Changes for the Better

MITSUBISHI ELECTRIC

MITSUBISHI CNC

Maintenance Manual

C80 Series

IB-1501454(ENG)-C

Introduction

This manual covers the items required for maintaining the MITSUBISHI CNC C80 Series.

Read this manual thoroughly and understand the product's functions and performance before starting to use.
The unit names, cable names and various specifications are subject to change without notice. Please confirm these before placing an order.
Be sure to keep this manual always at hand.

⚠ CAUTION

- ⚠ **For items described as "Restrictions" or "Usable State" in this manual, the instruction manual issued by the machine tool builder (MTB) takes precedence over this manual.**
- ⚠ **Items not described in this manual must be interpreted as "not possible".**
- ⚠ **This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.**
- ⚠ **Refer to the manuals issued by the machine manufacturer for each machine tool explanation.**
- ⚠ **Some screens and functions may differ depending on the NC system (or its version), and some functions may not be possible. Please confirm the specifications before use.**
- ⚠ **Do not connect NC system to the Internet-connected network.**
- ⚠ **To maintain the safety of the NC system against unauthorized access from external devices via the network, take appropriate measures.**

In this manual, the following abbreviations might be used.
MTB: Machine tool builder

Also refer to the manuals on "Manual List" as necessary.

Manual List

Manuals related to M800/M80/E80/C80 Series are listed as follows.
These manuals are written on the assumption that all optional functions are added to the targeted model.
Some functions or screens may not be available depending on the machine or specifications set by MTB. (Confirm the specifications before use.)
The manuals issued by MTB take precedence over these manuals.

Manual	IB No.	Purpose and Contents
M800/M80/E80 Series Instruction Manual	IB-1501274	• Operation guide for NC • Explanation for screen operation, etc.
C80 Series Instruction Manual	IB-1501453	• Operation guide for NC • Explanation for screen operation, etc.
M800/M80/E80/C80 Series Programming Manual (Lathe System) (1/2)	IB-1501275	• G code programming for lathe system • Basic functions, etc.
M800/M80/E80/C80 Series Programming Manual (Lathe System) (2/2)	IB-1501276	• G code programming for lathe system • Functions for multi-part system, high-accuracy function, etc.
M800/M80/E80/C80 Series Programming Manual (Machining Center System) (1/2)	IB-1501277	• G code programming for machining center system • Basic functions, etc.
M800/M80/E80/C80 Series Programming Manual (Machining Center System) (2/2)	IB-1501278	• G code programming for machining center system • Functions for multi-part system, high-accuracy function, etc.
M800/M80/E80/C80 Series Alarm/Parameter Manual	IB-1501279	• Alarms • Parameters

Manuals for MTBs (NC)

Manual	IB No.	Purpose and Contents
M800/M80/E80/C80 Series Specifications Manual (Function)	IB-1501505	• Model selection • Outline of various functions
M800/M80/E80/C80 Series Specifications Manual (Hardware)	IB-1501506	• Model selection • Specifications of hardware unit
M800W/M80W Series Connection and Setup Manual	IB-1501268	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
M800S/M80/E80 Series Connection and Setup Manual	IB-1501269	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
C80 Series Connection and Setup Manual	IB-1501452	• Detailed specifications of hardware unit • Installation, connection, wiring, setup (startup/adjustment)
M800/M80/E80 Series PLC Development Manual	IB-1501270	• Electrical design • I/O relation (assignment, setting, connection), field network • Development environment (PLC on-board, peripheral development environment), etc.
M800/M80/E80 Series PLC Programming Manual	IB-1501271	• Electrical design • Sequence programming • PLC support functions, etc.
M800/M80/E80/C80 Series PLC Interface Manual	IB-1501272	• Electrical design • Interface signals between NC and PLC
M800/M80/E80 Series Maintenance Manual	IB-1501273	• Cleaning and replacement for each unit • Other items related to maintenance
C80 Series Maintenance Manual	IB-1501454	• Cleaning and replacement for each unit • Other items related to maintenance

Manuals for MTBs (drive section)

Manual	IB No.	Contents
MDS-E/EH Series Specifications Manual	IB-1501226	• Specifications for power supply regeneration type
MDS-E/EH Series Instruction Manual	IB-1501229	• Instruction for power supply regeneration type
MDS-EJ/EJH Series Specifications Manual	IB-1501232	• Specifications for regenerative resistor type
MDS-EJ/EJH Series Instruction Manual	IB-1501235	• Instruction for regenerative resistor type
MDS-EM/EMH Series Specifications Manual	IB-1501238	• Specifications for multi-hybrid, power supply regeneration type
MDS-EM/EMH Series Instruction Manual	IB-1501241	• Instruction for multi-hybrid, power supply regeneration type
DATA BOOK	IB-1501252	• Specifications of servo drive unit, spindle drive unit, motor, etc.

Manuals for MTBs (Others)

Manual	No.	Purpose and Contents
GOT2000 Series User's Manual (Hardware)	SH-081194	• Outline of hardware such as part names, external dimensions, installation, wiring, maintenance, etc. of GOTs
GOT2000 Series User's Manual (Utility)	SH-081195	• Outline of utilities such as screen display setting, operation method, etc. of GOTs
GOT2000 Series User's Manual (Monitor)	SH-081196	• Outline of each monitor function of GOTs
GOT2000 Series Connection Manual (Mitsubishi Electric Products)	SH-081197	• Outline of connection types and connection method between GOT and Mitsubishi Electric connection devices
GT Designer3 (GOT2000) Screen Design Manual	SH-081220	• Outline of screen design method using screen creation software GT Designer3

■ For M800/M80/E80 Series

Manual	No.	Purpose and Contents
GOT2000/GOT1000 Series CC-Link Communication Unit User's Manual	IB-0800351	• Explanation for handling CC-Link communication unit (for GOT2000 series/GOT1000 series)
GX Developer Version 8 Operating Manual (Startup)	SH-080372E	• Explanation for system configuration, installation, etc. of PLC development tool GX Developer
GX Developer Version 8 Operating Manual	SH-080373E	• Explanation for operations using PLC development tool GX Developer
GX Converter Version 1 Operating Manual	IB-0800004E	• Explanation for operations using data conversion tool GX Converter
MELSEC-Q CC-Link System Master/ Local Module User's Manual	SH-080394E	• Explanation for system configuration, installation, wiring, etc. of master/local modules for CC-Link system
GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 1)	SH-081198ENG	• Explanation for connection types and connection method between GOT and other company's devices
GOT2000 Series Connection Manual (Non-Mitsubishi Electric Products 2)	SH-081199ENG	
GOT2000 Series Connection Manual (Microcomputers, MODBUS/ Fieldbus Products, Peripherals)	SH-081200ENG	• Explanation for connection types and connection method between GOT and microcomputers, MODBUS/fieldbus products, peripherals
GT SoftGOT2000 Version1 Operating Manual	SH-081201ENG	• Explanation for system configuration, screen configuration and operation method of monitoring software GT SoftGOT2000

■ For C80 Series

Manual	No.	Purpose and Contents
MELSEC iQ-R Module Configuration Manual	SH-081262	• Outline of system configuration, specifications, installation, wiring, maintenance, etc.
MELSEC iQ-R CPU Module User's Manual (Startup)	SH-081263	• Outline of specifications, procedures before operation, troubleshooting, etc. for CPU module
MELSEC iQ-R CPU Module User's Manual (Application)	SH-081264	• Outline of memory, functions, devices, parameters, etc. for CPU module
QCPU User's Manual (Hardware Design, Maintenance and Inspection)	SH-080483	• Outline of specifications, necessary knowledge to configure the system and maintenance-related descriptions for Q series CPU module, etc.
GX Works3 Operating Manual	SH-081215	• Outline of functions, programming, etc.

Reference Manual for MTBs

Manual	No.	Purpose and Contents
M800/M80 Series Smart safety observation Specification manual	BNP-C3072-022	♦ Explanation for smart safety observation function
C80 Series Smart safety observation Specification manual	BNP-C3077-022	
M800/M80 Series CC-Link (Master/ Local) Specification manual	BNP-C3072-089	♦ Explanation for CC-Link
M800/M80 Series PROFIBUS-DP Specification manual	BNP-C3072-118	♦ Explanation for PROFIBUS-DP communication function
M800/M80 Series Interactive cycle insertion (Customization) Specification manual	BNP-C3072-121-0003	♦ Explanation for interactive cycle insertion
M800/M80 Series EtherNet/IP Specifications manual	BNP-C3072-263	♦ Explanation for EtherNet/IP

Precautions for Safety

Always read the specifications issued by the MTB, this manual, related manuals and attached documents before installation, operation, programming, maintenance or inspection to ensure correct use. Understand this numerical controller, safety items and cautions before using the unit.
This manual ranks the safety precautions into "DANGER", "WARNING" and "CAUTION".

⚠ **DANGER** **When the user may be subject to imminent fatalities or major injuries if handling is mistaken.**
⚠ **WARNING** **When the user may be subject to fatalities or major injuries if handling is mistaken.**
⚠ **CAUTION** **When the user may be subject to bodily injury or when physical damage may occur if handling is mistaken.**

Note that even items ranked as "⚠ CAUTION", may lead to major results depending on the situation. In any case, important information that must always be observed is described.

The following sings indicate prohibition and compulsory.

	**This sign indicates prohibited behavior (must not do).** **For example, "Keep fire away" is indicated by  .**
	**This sign indicates a thing that is critical (must do).** **For example, "it must be grounded" is indicated by  .**

The meaning of each pictorial sing is as follows.

 **CAUTION**	 **CAUTION rotate object**	 **CAUTION HOT**	 **Danger Electric shock risk**	 **Danger explosive**
 **Prohibited**	 **Disassembly is prohibited**	 **KEEP FIRE AWAY**	 **General instruction**	 **Earth ground**

For Safe Use

MITSUBISHI CNC is designed and manufactured solely for applications to machine tools to be used for industrial purposes.
Do not use this product in any applications other than those specified above, especially those which are substantially influential on the public interest or which are expected to have significant influence on human lives or properties.

1. Items related to prevention of electric shocks

⚠ WARNING

⚠ **Do not open or remove the front cover while the power is ON or during operation. The high voltage terminals and charged sections are exposed, and this could result in electric shocks.**

⚠ **Do not remove the front cover even when the power is OFF, except for the wiring works or periodic inspections. The inside of the controller and drive unit are charged, and this could result in electric shocks.**

⚠ **Always wait at least 15 minutes after turning the power OFF. Then, check the voltage with a tester, etc., before wiring works, inspections or connecting with peripheral devices. Failure to observe this could result in electric shocks.**

⚠ **Earth ground the controller, drive unit and motor according to the local laws. (In Japan, ground the 200V Series input products with Class C or higher protective grounding and the 400V Series input with Class D or higher protective grounding.)**

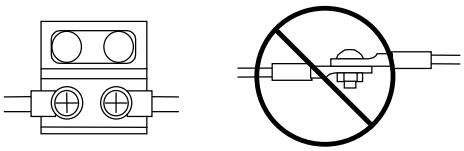
⚠ **All wiring works, maintenance and inspections must be carried out by a qualified technician. Failure to observe this could result in electric shocks. Contact your nearby Service Center or Service Station for replacing parts and servicing.**

⚠ **Wire the controller, drive unit and motor after installation. Failure to observe this could result in electric shocks.**

⚠ **Do not operate the switches with wet hands. Failure to observe this could result in electric shocks.**

⚠ **Do not damage, apply excessive stress, place heavy things on or sandwich the cables. Failure to observe this could result in electric shocks.**

⚠ **Insulate the power lead using a fixed terminal block. Failure to observe this could result in electric shocks.**



⚠ **Completely turn off the externally supplied power used in the system before wiring. Not doing so could result in electric shock or damage to the product.**

⚠ **When turning on the power supply or operating the module after wiring, be sure that the module's terminal covers are correctly attached. Not attaching the terminal cover could result in electric shock.**

2. Items related to prevention of fire

⚠ CAUTION

⚠ **Install the controller, drive unit, motor and regenerative resistor on non-combustible material. Installation directly on or near combustible materials could result in fires.**

⚠ **If any malfunction in the unit is observed, shut off the power at the unit's power supply side. Continuous flow of large current could result in fires.**

⚠ **Install an appropriate no fuse breaker (NFB) and contactor (MC) on the power input section of the drive unit and configure the sequence that shuts the power off upon drive unit's emergency stop or alarm.**

⚠ **When a breaker is shared for multiple power supply units, the breaker may not function upon short-circuit failure in a small capacity unit. Do not share a breaker for multiple units as this is dangerous.**

⚠ **Incorrect wiring and connections could cause the devices to damage or burn.**

3. Items related to prevention of bodily injury or property damage

⚠ DANGER

When transporting or installing a built-in IPM spindle or linear servomotor, be careful so that your hand or property is not trapped in the motors or other metal objects. Also keep the devices with low magnetic tolerance away from the product.

⚠ CAUTION

Do not apply voltages to the connectors or terminals other than voltages indicated in the connection and setup manual for the controller or specifications manual for the drive unit. Failure to observe this could cause bursting, damage, etc.

Incorrect connections could cause the devices to rupture or damage, etc. Always connect the cables to the indicated connectors or terminals.

Incorrect polarity (+ -) could cause the devices to rupture or damage, etc.

Persons wearing medical devices, such as pacemakers, must stay away from this unit. The electromagnetic waves could adversely affect the medical devices.

Fins on the rear of the unit, regenerative resistor and motor, etc., may be hot during operation and for a while after the power has been turned OFF. Do not touch or place the parts and cables, etc. close to these sections. Failure to observe this could result in burns.

Do not enter the machine's movable range during automatic operation. Keep your hands, feet or face away from the spindle during rotation.

4. Other items

Always follow the precautions below as well. Incorrect handling could result in faults, injuries or electric shocks, etc.

(1) Product and manual

⚠ CAUTION

For items described as "Restrictions" or "Usable State" in this manual, the instruction manual issued by the machine tool builder (MTB) takes precedence over this manual.

Items not described in this manual must be interpreted as "not possible"

This manual is written on the assumption that all the applicable functions are included. Some of them, however, may not be available for your NC system. Refer to the specifications issued by the machine tool builder before use.

Refer to the manuals issued by the machine manufacturer for each machine tool explanation.

Some screens and functions may differ depending on the NC system (or its version), and some functions may not be possible. Please confirm the specifications before use.

Do not connect NC system to the Internet-connected network.

To maintain the safety of the NC system against unauthorized access from external devices via the network, take appropriate measures.

(2) Transportation and installation

⚠ CAUTION

Correctly transport the products according to the mass.

Use motor's suspension bolts to transport the motor itself. Do not use it to transport the motor after installation onto the machine.

Do not stack the products exceeding the indicated limit.

Do not hold the cables, shaft or detector when transporting the motor.

⚠ CAUTION

⚠ **Do not transport the controller or drive unit by suspending or holding the connected wires or cables.**

⚠ **Do not hold the front cover when transporting the unit, or the front cover could come off, causing the unit to drop.**

⚠ **Install on a non-combustible place where the unit's or motor's mass can be withstood according to the instruction manual.**

⚠ **The motor does not have a complete water-proof (oil-proof) structure. Do not allow oil or water to contact or enter the motor. Prevent the cutting chips from being accumulated on the motor as they easily soak up oil.**

⚠ **When installing the motor facing upwards, take measures on the machine side so that gear oil, etc., will not enter the motor shaft.**

⚠ **Do not remove the detector from the motor. (The detector installation screw is treated with sealing.)**

⚠ **Do not allow foreign matters, especially, conductive foreign matters such as screws or metal chips, or combustible foreign matters such as oil, to enter the controller, drive unit or motor. Failure to observe this could result in rupture or damage.**

⚠ **Do not get on the product or place heavy objects on it.**

⚠ **Provide prescribed distance between the controller/drive unit and inner surface of the control panel/other devices.**

⚠ **Do not install or operate the controller, drive unit or motor that is damaged or has missing parts.**

⚠ **Take care not to cut hands, etc. with the heat radiating fins or metal edges.**

⚠ **Do not block the intake/outtake ports of the motor with the cooling fan.**

⚠ **Install the controller’s display section and operation board section on the spot where cutting oil will not reach.**

⚠ **The controller, drive unit and motor are precision devices, so do not drop or apply thumping vibration and strong impacts on them.**

⚠ **Store and use the units according to the environment conditions indicated in each specifications manual.**

⚠ **When disinfectants or insecticides must be used to treat wood packaging materials, always use methods other than fumigation (for example, apply heat treatment at the minimum wood core temperature of 56 °C for a minimum duration of 30 minutes (ISPM No. 15 (2009))).**

If products such as units are directly fumigated or packed with fumigated wooden materials, halogen substances (including fluorine, chlorine, bromine and iodine) contained in fumes may contribute to the erosion of the capacitors. When exporting the products, make sure to comply with the laws and regulations of each country.

⚠ **Do not use the products in conjunction with any components that contain halogenated flame retardants (bromine, etc). Failure to observe this may cause the erosion of the capacitors.**

⚠ **Securely fix the motor to the machine. The motor could come off during operation if insecurely fixed.**

⚠ **Always install the motor with reduction gear in the designated direction. Failure to observe this could result in oil leaks.**

⚠ **Always install a cover, etc., over the shaft so that the rotary section of the motor cannot be touched during motor rotation.**

⚠ **When installing a coupling to the servomotor shaft end, do not apply impacts by hammering, etc. The detector could be damaged.**

⚠ **Use a flexible coupling when connecting with a ball screw, etc., and keep the shaft core deviation smaller than the tolerable radial load of the shaft.**

⚠ **Do not use a rigid coupling as an excessive bending load may be applied on the shaft and could cause the shaft to break.**

⚠ **Do not apply a load exceeding the tolerable level onto the motor shaft. The shaft or bearing could be damaged.**

Before using this product after a long period of storage, please contact the Mitsubishi Service Station or Service Center.

⚠ CAUTION

⚠ **Following the UN recommendations, battery units and batteries should be transported based on the international regulations such as those determined by International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), International Maritime Organization (IMO) and U.S. Department of Transportation (DOT).**

⚠ **Due to ventilation problems, do not install the base units vertically or horizontally when C80 is mounted on a board, etc.**

⚠ **Install the basic base unit on a flat surface. Unevenness or warping of the surface can apply undue force to printed circuit boards and lead to operation failures.**

⚠ **Avoid fitting basic unit in proximity to vibration sources such as large electromagnetic contractors and no-fuse circuit breakers; fit the unit on a separate panel or at a distance.**

⚠ **To limit the effects of reflected noise and heat, leave 100mm or more clearance to instruments fitted in front of CNC CPU (on the rear of the door). Similarly, leave 50mm or more clearance between instruments and the left and right sides of the basic base unit.**

(3) Items related to wiring

⚠ CAUTION

⚠ **Correctly wire this product. Failure to observe this could result in motor runaway, etc.**

⚠ **Incorrect connections could cause devices to damage. Connect the cables to designated connectors.**

⚠ **Do not install a phase advancing capacitor, surge absorber or radio noise filter on the output side of the drive unit.**

⚠ **Correctly connect the output side (terminal U, V, W). The motor will not run properly if incorrectly connected.**

⚠ **Always install an AC reactor per each power supply unit.**

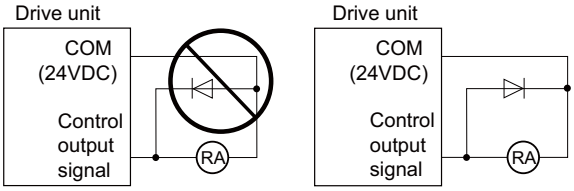
⚠ **Always install an appropriate breaker per each power supply unit. A breaker cannot be shared for multiple power supply units.**

⚠ **Do not directly connect a commercial power supply to the motor. Failure to observe this could result in faults.**

❗ **When using an inductive load such as relays, always connect a diode in parallel to the load as a noise countermeasure.**

❗ **When using a capacitive load such as a lamp, always connect a protective resistor serially to the load to suppress rush currents.**

⚠ **Do not mistake the direction of the surge absorption diode to be installed on the DC relay for the control output signal. If mistaken, the signal will not be output due to fault in the drive unit, and consequently the protective circuit, such as emergency stop, could be disabled.**



⃠ **Do not connect or disconnect the connection cables between each unit while the power is ON.**

⚠ **Do not connect or disconnect the PCBs while the power is ON.**

⚠ **Do not pull the cables when connecting/disconnecting them.**

⚠ **Securely tighten the cable connector fixing screw or fixing mechanism. The motor could come off during operation if insecurely fixed.**

⏚ **Always treat the shield cables indicated in the Connection Manual with grounding measures such as cable clamps.**

⚠ **Separate the signal wire from the drive line or power line when wiring.**

⚠ CAUTION

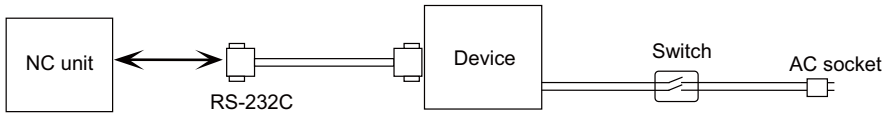
⚠ **Carry out wiring so that there is no possibility of short circuit between wires, nor of dangerous state.**

⚠ **Use wires and cables whose wire diameter, heat resistance level and bending capacity are compatible with the system.**

Ground the device according to the requirements of the country where the device is to be used.

⚠ **Wire the heat radiating fins and wires so that they do not contact.**

⚠ **When using the RS-232C device as a peripheral device, caution must be paid for connector connection/disconnection. Always use a double-OFF type AC power supply switch on the device side, and connect/disconnect the connector with the AC power supply on the device side OFF.**



⚠ **Using a stabilized power supply without overcurrent protection may cause the unit's failure due to miswiring of 24V.**

⚠ **12V, 5V, and 3.3V output from connectors are to supply the power for dedicated peripheral devices. Do not use for other equipment to supply the power since we do not guarantee the NC operation by voltage down or noise sneaking.**

When using an inductive load such as a relay, always connect a diode in parallel to the load to prevent a counter-electromotive force.

When the rush current exceeds the maximum output current, always connect a protective resistor serially to the load to suppress rush currents.

⚠ **The wires from the surge absorber should be connected without extensions.**

⚠ **Be sure to ground the earth terminal FG and LG with Class D or higher grounding (Ground resistance: 100Ω or less). Otherwise it may cause electric shock or operation failure.**

⚠ **When wiring in the unit, be sure that it is done correctly by checking the product's rated voltage and the terminal layout. Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.**

⚠ **External connections shall be crimped or pressure welded with the specified tools, or correctly soldered. Imperfect connections could result in short circuit, fire, or operation failure.**

⚠ **Tighten the terminal screws within the specified torque range. If the terminal screws are loose, it could result in short circuit, fire, or operation failure. Tightening the terminal screws too far may cause damages to the screws and/or the module, resulting in drop, short circuit, or operation failure.**

⚠ **Be sure there are no foreign matters such as sawdust or wiring debris inside the module. Such debris could cause fire, damage, or operation failure.**

⚠ **The module has an ingress prevention label on its top to prevent foreign matter, such as wiring debris, from entering the module during wiring. Do not remove this label during wiring. Before starting system operation, be sure to remove this label because of heat dissipation.**

⚠ **When connecting to a personal computer and a unit with the USB interface, an electric shock or a unit failure may occur. It depends on the type of computer to be connected, or the use environment.**
Operate these correctly according to the manual of a unit and a personal computer.
Observe the following cautions when a personal computer in an AC power supply is used.

(1) For a personal computer that uses a 3-pin power plug or power plug with a ground lead type, make sure to use a plug socket including a ground input electrode or ground the earth lead, respectively.
And, ensure to ground a personal computer and a unit with Class D or higher grounding (Ground resistance: 100Ω or less).

(2) For a personal computer that uses a 2-pin power plug without ground lead, make sure to connect the unit to the personal computer according to the following procedures. And, it is recommended to supply the same power supply line to a personal computer and the unit.
(a) Pull out the power plug of the personal computer from the AC outlet.
(b) Confirm that the power plug of the personal computer has been pulled out from the AC outlet, and connect USB cables, the extension cable or the bus connection cable of a GOT.
(c) Insert the power plug of the personal computer into the AC outlet.

(4) Set up

⚠ WARNING

Do not cancel the emergency stop before confirming the basic operation.

Always set the stored stroke limit. Failure to set this could result in collision with the machine end.

⚠ CAUTION

If the battery low warning is issued, save the machining programs, tool data and parameters in an input/output device, and then replace the battery. When the battery alarm is issued, the machining programs, tool data and parameters may be destroyed. Reload the data after replacing the battery.

Do not adjust the spindle when possible risks associated with adjustment procedures are not thoroughly taken into consideration.

Be careful when touching spindle's rotating section, or your hand may be caught in or cut.

It is dangerous to restore the backup data of other machine when the absolute position is established because the zero point will be established with the absolute position of the linear axis rewritten, thus the zero point position is off the right position. Initialize the zero point again.

Restoration by SRAM data is available only if the rotary axis motor has not rotated in a same direction 30,000 times or more since the acquisition of the data. Otherwise, the zero point of the rotary axis will change by turning the power OFF and ON after writing the SRAM data, which will cause danger. Make sure the zero point is not off the right position. The use of this method should be limited to when necessary, such as when replacing an NC unit, and requires enough safety confirmation before executing.

(5) Operation and adjustments

⚠ CAUTION

If the operation start position is set from a block in the program and the program is started, the program before the set block is not executed. Please confirm that G and F modal and coordinate values are appropriate. If there are coordinate system shift commands or M, S, T and B commands before the block set as the start position, carry out the required commands using the MDI, etc. If the program is run from the set block without carrying out these operations, there is a danger of interference with the machine or of machine operation at an unexpected speed, which may result in breakage of tools or machine tool or may cause damage to the operators.

Under the constant surface speed control (during G96 modal), if the axis targeted for the constant surface speed control moves toward the spindle center, the spindle rotation speed will increase and may exceed the allowable speed of the workpiece or chuck, etc. In this case, the workpiece, etc. may jump out during machining, which may result in breakage of tools or machine tool or may cause damage to the operators.

Check and adjust programs and each parameter before starting operation. Failure to observe this could result in unpredictable operations depending on the machine.

Do not make drastic adjustments or changes as the operation could become unstable.

In the explanation on bits, set all bits not used, including blank bits, to "0".

(6) Usage

⚠ CAUTION

⚠ **Use C80 in an environment that meets the general specifications contained in "C80 Series Connection and Setup Manual". Using C80 in an environment outside the range of the general specifications could result in electric shock, fire, operation failure, and damage to or deterioration of the product.**

⚠ **When mounting the module, be sure to insert the module fixing hook on the module's bottom into the module fixing hole on the base unit. Incorrect mounting could cause an operation failure or a damage/drop of the unit.**

⚠ **Hold down the module loading lever at the module bottom and securely insert the fixing hook into the fixing hole in the base unit. Install the module with the module fixing hole as a supporting point. Incorrect mounting could cause an operation failure or a damage/drop of the unit.**

⚠ **Be sure to fix all the modules with screws to prevent them from dropping. The fixing screws (M3 x 12) are to be prepared by user.**

⚠ **Tighten the screw in the specified torque range. Under tightening may cause a drop, short circuit or operation failure. Over tightening may cause a drop, short circuit or operation failure due to damage to the screw or module.**

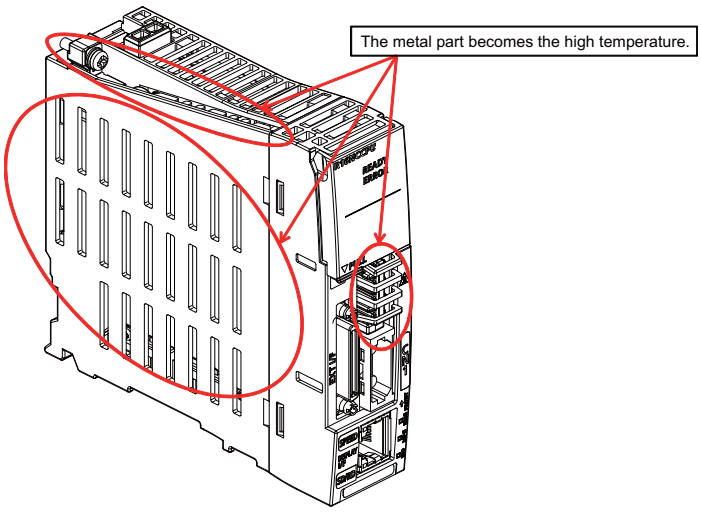
⚠ **Be sure to install the extension cable to connectors of the basic base unit correctly. After installation, check them for looseness. Poor connections could cause an input or output failure.**

⚠ **Completely turn off the externally supplied power used in the system before installation or removing the module. Not doing so could result in electric shock or damage to the product.**

⚠ **Do not install/remove the module on to/from base unit or terminal block more than 50 times, after the first use of the product. Mounting/dismounting over 50 times may cause an operation failure.**

⚠ **Do not directly touch the module's conductive parts or electronic parts. Touching these parts could cause an operation failure or give damage to the module.**

⚠ **Do not touch the heat radiating fins of CNC CPU module while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns. Remove the modules with close attention.**



⚠ **When removing the unit, always remove the fixing screws and then take the fixing hook out from the fixing hole. Incorrect removal will damage the module fixing hook.**

⚠ **When the module fixing screws are used, remove the screws first and module from the base unit. Failure to do so may damage the module.**

⚠ **The module surface temperature may be high immediately after power-off. When the module is removed, pay attention to the burn injury.**

❗ **Install an external emergency stop circuit so that the operation can be stopped and the power turns OFF immediately when unforeseen situation occurs. A contactor, etc., is required in addition to the shutoff function mounted in the controller.**

⚠ **Turn OFF the power immediately if any smoke, abnormal noise or odor is generated from the controller, drive unit or motor.**

🚫 **Only a qualified technician may disassemble or repair this product.**

⚠ **Do not alter.**

⚠ CAUTION

⚠ **Use a noise filter, etc. to reduce the effect of electromagnetic disturbances in the case where electromagnetic disturbances could adversely affect the electronic devices used near the drive unit.**

⚠ **Use the drive unit, motor and each regenerative resistor with the designated combination. Failure to observe this could result in fires or faults.**

⚠ **The combination of the motor and drive unit that can be used is determined. Be sure to check the models of motor and drive unit before test operation.**

⊘ **The brakes (electromagnetic brakes) mounted in the servomotor are used for the purpose of holding, and must not be used for normal braking. Also, do not run the motor with the motor brake applied. Motor brake is used for the purpose of holding.**

⚠ **For the system running via a timing belt, install a brake on the machine side so that safety can be ensured.**

⚠ **Be sure to confirm SERVO OFF (or READY OFF) when applying the electromagnetic brake. Also, be sure to confirm SERVO ON prior to releasing the brake.**

❗ **When using the DC OFF type electromagnetic brake, be sure to install a surge absorber on the brake terminal.**

⊘ **Do not connect or disconnect the cannon plug while the electromagnetic brake's power is ON. The cannon plug pins could be damaged by sparks.**

⚠ **After changing programs/parameters, or after maintenance/inspection, always carry out a test operation before starting actual operation.**

⚠ **Use the power that are complied with the power specification conditions (input voltage, input frequency, tolerable instantaneous power failure time) indicated in each specifications manual.**

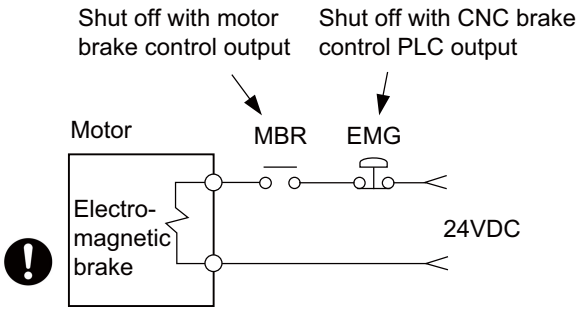
⚠ **When making detector cables, do not mistake connection. Failure to observe this could result in malfunction, runaway or fire.**

(7) Troubleshooting

⚠ CAUTION

⚠ **Use a motor with electromagnetic brakes or establish an external brake mechanism for the purpose of holding; this serves as countermeasures for possible hazardous situation caused by power failure or product fault.**

⚠ ❗ **Use a double circuit structure for the electromagnetic brake's operation circuit so that the brakes will activate even when the external emergency stop signal is issued.**



⚠ **The machine could suddenly restart when the power is restored after an instantaneous power failure, so stay away from the machine. (Design the machine so that the operator safety can be ensured even if the machine restarts.)**

⚠ **To secure the absolute position, do not shut off the servo drive unit's control power supply when its battery voltage drops (warning 9F) in the servo drive unit side.**

❗ **If the battery voltage drop warning alarm occurs in the controller side, make sure to back up the machining programs, tool data and parameters, etc. with the input/output device before replacing the battery. Depending on the level of voltage drop, memory loss could have happened. In that case, reload all the data backed up before the alarm occurrence.**

(8) Maintenance, inspection and part replacement

⚠ CAUTION

⚠ Periodically back up the programs, tool data and parameters to avoid potential data loss. Also, back up those data before maintenance and inspections.

⚠ The electrolytic capacitor's capacity will drop due to deterioration. To prevent secondary damage due to capacitor's faults, Mitsubishi recommends the electrolytic capacitor to be replaced approx. every five years even when used in a normal environment. Contact the Service Center or Service Station for replacements.

⚠ Never perform a megger test (measure the insulation resistance) of the drive unit. Failure to observe this could lead to faults.

⚠ Do not replace parts or devices while the power is ON.

⚠ Do not short-circuit, charge, overheat, incinerate or disassemble the battery.

⚠ Be careful not to break the heat radiating fins during maintenance or replacement.

⚠ Perform the daily and periodic inspections according to the maintenance manual.

⊘ Do not place fingers or hands in the clearance when opening or closing any opening.

⚠ Periodically replace consumable parts such as batteries according to the instruction manual.

⊘ Do not touch the lead sections such as ICs or the connector contacts.

⊘ Do not place the controller or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.

⚠ When replacing the controller or servo amplifier, always set the new unit settings correctly.

⚠ After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.

⊘ The electrolytic capacitor will generate gas during a fault, so do not place your face near the controller or servo amplifier.

⚠ If an error occurs in the self diagnosis of the controller or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.

⚠ If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.

⊘ The unit may suddenly restart after a power failure is restored, so do not go near the machine. (Design the machine so that the operator safety can be ensured even if the machine restarts.)

⚠ Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.

⊘ Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

(9) Disposal

⚠ CAUTION

⚠ **Take the batteries, etc. off from the controller, drive unit and motor, and dispose of them as general industrial wastes.**

Do not alter or disassemble controller, drive unit, or motor.

⚠ **Collect and dispose the spent batteries according to local laws.**

⚠ **Dispose the spent cooling fan according to local laws.**

(10) General precautions

To explain the details, drawings given in the instruction manual, etc., may show the unit with the cover or safety partition removed. When operating the product, always place the cover or partitions back to their original position, and operate as indicated in the instruction manual, etc.

Treatment of waste

The following two laws will apply when disposing of this product. Considerations must be made to each law. The following laws are in effect in Japan. Thus, when using this product overseas, the local laws will have a priority. If necessary, indicate or notify these laws to the final user of the product.

(1) Requirements for "Law for Promotion of Effective Utilization of Resources"
   (a) Recycle as much of this product as possible when finished with use.
   (b) When recycling, often parts are sorted into steel scraps and electric parts, etc., and sold to scrap contractors. Mitsubishi recommends sorting the product and selling the members to appropriate contractors.

(2) Requirements for "Law for Treatment of Waste and Cleaning"
   (a) Mitsubishi recommends recycling and selling the product when no longer needed according to item (1) above. The user should make an effort to reduce waste in this manner.
   (b) When disposing a product that cannot be resold, it shall be treated as a waste product.
   (c) The treatment of industrial waste must be commissioned to a licensed industrial waste treatment contractor, and appropriate measures, including a manifest control, must be taken.
   (d) Batteries correspond to "primary batteries", and must be disposed of according to local disposal laws.

Disposal

(Note) This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury (0,0005%), Cd: cadmium (0,002%), Pb: lead (0,004%)
In the European Union there are separate collection systems for used batteries and accumulators.
Please, dispose of batteries and accumulators correctly at your local community waste collection/ recycling centre.

Please, help us to conserve the environment we live in!

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Handling of our product

(English)
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

본 제품의 취급에 대해서

(한국어 /Korean)
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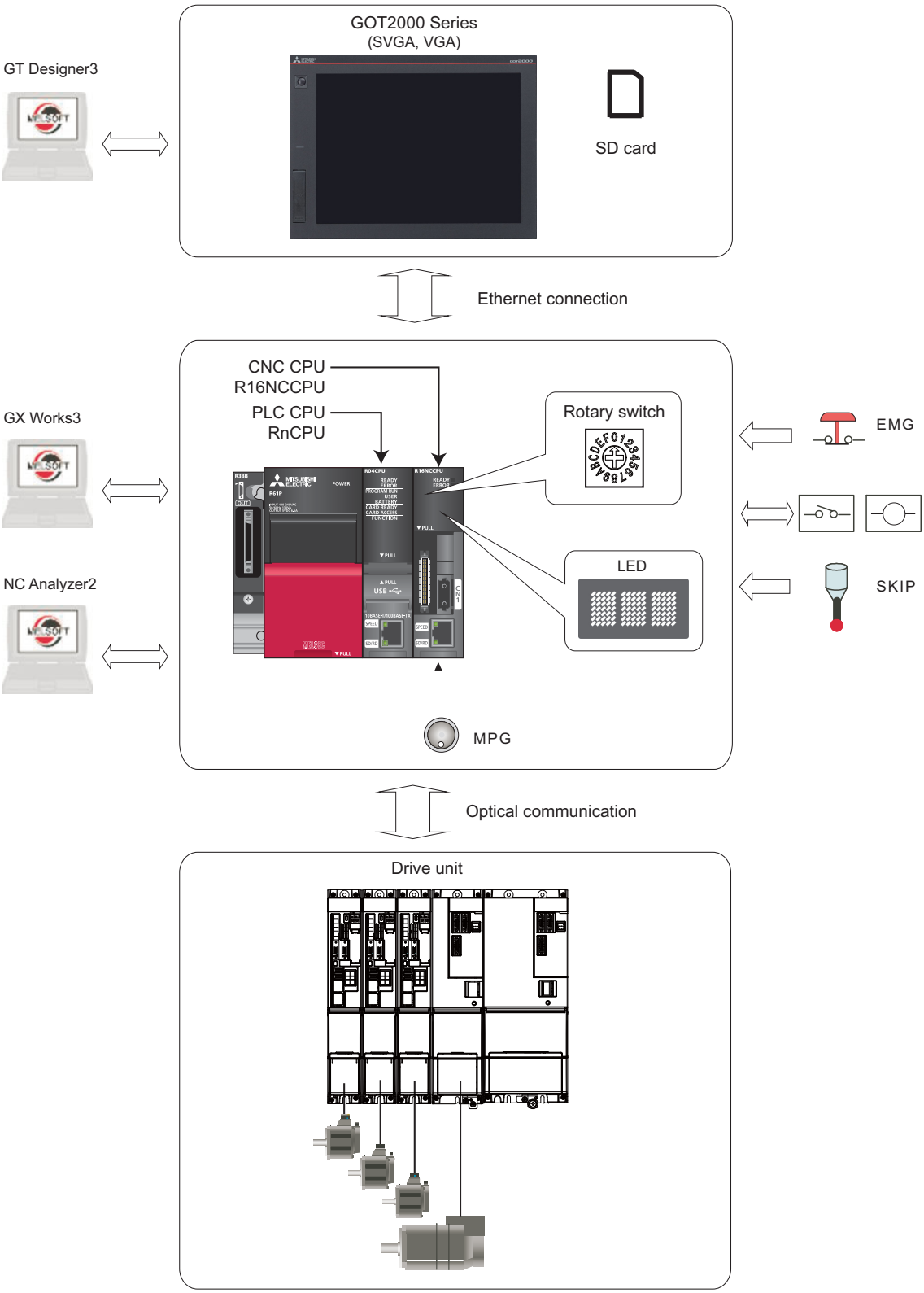
Contents

1

System Basic Configuration

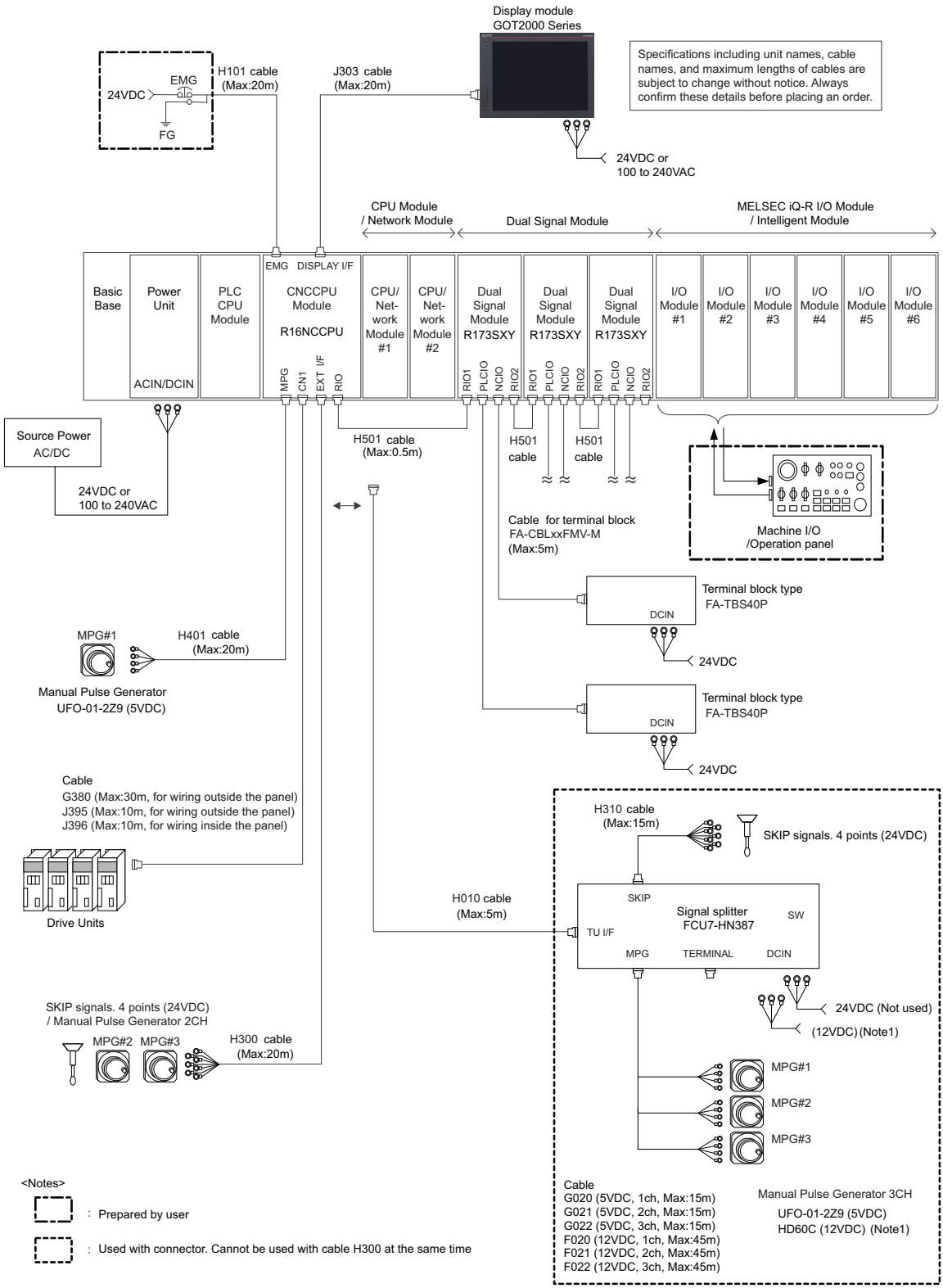
1.1 System Basic Configuration Drawing



Note

(1) The supported versions of the "GT Designer3" are as follows:
SVGA: Version 1.155M or later
VGA: Version 1.165X or later
"GX Works3" Version 1.025B or later is required.

1.2 General Connection Diagram



(Note 1) HD60C (12VDC) requires another power source 12VDC.

Note

(1) A CPU module can be mounted on the CPU slot of the base unit or the slot No. 0 to 6. A slot between CPU modules can be left empty for reservation. Note that you cannot mount an I/O module or intelligent function module on a slot between CPU modules.

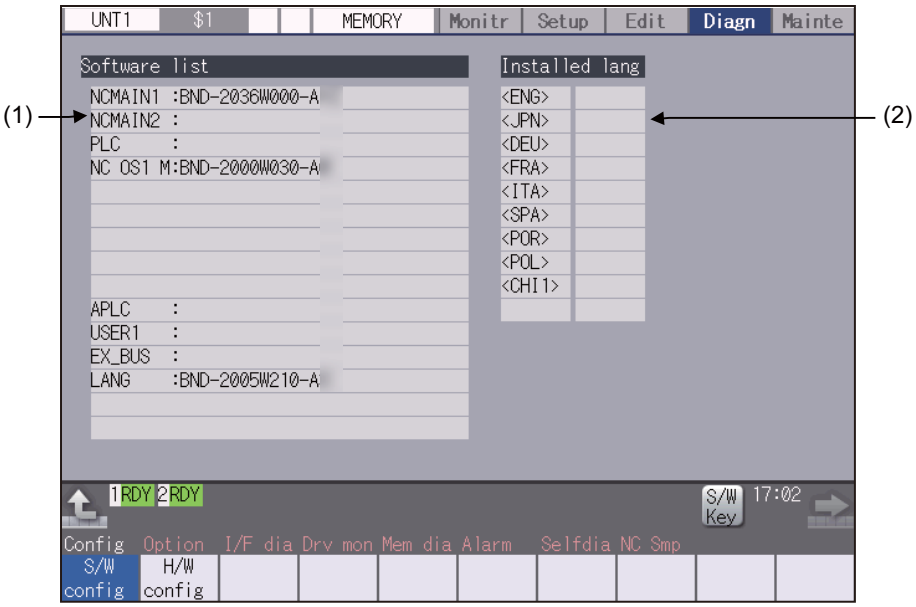
1.3 How to Check the System Configuration

1.3.1 System Configuration Screen

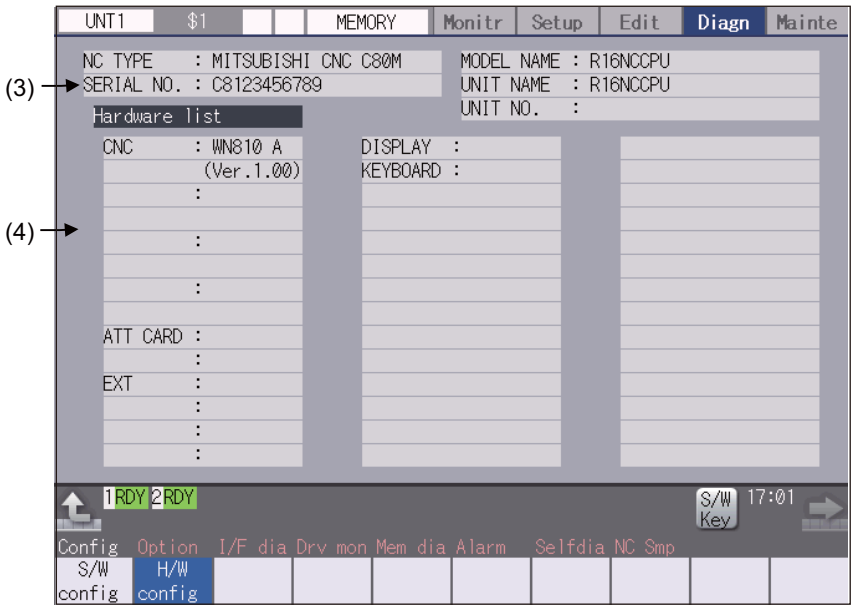
Diagn – Config

Select the menu [Config] on the diagnosis (Diagn) screen to display the hardware configuration (card name and sub-number), software configuration (software number and sub-number), and PLC program configuration (file name, file label, and execution type).

■Software configuration



■Hardware configuration



Display items

Display items	Details		Remarks
(1) Software list	This displays a list of the software being used. Use PAGE▲/PAGE▼ keys to change the pages and refer it.		
(2) Installed lang	This displays a list of installed languages. <ENG>: English <JPN>: Japanese <DEU>: German <FRA>: French <ITA>: Italian <SPA>: Spanish <CHI2>: Traditional Chinese <KOR>: Korean <POR>: Portuguese <DUT>: Dutch	<SWE>: Swedish <HUN>: Hungarian <POL>: Polish <CHI1>: Simplified Chinese <RUS>: Russian <TUR>: Turkish <CZE>: Czech	
(3) NC serial No.	This displays the NC model name, serial No, system type, and unit type.		
	NC TYPE:	NC type	
	MODEL NAME:	System type name	
	SERIAL NO.:	Serial No.	
	UNIT NAME:	Unit type	
(4) Hardware list	The hardware names are displayed. Use PAGE▲/PAGE▼ keys to change the pages and refer it.		
	CNC	This displays the CPU model name.	
	ATT CARD	Not displayed.	
	EXT	Not displayed.	
	DISPLAY	Not displayed.	
	KEYBOARD	Not displayed.	

Menus

Menus	Details
S/W config	This displays the software list.
H/W config	This displays the hardware list.

1.3.2 Option Display Screen

Diagn – Option

Select the menu [Option] on the diagnosis (Diagn) screen to display the contents of the additional specifications registered in the NC.

The additional specification items are displayed by name. If all of the additional specifications cannot be seen in one screen, the rest of items can be displayed by pressing the page up/down keys.

Display items

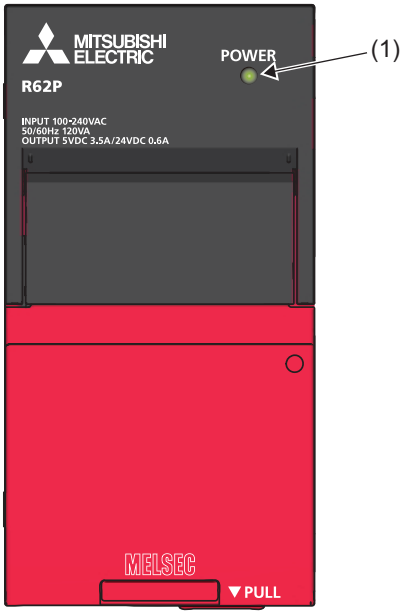
Display items	Details
(1) Option items	The list of currently usable additional specifications is displayed. As for the currently usable items, the background color is displayed in blue. The items set when the power supply was turned ON can be currently used.

1.4 Each Unit Status Display

Each unit status can be confirmed by checking the LED mounted on each unit.

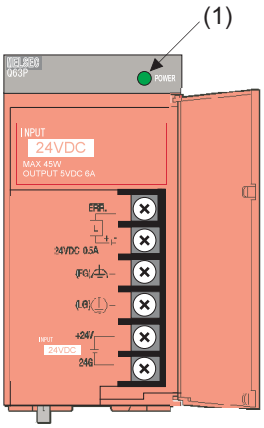
1.4.1 Power Supply

1.4.1.1 R61P/R62P/R63P/R64P

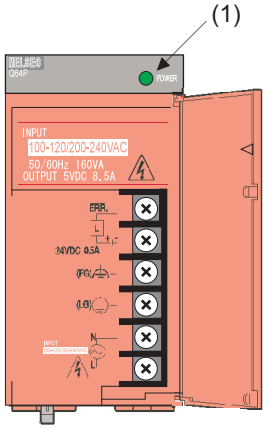


No.	Name	Details
(1)	POWER LED	Indicates the operating status of the power supply module. On: Normal operation Off: Power-off, power failure, or hardware failure

1.4.1.2 Q61P/Q63P/Q64PN



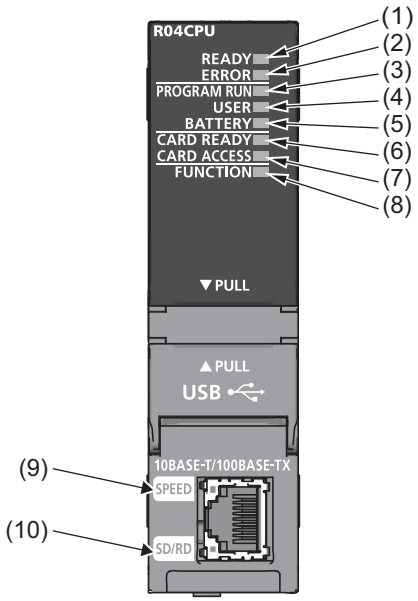
Q63P



Q61P/Q64PN

No.	Name	Details
(1)	POWER LED	Q61P/Q64PN ON (Green): •Normal (5VDC output, instantaneous power failure within 20ms) OFF: •The power supply module is out of order while AC power supply is ON. (5VDC error, internal circuit failure, blown fuse) •Over current protection or over voltage protection operated. •AC power supply is not ON (including power failure and an instantaneous power failure of more than 20ms)
		Q63P ON (Green): •Normal (5VDC output, instantaneous power failure within 10ms) OFF: •The power supply module is out of order while DC power supply is ON. (5VDC error, internal circuit failure, blown fuse) •Over current protection or over voltage protection operated. •DC power supply is not ON (including power failure and an instantaneous power failure of more than 10ms)

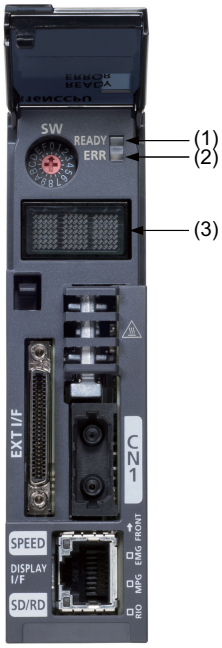
1.4.2 PLC CPU Module



No.	Name	Details
(1)	READY LED	Indicates the operating status of the CPU module and the error level.
(2)	ERROR LED	[READY LED - ERROR LED status] On-off: Normal operation On-on: Minor error On-flashing: Moderate error Flashing-on: Minor error (Changing module online) Flashing (every 2s)-off: Initial processing Flashing (every 400ms)-off: Changing module online Off-on/flashing: Major error

No.	Name	Details
(3)	PROGRAM RUN LED	Indicates the operating status of the program. On: Being executed (RUN state) Flashing: Being suspended (PAUSE state) Off: Stopped (STOP state) or stop error
	PROGRAM RUN LED (When the Process CPU is used in redundant mode)	Indicates the operating status of the program. (a) Control system (CTRL LED of the redundant function module: On) On: Being executed (RUN state) Flashing: Being suspended (PAUSE state) Off: Stopped (STOP state) or stop error (b) Standby system (SBY LED of the redundant function module: On) [Backup mode] On: Being executed (programs being executed in both systems) Flashing: Being suspended (PAUSE state) (programs being executed in both systems) Off: Stopped (STOP state/RUN state/PAUSE state) (no program being executed in both systems) or stop error [Separate mode] On: Being executed (RUN state) Flashing: Being suspended (PAUSE state) or waiting for state transition to RUN (same as STOP state) Off: Stopped (STOP state) or stop error (c) Systems not determined Flashing: Waiting for state transition to RUN by switch operation (same as STOP state) Off: Normal operation
(4)	USER LED	Indicates the status of the annunciator (F). On: Annunciator (F) ON Off: Normal operation
(5)	BATTERY LED	Indicates the battery status. Flashing: Battery low Off: Normal operation
(6)	CARD READY LED	Indicates the availability of the SD memory card. On: Available Flashing: Ready Off: Not available or not inserted
(7)	CARD ACCESS LED	Indicates the access status of the SD memory card. On: Being accessed Off: Not accessed
(8)	FUNCTION LED	Indicates the status of the function being executed.
(9)	SPEED LED	Refer to the following manual: MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup)
(10)	SD/RD LED	

1.4.3 CNC CPU Module



(1) READY LED

(2) ERROR LED

The operating state and the error state of CNC CPU will be displayed.

READY LED	ERROR LED	Operating state
Not lit	Not lit	Power OFF or hardware failure
Flashing	Not lit	Initializing
Lit	Not lit	Normal operation
Lit	Flashing	Occurrence of a moderate error
Not lit	Lit or flashing	Occurrence of a severe error

(3) Dot matrix LED

The operating state and the error information will be displayed (3 digits).

2

Daily Maintenance and Periodic Maintenance

Maintenance is categorized into daily maintenance items (items to be carried at set intervals) and periodic maintenance items (replacement of parts when life is reached).
Some parts may not function in a hardware manner when the life is reached, so these should be replaced before the life is reached.

For details of the maintenance on the GOT, refer to "GOT2000 Series User's Manual (Hardware)" (SH-081194ENG).
For details of the maintenance on the PLC, refer to "MELSEC iQ-R Module Configuration Manual" (SH-081262ENG).
For details of the inspection and maintenance of the drive section, refer to the instruction manuals for each drive unit.

2.1 Daily Maintenance

2.1.1 GOT

The following describes the items that must be maintained or inspected daily.

Inspection item	Inspection method	Criterion	Corrective action
Dirt on the protective sheet	Visual check	Not outstanding	Replace
Foreign material adherence	Visual check	Must not be attached	Remove and clean

Use the GOT always in a clean condition.
To clean the GOT, wipe the dirty part with a soft cloth using neutral detergent or ethanol.

2.2 Periodic Maintenance

There are no durable parts for CNC CPU module.

Check periodically if the usage environment is within the range of the specified environment conditions.
For the details of the specifications of GOT, I/O unit, etc., refer to the manuals listed in the "3 List of Configuration" in "C80 Series Connection and Setup Manual".
For the drive unit specifications, refer to the specification manual for the drive unit you are using.

3

Maintenance of the Drive Unit

⚠ WARNING

1. Before starting maintenance or inspections, turn the main circuit power and control power both OFF. Wait at least fifteen minutes until the CHARGE lamp turns OFF, and then confirm that the input and output voltage are zero using a tester, etc. Failure to observe this could lead to electric shocks.

2. Inspections must be carried out by a qualified technician. Failure to observe this could lead to electric shocks. Contact your nearest Mitsubishi branch or dealer for repairs and part replacement.

⚠ CAUTION

1. Never perform a megger test (measure the insulation resistance) of the drive unit. Failure to observe this could lead to faults.

2. The user must never disassemble or modify this product.

3.1 Periodic Inspections

The following periodic inspections are recommended to be done.

(1) Check that any of the screws on the terminal block is not loose. When there is a loose screw, tighten it.

(2) Check that any abnormal noise is not heard from the servo motor bearings or brake section.

(3) Check that any of the cables is not damaged or cracked. Inspect the cables periodically according to the working condition, especially when the cables move along with the machine.

(4) Check the load coupling shaft for misalignment.

3.2 Durable Parts

A guide to the part replacement cycle is shown below. Note that these will differ according to the working conditions or environmental conditions, so replace the parts if any abnormality is found. Contact Mitsubishi branch or your dealer for repairs or part replacements.

[MDS-E/EH Series]

Part name		Standard replacement time	Remarks
Servo drive unit	Smoothing capacitor	10 years	The standard replacement time is a reference. Even if the standard replacement time is not reached, the part must be replaced if any abnormality is found.
	Cooling fan	10,000 to 30,000 hours (2 to 3 years)	
	Battery	10,000 hours (for MDS-BAT6V1SET, MDSBTBOX-LR2060)	
Servo motor	Bearings	20,000 to 30,000 hours	
	Encoder	20,000 to 30,000 hours	
	Oil seal, V-ring	5,000 hours	

[MDS-EJ/EJH Series]

Part name		Standard replacement time	Remarks
Servo drive unit	Smoothing capacitor	10 years	The standard replacement time is a reference. Even if the standard replacement time is not reached, the part must be replaced if any abnormality is found.
	Cooling fan	10,000 to 30,000 hours (2 to 3 years)	
	Battery	10,000 hours (for MR-BAT6V1SET)	
Servo motor	Bearings	20,000 to 30,000 hours	
	Encoder	20,000 to 30,000 hours	
	Oil seal, V-ring	5,000 hours	

[MDS-EM/EMH Series]

Part name		Standard replacement time	Remarks
Servo drive unit	Smoothing capacitor	10 years	The standard replacement time is a reference. Even if the standard replacement time is not reached, the part must be replaced if any abnormality is found.
	Cooling fan	10,000 to 30,000 hours (2 to 3 years)	
	Battery	10,000 hours (for MR-BAT6V1SET, MDSBTBOX-LR2060)	
Servo motor	Bearings	20,000 to 30,000 hours	
	Encoder	20,000 to 30,000 hours	
	Oil seal, V-ring	5,000 hours	

(1) Power smoothing capacitor:

The characteristics of the power smoothing capacitor will deteriorate due to the effect of ripple currents, etc. The capacitor life is greatly affected by the ambient temperature and working conditions. However, when used continuously in a normal air-conditioned environment, (ambient temperature is an average of 40°C or less) the service life will be ten years.

(2) Relays:

Contact faults will occur due to contact wear caused by the switching current. The service life will be reached after 100,000 cumulative switches (switching life) although this will differ according to the power capacity.

(3) Servo motor bearings:

The motor bearings should be replaced after 20,000 to 30,000 hours of rated load operation at the rated speed. This will be affected by the operation state, but the bearings must be replaced when any abnormal noise or vibration is found in the inspections.

(4) Servo motor oil seal, V-ring:

These parts should be replaced after 5,000 hours of operation at the rated speed. This will be affected by the operation state, but these parts must be replaced if oil leaks, etc., are found in the inspections.

3.3 Adding and Replacing Units and Parts

⚠ CAUTION

1. Correctly transport the product according to its weight. Failure to observe this could result in injury.

2. Do not stack the product above the indicated limit.

3. Installation directly on or near combustible materials could result in fires.

4. Install the unit in a place which can withstand its weight.

5. Do not get on or place heavy objects on the unit. Failure to observe this could result in injury.

6. Always use the unit within the designated environment condition range.

7. Do not allow conductive foreign matter such as screws or metal chips, or combustible foreign matter such as oil enter the servo drive or servo motor.

8. Do not block the intake or exhaust ports of the servo drive of servo motor. Failure to observe this could result in faults.

9. The servo drive and servo motor are precision devices. Do not drop them or apply strong impacts.

10. Do not install or operate a servo drive or servo motor which is damaged or missing parts.

11. When the unit has been stored for a long time, contact the Service Center or Service Station.

12. Connect the encoder (CN2/CN3) immediately after the installation of the servo drive unit. In addition, when a battery box is used, immediately connect to the BTA/BTB connector. (prevention of absolute position data lost)

3.3.1 MDS-E/EH Series

3.3.1.1 Replacing the Drive Unit

■Arrangement of replacing parts

Contact Mitsubishi branch or your dealer for an order or a replacement of the drive unit.
Place an order for the same type of a drive unit as the one to be replaced.

■Replacement procedure

Replace the drive unit with the following procedures.

Procedures

(1) Turn the breaker for the input power OFF. Make sure the CHARGE lamp of the power supply unit is turned OFF.
(2) Disconnect all the connectors and the wires connected to the drive unit.
(3) Remove the two (four) screws fixing the drive unit onto the control panel. Remove the drive unit from the control panel.
(4) Make a same setting for the rotary switch and the dip switch of the new drive unit as those of the uninstalled drive unit.
(5) Install a new drive unit by following the removal procedure in reverse.

■Restoration

Data backup and restoration is not required before replacing drive units because drive units' data such as parameters are stored in the controller. However, carry out a backup of the whole system before replacement as a precautionary measure. The power for keeping the encoder's position data of an absolute position system is supplied from the battery connected to the drive unit. Keep the power ON once for 30 minutes or more if possible, and make sure to complete the replacement within 60 minutes after charging the encoder's capacitor.

3.3.1.2 Replacing the Unit Fan

■Replacing parts

<MDS-E Series>

Servo drive unit			Spindle drive unit			Power supply unit		
Type MDS-E-	Fan type	Size [mm]	Type MDS-E-	Fan type	Size [mm]	Type MDS-E-	Fan type	Size [mm]
V1-20	9WF0424H603	40SQ.	SP-20	9WF0424H603	40SQ.	CV-37	-	-
V1-40			SP-40			CV-75	-	-
V1-80			SP-80			CV-110	9WF0624H604	60SQ.
V1-160			SP-160	9WF0624H604	60SQ.	CV-185		
V1-160W	9WF0624H604	60SQ.	SP-200	9WF0924H206	90SQ.	CV-300	9WF0924H206	90SQ.
V1-320	9WF0924H206	90SQ.	SP-240			CV-370		
V1-320W			SP-320			CV-450		
V2-20	9WF0424H603	40SQ.	SP-400	9WF0924H403	90SQ.	CV-550	9WF1224H105	120SQ.
V2-40			SP-640	9WF1224H105	120SQ.			
V2-80			SP2-20	9WF0424H603	40SQ.			
V2-160	9WF0624H604	60SQ.	SP2-40					
V2-160W	9WF0924H206	90SQ.	SP2-80	9WF0624H604	60SQ.			
V3-20	9WF0424H603	40SQ.	SP2-16080					
V3-40								

<MDS-EH Series>

Servo drive unit			Spindle drive unit			Power supply unit		
Type MDS-EH-	Fan type	Size [mm]	Type MDS-EH-	Fan type	Size [mm]	Type MDS-EH-	Fan type	Size [mm]
V1-10	-	-	SP-20	9WF0424H603	40SQ.	CV-37	9WF0624H604	60SQ.
V1-20	9WF0424H603	40SQ.	SP-40			CV-75		
V1-40			SP-80	9WF0624H604	60SQ.	CV-110		
V1-80			SP-100	9WF0924H206	90SQ.	CV-185		
V1-80W	9WF0624H604	60SQ.	SP-160			CV-300	9WF0924H206	90SQ.
V1-160	9WF0924H206	90SQ.	SP-200	9WF0924H403	90SQ.	CV-370		
V1-160W			SP-320			CV-450		
V1-200	9WF0924H403	90SQ.	SP-480	9WF1224H105	120SQ.	CV-550	9WF1224H105	120SQ.
V2-10	-	-	SP600			CV-750		
V2-20	9WF0424H603	40SQ.						
V2-40								
V2-80	9WF0624H604	60SQ.						
V2-80W	9WF0924H206	90SQ.						

POINT

When the drive unit of E/EH Series which uses two cooling fans is in an emergency stop or alarm, one of fans (upper one in the case of vertical layout, or either one in the case of horizontal layout) is stopped and power-saving operation is performed. If the suspended fan is restarted by canceling the emergency stop, it is not a problem with the fan.

■Replacement procedure

Replace the unit fan with the following procedures.

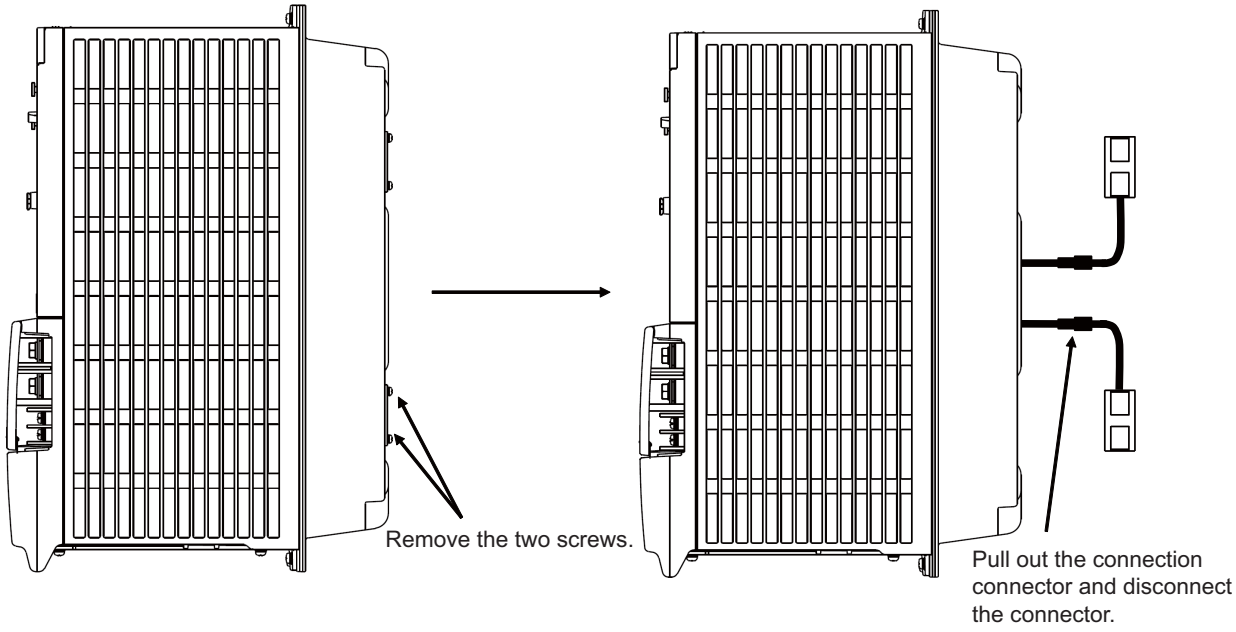
<MDS-E/EH-V1/V2/SP/SP2 Series>

(1) Turn the breaker for the input power OFF, and wait for the CHARGE lamp on the power supply unit to turn OFF before removing the unit.

(2) Remove the fan guard from the back of the drive unit, and remove the two fan mounting screws.

(3) Remove the fan power cable.

(4) Disconnect the connection connector, and replace the fan.



3.3.1.3 Replacing the Battery

■Replacing parts

<Replacing a battery equipped with the spindle/servo drive unit or the battery unit, MDSBTBOX-LR2060>

When the battery voltage is low (warning 9F), place an order for the same type of a battery as the one currently equipped with the unit.
Battery type LR20 is commercially available as a size-D alkaline battery. The battery may be purchased and replaced by the user.

Type	Battery equipped unit
MDS-BAT6V1SET	Servo drive unit
LR20 (size-D alkaline battery)	Battery unit, MDSBTBOX-LR2060

Note

(1) Four LR20 size-D alkaline batteries are needed for per battery unit, MDSBTBOX-LR2060.

⚠ CAUTION

1. When the battery voltage is low (warning 9F), do not shut OFF the power of the drive unit until replacement of the battery to protect the data.

2. Replace the MDSBTBOX-LR2060 battery with new batteries (LR20) that is within the recommended service period.

■Replacement procedure

Replace the battery with the following procedures.

⚠ CAUTION

1. Replace the batteries with new ones immediately after the battery voltage drop alarm (9F) has been output.

2. Replace the batteries while applying the drive unit's control power.

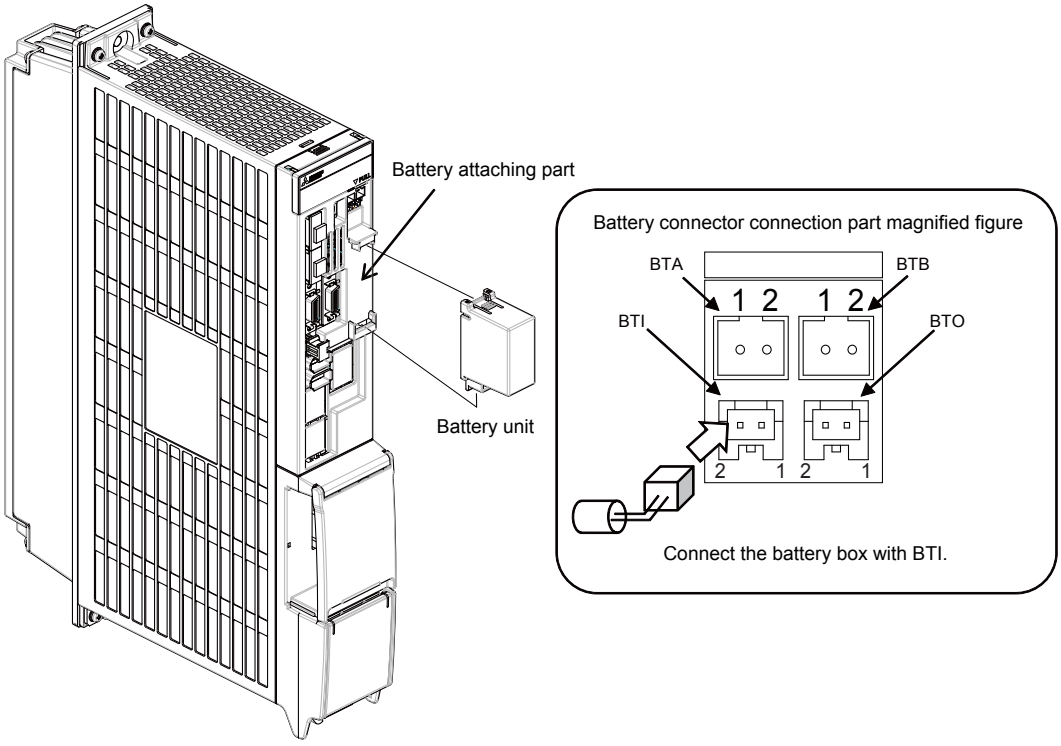
<Replacement procedure for the cell battery MDS-BAT6V1SET>

(1) Open the battery holder cover located at the front of the drive unit.

(2) Pull out the battery connector connected with the drive unit. Remove the battery.

(3) Connect a new battery connector to the connector position where the old battery connector was pulled out from in step (2).

(4) Cancel the warning 9F by executing an alarm reset (pushing the NC reset button).



<Replacement procedure for the battery unit MDSBTBOX-LR2060>

Possible backup period

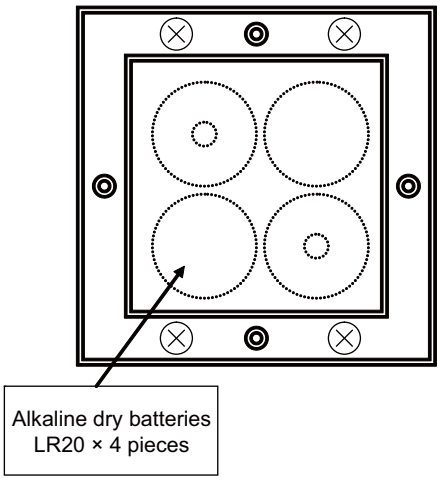
Possible backup period is at most one year. Thus, make sure to exchange the batteries in the one-year cycle.

How to replace the battery

(1) Remove the battery box cover (four screws).
(2) Replace the batteries with new ones. Be careful not to mistake the polarity.
(3) Attach the cover, and fix it with the four screws.

Note

(1) Replace the batteries while applying control power to the servo drive unit.
(2) When replacing the battery, do not let foreign objects enter. If the terminal area gets dirty, clean there.
(3) If the cover is ill-set, mist or foreign objects enter through the interstices and enter into the panel. Tighten the screws. (Tightening torque: 1N•m)



⚠ CAUTION

1. Replace the batteries with new ones that are in their recommended use period. (Check the recommended use period written on the batteries before using them.)
2. Replace the batteries with new ones immediately after the battery voltage drop alarm (9F) has been output.
3. Replace the batteries while applying the servo drive unit's control power.
4. Wrong connection may cause liquid leakage, heat generation and/or explosion.
5. Do not mix new batteries with used ones or mix different types of batteries.

3.3.2 MDS-EJ/EJH Series

3.3.2.1 Replacing the Drive Unit

■Arrangement of replacing parts

Contact Mitsubishi branch or your dealer for an order or a replacement of the drive unit.
Place an order for the same type of a drive unit as the one to be replaced.

■Replacement procedure

Replace the drive unit with the following procedures.

Procedures

(1) Turn the breaker for the input power OFF. Make sure the CHARGE lamp of the power supply unit is turned OFF.
(2) Disconnect all the connectors and the wires connected to the drive unit.
(3) Remove the two (four) screws fixing the drive unit onto the control panel. Remove the drive unit from the control panel.
(4) Make a same setting for the rotary switch and the dip switch of the new drive unit as those of the uninstalled drive unit.
(5) Install a new drive unit by following the removal procedure in reverse.

■Restoration

Data backup and restoration is not required before replacing drive units because drive units' data such as parameters are stored in the controller. However, carry out a backup of the whole system before replacement as a precautionary measure. The power for keeping the encoder's position data of an absolute position system is supplied from the battery connected to the drive unit. Keep the power ON once for 30 minutes or more if possible, and make sure to complete the replacement within 60 minutes after charging the encoder's capacitor.

3.3.2.2 Replacing the Unit Fan

■Replacing parts

Unit fan type

Drive unit type	Fan type	Size [mm]
MDS-EJ-V1-30	MMF-04C24DS BKO-CB0479H01	40SQ.
MDS-EJ-SP-20		
MDS-EJ-V1-40/80/100	MMF-06F24ES-RP3 BKO-CB0500H01	60SQ.
MDS-EJ-SP-40/80		
MDS-EJ-SP-100/120	MMF-08D24ES-RP1 BKO-CA1639H01 *M	80SQ.
MDS-EJ-SP-160	MMF-06F24ES-RP1 BKO-CA1638H01 *M×2	60SQ.
MDS-EJ-V2-30 MDS-EJ-SP2-20	MMF-06H24SS-CX1 BKO-CA2254H01	60SQ.
MDS-EJ-V2-40	MMF-08G24ES-CP1 BKO-CA1941H01	80SQ.

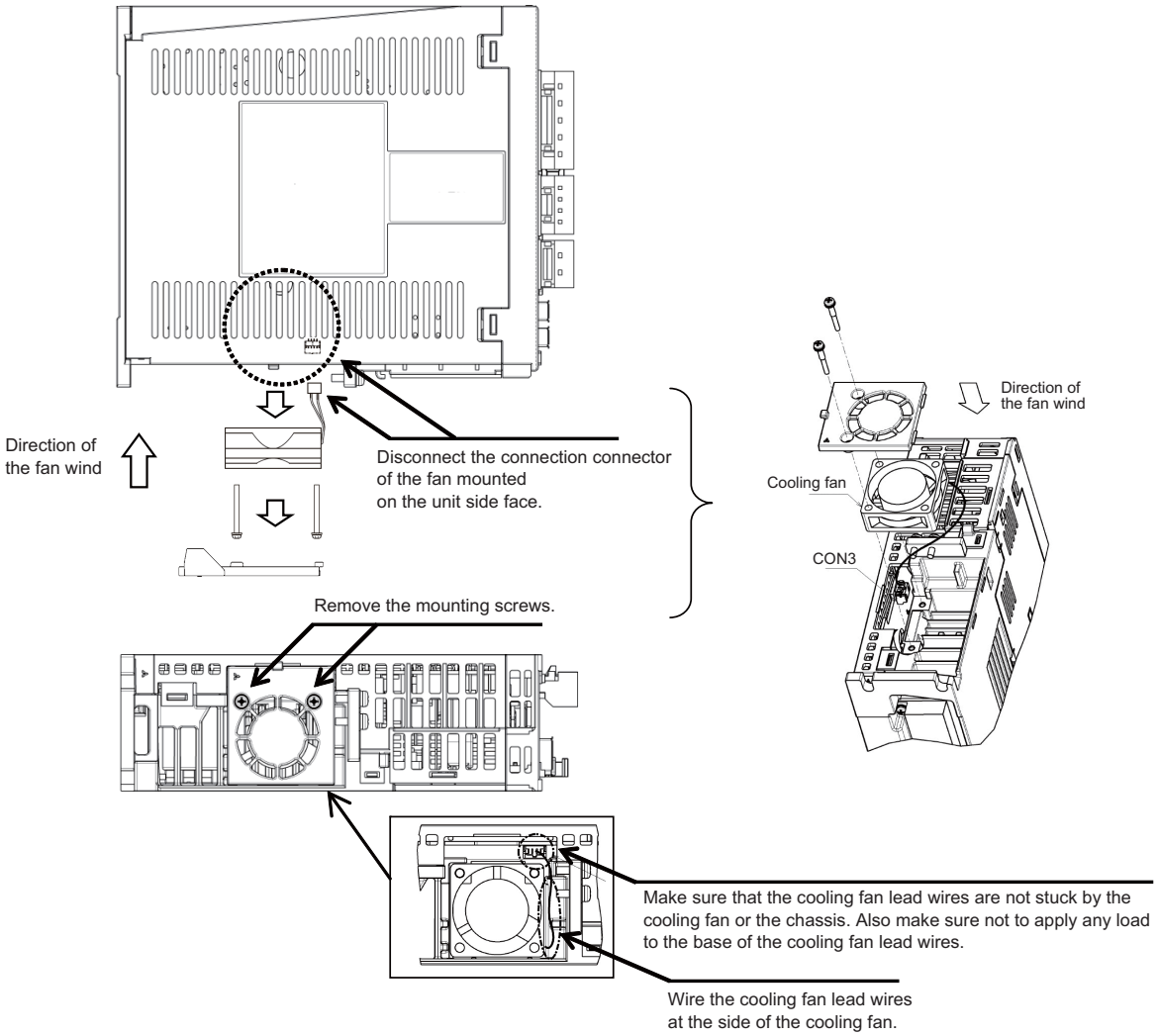
POINT

MDS-EJ-V1-10/15 does not have this unit fan.

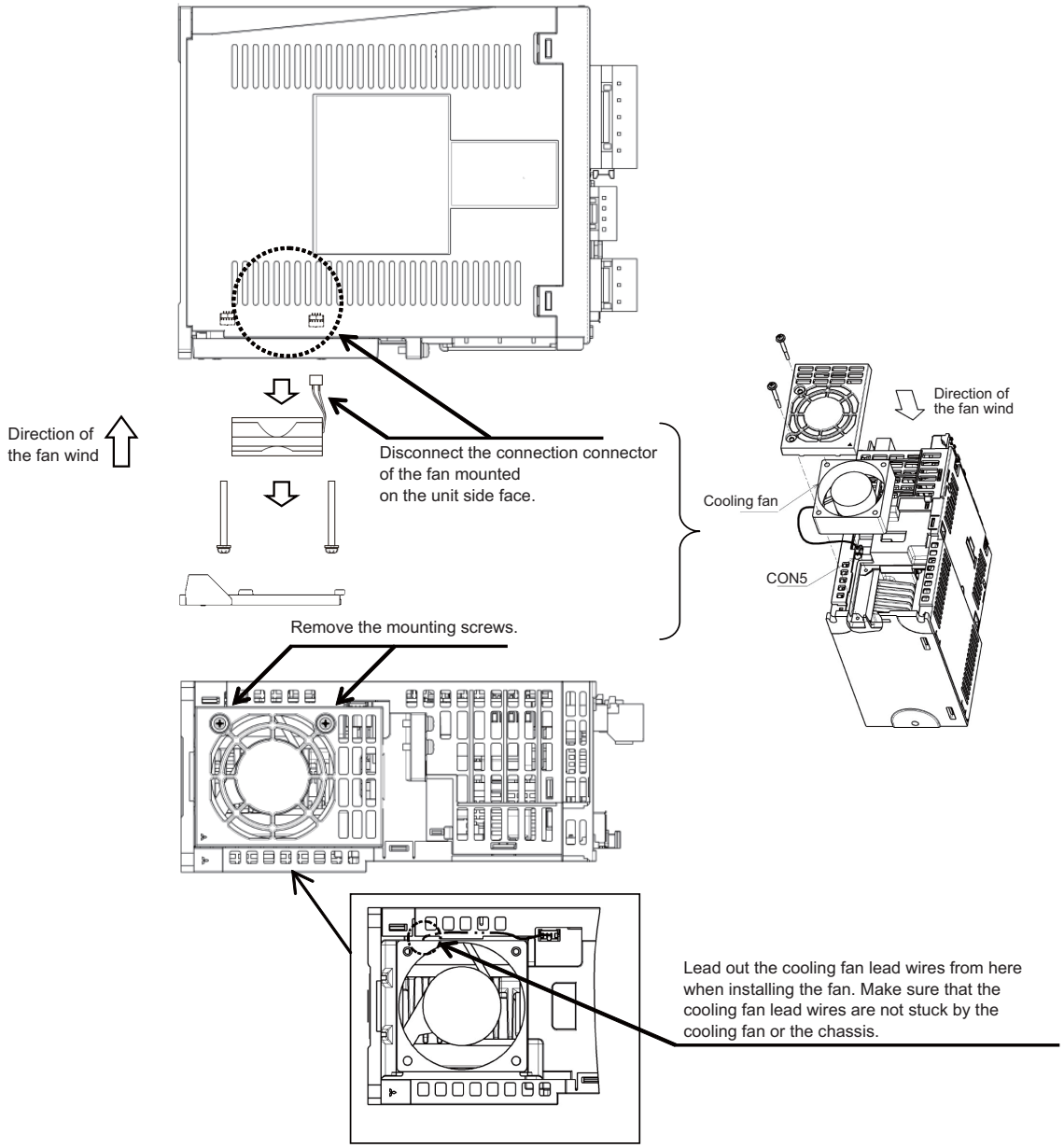
■Replacement procedure

Replace the unit fan with the following procedures.

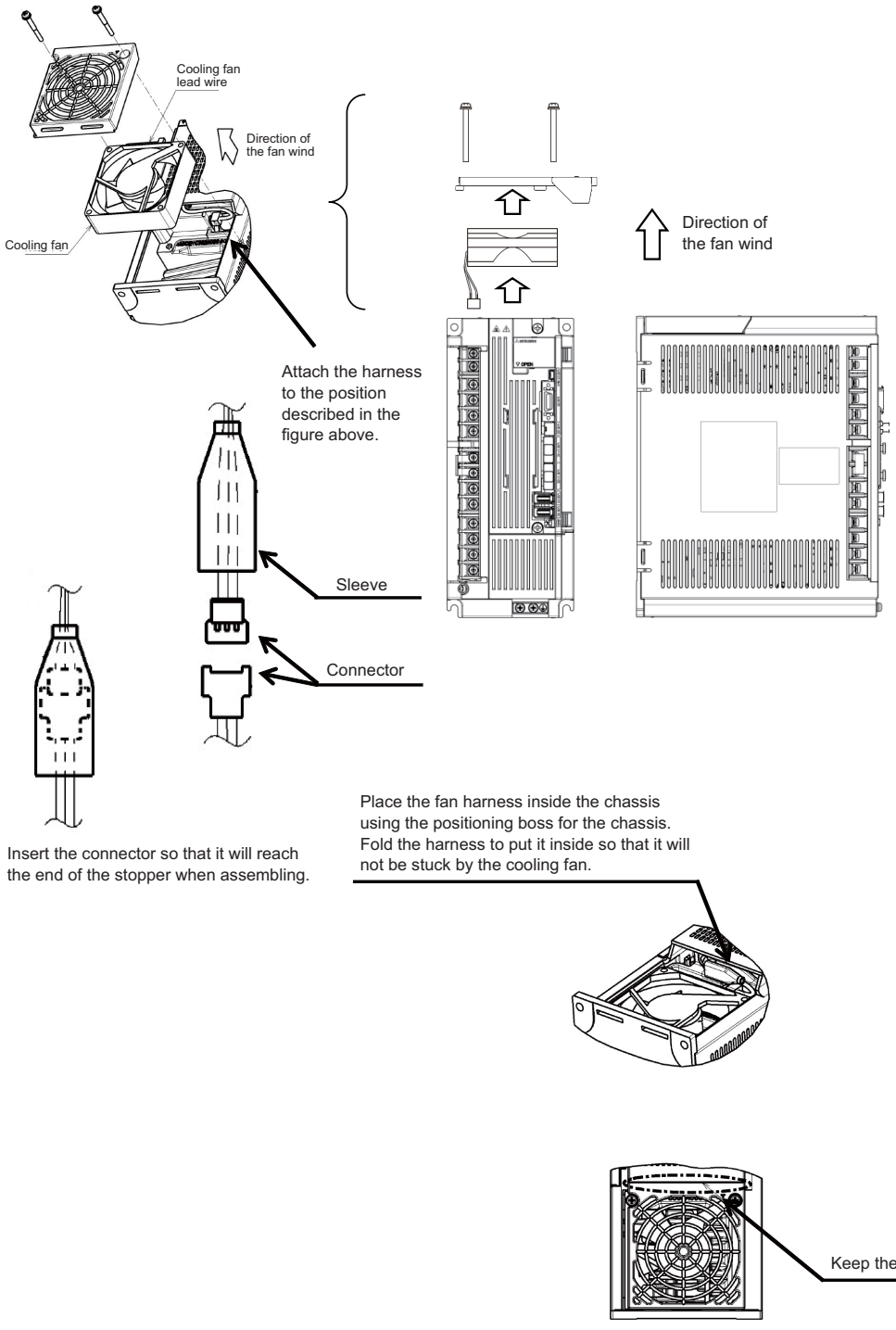
<MDS-EJ-V1-30, MDS-EJ-SP-20>



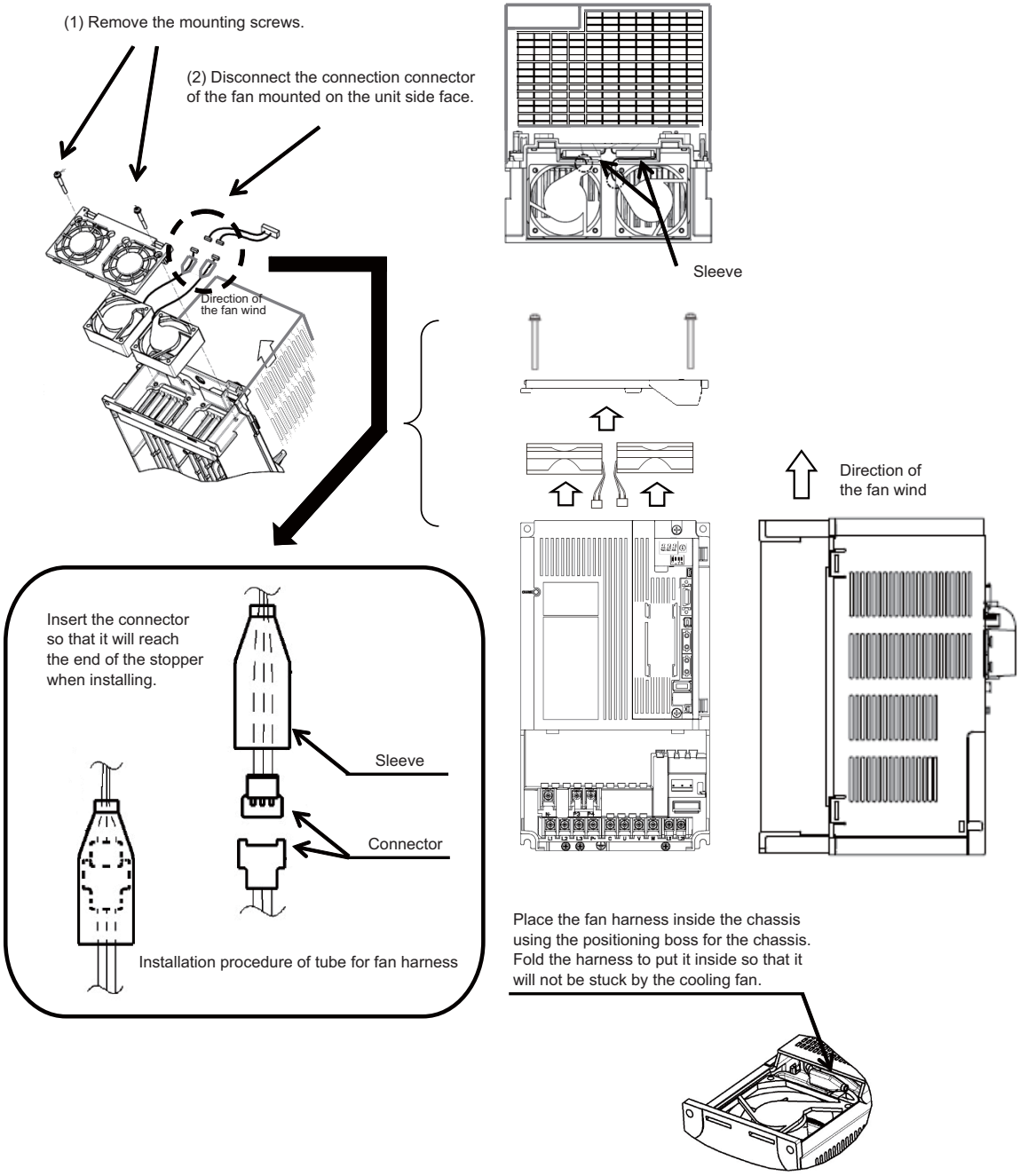
<MDS-EJ-V1-40/80/100, MDS-EJ-SP-40/80>



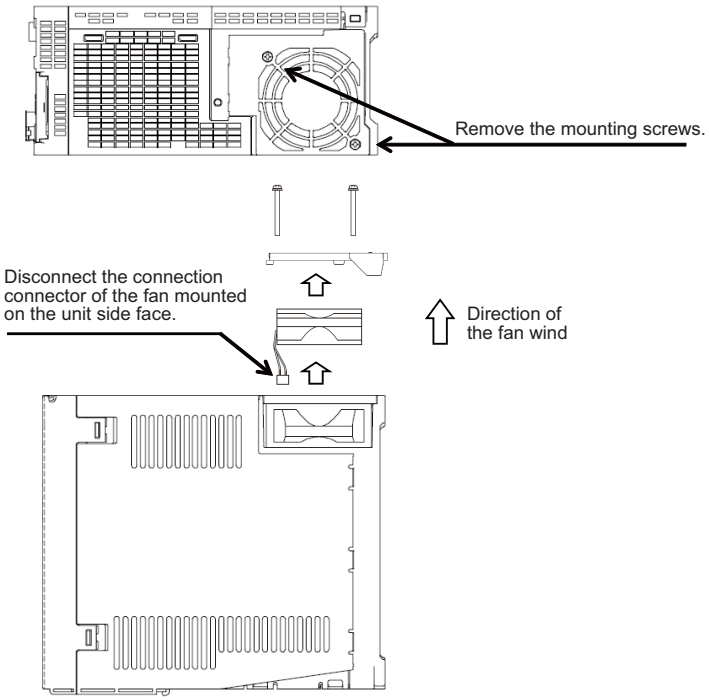
<MDS-EJ-SP-100/120>



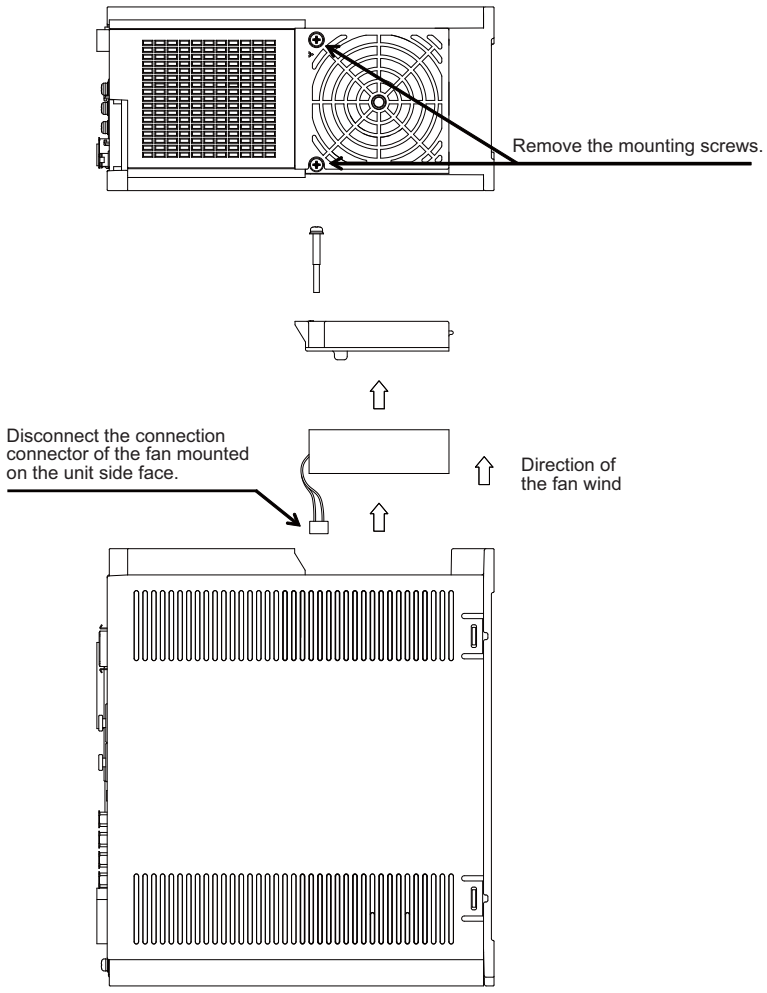
<MDS-EJ-SP-160>


(1) Remove the mounting screws.
(2) Disconnect the connection connector of the fan mounted on the unit side face.
Direction of the fan wind
Sleeve
Direction of the fan wind
Insert the connector so that it will reach the end of the stopper when installing.
Sleeve
Connector
Installation procedure of tube for fan harness
Place the fan harness inside the chassis using the positioning boss for the chassis. Fold the harness to put it inside so that it will not be stuck by the cooling fan.

<MDS-EJ-V2-30, MDS-EJ-SP2-20>



<MDS-EJ-V2-40>



3.3.2.3 Replacing the Battery

■Replacing parts

<Replacing a battery equipped with the servo drive unit or the battery unit, MDSBTBOX-LR2060>

When the battery voltage is low (warning 9F), place an order for the same type of a battery as the one currently equipped with the unit.

Type	Battery equipped unit
MR-BAT6V1SET	Servo drive unit
LR20 (size-D alkaline battery)	Battery unit, MDSBTBOX-LR2060

<Replacing the battery unit MR-BAT6V1SET>

The battery unit itself must be replaced because the battery is built into the unit.
When the battery voltage is low (warning 9F), place an order for the same type of the battery unit as the one to be replaced.

⚠ CAUTION

1. When the battery voltage is low (warning 9F), do not shut OFF the power of the drive unit until replacement of the battery to protect the data.

2. Replace the MDSBTBOX-LR2060 battery with new batteries (LR20) that is within the recommended service period.

■Replacement procedure

Replace the battery with the following procedures.

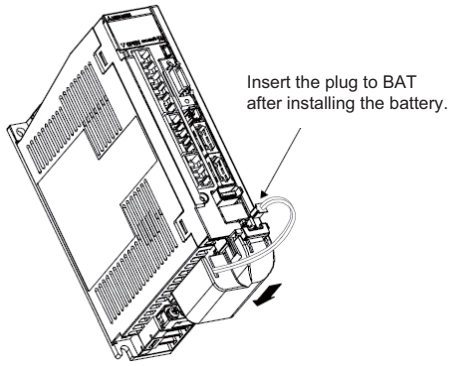
⚠ CAUTION

1. The power of the drive unit must be turned ON for 30min. or longer before replacing the battery.

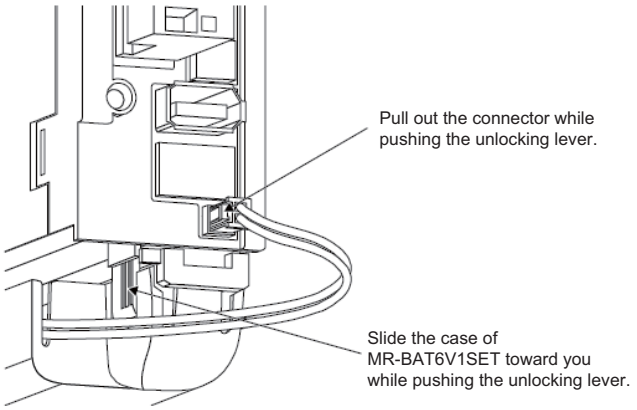
2. Replace the batteries while applying the drive unit's control power.

<Replacement procedure for the cell battery MR-BAT6V1SET>

(a) Installing and removing the cell battery



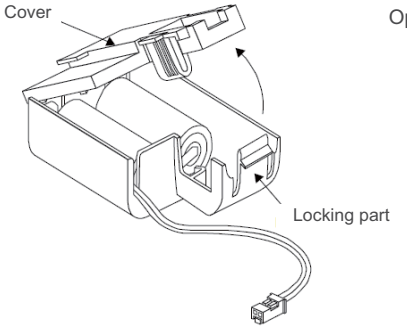
Installation



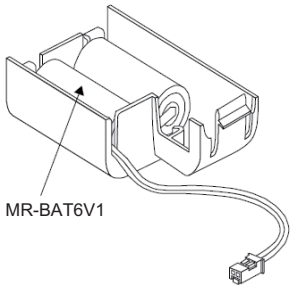
Removal

(b) Replacing the built-in battery

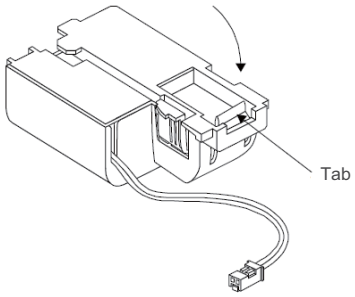
MR-BAT6V1SET that reached the end of the life can be reused by replacing the MR-BAT6V1 battery.



Open the cover while pushing the locking part.



Replace the built-in battery with a new battery for MR-BAT6V1.



Close the cover by pushing until it is fixed with the tab of the locking part.

Cancel the warning 9F by executing an alarm reset (pushing the NC reset button).

<Replacement procedure for the battery unit MDSBTBOX-LR2060>

Possible backup period

Possible backup period is at most one year. Thus, make sure to exchange the batteries in the one-year cycle.

How to replace the battery

(1) Remove the battery box cover (four screws).

(2) Replace the batteries with new ones. Be careful not to mistake the polarity.

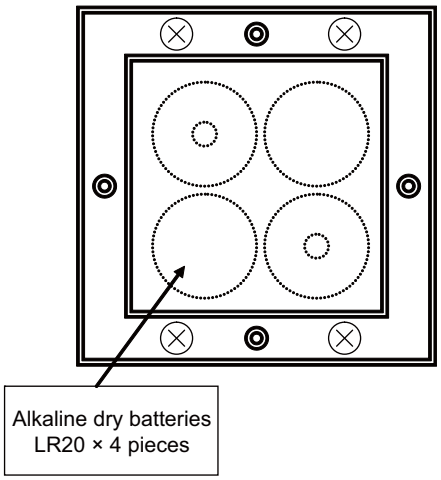
(3) Attach the cover, and fix it with the four screws.

Note

(1) Replace the batteries while applying control power to the servo drive unit.

(2) When replacing the battery, do not let foreign objects enter. If the terminal area gets dirty, clean there.

(3) If the cover is ill-set, mist or foreign objects enter through the interstices and enter into the panel. Tighten the screws. (Tightening torque: 1N•m)



⚠ CAUTION

1. Replace the batteries with new ones that are in their recommended use period. (Check the recommended use period written on the batteries before using them.)

2. Replace the batteries with new ones immediately after the battery voltage drop alarm (9F) has been output.

3. Replace the batteries while applying the servo drive unit's control power.

4. Wrong connection may cause liquid leakage, heat generation and/or explosion.

5. Do not mix new batteries with used ones or mix different types of batteries.

3.3.3 MDS-EM/EMH Series

3.3.3.1 Replacing the Drive Unit

■Arrangement of replacing parts

Contact Mitsubishi branch or your dealer for an order or a replacement of the drive unit.
Place an order for the same type of a drive unit as the one to be replaced.

■Replacement procedure

Replace the drive unit with the following procedures.

Procedures

(1) Turn the breaker for the input power OFF. Make sure the CHARGE lamp of the power supply unit is turned OFF.
(2) Disconnect all the connectors and the wires connected to the drive unit.
(3) Remove the two (four) screws fixing the drive unit onto the control panel. Remove the drive unit from the control panel.
(4) Make a same setting for the rotary switch and the dip switch of the new drive unit as those of the uninstalled drive unit.
(5) Install a new drive unit by following the removal procedure in reverse.

■Restoration

Data backup and restoration is not required before replacing drive units because drive units' data such as parameters are stored in the controller. However, carry out a backup of the whole system before replacement as a precautionary measure. The power for keeping the encoder's position data of an absolute position system is supplied from the battery connected to the drive unit. Keep the power ON once for 30 minutes or more if possible, and make sure to complete the replacement within 60 minutes after charging the encoder's capacitor.

3.3.3.2 Replacing the Fan Unit

■Replacing parts

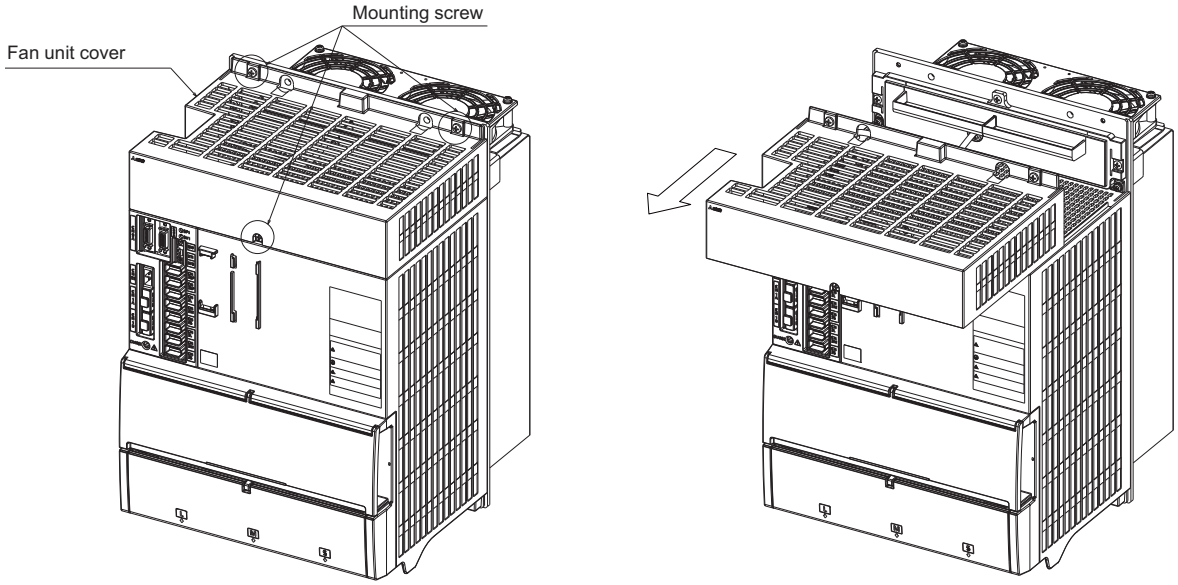
Drive unit type	Fan type
MDS-EM-SPV3-16040S	EM-FS-18
MDS-EM-SPV3-10040 to 200120 MDS-EMH-SPV3-8040 to 10060	EM-FS-26
MDS-EM-SPV3-320120	EM-FS-30

■Replacement procedure

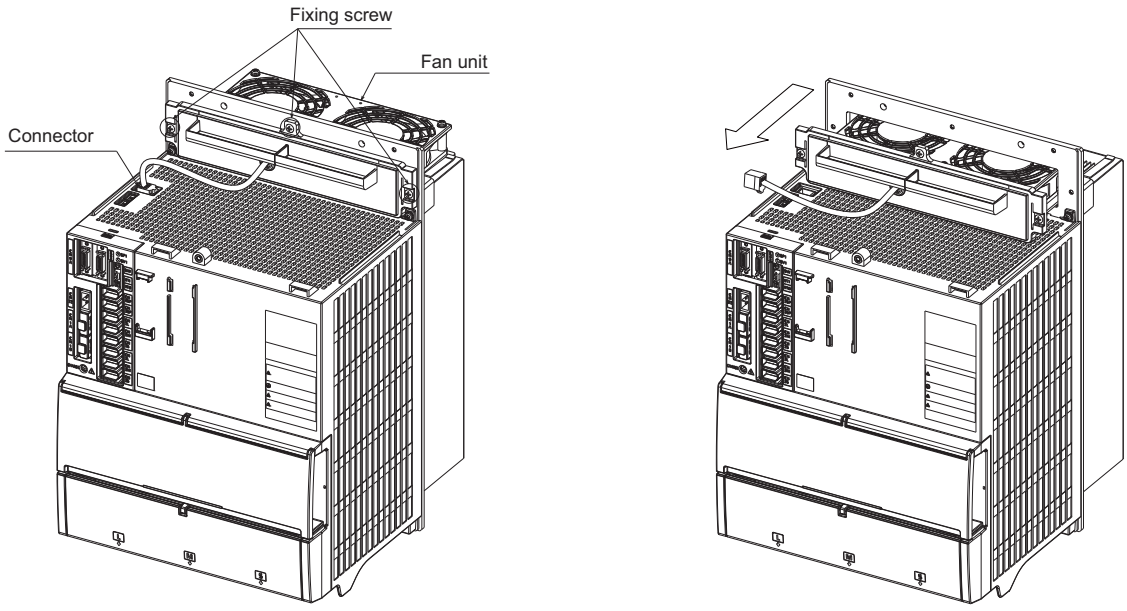
Replace the fan unit with the following procedures.

(1) Remove the mounting screws from the fan unit cover on the top of the drive unit.

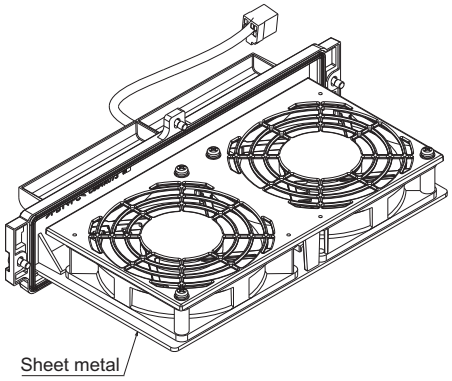
(2) Remove the fan unit cover.

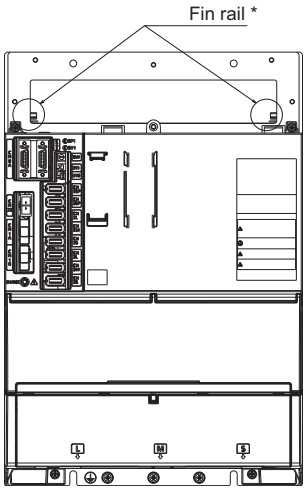


(3) Remove the fixing screws from the fan unit. Disconnect the connector on the top and pull out the fan unit.



(4) When installing the fan unit, insert the sheet metal of the fan unit into the fin rails.





* Although MDS-EM-SPV3-16040S and 320120 do not have fin rails, the installation of fan units is not affected.

3.3.3.3 Replacing the Battery

■Replacing parts

<Replacing a battery equipped with the spindle/servo drive unit or the battery unit, MDSBTBOX-LR2060>

When the battery voltage is low (warning 9F), place an order for the same type of a battery as the one currently equipped with the unit.
Battery type LR20 is commercially available as a size-D alkaline battery. The battery may be purchased and replaced by the user.

Battery type

Type	Battery equipped unit
MR-BAT6V1SET	Multi axis drive unit
LR20 (size-D alkaline battery)	Battery unit, MDSBTBOX-LR2060

Note

(1) Four LR20 size-D alkaline batteries are needed for per battery unit, MDSBTBOX-LR2060.

⚠ CAUTION

1. When the battery voltage is low (warning 9F), do not shut OFF the power of the drive unit until replacement of the battery to protect the data.

2. Replace the MDSBTBOX-LR2060 battery with new batteries (LR20) that is within the recommended service period.

■Replacement procedure

Replace the battery with the following procedures.

⚠ CAUTION

1. Replace the batteries with new ones immediately after the battery voltage drop alarm (9F) has been output.

2. Replace the batteries while applying the drive unit's control power.

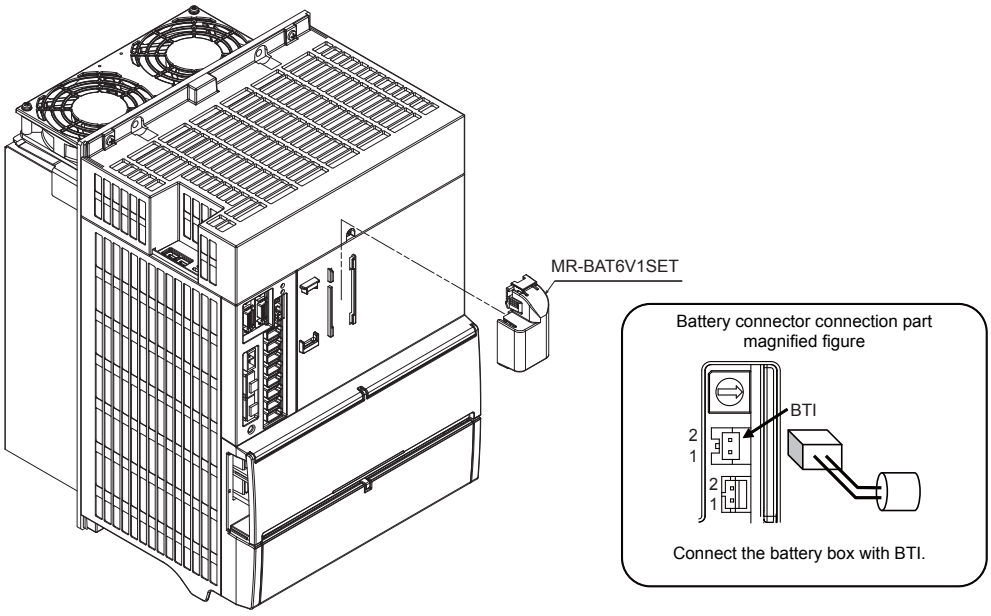
<Replacement procedure for the cell battery MR-BAT6V1SET>

(1) Pull out the battery connector connected with the drive unit while pushing the unlocking lever.

(2) Remove the battery unit by sliding upward while pushing the unlocking lever.

(3) Install a new battery and connect a cable connector to the connector position where the old battery connector was pulled out from in step (2).

(4) Cancel the warning 9F by executing an alarm reset (pushing the NC reset button).



<Replacement procedure for the battery unit MDSBTBOX-LR2060>

Possible backup period

Possible backup period is at most one year. Thus, make sure to exchange the batteries in the one-year cycle.

How to replace the battery

(1) Remove the battery box cover (four screws).

(2) Replace the batteries with new ones. Be careful not to mistake the polarity.

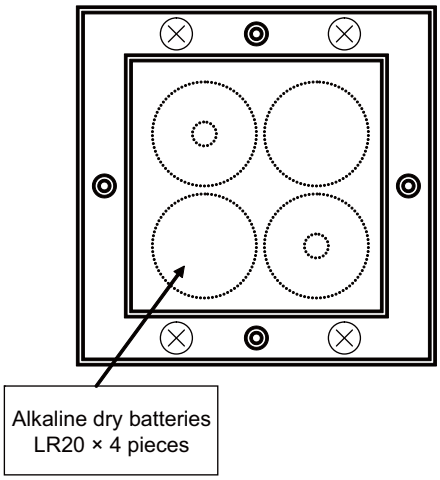
(3) Attach the cover, and fix it with the four screws.

Note

(1) Replace the batteries while applying control power to the servo drive unit.

(2) When replacing the battery, do not let foreign objects enter. If the terminal area gets dirty, clean there.

(3) If the cover is ill-set, mist or foreign objects enter through the interstices and enter into the panel. Tighten the screws. (Tightening torque: 1N•m)



⚠ CAUTION

1. Replace the batteries with new ones that are in their recommended use period. (Check the recommended use period written on the batteries before using them.)

2. Replace the batteries with new ones immediately after the battery voltage drop alarm (9F) has been output.

3. Replace the batteries while applying the servo drive unit's control power.

4. Wrong connection may cause liquid leakage, heat generation and/or explosion.

5. Do not mix new batteries with used ones or mix different types of batteries.

4

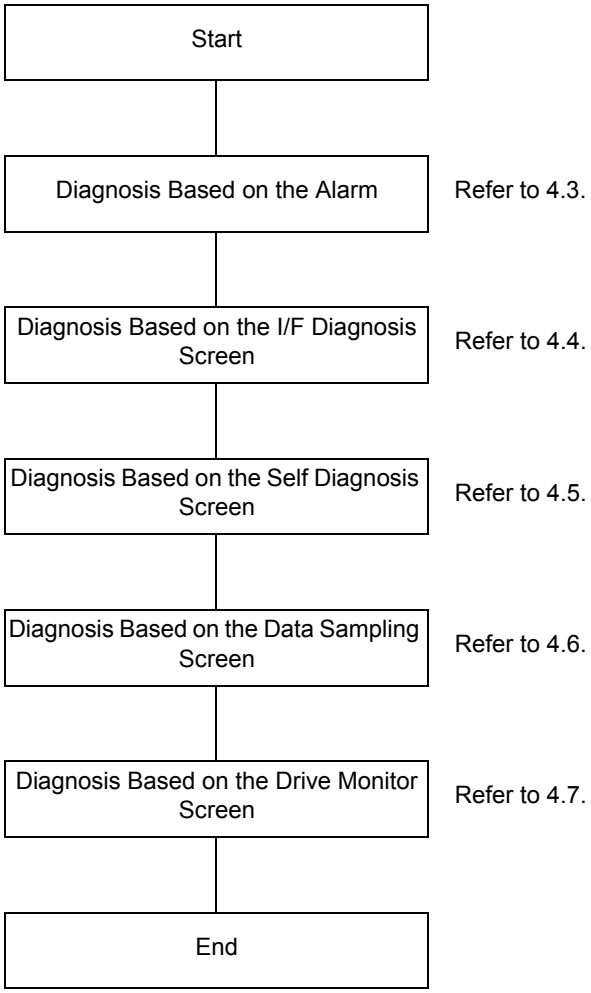
Failure Diagnosis

4.1 Introduction

If trouble occurs during operation, the accurate cause must be found so that adequate measures can be taken. Confirm "when", "when doing what", "what kind of trouble" and "how frequently" the trouble occurred. Also check how many years the machine has been operated, and how many hours a day it is used.

4.2 Failure Diagnosis Procedure

Investigate the cause of the failure according to the following procedures.



4.3 Diagnosis Based on the Alarm

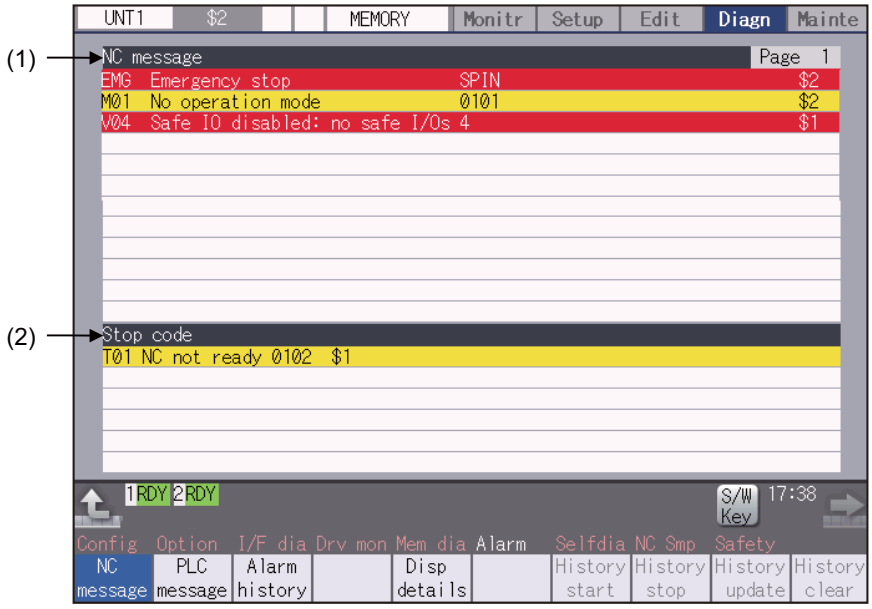
Alarm information includes the "NC message", "PLC message", and "Alarm history".

4.3.1 How To Check the Alarm Information

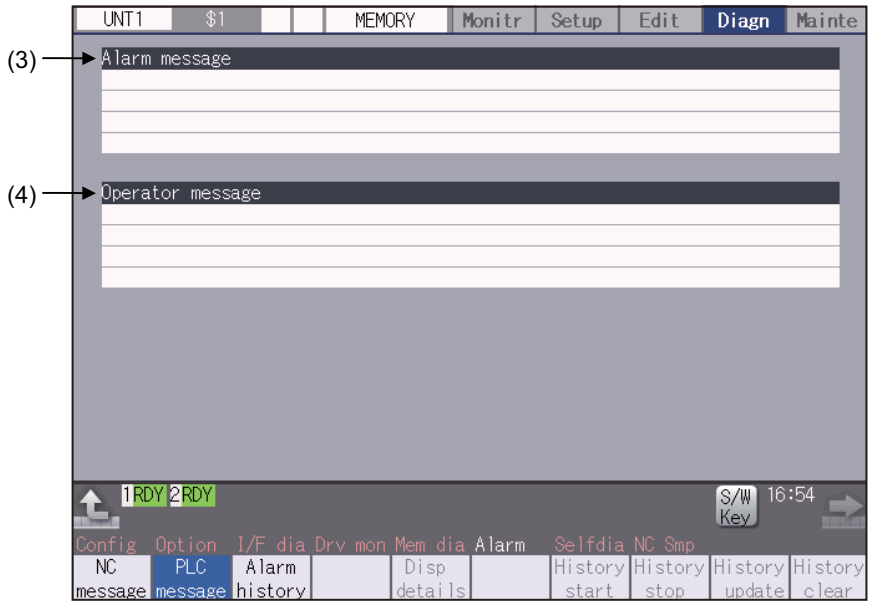
Diagn – Alarm

A list of currently occurring alarms or messages can be displayed on this screen.
The displayed messages include the NC alarms, stop codes, alarm messages, operator messages, etc.
A history of alarm information can be displayed also.

■NC message



■PLC message



Display items

Display items		Details
(1)	NC message	This displays the operation alarms, program errors, MCP alarms, servo alarms, system alarms, etc. Up to 10 messages are displayed in order of priority.
(2)	Stop code	This displays the automatic operation status or stop status during automatic operation. Up to 4 messages are displayed in order of priority.
(3)	Alarm message	The alarm messages for PLC are not displayed.
(4)	Operator message	The macro alarm messages are displayed. Up to 4 messages are displayed.

Message display colors

The messages are color-coded in the following manner:

Message type		Character color	Background color
NC message	Alarm	White	Red
	Warning	Black	Yellow
Stop code		Black	Yellow
Operator message		Black	Yellow

Axis name display

The axis name is displayed in messages for each axis. The axis name is displayed as shown below according to the axis type.

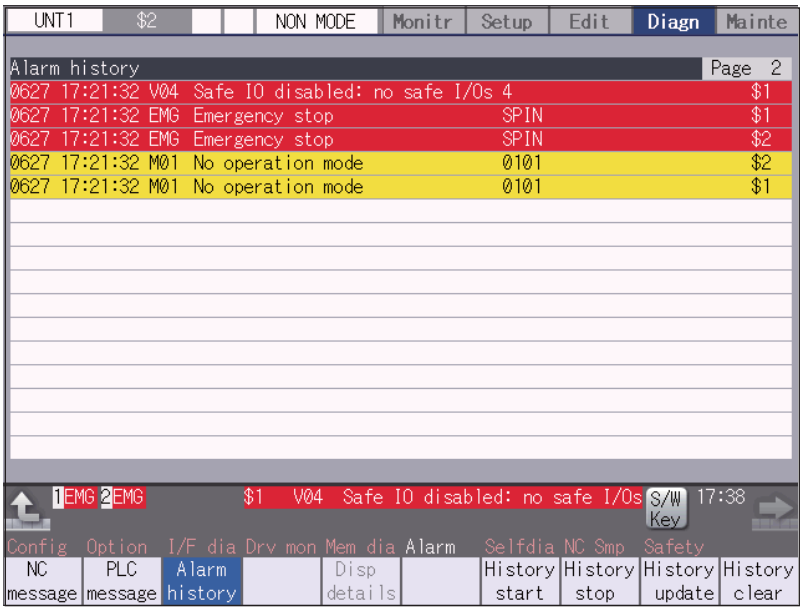
Axis type	Axis name display	Display example	Remarks
NC axis	Control axis name (Name of axis in part system)	XYZ	If the same message occurs for each part system, several NC axes are displayed together.
Spindle	'S' + spindle No.	S1S2	If the same message occurs, several spindles are displayed together.
PLC axis	'P' + PLC axis No.	P1P2	If the same message occurs, several PLC axes are displayed together.

If the same message occurs for different axis types, they will appear as separate messages.

Part system display

The part system name is also displayed if the message is output for each part system. The part system name set in "#1169 system name" is displayed. The part system name does not appear for the 1-part system.

4.3.2 Alarm History



When an alarm occurs, the alarm information is recorded. When the NC power is ON, an alarm is automatically recorded in alarm history. Alarm information is recorded from the latest alarm to 512.
Alarm information recorded in the history is NC message displayed on "NC message" screen and alarm messages displayed on "PLC message" screen.
The range etc. of record are shown as follows:

Record condition: When an alarm occurs (When two or more alarms occur at the same time, up to five alarms are recorded.)
With multi-part system, 1st part system is given priority and recorded. (Following 2nd part system, 3rd part system...)

Number of history: 512 alarms (Whole)

Range of record: NC alarm (alarm, warning)

Note

(1) The following alarms are not recorded on the alarm/warning screen.

♦Operation alarm

- External interlock axis exists (M01 0004)
- Cutting override zero (M01 0102)
- External feed rate zero (M01 0103)
- Block start interlock (M01 0109)
- Cutting block start interlock (M01 0110)
- Rapid override zero (M01 0125)
- Sp-Sp polygon (G51.2) cut interlock (M01 1033)

♦"U50 PLC stopped" before the HMI screen starts up

Menus

Menus	Details
Alarm history	This displays the first page of the alarm history. The history sequentially displays 16 alarms per page from the latest alarm. If there are two or more NC alarms of same day and time, the alarms are sequentially displayed from the alarm and warning of the 1st part system. To display the old history, press the PAGE ▲ key. To display the new history, press the PAGE ▼ key.
History start	The data collection of the alarm history is started (restarted). The operation message "The collection begin? (Y/N)" appears. When the [Y] or [INPUT] key is pressed, the data collection is started after the operation message "The collection begin" appears. Press the [N] or other than [INPUT] key when the data collection will be not started/restarted.
History stop	The data collection of the alarm history is stopped. The operation message "The collection stop? (Y/N)" appears. When the [Y] or [INPUT] key is pressed, the data collection is stopped after the operation message " The collection stop" appears. Press the [N] or other than [INPUT] key when the data collection will be not stopped.
History update	The alarm information of history is updated. When the history is updated, the page with latest alarm information (first page) is displayed. The history is updated even if changing to another screen, and returning to the alarm history screen.
History clear	The alarm information of history is cleared. The operation message "Execute the collection data clear? (Y/N)" appears. When the [Y] or [INPUT] key is pressed, the alarm information of history is cleared after the operation message "Data clear complete" appears. The first page is displayed when the history is cleared.

Note

(1) The menus [History start], [History stop], [History update] and [History clear] are valid when the alarm history function is valid and the menu [Alarm history] is selected.

(2) When the alarm history function is used for the first time, clear the alarm history contents by pressing the menu [History clear]. Unnecessary data may be recorded in the alarm history.

Precautions

(1) If the recording of the alarms is stopped with the menu [History stop] in the alarm history screen, alarms are not recorded in the history even after the NC power is turned OFF and ON. In this case, the recording of the alarms must be started with the menu [History start] in the alarm history screen.

(2) If the time and date are changed, the change is not reflected to the time and date of the history data recorded before the change. Therefore, if the time and date are changed, clear the history with the menu [History clear].

(3) If an alarm occurs while the alarm history is displayed, the display is not updated. Update the history by switching the screen with the menu [History update].

(4) Depending on the part system setting of "Sampling spec" in the maintenance diagnostic data collection setting, the part systems to be recorded in the alarm history vary. If "0" is set, alarms of all part systems are recorded.

(5) The alarm history data collection start/stop operation is switched using the menu [Start] or [Stop] of data collection regardless of whether "Alarm history" is set to "0" or "1" in "Collecting data select" in the maintenance diagnostic data collection setting.

4.3.3 Alarm Message Details

Methods to confirm the alarm message details (Details, Remedy) are as follows:

- Confirm by "Guidance display" on the NC screen
- Confirm by "Alarm manual"

■To confirm by "Guidance display" on the NC screen

Confirm details with the alarm guidance (alarm message details) displayed on the NC screen by pressing the [?] key or  key.

Note

(1)  is displayed only on the software keyboard.

■To confirm by "Alarm manual"

Confirm the details with "M800/M80/E80/C80 Series Alarm/Parameter Manual" (IB-1501279).

4.4 Diagnosis Based on the I/F Diagnosis Screen

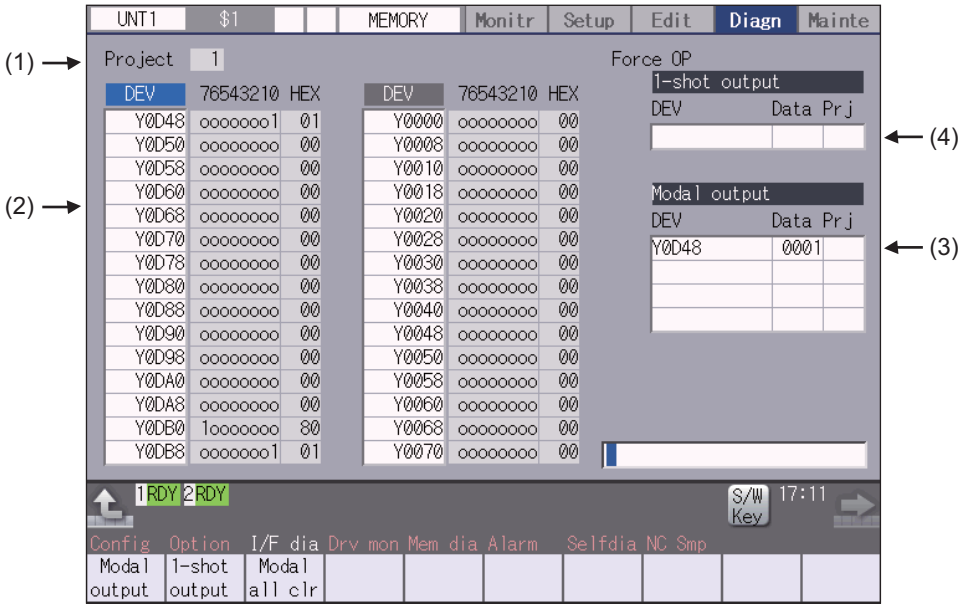
4.4.1 I/F Diagnosis Screen

Diagn – I/F dia

The various input/output signals for the PLC (Programmable Logic Controller) control can be displayed and set in this screen.
These signals can be used in confirmation of the machine sequence operation during PLC development, and in confirmation and forced output, etc., of the input/output data between the NC and PLC.

Note

(1) Pay close attention to the sequence operation when using these functions during machine operation.



Display items

	Display items	Details
(1)	Project	This displays the currently displayed project.
(2)	Device No. and input/output signal value (binary/hexadecimal display)	This displays the data from the device Nos. designated in the setting area in numerical order. The data is displayed as binary (bit units) and hexadecimal values. Individual device Nos. can be displayed separately in the left area and right area. Select the display area with the |← and →| key when operations such as display changeover and data setting are carried out. Target device: X, Y, M, L, F, SB, B, SM, V, SW, SD, TI, TO, TS, TA, STI, STO, STS, STA, CI, CO, CS, CA, D, R, ZR, W The common devices for each project are X, Y, R, and ZR.
(3)	Modal output	This displays the data and device to carry out modal output. The details to be defined are set here when carrying out the modal type forced output of PLC interface signals. For details, refer to "Carrying Out Modal Output".

Display items	Details
(4) 1-shot output	This displays the data and device to carry out one-shot output. The details to be defined are set here when carrying out the one-shot type forced output of PLC interface signals. For details, refer to "Carrying Out One-shot Output".

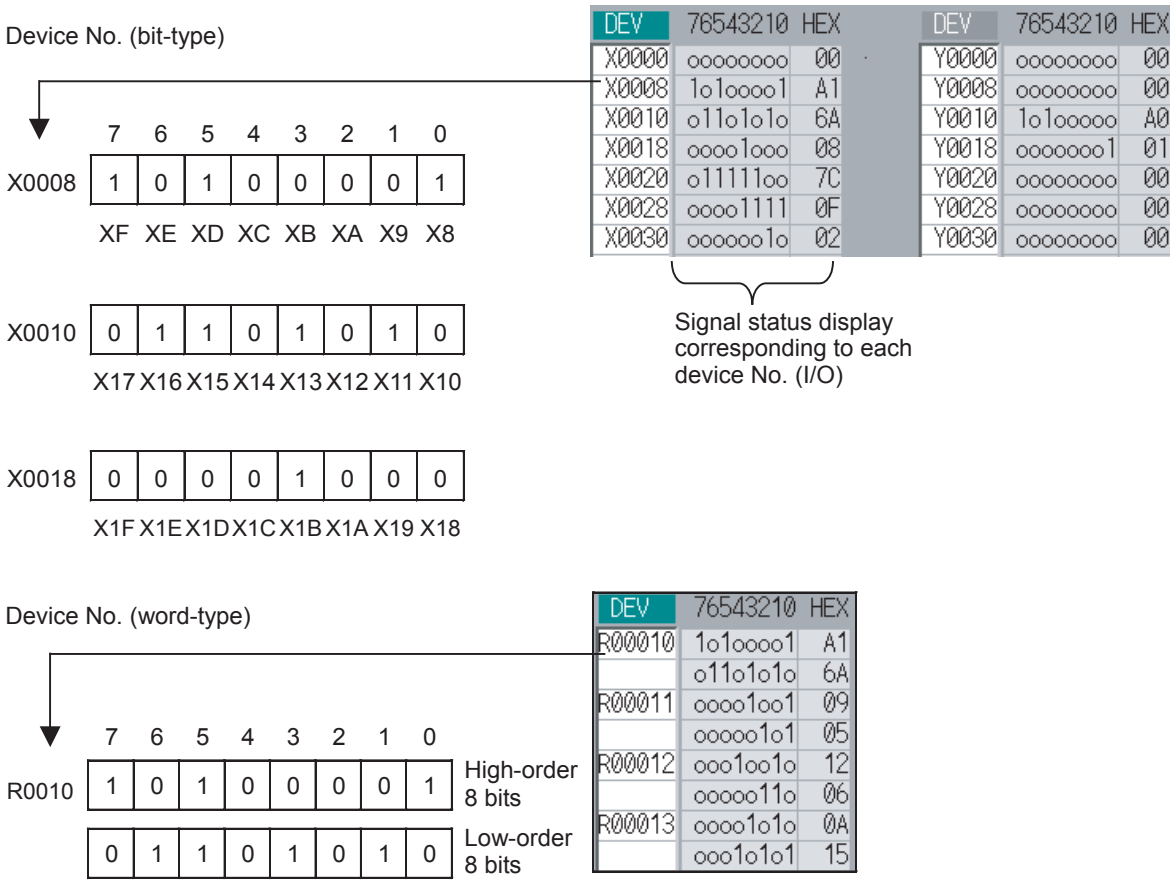
Menus

Menus	Details
Modal output	This changes the setting area to an input standby status. The signal is forcibly output (modal).
1-shot output	This changes the setting area to an input standby status. The signal is forcibly output (one-shot).
Modal all clr	A confirmation message appears, and the machine turns into standby status. The force OP (one-shot output) of all I/O signals are canceled. (*1)

(*1) These menus are grayed out ordinarily, and cannot be operated.

How to read the device No. and display data

A device is an address for classifying a signal handled in the PLC. A device No. is a series of numbers attached to that device.



4.4.1.1 Displaying the PLC Device Data

The various status signals and register data used in the PLC can be monitored and displayed.

When this screen is first selected, the respective 16-byte amounts of input/output data are displayed from device "X0000" on the left display area, and from device "Y0000" on the right side.

This screen constantly monitors and displays the PLC signal statuses. Consequently, when signals are changed in the PLC, the display is changed according to the changes.

Note that because time differences occur between the PLC signal change and the signal display, there may be a delay in the display. The machine may also not be able to correspond to extremely brief signal changes.

Displaying the data of a arbitrary device No. "X0020"

(1) Press the menu tab key [|←]/[→|], and select the area to display the data.

(2) Set the device No. (X0020), and press the [INPUT] key. → The device "X0020" appears at the head of the valid display area.

DEV	76543210	HEX	DEV	76543210	HEX
X0020	11111111	FF	Y0000	oooooooo	00
X0028	o1oooooo	40	Y0008	ooooooo1	01
X0030	oooo111o	0E	Y0010	oooooooo	00
X0038	oooooooo	00	Y0018	oooooooo	00

Note

(1) When setting the device No., an error will occur if a number exceeding the specifications or an illegal address is set.
(2) The input/output signals of X, Y, R, and ZR are the same for all projects.

Changing the display with the page keys

The valid area device Nos. change in page units when [PAGE▲]/[PAGE▼] is pressed. Changing of the pages stops within the range of device numbers of which the device has.

(1) Press the [PAGE▼] key. → The data is displayed from the next number currently displayed.

DEV	76543210	HEX	DEV	76543210	HEX
X0000	1ooooo01	81	Y0000	oooooooo	00
X0008	oooooo1o	02	Y0008	ooooooo1	01
X0010	oooo1111	0F	Y0010	oooooooo	00
X0018	1oo11111	9F	Y0018	oooooooo	00

⇩

DEV	76543210	HEX	DEV	76543210	HEX
X0080	11111111	FF	Y0000	oooooooo	00
X0088	o1oooooo	40	Y0008	ooooooo1	01
X0090	oooo1111	0F	Y0010	oooooooo	00
X0098	oooooooo	00	Y0018	oooooooo	00

4.4.1.2 Carrying Out Modal Output

Modal type forced output of PLC interface signals is carried out. Once set, this data is held until cancelled, the power is turned ON/OFF, or other data is overwritten. There are four sets of devices that modally output. If this number is exceeded, the previously existing data is overwritten.

Menus used in modal output

Menus	Details
Modal clear	This releases the modal output for the device at the cursor position in the modal output area. The released data is erased from this area.

Modally outputting data "1" to device "X0048"

(1) Press the menu [Modal output]. → The mode changes to the modal output mode, and the cursor appears at the modal output area.

(2) Using the [↑] and [↓] keys, move the cursor to the setting position.

(3) Set the device and data, and press the [INPUT] key. → Modal output is executed, and the cursor disappears. The data that was in the cursor position is overwritten by the input data, and is invalidated.
The modal output mode is canceled by pressing the key.

X0048/1 [INPUT]

Note

(1) The data of the modally output device is displayed in order in the selected area. This modal output is held until the output is canceled or the power is turned OFF.
(2) When no data is set (Example: "X0048/","X0048"), the operation message "Setting Data not found" is displayed.
(3) The X, Y, R, and ZR devices are modally output for all projects.
(4) The devices other than X, Y, R, and ZR are modally output for the currently displayed project.

Releasing the modal output

(1) Press the menu [Modal output]. → The mode changes to the modal output mode, and the cursor appears at the modal output area.

(2) Using the [↑] and [↓] keys, move the cursor to the data to be released.

(3) Press the menu [Modal clear]. → The data that was in the cursor position is released from modal output. The "DEV" and "Data" columns become blank.
The modal output mode is canceled by pressing the key.

⚠ CAUTION

Pay close attention to the sequence operation when carrying out forced data setting (forced output) in the I/F diagnosis screen during machine operation.

4.4.1.3 Carrying Out One-shot Output

The one-shot type PLC interface signal forced output is forcibly output only once during the screen operations. Thus, it may not be possible to confirm the PLC interface signals updated with the PLC on the screen.

One-shot outputting data "1" to device "X0042"

(1) Press the menu [1-shot output].

(2) Set the device and data, and press the [INPUT] key. → The input data is overwritten in the one-shot output area, and is one-shot output.
X0042/1 [INPUT]
The cursor in the one-shot output area disappears.
The data of the one-shot output device is displayed in order in the selected area.
The one-shot output mode is canceled by pressing the key.

Note

(1) Because the input signal (X, etc.) to the PLC is updated at the head of each PLC cycle, the machine immediately returns to the normal state, even if one-shot type forced output is carried out.

(2) When no data is set (Example: "X0048/","X0048"), the operation message "Setting Data not found" is displayed.

(3) The X, Y, R, and ZR devices are one-shot output for all projects.

(4) The devices other than X, Y, R, and ZR are one-shot output for the currently displayed project.

⚠ CAUTION

Pay close attention to the sequence operation when carrying out forced data setting (forced output) in the I/F diagnosis screen during machine operation.

4.4.2 List of Devices for PLC Uses

Devices	Device No.	No. of points (Maximum points of project)	Units	Description
X (*)	X0 to X1FFF	8192	1-bit	Input signals to PLC. Machine input, etc.
Y (*)	Y0 to Y1FFF	8192	1-bit	Output signals from PLC. Machine output, etc.
M	M0 to M61439	61440	1-bit	For temporary memory
L	L0 to L1023	1024	1-bit	Latch relay (Backup memory)
F	F0 to F2047	2048	1-bit	For temporary memory. Alarm message interface
SB	SB0 to SB3FF	1024	1-bit	Special relay for linking
B	B0 to BDFFF	57344	1-bit	Link relay
SM (*)	SM0 to SM4095	4096	1-bit	Special relay
V	V0 to V511	512	1-bit	Edge relay
SW	SW0 to SW1023	1024	16-bit	Special register for linking
SD	SD0 to SD4095	4096	16-bit	Special register
TI	TI0 to TI2047	2048	1-bit	Timer contact
TO	TO0 to TO2047	2048	1-bit	Timer output
TS	TS0 to TS2047	2048	16-bit	Timer setting value
TA	TA0 to TA2047	2048	16-bit	Timer current value
STI	STI0 to STI127	128	1-bit	Integrated timer contact
STO	STO0 to STO127	128	1-bit	Integrated timer output
STS	STS0 to STS127	128	16-bit	Integrated timer setting value
STA	STA0 to STA127	128	16-bit	Integrated timer current value
CI	CI0 to CI511	512	1-bit	Counter contact
CO	CO0 to CO511	512	1-bit	Counter output
CS	CS0 to CS511	512	16-bit	Counter setting value
CA	CA0 to CA511	512	16-bit	Counter current value
D	D0 to D8191	8192	16-bit/32-bit	Data register
R (*)	R0 to R32767	32768	16-bit/32-bit	File register, CNC word I/F
ZR	ZR0 to ZR4184063	4184064	16-bit/32-bit	File register, CNC word I/F
W	W0 to W2FFF	12288	16-bit/32-bit	Link register

Note

(1) As the use of devices marked with a * mark in the device column has been determined, do not use devices even if they are undefined vacant devices.

Refer to the following manuals for details on device No.:

♦M800/M80/E80/C80 Series PLC Interface Manual

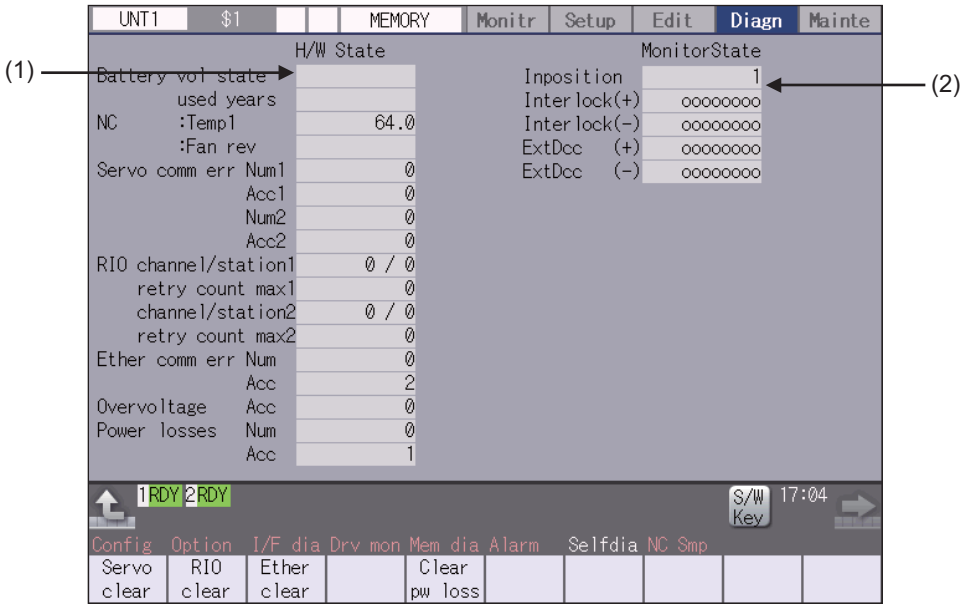
Refer to the specifications issued by the MTB for machine-specific information.

4.5 Diagnosis Based on the Self Diagnosis Screen

4.5.1 Self Diagnosis Screen

Diagn – Selfdia

The hardware state and NC operation state can be confirmed by selecting the menu [Selfdia] on the diagnosis (Diagn) screen.



Display items

	Display items	Details
(1)	H/W state (common for part systems)	This displays the hardware state of the NC unit and display unit. (*1)
(2)	Operation state (Depends on part system)	This displays the state when the operation seems to be stopped in spite that the alarm does not occur. (*2)

(*1) As for the NC unit, the contents are as follows depending on the condition:

NC

Item	Details	
Battery vol state	CPU module does not use the battery. This item is not displayed. The PLC CPU and the servo drive unit use batteries, but the states of these batteries are not displayed in the screen.	
Battery used years		
NC : temp. 1 (°C)	This displays the current temperature of the control unit.	
	Condition	**Class**
	94.5°C < Control unit temp. <= 96.5°C	Caution (gray)
	96.5°C < Control unit temp.	Warning (yellow)
NC :Fan rev	The fan is not mounted. This item is not displayed.	

Communication between NC unit and display unit

Item	Details
Servo comm err Num1	This displays the count of occurrence for "Y51 SV commu er: Recv frame No. xx04" after the power ON.
Servo comm err Acc1	This displays the cumulated count of occurrence for " Y51 SV commu er: Recv frame xx04". Press the menu [Servo clear] to clear the cumulated count to "0".
Servo comm err Num2	This displays the count of occurrence for "Y51 SV commu er: Data ID error xx03" after the power ON.
Servo comm err Acc2	This displays the cumulated count of occurrence for "Y51 SV commu er: Data ID error xx03". Press the menu [Servo clear] to clear the cumulated count to "0".
RIO channel/station1	This displays the Channel No./Station No. of occurrence for continuous error after the power ON. (*)
RIO retry count max 1	This displays the maximum value of the continuous error after the power ON. (*)
RIO channel/station 2	This displays the Channel No./Station No. held even if the power OFF. Press the menu [RIO clear] to clear the Channel No./Station No. to "0/0". (*)
RIO retry count max 2	This displays the count held even if the power OFF. (*) Press the menu [RIO clear] to clear the count to "0".
Ether comm err Num	This displays the number of Ethernet communication error after PLC program is executed once.
Ether comm err Acc	This displays the cumulated count of occurrence for Ethernet communication error. Press the menu [Ether clear] to clear the cumulated count to "0".
Overvoltage Acc	This displays the cumulated count of detection frequency of overvoltage after the power ON.
Power losses Num	This displays the count of detection frequency of power losses after the power ON.
Power losses Acc	This displays the cumulated count of detection frequency of power losses after the power ON. Press the menu [Clear pw loss] to clear the cumulated count to "0".

(*) The remote I/O communication error of the safety signal unit is the target. When the error occurs, the channel No. is fixed to "1".

(*2) The following state can be confirmed.

State	Details
In-position	This displays "1" (in-position state) when the following conditions are satisfied for even one axis. •There is a control axis whose acceleration/deceleration is not zero. •There is a control axis whose servo error exceeds the range designated with the parameter.
Interlock (+)	When the auto interlock +n-th axis signal or the manual interlock +n-th axis signal is OFF, "1" appears for the n-th axis. (Explanation of the display) o o o o o o 1 o 8th axis … 1st axis In the above case, the 2nd axis is interlocked. Even when the number of usable axes is less than 8 in 1 part system, this displays 8 axes fixed.
Interlock (-)	When the auto interlock -n-th axis signal or the manual interlock -n-th axis signal is OFF, "1" appears for the n-th axis. The explanation of the display is same as for the "Interlock (+)".
ExtDcc (+)	When the control axis is moving in (+) direction, "1" appears for the axis if the external deceleration speed is valid, and the feedrate is clamped, exceeding the set value of the external deceleration speed. (Explanation of the display) o o o o o 1 o 1 8th axis … 1st axis In the above case, the 1st axis and the 3rd axis are in external deceleration speed. Even when the number of usable axes is less than 8 in 1 part system, this displays 8 axes fixed.
ExtDcc (-)	When the control axis is moving in (-) direction, "1" appears for the axis if the external deceleration speed is valid, and the feedrate is clamped, exceeding the set value of the external deceleration speed. The explanation of the display is same as for the "ExtDcc(+)".

Menus

Menus	Details
Servo clear	This clears the cumulated count of the servo communication error 1 and 2 to "0".
RIO clear	This clears the cumulated count of the RIO communication error to "0".
Ether clear	This clears the cumulated count of the Ether communication error to "0".
Clear pw loss	This clears the accumulated number of instantaneous stop detection times to "0".

Clearing the cumulated counter to zero

(Example) Clearing the cumulated count of the servo communication error

(1) Press the menu [Servo clear]. → An operation message appears.

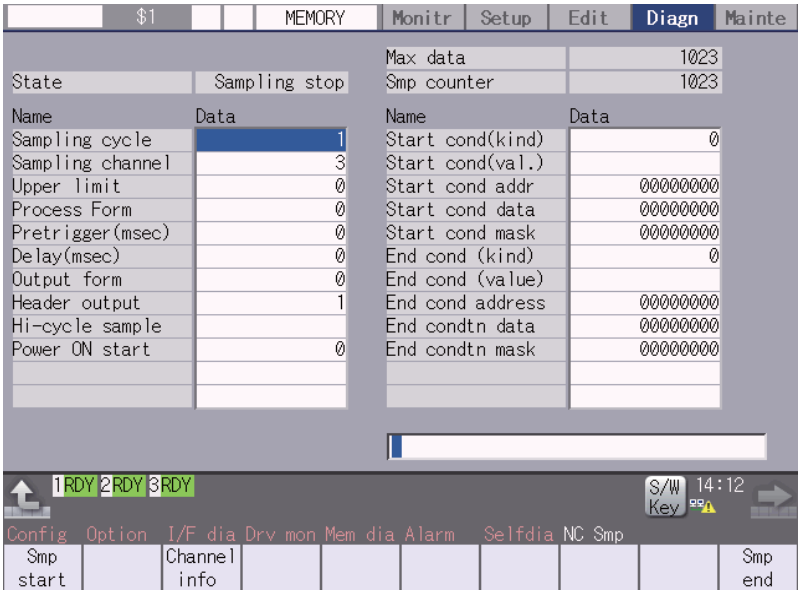
(2) Press the [Y] or [INPUT] key. → The cumulated count of the servo communication error 1 and 2 will be cleared to "0".
When other keys are pressed, it will not clear to "0".

This also applies to menus [RIO clear], [Ether clear], [Battery clear] and [Clear pw loss].

4.6 Diagnosis Based on the Data Sampling Screen

Diagn – NC Smp

Sampling start/stop, sampling state display, setting the sampling parameters necessary for sampling are performed in the data sampling screen. The NC internal data (speed output from NC to the drive unit, or feedback data from the drive unit, etc.) can be sampled.
Also, the sampling data can be output externally on the I/O screen on the maintenance (Mainte) screen.



For the details, refer to "C80 Series Data Sampling Specification Manual (BNP-C3077-034)".

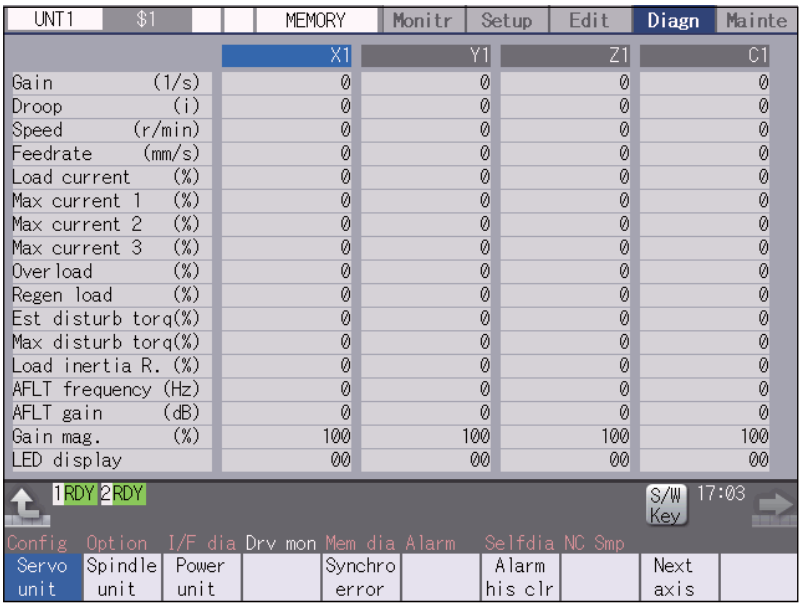
4.7 Diagnosis Based on the Drive Monitor Screen

4.7.1 Drive Monitor Screen (Servo Unit)

Diagn – Drv mon

The various data related to the servo axis (NC axis, PLC axis) can be monitored by selecting the menus [Drv mon] -> [Servo unit] on the diagnosis (Diagn) screen.

Change the display item with PAGE▲ or PAGE▼.



The axis name set in the base axis specification parameter "#1022 axname2" appears at the axis name.

Display items

Display items	Details
Gain (1/s)	This displays the position loop gain. The position loop gain is obtained by the following formula: $\frac{\text{Feedrate (mm/s)}}{\text{Tracking delay error (mm)}}$
Droop (i)	The error of the actual machine position to the command position is called droop. This error is proportional to command speed value. This follows the setting and display unit (#1003 iunit).
Speed (r/min)	This displays the actual rotation speed of motor.
Feedrate (mm/s)	This displays the feedrate on the machine end.
Load current (%)	This displays the FB value of the motor current in terms of continuous current during stalling.
Max current 1 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled after the power ON is displayed.
Max current 2 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled in most recent 2 seconds is displayed.

Display items	Details
Max current 3 (%)	This displays the FB value of the motor current in terms of continuous current during stalling. An absolute value of the current FB peak value sampled in most recent 2 seconds is displayed.
Overload(%)	This is the data used to monitor the overload of motor and drive unit.
Regen load (%)	This is the data used to monitor the resistance overload state when the resistance regenerative power supply is connected.
Est disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the disturbance observer is valid.
Max disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the collision detection function is adjusted. An absolute value of the estimated disturbance torque peak value sampled in most recent 2 seconds is displayed.
Load inertia R. (%)	This displays the estimated load inertia ratio when the collision detection function is adjusted.
AFLT frequency (Hz)	This displays the current operation frequency of the adaptive filter.
AFLT gain (dB)	This displays the current filter depth of the adaptive filter.
Gain mag. (%)	While Real-time tuning 1 is valid, the currently applied speed control gain is displayed with the magnification for the setting value of speed loop gain 1 (parameter "#2205 SP005 VGN1").
LED display	This displays the 7-segment LED of the driver.
Alarm	This displays the alarms and warnings other than the LED display (displayed on drive unit side).
Cycle counter (p)	This displays the position within one rotation of the encoder detector. The position is displayed within one rotation in the range of "0" to "RNG (movement units) × 1000" using the grid point value as "0".
Grid space	This displays the grid space for the reference position return. (Command unit)
Grid amnt	This displays the distance from the dog-off point to the grid point when the dog-type reference position return is displayed. The grid mask amount is not included. (Command unit)
Machine position	This displays the NC basic machine coordinate system position. (Command unit)
Motor end FB	This displays the feedback value of the speed detector. (Command unit)
Machine end FB	This displays the feedback position of the machine end position detector. (Command unit)
FB error (i)	This displays the error of the motor end FB and machine end FB. This follows the setting and display unit (#1003 iunit).
DFB compen amnt (i)	This displays the compensation pulse amount during dual feedback control. This follows the setting and display unit (#1003 iunit).
Remain command	The remaining movement distance of one block is displayed. (Command unit)
Currnt posn (2)	The value of the tool compensation amount subtracted from the current position is displayed. (Command unit)
Man int amt	The amount of interrupt movement in the manual absolute OFF state is displayed. (Command unit)
Abs pos command	The absolute position that does not include the machine error compensation amount is displayed. (Command unit)
Superimp syn er (mm)	This displays the current value of the synchronous error between the basic axis and the synchronous axis during control axis synchronization between part systems, control axis superimposition, or arbitrary axis superimposition.
Superimp err +P (mm)	This displays the maximum value of the distance in which the synchronous axis advances beyond the basic axis during control axis synchronization between part systems, control axis superimposition, or arbitrary axis superimposition.
Superimp err -P (mm)	This displays the maximum value of the distance in which the synchronous axis lags behind the basic axis during control axis synchronization between part systems, control axis superimposition, or arbitrary axis superimposition.
Superimp errP-P (mm)	This displays the synchronous error width between the basic axis and the synchronous axis during control axis synchronization between part systems, control axis superimposition, or arbitrary axis superimposition.

Display items	Details
Fan rev (r/min)	The detected rotation speed of the unit cooling FAN is displayed by converting it into percentage format.
Drive temp. (deg)	This displays the drive unit temperature.
Motor temp. (deg)	This displays the motor temperature.
Power cycles (p)	This displays the power cycle counter. (Number of times)
Insul resist. (MOhm)	The insulation degradation status is displayed.
FAN1 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
FAN2 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
Battery voltage (V)	This displays the voltage of the connected battery.
AUX current sta No. (*1)	This displays the current station No.
AUX current posn (*1)	This displays the current coordinates position.
AUX inst station No. (*1)	This displays the command station No. of automatic operation or the nearest station No. to stop by manual operation etc.
AUX inst posn (*1)	This displays the coordinates position corresponding to target station No.
Mach err comp val	This displays the machine error compensation amount. (Command unit)
Control input 1L	This indicates the control signal input from NC to servo. (bit0 to bit7) Bit0: READY ON command Bit1: Servo ON command Bit4: Position loop gain changeover command Bit6: Excessive error detection width changeover command Bit7: Alarm reset command
Control input 1H	This indicates the control signal input from NC to servo. (bit8 to bitF) Bit8: Current limit selection command
Control input 2L	This indicates the control signal input from NC to servo. (bit0 to bit7)
Control input 2H	This indicates the control signal input from NC to servo. (bit8 to bitF) Bit9: Speed monitor command valid BitA: In door closed (controller) BitB: In door closed (all drive units)
Control input 3L	This indicates the control signal input from NC to servo. (bit0 to bit7) Bit0: Control axis detachment command
Control input 3H	This indicates the control signal input from NC to servo. (bit8 to bitF)
Control input 4L	This indicates the control signal input from NC to servo. (bit0 to bit7)
Control input 4H	This indicates the control signal input from NC to servo. (bit8 to bitF)
Control input 5L	This indicates the control signal input from NC to servo. (bit0 to bit7)
Control input 5H	This indicates the control signal input from NC to servo. (bit8 to bitF)
Control input 6L	This indicates the control signal input from NC to servo. (bit0 to bit7) Bit0: OMR-FF control request
Control input 6H	This indicates the control signal input from NC to servo. (bit8 to bitF) Bit8: Drivers communication control request
Control output 1L	This indicates the control signal output from servo to NC. (bit0 to bit7) Bit0: In READY ON Bit1: In Servo ON Bit4: In position loop gain changeover Bit6: In excessive error detection width changeover Bit7: In alarm
Control output 1H	This indicates the control signal output from servo to NC. (bit8 to bitF) Bit8: In current limit selection BitC: In-position BitD: In current limit BitE: In absolute position data loss BitF: In warning

Display items	Details
Control output 2L	This indicates the control signal output from servo to NC. (bit0 to bit7) Bit0: Z-phase passed Bit3: In zero speed Bit7: In external emergency stop
Control output 2H	This indicates the control signal output from servo to NC. (bit8 to bitF) Bit9: In speed monitor BitA: In door closed (controller) BitB: In door closed (self drive unit)
Control output 3L	This indicates the control signal output from servo to NC. (bit0 to bit7) Bit0: In control axis detachment
Control output 3H	This indicates the control signal output from servo to NC. (bit8 to bitF)
Control output 4L	This indicates the control signal output from servo to NC. (bit0 to bit7)
Control output 4H	This indicates the control signal output from servo to NC. (bit8 to bitF)
Control output 5L	This indicates the control signal output from servo to NC. (bit0 to bit7)
Control output 5H	This indicates the control signal output from servo to NC. (bit8 to bitF)
Control output 6L	This indicates the control signal output from servo to NC. (bit0 to bit7) Bit0: In OMR-FF control
Control output 6H	This indicates the control signal output from servo to NC. (bit8 to bitF) Bit8: In drivers communication control
Detection system	This displays the detector type symbol of the absolute position detection system. ES: Semi-closed encoder EC: Ball screw end encoder LS: Linear scale MP: MP scale ESS: Semi-closed high-speed serial encoder ECS: Ball screw end high-speed serial encoder INC: Incremental
Power OFF posn	This displays the coordinate at NC power OFF in the basic machine coordinate system. (Command unit)
Power ON posn	This displays the coordinate at NC power ON in the basic machine coordinate system. (Command unit)
Current posn	This displays the current coordinate in the basic machine coordinate system. (Command unit)
R0	This displays the multi-rotation counter value of the detector stored in the memory during basic point setting.
P0	This displays the position within one rotation of the detector stored in the memory during basic point setting.
E0	This displays the absolute position error stored in the memory during basic point setting.
Rn	This displays the multi-rotation counter value of the current detector.
Pn	This displays the position within one rotation of the detector.
En	This displays the absolute position error during NC power OFF.
ABS0	This displays the absolute position reference counter.
ABSn	This displays the current absolute position.
MPOS	This displays the offset amount of the MP scale when the power is turned ON.
Unit type	This displays the servo driver type.
Unit serial No.	This displays the servo driver serial No.
Software version	This displays the servo side software version.
Control method	SEMI: Semi-closed loop CLOSED: Closed loop DUAL: Dual feedback
Motor end detector	This displays the motor end detector type.
Motor end detect No.	This displays the motor end detector serial No.

Display items	Details
Machine end detector	This displays the machine end detector type. The type is displayed when the control method is CLOSED or DUAL. * is displayed when the method is SEMI.
Mach. end detect No	This displays the machine end detector serial No.
Motor	This displays the motor type.
Work time	This displays the READY ON work time. (Units: 1 hr)
Alarm history 1: Time 1: Alarm 〜 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time: Work time when the alarm occurred Alarm No.: Number of the servo alarms that occurred
Maint hist 1 〜 Maint hist 4	This displays the maintenance dates. Year: One digit Month: 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

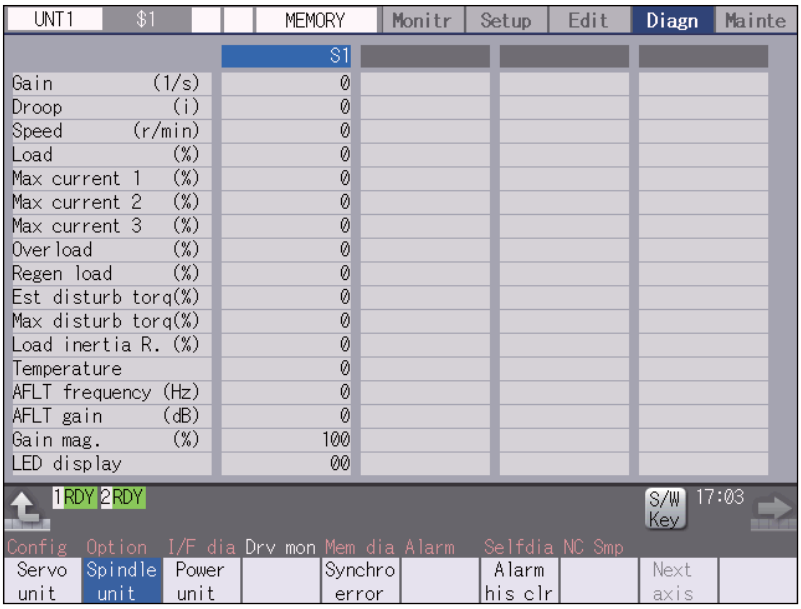
(*1) Data (station No./current position/command position) is displayed for axes of auxiliary axis state.
"-" is displayed for axes of non-auxiliary axis state (NC axis or during PLC axis control).

4.7.2 Drive Monitor Screen (Spindle Unit)

Diagn – Drv mon

The various data related to the spindle can be monitored by selecting the menus [Drv mon] -> [Spindle unit] on the diagnosis (Diagn) screen.

Change the display item with PAGE ▲ or PAGE ▼.



Display items

Display items	Details
Gain (1/s)	This displays the position loop gain. The position loop gain is obtained by the following formula: $\frac{\text{Feedrate (mm/s)}}{\text{Tracking delay error (mm)}}$
Droop (i)	The error of the actual machine position to the command position is called droop. This error is proportional to command speed value. (*1)
Speed (r/min)	This displays the actual rotation speed of motor.
Load (%)	This displays the motor load.
Max current 1 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled after the power ON is displayed.
Max current 2 (%)	This displays the motor current command in terms of continuous current during stalling. An absolute value of the current command peak value sampled in most recent 2 seconds is displayed.
Max current 3 (%)	This displays the FB value of the motor current in terms of continuous current during stalling. An absolute value of the current FB peak value sampled in most recent 2 seconds is displayed.
Overload(%)	This is the data used to monitor the overload of drive unit.
Regen load (%)	This is the data used to monitor the resistance overload state when the resistance regenerative power supply is connected.
Est disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the disturbance observer is valid.

Display items	Details
Max disturb torq (%)	This displays the estimated disturbance torque in terms of stall rated torque when the collision detection function is adjusted. An absolute value of the estimated disturbance torque peak value sampled in most recent 2 seconds is displayed.
Load inertia R. (%)	This displays the estimated load inertia ratio when the collision detection function is adjusted. The ratio is displayed according to the parameter setting of "#1251 set23/bit0".
Temperature (°C)	This displays the thermistor temperature.
AFLT frequency (Hz)	This displays the current operation frequency of the adaptive filter.
AFLT gain (dB)	This displays the current filter depth of the adaptive filter.
Gain mag. (%)	While Real-time tuning 1 is valid, the currently applied speed control gain is displayed with the magnification for the setting value of speed loop gain 1 (parameter "#13005 SP005 VGN1").
LED display	This displays the 7-segment LED of the driver.
Alarm	This displays the alarms and warnings other than the LED display (displayed on drive unit side).
Cycle counter (p)	This displays the position within one rotation of the encoder detector. The position is displayed within one rotation in the range of "0" to "RNG (movement units) × 1000" using the grid point value as "0".
Grid space	This displays the grid space for the reference position return. (Command unit) (*1)
Grid amnt	This displays the distance from the dog-off point to the grid point when the dog-type reference position return is displayed. The grid mask amount is not included. (Command unit) (*1)
Machine position	This displays the NC basic machine coordinate system position. (Command unit) (*1)
Motor end FB	This displays the feedback value of the speed detector. (Command unit) (*1)
FB error (i)	This displays the error of the motor end FB and machine end FB. (*1)
DFB compen amnt (i)	This displays the compensation pulse amount during dual feedback control. (*1)
Tap error (mm) (*2)	This displays the current value of the synchronous error between the tapping spindle and the drilling axis during synchronous tapping. (When the parameter "#1041 Initial inch" is set to "1", "Tap error (inch)" is displayed.) (*1)
Tap error +P (mm) (*2)	This displays the maximum value of the distance in which the drilling axis advances beyond the tapping spindle during synchronous tapping. (When the parameter "#1041 Initial inch" is set to "1", "Tap error +P (inch)" is displayed.) (*1)
Tap error -P (mm) (*2)	This displays the maximum value of the distance in which the drilling axis lags behind the tapping spindle during synchronous tapping. (When the parameter "#1041 Initial inch" is set to "1", "Tap error -P (inch)" is displayed.) (*1)
Tap error P-P (mm) (*2)	This displays the synchronous error width between the spindle and the drilling axis during the synchronous tapping. (When the parameter "#1041 Initial inch" is set to "1", "Tap error -P (inch)" is displayed.) (*1)
Tap error (deg) (*2)	This displays the current value of the synchronous error angle between the tapping spindle and the drilling axis during synchronous tapping. (±99999.999 deg) (*1)
Tap error +P (deg) (*2)	This displays the maximum value of the angle at which the tapping spindle advances beyond the drilling axis during synchronous tapping. (±99999.999 deg) (*1)
Tap error -P (deg) (*2)	This displays the maximum value of the angle at which the tapping spindle lags behind the drilling axis during synchronous tapping. (±99999.999 deg) (*1)
Tap error P-P (deg) (*2)	This displays the synchronous error angle between the spindle and the drilling axis during the synchronous tapping. (deg) (*1)
SP sync error (deg)	This displays the current value of the synchronous error between the basic spindle and the synchronous spindle during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
SP sync err +P (deg)	This displays the maximum value of the angle at which the synchronous spindle advances beyond the basic spindle during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)

Display items	Details
SP sync err -P (deg)	This displays the maximum value of the angle at which the synchronous spindle lags behind the basic spindle during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
SP syn err P-P (deg)	This displays the synchronous error width between the basic spindle and the synchronous spindle during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
SP syn phas er (deg)	This displays the phase difference stored in the memory by calculating the phase shift value. (±99999.999 deg)
SP sync ph1 FB (deg)	This displays the current value of the feedback phase difference that includes the phase difference stored in the memory by calculating the phase shift value during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
SP sync ph2 FB (deg)	This displays the current value of the feedback phase difference that does not include the phase difference stored in the memory by calculating the phase shift value during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
SP syn er comp (deg)	This displays the error compensation amount during spindle synchronization I, tool spindle synchronization IA/IB, or tool spindle synchronization II. (±99999.999 deg)
GB sync error (deg)	This displays the current value of the synchronous error between the basic spindle and the guide bushing spindle during guide bushing spindle synchronization. (±99999.999 deg)
GB sync err +P (deg)	This displays the maximum value of the distance in which the guide bushing spindle advances beyond the basic spindle during guide bushing spindle synchronization. (±99999.999 deg)
GB sync err -P (deg)	This displays the maximum value of the distance in which the guide bushing spindle lags behind the basic spindle during guide bushing spindle synchronization. (±99999.999 deg)
GB sync err P-P (deg)	This displays the synchronous error width between the basic spindle and the guide bushing spindle during guide bushing spindle synchronization. (±99999.999 deg)
Fan rev (r/min)	The detected rotation speed of the unit cooling FAN is displayed by converting it into percentage format.
Drive temp. (deg)	This displays the drive unit temperature.
Motor temp. (deg)	This displays the motor temperature.
Power cycles (p)	This displays the power cycle counter. (Number of times)
Insul degrade (%)	The insulation degradation status is displayed.
FAN1 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
FAN2 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
Battery voltage (V)	This displays the battery voltage.
Control input 1L	This indicates the control signal input from NC to spindle. (bit0 to bit7) Bit0: READY ON command Bit1: Servo ON command Bit7: Alarm reset command
Control input 1H	This indicates the control signal input from NC to spindle. (bit8 to bitF) Bit8 to BitA: Torque limit selection command
Control input 2L	This indicates the control signal input from NC to spindle. (bit0 to bit7)
Control input 2H	This indicates the control signal input from NC to spindle. (bit8 to bitF) Bit9: Speed monitor command valid BitA: In door closed (controller) BitB: In door closed (all drive unit)
Control input 3L	This indicates the control signal input from NC to spindle. (bit0 to bit7)
Control input 3H	This indicates the control signal input from NC to spindle. (bit8 to bitF)
Control input 4L	This indicates the control signal input from NC to spindle. (bit0 to bit7) Bit0 to Bit2: Spindle control mode selection command Bit4: In gear changeover command Bit5 to Bit6: Gear selection command

Display items	Details
Control input 4H	This indicates the control signal input from NC to spindle. (bit8 to bitF) BitC: M coil selection command BitD: L coil selection command BitE: Sub-motor selection command
Control input 5L	This indicates the control signal input from NC to spindle. (bit0 to bit7)
Control input 5H	This indicates the control signal input from NC to spindle. (bit8 to bitF) BitB: Minimum excitation 2 changeover request BitC: Speed gain set 2 changeover request BitD: Zero point re-detection request BitE: Increase holding power of spindle
Control input 6L	This indicates the control signal input from NC to spindle. (bit0 to bit7) Bit0: OMR-FF control request
Control input 6H	This indicates the control signal input from NC to spindle. (bit8 to bitF) Bit8: Drivers communication control request
Control output 1L	This indicates the control signal input from spindle to NC. (bit0 to bit7) Bit0: In READY ON Bit1: In Servo ON Bit7: In alarm
Control output 1H	This indicates the control signal input from spindle to NC. (bit8 to bitF) Bit8 to BitA: In torque limit selection BitC: In-position BitD: In torque limit BitF: In warning
Control output 2L	This indicates the control signal input from spindle to NC. (bit0 to bit7) Bit0: Z phase passed Bit3: In zero speed Bit7: In external emergency stop
Control output 2H	This indicates the control signal input from spindle to NC. (bit8 to bitF) Bit9: In speed monitor BitA: In door closed (controller) BitB: In door closed (self drive unit)
Control output 3L	This indicates the control signal input from spindle to NC. (bit0 to bit7)
Control output 3H	This indicates the control signal input from spindle to NC. (bit8 to bitF)
Control output 4L	This indicates the control signal input from spindle to NC. (bit0 to bit7) Bit0 to Bit2: In spindle control mode selection Bit4: In gear changeover command Bit5 to Bit6: In gear selection Bit7: Magnetic pole position not set
Control output 4H	This indicates the control signal input from spindle to NC. (bit8 to bitF) BitD: In L coil selection
Control output 5L	This indicates the control signal input from spindle to NC. (bit0 to bit7) Bit0: Current detection Bit1: Speed detection Bit6: In coil changeover
Control output 5H	This indicates the control signal input from spindle to NC. (bit8 to bitF) Bit9: 2nd speed detection BitB: In minimum excitation rate 2 selection BitC: In speed gain set 2 selection BitD: Zero point re-detection complete BitF: In 2nd in-position
Control output 6L	This indicates the control signal input from spindle to NC. (bit0 to bit7) Bit0: In OMR-FF control
Control output 6H	This indicates the control signal input from spindle to NC. (bit8 to bitF) Bit8: In drivers communication control
Unit type	This displays the spindle type.
Unit serial No.	This displays the spindle serial No.
Software version	This displays the software No. and version on the spindle side.

Display items	Details
Motor end detect No	This displays the motor end detector serial No.
Mach. end detect No	This displays the machine end detector serial No.
Motor	It displays the motor type which is set for the spindle specification parameter "#3138 motor_type". The maximum of 26 words are displayed with 2 lines and left aligned.
Work time	This displays the READY ON work time. (Units: 1 hr)
Alarm history 1: Time 1: Alarm 〜 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time: Work time when the alarm occurred Alarm No.: Number of the servo alarms that occurred
Maint hist 1 〜 4	This displays the maintenance dates. Year: One digit Month: 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

(*1) These follow the setting and display unit (#1003 iunit) of the 1st part system.

(*2) Synchronous tapping error

This displays the maximum values of the synchronous tapping error that occur during the synchronous tapping.
The synchronous tapping error means the motor tracking delay for the commanded positions of the spindle and the tapping axis.
The positive synchronous tapping error means that the tapping axis is delayed responding to the spindle, and the negative synchronous tapping error means that the spindle is delayed responding to the tapping axis.

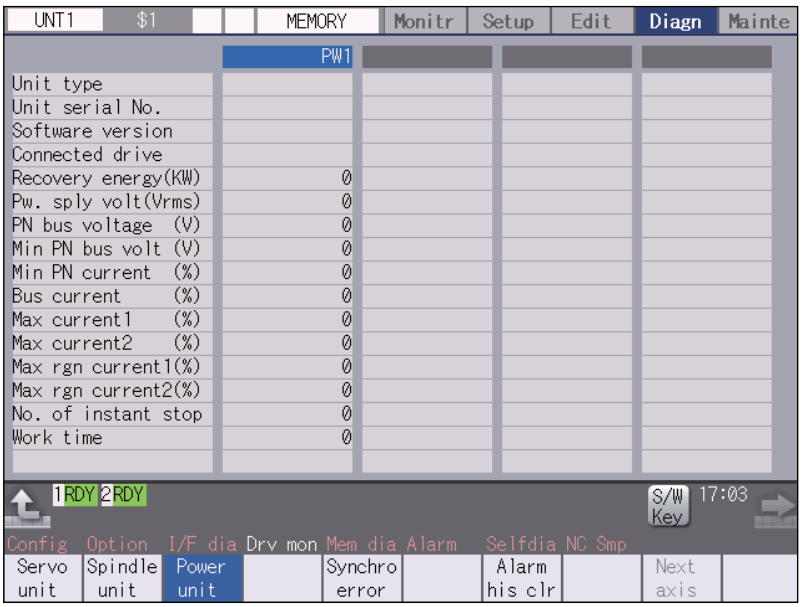
Data name	Details
Synchronous tapping error width (Max value)	♦This outputs the data of which absolute value is the largest among the synchronous tapping error width (-99999.999 to 99999.999 mm) during the synchronous tapping modal. ♦This data will be initialized to "0" when entering the synchronous tapping modal or restoring the power. Other than that, the data continues to display the maximum value.
Synchronous tapping error angle (Max value)	♦This outputs the data of which absolute value is the largest among the synchronous tapping error angle (-99999.999 to 99999.999°) during the synchronous tapping modal. ♦This data will be initialized to "0" when entering the synchronous tapping modal or restoring the power. Other than that, the data continues to display the maximum value.

4.7.3 Drive Monitor Screen (Power Supply Unit)

Diagn – Drv mon

The various data related to the power supply can be monitored by selecting the menus [Drv mon] -> [Power unit] on the diagnosis (Diagn) screen.

Change the display item with PAGE▲ or PAGE▼.



Display items

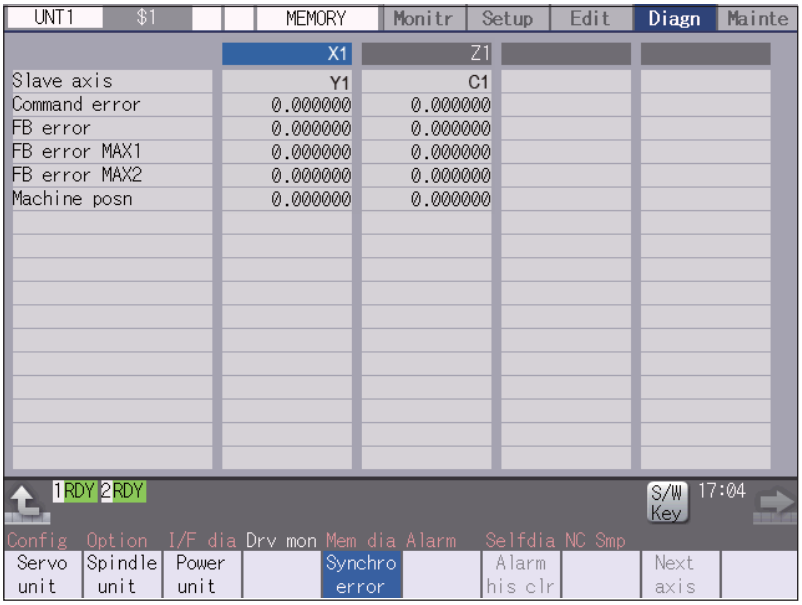
Display items	Details
Unit type	This displays the power supply unit type.
Unit serial No.	This displays the serial No. of the power supply unit.
Software version	This displays the software version.
Connected drive	This displays the I/F channel No. (mcp_no, smcp_no) of the drive unit connected to each power supply unit.
Recovery energy (KW)	This displays the regenerative power every two seconds. (0 to 999 kW)
Pw. sply volt (Vrms)	This displays the effective value of the power supply voltage. (0 to 999 Vrms)
PN bus voltage (V)	This displays PN bus voltage. (0 to 999V)
Min PN bus volt (V)	This displays the minimum PN bus voltage after the NC power ON. (0 to 999V)
Min PN current (%)	This displays the bus current when PN bus voltage is at minimum. (driving: +, regenerative: -) (0 to 999%)
Bus current (%)	This displays the bus current. (driving: +, regenerative: -) (0 to 999%)
Max current1 (%)	This displays the maximum driving current after the NC power ON. (0 to 999%)
Max current2 (%)	This displays the maximum driving current in most recent 2 seconds. (0 to 999%)
Max rgn current1 (%)	This displays the maximum regenerative current after the NC power ON. (0 to 999%)
Max rgn current2 (%)	This displays the maximum regenerative current in most recent 2 seconds. (0 to 999%)
No. of instant stop	This displays the number of instantaneous stop exceeding 1 cycle of the power. (0 to 9999 times)
Work time	This displays the READY ON work time. (Units: 1 hr)
Power-run pwr (kW)	The power-run power is calculated and displayed. (0.01 kW)
Regenerate pwr (kW)	The regenerated power is calculated and displayed. (0.01 kW)

Display items	Details
Consumed power (kW)	The power consumption is calculated and its integrated value is displayed. (0.01 kWh)
Pwr. distortion (V)	The amount of power distortion (harmonic voltage value) is calculated and displayed. (V)
Supplied power (kW)	The supplied power is calculated and displayed. (kW)
Accum. power (kWh)	The accumulated power is calculated and displayed. (kWh)
Harmonic volt. (V)	The power line harmonic voltage is displayed. (V)
CV margin (%)	The CV margin is calculated and displayed. (%)
FAN1 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
FAN2 rot. state (%)	The detected rotation speed of the unit cooling fan is displayed by converting it into percentage format (converted with the rated speed of the fan as 100%).
Alarm history 1: Time 1: Alarm 〜 8: Time 8: Alarm	This displays servo alarms that occurred in latest order with the following formats. Time: Work time when the alarm occurred Alarm No.: Number of the servo alarms that occurred
Maint hist 1 〜 4	This displays the maintenance dates. Year: One digit Month: 1 to 9, X (Oct.), Y (Nov.), Z (Dec.)
Maint status	This displays the maintenance status.

4.7.4 Drive Monitor Screen (Synchronous Error)

Diagn – Drv mon

The "Synchronous error" appears only when the synchronous control axis specification is valid.
The various data related to the synchronous error can be monitored by selecting the menus [Drv mon] -> [Synchro error] on the diagnosis (Diagn) screen.



Display items

Display items	Details
Slave axis	This displays the slave axis name which is controlled following the master axis. The axis name corresponding to the axis No. set in the axis specification parameter "#1068 slavno" (slave axis No.) is displayed. The name set in the base axis specification parameter "#1022 axname2" (2nd axis name) is displayed for the slave axis.
Command error	This is the deviation of the slave axis machine position in respect to the master axis. The error of the commanded position to the servo control section before pitch error compensation, relative position compensation and backlash compensation is displayed. If this error occurs, the parameters that should be the same for the synchronous axes are different. Command error = Command s - command m -Δ Command s: Slave axis commanded position Command m: Master axis commanded position Δ: Command s - command m at start of synchronous control
FB error	This is the deviation of the slave axis feedback position in respect to the feedback position from the master axis servomotor. The actual error of the machine position is displayed. The synchronous error check is carried out on this error. FB error = FBs - FBm - Δ FBs: Slave axis feedback position FBm: Master axis feedback position Δ: FBs - FBm at start of synchronous control
FB error MAX1	This displays the maximum FB error after the start of the synchronous control.
FB error MAX2	This displays the maximum FB error approx. every 30 seconds after the start of the synchronous control.
Machine position	This displays the commanded machine position for the master axis.

4.7.5 Clearing the Alarm History on Drive Monitor Screen

Diagn – Drv mon

Operation method

(1) Press the menu [Servo unit], [Spindle unit] or [Power unit].

(2) Using the menu [Next axis], tab keys |← and →|, select the axis (device) from which to clear the alarm history.

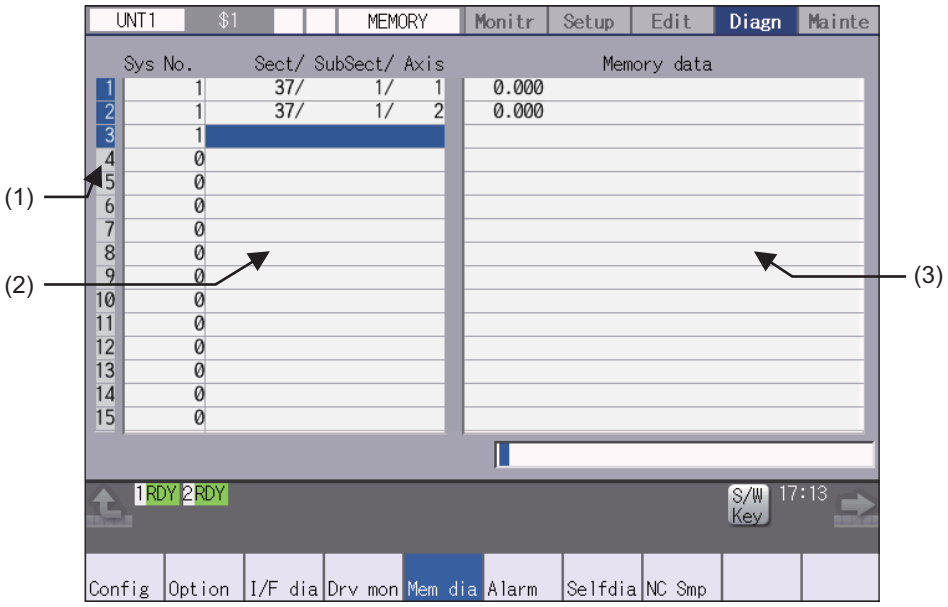
(3) Press the menu [Alarm his clr]. ➡ The menu is highlighted, and a message appears to confirm the erasing.
The alarm history1: Time appears at the head.

(4) Press the [Y] key. ➡ All alarm history data for the selected axis (device) are cleared to "0".

4.8 NC Memory Diagnosis Screen

Diagn – Mem dia

The NC internal data can be displayed and rewritten on the NC memory diagnosis (Mem dia) screen of the diagnosis (Diagn) screen. The custom API library's NC data read/write interface is used to display and rewrite the NC's internal data. The contents of the NC data can be displayed by designating the part system No., section No., sub-section No. and axis No. on this screen.



Display items

Display items		Details
(1)	Index No.	This displays the registration No. of the NC memory data. When one of the "2. Data contents" is set, the number is highlighted indicating that the normal display of the data contents has stopped.
(2)	Data contents	Part system No. Designate the part system No. (1: 1st part system). Designate "0" to designate the data common for the part systems. Section/sub-section/axis: Designate the section No., sub-section No. and axis No. of the data to be set and displayed. The setting format is, section No./sub-section No./axis No. <Note> ♦The axis No. "1" is handled as the first axis. Designate "0" for the data which does not require an axis designation.
(3)	Memory data	This displays the contents of the data.

Menus

Menus	Details
Line clear	This erases the information in the line where the cursor is. (One entire line becomes blank.) The cursor does not move at this time.
Data read	The contents of the set address data (Part system No, Section/sub-section/axis) for all the lines are constantly displayed. The Index No. highlight (indicating data is being set) is released. The cursor appears in "Part system No" of that line.
Data write	This writes the data in the setting area to the NC memory indicated by address data at the cursor position. (*1) The Data No. highlight (indicating data is being set) is released, and constant display is started. After writing, the cursor moves to "Part system No" of the next line.
Subsect continu	Based on the data of the address data where the cursor is, this displays the continuous data to which the sub-section No. has been added to the address data from the line where the cursor is. The cursor moves to "Part system No " of that line.
Axis continu	Based on the data of the address data where the cursor is, this displays the continuous data to which the axis No. has been added to the address data from the line where the cursor is. The cursor moves to "Part system No " of that line.

(*1) Decimal, hexadecimal, floating point data and character string data writing is possible. Note that hexadecimal, floating point data and character strings may not be settable depending on the data.

Decimal: Integers without decimal points (Example) -1234
Hexadecimal: An "H" is necessary at the end (Example) 1234H
Floating point data: Data with a decimal point (Example) -12.3
Character string data: Character string (Example) X

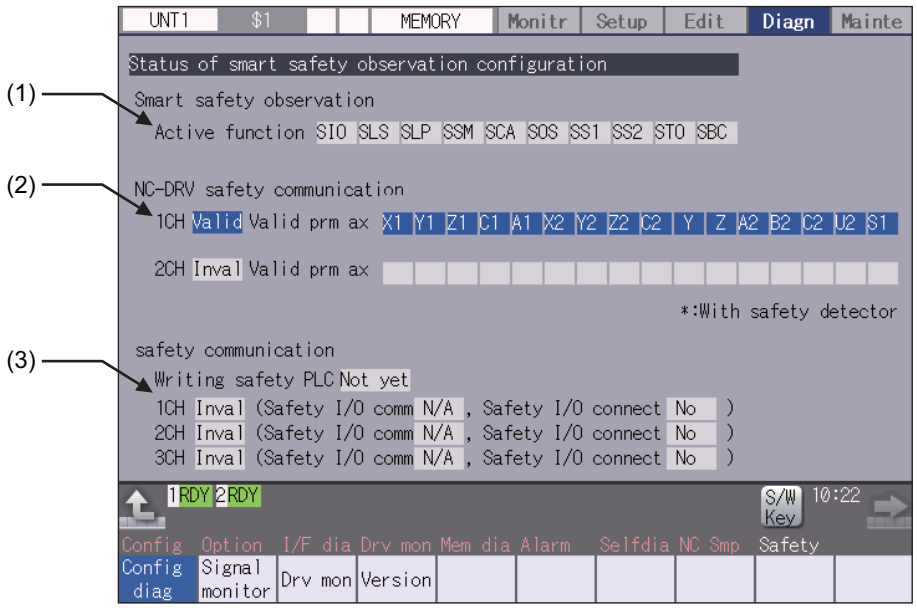
4.9 Safety Observation Screen

Diagn – Safety

The configuration, signal status, drive status and version in use of the smart safety observation function are displayed on the safety observation screen.

4.9.1 Safety Observation Screen (Configuration Diagnosis)

The available/unavailable states of the smart safety observation function are displayed on the configuration diagnosis screen.



Display items

Display items		Details
(1)	Active function	The drive safety functions which are enabled with the parameters are highlighted. SIO: Safety-related I/O observation, emergency stop observation SLS: Safety-limited speed observation SLP: Safety-limited position observation SSM: Safe speed monitor SCA: Safe cam SOS: Safe operating stop observation SS1: Safe stop 1 SS2: Safe stop 2 STO: Safe torque OFF SBC: Safe brake control
(2)	NC-DRV safety communication	This displays the safety communication status of the drive unit. To perform the safety drive communication, the smart safety observation target axis needs to be set by the parameter, and the connected channel with the drive unit needs to be optical communication and configured only with drive units MDS-E Series. Valid prm ax: Out of the axes connected to each channel, the axes that the parameter "#51101 SF_Disable" (Disable smart safety observation) is OFF are highlighted. For the axis with safety detector, "*" appears at the top of the axis name.

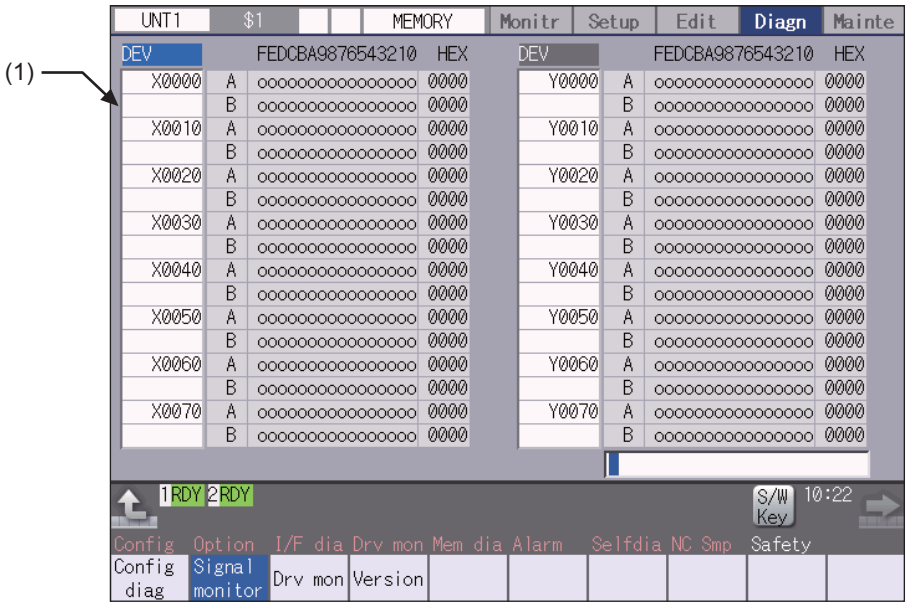
Display items		Details
(3)	NC-I/O safety communication	This displays the communication status of the safety I/O communication. To perform the safety I/O communication, at least one of remote I/O channels needs to be configured with the safety I/O devices (safety remote I/O unit, operation panel equipped with safety I/Os) and RIO2.0 unit alone. Writing safety PLC: This displays the status (Done/Not yet) whether the PLC ladder for safety is written. Safety I/O comm: "OK" is displayed when the channel is configured only with RIO2.0 units. Safety I/O connect: "Yes" is displayed when connected to the safety I/O devices (safety RIO unit, operation panel equipped with safety I/O).

Menus

Menus	Details
Config diag	This switches the screen to the configuration diagnosis display of the smart safety observation.
Signal monitor	This switches the screen to the signal monitor display of the smart safety observation.
Drive monitor	This switches the screen to the drive monitor display of the smart safety observation.
Version	This switches the screen to the version display of the smart safety observation.
Servo unit	This switches the drive monitor diagnosis information to the servo unit information. Only when the drive monitor is displayed, the menu appears, and the operation can be performed.
Spindle unit	This switches the drive monitor diagnosis information to the spindle unit information. Only when the drive monitor is displayed, the menu appears, and the operation can be performed.
Next axis	This switches the axis to be displayed on the drive monitor. Only when the number of axes is five or more on the drive monitor screen, the menu appears, and the operation can be performed.

4.9.2 Safety Observation Screen (Signal Monitor)

The signal monitor screen displays the safety PLC signal status. The safety PLC signal displays both of the duplex PLC signals to identify the incongruous state. With the initial display, the input/output signal status from the device "X0000" is displayed on the left side and the input/output signals from the device "Y0000" is displayed on the right side.
Note that because time differences occur between the PLC signal change and the signal display, there may be a delay in the display. The machine may also not be able to correspond to extremely brief signal changes.



Display items

	Display items	Details
(1)	Device No. and input/output signal value (binary/hexadecimal display)	This displays the duplex safety PLC signals (A, B) from the designated device No. in order. The input/output signal is displayed in binary and hexadecimal (bitwise). The device to be displayed can be switched individually for the left area and right area. The operation target (right or left) can be switched with the |← and →| keys. The head device and the operation target area are held until the power OFF. The displayable devices are X, Y, and ZR. If there is a comparison error with duplex safety PLC signals, the background color becomes yellow.

List of displayable PLC devices

Devices	Device No.	No. of points	Units	Details
X	X0 to X1FF	512	1-bit	Input signals to PLC. Machine input, etc.
Y	Y0 to Y1FF	512	1-bit	Output signals from PLC. Machine output, etc.
ZR	ZR0 to ZR3071	3072	16-bit	File register, CNC word I/F

Displaying the PLC device input/output signal

To refer the arbitrary input/output signal status, enter the target device No. to the input area, and the display will be switched.

(Example) For displaying the input/output signal of the arbitrary device No. "X0020"

(1) Press the tab key [|←] or [→|] to select the area where the data is displayed.

(2) Set the device No. (X0020), and then press the [INPUT] key.

Note

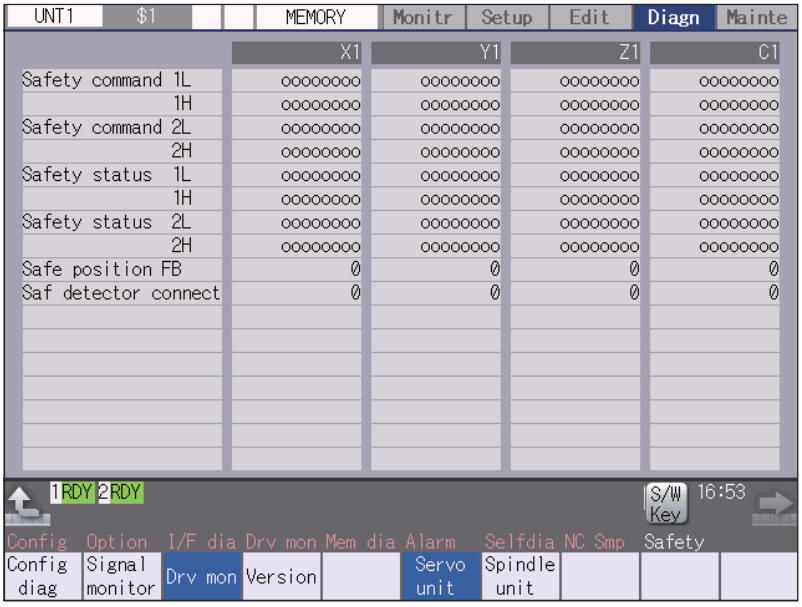
(1) Setting a device No. which exceeds the specification or setting an illegal address causes a setting error.

Changing the display with the page keys

The operation target device Nos. change in page unit when [PAGE ▲]/[▼ PAGE] is pressed. Changing of the pages stops within the range of device numbers of which the device has.

4.9.3 Safety Observation Screen (Drive Monitor)

The safety communication state with servo drive (NC axis, PLC axis) and spindle drive can be monitored. Only the safety drive communication parameter enabled axes are displayed on this screen.



Display items

Display items	Details
Safety command 1L	This displays the data sent to the drive.
Safety command 1H	

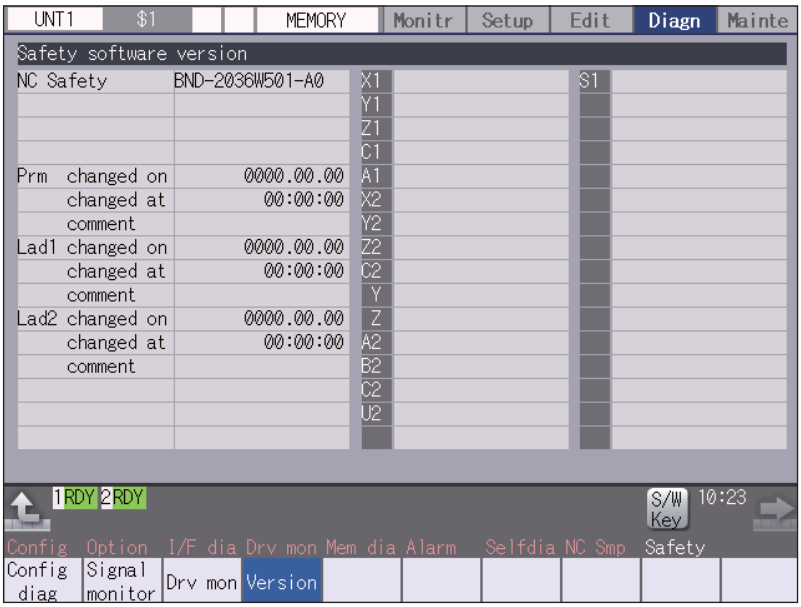
	Bit	Details
1L	0	STO command (0: No command, 1: With command)
	1	
	2	
	3	
	4	
	5	
	6	
	7	
1H	8	
	9	
	A	
	B	
	C	
	D	
	E	
	F	

<table>
<tr><th>Display items</th><th>Details</th></tr>
<tr><td>Safety command 2L
Safety command 2H</td><td>This displays the data sent to the drive.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">2L</td><td>0</td><td></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td>SBC command (0: No command, 1: With command)</td></tr>
<tr><td>3</td><td>SBC command for SBT (1CH side) (0: No command, 1: With command)</td></tr>
<tr><td>4</td><td>SBC command for SBT (2CH side) (0: No command, 1: With command)</td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">2H</td><td>8</td><td></td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table></td></tr>
<tr><td>Safety status 1L
Safety status 1H</td><td>This displays the data received from the drive.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">1L</td><td>0</td><td>STO status (0: No operation, 1: In operation)</td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">1H</td><td>8</td><td></td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Display items</th><th>Details</th></tr>
<tr><td>Safety status 2L</td><td>This displays the data received from the drive.
<table>
<tr><th></th><th>Bit</th><th>Details</th></tr>
<tr><td rowspan="8">2L</td><td>0</td><td></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td>SBC status (0: No operation, 1: In operation)</td></tr>
<tr><td>3</td><td>SBC status for SBT (1CH side) (0: No operation, 1: In operation)</td></tr>
<tr><td>4</td><td>SBC status for SBT (2CH side) (0: No operation, 1: In operation)</td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td rowspan="8">2H</td><td>8</td><td></td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>A</td><td></td></tr>
<tr><td>B</td><td></td></tr>
<tr><td>C</td><td></td></tr>
<tr><td>D</td><td></td></tr>
<tr><td>E</td><td></td></tr>
<tr><td>F</td><td></td></tr>
</table></td></tr>
<tr><td>Safety status 2H</td><td></td></tr>
<tr><td>Safe position FB</td><td>This displays the encoder position information from the drive to NC.</td></tr>
<tr><td>Saf detector connect</td><td>This displays the safety encoder connection status.
0: No connection
1: With connection</td></tr>
<tr><td>Safety status 2L</td><td>This displays the data received from the drive.</td></tr>
</table>

4.9.4 Safety Observation Screen (Version Display)

Software version about smart safety observation is displayed on the version display screen.



Display items

Display items	Details
NC Safety	This displays the smart safety observation software version of the NC system.
Parameters	This displays the safety parameter changed date and time, and comment.
Lad 1, 2	This displays the safety PLC ladder 1, 2 changed date and time, and comment.
Servo axis (up to 32 axes)	This displays the safety software version of servo axis. The version only for axis of the safety servo unit is displayed. Change the display item with PAGE ▲ or PAGE ▼.
Spindle (up to 8 spindles)	This displays the safety software version of spindle. The version only for spindle of the safety spindle unit is displayed.

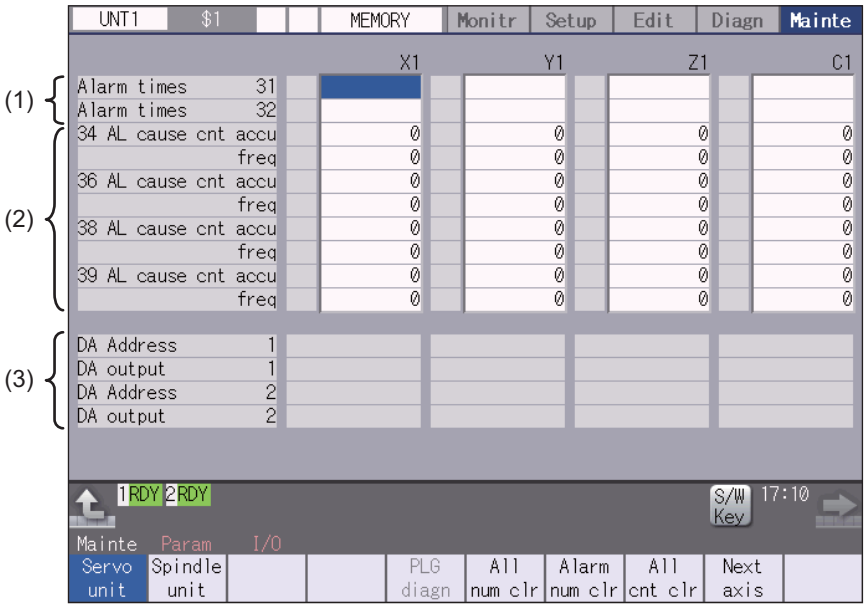
4.10 Servo Diagnosis Screen

Mainte – Mainte

You can confirm the following information on the servo diagnosis screen by pressing [Mainte] -> [Servo diagn] on the diagnosis (Diagn) screen:
- The number of alarms of servo/spindle drive unit
- DA output information
- PLG diagnosis (spindle)
- The maintenance diagnosis information of servo/spindle unit such as alarm cause counter

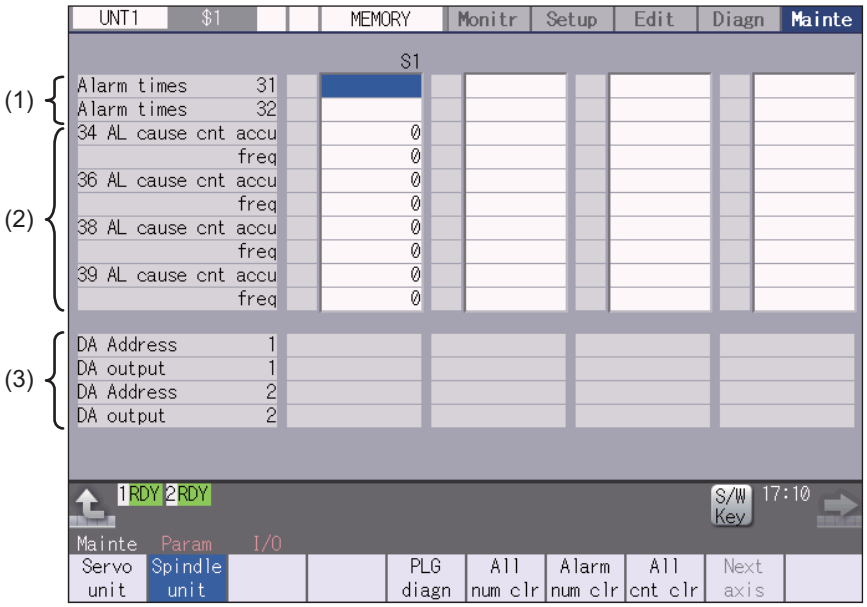
This operation is protected according to the operation level.

■Servo unit

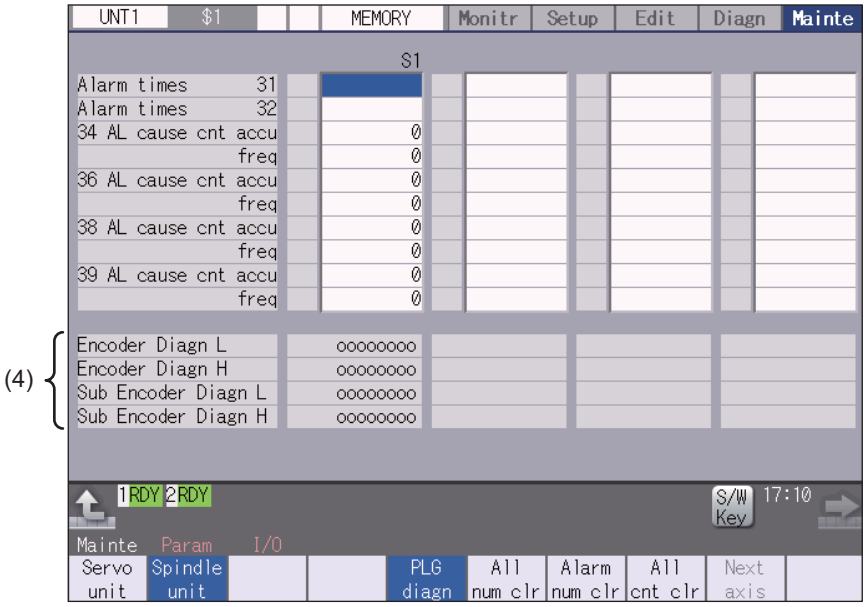


■Spindle unit

(1) Display of the DA output data



(2) Display of the spindle PLG diagnosis information



Display items

Display items	Details
(1) Alarm times	This displays the data for each axis or unit. There are Alarm times 1 to 32, and there are switched with the page up/down keys. The number of times can be cleared for each axis or each column. Alarm No: Servo alarm No. (unit: ASCII) No. of times: The number of times of meeting the servo alarm condition after the servo drive unit ON. (Units: Number of times)
(2) Alarm cause counter	An alarm occurs when the specified number of conditions are met. This counter displays the number of times in which the alarm occurrence condition is met since the drive unit power was turned ON. The number of times can be cleared for each axis with [All cnt clr]. accu: Displays the number of times in which the alarm occurrence condition was met since the drive unit power was turned ON. freq: Displays the peak hold value when the alarm occurrence condition is met per constant cycle.
(3) DA output	This displays the data for each axis or unit. DA Address 1: Servo parameter sv061 set value (address) (unit: ASCII) DA output 1: Servo parameter sv061 set address data (unit: pulse) DA Address 2: Servo parameter sv062 set value (address) (unit: ASCII) DA output 2: Servo parameter sv062 set address data (unit: pulse)
(4) Spindle PLG diagnosis information (Spindle drive unit only)	Displays the data for each axis Encoder Diagn L: Displays the output signal (Low) of the motor end PLG Encoder Diagn H: Displays the output signal (High) of the motor end PLG Sub Encoder Diagn L: Displays the output signal (Low) of the machine end PLG Sub Encoder Diagn H: Displays the output signal (High) of the machine end PLG

Note

(1) PLG (pulse generator) detects the pulse signal and it is used to detect the rotation state of the motor.

Menus

Menus	Details
Servo unit	Displays the servo unit diagnosis information in the data display area.
Spindle unit	Displays the spindle unit diagnosis information in the data display area. <Note> •When the parameter "#1039 spinno" is set to "0", this menu is not displayed.
PLG diagn	Switches the display between the DA output and the spindle PLG diagnosis information. Pressing this button again after this menu is highlighted, the display switches to the DA output. <Note> •When the parameter "#1039 spinno" is set to "0", this menu is not displayed. •Even when the parameter "#1039 spinno" is set to other than "0", this menu will be grayed out and non-selectable. while displaying the servo unit diagnosis information.
All num clr	This clears the number of alarms of the axis at the cursor position to "0".
Alarm num clr	This clears the number of alarms at the cursor position to "0". <Note> •When the cursor is on "AL cause cnt accu" or "freq", this menu is grayed out and non-selectable.
All cnt clr	Clears the all values of "AL cause cnt accu" and "freq" of the axis where the cursor is placed to 0.
Next axis	Displays the data of four axes from the next axis. This menu is displayed only when there are five or more servo axes or spindle.

4.11 Diagnosis Data Collection Setting

Mainte – Mainte

The following operations can be performed on the diagnosis collection setting screen:

(1) Setting to perform the diagnosis data collection

(2) Confirming the status of the diagnosis data collection

(3) Starting/stopping the diagnosis data collection

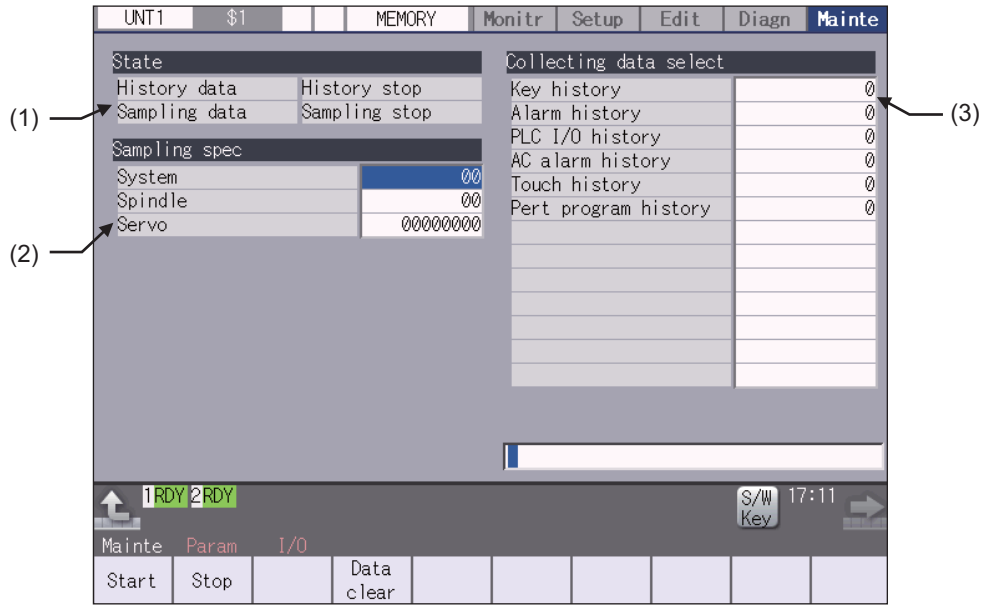
(4) Clearing the diagnosis data.

The data collection is started at the time of the NC power ON.

This operation is protected according to the operation level.

Diagnosis data (history data)

Data name	Max number of collection	Description
Key history	2048	This shows the key input history information on the NC operation board. [Input time, display screen No., screen name, detailed screen No., key codes and key names]
Alarm/warning history	512	This shows the history information of alarm and warning when an alarm or a warning occurs on the NC. (Including PLC alarm messages.) [Alarm occurrence time, part system, alarm No., parameter 1 and parameter 2]
PLC I/O history (bit data)	16384	This shows the change history of the input/output signals (X device and Y device) between the machine, PLC ladder and the NC. [Changed time, device names and device value]
PLC I/O history (word data)	1024	This shows the change history of the input/output signals (R device and D device) between the machine, PLC ladder and the NC. [Changed time, device names and status (1: OFF→ON/0: ON→OFF)]
AC power ON/OFF history	64	This shows the history information when the power is ON/OFF. [Occurrence time and NC power ON/OFF]
Touch history	2048	This shows the touchscreen input history information on the NC operation board. [Input time, display screen No., screen name, detailed screen No., coordinate values (X/Y) and status]
Program No. history	64 per part system	This shows the change history information on the program No. of the machining program under operation. [Time of change, type and value]
Sequence No. history	512 per part system	This shows the change history information on the sequence No. of the machining program under operation. [Time of change, type and value]
Alarm detailed information history	Variable	This shows the detailed alarm history information when n alarm occurs on the NC. * Excluding warnings. [Alarm information, modal information and coordinate information]



Display items

Display items		Details
(1)	State	Display the history data and sampling data collection status.
	History data	Display the history data collection status. History collecting: History data collection is in progress. History stop: History data collection is stopped.
	Sampling data	Display the sampling data collection status. Sampling: Sampling data collection is in progress. Sampling stop: Sampling data collection is stopped. Sampling invalid: Sampling data collection is disabled.
(2)	Sampling specifications	Specify the part system, spindle, and servo axes where sampling data is to be collected.
	System	Specify the part systems where sampling data is not to be collected. Specify the part system in HEX. When "0" is set, sampling is carried out for all part systems. This setting is ignored if a non-existent part system is specified.
	Spindle	Specify the spindle where sampling data is not to be collected. Specify the part system in HEX. When "0" is set, sampling is carried out for all spindles. This setting is ignored if a non-existent spindle is specified.
	Servo	Specify the servo axes where sampling data is not to be collected. Specify the part system in HEX. This setting is not system-specific. When "0" is set, sampling is carried out for all axes. This setting is ignored if a non-existent servo axis is specified.
(3)	Collecting data select	This selects the diagnosis data to be collected. 0: Collected. 1: Not collected.
	Key history	This selects whether or not key history data is collected.
	Alarm history	This selects whether or not alarm history data is collected.
	PLC I/O history	This selects whether or not PLC input/output signal history data is collected.
	AC alarm history	This selects whether or not AC power ON/OFF history data is collected.
	Touch history	This selects whether or not touchscreen history data is collected.
	Pert program history	This selects whether or not the data of the machining program No. and the sequence No. is collected.

Menus

Menus	Details
Start	This begins collecting sampling data and history data.
Stop	This stops the sampling data and history data collection operation.
Data clear	This stops the sampling data and history data collection operation, and clears the collected data. This is not displayed when "#1263 bit1" is ON.

Note

(1) The alarm history data collection start/stop operation is switched using the menu [Start] or [Stop] of data collection regardless of whether "Alarm history" is set to "0" or "1".

4.11.1 Starting the Data Collection

When the NC is turned ON, the data collection starts automatically according to the settings in "Sampling spec" and "Collecting data select" on the diagnosis data collection setting screen.
After the diagnosis data collection is stopped by pressing the menu [Stop] or [Data clear] on the diagnosis data collection setting screen, the data collection does not start even if the NC power is turned ON again. In this case, press the menu [Start] on the diagnosis data collection setting screen to start the diagnosis data collection.
The settings for "Sampling spec" and "Collecting data select" on the diagnosis data collection screen are valid after the NC power is ON again.

(1) When the menu [Start] is pressed, the confirmation message appears.

(2) Press the [Y] or [INPUT] key to start (restart) the data collection.

Note

(1) Data collection starts even if "Alarm history" is set to "1" (Not collect).

4.11.2 Stopping the Data Collection

The data collection stops when any of the following operations is performed:

Condition to stop data collection (trigger)	Target data to stop collection
Press the menu [Stop] on the support screen.	Sampling data and history data
Press the menu [Data clear] on the support screen.	Sampling data and history data
At the time of the occurrence of servo alarm (emergency stop state)	Sampling data
At the rising edge of the diagnosis data collection stop signal (NETSTP)	Sampling data

(1) When the menu [Stop] is pressed, the confirmation message appears.

(2) Press the [Y] or [INPUT] key to stop the data collection.
Press the menu [Start] to restart the data collection. When the data collection is stopped by pressing the menu [Stop], the data collection is not restarted even when the NC is turned ON again.

Note

(1) Data collection is stopped even if "Alarm history" is set to "0" (Collect).

4.11.3 Clearing the Collected Data

When the data clear menu is executed, the data collection is stopped and the collected data is cleared.

(1) When the menu [Data clear] is pressed, the confirmation message appears.

(2) Press the [Y] or [INPUT] key to clear the collected data.
When the collected data is cleared, the data collection is stopped.
Press the menu [Start] to restart the data collection. When the data collection is stopped by pressing the menu [Data clear], the data collection is not restarted even when the NC is turned ON again.

4.11.4 Referring to the Collected Data

The history data can be output via the input/output screen as the history data file. It can also be viewed on the edit screen.
However, the password issued by the MTB is required to view it on the edit screen.
The types of history data files are as follows:

All history	Ascending by date and time for each history type #11052 LOG Sort Order = "0"	History data is output in time ascending order and individually for each of the following types: key history, touchscreen history, alarm history, PLC I/O signal history, AC alarm history, program No. history and sequence No. history. If two or more oldest histories have the same time and date, they are displayed in the order of key history, touchscreen history, alarm history, PLC I/O signal history, AC alarm history, program No. history and sequence No. history.
	Ascending by date and time for all history #11052 LOG Sort Order = "1"	History data of each history type is output collectively in time ascending order. If two or more histories have the same time and date, they are displayed in the order of key history, touchscreen history, alarm history, PLC I/O signal history, AC alarm history, program No. history and sequence No. history.
Key history		Only the key history data is displayed in time ascending order. (/LOG/KEYLOG.LOG)
Touch history		Only the touchscreen history data is displayed in time ascending order. (/LOG/TOUCHLOG.LOG)
Alarm detailed information history		Only the alarm detailed information history is displayed in time ascending order. (/LOGEX/ALM-SV1.LOG) Latest servo/spindle alarm detailed information history (/LOGEX/ALM-SV2.LOG) Previous servo/spindle alarm detailed information history (/LOGEX/ALM-SV3.LOG) Second to last servo/spindle alarm detailed information history (/LOGEX/ALM-SV4.LOG) Third to last servo/spindle alarm detailed information history (/LOGEX/ALM-SV5.LOG) Fourth to last servo/spindle alarm detailed information history (/LOGEX/ALM-OTR1.LOG) Latest alarm detailed information history of other than servo/spindle alarm (/LOGEX/ALM-OTR2.LOG) Previous alarm detailed information history of other than servo/spindle alarm (/LOGEX/ALM-OTR3.LOG) Second to last alarm detailed information history of other than servo/spindle alarm (/LOGEX/ALM-OTR4.LOG) Third to last alarm detailed information history of other than servo/spindle alarm (/LOGEX/ALM-OTR5.LOG) Fourth to last alarm detailed information history of other than servo/spindle alarm

Procedures to output the history data files

(1) Select [Mainte]-[I/O].

(2) Set the files of device A as follows:
A:Dev: Memory
Directory: /LOG (Displayed as "History".)
File name: ALLLOG.LOG (all history), KEYLOG.LOG (key history), TOUCHLOG.LOG (touchscreen history)

<Note>

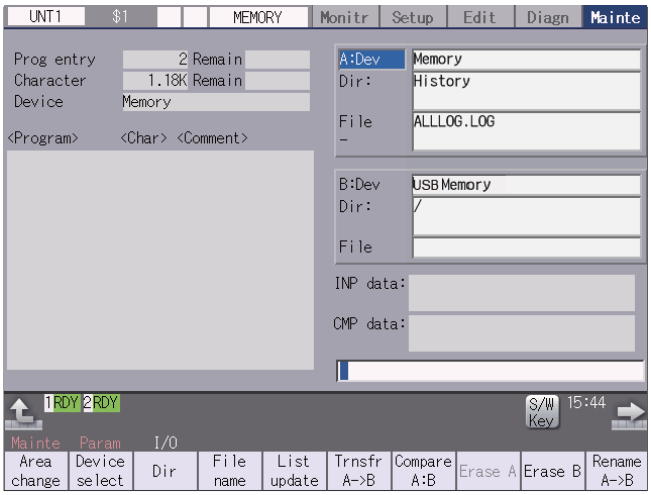
- Even if the menu [List update] is executed, ALLLOG.LOG, KEYLOG.LOG or TOUCHLOG.LOG is not displayed in the list.

(3) Press the menu [Area change] to set the destination of the device B file.
(In this manual, the destination is USB memory as an example.)
B: Dev: USB memory
Directory: Select a destination directory.
File name: Input a file name to save.

<Note>

- If you omit the file name, the file is named with the same name as the device A.

(4) Press the menu [Trnsfr A→B] to output the file.



```
...
S1008 1500303321Y8E0   1
S1008 1500304628Y8E1   1
S1008 1500305826Y8E2   1
E1008 15003062131 S01  0053 XYZCA
S1008 1501307211Y700   1
S1008 1502307544Y701   1
S1008 1502307544Y702+  1
K1008 1503308634004F 0
```

Procedures to output the alarm detailed information history data files

(1) Select [Mainte]-[I/O].

(2) Set the files of device A as follows:
A:Dev: Memory
Directory: /LOGEX
File name: ALM-SVn.LOG, ALM-OTRn.LOG (n = 1 to 5)

<Note>

- When the menu [List update] is executed, ALM-SV1.LOG to ALM-SV5.LOG and ALM-OTR1.LOG to ALM-OTR5.LOG are displayed in the list.

(3) Press the menu [Area change] to set the destination of the device B file.
(In this manual, the destination is USB memory as an example.)
B:Dev: USB memory
Directory: Select a destination directory.
File name: Input a file name to save.

<Note>

- If you omit the file name, the file is named with the same name as the device A.

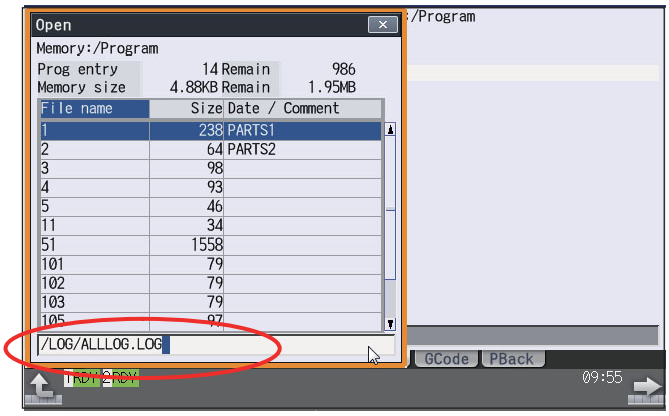
(4) Press the menu [Trnsfr A→B] to output the file.

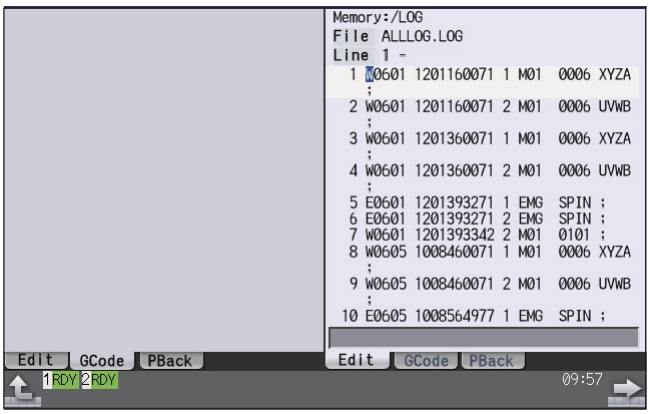
Procedures to view on the edit screen of the history data

(1) On the Mainte screen, select [Mainte] and then [Psswd input] to input the password issued by the MTB.

(2) Select the menu [Edit]-[Open] on the edit screen.

(3) Input the following strings in the input area according to the history data to browse, and then press the [INPUT] key.
- "/LOG/ALLLOG.LOG" for all history data
- "/LOG/KEYLOG.LOG" for key history data
- "/LOG/TOUCHLOG.LOG" for touchscreen history data
- "/LOGEX/ALM-SVn.LOG" (n = 1 to 5) for servo/spindle alarm detailed information history data
- "/LOGEX/ALM-OTRn.LOG" (n = 1 to 5) except for servo/spindle alarm detailed information history data





5

Troubleshooting

If trouble occurs during operation, the accurate cause must be found so that adequate measures can be taken. Perform the following checks for this.

5.1 Troubleshooting

Confirm "when", "when doing what", "what kind of trouble" and "how frequently" the trouble occurred. Also check how many years the machine has been operated, and how many hours a day it is used.

(1) General confirmation items

- MTB and type of machine

(2) When?

- What time did the trouble occur?
- How long had passed after the power was turned ON?

(3) What kind of trouble?

- What was displayed on the Alarm Diagnosis screen of the display unit?
  Display the Alarm Diagnosis screen, and check the alarm details.
- What was displayed for the machine sequence alarm?

(4) What were you doing when this occurred?

- What was the NC operation mode?
  During automatic operation: Program No., sequence No. and program details when the trouble occurred.
  During manual operation: manual operation
- What was the operation procedure?
- What were the previous and next steps?
- What screen is displayed on the display unit of MTB?
- What is the state of the peripheral devices?
- Did the trouble occur during input/output operations?
- What was the machine side state?
- Did the trouble occur while replacing the tools?
- Did hunting occur in the control axis?

(5) How frequently does the trouble occur?
If the trouble occurs infrequently or if it occurs during the operation of another machine, the cause may be an error in the power voltage or the noise, etc. Check whether the power voltage is normal (does it drop momentarily when other machines are operating?), and whether noise measures have been taken.

- How frequently does the trouble occur in a day? (Times/day)
- Were the peripheral devices operating?
- Check whether the same trouble is repeated during the same operation. (Repeatability)
- Check whether the same trouble occurs when the conditions are changed.
- Does the trouble occur during a specific mode?
- What is the frequency in the same workpiece?
- What is the ambient temperature?
  (Was there a sudden change in the temperature?)
- Is there any contact defect or insulation defect in the cables?
  (Is there any oil or cutting oil splattered onto the cables?)

5.1.1 Possible Causes of Trouble

The most common cause is a cable contact defect and wire breakage defect.

- Is the connection correct?
- Are the cables bent or stepped on?
- Are the joints of the cables and connectors deteriorated?
- Was a continuity test done on the cables?
- Is any of the terminal block or connector screws loosen?
- Is there any oil or cutting oil splattered onto the cables?
- Was a cable disconnected while the power was ON?
- Is any cable overheated?

Often trouble occurs due to fluctuation in the power voltage or noise from the communication cable.

- Is the power voltage always correct?
- Is the power frequency always correct?
- Does the voltage fluctuate depending on the time?
- Does the voltage drop momentarily when a peripheral device starts operation?
- Was there an instantaneous power failure before the trouble?
- Have measures against noise been taken for each unit?
- Are the communication and power system cables separated and laid?
- Is the communication cable shield sufficient?

The trouble may also occur due to sudden temperature changes or vibration and impact, although this is rare.

- Are the ambient temperature and humidity adequate?
- Is the fan in the panel where the unit is stored rotating?
- Is the panel fixed on a flat and stable floor with little vibration?

6

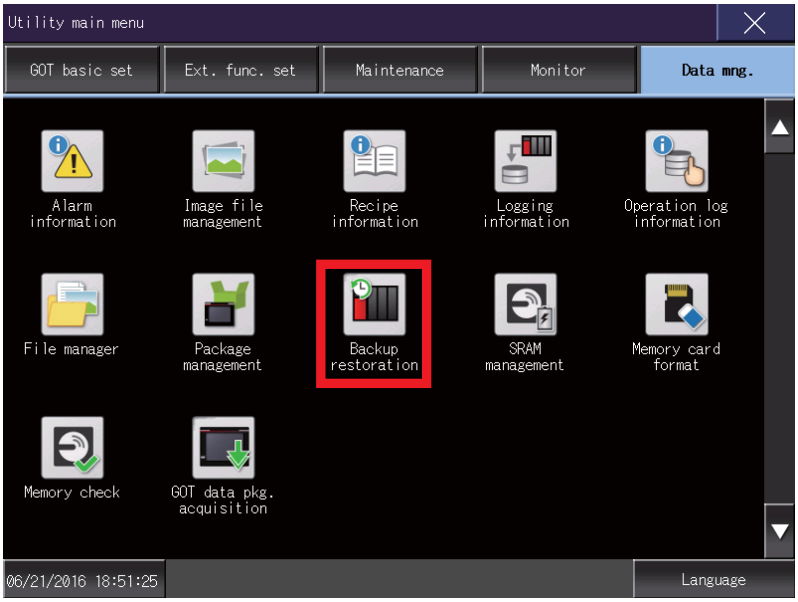
Replacing Each Unit

6.1 CNC CPU Module

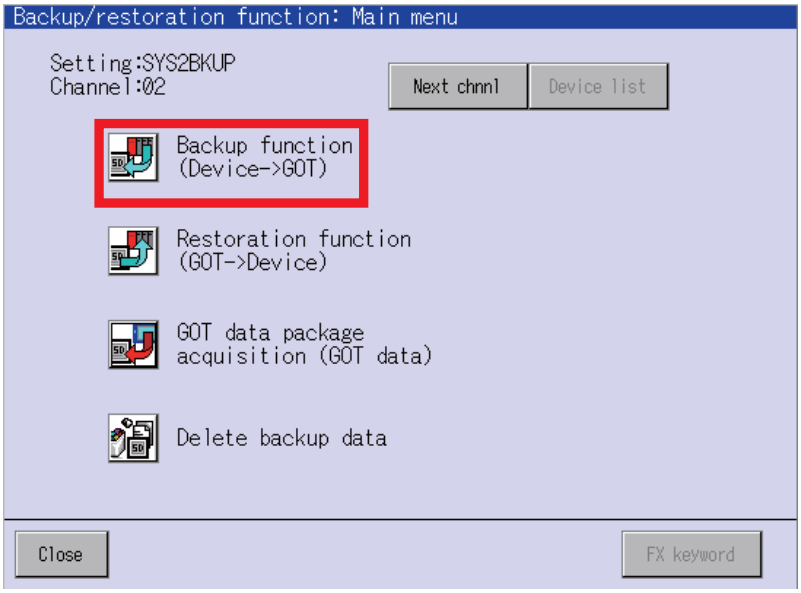
6.1.1 Procedure of Replacing the CPU Module Using the Backup/restoration Data

(1) Backup the memory data.

(a) Press [Data mng.] tab -  (Backup restoration) of GOT utility main menu screen.



(b) Press  (Backup function).

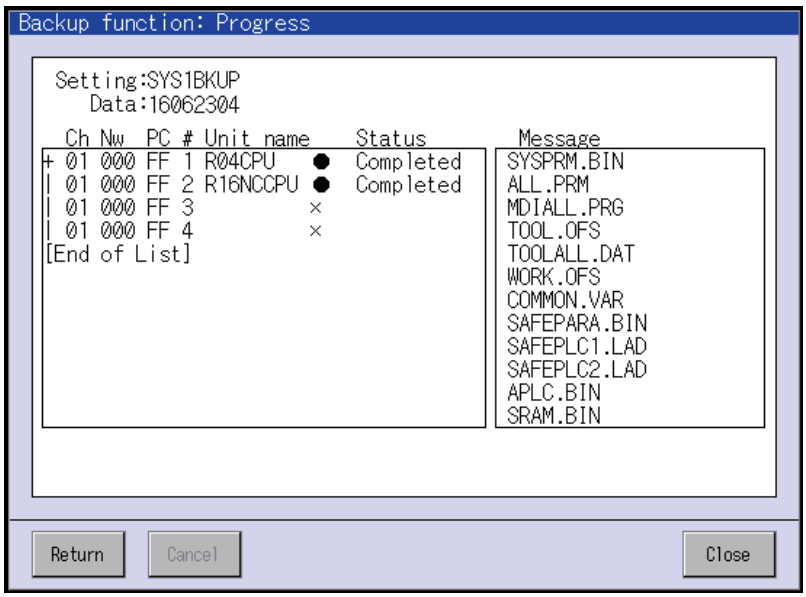


(c) When a dialog box to execute the backup is displayed, press [OK].

(d) The backup will start.

<Example>

PLC CPU/CNC CPU data has been backed up processing in the data name of "16062304".

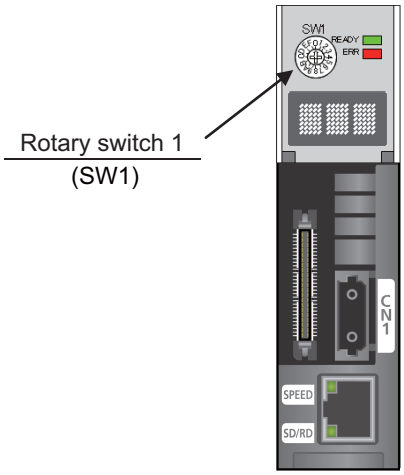


(e) The dialog box will be displayed when the backup is completed. Press [OK] to complete the process.

(2) Turn off the NC.

(3) Exchange the CNC CPU.

(4) Initialize the CNC CPU.



(a) With the power OFF, set SW1 to "7" and then turn the power ON.

(b) When the minus sign (-) appears on the right end of the dot matrix display, turn the power OFF.

(c) Set SW1 to "C" and then turn the power ON.

(d) When "y" is displayed on the right end of the dot matrix display, turn the power OFF.

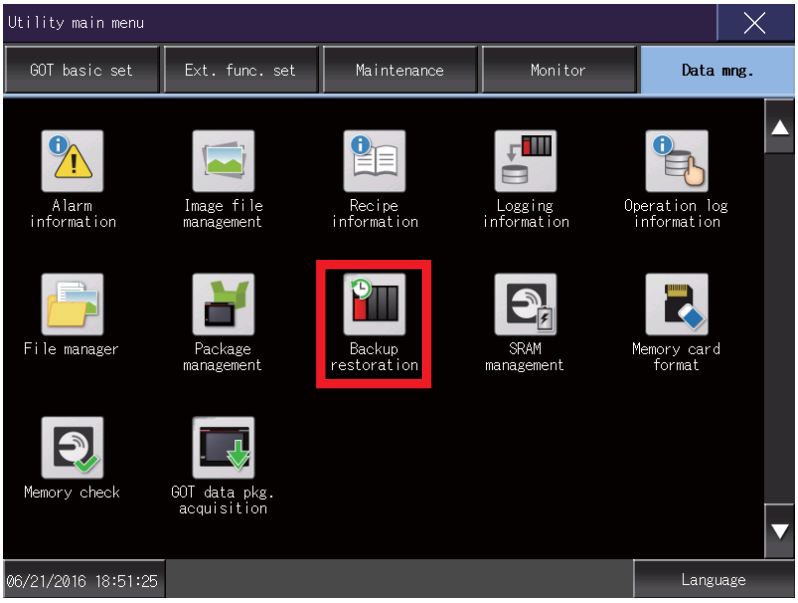
(e) Set SW1 to "0" and then turn the power ON.

<Note>

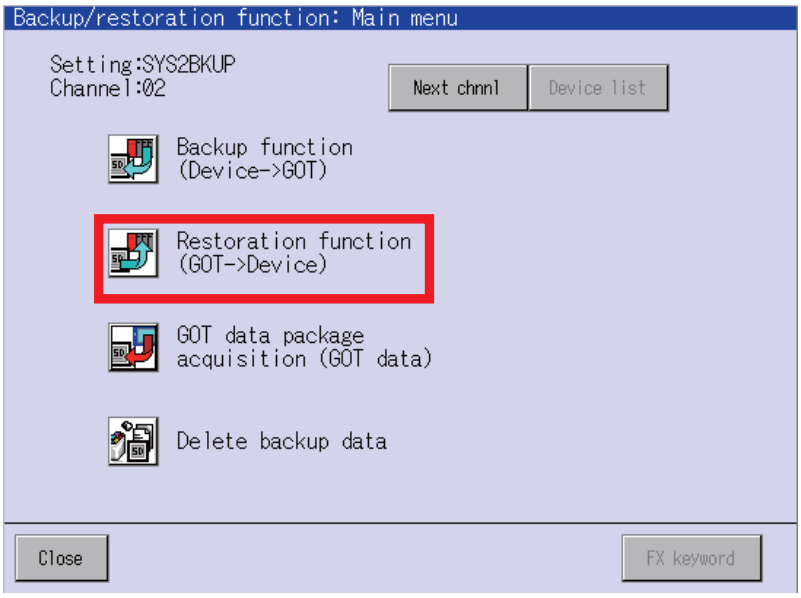
- After initialization, the IP address will be set to "192.168.200.1".
- The initial screen after the initialization is displayed in English.

(5) Restore the memory data

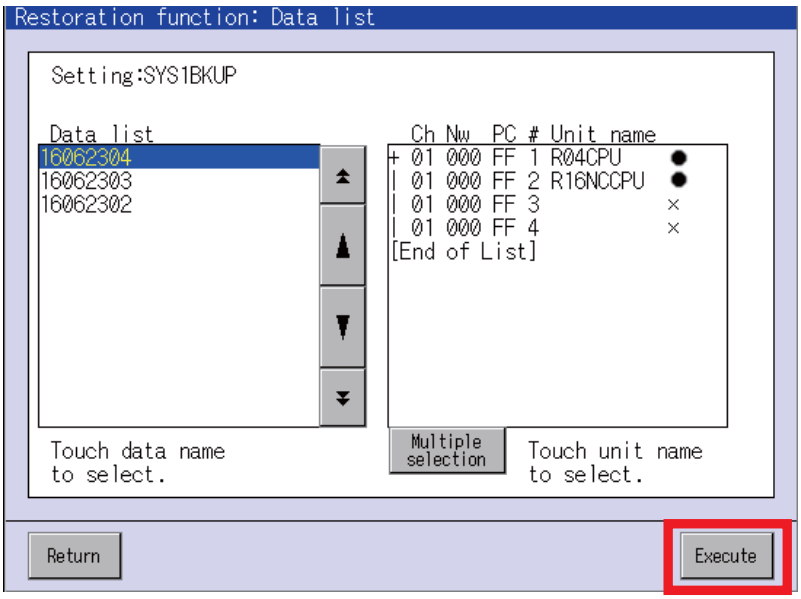
(a) Press [Data mng.] tab -  (Backup restoration) of GOT utility main menu screen.



(b) Press  (Restoration function).



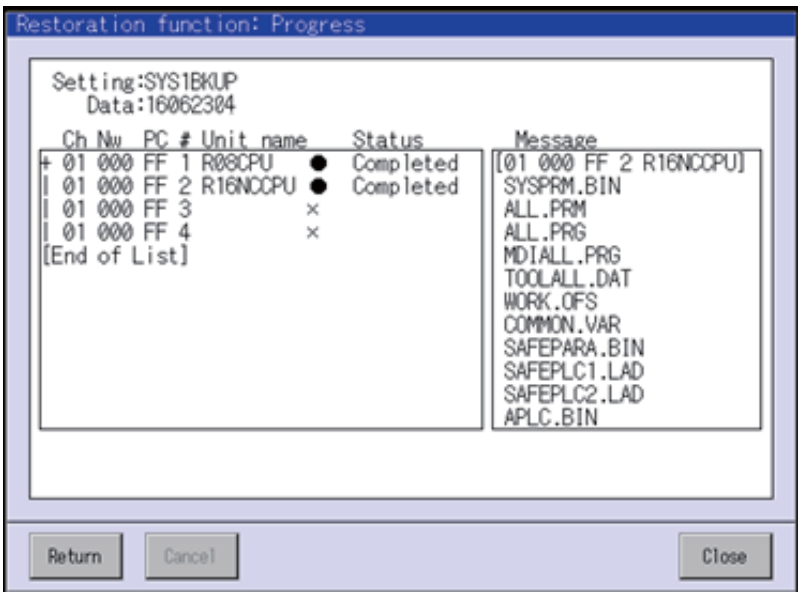
(c) Select the file data to be restored from the list and then click [Execute].



(d) When a dialog box to execute the restoration is displayed, press [OK].

(e) The restoration will start.

(f) The restored data will be displayed in the "Message".



(g) The dialog box will be displayed when the restoration is completed. Press [OK] to complete the process.

(6) Turn the NC OFF and ON.

6.2 GOT

When replacing the GOT, make sure to have the following related manuals at hand:

(a) GOT2000 Series User's Manual (Utility) (SH-081195)

(b) GOT2000 Series User's Manual (Hardware) (SH-081194)

Replacement procedures

(1) Before replacing the unit, use "GOT data package acquisition function" to save the backup data in an SD card or a USB memory.
For details, refer to "6.13 GOT Data Package Acquisition" in the manual (a).

(2) Turn OFF the GOT.

(3) Install the battery on the GOT.
For details, refer to "6.9 Installing the Battery" in the manual (b).

(4) Remove the GOT and then install the new GOT with the battery.
For details, refer to "6.7 Removing the GOT" and "6.6 Installing the GOT" in the manual (b).

(5) Connect the GOT and the CNC CPU module with the LAN cable.

(6) Mount the SD card or the USB memory on the GOT and then install the GOT data.
For details, refer to "7.3 BootOS and System Application Installation Using Data Storage" in the manual (a).

Note

(1) When starting from the memory card directly, the acquisition of the backup data in (1) is not required. Remove the SD card from the GOT, start the new GOT with the SD card and the replacement will be completed.

6.3 PLC CPU

When replacing the PLC CPU, make sure to have the following related manual at hand:

(a) MELSEC iQ-R CPU Module User's Manual (Startup) (SH-081263)

Replacement procedures

(1) Before replacing the unit, use backup/restoration function of GOT to save the backup data in an SD card or a USB memory.
For details, refer to "8 Appx.2: Data Backup and Restoration".

(2) Turn OFF the PLC CPU.

(3) Connect the battery to the PLC CPU and then mount the CPU on the base unit.
For details, refer to "4.2 Installing a Battery" in the manual (a).

(4) Turn ON the PLC CPU.

(5) Restore the backup data to the PLC CPU.
For details, refer to "8 Appx.2: Data Backup and Restoration".

(6) When the restoration is completed, restart the PLC CPU.

6.4 Drive Unit

Refer to the drive unit manual you are using.

6.5 Signal Splitter

When replacing the signal splitter, make sure to have the following related manuals at hand:

(a) C80 Series Connection and Setup Manual (IB-1501452)

Replacement procedures

Make sure to turn OFF the machine before replacing the signal splitter.

(1) Confirm that the machine power is OFF. (If the power is not OFF, turn it OFF.)

(2) Open the electric cabinet door.

(3) Disconnect all the cables from the signal splitter.

(4) Use a tool such as a flat-blade screwdriver to lower the rail hook of the signal splitter, and remove the signal splitter unit from the DIN rail.
For details, refer to "5.1.4 Installation and Removal the Signal Splitter" in the manual (a).

(5) Hook the upper latch of the unit on the DIN rail and then install a new signal splitter.

(6) Connect all the cables back to the new signal splitter.

(7) Confirm that all the cables are correctly connected before closing the electric cabinet door.

⚠ CAUTION

1. Incorrect connections could cause devices to damage. Connect the cables to designated connectors.

2. Do not replace the signal splitter while the power is ON.

3. Do not connect or disconnect the cables between units while the power is ON.

7

Appx.1: Types of Backup Data

7.1 Types of Backup Data

The table below lists the data to be backed up and the target range of the format, SRAM clear and the backup/restoration.

○: Targeted ×: Not targeted

Data contents	Data name	Backup	Restoration	Targeted for SRAM clear	Targeted for Format (*1)
System file	SYSPRM.BIN	○	○	×	×
Parameters	ALL.PRM	○	○	○	×
Machining program	ALL.PRG	○	○	○	○
	ALL2.PRG (*2)	○	○	×	○
MTB macro program	MACROALL.BIN	○	○	○	○
MDI program	MDIALL.PRG	○	○	○	○
Tool offset data	TOOL.OFS	○	×	○	×
Tool all data files	TOOLALL.DAT	○	○	○	×
Workpiece offset data	WORK.OFS	○	○	○	×
Common variable	COMMON.VAR	○	○	○	×
Safety parameters	SAFEPARA.BIN	○	○	○	×
Safety ladders	SAFEPLC1.LAD SAFEPLC2.LAD	○	○	×	×
APLC load module	APLC.BIN	○	○	×	×
System data	SRAM.BIN	○	×	○	×

(*1) The data is formated by the [Format] menu on the maintenance screen.

(*2) This file is valid when the specification of program memory capacity is 1000kB[2560m] or 2000kB[5120m].

7.2 Loss and Restoration of Absolute Position Data

Any of the followings may result in the loss of absolute position data.

- Changing a parameter related to absolute position
- Writing a parameter which was acquired when the zero point was in a different position
- SRAM clear of NC
- Failure in NC absolute position data
- Low battery or uninstallation of the battery of servo drive
- Disconnection of detector cable of servo drive

The absolute position data can be restored by backup/restoration function or SRAM data.

Restoration by backup/restoration function

(1) Execute "Restore" by backup/restoration function.
For details, refer to "8 Appx.2: Data Backup and Restoration".

(2) Turn the NC OFF and ON.

Note

(1) Restoration with the GOT's backup/restoration function restores the linear axis, but not the rotary axis. An initialization of the absolute position of the rotary axis must be performed.
The same restoration as the backup/restoration function can be performed by writing the parameter (ALL.PRM).

Status at restore	Absolute position established	Absolute position not established, SRAM clear
Linear axis	Status will not change. Absolute position internal data will be updated.	Absolute position will be established. Absolute position internal data will be updated.
Rotary axis	Status will not change. Absolute position internal data will not be updated.	

⚠ CAUTION

It is dangerous to restore the backup data of other machine when the absolute position is established because the zero point will be established with the absolute position of the linear axis rewritten, thus the zero point position is off the right position. Initialize the zero point again.

Restoration by SRAM data

(1) Select [Mainte] from the screen group at the top of the CNC monitor2 screen (GOT operation panel) and then select [Psswd input] from the menu.

(2) Enter the password for the machine parameter and then press [INPUT]. This enables the next modal output.

(3) Select [Diagn] from the screen group at the top of the CNC monitor2 screen (GOT operation panel).

(4) Select [I/F dia] from the menu.

(5) Select [Model output] from the menu and enter "Y709/1" in the input area to reset the data protection key 1.

(6) Select [Mainte] from the Screen group at the top of the CNC monitor2 screen (GOT operation panel).

(7) Press the return button on the menu to switch the menu display.

(8) Select [I/O] from the menu.

(9) Select [USB memory] for "A: Dev" and then select [Dir] from the menu.

(10) Select [From list] from the menu.

(11) Select "SRAM.BIN" displayed in the program list on the left.

(12) Press [INPUT] twice continuously.

(13) Select [Memory] for "B: Dev", select [Dir] from the menu and then enter "/DAT" in the input area.

(14) Select [Trnsfr A->B] from the menu and enter "Y" according to the displayed message.
When the message changed "Now, transferring data" to "Transfer completed", the restoration is completed.

(15) Turn the NC OFF and ON.

> ⚠ **CAUTION**
>
> **Restoration by SRAM data is available only if the rotary axis motor has not rotated in a same direction 30,000 times or more since the acquisition of the data. Otherwise, the zero point of the rotary axis will change by turning the power OFF and ON after writing the SRAM data, which will cause danger. Make sure the zero point is not off the right position. The use of this method should be limited to when necessary, such as when replacing an NC unit, and requires enough safety confirmation before executing.**

Note

(1) If "Z70 Abs posn error 0101" occurs, execute SRAM clear and data restoration or initialize the zero point.

Correspondence between absolute position data and parameters

Correspondence between absolute position data and I/O parameter #10000s is shown below.

#	Name	Details	Timing of Updating
10001	absfint	Absolute position setting completed I/O tempo	When the power is turned OFF and ON after changing a parameter related to absolute position detection.
10002	SV077	E0 The absolute position error saved when the basic position was set.	When the status changes to "Completed" during the initialization procedure.
10003	SV078	R0 The multi-rotation counter value of the detector saved when the basic point was set.	
10004	SV079	P0 The position in one rotation of the detector saved when the basic point was set.	
10005	SV080	P0 The position in one rotation of the detector saved when the basic point was set.	
10006	absg	The distance from the machine basic position to the first grid point (cunit unit).	
10007	abssum1	SV077 to SV080 Checksum (:absn abs1x absg)	
10008	abseor1	SV077 to SV080 EOR (:absn abs1x absg)	
10009	abssum2	Parameter checksum	
10010	abseor2	Parameter EOR	
10011	absbase	Zero point (micro) (cunit unit)	The value in the #2 "Zero point" of [Mainte] - [Absolute Position Setting] screen. Updated by screen input.

8

Appx.2: Data Backup and Restoration

Using the backup/restoration function of the GOT, the data of the NC memory can be backed up in the external device. Also, the data can be restored from the external device to the NC memory.
This section explains the procedures to backup/restore the data using the front-side USB drive of the GOT.

The target data for the backup/restoration are as follows:

○: Targeted ×: Not targeted

Data outline	File name	Backup	Restoration
System file	SYSPRM.BIN	○	○
Parameters	ALL.PRM	○	○
Machining program	ALL.PRG	○	○
	ALL2.PRG (*2)	○	○
MTB macro program	MACROALL.BIN	○	○
MDI program	MDIALL.PRG	○	○
Tool offset data	TOOL.OFS	○	×
Tool all data files	TOOLALL.DAT	○	○
Workpiece offset data	WORK.OFS	○	○
Common variable	COMMON.VAR	○	○
Safety parameters (*1)	SAFEPARA.BIN	○	○
Safety ladders (*1)	SAFEPLC1.LAD	○	○
	SAFEPLC2.LAD		
APLC load module	APLC.BIN	○	○
System data	SRAM.BIN	○	×

(*1) When the parameter "#1481 Enable S-safety" (Enable smart safety observation) is set to "1", and when restoring the safety parameters and the safety ladders, release the safety password with the parameter "#51013 SF_PSWD". If the safety password is not released, these files will not be restored (the restoration will be skipped). When the safety password of the CNC does not match that of the target file for the restoration, an error will occur during the restoration even though the safety password has been released.

(*2) This file is valid when the specification of program memory capacity is 1000kB[2560m] or 2000kB[5120m].

Note

(1) Make sure to complete the editing of the machining program or the data setting operation before performing the backup/restoration.

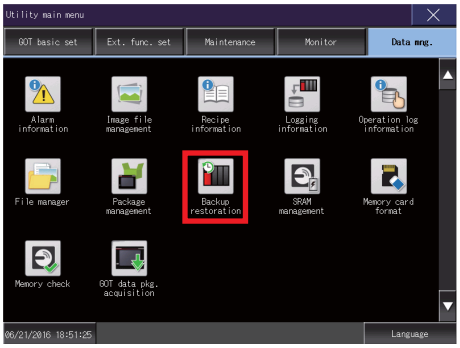
(2) When the parameter "#1391 User level protect" (Enable Data protection by user's level) is set to "1", release the protection before operating the backup/restoration.

Operation method for backup

(1) Insert a USB memory in the front-side USB drive of the GOT.

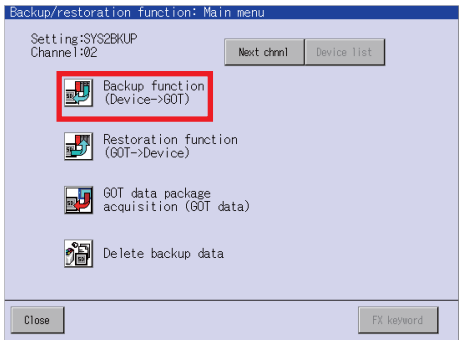
(2) Press the screen at the top left to open the utility screen.

(3) Press [Data mng.] tab - (Backup restoration).

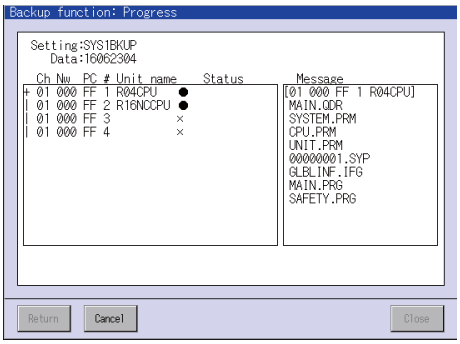


(4) Press (Backup function).

When the confirmation message appears, press [OK] to start the backup.



CPU modules are selected and displayed automatically. The backup files will be created. The file names will be displayed automatically.



(5) When the completion window appears, press [OK].

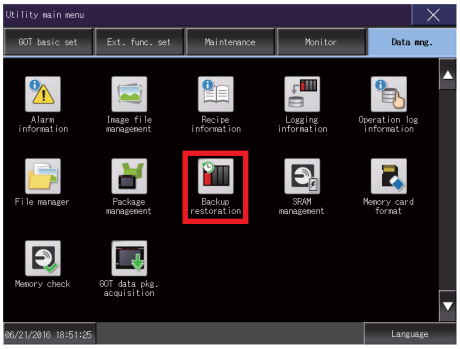
(6) Remove the USB memory from the front-side USB drive of the GOT.

Operation method for restoring

(1) Insert a USB memory with the backup data in the front-side USB drive of the GOT.

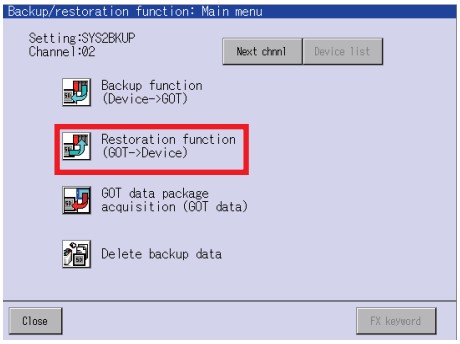
(2) Press the screen at the top left to open the utility screen.

(3) Press [Data mng.] tab -  (Backup restoration).



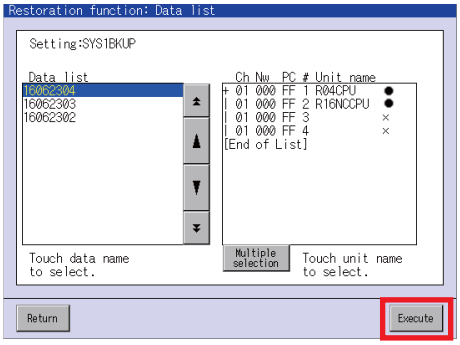
(4) Press  (Restoration function).

When the device selection screen appears, select the restoration target device.



(5) Select the data to restore and the device and then press [Execute].

When the confirmation message appears, press [OK] to start the restoration.



(6) When the completion window appears, press [OK].

(7) Remove the USB memory from the front-side USB drive of the GOT.

The files in the USB memory are displayed in "Data list".

<Note>

- Data name displayed in the "Date list" column indicates the date of backup and the number of backups.
  (Example) The data backed up on 2016/04/05 is displayed as follows.
  16040500 (1st backup)
  16040501 (2nd backup)

9

Appx.3: Outputting the Error Code

This function is to output the information of alarm which is occurring in the CNC CPU. The information is output in the form of 4-digit hexadecimal error code.

The uniform 4-digit codes express all the alarms.

The error codes are output to the PLC I/F. Thus they can be acquired through a sequence program.

The error codes are displayed on the dot matrix on the front panel of the CNC CPU module.

If you perform CNC CPU module diagnosis using "GX Works3", an engineering tool for PLC, these error codes can be displayed along with the details for those error codes.

9.1 PLC Interface

Signal name	Abbreviation	1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
Error code		R573	R773	R973	R1173	R1373	R1573	R1773

[Function]

This signal outputs the alarm occurring in NCCPU with a code in four hexadecimal digits.

[Operation]

Each part system has the R register that stores one set of error code.
The register in which no errors are stored is set to "0".
The error code which is common for part systems is stored in the 1st part system.

9.2 Classification of the Error Code

The error codes are classified as shown in the table below:

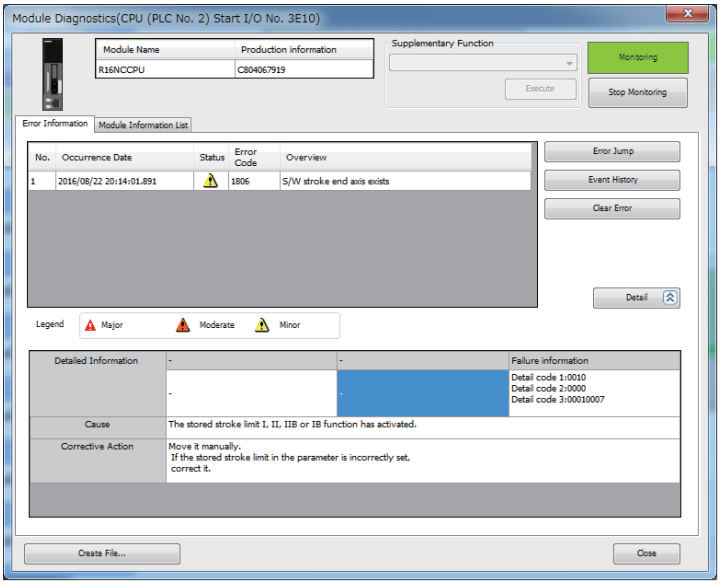
The major error stops the operations of all the CPUs including the CPU No.1.

The moderate error requires the setting which does not stop the operation. When setting the system parameters for the CPU No.1, go to [Multiple CPU Setting] - [Operation Mode Setting] and make sure to set the stop setting for CNC CPU as "Major: All Station Stop, Moderate: All Station Continue". If the setting is different, a "multi-CPU error" will occur.

Class	Range of the Error Code	Meaning of classification
Minor	1000 to 1FFF	A minor alarm except for the moderate/major alarms. Some servo alarms which can be canceled by the NC reset.
Moderate	2000 to 3BFF	Servo and other alarms which cause emergency stop and are canceled by the power OFF/ON.
Major	3C00 to 3FFF	An alarm which includes a severe cause such as H/W failure.

9.3 Method and Content of Diagnosis Using the Engineering Tool

Connect "GX Works3", an engineering tool, to the PLC CPU, and go to [Diagnostics] - [Module Diagnostics (CPU Diagnostics)] to start CNC CPU module diagnosis.



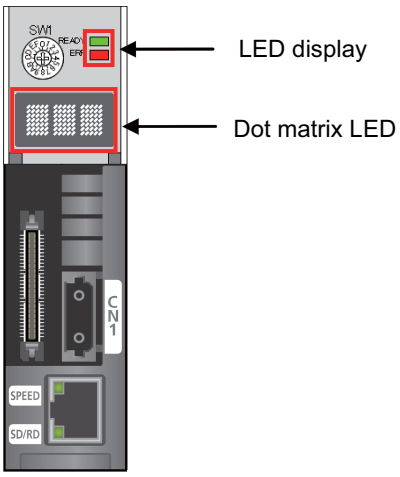
Up to 5 errors are displayed in the error information area.
The detailed information, cause and corrective actions for the selected error information are displayed.

The following information is displayed in the detailed information area according to each error code.

Types of alarm	Detailed information
Multi-CPU Error	
System alarm	
Absolute position alarm	
Servo alarm	Axis information
mcp alarm	Axis information and alarm detail type
Basic PLC alarm	
Program error	Sub No. for some errors
Operation error	Partially axis information
Safety observation alarm	
Safety observation warning	

9.4 Dot Matrix Display on the Front of the Module

The below shows the appearance of the CNC CPU module.



The dot matrix displays the state of battery alarm as priority as shown below.
When no alarm is occurring, the dot matrix displays the normal state (RUN).

Display of dot matrix	State
BT2	Low battery alarm
BT1	Low battery warning
RUN	Normal

When no battery alarm is occurring but some sort of alarm occurs, the display of the dot matrix changes from the normal to the alarm display.

In the state of alarm display, the alarm is displayed in the form of error code as specified in "9.4.1 The Specifications of String Displayed at the Time of Alarm Display".

The string is displayed shifting from right to left in the dot matrix.

Even if the alarm changes while displaying, the content will not be updated until the string is displayed to the end.

9.4.1 The Specifications of String Displayed at the Time of Alarm Display

(1) The string starts with "ALM".

(2) It displays the error codes from the 1st part system in order. The part system number is displayed at the beginning together with $ symbol.

(3) When multiple alarms occur in one part system, the error codes will be displayed in order of priority. Up to 5 error codes are displayed in one part system.

(4) The alarms which are common for all the part systems are displayed in the 1st part system. The alarms which are common for all the part systems will be displayed with a higher priority.

Display example

When the alarms 1C37 and 1266 are occurring in the 1st part system, and 3062 in the 2nd part system, the indication is as follows:

ALM	$1	1C37	1266	$2	3062

This message is displayed repeatedly.

9.5 LED Display on the Front of the Module

READY LED and ERROR LED are mounted on the front of the CNC CPU module.

The display is as follows:

To light ERROR LED upon occurrence of a minor error, set "1" in the parameter "#6471/bit0".

LED name		State of CNC CPU	Corrective actions
READY LED (green)	ERROR LED (red)		
■ Lit	□ Not lit	Normal	-
	■ Lit	Minor error	Confirm the error code with the engineering tool, etc. and perform the corrective actions corresponding to the error code.
	(□■) Flashing	Moderate error	
□ Not lit	(□■) Flashing	Major error	(1) Restart the said module (Power OFF/ ON or NC reset). (2) If the same phenomenon occurs even after restarting, replace the said module as it may have an H/W failure.
(□■) Slow flashing	□ Not lit	Initial	-

9.6 Error Code List

Error code	Details	
	Operation error (M01)	
1800	Dog overrun	0001
1801	Some ax does not pass Z phase	0002
1802	R-pnt direction illegal	0003
1803	External interlock axis exists	0004
1804	Internal interlock axis exists	0005
1805	H/W stroke end axis exists	0006
1806	S/W stroke end axis exists	0007
1807	Chuck/tailstock stroke end ax	0008
1808	Ref point return No. invalid	0009
180C	Illegal op in mid pt sg block	0013
1812	Sensor signal illegal ON	0019
1813	Ref point retract invalid	0020
1814	Tool ofs invld after R-pnt	0021
1817	R-pnt ret invld at abs pos alm	0024
1818	R-pnt ret invld at zero pt ini	0025
181B	High-accuracy skip disabled	0028
181C	Hi-ac skip coord retrieval err	0029
181D	Now skip on	0030
181E	No skip	0031
1820	Rtn dir err in manual measure	0033
1831	Chopping axis R-pnt incomplete	0050
1832	Synchronous error excessive	0051
1834	No spindle select signal	0053
1835	No spindle serial connection	0054
1836	Spindle fwd/rvs run para err	0055
1837	Tap pitch/thread number error	0056
1838	Wait for tap retract	0057
183B	Handle ratio too large	0060
1840	R-pos offset value illegal	0065
1841	R-pos scan distance exceeded	0066
1845	Illegal op in wk instl err cmp	0070
1864	No operation mode	0101
1865	Cutting override zero	0102
1866	External feed rate zero	0103
1867	F1-digit feed rate zero	0104
1868	Spindle stop	0105
1869	Handle feed ax No. illegal	0106
186A	Spindle rotation speed over	0107
186B	Fixed pnt mode feed ax illegal	0108
186C	Block start interlock	0109
186D	Cutting block start interlock	0110
186E	Restart switch ON	0111
186F	Program check mode	0112
1870	Auto start in buffer correct	0113
1872	In reset process	0115
1874	Playback not possible	0117
1875	Turn stop in normal line cntrl	0118

Error code	Details	
1876	Reverse run impossible	0119
1877	In synchronous correction mode	0120
1878	No synchronous control option	0121
187A	Computer link B not possible	0123
187B	X/Z axes simultaneous prohibit	0124
187D	Program restart machine lock	0126
187E	Rot axis parameter error	0127
187F	Restart pos return incomplete	0128
1880	PLC interruption impossible	0129
1881	Restart posn return disabled	0130
1884	Excessive no. of reverse block	0133
1885	Illegal mode in prg check mode	0134
1886	Too many active axes per sys	0135
1887	Pre-intrpl variable accel err	0136
1888	Unable to start automatic mode	0137
1889	Tool data sorting in progress	0138
188A	Tolerance control invalid	0139
1895	Chopping override zero	0150
1896	Command axis chopping axis	0151
1898	Bottom dead center pos. zero	0153
1899	Chopping disable for handle ax	0154
189C	Dir cmnd mode invalid	0157
189D	Dir cmnd mode restart invalid	0158
189F	No speed set out of soft limit	0160
18A0	Aux ax R-pnt ret incomplete	0161
18A1	Aux abs position initializing	0162
18A2	Aux ax abs position error	0163
18A3	Aux ax arbitrary positioning	0164
18A4	Aux uneven index sta No. ilgl	0165
18A5	Aux axis changeover error	0166
18A9	Ill. op during T tip control	0170
18B8	Illegal OP in tilted face cut	0185
18C7	Interference check disabled	0200
18C8	Machine interference 1	0201
18C9	Machine interference 2	0202
18D2	Too many simul. control axes	0211
18E5	Multi ax for 3D manual feed	0230
18E6	3D manual feed coord sys err	0231
18E7	Illegal op in 3D tool R comp	0232
18F9	Machining surface op disabled	0250
18FA	Axs travel n/a in manual index	0251
18FB	Tool length compensation amt 0	0252
18FC	Feat coord ill w/ multi-handle	0253
1903	No spec: Spatial error comp	0260
1904	Spatial error comp excessive	0261
190D	Auto backlash adjust illegal	0270
190E	Operating auto backlash adjust	0271
1917	APLC password mismatch	0280
1921	High-cycle sampling disabled	0290
1922	N/A during high-cycle sampling	0291

Error code	Details	
1960	Illegal command in superimpose	1003
1961	Superimpose command illegal	1004
1962	G114.n command illegal	1005
1964	Spindle in-use by synchro tap	1007
196B	GB spindle synchro signal OFF	1014
196C	GB SP sync: Spindle type error	1015
1972	GB SP sync: Phase mem sgnl ilgl	1021
1973	GB SP sync: Phase set sgnl ilgl	1022
1974	GB SP sync: Z phase not pass	1023
1976	Other cmnd disabled in orient.	1025
1977	SP-C ax ctrl runs independntly	1026
197B	Synchronization mismatch	1030
197C	Multiple C axes select invalid	1031
197D	Tap retract Sp select illegal	1032
197E	Sp-Sp polygon cut interlock	1033
197F	Mixed sync ctrl prmtr illegal	1034
1980	Mixed sync ctrl disable modal	1035
1981	Synchro ctrl setting disable	1036
1982	Synchro start/cancel disable	1037
1983	Move cmnd invld to synchro ax	1038
1988	No spindle speed clamp	1043
1989	Cont ax superimpos II prm illg	1044
198A	Sync error btwn part systems	1045
19C2	Arbitrary axis unexchangeable	1101
19C3	Cross control axis exists	1102
19C4	Arbitrary ax superimp. sys err	1103
19C7	Sp synchro phase calc illegal	1106
19C9	Illegal cmd in SP oscillation	1108
19CA	SP oscillation cmd illegal	1109
19CB	SP oscillation set val illegal	1110
19CC	Sub part system I call error	1111
19CD	Sub part system II start error	1112
19CE	Constant surface speed rdndnt	1113
19CF	Constant torque disabled	1114
19D0	P torque stopper disabled	1115
19D1	Droop cancel disabled	1116
19D2	Cmnd disabled in droop cancel	1117
19E0	Differential tap cmnd disabled	1131
19E1	Spd clamp in differential tap	1132
19E2	Constant surface spd disabled	1133
19E4	Spindle sync cancel error	1135
19E6	GB SP sync: Cancel sgnl illegal	1137
19E7	GB SP sync runs independently	1138
1A0A	Prog check: work posn error	1215
1A0B	Prog check: machine posn error	1216
1A2C	Aux ax dog overrun	0001
1A2D	Aux ax R-pnt direction illegal	0003
1A2E	Aux ax external interlock	0004
1A2F	Aux ax internal interlock	0005
1A30	Aux ax soft limit	0007

Error code	Details	
1A31	Aux ax R ret invld at abs alm	0024
1A32	Aux ax R ret invld at ini	0025
	Abs data error (Z70)	
1A4A	Abs posn base set incomplete	0001
1A4B	Absolute position data lost	0002
1A4C	Abs posn param changed	0003
1A4D	Abs posn initial set illegal	0004
1A4E	Abs posn param restored	0005
1A50	Abs posn error (servo alm 25)	0101
1A55	Abs posn error (servo alm E3)	0106
	Abs encoder failure (Z71)	
1A5A	AbsEncoder: Abs/inc posn diffr	0006
	Position check error (Z72)	
1A5C	Position check error	
	Absolute position data warning (Z73)	
1A5D	Absolute position data warning	
	3D Machine interference error (Z82)	
1A64	No machine model	0001
1A65	Machine model error	0002
1A66	Interference check load excess	0003
1A67	Interference check error	0004
	OP panel I/O error (Z85)	
1A6A	OP panel I/O not connected	0001
1A6B	No display conn. to panel I/O	0002
1A6C	Power ON sequence error	0003
1A6D	Power OFF sequence error	0004
1A6E	Display unit shutoff timeout	0005
	Servo alarm (S01/S02/S04)	
1A81	Motor overheat	0046
1A87	Current err mag pole estim	004C
1A89	NC command mode error	004E
1A8A	Instantaneous power interrupt	004F
1A8B	Overload 1	0050
1A8C	Overload 2	0051
1A8D	Excessive error 1	0052
1A8E	Excessive error 2	0053
1A8F	Excessive error 3	0054
1A90	External emergency stop error	0055
1A93	Collision detection 1: G0	0058
1A94	Collision detection 1: G1	0059
1A95	Collision detection 2	005A
1A97	Orientation feedback error	005C
1A9A	External contactor error	005F
1AAC	Pw sply: Instant pwr interrupt	0071
1AAE	Pw sply: Over regeneration	0073
1AAF	Pw sply: Option unit error	0074
1AB0	Pw sply: Overvoltage	0075
1AC2	Drive unit communication error	0087
1AC3	Watchdog	0088
1AC5	Drivers commu data error 1	008A

Error code	Details	
1AC6	Drivers commu data error 2	008B
1ACE	Init abs pos fluctuation	0093
1AD1	Scale feedback error	0096
1AD9	Abs pos dtc: Rev count error	009E
1ADA	Battery voltage drop	009F
1ADE	In initial setup of ABS posn.	00A3
1AE1	Fan stop warning	00A6
1AE3	Turret indexing warning	00A8
1AE4	Orientation feedback warning	00A9
1B1B	Over regeneration warning	00E0
1B1C	Overload warning	00E1
1B1D	Cont high-speed rev warning	00E2
1B1E	Abs pos counter warning	00E3
1B1F	Set parameter warning	00E4
1B21	Control axis detach warning	00E6
1B22	In NC emergency stop state	00E7
1B23	Pw sply: Ov supplmnt regen frq	00E8
1B24	Instant pwr interrupt warning	00E9
1B25	In external EMG stop state	00EA
1B26	Pw sply: Over regenerat warn	00EB
1B29	Pw sply: Fan stop warning	00EE
1B2A	Pw sply: Option unit warning	00EF
	Emergency stop (EMG)	
1B40	STOP	
1B41	XTEN	
1B42	WAIT	
1B43	LINK	
1B44	EXIN	
1B45	CVIN	
1B46	PLC	
1B48	MCT	
1B4B	LAD	
1B4C	PC_H	
1B4D	PARA	
1B4E	SPIN	
1B4F	SRV	
	Safety observation warning (Y21)	
1B64	Speed obsv signal: Speed over	0001
	Parameter error (Y51)	
1B66	Parameter G0tL illegal	0001
1B67	Parameter G1tL illegal	0002
1B68	Parameter G0t1 illegal	0003
1B69	Parameter G1t1 illegal	0004
1B6E	Parameter grid space illegal	0009
1B71	Parameter stapt1-4 illegal	0012
1B74	Parameter skip_tL illegal	0015
1B75	Parameter skip_t1 illegal	0016
1B76	Parameter G0bdcc illegal	0017
1B77	OMR-II parameter error	0018
1B78	PLC indexing stroke length err	0019

Error code	Details	
1B79	Hi-acc time const unextendable	0020
1B7B	Superimpos linear G0 error	0022
1B7C	Superimpos linear G1 error	0023
1B81	Primary delay G0time const err	0028
1B82	Primary delay G1time const err	0029
1B83	Jerk filter time constant err	0030
1B84	Unable to alloc. hi-acc buffer	0031
1B85	Too many hi-speed/accu systems	0032
1B86	Parameter G0tL_2 illegal	0033
1B87	Parameter G0t1_2 illegal	0034
1B88	3ax line accel G0time const er	0035
1B89	3ax line accel G1time const er	0036
1B8A	3ax prim delay G0time const er	0037
1B8B	3ax prim delay G1time const er	0038
1B8C	Machine group No. discrepancy	0039
1B8D	M-group alarm stop disabled	0040
1B97	Values of PC1/PC2 too large	0101
	Smart safety observation warning (V50)	
1BB0	SSM hysteresis setting error	0001
1BB1	Safe absol. posn unestablished	0002
	Smart safety observation warning (V51)	
1BC0	SBT start disabled	0001
1BC1	SBT warning 1	0002
1BC4	SBT warning 4	0005
1BC5	SBT warning 5	0006
1BC6	SBT warning 6	0007
	Smart safety observation warning (V52)	
1BD0	PLC safety stop is active	0001
	Smart safety observation warning (V53)	
1BE0	Warning on 24Hr continuous ON	0001
	Smart safety observation warning (V54)	
1BF0	Simple test mode is active	0001
	Program error (P)	
1C0A	P10 No. of simultaneous axes over	
1C0B	P11 Illegal axis address	
1C14	P20 Division error	
1C1D	P29 Not accept command	
1C1E	P30 Parity H error	
1C1F	P31 Parity V error	
1C20	P32 Illegal address	
1C21	P33 Format error	
1C22	P34 Illegal G code	
1C23	P35 Setting value range over	
1C24	P36 Program end error	
1C25	P37 O, N number zero	
1C26	P38 No spec: Add. Op block skip	
1C27	P39 No specifications	
1C28	P40 Pre-read block error	
1C2D	P45 G code combination error	
1C30	P48 Restart pos return incomplete	

Error code	Details	
1C31	P49 Invalid restart search	
1C32	P50 No spec: Inch/Metric change	
1C3C	P60 Compensation length over	
1C3D	P61 No spec: Unidirectional posit.	
1C3E	P62 No F command	
1C41	P65 No spec: High speed mode 3	
1C43	P67 F value is exceeding the limit	
1C46	P70 Arc end point deviation large	
1C47	P71 Arc center error	
1C48	P72 No spec: Helical cutting	
1C49	P73 No spec: Spiral cutting	
1C4A	P74 Can't calculate 3DIM arc	
1C4B	P75 3DIM arc illegal	
1C4C	P76 No spec: 3DIM arc interpolat	
1C5A	P90 No spec: Thread cutting	
1C5D	P93 Illegal pitch value	
1C64	P100 No spec: Cylindric interpolat	
1C6E	P110 Plane select during figure rot	
1C6F	P111 Plane selected while coord rot	
1C70	P112 Plane selected while R compen	
1C71	P113 Illegal plane select	
1C78	P120 No spec: Feed per rotation	
1C79	P121 F0 command during arc modal	
1C7A	P122 No spec: Auto corner override	
1C7B	P123 No spec: High-accuracy control	
1C7C	P124 No spec: Inverse time feed	
1C7D	P125 G93 mode error	
1C7E	P126 Invalid cmnd in high-accuracy	
1C7F	P127 No spec: SSS Control	
1C80	P128 Machin condtn select I disable	
1C81	P129 Hi-speed Hi-accuracy both ON	
1C82	P130 2nd M function code illegal	
1C83	P131 No spec: Cnst surface ctrl G96	
1C84	P132 Spindle rotation speed S=0	
1C85	P133 Illegal P-No. G96	
1C86	P134 G96 Clamp Err.	
1C8C	P140 No spec: Pos compen cmd	
1C8D	P141 Pos compen during rotation	
1C8E	P142 Pos compen invalid arc	
1C96	P150 No spec: Nose R compensation	
1C97	P151 Radius compen during arc mode	
1C98	P152 No intersection	
1C99	P153 Compensation interference	
1C9A	P154 No spec: 3D compensation	
1C9B	P155 Fixed cyc exec during compen	
1C9C	P156 R compen direction not defined	
1C9D	P157 R compen direction changed	
1C9E	P158 Illegal tip point	
1CA1	P161 No spec: 3D tool R comp	
1CA2	P162 Disable Cmd in 3D tool R comp	

Error code	Details	
1CA3	P163 3D tool R comp is disabled	
1CAA	P170 No offset number	
1CAB	P171 No spec: Comp input by prog G10	
1CAC	P172 G10 L number error	
1CAD	P173 G10 P number error	
1CAE	P174 No spec: Comp input by prog G11	
1CB1	P177 Tool life count active	
1CB2	P178 Tool life data entry over	
1CB3	P179 Illegal group No.	
1CB4	P180 No spec: Drilling cycle	
1CB5	P181 No spindle command (Tap cycle)	
1CB6	P182 Synchronous tap error	
1CB7	P183 No pitch/thread number	
1CB8	P184 Pitch/thread number error	
1CB9	P185 No spec: Sync tapping cycle	
1CBA	P186 Illegal S cmnd in synchro tap	
1CBE	P190 No spec: Turning cycle	
1CBF	P191 Taper length error	
1CC0	P192 Chamfering error	
1CC8	P200 No spec: MRC cycle	
1CC9	P201 Program error (MRC)	
1CCA	P202 Block over (MRC)	
1CCB	P203 D cmnd figure error (MRC)	
1CCC	P204 E cmnd fixed cycle error	
1CD2	P210 No spec: Pattern cycle	
1CDC	P220 No spec: Special fixed cycle	
1CDD	P221 No. of special fixed holes = 0	
1CDE	P222 G36 angle error	
1CDF	P223 G12/G13 radius error	
1CE0	P224 No spec: Circular (G12/G13)	
1CE6	P230 Subprogram nesting over	
1CE7	P231 No sequence No.	
1CE8	P232 No program No.	
1CEB	P235 Program editing	
1CF0	P240 No spec: Variable commands	
1CF1	P241 No variable No.	
1CF2	P242 = not defined at vrble set	
1CF3	P243 Can't use variables	
1CF4	P244 Invalid set date or time	
1CF5	P245 Tool No. error	
1CFA	P250 No spec: Figure rotation	
1CFB	P251 Figure rotation overlapped	
1CFC	P252 Coord rotate in fig. rotation	
1D04	P260 No spec: Coordinates rotation	
1D05	P261 G code illegal (Coord rot)	
1D06	P262 Illegal modal (Coord rot)	
1D0E	P270 No spec: User macro	
1D0F	P271 No spec: Macro interrupt	
1D10	P272 NC and macro texts in a block	
1D11	P273 Macro call nesting over	

Error code	Details	
1D13	P275 Macro argument over	
1D14	P276 Illegal G67 command	
1D15	P277 Macro alarm message	
1D18	P280 Brackets [,] nesting over	
1D19	P281 Brackets [,] not paired	
1D1A	P282 Calculation impossible	
1D1B	P283 Divided by zero	
1D22	P290 IF sentence error	
1D23	P291 WHILE sentence error	
1D24	P292 SETVN sentence error	
1D25	P293 DO-END nesting over	
1D26	P294 DO and END not paired	
1D27	P295 WHILE/GOTO in tape	
1D28	P296 No address (macro)	
1D29	P297 Address-A error	
1D2A	P298 G200-G202 cmnd in tape	
1D2C	P300 Variable name illegal	
1D2D	P301 Variable name duplicated	
1D36	P310 Not use GMSTB macro code	
1D5E	P350 No spec: Scaling command	
1D68	P360 No spec: Program mirror	
1D72	P370 No spec: Facing t-post MR	
1D73	P371 Facing t-post MR illegal	
1D7C	P380 No spec: Corner R/C	
1D7D	P381 No spec: Arc R/C	
1D7E	P382 No corner movement	
1D7F	P383 Corner movement short	
1D80	P384 Corner next movement short	
1D81	P385 Corner during G00/G33	
1D86	P390 No spec: Geometric	
1D87	P391 No spec: Geometric arc	
1D88	P392 Angle < 1 degree (GEOMT)	
1D89	P393 Inc value in 2nd block (GEOMT)	
1D8A	P394 No linear move command (GEOMT)	
1D8B	P395 Illegal address (GEOMT)	
1D8C	P396 Plane selected in GEOMT ctrl	
1D8D	P397 Arc error (GEOMT)	
1D8E	P398 No spec: Geometric1B	
1D9B	P411 Illegal modal G111	
1DA4	P420 No spec: Para input by program	
1DA5	P421 Parameter input error	
1DA6	P422 Tool/Work shape input error	
1DAE	P430 R-pnt return incomplete	
1DAF	P431 No spec: 2,3,4th R-point ret	
1DB0	P432 No spec: Start position return	
1DB1	P433 No spec: R-position check	
1DB2	P434 Compare error	
1DB3	P435 G27 and M commands in a block	
1DB4	P436 G29 and M commands in a block	
1DB6	P438 G52 invalid during G54.1	

Error code	Details	
1DC2	P450 No spec: Chuck barrier	
1DC3	P451 No spec: Stroke chk bef travel	
1DC4	P452 Limit before travel exists	
1DCC	P460 Tape I/O error	
1DCD	P461 File I/O error	
1DCE	P462 Computer link commu error	
1DE0	P480 No spec: Milling	
1DE1	P481 Illegal G code (mill)	
1DE2	P482 Illegal axis (mill)	
1DE4	P484 R-pnt ret incomplete (mill)	
1DE5	P485 Illegal modal (mill)	
1DE6	P486 Milling error	
1DF5	P501 Cross (G110) impossible	
1DF7	P503 Illegal G110 axis	
1DFF	P511 Synchronization M code error	
1E08	P520 Illegal axis for superimpose	
1E09	P521 Illegal synchronization axis	
1E20	P544 No spec: Wk instl err cmp	
1E21	P545 Invld cmd in wk instl err cmp	
1E22	P546 Wk instl err cmp cmd invalid	
1E23	P547 Illegal wk instl err cmp cmd	
1E26	P550 No spec: G06.2 (NURBS)	
1E27	P551 G06.2 knot error	
1E28	P552 Start point of 1st G06.2 err	
1E29	P553 G06.2 knot duplicated	
1E2A	P554 Invld manual interrupt in G6.2	
1E30	P560 Fairing changeover disabled	
1E58	P600 No spec: Auto TLM	
1E59	P601 No spec: Skip	
1E5A	P602 No spec: Multi skip	
1E5B	P603 Skip speed 0	
1E5C	P604 TLM illegal axis	
1E5D	P605 H & TLM command in a block	
1E5E	P606 H cmnd not found before TLM	
1E5F	P607 TLM illegal signal	
1E60	P608 Skip during radius compen	
1E62	P610 Illegal parameter	
1E63	P611 No spec: Exponential function	
1E64	P612 Exponential function error	
1E8A	P650 Sub sys identification # error	
1E8B	P651 Other G code in sub sys block	
1E8C	P652 Illegal mode (sub part system)	
1E8D	P653 Illegal G code (sub part sys)	
1E90	P656 Illegal PLC device	
1E91	P657 PLC Device too much	
1EBC	P700 Illegal command value	
1F84	P900 No spec: Normal line control	
1F85	P901 Normal line control axis G92	
1F86	P902 Normal line control axis error	
1F87	P903 Plane chg in Normal line ctrl	

Error code	Details	
1F98	P920 No spec: 3D coord conv	
1F99	P921 Illegal G code at 3D coord	
1F9A	P922 Illegal mode at 3D coord	
1F9B	P923 Illegal addr in 3D coord blk	
1FA2	P930 No spec: Tool axis compen	
1FA3	P931 Executing tool axis compen	
1FA4	P932 Rot axis parameter error	
1FAC	P940 No spec: Tool tip control	
1FAD	P941 Invalid T tip control command	
1FAE	P942 Invalid cmnd during T tip ctrl	
1FAF	P943 Tool posture command illegal	
1FB6	P950 No spec: Tilt face machining	
1FB7	P951 Ill cmd in tilt face machining	
1FB8	P952 Inclined face cut prohibited	
1FB9	P953 Tool axis dir cntrl prohibited	
1FBA	P954 Inclined face command error	
1FBB	P955 Inclined face coord illegal	
1FBC	P956 G68.2P10 surface not defined	
1FBD	P957 Tool axis dir ctrl cmp amt 0	
1FC0	P960 No spec: Direct command mode	
1FC1	P961 Invalid during dir cmnd mode	
1FC2	P962 Dir cmnd mode cmnd invalid	
1FC3	P963 Illegal direct cmnd mode cmnd	
3000	P990 PREPRO error	
	Abs encoder failure (Z71)	
3020	AbsEncoder: Backup voltage drop	0001
3022	AbsEncoder: Commu error	0003
3023	AbsEncoder: Abs data changed	0004
3024	AbsEncoder: Serial data error	0005
3026	AbsEncoder: Initial commu err	0007
	Servo alarm (S01/S02/S04)	
3040	Insufficient voltage	0010
3041	Axis selection error	0011
3042	Memory error 1	0012
3043	Software processing error 1	0013
3044	Software processing error 2	0014
3045	Memory error 2	0015
3046	Init mag pole pos detect err	0016
3047	A/D converter error	0017
3048	Motor side dtc: Init commu err	0018
3049	Detector commu err in syn cont	0019
304A	Machine side dtc: Init comu er	001A
304B	Machine side dtc: Error 1	001B
304C	Machine side dtc: Error 2	001C
304D	Machine side dtc: Error 3	001D
304E	Machine side dtc: Error 4	001E
304F	Machine side dtc: Commu error	001F
3050	Motor side dtc: No signal	0020
3051	Machine side dtc: No signal	0021

Error code	Details	
3053	Excessive speed error	0023
3054	Grounding	0024
3055	Absolute position data lost	0025
3056	Unused axis error	0026
3057	Machine side dtc: Error 5	0027
3058	Machine side dtc: Error 6	0028
3059	Machine side dtc: Error 7	0029
305A	Machine side dtc: Error 8	002A
305B	Motor side dtc: Error 1	002B
305C	Motor side dtc: Error 2	002C
305D	Motor side dtc: Error 3	002D
305E	Motor side dtc: Error 4	002E
305F	Motor side dtc: Commu error	002F
3060	Over regeneration	0030
3061	Overspeed	0031
3062	Power module overcurrent	0032
3063	Overvoltage	0033
3064	NC-DRV commu: CRC error	0034
3065	NC command error	0035
3066	NC-DRV commu: Commu error	0036
3067	Initial parameter error	0037
3068	NC-DRV commu: Protocol error 1	0038
3069	NC-DRV commu: Protocol error 2	0039
306A	Overcurrent	003A
306B	Power module overheat	003B
306C	Regeneration circuit error	003C
306D	Pw sply volt err acc/dec	003D
306E	Magnet pole pos detect err	003E
3070	Detector select unit swtch err	0040
3071	Feedback error 3	0041
3072	Feedback error 1	0042
3073	Feedback error 2	0043
3074	Inappropriate coil for C axis	0044
3075	Fan stop	0045
3077	Regenerative resistor overheat	0047
3078	Motor side dtc: Error 5	0048
3079	Motor side dtc: Error 6	0049
307A	Motor side dtc: Error 7	004A
307B	Motor side dtc: Error 8	004B
308B	Sfty obsrvation: Cmd spd err	005B
308D	Sfty obsrvation: Door stat err	005D
308E	Sfty obsrvation: FB speed err	005E
3090	Pw sply: Inst pw interpt (DC24V)	0060
3091	Pw sply: Pwr module overcurnt	0061
3092	Pw sply: Frequency error	0062
3093	Pw sply: Supplement regen err	0063
3095	Pw sply: Rush relay error	0065
3096	Pw sply: Process error	0066
3097	Pw sply: Phase interruption	0067
3098	Pw sply: Watchdog	0068

Error code	Details	
3099	Pw sply: Grounding	0069
309A	Pw sply: Ext contactor weld	006A
309B	Pw sply: Rush circuit error	006B
309C	Pw sply: Main circuit error	006C
309D	Pw sply: Parameter error	006D
309E	Pw sply: H/W error	006E
309F	Power supply error	006F
30A0	Pw sply: Ext EMG stop set err	0070
30A2	Pw sply: Fan stop	0072
30A6	Pw sply: Function setting err	0076
30A7	Pw sply: Power module overhea	0077
30AF	Drv unit pw supply restart req	007F
30B0	Motor side dtc: cable err	0080
30B1	Machine side dtc: cable err	0081
30B7	Drive unit communication error	0087
30B8	Watchdog	0088
30BA	Drivers commu data error 1	008A
30BB	Drivers commu data error 2	008B
30C7	Scale offset error	0097
30CB	Detec cnv: Mag pole shift warn	009B
	System alarm (Y02)	
3100	System alm: Process time over	0050
3101	SV commu er: CRC error 1	0051
	Smart safety observation error (V01)	
3200	Safety watchdog error	0001
3201	Cross-check error	0002
3202	Safe sys internal process err	0003
3203	Safe para storage memory err 1	0004
3204	Safe para storage memory err 2	0005
3205	Safety initial process timeout	0006
3206	NC-DRV initial safe comm error	0007
3207	Safe IO init. process timeout	0008
	Smart safety observation error (V02)	
3210	Encoder error	0001
3213	NC-DRV safe communication err	0004
3214	Excess movement during pwr OFF	0005
	Smart safety observation error (V03)	
3220	Slave station comm. error 1	0001
3221	Slave station comm. error 2	0002
3222	Slave station comm. error 3	0003
3223	Slave station data compare err	0004
3224	Output OFF check error	0005
3225	Output signal cross-check err	0006
3226	Transmission cross-check error	0007
3227	Reception cross-check error	0008
3228	Host station comm. error 1	0009
3229	Host station comm. error 2	0010
322A	Host station comm. error 3	0011
322B	Drv safe receive crosscheck er	0012
322C	User safety sequence 1 error	0013

Error code	Details	
322D	User safety sequence 2 error	0014
322E	Output sig. cross check error	0015
	Smart safety observation error (V04)	
3230	Safety observation & Smart both ON	0001
3231	Safety IO device unconnectable	0002
3232	Safe IO disabled: connect err	0003
3233	Safe IO disabled: no safe I/Os	0004
3234	Safety PLC is not yet written	0005
3235	NC-DRV safety comm. Disabled	0006
3236	EMG stop signal device illegal	0007
3238	Safe IO assign para setting er	0009
	Smart safety observation error (V05)	
3240	SLS speed error	0001
3241	SLS deceleration error	0002
3242	SLP position error	0003
3243	SOS speed error	0004
3244	SOS position deviation error	0005
3245	SOS travel distance error	0006
3246	SS1 deceleration error	0007
3247	SS2 deceleration error	0008
	Smart safety observation error (V06)	
3250	Safety external EMG stop is ON	0001
	Smart safety observation error (V07)	
3260	DRV safe circuit error	0001

Revision History

Date of revision	Manual No.	Revision details
Oct. 2016	IB(NA)1501454-A	First edition created.
Sep. 2017	IB(NA)1501454-B	Added or modified the following contents corresponding to the A2 version of the system software. Added the following contents: - 1.2 General Connection Diagram - 3 Maintenance of the Drive Unit - 4.8 NC Memory Diagnosis Screen - 4.9 Safety Observation Screen - 4.10 Servo Diagnosis Screen - 4.11 Diagnosis Data Collection Setting Deleted the following contents: (Included in "4.3.2 Alarm History".) - 1.3 How to Check the Alarm Screen Corrected the chapter No.: The existing chapter No. was corrected according to the addition or deletion of the contents above. Reviewed the contents in the following contents: - 1.3 How to Check the System Configuration - 4.3 Diagnosis Based on the Alarm - 4.4 Diagnosis Based on the I/F Diagnosis Screen - 4.5 Diagnosis Based on the Self Diagnosis Screen - 4.6 Diagnosis Based on the Data Sampling Screen - 4.7 Diagnosis Based on the Drive Monitor Screen - 8 Appx.2: Data Backup and Restoration Also, corrected wrong indications.
Aug. 2018	IB(NA)1501454-C	The descriptions were revised corresponding to S/W version B0 of MITSUBISHI CNC C80 series. Changed the contents of the following chapters. - 1.3.1 System Configuration Screen - 3.2 Durable Parts - 3.3.3.2 Replacing the Fan Unit - 4.6 Diagnosis Based on the Data Sampling Screen - 4.11.4 Referring to the Collected Data - 7.1 Types of Backup Data - 8 Appx.2: Data Backup and Restoration Changed the titles of the following chapters. - 4.7.1 Drive Monitor Screen (Servo Unit) - 4.7.2 Drive Monitor Screen (Spindle Unit) - 4.7.3 Drive Monitor Screen (Power Supply Unit) - 4.7.4 Drive Monitor Screen (Synchronous Error) - 4.7.5 Clearing the Alarm History on Drive Monitor Screen - 4.9.1 Safety Observation Screen (Configuration Diagnosis) - 4.9.2 Safety Observation Screen (Signal Monitor) - 4.9.3 Safety Observation Screen (Drive Monitor) - 4.9.4 Safety Observation Screen (Version Display) Deleted the following chapter. - 6.1.1 Procedure of Replacing the CPU Module Using the SRAM.BIN Data Also, corrected wrong indications.

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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.
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MITSUBISHI CNC

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MODEL	C80 Series
MODEL CODE	100-566
Manual No.	IB-1501454

IB(NA)1501454(ENG)-C(1808)MEE
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