MULTI-SPINDLE AUTOMATIC
SCREWDRIVING MACHINW

FEEDMAT® FM5000

Instruction Manual

FM5000C
FM5000V

— Machinery Division —

NITTO SEIKO CO., LTD.

Preface

We appreciate for your purchasing our multi-spindle automatic screwdriving machine model FM5000. Please read this instruction manual carefully so that you will operate this machine correctly for proper and safety operation.

Instruction manual for respective unit

This machine consists of several units. Refer to the other instruction manuals accompanied with this volume as below.

- Instruction manual for screw feeder unit
- Instruction manual for driver unit
- Bill of materials and list of consumptive items for delivered machine
- Miscellaneous

Contents of instruction manual

FM5000 is a multi-spindle automatic screwdriving machine which flexibly covers various screw fastening purposes. As each part of this machine has been set most suitably to the requirements of screw fastening, purchased machine may slightly differ from the contents of this instruction manual.

Table of contents

1. For safety operation

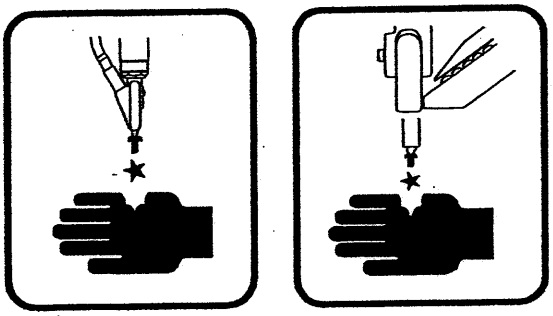
1.1 Warnings and notes

Please carefully read the contents of this paragraph "For safety operation" before use of this machine so that you will operate correctly and safe. As this volume may not cover the entire matters regarding safety operation, please remember that correct and proper decision made by the operator is the key to prevent danger.

⚠ Warning	This marking indicates that misuse may cause severe injury or death.

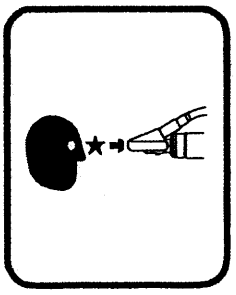
⚠ Note	This marking indicates that misuse may cause injury or material loss, or may cause malfunction of the machine.

⚠ Warning Screwdriving



Do not place hand under the screwdriving unit during operation. The bit or the screw may cause injury.

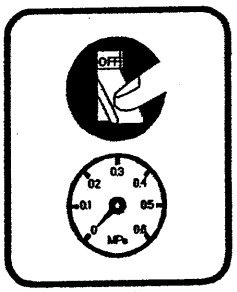
⚠ Warning Screw feeding



Do not look into the screw chucking unit from its front, or do not point it toward a person. It may cause a loss of eyesight, or injury.

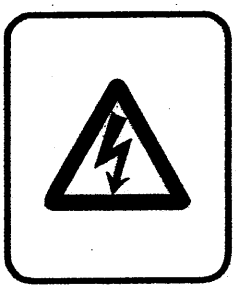
For safety operation

⚠ Warning Power source and compressed air supply



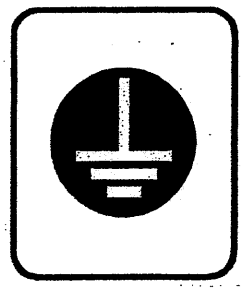
Both power source and compressed air supply must be shut off during machine readjustment, maintenance or inspection. If not, electric shock or injury may occur.

⚠ Warning Power source



Power source must be shut off during maintenance and inspection. If not, electric shock may occur.

⚠ Warning Grounding



A grounding of class 3 must be executed. If not, electric shock or malfunction may occur.

⚠ Warning Wiring work

All phases of power source must be shut off before installation or wiring work. If all phases are not shut off, electric shock or damage to the material may occur.

⚠ Warning Starting up and maintenance

Do not touch a live terminal. You may receive an electric shock, or malfunction may occur.

⚠ Warning After maintenance, inspection or readjustment

Tools used for maintenance, inspection or readjustment must be stored in tool box. If these tools are left on the machine or around it during operation, unexpected accident may occur.

⚠ Note After daily operation

After finishing daily operation, make sure to shut off power source and compressed air supply.

⚠ Note Suspension of operation for long time

Take a backup data of the controller before suspension of operation for long time.

⚠ Note Restarting after suspension of operation for long time

Carefully clean and inspect the machine before restarting after suspension of operation for long time. Confirm that there is no problem by trial operation before starting automatic operation.

2. Construction of multi-spindle Feedmat FM5000C and FM5000V

2.1.Construction of FM5000C

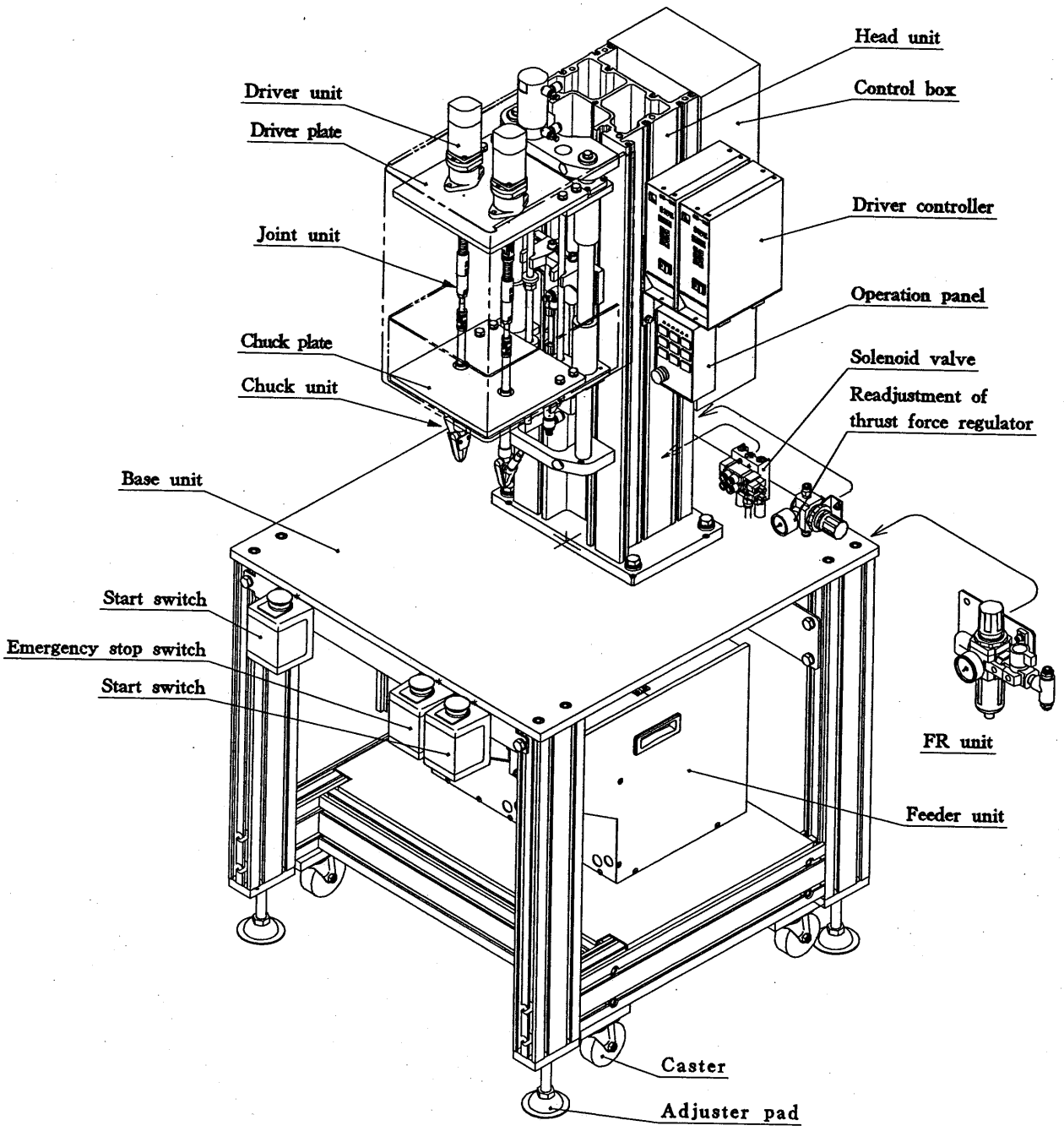


Figure shows 2 spindle model.

2.2.Construction of FM5000V

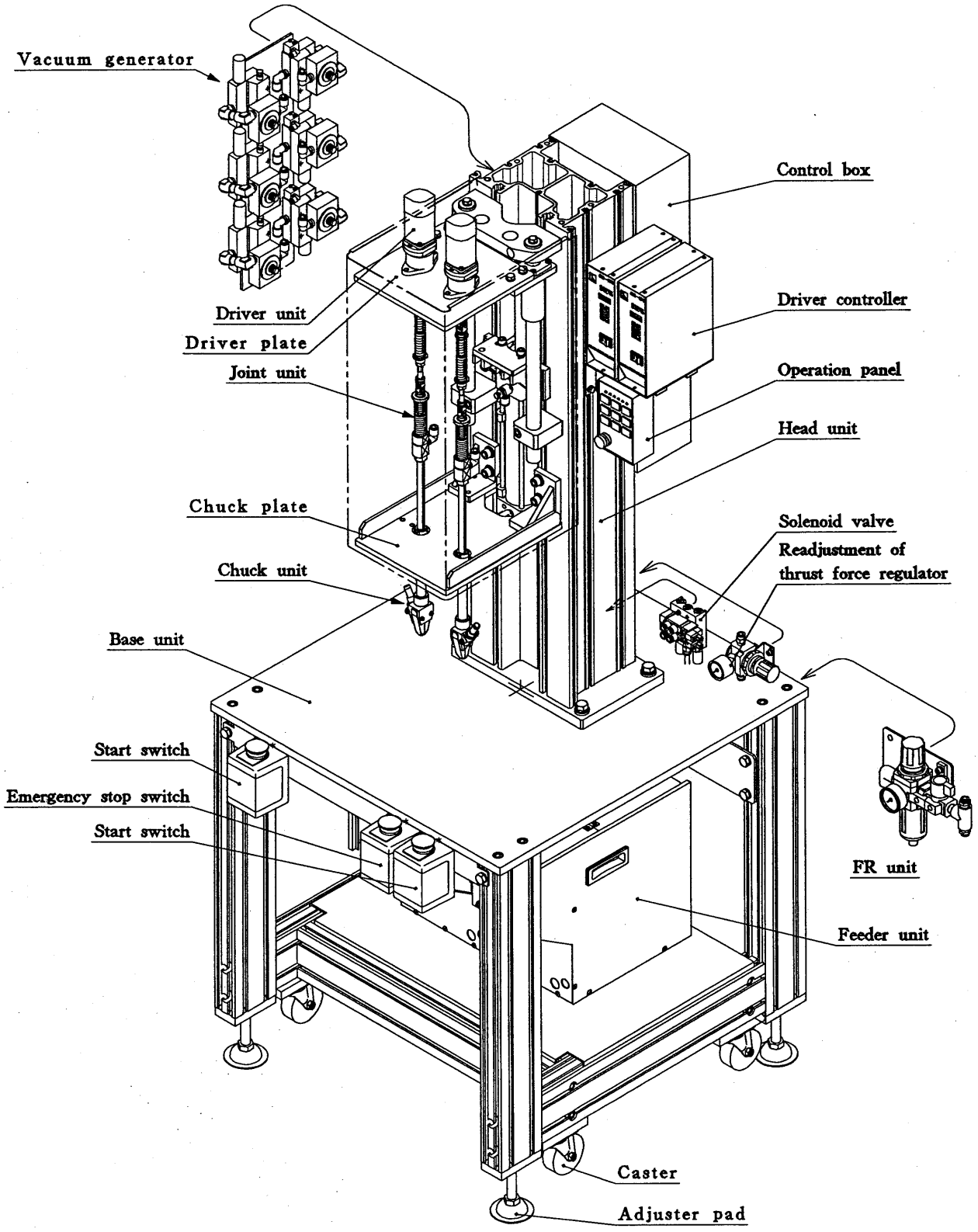


Figure shows 2 spindle model.

2.3. Specifications (standard specifications)

		FM5000C	FM5000V
No. of spindles		2 to 6	
Screw size	Diameter	2 to 5 mm	
	Length	25 mm maximum	
Driver		KX driver	
Fastening travel		50 or 100 mm	
Standard fastening area		Depth 160 mm x width 190 mm	
Screw retaining method		Mechanical retaining type	Vacuum retaining type
Power source (see note 1)		100 VAC ±10% 50 or 60 Hz	
Power source capacity		2 spindle: 1.1 kVA 4 spindle: 1.5 kVA 6 spindle: 1.9 kVA	
Compressed air pressure		0.4 to 0.5 Mpa	
Air consumption/cycle		2 spindle: 10 liters (ANR) 4 spindle: 16 liters (ANR) 6 spindle: 22 liters (ANR)	2 spindle: 18 liters (ANR) 4 spindle: 32 liters (ANR) 6 spindle: 46 liters (ANR)
Mass of machine		Approximately 250 kg (2 spindle model)	
Screw feeder model		FF502H	

Note 1: Refer to the specification sheet attached to the delivered machine for the detail of specifications.

Note 2: Power source capacity varies depending on fastening torque, driver model, etc.

Note 3: Air consumption per cycle varies depending on fastening method, machine installation, etc.

⚠ Warning

The table above shows standard specification while the power source requirement may vary depending on the machine.

3. Installation and preparation before use

3.1. Installation

For proper operation, environmental condition of this machine must satisfy the table below.

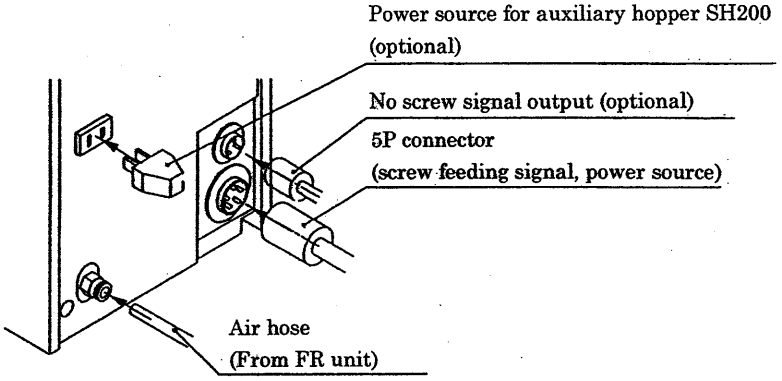
Temperature during operation	0℃ to +40℃
Humidity during operation	45 to 85 %RH
Vibration	No vibration permissible
Air around the machine	Free of dust or oil smoke No corrosive gas permissible
Electrical noise	Pulse width 1 sec., wave height 1000 V or less

Error may occur in the control circuit if the machine is installed under an environmental condition not satisfying the above, resulting in malfunction, and accident or machine breakage may occur. If the environmental condition is not good enough, protect the machine by proper means.

3.2. Preparation before use

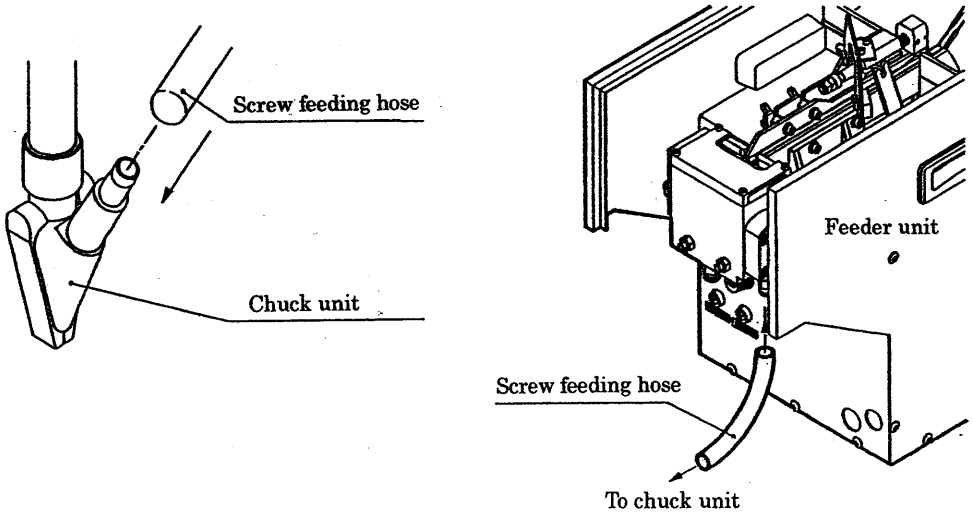
3.2.1. Connection of screw feeder unit

Connect the connector(s) and the air hose with the screwdriving machine.



3.2.2. Connection of screw feeding hoses

Connect the screw feeding hoses from the screw feeder to the chuck units.



The above illustration shows standard screw feeding hose.
Connection method varies depending on hose material.

3.2.3. Compressed air supply

Refer to the specifications and connect the compressed air supply hose from the plant air source to this machine so that proper capacity of air will be supplied. If supplied air capacity is not enough, trouble in screw feeding and screw dropping during fastening (in case of FM5000V: vacuum retaining type) may occur.

If air pressure excessively drops during operation, improve the air supply route.

3.2.4. Grounding

Grounding of class 3 or better must be executed.

3.2.5. Power source supply

Refer to the specifications and connect the power supply of enough capacity.

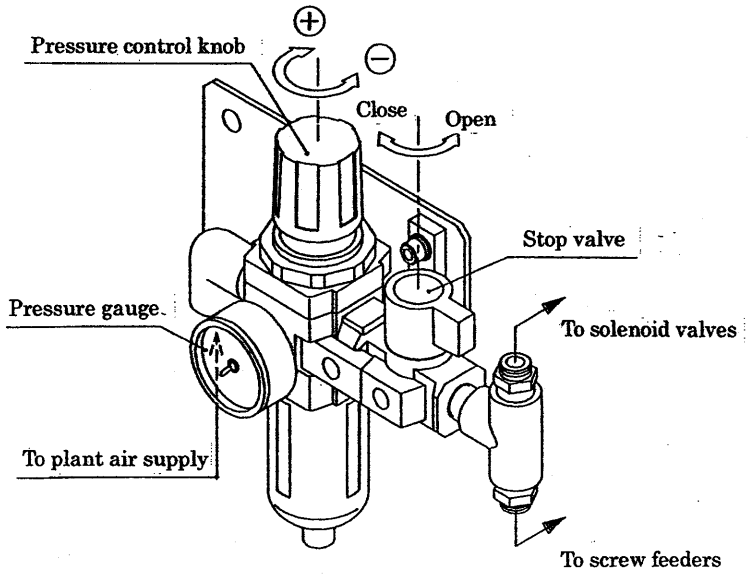
The standard power source voltage of FM5000 is 100VAC, however it may differ depending on the customers requirements. Make sure to confirm the correct power source specifications to connect.

If power source capacity is not enough, output power of the drivers is reduced causing improper screw fastening. If the cables for primary power supply are not big enough, the cables will be heated and may cause fire. Cables bigger than $2mm^2$ must be used for primary power supply. Required power source capacity may be larger than standard if; fastening spindles are many, non-standard drivers are used, or special peripheral devices are attached. If so, make sure to confirm the specifications of purchased machine and determine the power source capacity and the cable size.

⚠ Warning Make sure to confirm the power source specifications of the machine.

3.2.6. Air pressure adjustment

After connecting the plant air source, adjust the air pressure regulator so that the pressure gauge will indicate 0.4 to 0.5Mpa.



3.3. Preliminary operation

When preparation is completed, confirm power source connection, power source voltage, power source capacity, compressed air supply, etc. once again and execute preliminary operation.

3.3.1. Turning power on

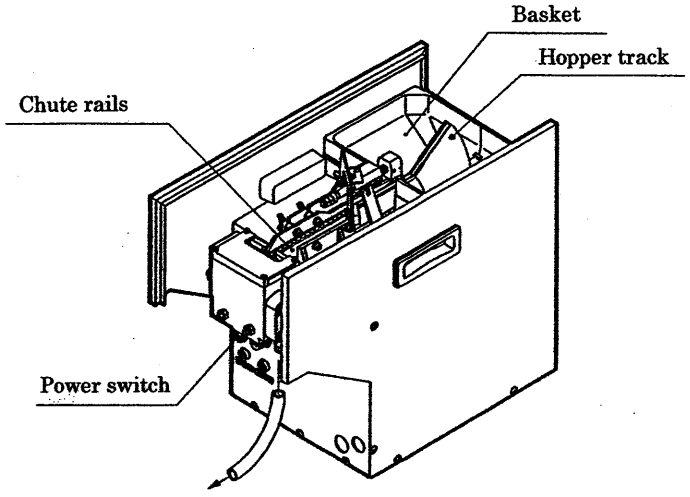
Turn on the no-fuse circuit breaker in the control panel.

3.3.2. Turning on master power

Press the master power button on the control panel.

3.3.3. Screws on the chute rails

Supply screws in the basket of the screw feeder and turn on the power switch. Confirm that screws are properly aligned on the chute rails.
(See the instruction manual for the screw feeder for the detail.)



3.3.4. Screw supply to the chuck units

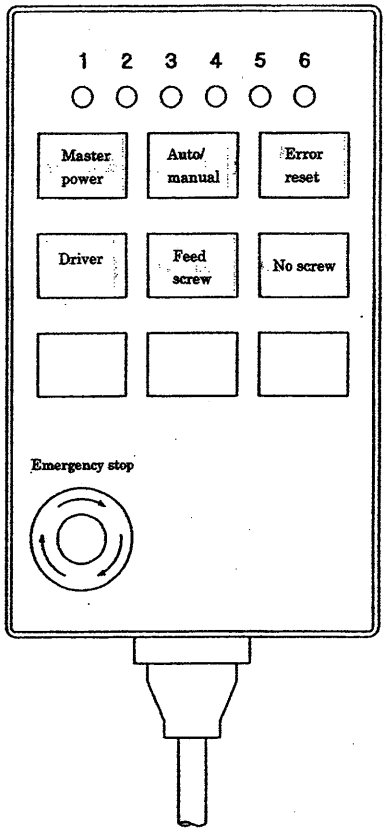
Press the screw feeding switch and confirm that screws are properly supplied to the chuck units. Repeat trial feeding removing supplied screws every time. The screw feeding has been adjusted before shipping, but if any improper feeding occurs, readjust referring the paragraph 5.4 "Readjustment of screw feeding".

3.3.5. Fastening torque

Execute automatic operation and check the fastening status and the fastening torque. When readjustment of the fastening torque is necessary, refer to the instruction manual for the driver.

4. Operation

4.1. Operation panel



[Master power] Push-button switch with built-in illumination lamp
When the button is pressed, the lamp lights indicating the control circuit is powered.

[Auto/Manual] Push-button switch with built-in illumination lamp
By pressing the button, either automatic operation mode or manual operation mode is selected alternatively. The lamp lights when automatic operation mode is selected.

[Error/Reset] Push-button switch with built-in illumination lamp
The lamp lights when an error as improper fastening, improper screw feeding (optional), excessive cycle time, etc. occurs.
Error alarm is cancelled by pressing the button. The switch can be operated during manual operation mode only.

[Driver] Manual push-button switch
By each pressing of the button, a sequence as head descending, driver revolving, driver stopping and head ascending occurs in this order.
The switch can be operated during manual operation mode only. No screw feeding occurs by this switch.

[Feed screw] Manual push-button switch
Screw feeding is executed by pressing the button. The switch can be operated during manual operation mode and the head has ascended.

[No screw] Indication lamp

The lamp lights when no screw signal is inputted from the screw feeder.

Supply screws when the lamp lights.

[Error 1—6] Indication lamps on the top of the operation panel

These are the error indication lamps of each spindle.

Improper fastening torque is indicated by continuous lighting while improper fastening height is indicated by blinking lamp (optional).

When improper screw feeding occurs, the lamp continuously lights also.

Error display is cancelled by resetting operation.

[Buzzer] The buzzer beeps when an error occurs.

Buzzer stops beeping by resetting operation.

[Emergency stop] Push-button switch

The control power is shut off and the machine stops operation when this switch is pressed. To restart, turn the button clockwise to release it, and press the master power button after confirming the machine status.

※ 3 push-button switches on the bottom of the operation panel are reserved for optional functions. These switches may be used for operation of peripheral devices.

4.2. Preparatory steps

Before starting actual operation, execute "Preparatory steps" as below.

① Confirm the machine status. Check that there is no danger. Make sure that necessary covers are attached and hoses are correctly connected. If anything unnecessary is left around the machine, remove it.

② Confirm the air pressure. The gauge must indicate 0.4 to 0.5Mpa/

③ Turn on the main circuit breaker.

④ Press the [Master power] button.
The [Master power] lamp lights indicating the machine can be operated.

Note: If power is not activated, check the emergency stop switch and optional peripheral devices (pressure switch, area sensor, door switch, etc.)

4.3. Automatic operation

When the above "Preparatory steps" is completed, start automatic operation.

① Select automatic operation mode.

② Load a workpiece.

③ One cycle of automatic operation starts when dual palm buttons are pressed.

④ Unload the workpiece after one cycle operation is completed.

⑤ Repeat above steps from ② to ④.

4.4. Manual operation

To manually operate each function of the screwdriving machine, select manual operation mode and press respective push-button switch.

4.5. Recovery from trouble

When an error occurs, depending on the error, the machine immediately stops or stops after finishing one cycle.

[Improper fastening] →Stops after finishing one cycle

"Low torque (thread breakage)" "Improper screw height (optional) "

[Other error] →Stops immediately

"Excessive cycle time" "Emergency stop"

"Improper screw feeding (optional) "

After confirming the error contents, cancel the error alarm by pressing the [Reset] switch. To restart, make sure to remove the cause of the error.

⚠ Warning

If the machine will not retract to home position by switch operation, inspect the cause of error after shutting off power source and compressed air supply.

※ Immediate stop: Entire operation stops when an error occurs.

※ Cycle stop: When an error occurs, operation stops after one cycle is completed.

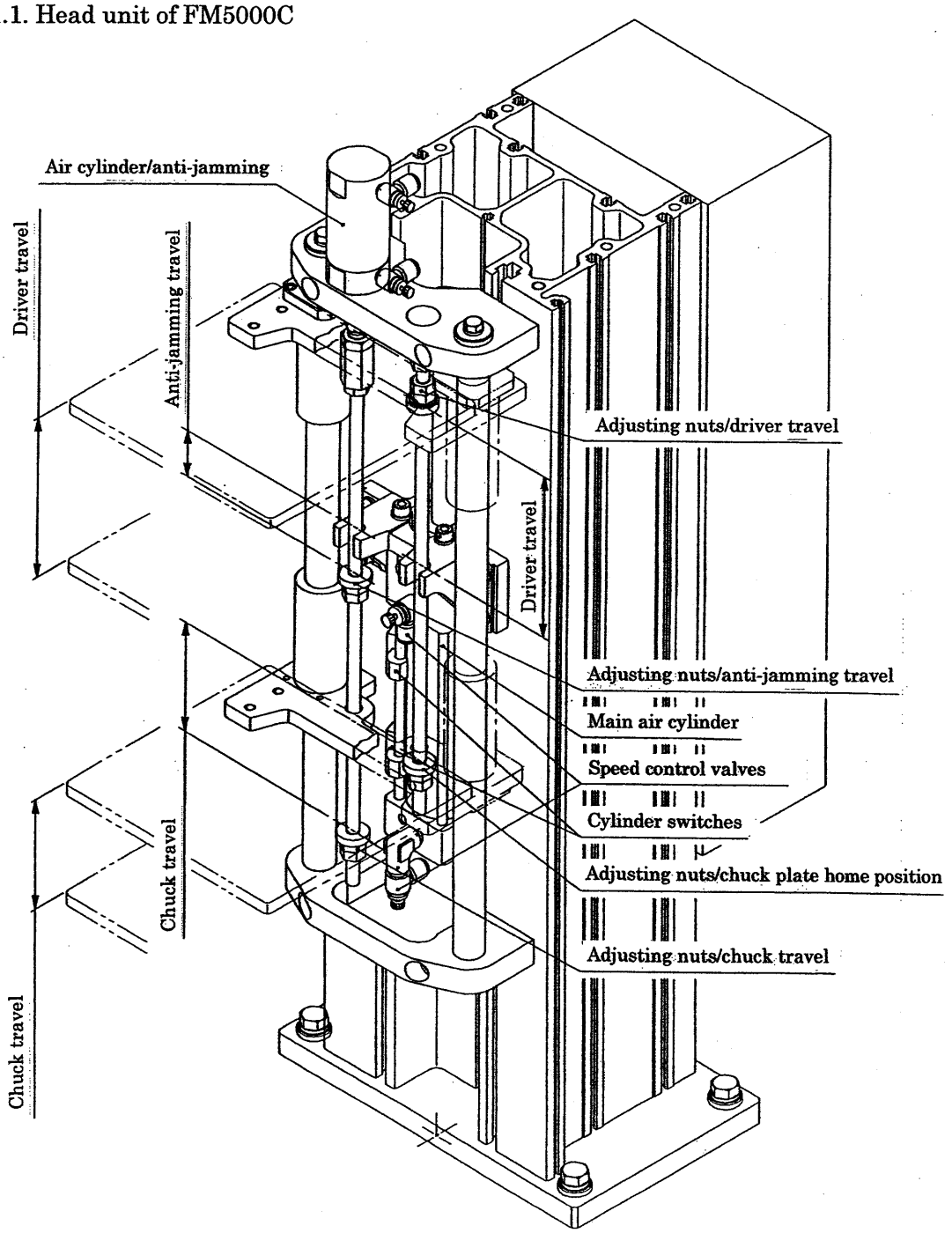
5. Adjustment

Various assembly of joint units and chuck units are used for FM5000 depending on screws and workpieces. The main part of screwdriving machine contains various setting of dimensions and travels depending on each construction element. Therefore, if a large scale modification is necessary, it requires a lot of information. This volume will explain items needed for maintenance only.

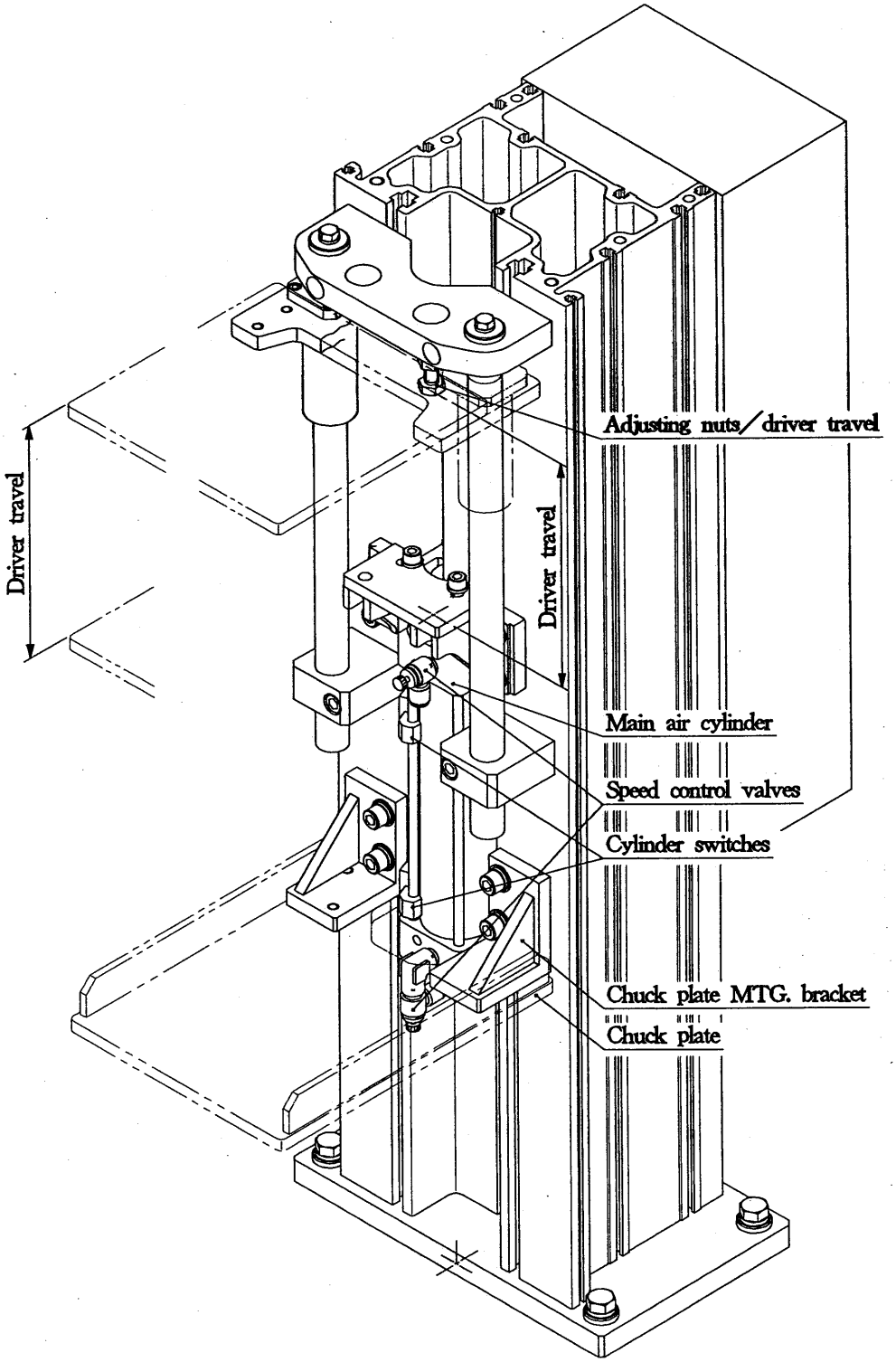
> ⚠ **Warning** To touch the machine moving part, make sure to shut off power source and compressed air supply.

5.1. Head unit

5.1.1. Head unit of FM5000C



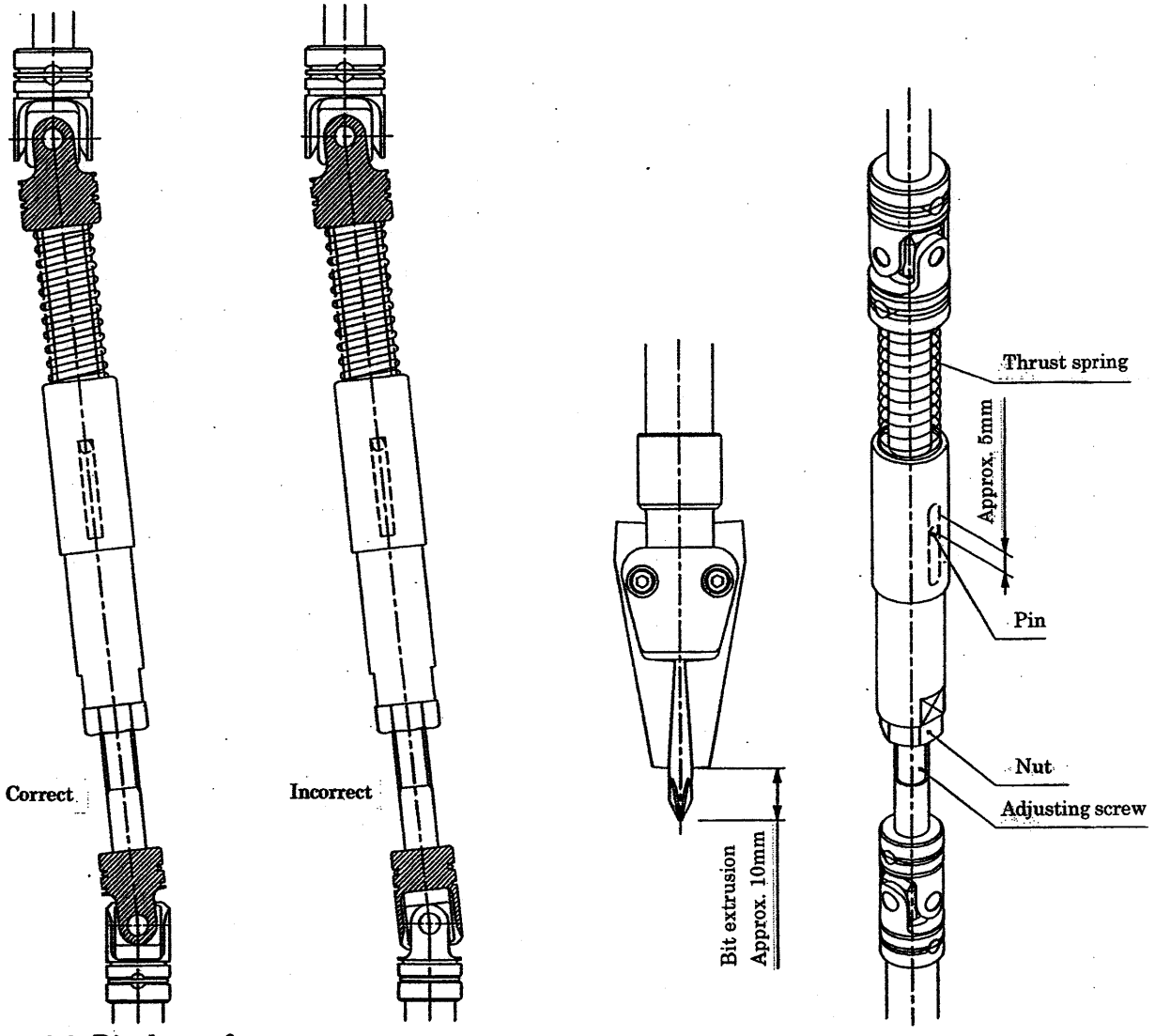
5.1.2.Head unit of FM5000V



5.2. Joint unit of FM5000C (mechanical screw retaining type)

5.2.1. Bit extrusion

If "Bit extrusion" from the end of chuck unit is not long enough, proper fastening cannot be executed. It will cause damaged cross-recess of screw head, or improper screw height. When necessary, readjust the adjusting screw of the joint unit to obtain proper bit extrusion. When readjusting, align two universal joints correctly as illustrated.



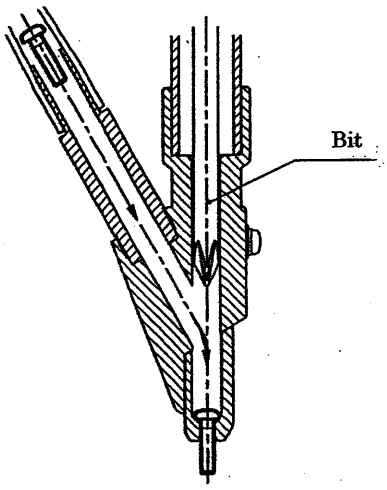
5.2.2. Bit thrust force

If bit thrust force is not enough, bit end may be ejected from the cross-recess of screw head (cam-out), causing damaged screw head. To confirm, load a workpiece to which screws are already driven on the fixture. Then, shut off air source and manually descend the driver head. When the driver head fully descends, check whether the thrust spring is properly compressed or not. If not, readjust in the same way as above paragraph. Amount of spring compression can be confirmed by looking the pin inside the slot of the joint. Thrust force required for proper screw fastening varies depending on shape of screw (cross-recess, hex, etc.), screw diameter and fastening torque.

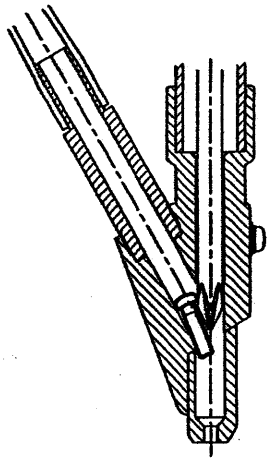
5.2.3. Bit end in the chuck unit

Screws are fed when the driver head fully ascends (home position). If positional relationship between bit and chuck unit is improper, bit may obstacle screw feeding. If so, the chuck plate must be lowered by lowering the adjusting nuts of the hanging rod as illustrated below.

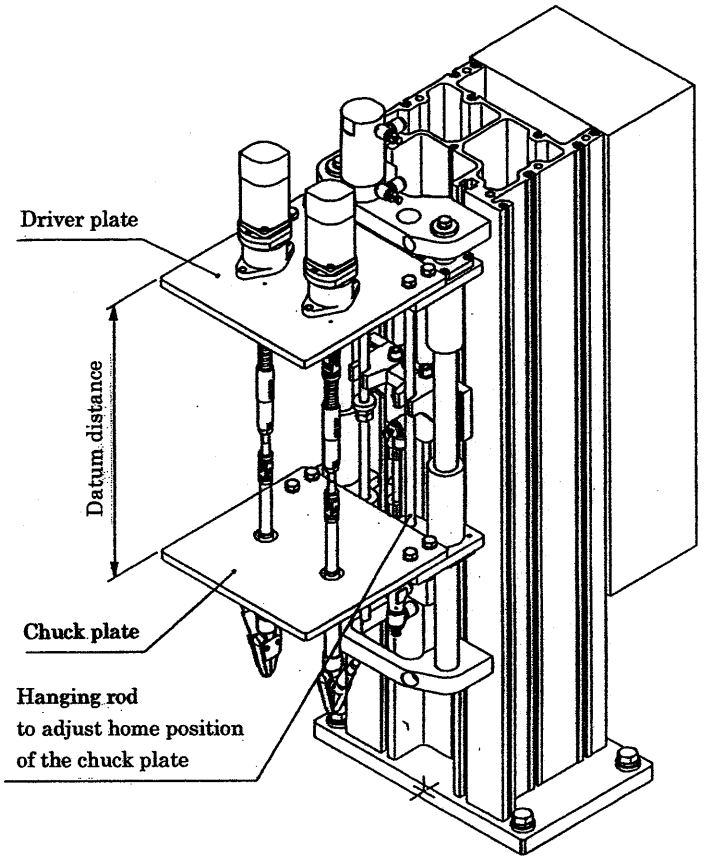
When the chuck plate is lowered, confirm that there is no interference between the chuck units and workpiece.



◆ Correct position of bit



◆ Incorrect position of bit
Screw feeding is obstructed by the bit.

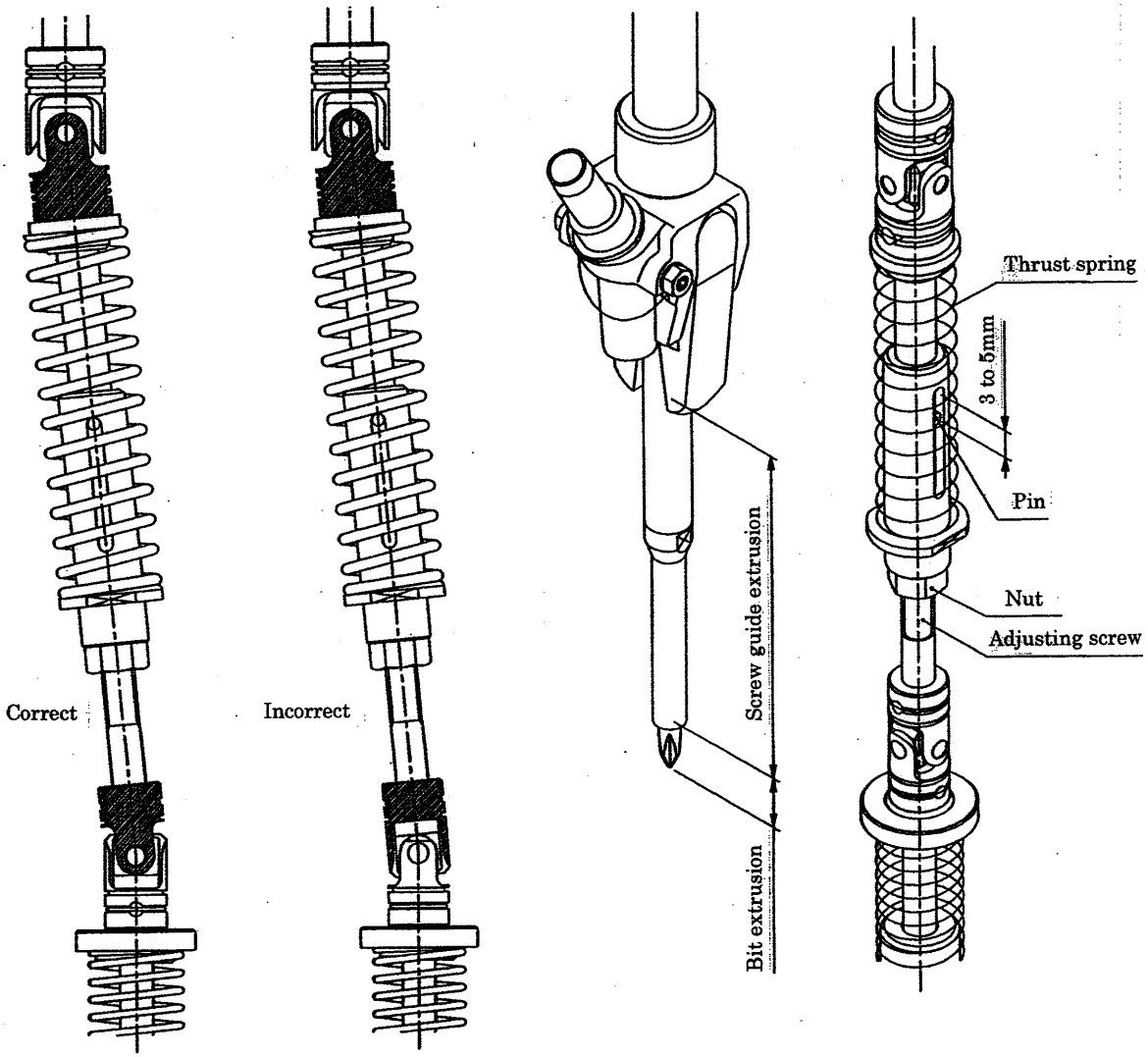


The datum distance varies depending on fastening specifications. See the dimension drawings attached to the machine.

5.3. Joint unit of FM5000V (vacuum screw retaining type)

5.3.1. Screw guide and bit extrusion

If "Bit extrusion" from the end of chuck unit is not long enough, proper fastening cannot be executed. It will cause damaged cross-recess of screw head, or improper screw height. When necessary, readjust the adjusting screw of the joint unit to obtain proper bit extrusion. When readjusting, align two universal joints correctly as illustrated.



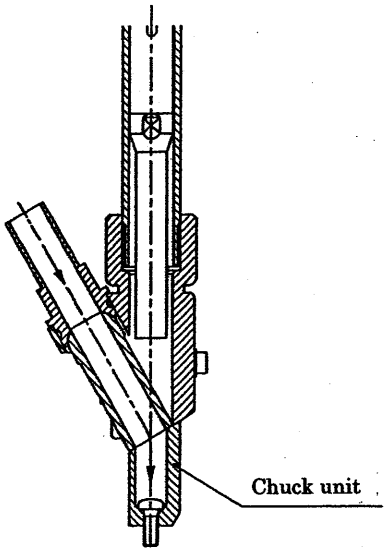
5.3.2. Bit thrust force

If bit thrust force is not enough, bit end may be ejected from the cross-recess of screw head (cam-out), causing damaged screw head. To confirm, load a workpiece to which screws are already driven on the fixture. Then, shut off air source and manually descend the driver head. When the driver head fully descends, check whether the thrust spring is properly compressed or not. If not, readjust in the same way as above paragraph. Amount of spring compression can be confirmed by looking the pin inside the slot of the joint. Thrust force required for proper screw fastening varies depending on shape of screw (cross-recess, hex, etc.), screw diameter and fastening torque.

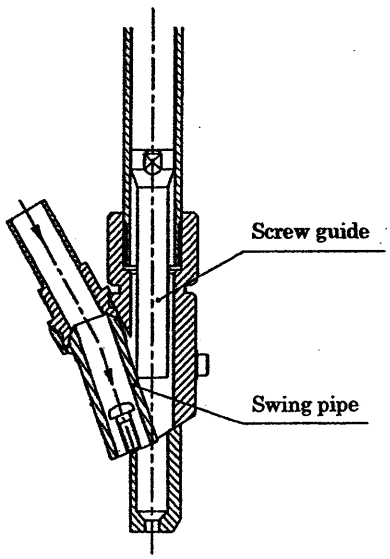
5.3.3. Screw guide in the chuck unit

Screws are fed when the driver head fully ascends (home position). If positional relationship between screw guide and chuck unit is improper, screw guide interferes swing pipe and obstacles screw feeding. If so, the chuck plate must be lowered as illustrated below.

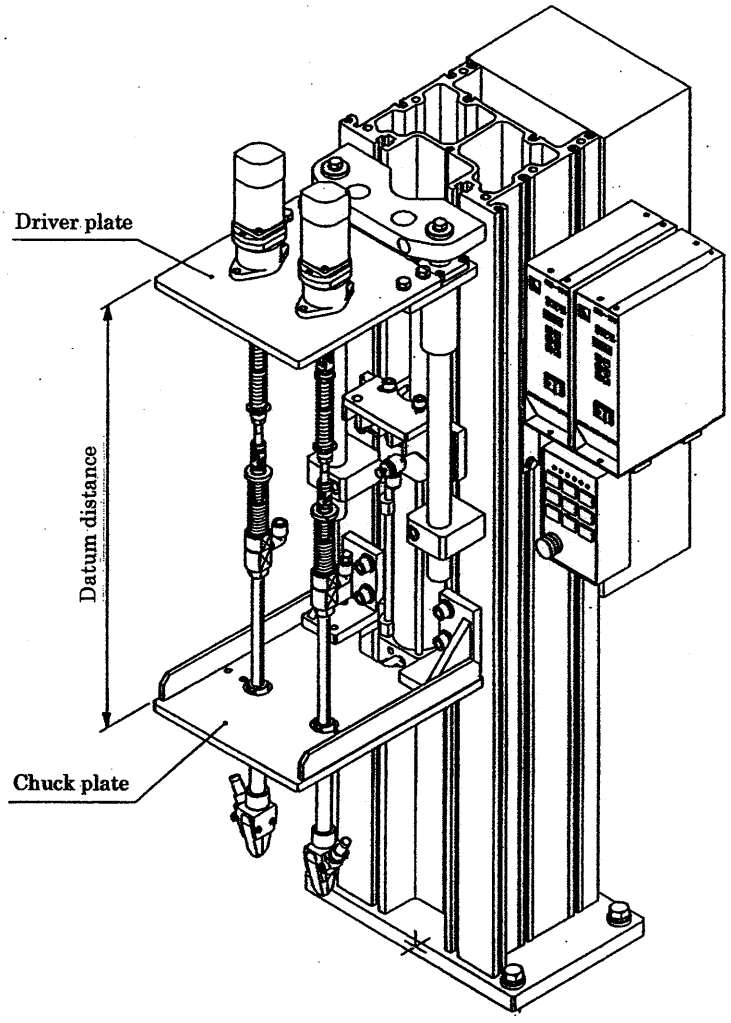
When the chuck plate is lowered, confirm that there is no interference between the chuck units and workpiece.



◆ Correct position



◆ Incorrect position
Screw feeding is obstructed by the screw guide.



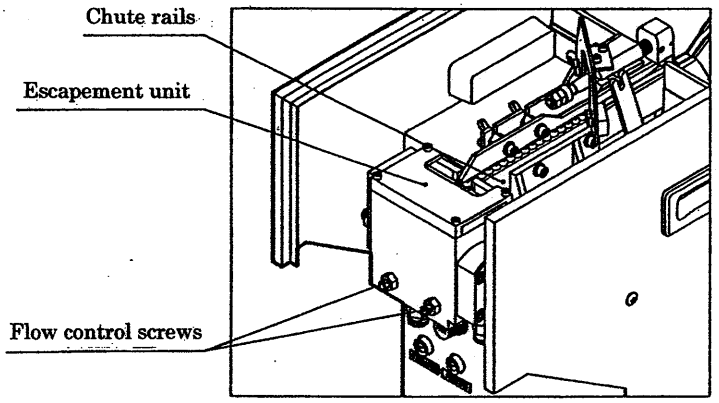
The datum distance varies depending on fastening specifications. See the dimension drawings attached to the machine.

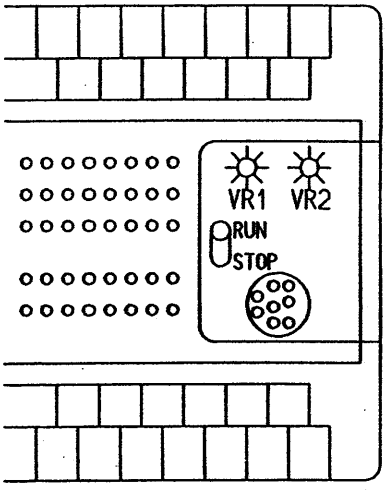
5.4. Readjustment of screw feeding

If screw feeders are relocated and length of screw feeding hoses is altered, screw feeding time and blow air flow may have to be readjusted.

Blow air flow can be readjusted with the flow control screws in front of the escapement unit. Screw feeding time can be set with the timer inside the control panel. To readjust, open the right lid of the sequencer inside the control panel and readjust the variable resistor (VR2). Feed screws several times and set the screw feeding time with slight margin. Because required screw feeding time changes depending on stain inside the feeding hose and wear and tear of hose, such margin is necessary.

Note: Screw feeding time may be controlled with a timer within the sequence program. If so, set the time with the handy programming controller (optional) referring the sequence ladder chart.





VR1: Improper fastening detection time
If fastening time exceeds this time period, it decides improper fastening as screw breakage, no screw, etc.

VR2: Screw feeding time
Screw feeding time is set with this timer.

5.5. Readjustment of improper fastening detection time

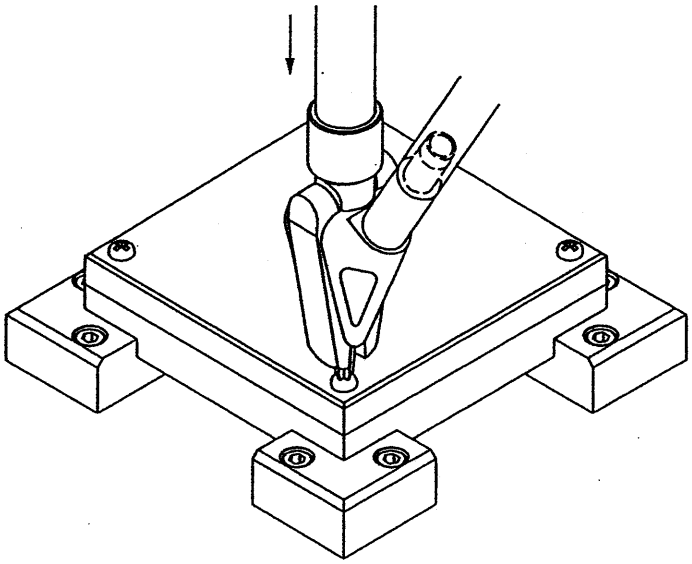
If screw breakage or no screw occurs during fastening, fastening completion signal from the driver will not occur within a set time period and a decision of improper fastening is made. This detection time is set with the timer (VR1) of the sequencer. This time period must be 1.5 to 2 times of normal fastening time.

Note: If set time period is too short, proper fastening may be decided improper.

5.6. Inspection and readjustment of fastening torque

5.6.1. Trial fastening

Load a workpiece on the fixture and execute screwdriving.



5.6.2. Readjustment of fastening torque

Measure the fastening torque of the fastened workpiece and confirm whether the torque is proper or not. If necessary, readjust the output torque of the driver referring the instruction manual for the driver unit.

Note: When the fastening torque of a screw is measured by its loosening torque, measured value will be 50% (self-tapping screw) to 70% (machine screw) of fastened torque. Set the driver output toque considering the properties of the screw and workpiece.

5.7. Readjustment of the air cylinder

5.7.1. Readjustment of speed

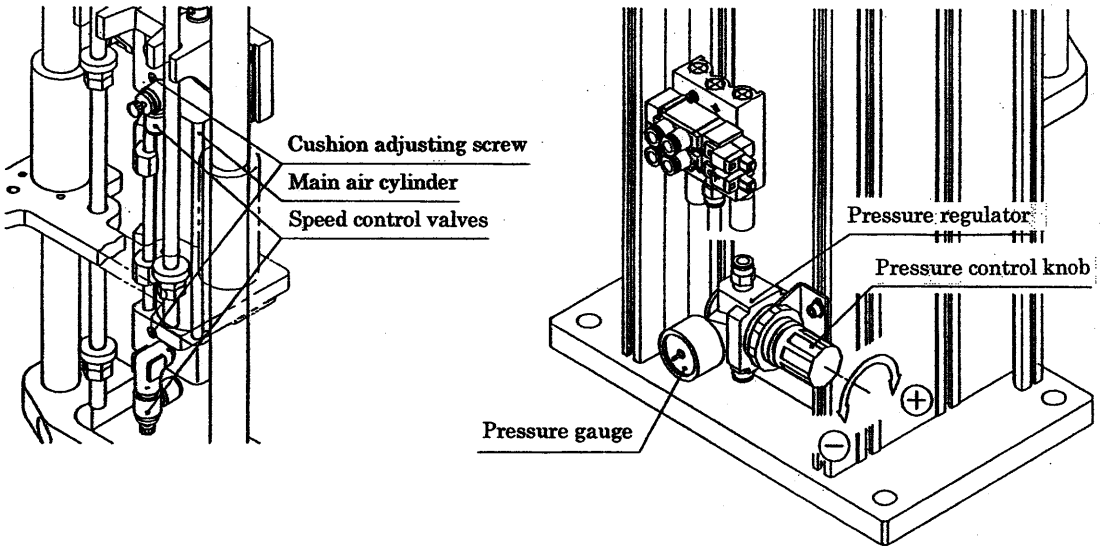
If necessary, readjust the speed of the air cylinder with the speed control valves attached to it. Both ascending and descending speed must be slower than 150mm/sec. If an impact occurs at the upper end, readjust the cushion adjusting screw of the air cylinder.

⚠ Warning	Make sure to shut off power source and compressed air supply during readjustment.
⚠ Note	If speed of the air cylinder is too fast, driver may be damaged by impact at the upper end. Speed must be slower than 150mm/sec.

5.7.2. Readjustment of thrust force

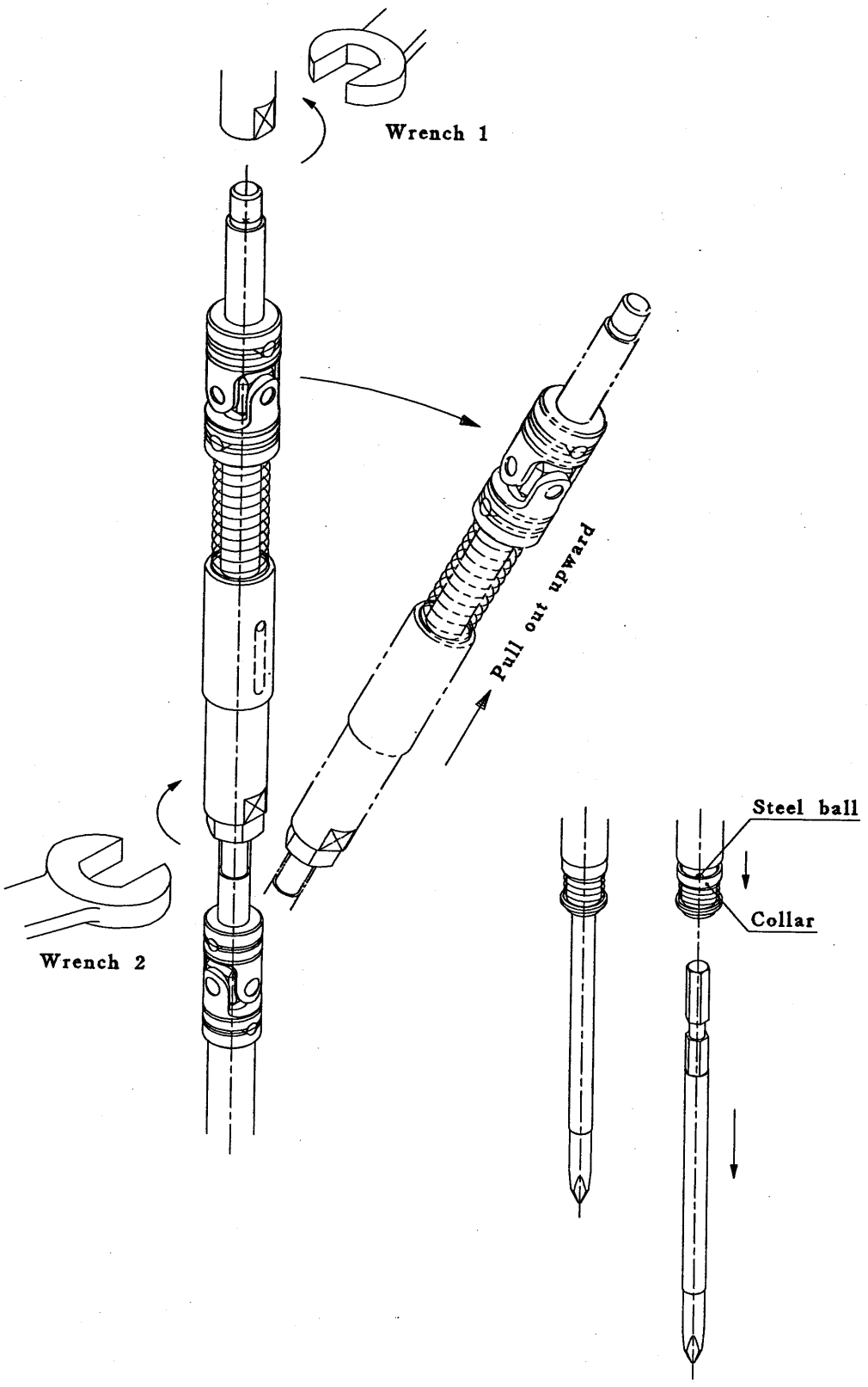
If necessary, readjust the thrust force with the pressure regulator attached on the back of the column. Proper pressure varies depending on number of spindles, fastening torque, weight of the chuck plate and driver plate, etc., and it shall be a value by which proper thrust of each bit can be obtained (0.2 to 0.3Mpa).

Set value must be no lower than 0.2Mpa. If pressure is lower than it, the air cylinder may not be activated due to malfunction of the anti-descending device.

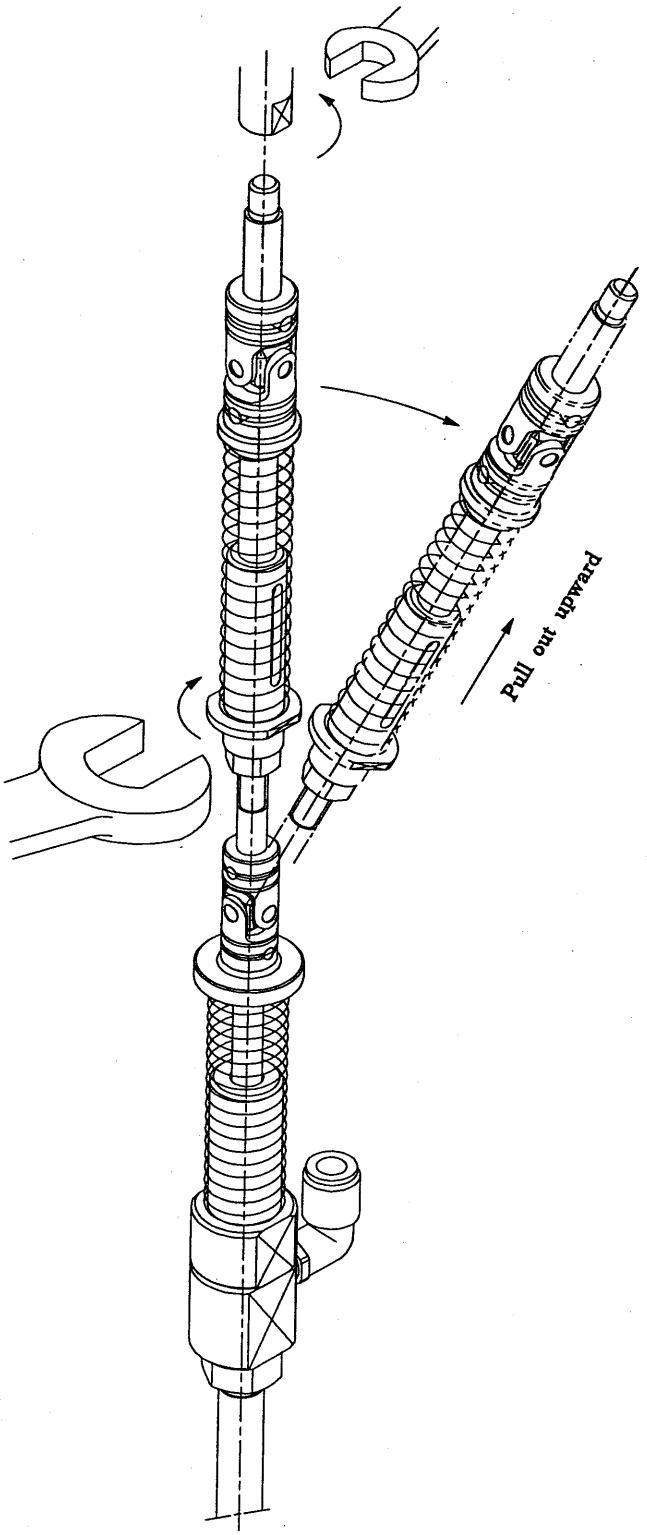


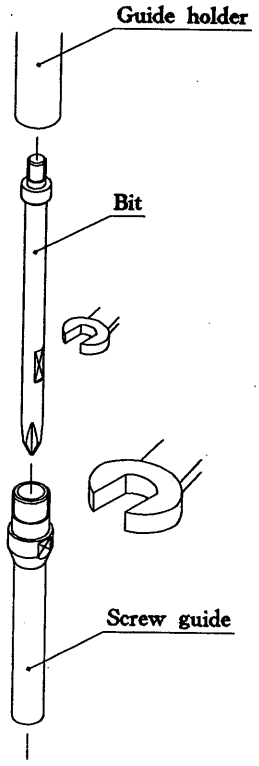
6. Maintenance and inspection

6.1.1.FM5000C(mechanical screw retaining type)



6.1.2.FM5000V(vacuum screw retaining type)



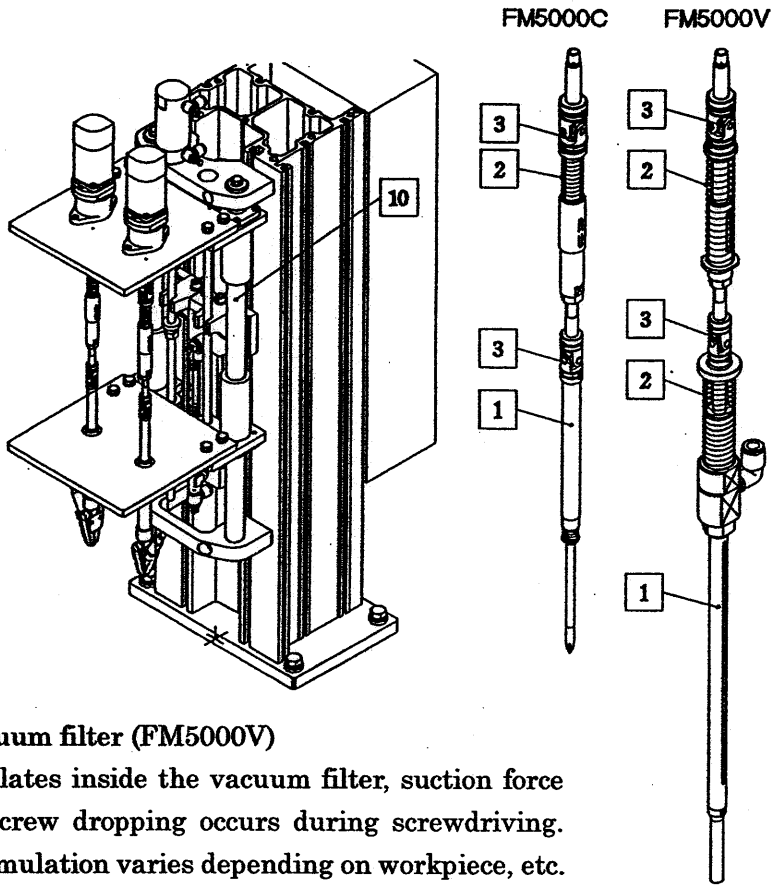


6.2. Lubrication

Refer to the table below and lubricate each part periodically.

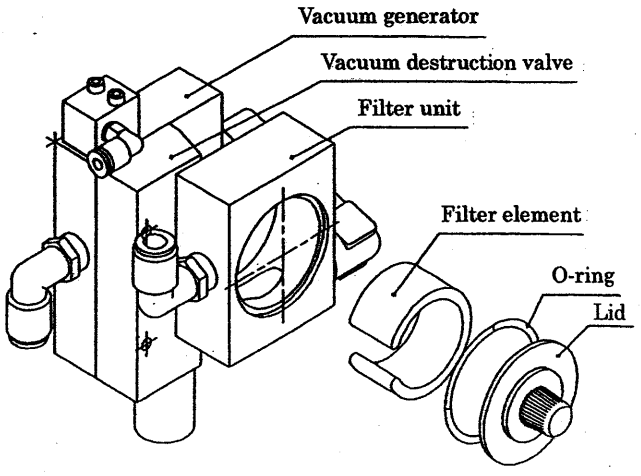
The interval of lubrication varies depending on circumstances and frequency of operation. Avoid that each part becomes dry.

Lubricating part		Grease	Method	Period
1	Bit holder	Molyspeed grease No. 2	Apply thin coat of grease with a brush.	Once a week
2	Joint spring	Molyspeed grease No. 2	Apply thin coat of grease with a brush.	Once a week
3	Universal joint	Molyspeed grease No. 2	Apply thin coat of grease with a brush.	Once a week
10	Slide shaft	Lithium soap base grease No. 2	Apply thin coat of grease with a brush.	Once a month



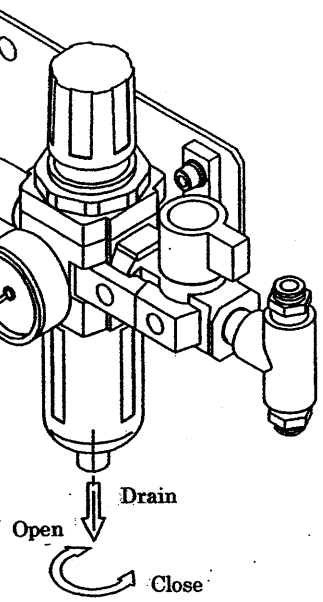
6.3. Cleaning of the vacuum filter (FM5000V)

When dust accumulates inside the vacuum filter, suction force is weakened and screw dropping occurs during screwdriving. Extent of dust accumulation varies depending on workpiece, etc. Initially, inspect the vacuum filter every day to see its condition and then, clean it periodically later.



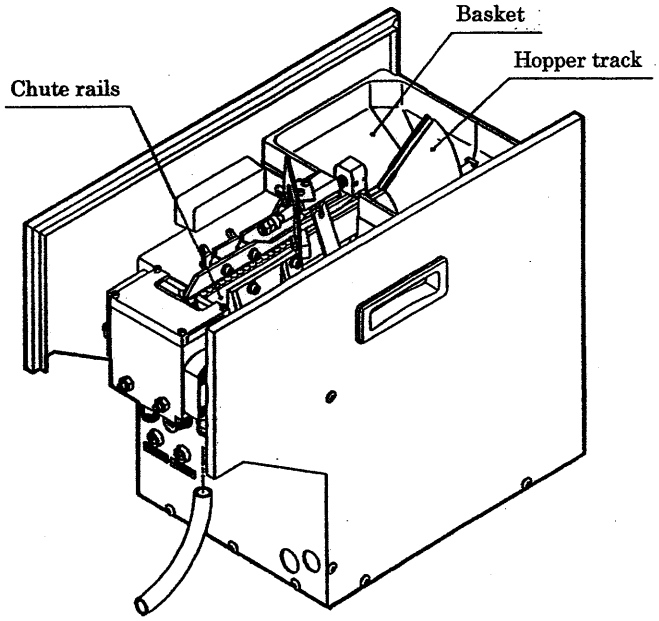
6.4. Draining

Inspect the water in the F.R. unit and drain it every day.



6.5. Cleaning of the screw feeder

When the chute rails, the basket and the hopper track are soiled with oil or dust, clean them with a piece of cloth.



6.6. Inspection of the screw feeding hoses

Inspect the screw feeding hoses every day. If screw feeding is obstructed by wear and tear of the hose, or dust inside it, replace the hose.

7. Cause of trouble and troubleshooting

Trouble	Cause	Troubleshooting
No operation occurs.	No air is supplied.	Supply air.
	Power source is not connected correctly.	Connect power source correctly.
	Circuit breaker inside control panel is open.	Close the circuit breaker
	Speed control valve is closed.	Readjust the speed control valve.
	Air pressure supplied to the air cylinder is too low.	Readjust the pressure regulator within 0.2 to 0.3Mpa.
Descending is not smooth, or stops.	Air pressure drops due to lack of supplied air capacity.	Check the air supply piping.
	Foreign material interferes.	Return to home position and remove interference.
Driver does not revolve.	Power switch of the driver controller is turned off.	Turn on the switch.
	Set torque is too low.	Confirm the set torque value.
Screw feeder is not activated. Screw feeding is improper.	Power switch of screw feeder is turned off.	Turn on the switch.
	Compressed air source is supplied.	Supply air.
	Dust contaminates feeding routes.	Clean screw feeding routes.
Screws are not driven until they are seated.	Bit is worn out or broken.	Replace the bit.
	Set torque is too low.	Confirm the set torque value.
	Lower end position of bit is high.	Lower the bit position.
	Chuck unit is not aligned correctly.	Align the chuck unit correctly.
	Hole position of workpiece is unstable.	Inspect workpiece and improve.
Female threads are broken. Or screw head is broken.	Fastening torque is too high.	Lower fastening torque.
	Used driver model is improper.	Change the driver.
	Screws are improper.	Change screws.
	Female threads are improper (machine screw). Screw holes are improper (self-tapping screws).	Inspect workpiece and improve.
	Hole position of workpiece is unstable.	Inspect workpiece and improve.
Cross-recess of screw head is damaged.	Lower end position of bit is high.	Lower the bit position.
	Bit shape is improper.	Change the bit.
	Lower end position of chuck plate is too high.	Lower the chuck plate position.
Screws are rejected from chuck fingers.	Spring/chuck finger is defective.	Replace the spring/chuck finger.
	Chuck fingers are defective.	Replace the chuck fingers.
Screws jam inside screw feeding hose.	Screw feeding hose is worn out, or soiled with dust.	Replace the screw feeding hose.
	Screw feeding time is too short.	Readjust screw feeding time.
	Blow air flow is too little.	Readjust the blow air control screw of the escapement unit.
	Air pressure drops due to lack of supplied air capacity.	Check the air supply piping.
Abnormal sound occurs during operation.	No lubricant.	Lubricate.
	Loosened bolts.	Tighten the bolts.
Screws drop during the head is descending (FM5000V)	Vacuum filter is clogged.	Clean the filter.
	Driver descending speed is too fast.	Readjust the speed control valve.
	Air pressure drops due to lack of supplied air capacity.	Check the air supply piping.

8. Consumptive items

Standard consumptive items of FM5000 are attached as spare parts. It is recommended that these parts are held by the customer always. Depending on the machine operation status, please order needed quantities of these parts from us.

[Consumptive items] [List of spare parts]

Item	Attached qty./spindle	Remark
Bit	4	Case of cross-recess screws
Screw feeding hose	1	
Screw guide	1	FM5000V
Socket bit	1	Case of hex head bolts
Special bit		Case of special screws Attached qty. is determined each time.

Parts listed below are semi-consumptive items. These parts are not attached as spare parts, but tend to wear relatively early.

[Semi-consumptive items]

Item	Used qty./spindle	Remark
Joint/screw feeding hose	1	
Chuck fingers	1	
Spring/chuck finger	2	
Bit holder	1	FM5000C
Swing pipe	1	FM5000C anti-jamming type, FM5000V
Spring/swing pipe	1	FM5000C anti-jamming type, FM5000V
Screw guide holder	1	FM5000V

※ Above listed parts vary depending on specification of the machine. For detailed information as part number, etc. refer to the bill of materials attached.

※ Optional devices for delivered machine may contain consumptive items.

※ Consumptive items for optional devices may not be attached to the machine.

9. Guarantee

[Period of guarantee]

Item	Period of guarantee
Ordinary parts	One year after delivery (8 hours operation per day, 3000 operation hours)
Ordinary purchased items	Six months after delivery (8 hours operation per day, 1500 operation hours)
Consumptive items	Out of guarantee

Excluding consumptive items specified by us, we will repair any defective items within the period of guarantee without charge. However, cases not considered as our responsibility are excluded as; damage caused from external factors, damage caused by incorrect way of use or lack of proper maintenance, matters hard to expect at the time of machine construction, matters out of requirement at the time of machine order, malfunction caused by improper quality of workpiece or screws, etc.

Depending on troubleshooting contents, we request the customer to replace parts. (Part replacement out of Japan is always requested to the customer.)

Period of repair work, etc. shall be determined each time by negotiation.

Instruction Manual for FM5000

October, 2000

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Think solution. NITTO SEIKO

Operation Box for Multi Spindle Screw Driving Machine

User's Manual
Ver. 1.00

NITTO SEIKO CO.,LTD.

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 to be 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.

⚠ WARNING

[Installation]

Be sure to provide 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 machine where the equipment and the controller may be splashed with water or oil.

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

DO NOT modify the equipment and the controller. NEVER connect the controller to the equipment other than of the specified type.

Otherwise, the controller may be damaged, or the equipment may be malfunctioned, causing fires or serious accidents.

DO NOT install the equipment and the controller to the locations where are unstable or subjected to vibrations.

Otherwise, the equipment may be moved or tipped, leading to accidents or breakage.

⚠ WARNING

[Installation]

Install the safety guard to the outside of motion areas.

Otherwise, you may suffer serious injury.
For safety, be sure to provide the interlock switch for the door of the safety guard.
Secure working space to carry out works related to maintenance, and check safely.

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 earth leakage or disconnection may be caused.

Always provide the emergency stop switch for a location convenient for operation.

Otherwise, you cannot deal with unexpected troubles quickly, causing serious injury.

⚠ 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.

NEVER use the equipment or the controller if they have been dropped or immersed in water.

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 misoperation.

⚠ 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, humidity is within the range between 30% and 80%, free from dew condensation.

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

DO NOT use this machine with the power supply and under the voltage other than specified.

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

Do not connect any device other than the operation box to the operation box connector.

Otherwise, malfunctions or faults may occur.

[Basic Guide]

1. Introduction

Thank you for purchasing this product.

To ensure proper use of this product, read this instruction manual thoroughly.
After reading this instruction manual, keep it carefully in a place where it can be accessed anytime.
Be sure to hand over this instruction manual to end users.

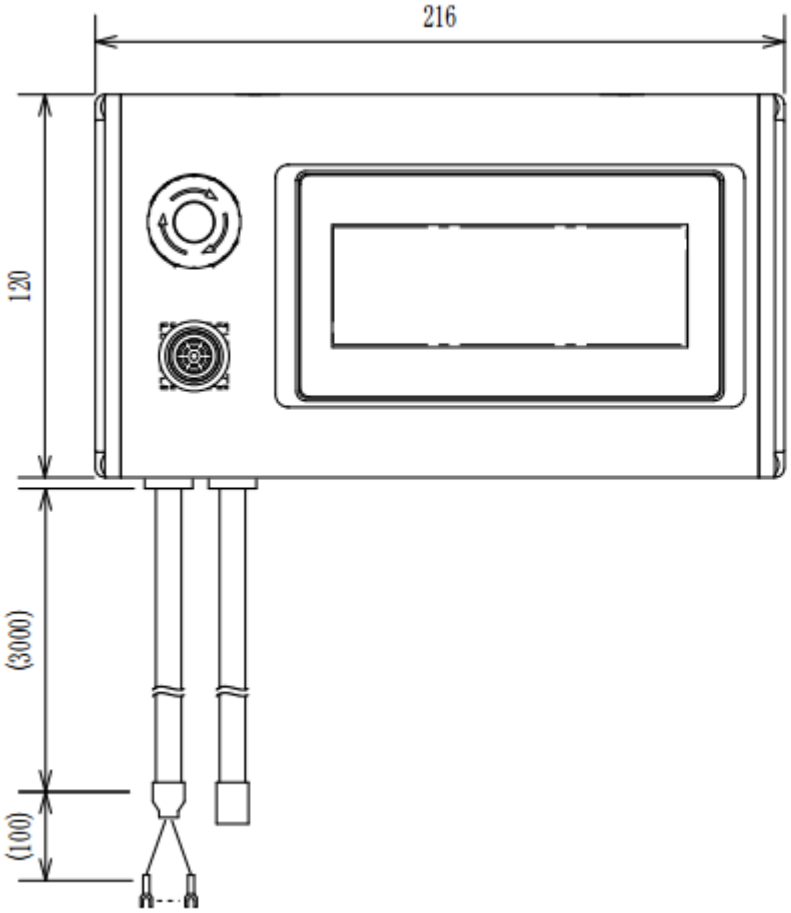
1.1 Outline of this product

This operation box uses a touch panel, which is intended for easy operation and setup of the multi spindle screw driving machine. This machine is designed to be compact and easy to operate so that it can be used as substitute for the conventional switch type operation box.

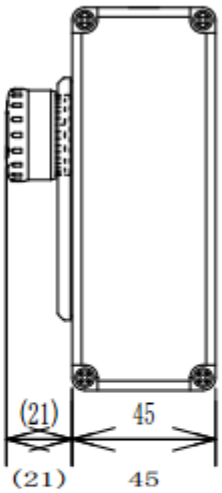
* To use this product as substitute for the existing switch type operation box, an additional cable (option) and CPU (PLC) program change are required. However there is limitation in the type of CPU. If you intend to use this product as substitute for the conventional one, consult our sales section.

1.2 Outline of the operation box

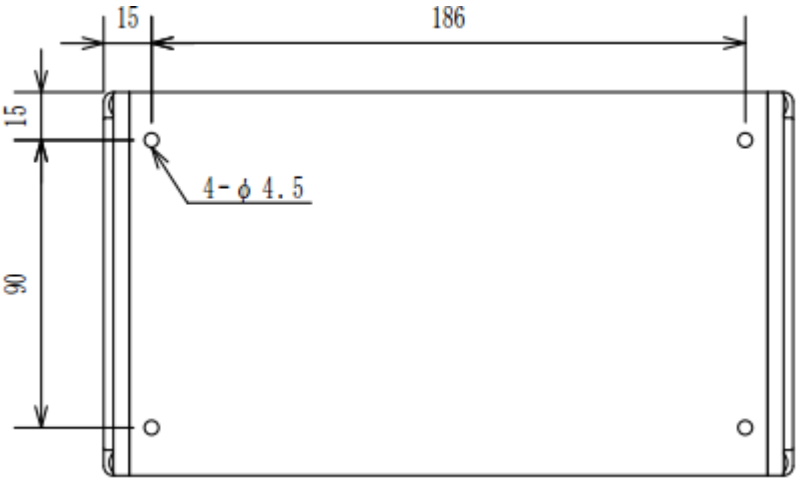
(Front)



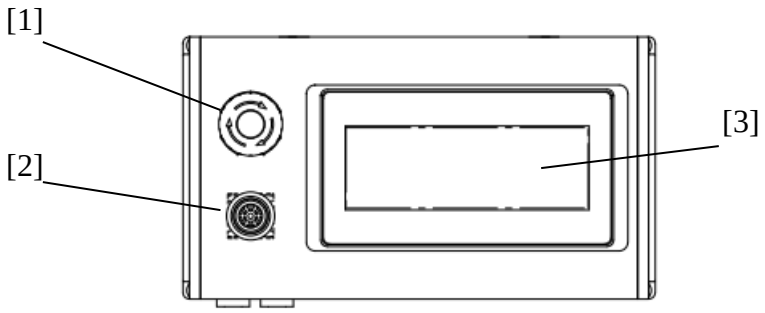
(Side)



(Back)



(Description of equipment)



[1]	Emergency stop switch	Push-lock/turn-reset type emergency stop switch. Once the button is pressed, it is locked in recessed condition, and the machine is brought into emergency stop status. To reset the emergency stop status, turn the button in the direction indicated by arrow (clockwise). Model: XA1E-BV3T11RM (IDEC)
[2]	Buzzer	When a fault or parts shortage occurs, the buzzer sounds. In case of parts shortage, the buzzer can be turned OFF with the fault reset switch. At occurrence of a fault, the buzzer cannot be turned OFF unless the fault condition is eliminated, even if the fault reset switch is pressed. Model: LB6Z-1T04 (IDEC)
[3]	LCD with touch switches	The display is a liquid crystal device with touch switches. Touching the display enables various operations and monitoring. Model: HG1F-SB22YF-S (IDEC)

2. Functions of the operation panel

2.1 Outline of functions

The operation box for the multi spindle screw driving machine uses a programmable display unit (HG1F-SB22YF-S: IDEC) for the operation panel, which incorporates dedicated software for fastening tool control screens. The operation box provides both operation panel functions and various setting functions, which is intended for easy operation of screw-fastening tools.

1) Operation panel functions required for automatic operation and manual operation are provided.
2) Various timer and counter setup and change functions are provided.
3) Fault view function, fault record view functions and fault reset function are provided.

Through development of the dedicated software, the operation panel enables easy operation of the above functions.

2.1.1 Emergency stop function

Emergency stop function is used for Master-OFF and emergency stop operations.

[Main functions]
- Master OFF operation and emergency stop operation using the hardware switches and emergency stop status are indicated on the operation panel screen.

If you press the emergency stop switch (red switch) at the upper left of the operation pendant when the master switch is ON, the machine is brought into emergency stop status. To turn OFF the master switch, or if a hazardous condition occurs during machine operation, conduct this operation.

2.1.2 Emergency stop reset function

This function is used to reset emergency stop status.

[Main function]
- Emergency stop reset operation using the hardware switch and emergency stop reset status are indicated on the operation panel screen.

The emergency stop switch (red switch) at the upper left of the operation pendant provides “push-lock & turn-reset” functions. To reset emergency stop status, turn the emergency stop switch clockwise.

POINT: If the machine remains in emergency stop status even after the emergency stop switch on the operation panel is reset, check the “external emergency stop switch.”

2.1.3 Programmable display unit

This system uses a programmable display unit (HG1F-SB22YF-S: IDEC) as the operation panel. The programmable display unit (hereinafter, referred to as “operation panel”) provides switch and lamp functions, character display and screen change function, offering simple and easy-to-understand operating environment.

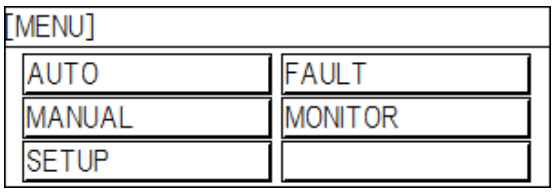
[Main functions]
- With the compact operation panel, all required functions are available.
- Ensuring simple and easy-to-understand operations

The operation panel provides hierarchical menu structure, enabling selection of necessary functions from the menu list. The operation panel screens are switched over for various operations and indications.
The menu comprises five modes: “AUTO mode”, “MANUAL mode”, “FAULT mode”, “SETUP mode” and “MONITOR mode”, as shown below.

[Operation mode list]

Mode		Main functions
Main menu	AUTO mode	• Automatic cycle operation • Various data monitoring • Counter setup • Fault reset
	MANUAL mode	• Manual operations (Reset, tightening, screw feed, driver advance/return, driver rotation, vacuum)
	FAULT mode	• Fault view, or fault record view • Fault reset
	SETUP mode	• Model changeover • Model setup • Machine setup • Touch panel setup
	MONITOR	• Counter setup • I/O monitor

- MENU screen



Change over the screens by pressing each mode switch, as required.
* During automatic operation, the “MANUAL”, “SETUP”, “FAULT” and “MONITOR” switches are inactive.

2.1.4 Authentication (password) function

All operations of this system are enabled by using the operation panel. However, to execute some of them, password input is required.
With this system, operators are identified with the password for limitation of operations.
Operators' right to access this system is classified into the following three levels by the password:

Level 1: Normal operation [Non USER]
No password is required. Automatic operation, manual operation and counter operation are enabled. Model changeover is also enabled.

Level 2: Model setup enabled [USER1]
Input of the password for Level 2 is required.
Level 1 operation + Model setup and registration are enabled.

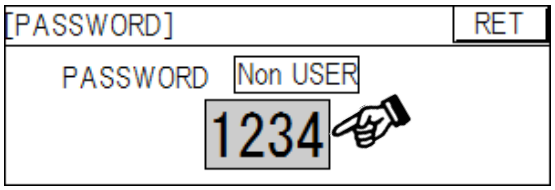
Level 3: Machine setup enabled [System administrator] [USER2]
Input of the password for Level 3 is required.
Level 2 operation + Machine setup and registration are enabled.

The password is a fixed value using the touch panel security password, which cannot be changed. (When the touch panel edition software is used, password change is enabled. If password change is required, contact us.)

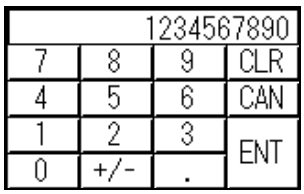
1
[Factory-set password]

[USER1] Level 2 password	**1111**
[USER2] Level 3 password	**1234**

• Password input screen



• Numeric keys



Touching the numerical display field on the above screen displays numeric keys.
Enter the password for each level. The current level is displayed beside characters of "Password".
Level 1: Non USER
Level 2: USER1
Level 3: USER2

2.2 Automatic operation function

This function is used to execute automatic operations of the machine.

Main functions
- Automatic operation start/stop
- Counter setup and /view function
- Detailed machine information (Model subject to work, driver (Dr) channel, screw shortage alarm, fault, cycle time), etc.
- Monitor function (Tightening result, I/O monitor), etc.

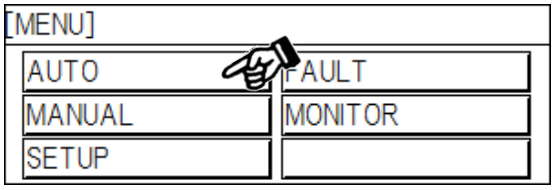
The system incorporates the above functions required for automatic operation.

This section describes manipulation and operation of each switch on the “AUTO” screen.

To execute automatic cycle operation, assume that all required settings for automatic operation are completed, and that the machine is at the origin.

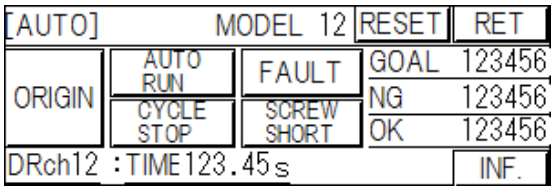
To change the display to the AUTO screen, follow the procedure below:

- MENU screen



Touch the “AUTO” switch on the MENU screen as shown above, to change the display to the AUTO screen.

- AUTO screen



- [ORIGIN]
  This lamp indicates that the machine is at the origin.
  When the machine is at the origin: Lit
  When the machine is not at the origin: Unlit

- [AUTO RUN]
  This switch/lamp is used to start automatic operation of the machine.
  Pressing [AUTO RUN] starts screw tightening operation according to the model settings.
  During automatic operation: Lit
  When the machine is not in automatic operation: Unlit

- [CYCLE STOP]
  This switch/lamp is used to stop automatic operation of the machine. During cycle stop, the lamp is lit. At the time when one cycle operation is completed, automatic operation stops, and the cycle stop lamp turns off.
  During cycle stop status: Lit
  When the machine is not in cycle stop status: Unlit

- [FAULT]
  This lamp indicates fault status when a fault occurs with the machine.
  During immediate stop fault: Lit
  During cycle stop fault: Blinking
  When the machine has no fault: Unlit

- [RESET]
  This switch/lamp is used to reset a fault of the machine. The buzzer and fault status can be reset if the machine is in the condition that enables fault reset.
  During a fault: Lit
  When the machine has no fault: Unlit

- [RET]
  This switch is used to change the display to the MENU screen. You can go to the MENU screen even when the machine is under automatic cycle operation. In this case, however, switches other than “AUTO” are disabled. At completion of the current cycle, each switch becomes active, and you can change the screen.

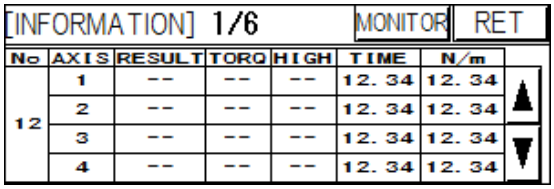
- [DRch]
  This item indicates a channel number of the currently selected driver. A channel No. that has been registered in model setup is displayed.

- [TIME]
  A cycle time of the previous cycle is displayed. During operation, elapse time is displayed.

- [Counter display]
  A current count value of each counter is displayed.
  GOAL: Counts a number of all completed products.
  NG: Counts a number of products judged to be NG among completed products.
  OK: Counts a number of products judged to be OK among completed products.

- [INF.]
  This switch is used to change the display to the INFORMATION screen.
  Contents of the INFORMATION screen are as follows:

• INFORMATION 1/6 screen



This screen displays results of products that have been completed up to the previous cycle (10 units). Results of up to 4 axes are stored. When production count exceeds 10 units, old record data are replaced with new ones.

* Data on "N·m" can be stored with the machine that communicates with the driver controller (SD550 series) via the RS485 interface only.

• [▲] and [▼]

These switches are used to change the tightening result record No. (Record of up to 10 units in the past is displayed.)

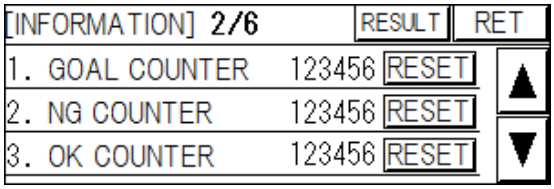
• [MONITOR]

This switch is used to change the display to the INFORMATION 2/6 screen (monitor screen).

• [RET]

This switch is used to change the display to the AUTO screen.

• INFORMATION 2/6 screen



This screen is used to view a count value of each counter, and to reset each counter.

• [RESET]

This switch is used to reset each counter. To activate reset operation, press this switch for one second or longer. Through this operation, the existing count value is reset to "0". Note that once the reset operation is executed, the existing count value will be completely cleared.

• [RESULT]

This switch is used to change the display to the INFORMATION 1/6 screen (result record screen).

• [RET]

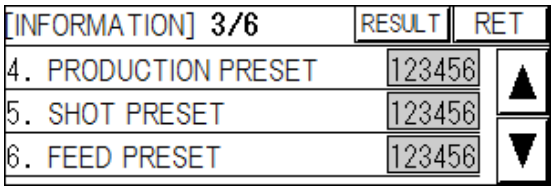
This switch is used to change the display to the AUTO screen.

• [▲]

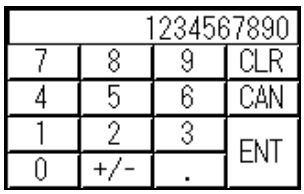
This switch is used to change the display to the INFORMATION 6/6 screen (I/O monitor screen).

- [▼]
  This switch is used to change the display to the INFORMATION 3/6 screen (monitor screen).

• INFORMATION 3/6 screen



• Numeric keys



This screen is used to view and change each counter's preset value. Touching the numerical display field for each counter displays numeric keys. Set a value, and press "ENT" to register the setting.

* When each counter's count reaches the preset value, the system outputs "Count-up stop" signal for each counter. This condition is handled as cycle stop fault. When the preset value is "999999", the counter does not work.

• [RESULT]

This switch is used to change the display to the INFORMATION 1/6 screen (result record screen).

• [RET]

This switch is used to change the display to the AUTO screen.

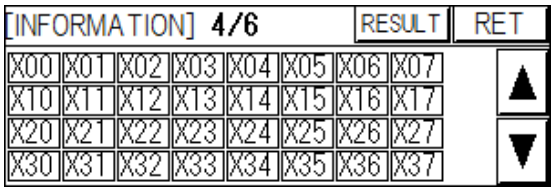
• [▲]

This switch is used to change the display to the INFORMATION 2/6 screen (monitor screen).

• [▼]

This switch is used to change the display to the INFORMATION 4/6 screen (I/O monitor screen).

• INFORMATION 4/6 screen



This screen is used to check PLC input/output status.

• [RESULT]

This switch is used to change the display to the INFORMATION 1/6 screen (result record screen).

• [RET]

This switch is used to change the display to the AUTO screen.

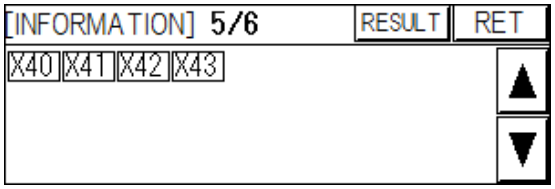
• [▲]

This switch is used to change the display to the INFORMATION 3/6 screen (monitor screen).

• [▼]

This switch is used to change the display to the INFORMATION 5/6 screen (I/O monitor screen).

• INFORMATION 5/6 screen



This screen is used to check PLC input/output status.

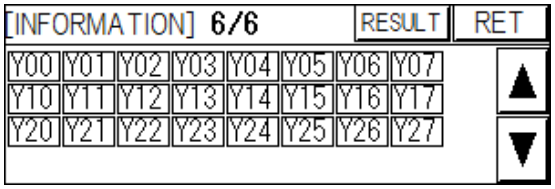
• [RESULT]
This switch is used to change the display to the INFORMATION 1/6 screen (result record screen).

• [RET]
This switch is used to change the display to the AUTO screen.

• [▲]
This switch is used to change the display to the INFORMATION 4/6 screen (I/O monitor screen).

• [▼]
This switch is used to change the display to the INFORMATION 6/6 screen I/O (monitor screen).

• INFORMATION 6/6 screen



This screen is used to check PLC input/output status.

• [RESULT]
This switch is used to change the display to the INFORMATION 1/6 screen (result record screen).

• [RET]
This switch is used to change the display to the AUTO screen.

• [▲]
This switch is used to change the display to the INFORMATION 5/6 screen (I/O monitor screen).

• [▼]
This switch is used to change the display to the INFORMATION 2/6 screen I/O (monitor screen).

2.3 Manual operation function

This function is used to execute manual operations of the machine.

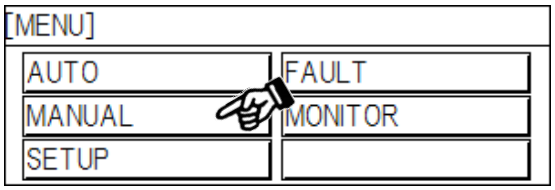
Main functions
- Machine origin return operation
- Manual operation of each actuator

Mainly, functions required for return operation and adjustment through manual operation are provided as described above. Assuming a case where equipment specific to each machine is provided, spare switches are prepared, which can be added as an option.

For our standard type multi spindle screw driving machine, this section describes manipulation and operation of each switch on the “MANAUL” screen.

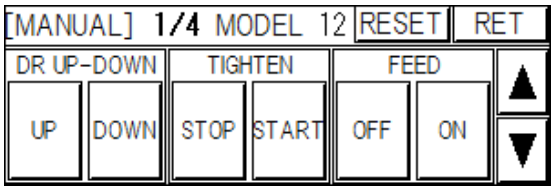
To change the display to the manual operation screen, follow the procedure below:

- MENU screen



Touch the “MANUAL” switch on the MENU screen as shown above, to change the display to the manual operation screen.

- MANUAL 1/4 screen



- [DR (driver) UP-DOWN]
  These switches/lamps are used to raise or lower the driver up/down unit of the machine.
  In UP status: The “UP” lamp is lit. The “DOWN” lamp is unlit.
  In DOWN status: The “DOWN” lamp is lit. The “UP” lamp is unlit.
  When the unit is moving up: The “UP” lamp is blinking. The “DOWN” lamp is unlit.
  When the unit is moving down: The “DOWN” lamp is blinking. The “UP” lamp is unlit.

- [TIGHTEN]
  These switches/lamps are used for tightening operation of the machine. Pressing the “START” switch lowers the driver up/down unit, and starts rotation of the driver. After completion of tightening operation, or by pressing the “STOP” switch, the driver up/down unit is raised, and the driver rotation stops.
  * The “START” switch is active when the machine is at the origin and screw feed is OFF.
    During tightening operation: The “START” lamp is blinking. The “STOP” lamp is unlit.
    When the machine is not in tightening operation: The “STOP” lamp is lit. The “START” lamp is unlit.

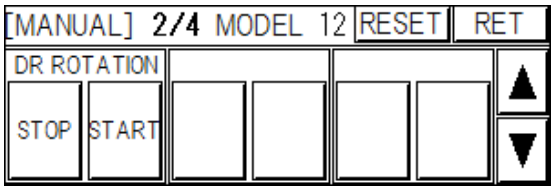
- [FEED]
  These switches/lamps are used for screw feed operation. Pressing the “ON” switch starts screw feed operation. After elapse of the screw feed time specified in machine setup, press-feed operation is completed. Screw feed operation can be forcedly stopped by pressing the “OFF” switch. If a screw does not reach the tip of the driver after screw feed operation, screw jam in the hose can be considered. After completion of feed operation, use caution about this matter.
  During screw feed operation: The “ON” lamp is blinking, The “OFF” lamp is unlit.
  When the machine is not in screw feed operation: The “OFF” lamp is lit, The “ON” lamp is unlit.

- [RESET]
  This switch/lamp is used to reset a fault of the machine. The buzzer and fault status can be reset if the machine is in the condition that enables fault reset.
  During a fault: Lit
  When the machine has no fault: Unlit

- [RET]
  This switch is used to change the display to the MENU screen.

- [▲], [▼]
  These switches are used to change the display to other manual screens.

- MANUAL 2/4 screen



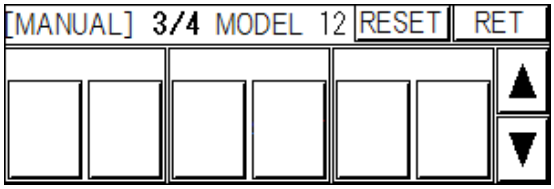
- [DR (driver) ROTATION]
  These switches/lamps are used for driver rotation. Pressing the “START” switch starts rotation of the driver. After elapse of the time specified in machine setup, or at torque-up, rotation stops. Driver rotation can be forcedly stopped by pressing the “STOP” switch.
  During rotation: The “START” lamp is blinking. The “STOP” lamp is unlit.
  When the driver is not rotating: The “STOP” lamp is lit. The “START” lamp is unlit.

- [RESET]
  This switch/lamp is used to reset a fault of the machine. The buzzer and fault status can be reset if the machine is in the condition that enables fault reset.
  During a fault: Lit
  When the machine has no faults: Unlit

- [RET]
  This switch is used to change the display to the MENU screen.

- [▲], [▼]
  These switches are used to change the display to other manual screens.

• MANUAL 3/4 screen



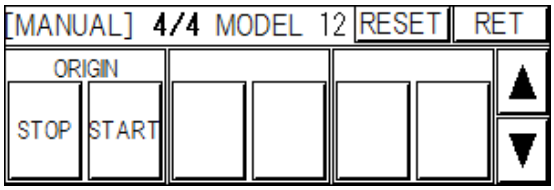
Each switch on this screen is optionally available in case where special equipment is provided for the machine. No function has been assigned, as standard.

• [RESET]
This switch/lamp is used to reset a fault of the machine. The buzzer and fault status can be reset if the machine is in the condition that enables fault reset.
During a fault: Lit
When the machine has no fault: Unlit

• [RET]
This switch is used to change the display to the MENU screen.

• [▲], [▼]
These switches are used to change the display to other manual screens.

• MANUAL 4/4 screen



• [ORIGIN]
These switches/lamps are used for machine origin return operation. Pressing the “START” switch starts machine origin return. When all units are returned to the origin, operation ends. Origin return operation can be forcedly stopped by pressing the “STOP” switch.
During origin return operation: The “START” lamp is blinking. The “STOP” lamp is unlit.

• [RESET]
This switch/lamp is used to reset a fault of the machine. The buzzer and fault status can be reset in the condition where fault reset is enabled.
During a fault: Lit
When the machine has no fault: Unlit

• [RET]
This switch is used to change the display to the MENU screen.

• [▲], [▼]
These switches are used to change the display to other manual screens.

3. Setup function

3.1 Outline of setup function

The setup function enables model change, model setup and machine parameter change/registration.

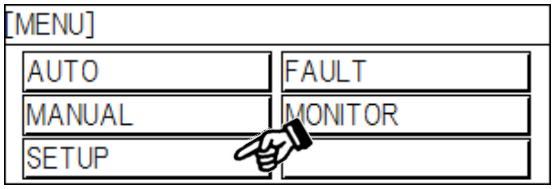
Main functions
- Model change
- Setting change by model
- Machine setup change
- Touch panel system change
- Maintenance information check

As described above, the system can be customized according to user's machine through registration of machine structure settings and functional settings, and conditions specific to model. The system enables condition setup for each model, so that it can cope with various models.
Also, optional setting items are prepared in model setup, enabling easy setup of additional functions.
* To add optional functions, software change is required.

This section describes manipulation and operation of each setting for our standard type multi spindle screw driving machine.

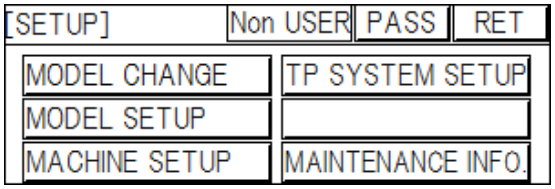
To change the display to the SETUP screen, follow the procedure below:

- MENU screen



Touch the "SETUP" switch on the MENU screen as shown above, to change the display to the SETUP screen.

- SETUP screen



Verification and registration of settings on this screen are under authentication level management by password. To execute each operation, read "3.1.4 Authentication (password) function" in this manual in advance. If you change the settings of "Machine setup", the machine may not operate, or malfunction occurs. Before operation of the SETUP screen, understand the contents of the manual thoroughly.

3.2 Model change function

This function is used to change a model according to the product subject to screw tightening work.

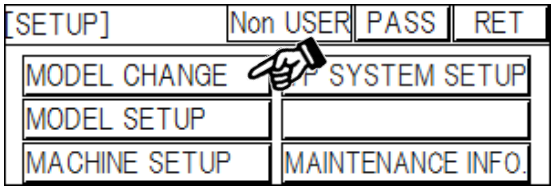
Main function

- Model setting can be changed. Up to 0 to 15 models (16 types) can be set.

  Select a model that has been registered. The contents registered in “MODEL SETUP” will be reflected.

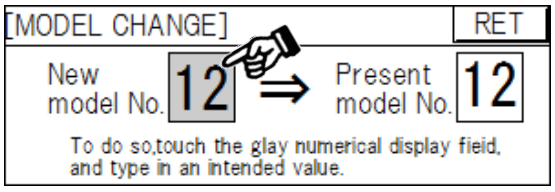
  To change the display to the MODEL CHANGE screen, follow the procedure below:

- SETUP screen

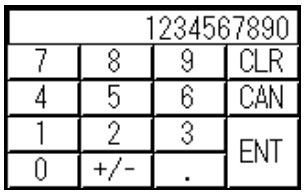


Touch the “MODEL CHANGE” switch on the SETUP screen as shown above, to change the display to the MODEL CHANGE screen.

- MODEL CHANGE screen



- Numeric keys



- [Model change procedure]

  Touching the numerical display field “New model No.” (gray area) on the above screen displays numeric keys. Select a model with the numeric keys. Note: You should select a model that has been registered in model setup. If you select a model yet to be registered, it may cause malfunction of the machine.

3.3 Model setup function

This function is used to specify tightening conditions for a model according to the product subject to screw tightening work.

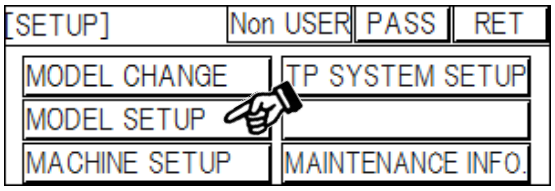
Main functions

- Model conditions can be specified. Up to 0 to 15 models (16 types) can be set.
- With the standard machine, model settings are intended for driver channels only. However, optional settings (4 free items of 1 to 4) are also available.

If you quit model setup without registering the model setting, it will not be rewritten. Be sure to press the registration switch to complete registration. If you intend to view a setting without necessity of registration, do not execute registration procedure.

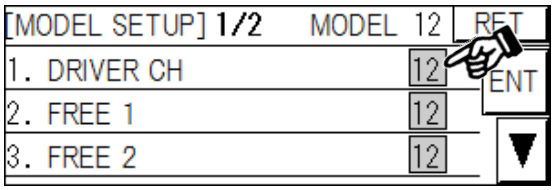
To change the display to the MODEL SETUP screen, follow the procedure below:

- SETUP screen

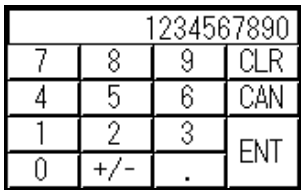


Touch the “MODEL CHANGE” switch on the SETUP screen as shown above, to change the display to the MODEL SEATUP screen.

- MODEL SETUP screen



- Numeric keys



- [DRIVER CH]

  This item is used to set a driver channel. Touching the numerical display field (gray area) on the above screen displays numeric keys.

  Set a driver channel with the numeric keys. In this case, however, you should set a channel for which a driver controller has been set in advance. If you set a channel without driver controller setting, it may cause malfunction of the machine.

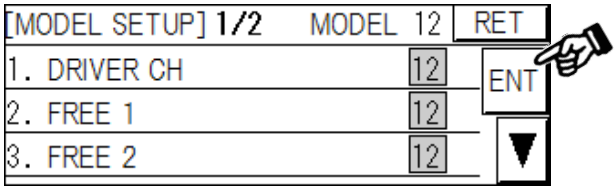
- [FREE *]

  Optional function. To incorporate a function specific to user’s machine, use this parameter. To use this parameter, the CPU program must be changed. With the standard program, setting of this parameter will not be reflected in machine operation.

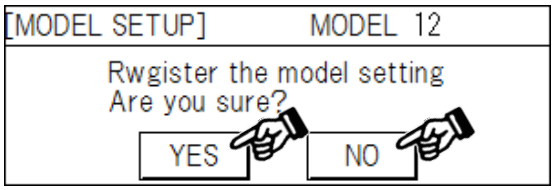
- [ENT]

  After a setting is changed, this switch is used to register the setting. Pressing the “ENT” switch displays the model setting registration screen. If you press “YES” on this screen, the display returns to the “MODEL SETUP” screen after registration is completed. If you press “NO”, the display changes to the “MODEL SETUP” screen without registration of the setting change.

- MODEL SETUP screen



- Model setting registration screen



3.4 Machine setup function

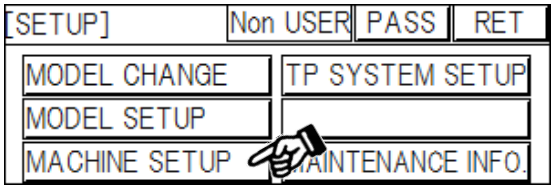
This function is used to set parameters to meet the machine specifications.

Main functions
- Enabling setup and change of machine parameters
- Enabling change of selection of screw feed function, selection of tightening check function, etc.
- Enabling setup and change of each timer
- Enabling setup and change of machine structure
- Language change function (Japanese/English)

This function can change operating conditions depending on the settings that meet the machine specifications. With these settings, you can easily change the machine conditions.
In principle, settings that meet the machine specifications are required. For example, in case of a fault of an axis, you can take an emergency action to operate the machine by changing the axis to be used.
Note that such an emergency action may change product installation conditions. Such an action should be conducted under agreement and responsibility of system administrator.

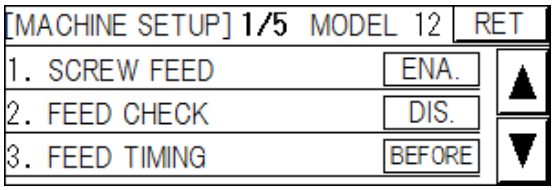
To change the display to the MACHINE SETUP screen, follow the procedure below:

• SETUP screen



Touch the “MACHINE SETUP” switch on the SETUP screen as shown above, to change the display to the MACHINE SETUP screen.

• MACHINE SETUP 1/5 screen



- [1. SCREW FEED]
  This item is used to enable or disable screw feed operation. For the machine with a screw feeder, select “ENABLE”. If a screw feeder is not provided, or to execute re-tightening operation, select “DISABLE”.

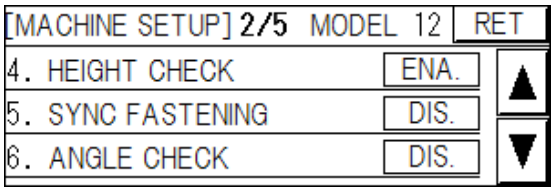
- [2. FEED CHECK]
  This item is used to enable or disable screw feed detection. As an option, a screw feed detection sensor may be provided for the machine. In this case, screw feed detection is enabled if the setting of this item is “ENABLE”. Under this setting, if screw feed cannot be detected during screw feed operation, the fault is output and the machine will be stopped on the spot.

- [3. FEED TIMING]
  This item is used to change screw feed timing. To execute press-feed operation before tightening, select “BEFORE”, To execute press-feed after tightening, select “AFTER”.

- [RET]
  This switch is used to change the display to the SETUP screen.

- [▲], [▼]
  These switches are used to change machine settings.

• MACHINE SETUP 2/5 screen



- [4. HEIGHT CHECK]
  This item is used to enable or disable height check. A screw tightening height detection sensor may be provided for the machine. In this case, if the setting of this item is “ENABLE”, height detection is conducted after tightening (after torque-up). If the screw tightening height is “NG”, a height detection fault is output to bring the machine into cycle stop status. If the setting of this item is “DISABLE”, height detection is disabled. (Any height is judged “OK”.)

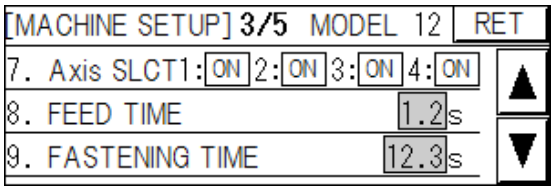
- [5. SYNC FASTENING]
  This item is used to enable or disable the synchronous tightening function. When our driver is used for the multi spindle screw driving machine, the “synchronous tightening function” is provided, which delays start of final tightening until all axes reaches provisional tightening torque. To use this function, select “ENABLE”. When the setting of this item is “ENABLE”, it is necessary that driver operation code setting and each axis synchronous signal from the driver controller should be loaded into the PLC. To enable this function, you must arrange specifications of peripheral equipment.

- [6. ANGLE CHECK]
  This item is used to enable or disable the angle judgment function. As our driver’s function, the “angle judgment function” that detects a rotation angle during final tightening is provided. Setting the parameter of the driver controller makes the angle judgment function available. To use this function, select “ENABLE”. When the setting of this item is “ENABLE”, it is necessary that driver operation code setting and angle check OK signal from the driver controllers should be loaded into the PLC. To enable this function, you must arrange specifications of peripheral equipment.

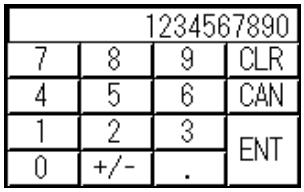
- [RET]
  This switch is used to change the display to the SETUP screen.

- [▲], [▼]
  These switches are used to change machine setup items.

• MACHINE SETUP 3/5 screen



• Numeric keys



• [7. AXIS SLCT]

This item is used to select tightening axes of this machine. Normally (as the factory-setting), all axes of the machine should be set as “ON”. However, in case where a fault occurs with any of the axes, for example, tightening operation and judgment for the relevant axis are disabled by setting the axis as “OFF”. This function serves as an emergency action to operate the machine.

• [8. FEED TIME]

This item is used to set a screw feed time. Touching the numerical display field (gray area) displays numeric keys. Arbitrary setting is enabled. (Setting range: 0.1 to 9.9 s)
When the machine is equipped with a screw feeder, and the setting of “1. SCREW FEED” is “ENABLE”, this item can be set. When the setting of “3. FEED CHECK” is “ENABLE”, and the screw feed detection sensor does not turn ON within the time of this setting, a screw feed fault is output.

• [9. FASTENING TIME]

This item is used to set a tightening failure detection wait time. Touching the numerical display field (gray area) displays numeric keys.
Arbitrary setting is enabled. (Setting range: 0.1 to 99.9 s)
If the torque-up signal from the driver controller is not input within the time of this setting, a tightening torque fault is output.

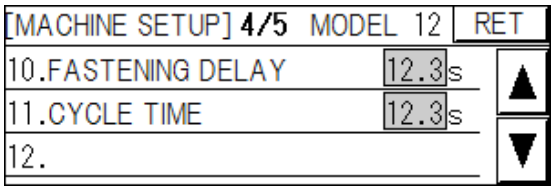
• [RET]

This switch is used to change the display to the SETUP screen.

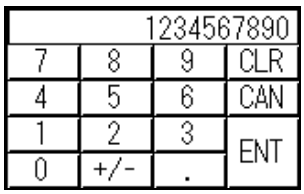
• [▲], [▼]

These switches are used to change machine setup items.

• MACHINE SETUP 4/5 screen



• Numeric keys



• [10. FASTENING DELAY]

This item is used to set a driver rotation delay time. Touching the numerical display field (gray area) displays numeric keys.
Arbitrary setting is enabled. (Setting range: 0.0 to 99.9 s)
Normally, driver rotation will start simultaneously when the driver starts lowering, However, with this setting of the delay time, driver rotation will start at elapse of the time of this setting, after the driver starts lowering.

• [11. CYCLE TIME]

This item is used to set a cycle time. Touching the numerical display field (gray area) displays numeric keys.
Arbitrary setting is enabled. (Setting range: 0.1 to 99.9 s)
If one cycle operation is not completed within the time of this setting, cycle time over signal is output, and the machine stops immediately. (Note: With the standard machine, the driver up/down unit uses a single solenoid valve. Therefore, the unit will be automatically raised even when the immediate stop fault occurs.)

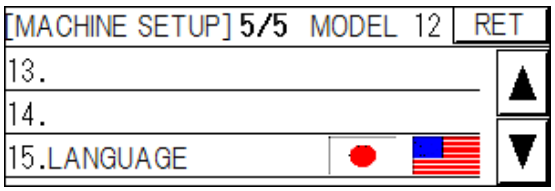
• [RET]

This switch is used to change the display to the SETUP screen.

• [▲], [▼]

These switches are used to change machine setup items.

• MACHINE SETUP 5/5 screen



• [15. LANGUAGE]

This item is used to select language. Language can be changed over between Japanese and English. Touching each flag changes the display into the selected language.

• [RET]

This switch is used to change the display to the SETUP screen.

• [▲], [▼]

These switches are used to change machine setup items.

3.5 Touch panel system setup function

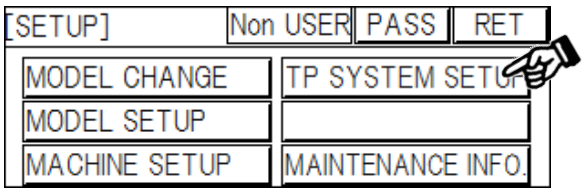
This function is used to set parameters to meet the machine specifications.

Main function

- Enabling touch panel system setup and change

This function enables touch panel system setup and change, backlight off time change, and touch panel system time adjustment. However, touch panel system change will affect the conditions related to the machine specifications (communication settings, etc.). In consideration of such a risk, the dedicated password is required for touch panel system change. The relevant password shall be a secret. To execute the touch panel system change, contact our sales section.

- SETUP screen



Touch the [TP SYSETM SETUP] switch on the SETUP screen as shown above, to change the display to the touch panel system setup screen.
A password authentication screen is displayed. The password is a secret.
For the touch panel system setup/change procedure, refer to the “Programmable Display Unit WindO/I-NV2 User’s Manual” (IDEC).
You can download this manual from the IDEC web site.

3.6 Maintenance information function

This function is used to check machine maintenance information.

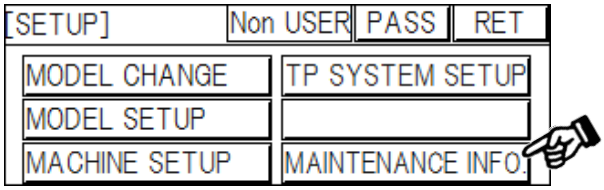
Main functions

- Checking the touch panel battery type
- Checking the PLC and touch panel (TP) version information

This function is used to check the touch panel battery type and software version information.

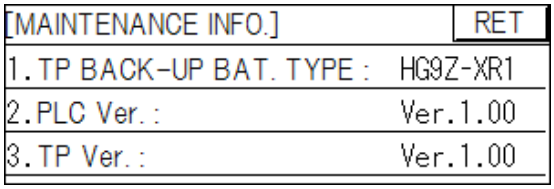
To change the display to the maintenance information screen, follow the procedure below:

• SETUP screen



Touch the [MAINTENANCE INFO.] switch on the SETUP screen as shown above, to change the display to the maintenance information screen.

• MAINTENANCE INFO. screen



- [TP BACK-UP BAT. TYPE]
  This item is used to check the back-up battery type of this touch panel. When the battery voltage is low, replace the “HG9Z-XR1 (IDEC)” battery of this type

- [PLC Ver.]
  This item is used to check the PLC software version information of this machine. If you contact our information section for inquiry of the software version, you can smoothly get information.

- [TP Ver.]
  This item is used to check the touch panel software version information of this machine. If you contact our information section for inquiry of the software version, you can smoothly get information.

4. Fault view function

4.1 Real-time fault view function

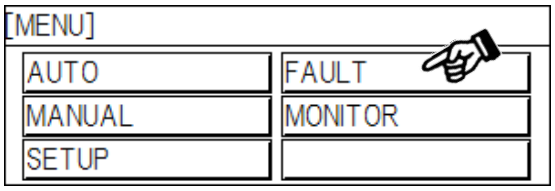
This function is used to check and reset a fault in real time.

Main functions
- Checking a current fault
- Resetting a current fault

This function enables you to check current fault conditions and reset a fault as described above. Reset a fault after taking corrective measures according to fault conditions. Fault reset is enabled after a cause of a fault is eliminated.

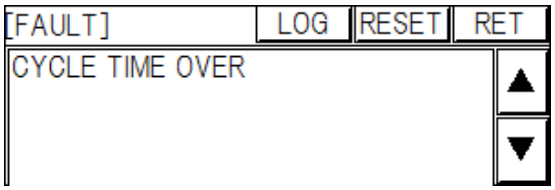
To change the display to the FAULT screen, follow the procedure below:

- MENU screen



Touch the “FAULT” switch on the MENU screen as shown above, to change the display to the FAULT screen.

- FAULT screen



- [Fault view]
  A current fault condition is displayed.
  (Example) Cycle time over

- [▲], [▼]
  These switches are used to scroll the fault view field when four or more faults simultaneously occur.

- [LOG]
  This switch is used to change the display to the FAULT LOG screen.

- [RESET]
  This switch is used to reset a current fault. After eliminating a cause of the fault, execute the reset operation.

- [RET]
  This switch is used to change the display to the MENU screen.

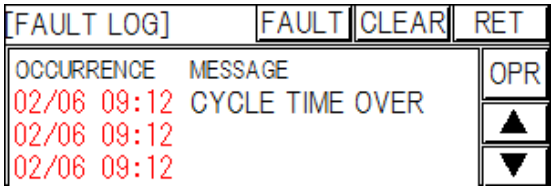
4.2 FAULT LOG function

This function is used to check and clear the record of faults that have occurred up to now.

Main functions
- Checking a fault log
- Clearing a fault log

As described above, you can check and clear the record of faults that have occurred up to now. Once the fault log is cleared, existing fault record will be cleared.
Up to 100 faults in the past can be stored in the fault log.

- FAULT LOG screen



- [FAULT LOG view]
  You can view record of faults that have occurred up to now.
  Up to 100 faults in the past can be stored in the fault log. If the number of faults in the fault log exceeds 100, old data will be cleared in sequence.
  (Example) Cycle time over

- [OPR]
  To scroll the fault log, any item in the fault log must be selected. Select an item in the fault log with this switch.

- [▲], [▼]
  These switches are used to scroll record of faults that have occurred up to now.

- [FAULT]
  This switch is used to change the display to the FAULT screen.

- [CLEAR]
  This switch is used to clear record of faults that have occurred up to now. Once clear operation is executed, existing fault record will be cleared. (Pressing this switch for 0.5 sec. or longer activates clear operation.)

- [RET]
  This switch is used to change the display to the MENU screen.

5. Monitor function

5.1 Outline of monitor function

This function enables monitoring of PLC input/output signals, and production counter reset and preset value registration.

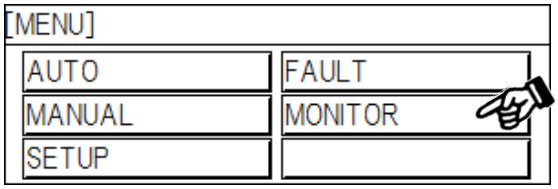
Main functions

- Monitoring and resetting each counter
- Registration of preset value for each counter
- I/O monitor

As described above, the monitor function enables control of production quantity, and standard consumable parts replacement timing and I/O status check by using various counters, offering functions useful for machine maintenance.

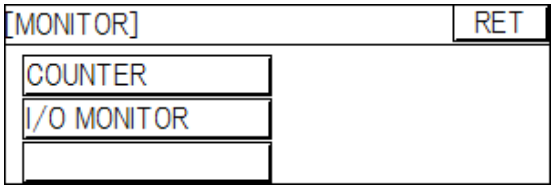
To change the display to the MONITOR screen, follow the procedure below:

- MENU screen



Touch the “MONITOR” switch on the MENU screen as shown above to change the display to the MONITOR screen.

- MONITOR screen



You can go to the “COUNTER” or “MONITOR” screen from this screen.

5.2 Counter function

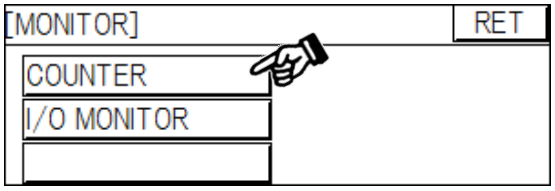
This function is used to monitor and clear each counter, and to register a preset value for each counter

Main functions

- Monitoring each counter
- Clearing each counter
- Registration of preset value for each counter

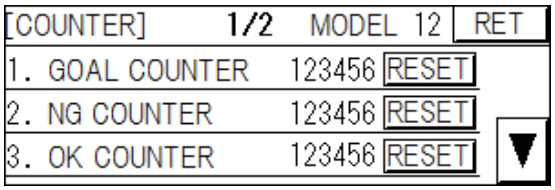
To change the display to the COUNTER screen, follow the procedure below:

• MONITOR screen



Touch the “COUNTER” switch on the MONITOR screen as shown above, to change the display to the COUNTER screen.

• COUNTER 1/2 screen

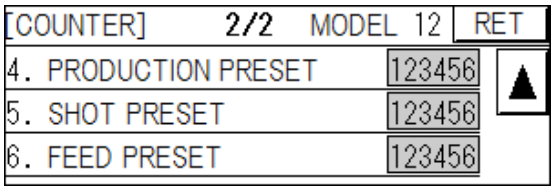


- [RESET]
  This switch is used to reset each counter. Pressing this switch for 1 sec. or longer activates reset operation. If reset operation is executed, existing count value will be reset to”0”. Note that once a counter is reset, the existing count value will be completely deleted.

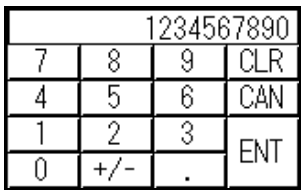
- [RET]
  This switch is used to change the display to the MONITOR screen.

- [▼]
  This switch is used to change the display to the COUNTER 2/2 screen.

• COUNTER 2/2 screen



• Numeric keys



This screen is used to view and change a preset value for each counter. Touching the numerical display field for each counter displays numeric keys. Set a value, and press [ENT] to register the value.

* When each counter reaches the preset value, the system outputs “Count-up stop” signal for each counter. This condition is handled as cycle stop fault. When the preset value is “999999”, the counter does not work.

• [RET]

This switch is used to change the display to the MONITOR screen.

• [▼]

This switch is used to change the display to the COUNTER 1/2 screen.

5.3 I/O monitor function

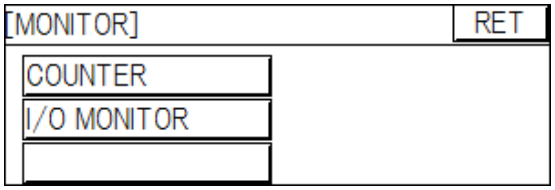
This function is used for PLC input/output monitor (I/O monitor).

Main functions

- PLC input/output monitor (I/O monitor)
- Clearing each counter
- Registration of preset value for each counter

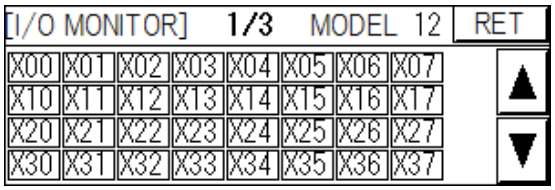
To change the display to the I/O MONITOR screen, follow the procedure below:

• MONITOR screen



Touch the “I/O MONITOR” switch on the MONITOR screen as shown above, to change the display to the I/O MONITOR screen.

• I/O MONITOR 1/3 screen

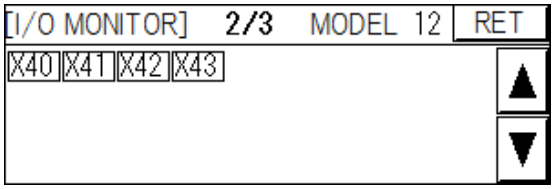


- [RET]
  This switch is used to change the display to the MONITOR screen.

- [▲]
  This switch is used to change the display to the I/O MONITOR 3/3 screen.

- [▼]
  This switch is used to change the display to the I/O MONITOR 2/3 screen.

• I/O MONITOR 2/3 screen

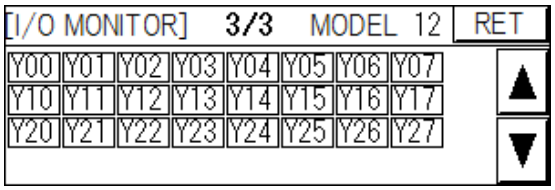


• [RET]
This switch is used to change the display to the MONITOR screen.

• [▲]
This switch is used to change the display to the I/O MONITOR 1/3 screen.

• [▼]
This switch is used to change the display to the I/O MONITOR 3/3 screen.

• I/O MONITOR 3/3 screen



• [RET]
This switch is used to change the display to the MONITOR screen.

• [▲]
This switch is used to change the display to the I/O MONITOR 2/3 screen.

• [▼]
This switch is used to change the display to the I/O MONITOR 1/3 screen.

6. Appendix

6.1 Description of faults

Possible fault conditions of the multi spindle screw driving machine (standard type) are listed below.
* Actual fault conditions may vary depending on the machine being used.

[List of immediate stop faults]

Name of fault	Memory	Description
CYCLE TIME OVER	M400	When one cycle operation time exceeds the set value of the cycle time over parameter, it is indicated as a fault.
(Immediate stop fault 2)	M401	
(Immediate stop fault 3)	M402	
(Immediate stop fault 4)	M403	
(Immediate stop fault 5)	M404	
(Immediate stop fault 6)	M405	
DRIVER ALARM	M406	When the driver controller's system alarm detection output is detected, it is indicated as a fault. If this fault occurs, the machine automatically executes emergency stop operation when the fault is reset. However, the fault cannot be reset depending on the fault condition. For details, refer to the driver controller operation manual. If the machine is equipped with our KX/NX driver, an alarm code "A***" is indicated on the display of the driver controller when the driver alarm is activated.
BEHAVIO ALARM	M407	Improper adjustment or malfunction of the cylinder sensor of the driver up/down unit can be considered. Check the relevant sensor.
(Immediate stop fault 9)	M408	
(Immediate stop fault 10)	M409	

[List of cycle stop faults]

Name of fault	Memory	Description
(Cycle stop fault 1)	M410	
SCREW FEED FAULT 1	M411	When screw feed operation is not normally completed with Axis 1, this fault occurs. To detect a screw feed fault, the optional screw feed check sensor is required. If the setting of [2. FEED CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
SCREW FEED FAULT 2	M412	When screw feed operation is not normally completed with Axis 2, this fault occurs. To detect a screw feed fault, the optional screw feed check sensor is required. If the setting of [2. FEED CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
SCREW FEED FAULT 3	M413	When screw feed operation is not normally completed with Axis 3, this fault occurs. To detect a screw feed fault, the optional screw feed check sensor is required. If the setting of [2. FEED CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
SCREW FEED FAULT 4	M414	When screw feed operation is not normally completed with Axis 4, this fault occurs. To detect a screw feed fault, the optional screw feed check sensor is required. If the setting of [2. FEED CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
(Cycle stop fault 6)	M415	
(Cycle stop fault 7)	M416	
(Cycle stop fault 8)	M417	
(Cycle stop fault 9)	M418	
(Cycle stop fault 10)	M419	
(Cycle stop fault 11)	M420	
TORQUE FAULT 1	M421	If tightening operation is not completed at proper tightening torque with Axis 1, this fault occurs. The following two causes can be considered: • Driver operation is completed in NG condition, or alarm • Tightening time over If tightening time exceeds the time over setting of [9. FASTENING TIME] in machine setup, this fault occurs.
TORQUE FAULT 2	M422	If tightening operation is not completed at proper tightening torque with Axis 2, this fault occurs. The following two causes can be considered: • Driver operation is completed in NG condition, or alarm • Tightening time over If tightening time exceeds the time over setting of [9. FASTENING TIME] in machine setup, this fault occurs.

Name of fault	Memory	Description
TORQUE FAULT 3	M423	If tightening operation is not completed at proper tightening torque with Axis 3, this fault occurs. The following two causes can be considered: • Driver operation is completed in NG condition, or alarm • Tightening time over If tightening time exceeds the time over setting of [9. FASTENING TIME] in machine setup, this fault occurs.
TORQUE FAULT 4	M424	If tightening operation is not completed at proper tightening torque with Axis 4, this fault occurs. The following two causes can be considered: • Driver operation is completed in NG condition, or alarm • Tightening time over If tightening time exceeds the time over setting of [9. FASTENING TIME] in machine setup, this fault occurs.
(Cycle stop fault 16)	M425	
(Cycle stop fault 17)	M426	
(Cycle stop fault 18)	M427	
(Cycle stop fault 19)	M428	
(Cycle stop fault 20)	M429	
(Cycle stop fault 21)	M430	
HEIGHT FAULT 1	M431	If tightening operation is not completed at proper tightening height with Axis 1, this fault occurs. If the setting of [4. HEIGHT CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
HEIGHT FAULT 2	M432	If tightening operation is not completed at proper tightening height with Axis 2, this fault occurs. If the setting of [4. HEIGHT CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
HEIGHT FAULT 3	M433	If tightening operation is not completed at proper tightening height with Axis 3, this fault occurs. If the setting of [4. HEIGHT CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
HEIGHT FAULT 4	M434	If tightening operation is not completed at proper tightening height with Axis 4, this fault occurs. If the setting of [4. HEIGHT CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
(Cycle stop fault 26)	M435	
(Cycle stop fault 27)	M436	
(Cycle stop fault 28)	M437	
(Cycle stop fault 29)	M438	
(Cycle stop fault 30)	M439	
(Cycle stop fault 31)	M440	

Name of fault	Memory	Description
ANGLE FAULT 1	M441	If tightening operation is not completed at proper tightening angle with Axis 1, this fault occurs. When the tightening angle is out of the angle setting range of the driver controller's parameter, this fault occurs. If the setting of [6. ANGLE CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
ANGLE FAULT 2	M442	If tightening operation is not completed at proper tightening angle with Axis 2, this fault occurs. When the tightening angle is out of the angle setting range of the driver controller's parameter, this fault occurs. If the setting of [6. ANGLE CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
ANGLE FAULT 3	M443	If tightening operation is not completed at proper tightening angle with Axis 3, this fault occurs. When the tightening angle is out of the angle setting range of the driver controller's parameter, this fault occurs. If the setting of [6. ANGLE CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
ANGLE FAULT 4	M444	If tightening operation is not completed at proper tightening angle with Axis 4, this fault occurs. When the tightening angle is out of the angle setting range of the driver controller's parameter, this fault occurs. If the setting of [6. ANGLE CHECK] is [DISABLE] in machine setup, the above condition is not regarded as a fault.
(Cycle stop fault 36)	M445	
(Cycle stop fault 37)	M446	
(Cycle stop fault 38)	M447	
(Cycle stop fault 39)	M448	
(Cycle stop fault 40)	M449	
(Cycle stop fault 41)	M450	
Pro. COUNT UP	M451	The production counter has reached the preset value of the [4. PRODUCTION PRESET] parameter on the COUNTER screen. Reset the [1. GOAL COUNTER]. If [4. PRODUCTION PRESET] is set at "999999", cycle stop will not occur.
SHOT COUNT UP	M452	The setting of [5. SHOT PRESET] on the COUNTER screen is "0". Set the [5. SHOT PRESET] parameter on the COUNTER screen again. If the set value is "999999", cycle stop will not occur.
FEED COUNT UP	M453	The setting of [6. FEED PRESET] on the COUNTER screen is "0". Set the [6. FEED PRESET] parameter on the COUNTER screen again. If the set value is "999999", cycle stop will not occur.

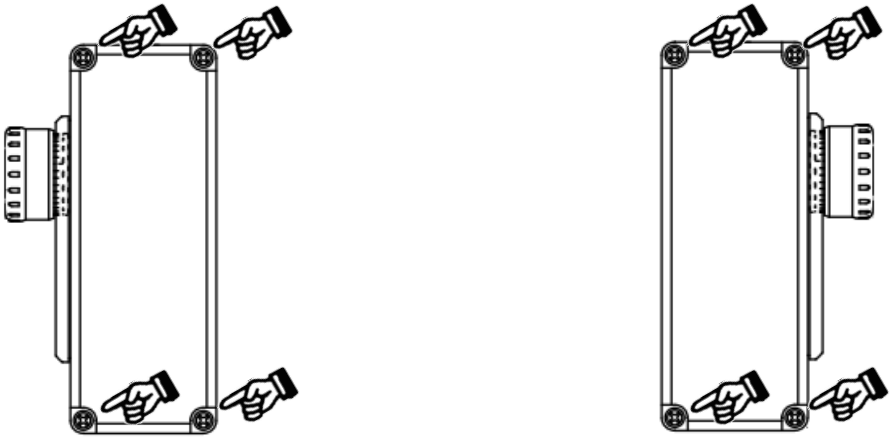
6.2 Touch panel backup battery replacement procedure

The touch panel HG1F-SB22YF-S (IDEC) mounted to this machine incorporates a backup battery to store internal backup data (log data, keep register and keep relay), and clock data.
When a message prompting battery replacement is displayed, replace the backup battery by following the procedure below:
If a message indicating “battery is almost exhausted” is displayed, replace the battery immediately. Otherwise, backup data and clock data may be lost.

(Replacement procedure)

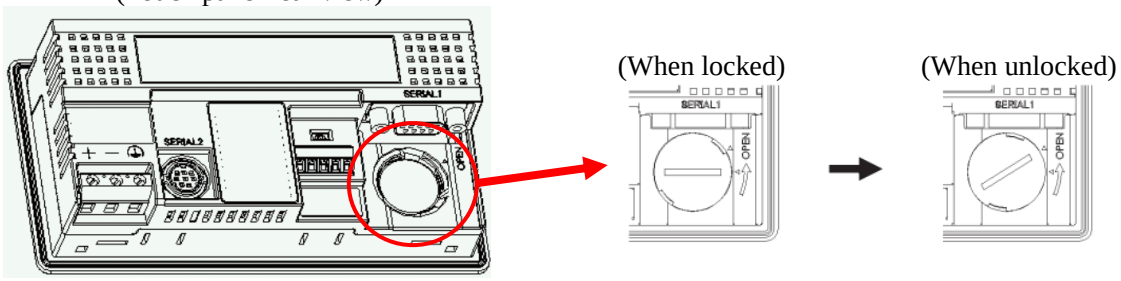
1. Loosen the screws on both sides of the operation box case. (8 places in total)
   You can access the back of the touch panel by removing the screws from the side covers, as shown below:

(Right side) (Left side)

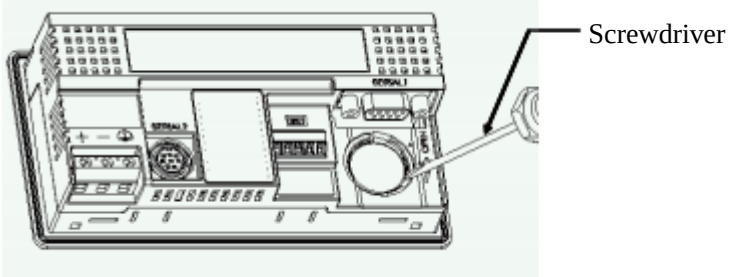


2. Remove the battery cover from the back of the touch panel.

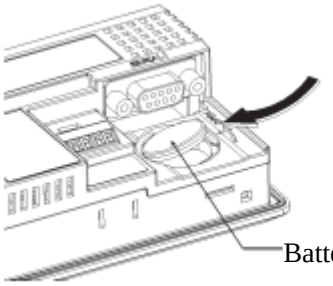
(Touch panel rear view)



3. Turn ON the power switch once, and after elapse of approx. one minute, turn OFF the power switch.
4. Insert a slotted screwdriver into the position shown in the figure below, and remove the battery.
   * In this step, the battery may jump out. Use caution.



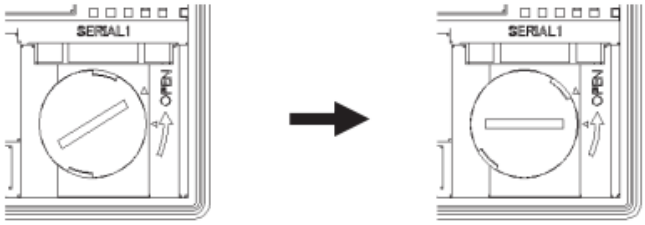
5. Insert a new battery into the battery holder. To mount the battery, use caution about the polarities (+, -) of the battery.



* Insert the battery in the direction indicated with arrow as shown above, and push it into the battery holder.

6. Mount the battery cover.
   * After placing the battery cover on the body, turn the cover clockwise to lock it.

(When unlocked) (When locked)



CAUTION) The backup battery service life is four years as standard. Even if the battery replacement message is not displayed, it is recommended that the battery should be replaced at intervals of 4 years.
Details of the backup battery replacement procedure are described in the IDEC product manual “WindO/I-NV2 User’s Manual.” You should conduct the battery replacement procedure while confirming the precautions given in the manual.

[Revision history]

- January 2015 Preparation of first edition, User's Manual Ver1.00 BOX-SP0000OA

Operation Box for Multi Spindle Screw Driving Machine

User's Manual
Ver. 1.00

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