operation.

When the specified production count is reached, the “COMPLETE!” message appears, and you cannot enter the operation cycle. (Cycle stop processing)

You can restart operation by setting the production count again.

The production count setting can be enabled or disabled depending on the set value, as described below.

<Production count setting>

- Production count setting is enabled: If a number of “0” to “999998” is set for target production count, this setting is enabled, and cycle stop processing is executed after the target count is reached.
- Production count setting is disabled: If a number of “999999” is set for target production count, this setting is disabled, and cycle stop processing is not executed after the target count is reached.

This section describes operations and functions of the switches on the [SET PRODUCT NUMBER] screen.

<Operation flow to [SET PRODUCT NUMBER] screen>

[MAIN] screen

[MAIN] MODEL 000
ORD. MODE RVS. CAL
PRESENT axis1: 0 pls axis2: 0 pls
MODEL [INFO] [FAULT] [RESULT] [CLR.ORG] [MENU]

Select the [INFO] switch.

[INFO. MENU] screen

[INFO. MENU] MODEL 002 Point 001 [RET]
1. COUNTER
2. 1-CYCLE INFO.
3. I/O MONITOR

Select “1. COUNTER”.

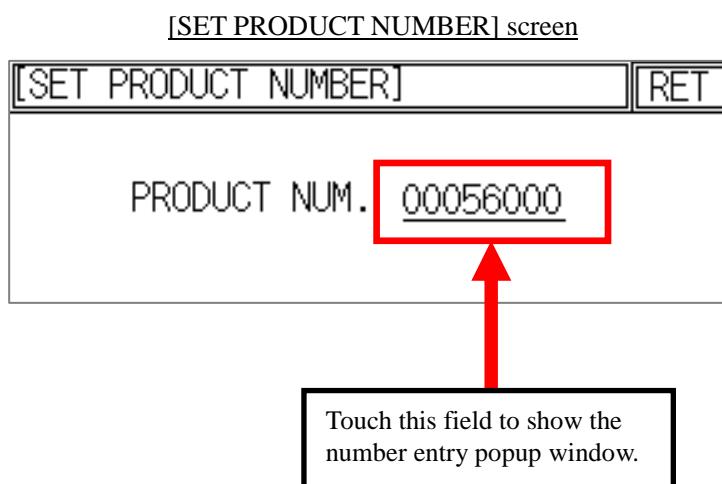
[COUNTER] screen (1/2)

[COUNTER] 1/2 [RET]
1. PRODUCT NUM. 01234567 [SET]
2. REJECT CNTR. 00000012 [CLR]
3. GOOD CNTR. 00003456 [CLR] ▼

Select the [SET] switch.

3. Description on functions

This section describes operations and functions of the switches on the [SET PRODUCT NUMBER] screen.



<Production count setting procedure>

Select the [INFO] switch on the [MAIN] screen to show the [INFO. MENU] screen.

⇒ Select “1. COUNTER”.

⇒ Select the [SET] switch for “1. PROD.” on the [COUNTER] screen.

⇒ The [SET PRODUCT NUMBER] screen appears.

First, touch the current production number beside “PRODUCT NUM.” (“01234567” in the above figure) on the [SET PRODUCT NUMBER] screen, to show the number entry popup window. Then, enter a desired production number, and press the [ENT] key in the popup window. Then, the popup window disappears, and the new production count setting is displayed. Now, the change of production count is registered, and the production count setting is completed.

<Switch>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.1.3 Counter (REJECT/GOOD/TOTAL/SHOT counter clear function)

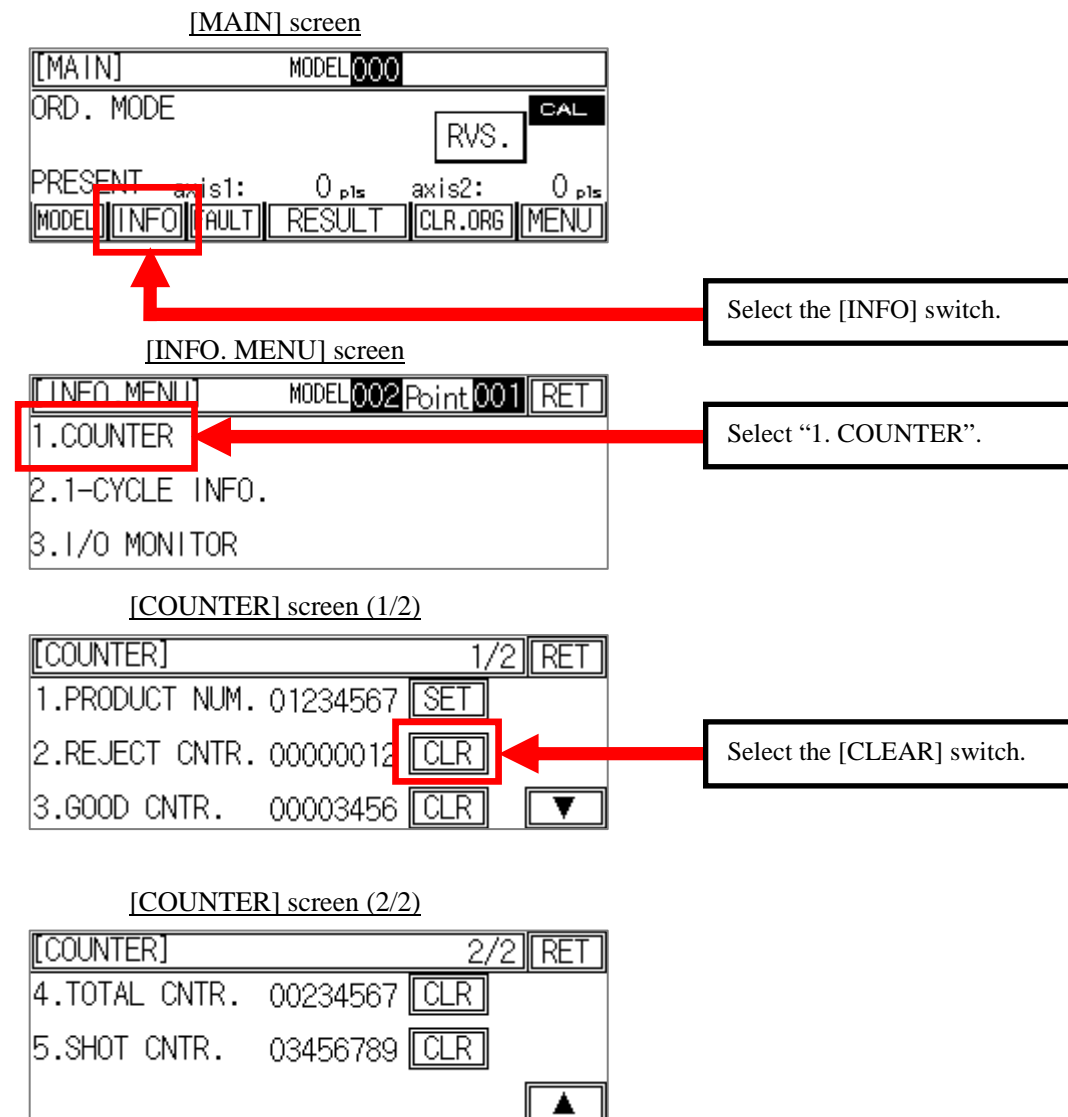
This function is used to count the following items, and to clear each counter.

<Description on counters>

- REJECT counter: Counts the number of tightening faults.
- GOOD counter: Counts the number of cycles completed without the fault.
- TOTAL counter: Counts the number of cycles completed.
- SHOT counter: Counts the number of cycles in which the driver starts rotation with the start switch.

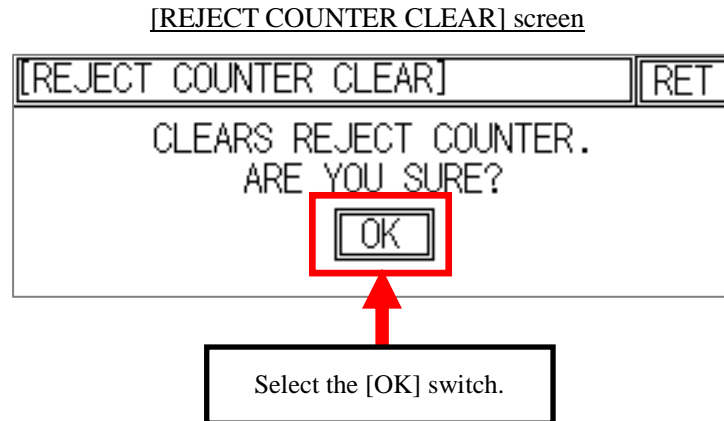
This section describes operations and functions of the switches on the [COUNTER CLEAR] screen of "REJECT/GOOD/TOTAL/SHOT "

<Operation flow to [COUNTER CLEAR] screen>



3. Description on functions

This section describes operations and functions of the switches on the [REJECT/GOOD/TOTAL/SHOT COUNTER CLEAR] screen.



<REJECT/GOOD/TOTAL/SHOT counter clearing procedure>

Select the [INFO] switch on the [MAIN] screen to show the [INFO. MENU] screen.

⇒ Select “1. COUNTER”.

⇒ Select the [CLR] switch for “2. RJCT CNTR.” on the [COUNTER] screen.

⇒ The [REJECT COUNTER CLEAR] screen appears.

Select the [OK] switch on the [REJECT COUNTER CLEAR] screen. Then, the REJECT counter is cleared. If you press the [RET] switch to return to the [COUNTER] screen, the count value is reset to “0”. The procedure for cleaning other counters (“3. GOOD COUNTER”, “4. TOTAL COUNTER” and “5. SHOT COUNTER”) is the same as the above.

<Switches>

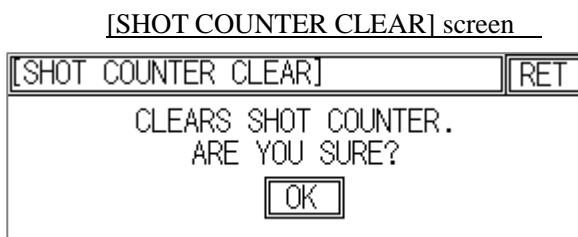
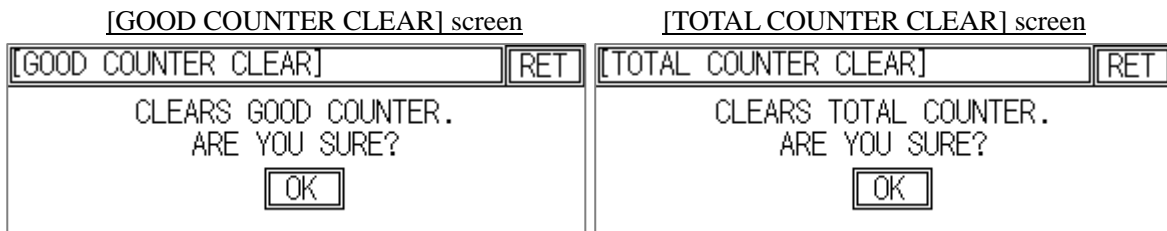
- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

- [OK]

Pressing this switch triggers the counter clear processing.

(Reference screens)



3. Description on functions

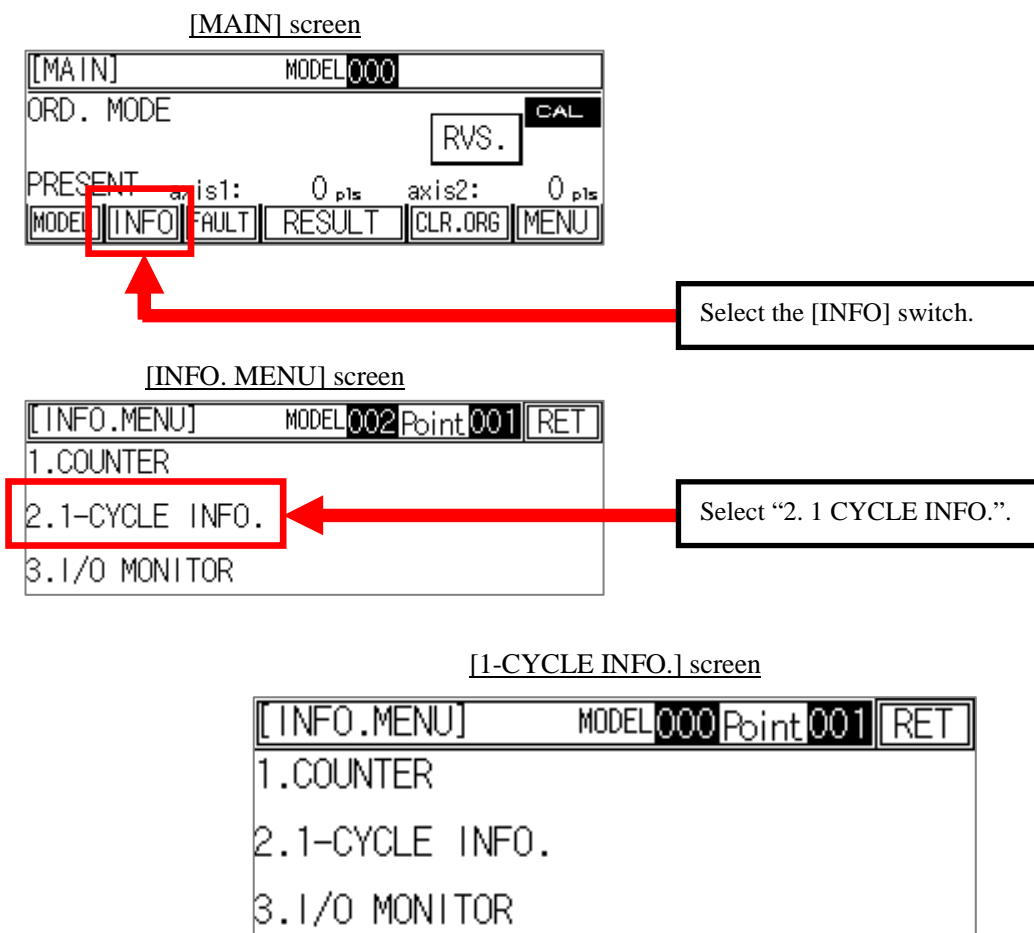
3.1.4 1 cycle information

This function allows you to check the time spent in the current operation cycle, and to check the number of points yet to be tightened.

<Description on 1-cycle information>

- 1-CYCLE TIME [s]: Displays a time currently spent after start of the current operation cycle.
- FASTENING COUNT: Displays a number of tightening points remaining until completion of the cycle during 1-cycle operation.

<Operation flow to [1-CYCLE INFO.] screen>



<Switch>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.1.5 I/O monitor

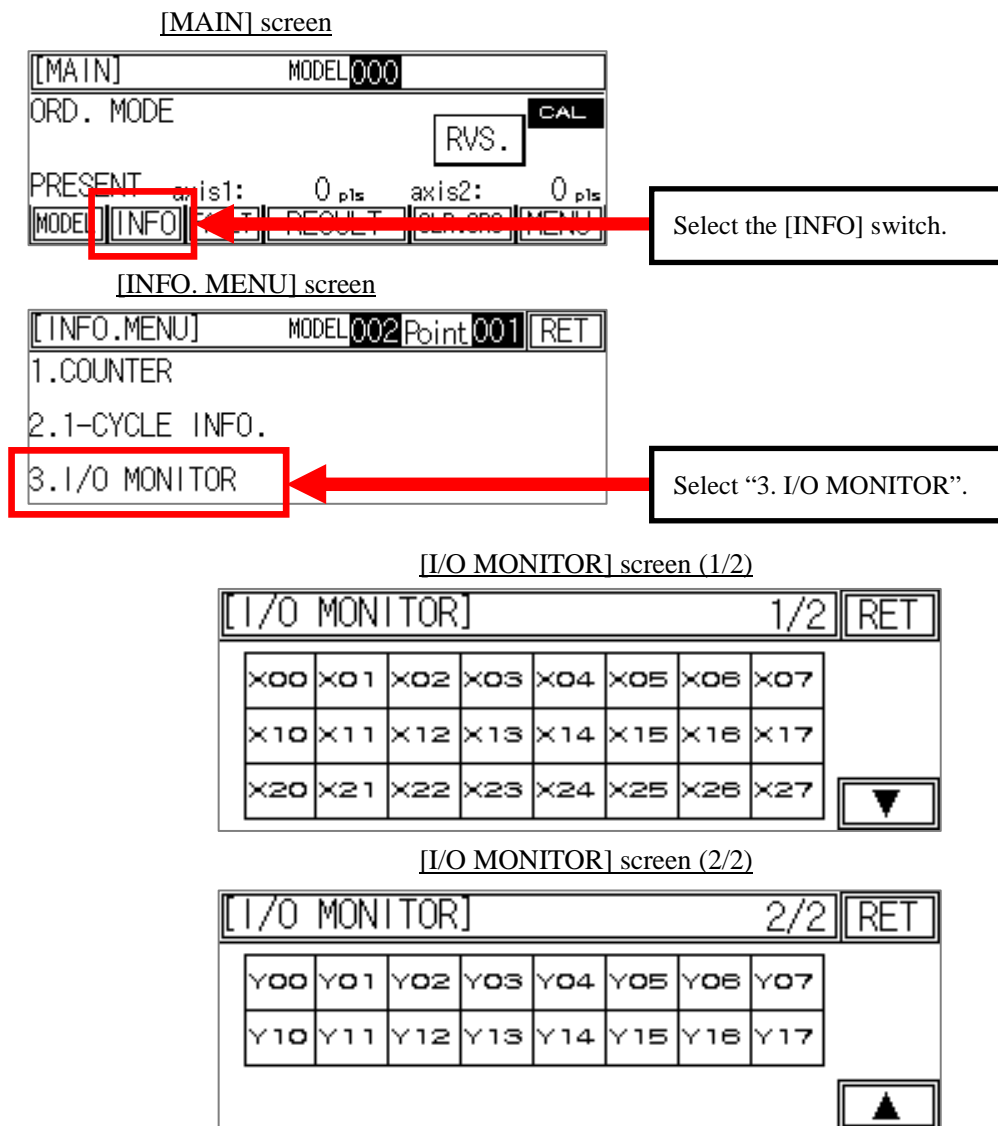
This function allows you to monitor the system I/O status and peripheral equipment control I/O status.

<Description on I/O monitor>

[* ON status: White character on black background, OFF status: Black character on white background]

- X00 to X27: Displays the ON/OFF status of system I/Os and peripheral equipment control input. *
- Y00 to Y17: Displays the ON/OFF status of system I/Os and peripheral equipment control output. *

<Operation flow to [I/O MONITOR] screen>



<Switch>

- [▼] [▲]

These switches are used to change the pages on the [I/O MONITOR] screen.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.1.6 Fault detail / Fault display function

This function notifies you of a fault.

<Conditions and causes of faults>

- **TIGHTENING TORQUE FAULT:** Tightening workpiece is not completed with proper tightening torque.

- **TORQUE WAVEFORM FAULT:** Waveform judgment OK signal is not output from the driver controller. (This function is active when the driver controller that enables waveform judgment is used, and “3.WAVEFORM/ANGLE JUDGE.SETTING:” is set to “WAV.ENBL” in working point information during teaching.)

- **TIGHTENING ANGLE FAULT:** Angle judgment OK signal is not output from the driver controller. (This function is active when the driver controller that enables angle judgment is used, and “3.WAVEFORM/ANGLE JUDGE.SETTING:” is set to “ANG.ENBL” in working point information during teaching.)

- **POS.CHECK FAULT AFTER TIGHTENING:** When the tightening completion position is verified with the teaching position, the displacement exceeds a specified check width. (This function is active when “7. POS. CHECK after TGHT”(3-axes type is '10.') is set to "ENBL" on the [OPERATING CONDITIONS] screen.)

- **PRODUCTION COMPLETION !!:** When the target production count that has been specified in “1. “PRODUCT NUM.” on the [INFO. MENU] – [COUNTER] screen is reached.(If “99999999” is set for “1. PRODUCT NUM.”, this function is not active.)

- **DRIVER SYSTEM ALARM:** When the driver controller’s system alarm is activated.

- **NOT COMPLETE CYCLE:** When a workpiece is removed before tightening operations for all teaching points are completed.
(This function is active when “6. WORKPC. DETECT” (3-axes type is '9.') is set to "ENBL" on the [OPERATING CONDITIONS] screen and the optional workpiece detection sensor is mounted.)

- **DRIVER CONTROLLER IS NOT POWERED:** When the driver controller’s start ready signal is not ON at start of tightening operation.

3. Description on functions

- TIGHTENING HEIGHT FAULT: *** 3-Axes type only**

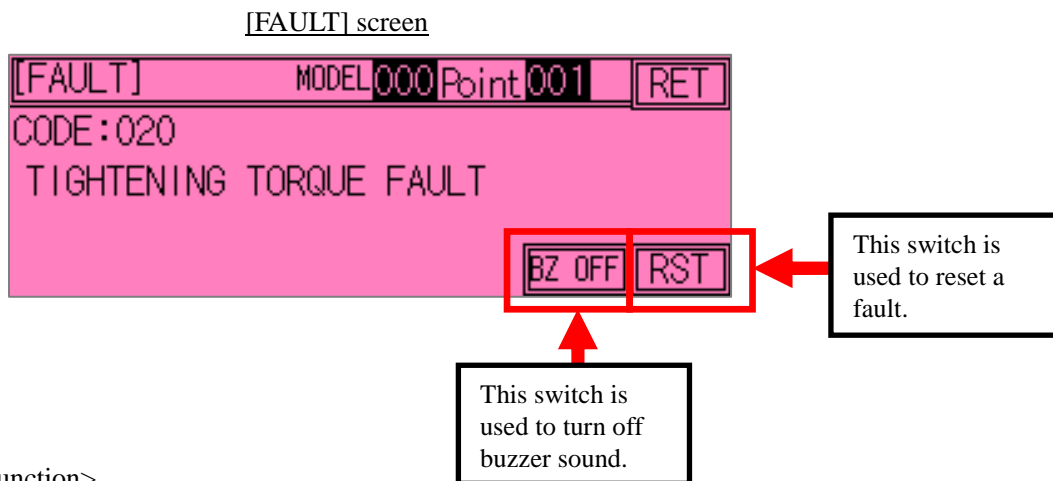
When the tightening completion height is verified with the teaching height, the displacement exceeds a specified check width. (This function is active when "2. HEIGHT CHECK is set to "ENBL" on the [OPERATING CONDITIONS] screen.)

<[FAULT] screen displaying procedure>

[FAULT] screen is displayed in one of the following.

- When the [FAULT] switch in the [MAIN] screen etc is pressed.
- When the fault occurs during tightening.

This section describes operations and functions of the switches on the [FAULT] screen.



<Function>

- Fault code/fault condition display

Displays a fault code and the condition of the fault that has occurred.

The above screen indicates that "TIGHTENING TORQUE FAULT" (CODE 020) has occurred.

<Switches>

- [BZ OFF]

This switch is used to turn off the buzzer sound when a fault occurs.

- [RST]

This switch is used to reset a currently displayed fault.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.1.7 Tightening result display function

This function is used to display a result at each tightening point, which is a special feature of the arm driver with position check function.

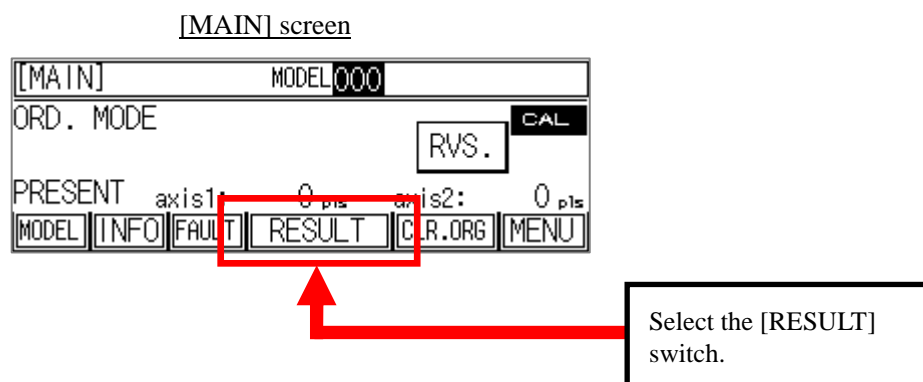
<Description on tightening result display>

- **O:** Tightening completion
- **T:** TIGHTENING TORQUE FAULT
- **W:** TORQUE WAVEFORM FAULT
- **A:** TIGHTENING ANGLE FAULT
- **S:** POS.CHECK FAULT AFTER TIGHTENING
- **H:** TIGHTENING HEIGHT FAULT: *** 3-Axes type only**

Tightening result is displayed in the section corresponding to each point number.

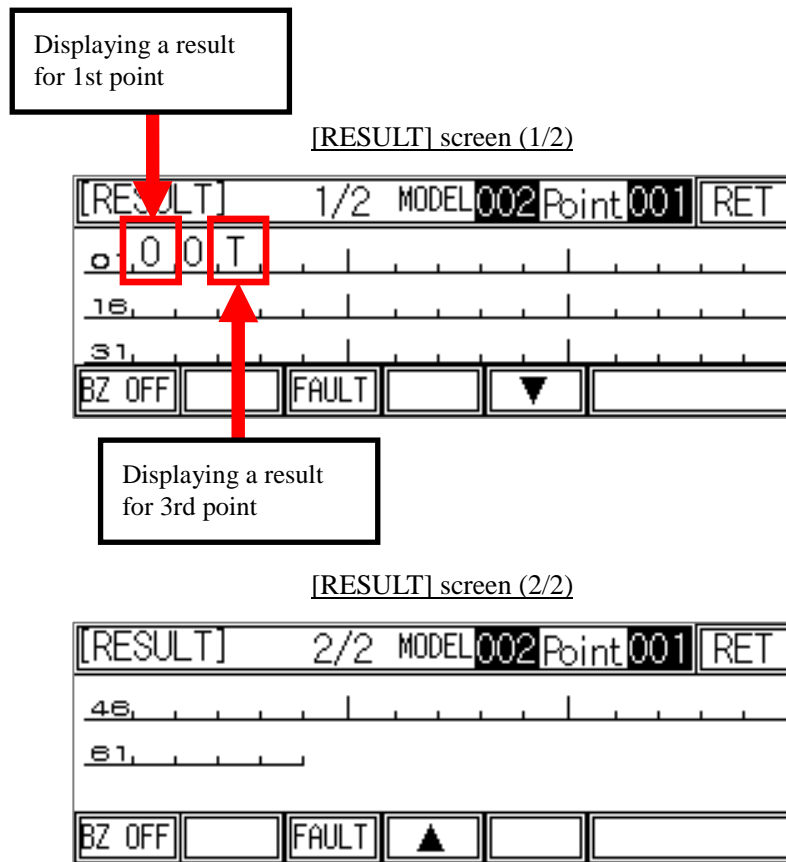
For example, when the driver is operated in the RANDOM mode, the tightening result for the 1st point is displayed in the 1st section, and the tightening result for the 3rd point is displayed in the 3rd section.

<Operation flow to [RESULT] screen>



3. Description on functions

This section describes operations and functions of the switches on the [RESULT] screen.



<Switches>

- [BZ OFF]

This switch is used to turn off only buzzer sound when a fault occurs, without resetting the fault.

- [FAULT]

This switch is used to show the [FAULT] screen.

To check or reset a fault, select this switch.

For details, refer to Section 3.1.6 “Fault detail / Fault display function” (p. 33).

- [▼] [▲]

These switches are used to change the pages on the [RESULT] screen.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

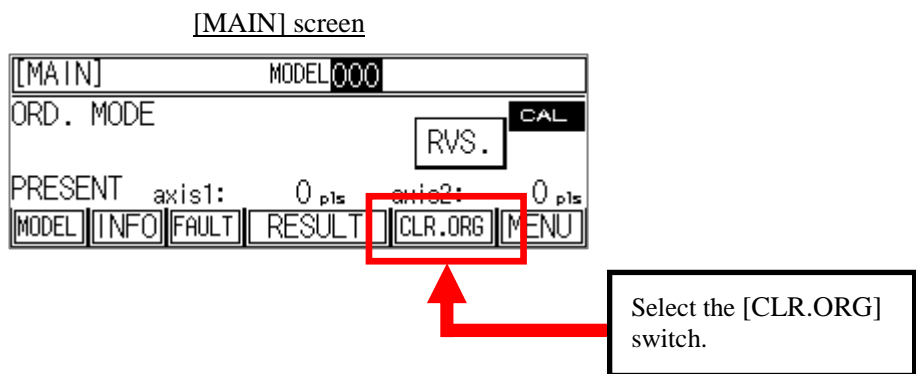
3. Description on functions

3.1.8 Origin calibration function

This function is used to execute origin calibration, which is a special feature of the arm driver with position check function.

This function is intended to re-execute origin calibration after origin calibration is executed once at first power-ON. Normally, this function is not used.

<Operation flow to [CLEAR ORG.] screen>

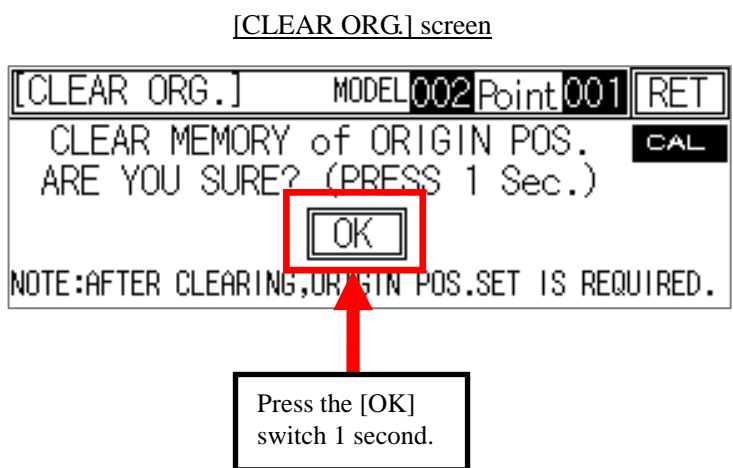


<Origin reset procedure>

Select the [CLR.ORG] switch on the [MAIN] screen to show the [CLEAR ORG.] screen.

Then, press the [OK] switch 1 second on the [CLEAR ORG.] screen.

Now, the origin is reset. If you reset the origin, you must execute origin calibration again. For details, refer to Section 2.1.1 “Equipment origin calibration” (p. 13).



3. Description on functions

3.2 Teaching

This section describes teaching.

<<NOTE>> The teaching function cannot be used unless origin calibration is completed.
To execute teaching, be sure to execute origin calibration in advance.

<Operation flow to [TEACHING MENU] screen>

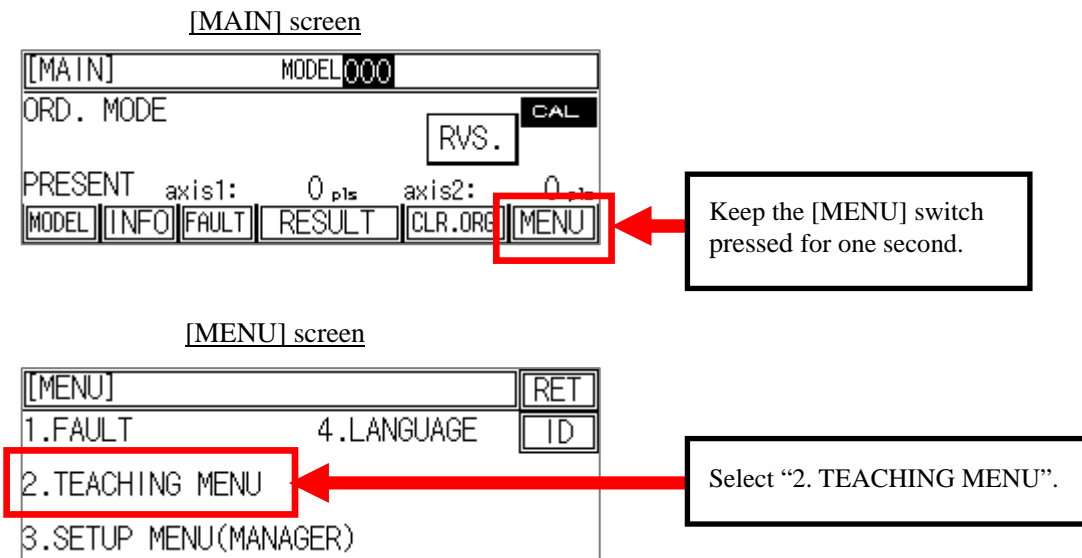
Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “2. TEACHING MENU” on the [MENU] screen, and enter “9” for a password in the password window displayed on the screen.

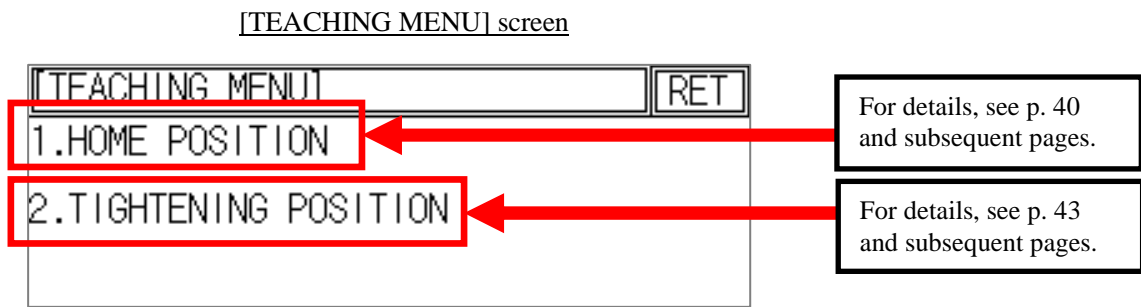
⇒ The [TEACHING MENU] screen appears.

Two types of teaching targets are available: “1. HOME POSITION” and “2. FASTENING POSITION”.

The [TEACHING MENU] screen displays the switches to select individual setting screens. By selecting the switch for a desired teaching item, you can go to the corresponding teaching screen.



3. Description on functions



<Switch>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

(REFERENCE)

- [ID]

This switch is located on the [MENU] screen, allowing you to enter an ID password.

However, it does not mean that you must use this switch when you enter a password, because the password entry window appears whenever ID password is required.

This switch is one option of the password entry methods.

The following section describes teaching methods.

3. Description on functions

3.2.1 Home position teaching function

This function executes teaching of a home position.

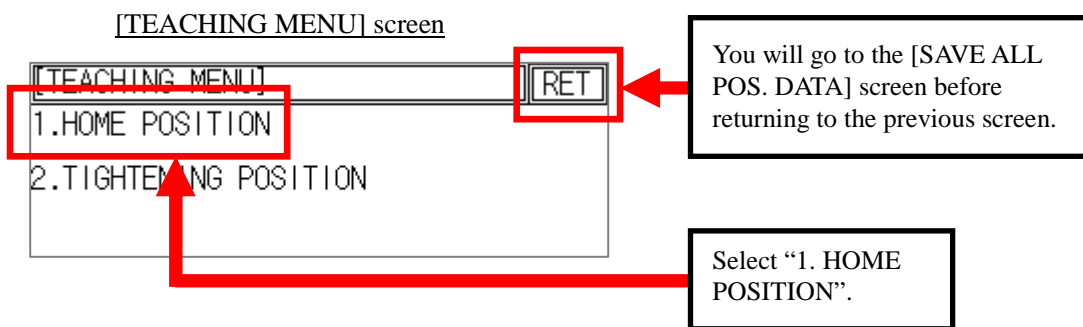
<Operation flow to [TEACHING] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “2. TEACHING MENU” on the [MENU] screen, and enter “9” for a password in the password window displayed on the screen.

⇒ Select “1. HOME POSITION” on the [TEACHING MENU] screen.

⇒ The [HOME POS.] screen appears.



[IMPORTANT!!]

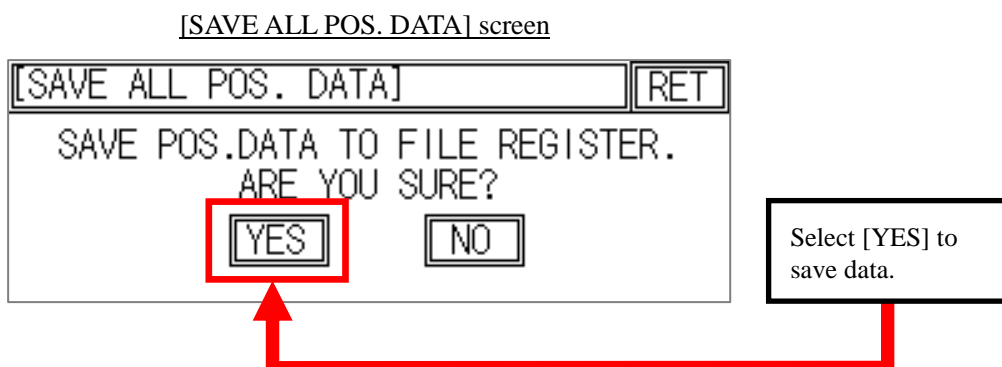
• Saving teaching data into file register

If you use the [RET] switch on the [TEACHING MENU] screen, you will go to the [SAVE ALL POS. DATA] screen as shown below. Select [YES] on this screen to save teaching data into the file register.

*If you do not save data in this step, changed teaching data may be lost while the power supply for HC100 is kept OFF for several days. If you select [YES] on this screen to save teaching data into the file register, changed data can be protected.

After selection of either [YES] or [NO], you will return to the [MENU] screen.

* Once data are saved, it need not be saved again.



3. Description on functions

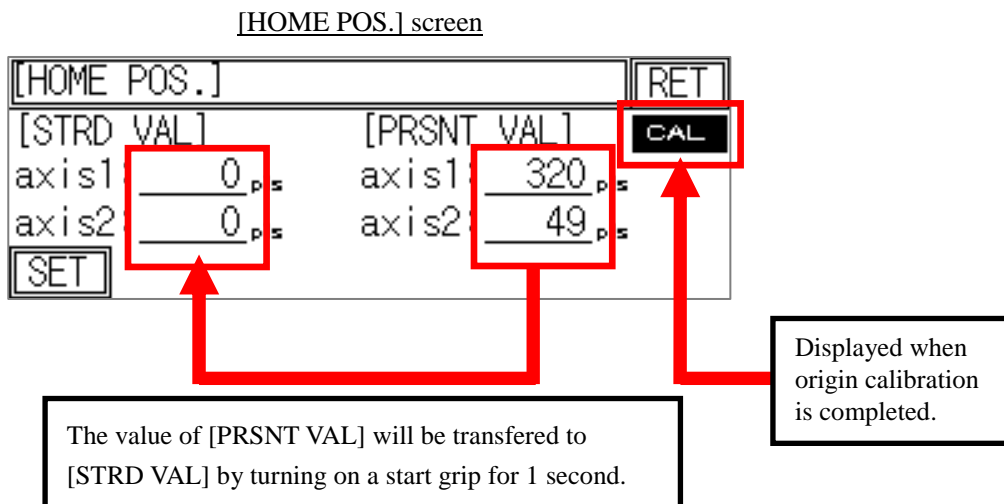
<Teaching method>

The following two types of teaching methods are available: “Direct teaching” and “Numerical input teaching”.

I. Direct teaching

• Entering [PRSNT VAL] (present value) in [STRD VAL] (registration value)

You can directly register the present tool tip position data as the standard value by turning ON the start switch (grip) for 1 second when the [HOME POS.] screen is displayed.



<Switches>

• [SET]

This switch is used to show the [HOME POS. SET] screen.

(for **II. Numerical input teaching**)

• [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

II. Numerical input teaching

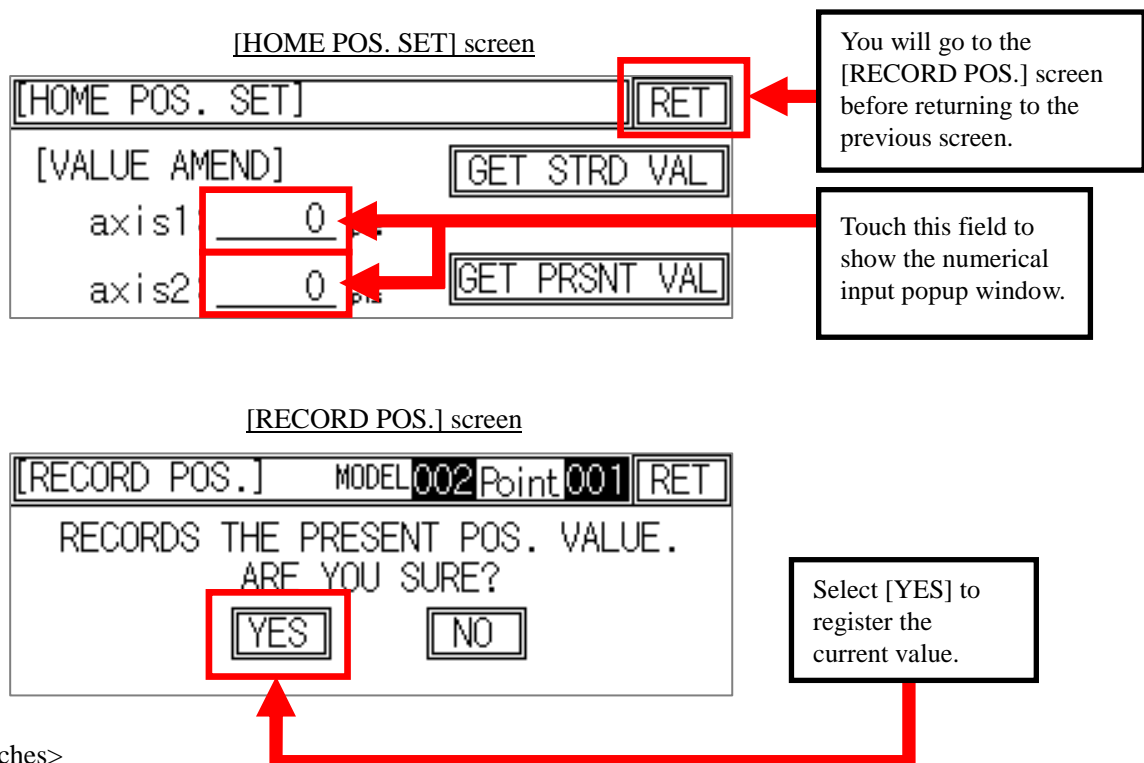
(i) Pressing the [SET] switch on the [HOME POS.] screen displays the [HOME POS. SET] screen as shown below.

If you touch a number on this screen, a numerical input popup window appears. You can change the standard value directly by entering a desired value.

(ii) If you select [YES] on the [RECORD POS.] screen, the changed value can be registered.

You can go to the [RECORD POS.] screen by pressing the [RET] switch on the [HOME POS.] screen.

If you select [NO], a changed value will be restored to the original value.



<Switches>

- [GET STRD VAL]

Pressing this switch reads a registered standard value.

This switch is used to restore the standard value to the original value that has been stored before registration, after a value is changed through numerical input, or by getting the current position data.

(After the current value is registered, the standard value is overwritten, and it cannot be restored to the original value.)

- [GET PRSNT VAL]

Pressing this switch acquires the current value.

To enter the current pulse value, use this switch.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.2.2 Tightening point teaching function

This function executes teaching of tightening points.

Note : The point data of the height direction (Z-axis) must be register the height data when the screw was tightened correctly.
If the different point had registered, The height detection does not work correctly.

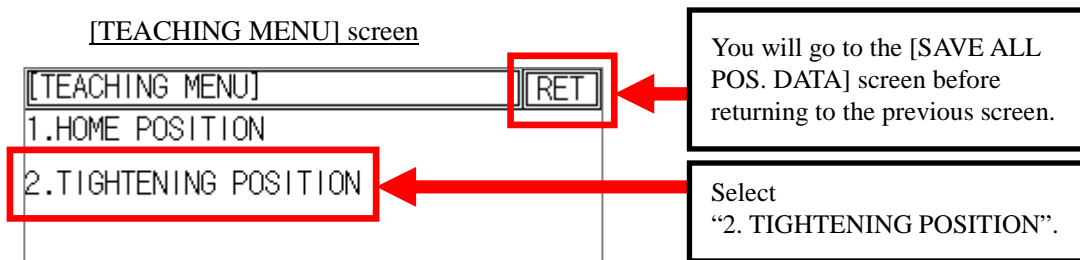
<Operation flow to [TEACHING] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “2. TEACHING MENU” on the [MENU] screen, and enter “9” for a password in the password window displayed on the screen.

⇒ Select “2. TIGHTENING POSITION” on the [TEACHING MENU] screen.

⇒ The [TTNG. POS.] screen appears.



[IMPORTANT!!]

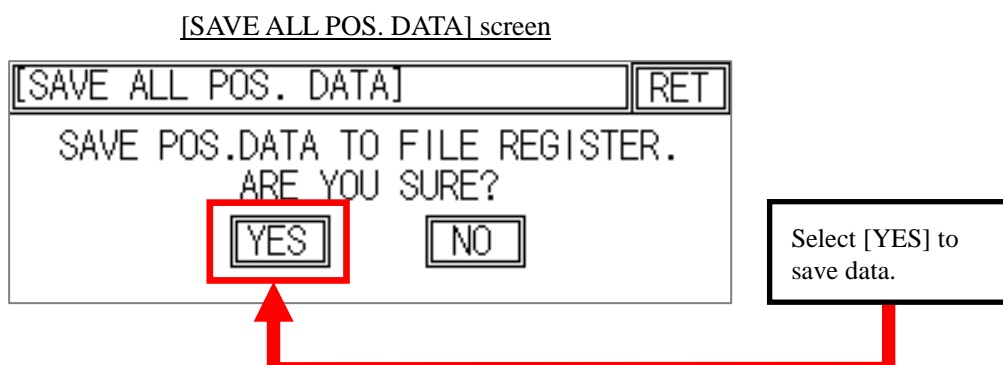
• Saving teaching data into file register

If you use the [RET] switch on the [TEACHING MENU] screen, you will go to the [SAVE ALL POS. DATA] screen as shown below. Select [YES] on this screen to save teaching data into the file register.

*If you do not save data in this step, changed teaching data may be lost while the power supply for HC100 is kept OFF for several days. If you select [YES] on this screen to save teaching data into the file register, changed data can be protected.

After selection of either [YES] or [NO], you will return to the [MENU] screen.

* Once data are saved, it need not be saved again.



3. Description on functions

<Teaching method>

The following two types of teaching methods are available: “Direct teaching” and “Numerical input teaching”.

When tightening point teaching is executed in either of the following conditions, the relevant point is not regarded as a tightening point, and the points before the relevant point are regarded as tightening points.

- 1) When both “axis 1” and “axis 2” are set at “0” [pls] as standard values
- 2) When "Driver CH." setting is "less than 0" or "15 excess".

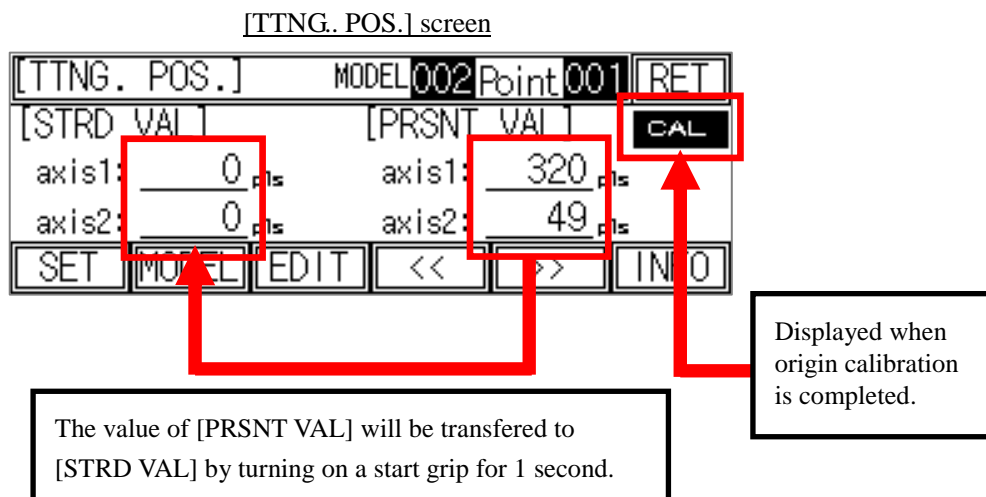
However, if the maximum number of points specified for the model are registered as tightening points, all points up to the last one can be used, regardless of the above conditions.

I. Direct teaching

(i) Entering [PRSNT VAL] (present value) in [STRD VAL] (registration value)

You can directly register the current tool tip position data as the standard value by turning ON the start switch (grip) for 1 second when the [TTNG..POS.] screen is displayed.

[TTNG.. POS.] screen

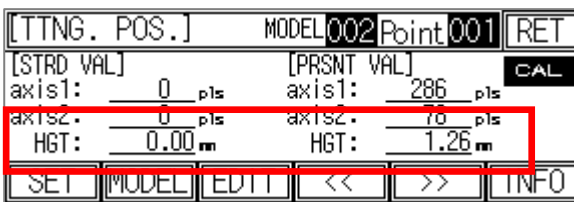


The value of [PRSNT VAL] will be transferred to [STRD VAL] by turning on a start grip for 1 second.

Displayed when origin calibration is completed.

[TTNG.. POS.] screen (3-Axes type)

***Note:**
In addition to the above diagram as shown on the right, "3-axes type" is displayed height [HGT] value.



3. Description on functions

<Switches>

- [SET]
This switch is used to go to the [HOME POS.] screen.
- [MODEL]
This switch is used to select a model subject to teaching.
For details, refer to Section 3.1.1 “Model selecting function” (p. 25).
- [EDIT]
This switch is used to edit teaching data (copy, etc.).
For details, refer to “(iii) Edit menu” (p. 47).
- [<<] [>>]
These switches are used to change a point subject to teaching.
Pressing [>>] increments a point number by one. Pressing [<<] decrements a point number by one.
- [INFO]
This switch is used to go to the screen that allows you to set information for each teaching point (“Driver CH”, etc.). For details, refer to “(ii) Tightening point information” (p. 45).
- [RET]
Pressing this switch allows you to return to the screen immediately before the current screen.

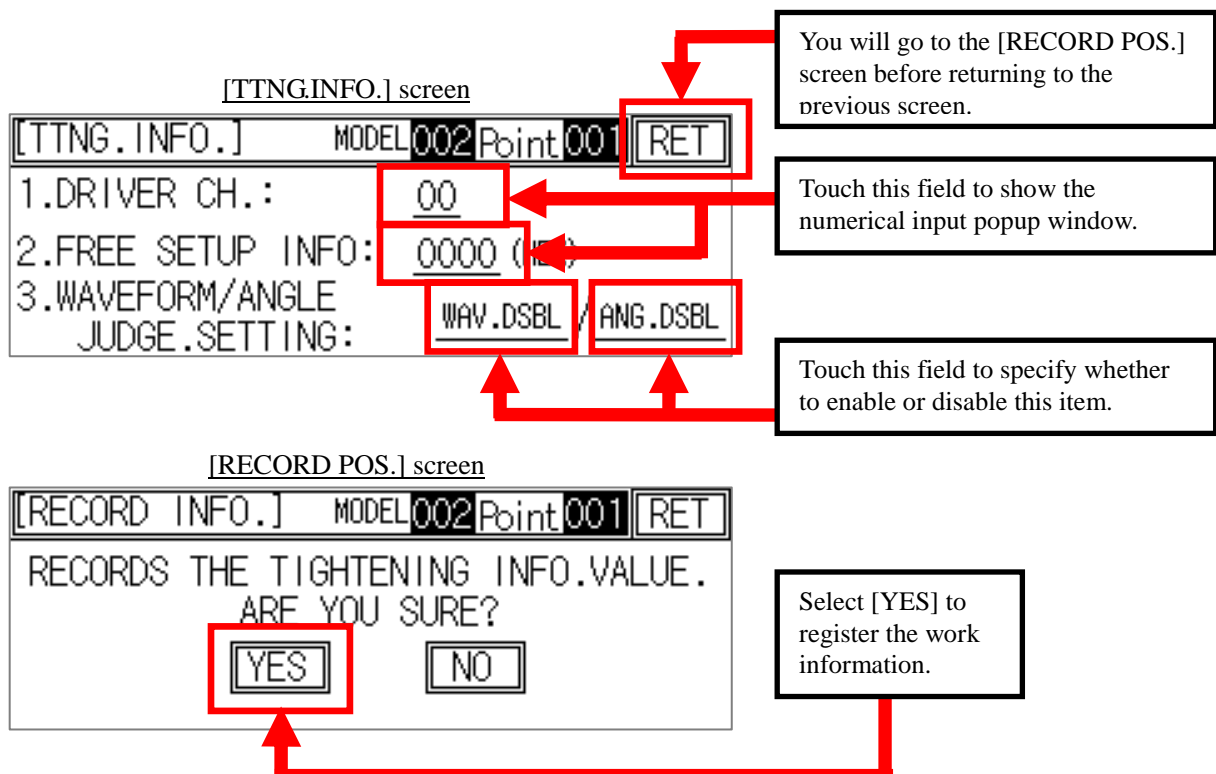
3. Description on functions

(ii) Tightening point information

Selecting the [INFO] switch on the [TTNG. POS.] screen displays the [TTNG.INFO.] screen.

1. DRIVER CH: You can set a driver channel number for each point.
2. FREE SETUP INFO: Not used as standard.
3. WAVEFORM/ANGLE JUDGE. SETTING: You can specify whether to enable or disable waveform/angle judgment for each point.

- 1) Select the [INFO] switch on the [TTNG. POS.] screen to show the [TTNG.INFO.] screen.
- 2) <DRIVER CH. setting procedure>
 ⇒ Touch a number for “1. DRIVER CH” to show the numerical input popup window.
 Then, enter a desired driver channel No. You can enter a driver channel No. in a range of 1 to 15.
- 3) <FREE SETUP INFO setting procedure>
 ⇒ Touch a number for “2. FREE SETUP INFO” to show the numerical input popup window.
 Then, enter the any hexadecimal data.
- 4) <Waveform/Angle judgment setting procedure>
 ⇒ Touch a setting switch of “3. WAVEFORM/ANGLE JUDGMENT SETTING” to set this item to "ENBL" or "DISABLE".
 Note: If the driver controller does not provide the waveform/angle judgment function, waveform/angle judgment cannot be performed, even if this item is set to "ENBL".
- 5) <Tightening information registration procedure>
 Note that the setting changes in the above 1) to 4) steps can be registered by selecting [YES] on the [RECORD POS.] screen. You can go to the [RECORD POS.] screen by pressing the [RET] switch on the [TTNG.INFO.] screen.



3. Description on functions

(iii) Edit menu

Selecting the [EDIT] switch on the [TTNG.INFO.] screen displays the [EDIT MENU] screen. You can perform teaching operations more efficiently by using the following functions.

1. POINT INSERTION: You can add (insert) a new teaching point.
2. POINT DELETION: You can delete a teaching point.
3. MODEL DELETION: You can delete all teaching points that have been registered for a model.
4. MODEL COPY: You can copy model information by selecting a copy source and a copy target.

[EDIT MENU] screen (1/2)

[EDIT MENU] 1/2	MODEL 002	Point 001	[RET]
1.POINT INSERTION			
2.POINT DELETION			
3.MODEL DELETION			
			▼

[EDIT MENU] screen (2/2)

[EDIT MENU] 2/2	MODEL 002	Point 001	[RET]
4.MODEL COPY			
			▲

<Switches>

- [▼] [▲]

These switches are used to change the pages on the [EDIT MENU] screen.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

<Point inserting procedure>

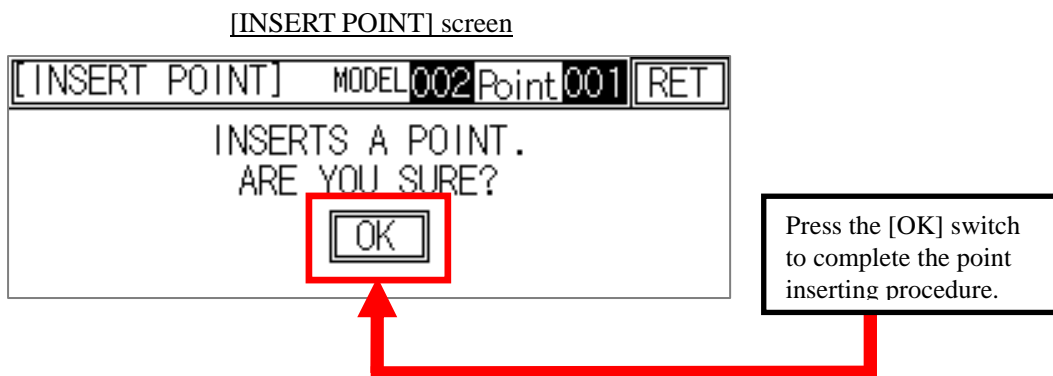
Select the [EDIT] switch on the [TTNG.INFO.] screen to show the [EDIT MENU] screen.

⇒ Select “1. POINT INSERTION”.

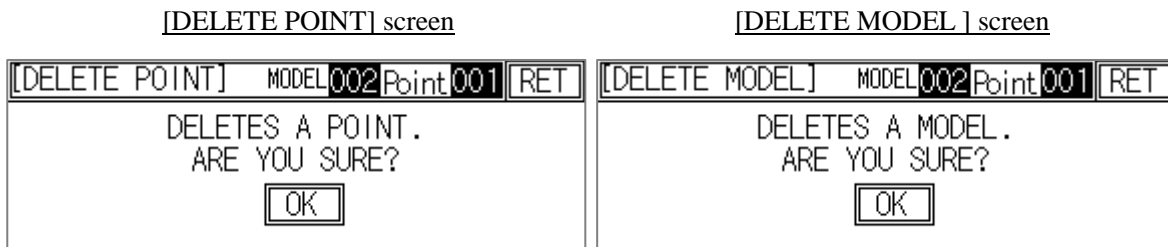
⇒ The [INSERT] screen appears.

⇒ If you select the [OK] switch on the [INSERT] screen, a new point is inserted, and the point inserting procedure is completed.

To execute “2. POINT DELETION” and “3. MODEL DELETION”, follow the same procedure.



(REFERENCE)



3. Description on functions

< MODEL COPY procedure >

Select the [EDIT] switch on the [TTNG.INFO.] screen to show the [EDIT MENU] screen.

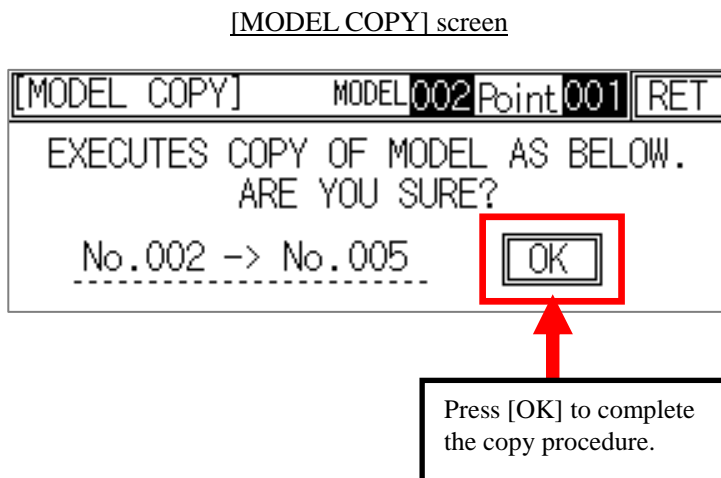
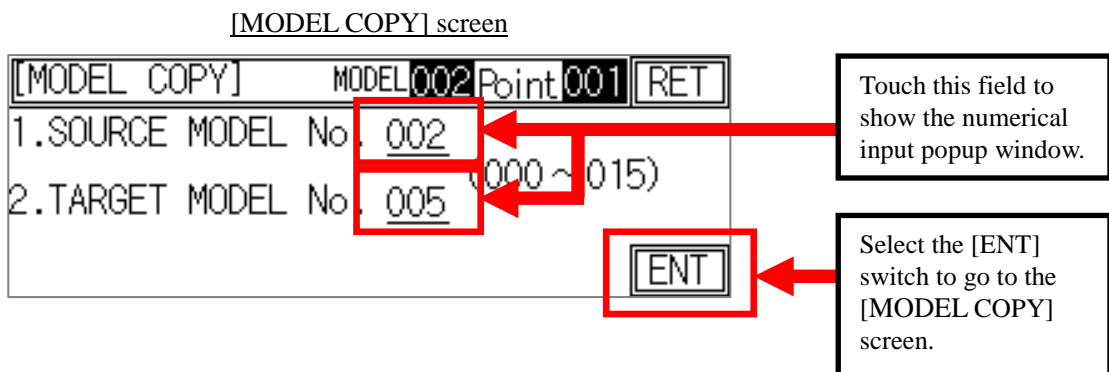
⇒ Select “4. MODEL COPY”.

⇒ The [MODEL COPY] screen appears.

Touch the numbers for “SOURCE MODEL ” and “TARGET MODEL ” on the [MODEL COPY] screen to show the numerical input popup window.

Then, enter a desired model number, and select the [ENT] switch to go to the [MODEL COPY] screen.

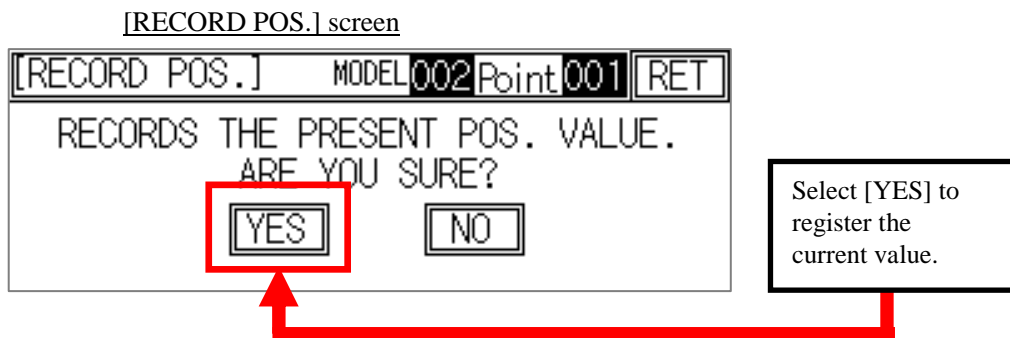
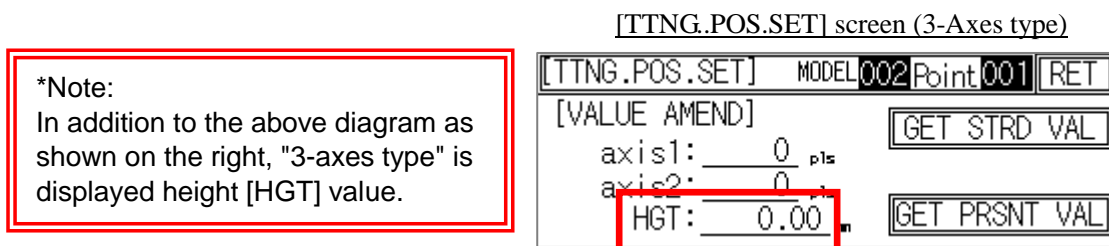
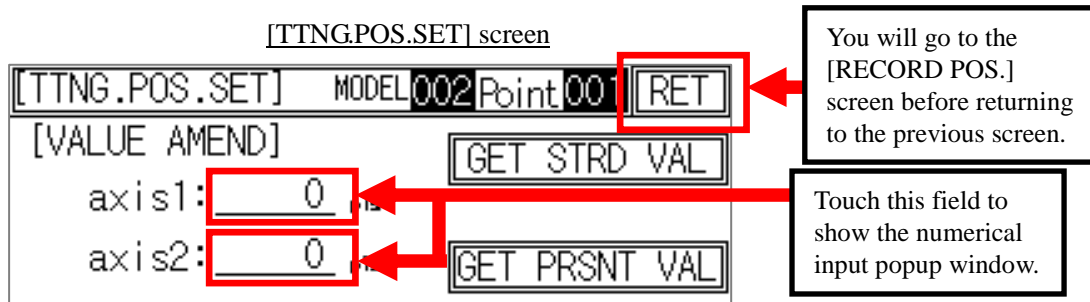
If you select [OK], the copy procedure is completed.



3. Description on functions

II. Numerical input teaching

- (i) Pressing the [SET] switch on the [TTNG.POS.] screen displays the [TTNG.POS.SET] screen as shown below. If you touch a number on this screen, a numerical input popup window appears. You can change the standard value directly by entering a desired value.
- (ii) If you select [YES] on the [RECORD POS.] screen, the changed value can be registered. You can go to the [RECORD POS.] screen by pressing the [RET] switch on the [TTNG.POS.SET] screen. If you select [NO], a changed value will be restored to the original value.



<Switches>

- [GET STRD VAL]
Pressing this switch reads a registered standard value.
This switch is used to restore the standard value to the original value that has been stored before registration, after a value is changed through numerical input, or by getting the current position data. (After the current value is registered, the standard value is overwritten, and it cannot be restored to the original value.)
- [GET PRSNT VAL]
Pressing this switch acquires the current value.
To enter the current pulse value, use this switch.
- [RET]
Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.3 Setup menu

This chapter describes the setup menu (for manager).

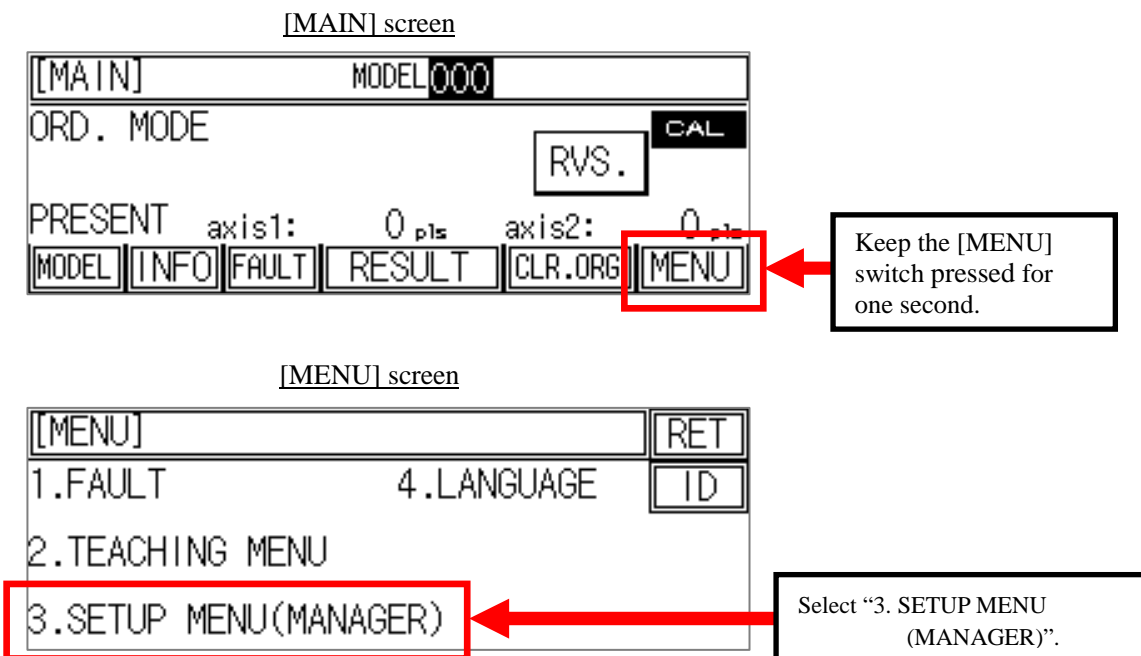
<Operation flow to [SETUP MENU] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

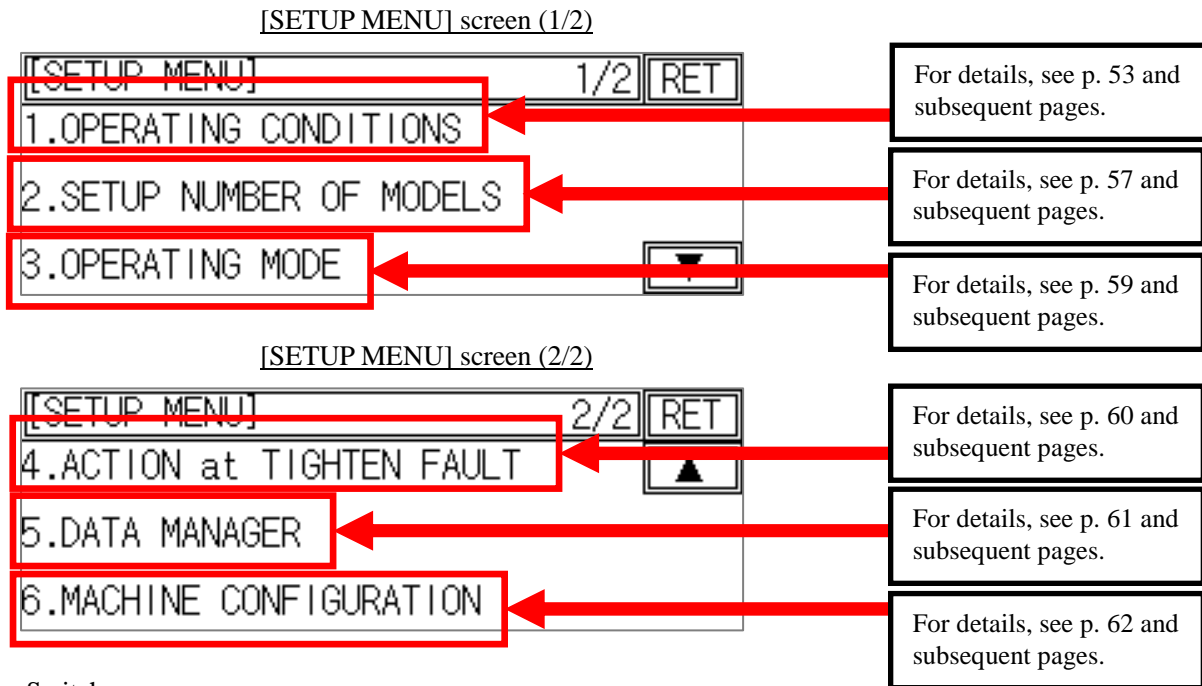
⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ The [SETUP MENU] screen appears.

The [SETUP MENU] screen displays switches to show each setting screen. You will go to each setting screen by selecting the switch for an item to be changed.



3. Description on functions



<Switches>

- [▼] [▲]

These switches are used to change the pages on the [SETUP MENU] screen.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

(REFERENCE)

- [ID]

This switch is located on the [MENU] screen, allowing you to enter an ID password.

However, it does not mean that you must use this switch when you enter a password, because the password entry window appears whenever ID password is required.

This switch is one option of the password entry methods.

The setting procedure on each setup screen is described below.

3. Description on functions

3.3.1 Operating condition setting function

This function enables you to set and change operating conditions.

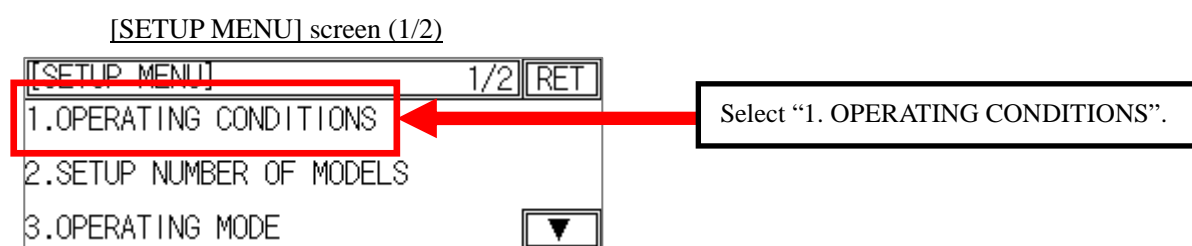
<Operation flow to [OPERATING CONDITIONS] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “1. OPERATING CONDITIONS” on the [SETUP MENU] screen (1/2).

⇒ The [OPERATING CONDITIONS] screen appears.



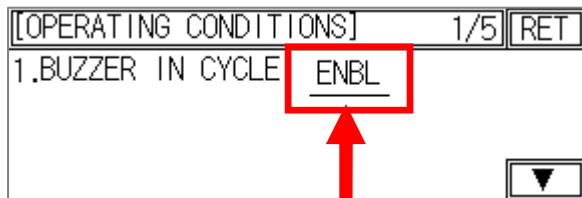
The setting procedure on the [OPERATING CONDITIONS] screen is described below.

3. Description on functions

This section describes operations and functions of the switches on the [OPERATING CONDITIONS] screen.

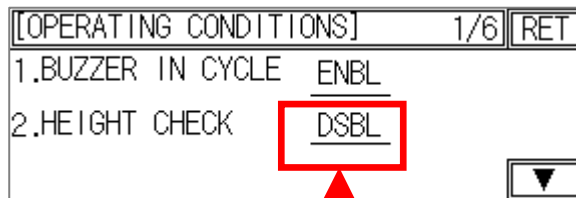
***Screen number, item number and item contents are different in '2-axes type' and '3-axes type'.**

2-axes type[OPERATING CONDITIONS]screen(1)



This switch is used to specify whether to enable or disable the buzzer.

3-axes type[OPERATING CONDITIONS]screen(1)



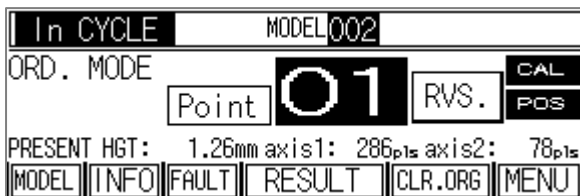
This switch is used to specify whether to enable or disable the height check.

1. BUZZER IN CYCLE: You can specify whether to enable or disable the buzzer (tightening OK/NG buzzer) during cycle operation.

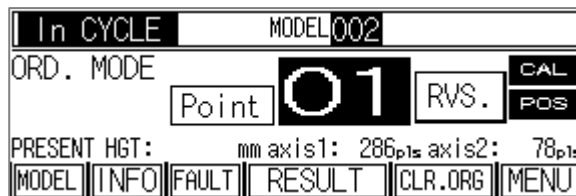
2. HEIGHT CHECK: *** 3-Axes type only**

You can specify whether to enable or disable the buzzer (tightening OK/NG buzzer) during cycle operation.

3-axes type[HEIGHT CHECK 'ENABL']



3-axes type[HEIGHT CHECK 'ENABL']

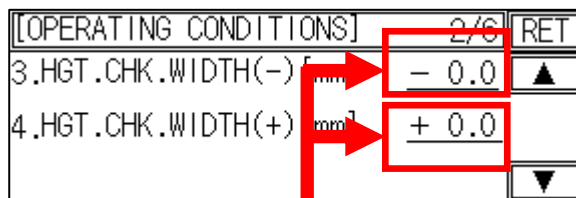


***Note: Height value is displayed in 'In CYCLE' status only.**

2-axes type -----

* There is no equivalent content that corresponds to the right screen in 2-axes type.

3-axes type[OPERATING CONDITIONS]screen(2)



Touch this field to show the numerical input popup window.

3. POS. CHK WIDTH (-)[pls]: *** 3-Axes type only**

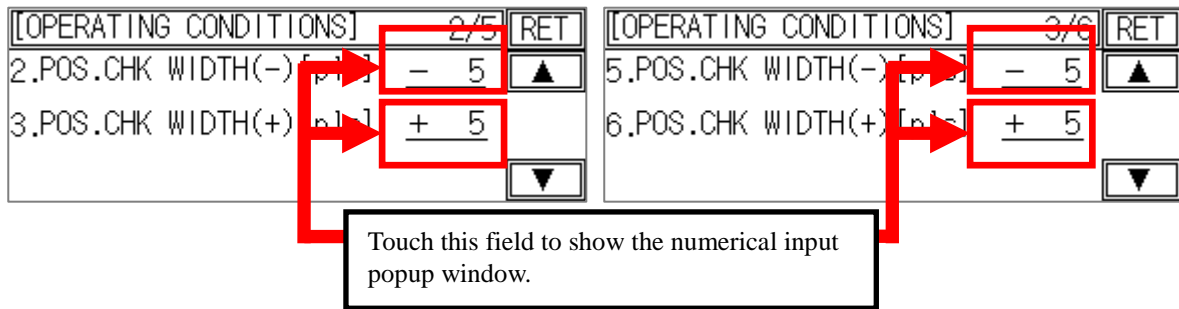
4. POS. CHK WIDTH (+)[pls]: *** 3-Axes type only**

Set a height check width ("-" and "+" side).

These parameters are used when '2. HEIGHT CHECK' is 'Enable(ENBL)' in above.

3. Description on functions

2-axes type[OPERATING CONDITIONS]screen(2) 3-axes type[OPERATING CONDITIONS]screen(3)



2.(5. in 3-Axes type) POS. CHK WIDTH (-)[pls]:

3.(6. in 3-Axes type) POS. CHK WIDTH (+)[pls]:

These are check width of the tightening position. If there is this within tolerance position, tightening is possible. Set the value for "-" side and "+" side. *1

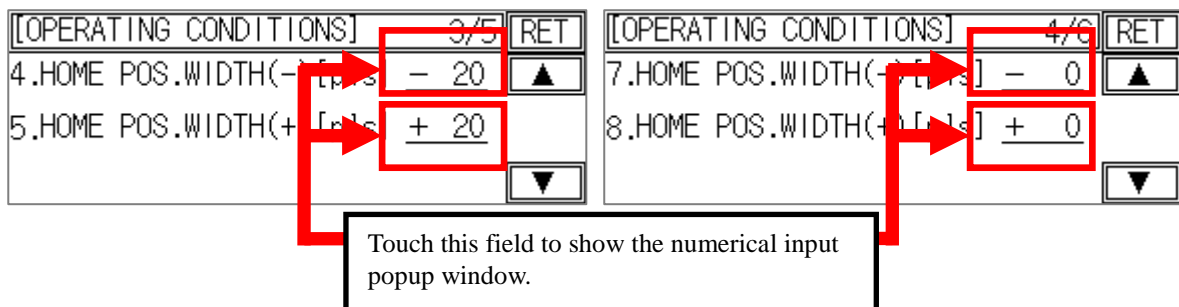
*1: Normally, set the same value for both "-" side and "+" side.

(REFERENCE) [V type]: When the arm is extended straight, 1 [pls] = 0.18° (on both 1st and 2nd axes).

Tool tip: 1 [pls] = 3.3 mm

[T type]: 1st axis (Rotary axis): 1 [pls] = 0.2°, 2nd axis (Horizontally movable axis): 1 [pls] = 1 mm, Tool tip: 1 [pls] = 1.15 mm

2-axes type[OPERATING CONDITIONS]screen(3) 3-axes type[OPERATING CONDITIONS]screen(4)



4. (7. in 3-Axes type) HOME POS. WIDTH (-)[pls]:

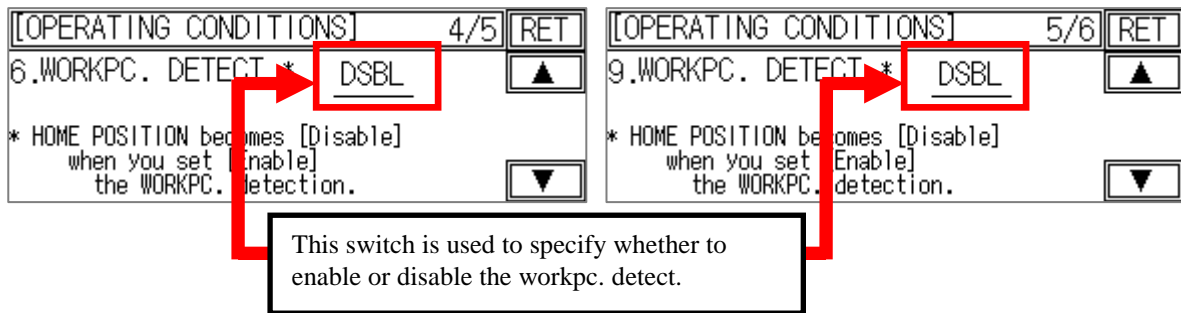
5. (8. in 3-Axes type) HOME POS. WIDTH (+)[pls]:

These are check width of the home position. Set the value for "-" side and "+" side. *2

*2: Normally, set the same value for both "+" side and "-" side.

3. Description on functions

2-axes type[OPERATING CONDITIONS]screen(4) 3-axes type[OPERATING CONDITIONS]screen(5)



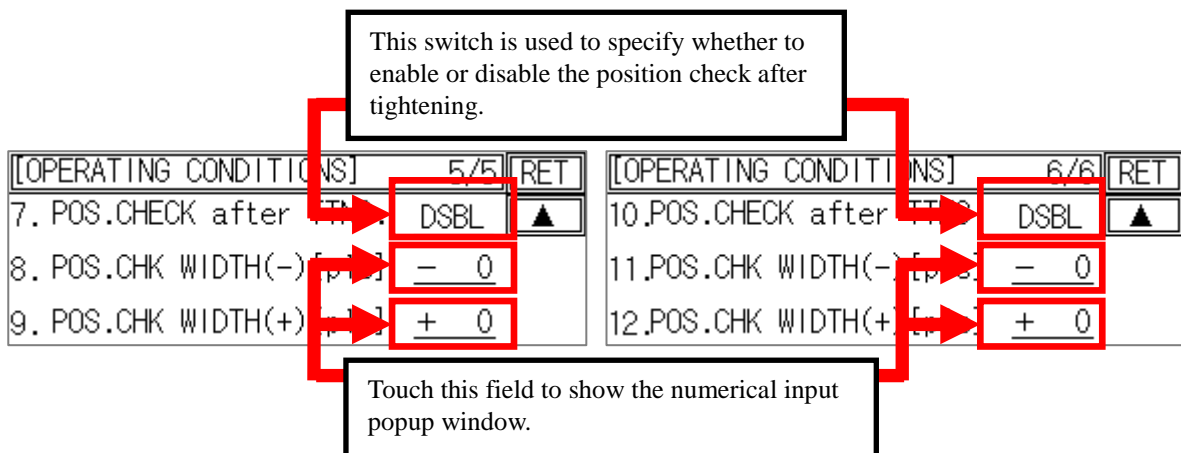
6. (9. in 3-Axes type) WORKPC. DETECT:

Specify whether to use the workpiece detection sensor, or not.

If you intend to use the workpiece detection sensor, set this item to "ENBL". If you intend not to use the workpiece detection sensor, set this item to "DISABLE".

Note: To use the workpiece detection sensor, a sensor of "DARK-ON" type must be connected to the X20 terminal of the PLC in HC100. If "LIGHT-ON" type sensor is used, a sequence change is required.

2-axes type[OPERATING CONDITIONS]screen(5) 3-axes type[OPERATING CONDITIONS]screen(6)



7. (10. in 3-Axes type) POS. CHECK after TGHT:

Specify whether to verify that the work position is not displaced from the teaching position after completion of tightening. If you intend to execute the position check, set this item to "ENBL". If you intend not to execute the position check, set this item to "DSBL".

8. (11. in 3-Axes type) POS. CHK WIDTH (-)[pls]:

9. (12. in 3-Axes type) POS. CHK WIDTH (+)[pls]:

These are check width of the after tightening. Set the value for "-" side and "+" side. *3

*3: Normally, set the same value for both "-" side and "+" side.

<Switches>

- [▼] [▲]

These switches are used to change the pages on the [OPERATING CONDITIONS] screen.

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.3.2 Number of models registration setting function

This function allows you to change the number of models that can be registered in HC100.

<NOTE> Once the number of models registration is changed and registered, all tightening point data that have been registered in previous teaching will be cleared.

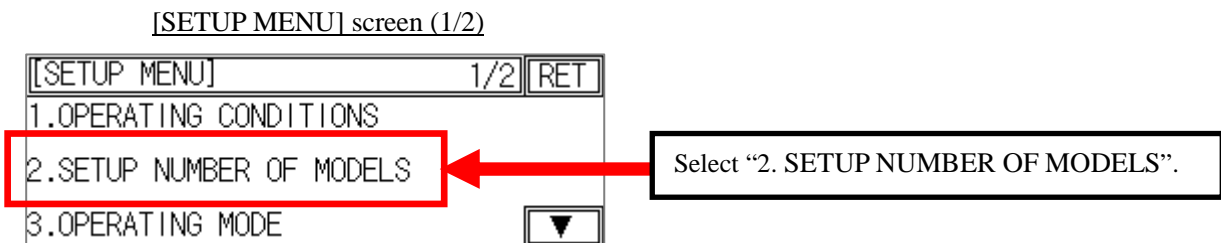
<Operation flow to [SETUP NUMBER OF MODELS] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

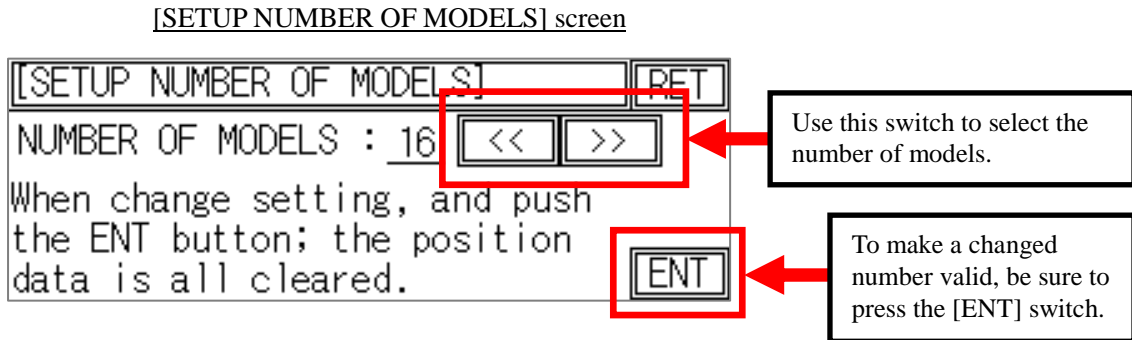
⇒ Select “3. SETUP NUMBER OF MODELS” on the [SETUP MENU] screen (1/2).

⇒ The [SETUP NUMBER OF MODELS] screen appears.



3. Description on functions

This section describes operations and functions of the switches on the [SETUP NUMBER OF MODELS] screen.



- On the [SETUP NUMBER OF MODELS] screen, select the number of models that can be registered. Change the number of models with the [<<] or [>>] buttons, and press the [ENT] switch to register the number of models setting.

Note: In this step, all tightening point point data will be cleared (all data that have been registered in previous teaching will be deleted).

- Selectable number of models, and corresponding numbers of points
The number of models can be selected from four options (16, 32, 48 and 64). The corresponding numbers of points per model are 50, 25, 16 and 12, respectively.
The selectable number of models and corresponding number of points are listed below.

Selectable number of models	16	32	48	64
Maximum number of points that can be registered	50	25	16	12

<Switches>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

- [<<] [>>]

These switches are used to select the number of models to be registered from four options (16, 32, 48 and 64).

- [ENT]

Press this switch to register the number of models selected with [<<] or [>>].

Note that, once the number of models is changed and registered, all tightening point point data that have been registered in previous teaching will be cleared.

3. Description on functions

3.3.3 Operating mode selecting function

This function allows you to change the operating mode.

<Operation flow to [OPERATING MODE SELECT] screen>

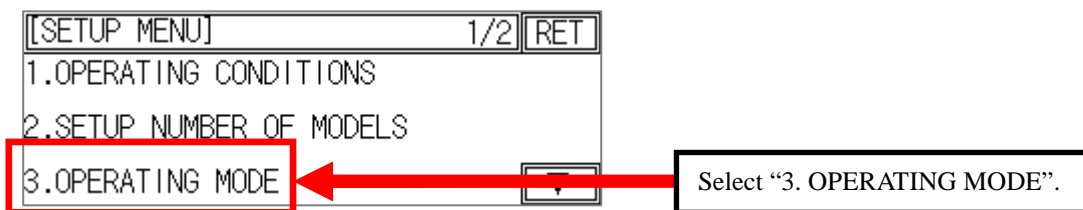
Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “3. OPERATING MODE” on the [SETUP MENU] screen (2/2).

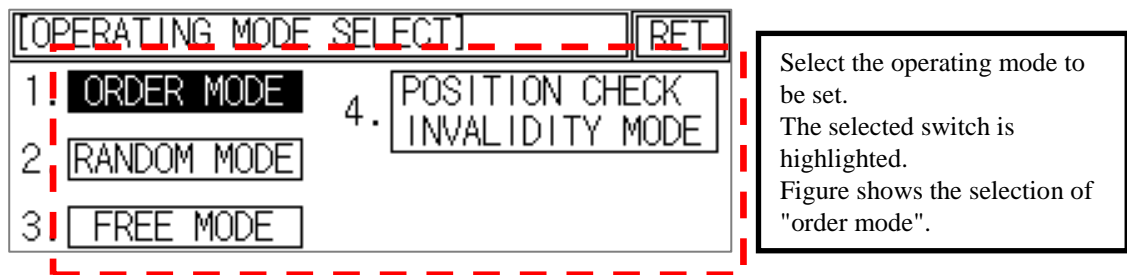
⇒ The [OPERATING MODE SELECT] screen appears.

[SETUP MENU] screen (2/2)



This section describes operations and functions of the switches on the [OPERATING MODE SELECT] screen.

[OPERATING MODE SELECT] screen



Select one of the four operating modes (1 to 4). Description on each mode is as follows:

- | | |
|------------------------------------|---|
| 1. ORDER MODE: | Executes tightening work according to the order of teaching data. |
| 2. RANDOM MODE: | Executes tightening work regardless of the order of teaching data. |
| 3. FREE MODE: | Executes tightening work at any positions registered in teaching data as many times as required. |
| 4. POSITION CHECK INVALIDITY MODE: | Disables position check, and executes tightening (loosening) work regardless of registered positions. |

Note 1) If the above “1” or “2” is selected, a point that has been tightened once (tightening result: OK) cannot be re-tightened in the same cycle. You can see the cycle status (cycle in progress, or completed) by checking if the “In CYCLE” indication is shown or not.

Note 2) If “3” is selected, the driver is kept running. To end a cycle, keep the [MENU] switch pressed to stop the cycle forcibly.

<Switch>

- [RET] : Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.3.4 Changing action at tightening fault

This function allows you to change the action at occurrence of a tightening fault.

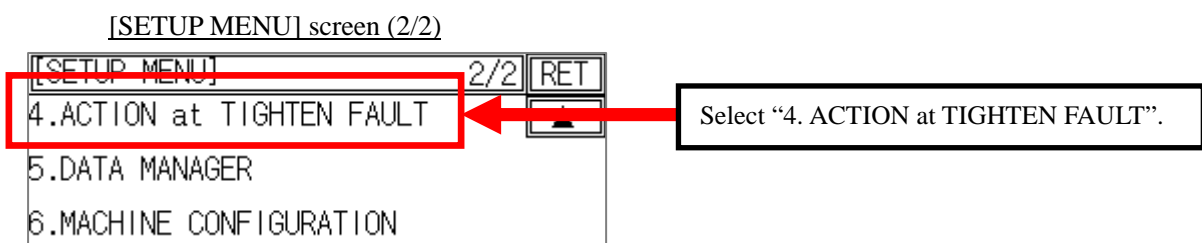
<Operation flow to [ACTION FASTENING FAULT] screen>

Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

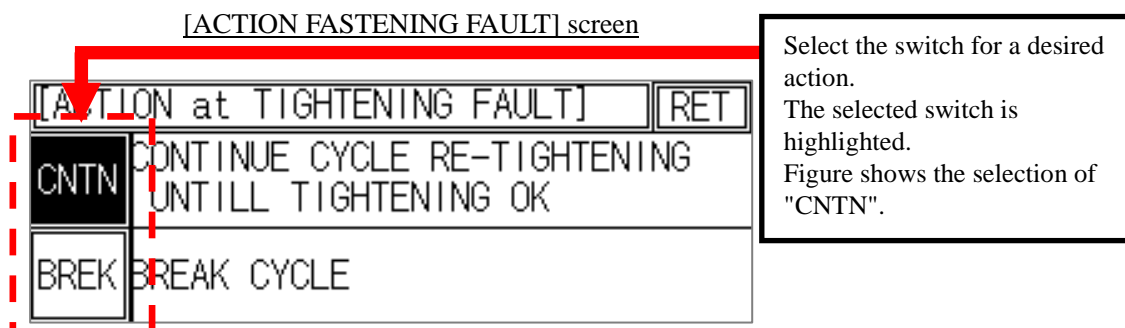
⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “5. ACTION at TIGHTEN FAULT” on the [SETUP MENU] screen (2/2).

⇒ The [ACTION FASTENING FAULT] screen appears.



This section describes operations and functions of the switches on the [ACTION FASTENING FAULT] screen.



- Select one of the two options (“CNTN” or “BREK”). Description on each processing is as follows:
- CNTN: .. Outputs a fault signal when a tightening fault occurs. Tightening work can be executed repeatedly at the current point until tightening at that point is judged OK.
- BREK**: Outputs a fault signal when a tightening fault occurs, and forcedly ends the current cycle.

**Note : It is not interrupted in 'FREE MODE' and 'POSITION CHECK INVALIDITY MODE'.

<Switch>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.3.5 Data management function

This function is used for data management, allowing you to delete all tightening point data.

<Operation flow to [CLEAR ALL POS. DATA] screen>

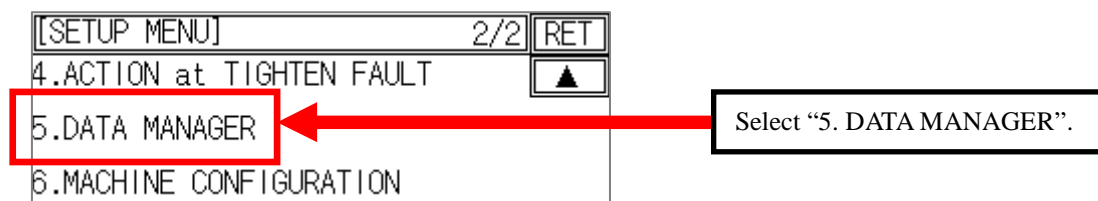
Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “6. DATA MANAGER” on the [SETUP MENU] screen (2/2).

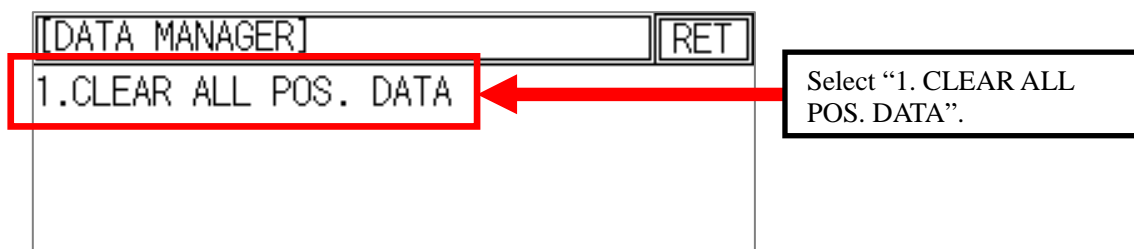
⇒ The [DATA MANAGER] screen appears.

[SETUP MENU] screen (2/2)

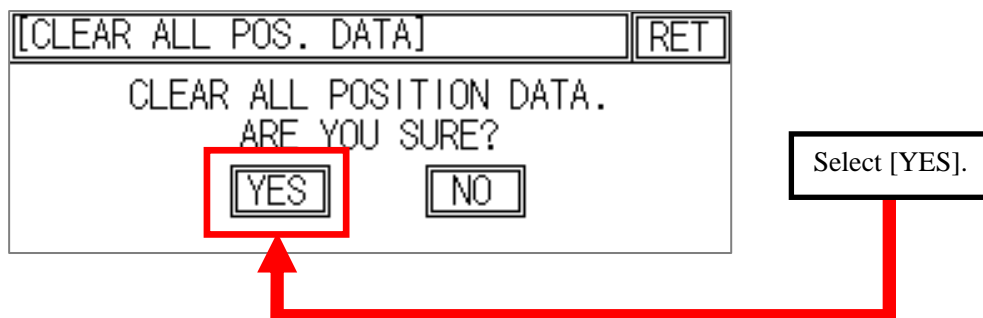


This section describes operations and functions of the switches on the [DATA MANAGER] screen.

[DATA MANAGER] screen



[CLEAR ALL POS. DATA] screen



- If you select “1. CLEAR ALL POS. DATA” on the [DATA MANAGER] screen, the [CLEAR ALL POS. DATA] screen appears. If you select [YES] on the [CLEAR ALL POS. DATA] screen, all tightening point data (all data that have been registered in previous teaching) will be cleared (deleted).

<Switch>

- [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.3.6 Machine configuration function

This function is used for machine configuration.

<Operation flow to [MACHINE CONFIGURATION] screen>

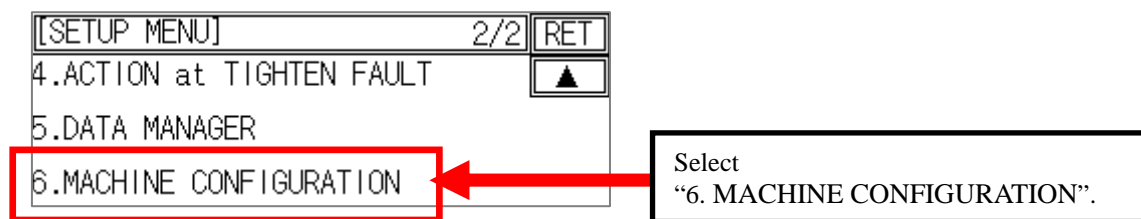
Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. SETUP MENU (MANAGER)” on the [MENU] screen, and enter “100” for a password in the password window displayed on the screen.

⇒ Select “6. MACHINE CONFIGURATION” on the [SETUP MENU] screen (2/2).

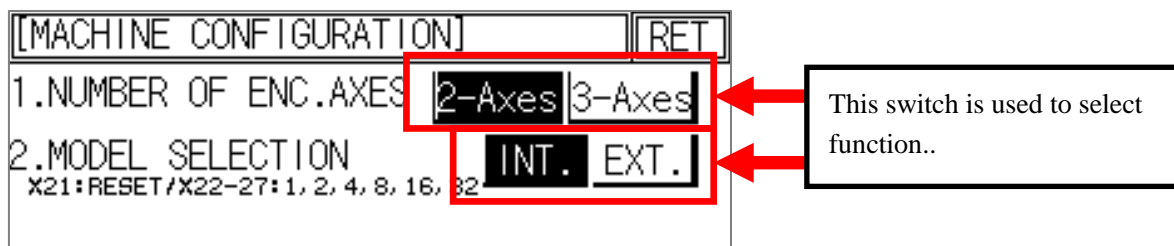
⇒ The [MACHINE CONFIGURATION] screen appears.

[SETUP MENU] screen (2/2)



This section describes operations and functions of the switches on the [MACHINE CONFIGURATION] screen.

[MACHINE CONFIGURATION] screen



1.NUMBER OF ENC.AXES:

Set the number of encoder axes. The selected switch is highlighted.

Note: Please do not change unnecessarily.

When you have changed the number of encoder axis, please check the origin and check the teach points.

2.MODEL SELECTION

Switch the model selection to internal or external. The selected switch is highlighted.

When model selection is set to external, it is not possible to select the model by touch panel,

And also, at the same time, external reset(input X021) will be enabled.

<Switch>

• [RET]

Pressing this switch allows you to return to the screen immediately before the current screen.

3. Description on functions

3.4 Language selection function

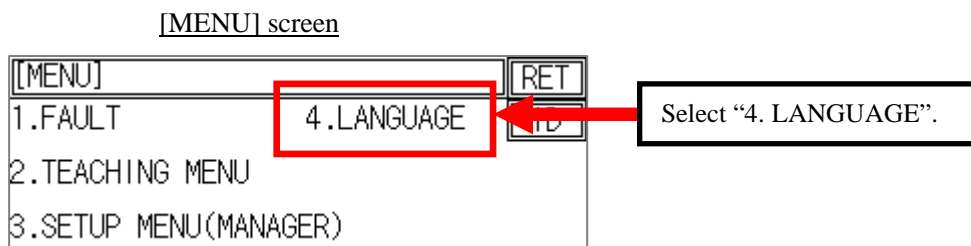
This chapter describes functions of language selection of the touch panel display.

<Operation flow to [CLEAR ALL POS. DATA] screen>

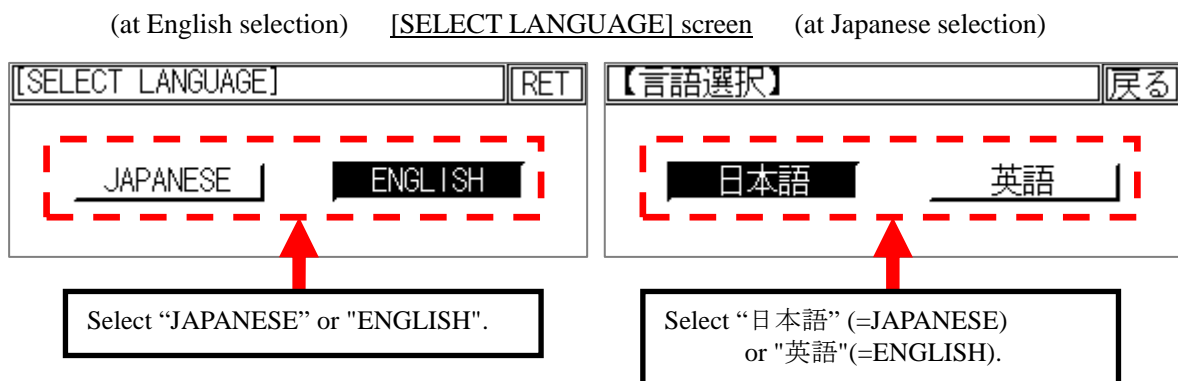
Keep the [MENU] switch on the [MAIN] screen pressed for one second, to show the [MENU] screen.

⇒ Select “3. LANGUAGE” on the [MENU] screen.

⇒ The [SELECT LANGUAGE] screen appears.



This section describes operations and functions of the switches on the [SELECT LANGUAGE] screen.



Note : The selected switch is highlighted.

And, the system language of the touch panel is also linked, and switched together.

3. Description on functions

3.5 External input/output signals

This chapter describes the external input/output signals.

- External I/O signals other than a screwdriver have the following signal.
Please use it appropriately as needed.

(1) External input signals

I/O address	Signal name	Detail
X020	WORKPIECE DETECTION	The signal must be turned on when the parts are placed correctly. (Sensor is options.) * This signal is used when "WORKPC. DETECT" is set as"ENBL" by a touch panel.
X021	EXTERNAL RESET	One fault is reset by ON. It cannot reset, when the fault cause remains. * This signal is used when "MODEL SELECTION" is set as"EXT." by a touch panel. Also,Reset of all the faults is also possible at ON. (It is specification necessity at the time of order)
X022-027	EXTERNAL MODEL SEELCT	Model selection is made at the time of an automatic 1-cycle operation start. * This signal is used when "MODEL SELECTION" is set as"EXT." by a touch panel. Model weight: X022-X027=1, 2, 4, 8, 16, 32. The table of next page is an example of model selection. (●:ON, -:OFF)

Model No.	X022	X023	X024	X025	X026	X027
0	-	-	-	-	-	-
1	●	-	-	-	-	-
2	-	●	-	-	-	-
3	●	●	-	-	-	-
4	-	-	●	-	-	-
5	●	-	●	-	-	-
6	-	●	●	-	-	-
7	●	●	●	-	-	-
8	-	-	-	●	-	-
9	●	-	-	●	-	-
...						
15	●	●	●	●	-	-
16	-	-	-	-	●	-
17	●	-	-	-	●	-
...						
31	●	●	●	●	●	-
32	-	-	-	-	-	●
33	●	-	-	-	-	●
...						
62	-	●	●	●	●	●
63	●	●	●	●	●	●

3. Description on functions

(2) External output signals

I/O address	Signal name	Detail
Y014	HOME POSITION	This signal will be turned ON while the screwdriver is placed in the home position. (It does not turn ON in the state of origin calibration incomplete.) <u>**Note : It does not turn ON when workpiece detection is enabled.</u>
Y015	COMPLETED	This signal will be turned ON when cycle is completed. And this signal will be turned OFF when it is in home position(or when a workpiece is taken out; when"WORKPC.DETECT" is set as"ENBL").
Y016	NG	This signal will be turned ON while the tightening related fault is occurred. Tightening related fault: · TIGHTENING TORQUE FAULT · TORQUE WAVEFORM FAULT · TIGHTENING ANGLE FAULT · POS.CHECK FAULT AFTER TIGHTENING · TIGHTENING HEIGHT FAULT(* 3-Axes type only) And, this signal will be turn OFF at the start tightening, or fault reset operation.
Y017	COMPREHENSIVE ABNORMAL	This signal is turned while the any abnormal(fault) is occurred. If this signal is tightening related abnormal(fault), timing of OFF is same to the above Y016. If this signal is non-tightening related abnormal(fault), this signal will be turn OFF when a fault reset operation after having removed the fault cause.

Revision history

<Revision history>

May. 2009	First edition	HC100 Ver.1.00:HC100-0001
Nov. 2009	Partially revised	HC100 Ver.1.01 TIGHTENING CONDITIONS is deleted.:HC100-0002
Aug. 2010	Partially revised	HC100 Ver.1.01 The model of the touch panel and the sequencer is changed. Specification of HC100 is arranged.:HC100-0003
Oct. 2014	Partially revised	HC100 Ver.1.10 Added the language switching function, Added the 3-axes type description, And other corrections.:HC100-0004
Nov. 2014	Partially revised	HC100 Ver.1.20 Added the machine configuration function. :HC100-0005
Nov. 2014	Partially revised	HC100 Ver.1.21 Added the external input/output signals description.:HC100-0006
Nov. 2014	Partially revised	HC100 Ver.1.21a A screen display of touch panel are corrected in part.:HC100-0006a
Dec. 2017	Partially revised	HC100 Ver.1.21b Added supplement for BRAK mode / HOME POSITION signal.:HC100-0006b

**Control Box for Arm Driver
with Position Check Function
<HC100>**

**OPERATION MANUAL
Ver. 1.21b
(For System Ver. 4.00a)**

**NITTO SEIKO CO., LTD.
Machinery Division**

<http://www.nittoseiko.co.jp/>

Machinery Division: Shiroyama-cho 2, Ayabe, Kyoto 623-0003, Japan
Telephone: 81(773) 43-1550
Facsimile: 81(773) 43-1553

Kita-Kanto office: Yoshida 1221-3, Ohizumi-cyo, Oura-gun, Gunma 370-0523, Japan
Telephone: 81(276) 63-8158
Facsimile: 81(276) 63-8480

Tokyo branch office: Tsunashima-higashi 6-2-21, Kohoku-ku, Yokohama 223-0052, Japan
Telephone: 81(45) 546-4744
Facsimile: 81(45) 542-6449

Nagoya branch office: Kamiyashiro 5-405, Meito-ku, Nagoya 465-0025, Japan
Telephone: 81(52) 709-5063
Facsimile: 81(52) 709-5065

Foreign Trade Dept.: Inokura-cho umegahata 20, Ayabe, Kyoto 623-0054, Japan
Telephone: 81(773) 43-0290
Facsimile: 81(773) 42-5571

● For improvement in performance, specifications may be modified without notice.