Highly-Efficient Two-Axis Controller-Driver (0.75A/Phase)

QT-AMH2
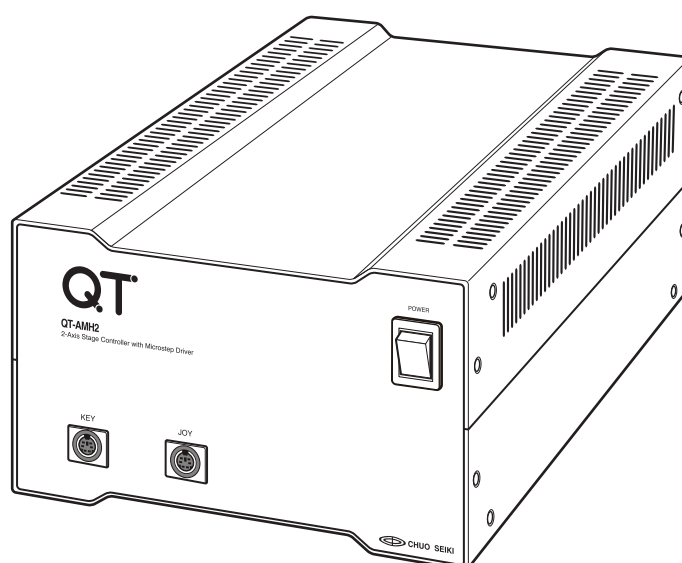
Highly-Efficient Two-Axis Controller-Driver (0.35A/Phase)

QT-AMH2-35

Instruction Manual

Thank you for purchasing our product.
This manual describes the accurate, safe usage of the product,
so please read it thoroughly before actually using the devices and
keep it where it can be referred to at any time.

CHUO PRECISION INDUSTRIAL CO., LTD.

Preface

If you are going to use the product for the first time, be sure to read this Instruction Manual thoroughly and obtain sufficient knowledge before you actually use the device

⚠ Safety Precautions

Be careful of the motor phase current

The motor phase current (drive current) of the controller drivers in the QT-A series comes in two types.
The motor phase current for the QT-AMH2 is 0.75A/phase and that for QT-AMH2-35 is 0.35A/phase. As a result, a stage that can be used with the devices differs as well.
So, when connecting a stage, check the motor phase current (drive current) of the stage being connected.

For safe usage

- These products are general-purpose devices for the general industrial market. They are not designed or manufactured to be used in a situation where human lives could be endangered or integrated as part of a larger system or device.
- The devices are manufactured under a strict-control system. However, when using the devices in a facility where the occurrence of a breakdown may result in a serious accident or failure, be sure to set the backup or fail-safe function systematically.

Liability

Chuo Precision shall not be liable for losses or damages caused by the use or misuse of, or inability to use the devices.

▉ Contents

1 Safety Precautions

Although safety is emphasized in the designing of the QT-AMH2 / QT-AMH2-35, it can cause serious injuries from fire or electric shock resulting from faulty operations. In order to prevent such an accident, please be sure to read and observe the following precautions thoroughly.
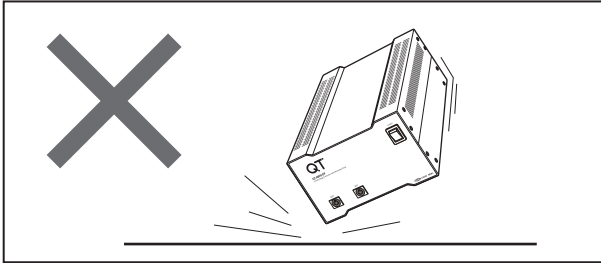
Do not apply shock or use the device in an environment subject to excessive shock as it is made of very precise components.
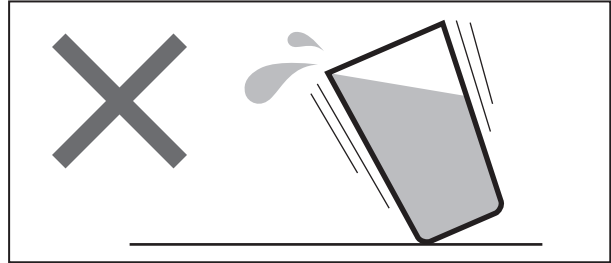
Never use the device where there is risk of contact with liquid as it could lead to serious damage.
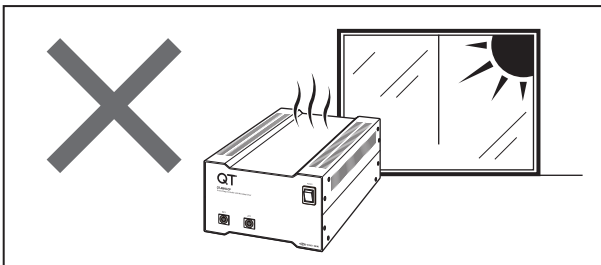
Never locate the device where it is exposed to direct sunlight, or near an air conditioner or heating device where the temperature could change dramatically.
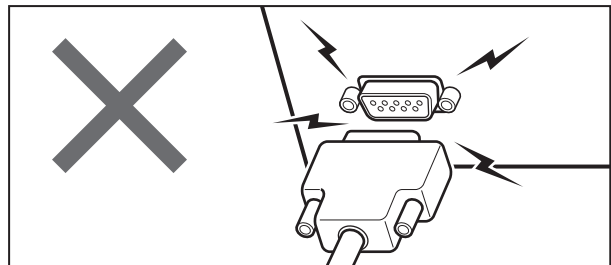
Never attach or detach the connector when the power is still ON as it may damage the device.
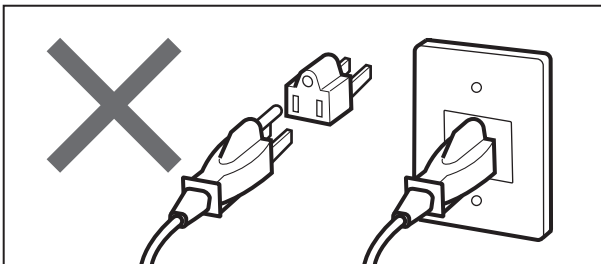
Be sure that the outlet of the power cable is a 3-pin grounding-type receptacle. Do not use a 3-pin to 2-pin conversion adaptor.
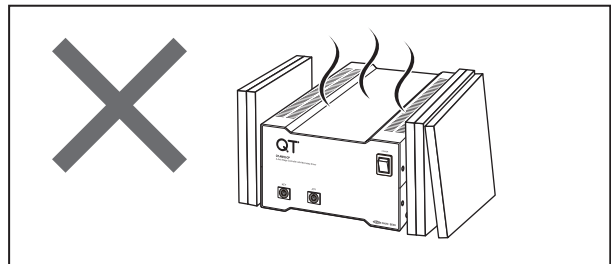
This device becomes relatively hot when power is applied. Be careful not to block the air vents and be sure to use the device in a well-ventilated environment.
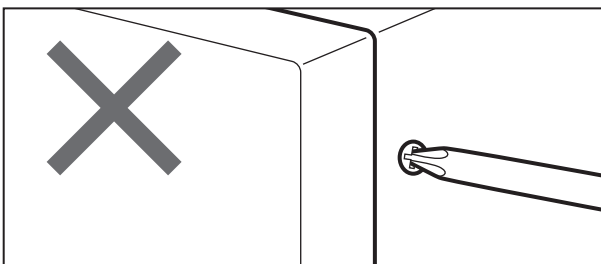
Never remove the secured panels or covers on the device, or attempt to modify the device.

QT-AMH2 : 0.75A/phase
QT-AMH2-35 : 0.35A/phase
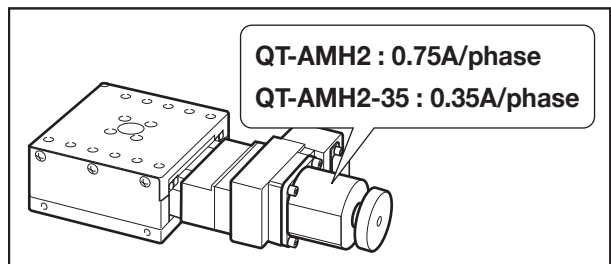
The motor phase current of the QT-AMH2 is 0.75A/phase, QT-AMH2-35 is 0.35A/phase.
So, when connecting a stage, check the motor phase current (drive current) of the stage being connected.

2 | System Outline and Main Specifications

2.1 Features

1. Installed with a micro-step driver and is capable of two-axis control.
2. Capable of mobile operation, parameter setting, and teaching by connecting to the QT-AK (sold separately).
3. Each axis can be driven independently or multiple axes can be driven simultaneously by remote control or program operation.
4. Program data created with a personal computer can be stored and executed with just the controller unit (using the exclusively-designed software that comes with the device).
5. Supports a unit display function (simplified display of symbols such as mm, μm, angle, sec, min, etc.) (when using the QT-AK).
6. Supports a connector for RS-232C, Ethernet (LAN), GP-IB and QT-AT (isolation interface).
7. QT-AMH2 is equipped with an electromagnetic brake control function. A stage with an electromagnetic brake can be controlled with the QT-BK electromagnetic brake box (sold separately).

⚠ CAUTION

The QT-AMH2-35 does not have an electromagnetic control function. It also cannot use the QT-BK. Furthermore, the only stage that can be used is the 0.35A/phase stage made by Chuo Precision.

Outline Diagram

X-Y Stage
- A stage with one axis to two axes such as the HG stage, MM stage, and MSS made by Chuo Precision can be used

QT-AJ
- Mobile operation using the Joy Stick.
- Speed setting, switching between JOG and STEP, one-pulse feed.

QT-AK
- Mobile operation using a key switch.
- Capable of controlling and setting the menu, parameter, program, etc.

Host Computer
- Parameter setting, setting and controlling various movements.
- Remote control and automatic operation with programs using communication.

Lineup of the QT-A Series

Product No.	Product Name
QT-AMH2 / QT-AMH2-35	Highly-Efficient Two-Axis Controller-Driver
QT-AMH2(K) / QT-AMH2-35(K)	Highly-Efficient Two-Axis Controller-Driver (with a control box)
QT-AJ	Analog Joy Stick (capable of controlling speed with stick angle)
QT-AK	Control Box

* A device in which the product number ends with "-35" conforms to a 5-phase stepping motor of 0.35A/phase. Other devices conform to a 5-phase stepping motor of 0.75A/phase.

2.2 General Specifications

QT-AMH2 / QT-AMH2-35

Power Supply	AC90-240V 50/60Hz (QT-AMH2 44W / QT-AMH2-35 37.5W)
Ambient temperature/humidity	10 to 40ºC / 20-80% (no condensation)
Outer dimensions (W x D x H)	W165 x D260 x H100 (mm)
Weight	3.5kg
No. of control axes	Two axes (installed with micro-step driver)
Suitable Models	MM stage, MSS, and HG stage (automatic) made by Chuo Precision. The separately-sold QT-BK is required for Z-stage equipped with an electromagnetic brake (for QT-AMH2 only).
Control function	Jog feed with QT-AJ, manual operation with QT-AK
	Remote control by communication (RS-232C, Ethernet, GP-IB)
Max. pulse output	199,999,998 pulses
Coordinate range	+99,999,999 to -99,999,999
Drive output frequency	10 to 500,000pps
Accelerating/decelerating	1 to 1,000ms
Origin return method	10 methods
External input/output	4 general-purpose inputs, 4 general-purpose outputs, 4 program CH selection inputs, drive pulse input, movement start input, program start input, drive pulse output, transit/stop output, arbitrary step pulse output (the separately-sold QT-AT is required for using the external input/output function)
Scale Input	Adaptable to 2-phase (AB phase) square wave input (5Vp-p signal voltage with differential input of A+, A-, B+, B-) of 90-degree phase difference (recommended linear scale: Mercury II Series of MicroE Systems)
Overrun prevention	CW/CCW hard limit, CW/CCW soft limit, origin return range
Communication interface	RS-232C, Ethernet (LAN), GP-IB
Control command	QT Series, MS Series upper compatibility
Program function	Program operation function using the exclusive application software that comes with the device: simplified teaching function using the control box (QT-AK)
Backup	Backup with FLASH ROM
Other functions	S-shape drive, circular interpolation between two axes, linear interpolation between two axes, communication line check function (QT-AK is required), micro-step drive (accelerating/decelerating smooth drive function), auto stage selection function made by Chuo Precision, installed driver OFF function
Control method	Five-phase pentagon wire bi-polar constant current micro-step method (supported with a smooth-drive function)
Drive current	0.75A/phase (0.35A/phase for QT-AMH2-35)
Step angle	16 types from 1/1 to 1/250 (cannot be changed while moving)
Power-down function	Power goes down 50% automatically when stopping
Excitation release function	Supported (an axis specified for excitation release cannot release the electromagnetic brake)

QT-AJ (Analog Joy Stick)

Power Supply	Supplied from main controller unit of the QT-A Series
Ambient temperature/humidity	10 to 40ºC / 20-80% (no condensation)
Outer dimensions (W x D x H)	110 x 170 x 45 (mm)
Weight	0.9kg
Joy Stick	Jog feed
Function	Jog feed speed controlled by inclined angle of joy stick, one step movement, step movement, switch between Jog and Step Movement Mode, speed table selection
Compatible models	QT-A Series controllers

QT-AK (Control Box)

Power Supply	Supplied from main controller unit of the QT-A Series
Ambient temperature/humidity	10 to 40ºC / 20-80% (no condensation)
Outer dimensions (W x D x H)	85 x 135 x 25 (mm)
Weight	0.6kg
Display	Reflective LCD
Function switch	Key switch
Function	Jog absolute step movement, step movement, one step movement, origin return, control of displayed unit, communication test, speed table selection
Compatible models	QT-A Series controllers

3 | Name and Function of Each Part

QT-AMH2 / QT-AMH2-35
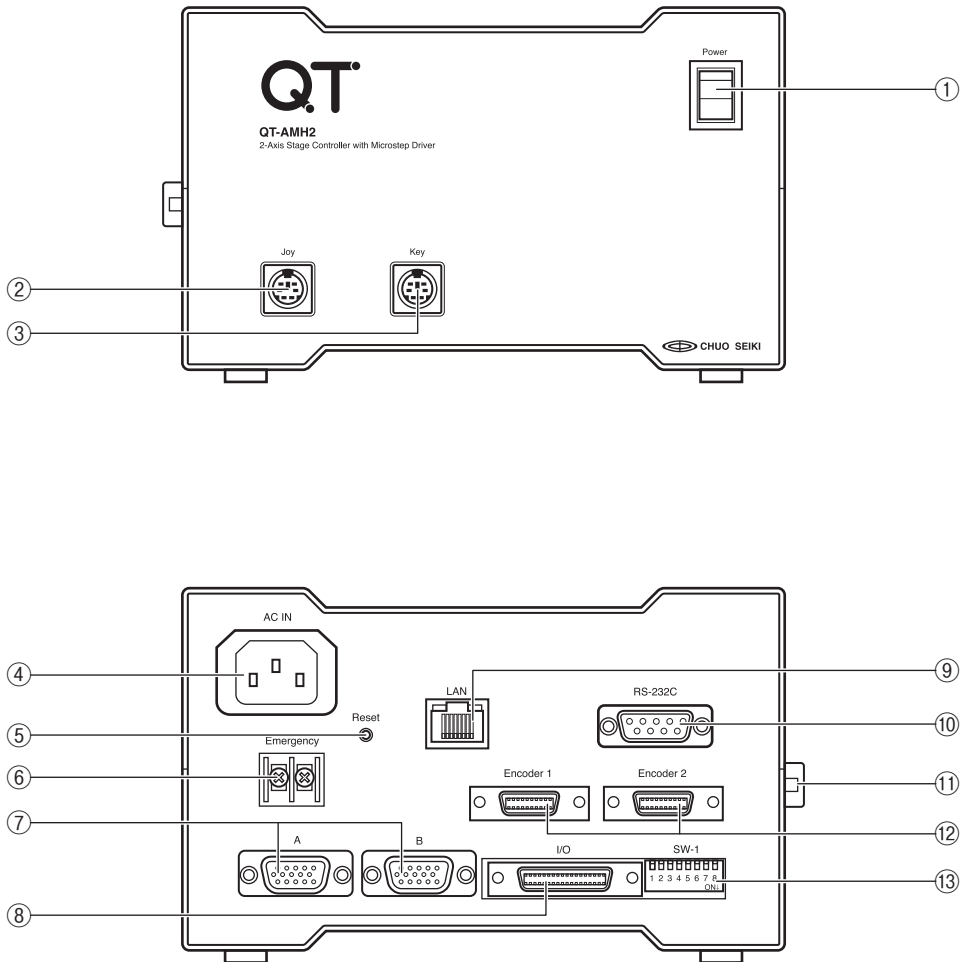
① **Power Switch**

This is the main power switch of the main unit. Power is also supplied to the control box when the switch is set to ON and the initial screen is displayed on the LCD. When turning the power ON again, wait at least 10 seconds after turning it OFF.

② **Joy Connector**

This is to connect the analog joy stick QT-AJ (sold separately).

③ **Key Connector**

This is to connect the control box QT-AK (sold separately).

④ **AC Inlet**

With the QT-AMH2 / QT-AMH2-35, connect the power cable to the AC inlet and connect the plug to the 100V AC (with 3P ground) outlet.

⑤ **Reset SW**

This switch resets the system program of the main unit when a problem occurs. The parameter, set value, and memory of the automatic operation program will be reset to their default setting.

⑥ **Emergency (Emergency Stop Input Terminal)**

By connecting an emergency stop switch, a moving stage can be stopped by external operation. For details, refer to "4. Emergency Stop Function" (P.12).

⑦ **Stage Connector**

Connect the automatic stage cable made by Chuo Precision. It also contains the input signal of the limit sensor and home sensor.
Connect Axis A of the stage to "A" and Axis B to "B".

⑧ **I/O (QT=AT Connector)**

This is an optional isolation interface connector to connect the QT-AT (sold separately) to an external device.

⚠ **CAUTION**

- This connector is exclusively for QT-AT. It cannot be used to connect other devices or input/output signals directly to this connector. Please also note that Chuo Precision cannot provide information such as those related to connecting other devices, pin assignment of connectors, and I/O circuits.
- The warranty is invalid if damage occurs as a result of connecting a device other than the QT-AT to this connector.

⑨ **LAN Connector**

This is an RJ-45 connector for Ethernet (LAN). Communication can be controlled by connecting the host computer with Ethernet (LAN).
This interface can be used only as a virtual COM port (VCP) with Windows. The attached device driver must be installed in order to be used.

⑩ **RS-232C Connector**

This is an RS-232C interface connector. Communication with the host computer can be controlled by connecting in an RS-232C format.

⑪ **GP-IB Connector**

This is a GP-IB interface connector. Communication can be controlled by connecting the host computer with GP-IB.

⑫ **Encoder Connector**

This is to input signals from the encoder. Connect Axis A of the encoder output connector of our automatic stage attached with a scale to "Encoder1" and Axis B to "Encoder2".

⑬ **Dip Switch (Dip SW)**

This is to set various items such as the limit sensor logic, communication setting, communication line check, and changing of the emergency stop terminal.

Joy Stick (QT-AJ) / Control Box (QT-AK)

For details on using the joy stick and control box (sold separately), see "Joy Stick (QT-AJ)" (P.22) and "Control Box (QT-AK)" (P.23).
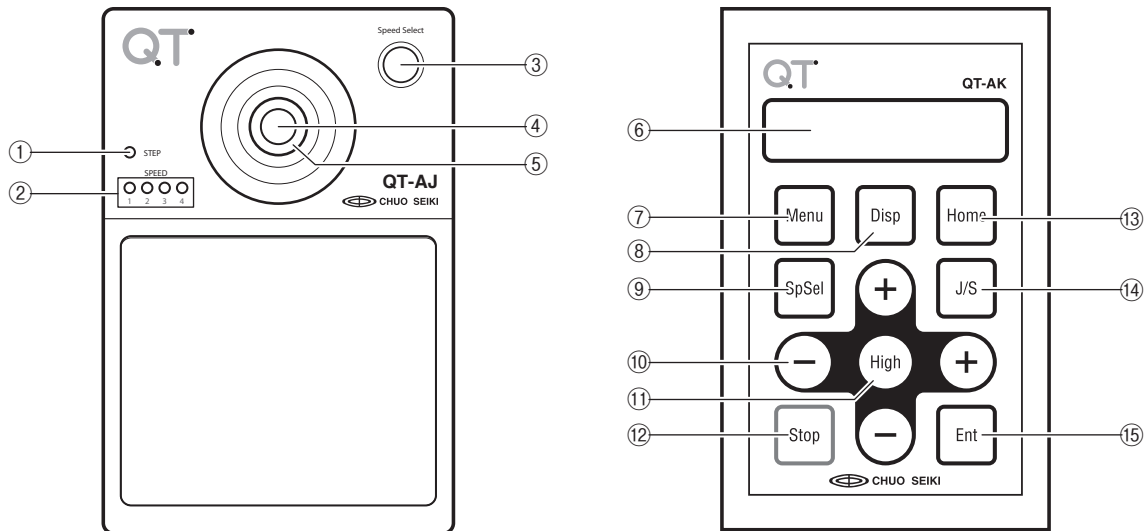
① **STEP Lamp**

Illuminates during STEP mode. (Goes OFF during JOG mode.)

② **SPEED Lamp**

Indicates the currently selected speed group.

③ **Speed Select**

Changes the speed group when pressed.

④ **JOG/STEP Switcher / 1 Pulse Feed**

The button at the leading edge enables switching between JOG mode and STEP mode. In addition, inclining the joy stick while pressing the button will move an axis to the inclined direction by one pulse.

⑤ **Joy Stick**

Inclining the joy stick to the left or right moves Axis A. Inclining it to the front or rear moves Axis B. In addition, you can adjust the moving speed by the degree of the inclined angle.

⑥ **Display**

Displays information such as coordinates and specified values.

⑦ **Menu**

Changes the mode. The mode selection screen appears by pressing the [MENU] key.

⑧ **Disp**

Changes the unit display (pulse display/unit display). The unit in unit display is specified with a parameter.

⑨ **SpSel**

To select the stage speed by selecting a speed group number.

⑩ + / - (Transition Key)

Press [+] or [-] at the left and right to move Axis A and press [+] or [-] at the front and rear to move Axis B during JOG mode (or STP mode).

In various input screens, the [+] or [-] at the left and right is used for moving, selecting items, or selecting number of digits. The [+] or [-] at the front and rear is used for changing values.

⑪ High

Moves the axis at high speed. When this key is pressed along with a Transition key during JOG mode, the axis moves in the specified direction at high speed.

⑫ Stop

Stops a moving stage. Cancels the entry when pressed while inputting data in the display.

Changes to a one-pulse feed mode when the Transition key and this key are pressed simultaneously in JOG mode.

⑬ Home

Returns to origin point. (Enters the origin return axis selection mode when the [Home] key is pressed.)

⑭ J/S

Switches between JOG mode and STP mode.

⑮ Ent / Change Coordinate Value

This is used as a key to determine entered data or to start a movement in ABS mode. It is also used for changing the coordinate value which is currently displayed.

4 | Emergency Stop Function

A stage moving by external operation can be stopped by using Emergency (emergency stop input terminal) located on the back side of the main unit. The following section describes how to use the terminal.

QT-AMH2 / QT-AMH2-35

Emergency
(Emergency stop input terminal)
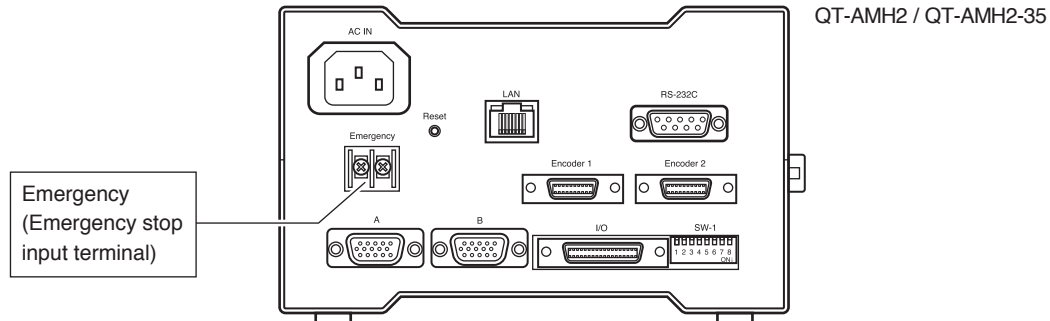
Constraints on electric wire

The length of the electric wire or cable that you connect to the emergency stop input terminal must be two meters of shorter. (Using one that is longer than two meters may cause faulty operation.) Furthermore, use two electric wires (with thickness of approx. AWG #20 ($\fallingdotseq$ 0.5 □) and make them into a twisted wire. In an environment with a lot of noise, please come up with sufficient remedies for eliminating the noise.

If the length must be extended beyond two meters, extend it through mechanical contact such as the relay method. In doing so, the customer will be responsible for the relay drive circuit.

Constraints on the emergency stop switch

Only a switch with a mechanical contact (limited to a non-polar switch or relay) can be used for the emergency stop function. Never apply a signal or electric power to the wires or perform short-circuit or open-circuit operation with a semiconductor. It may disable operation during an emergency.

⚠ **CAUTION**

- This device is designed so that the maximum length of an electric wire pulled from the main unit is two meters and that open/close operation is performed at the very end of the wire by mechanical contact (limited to a non-polar switch or relay).
- Proper operation cannot be guaranteed when connecting to a device that is not in mechanical contact. Furthermore, Chuo Precision cannot provide information on making connection to a device that is not in mechanical contact or on changing specifications.

Logic of the emergency stop operation

The two wires connected to the emergency stop input terminal generating a short circuit is the normal operating position. An emergency stop is performed upon creating an open circuit. (Normal close contact, b contact)

Operation upon an emergency stop

The emergency stop operation is the same as when executing the emergency stop command "E:"in communication control and the method for releasing emergency stop status is the same as well. Furthermore, the emergency stop status can also be released by turning the power of the main controller unit OFF and ON again.
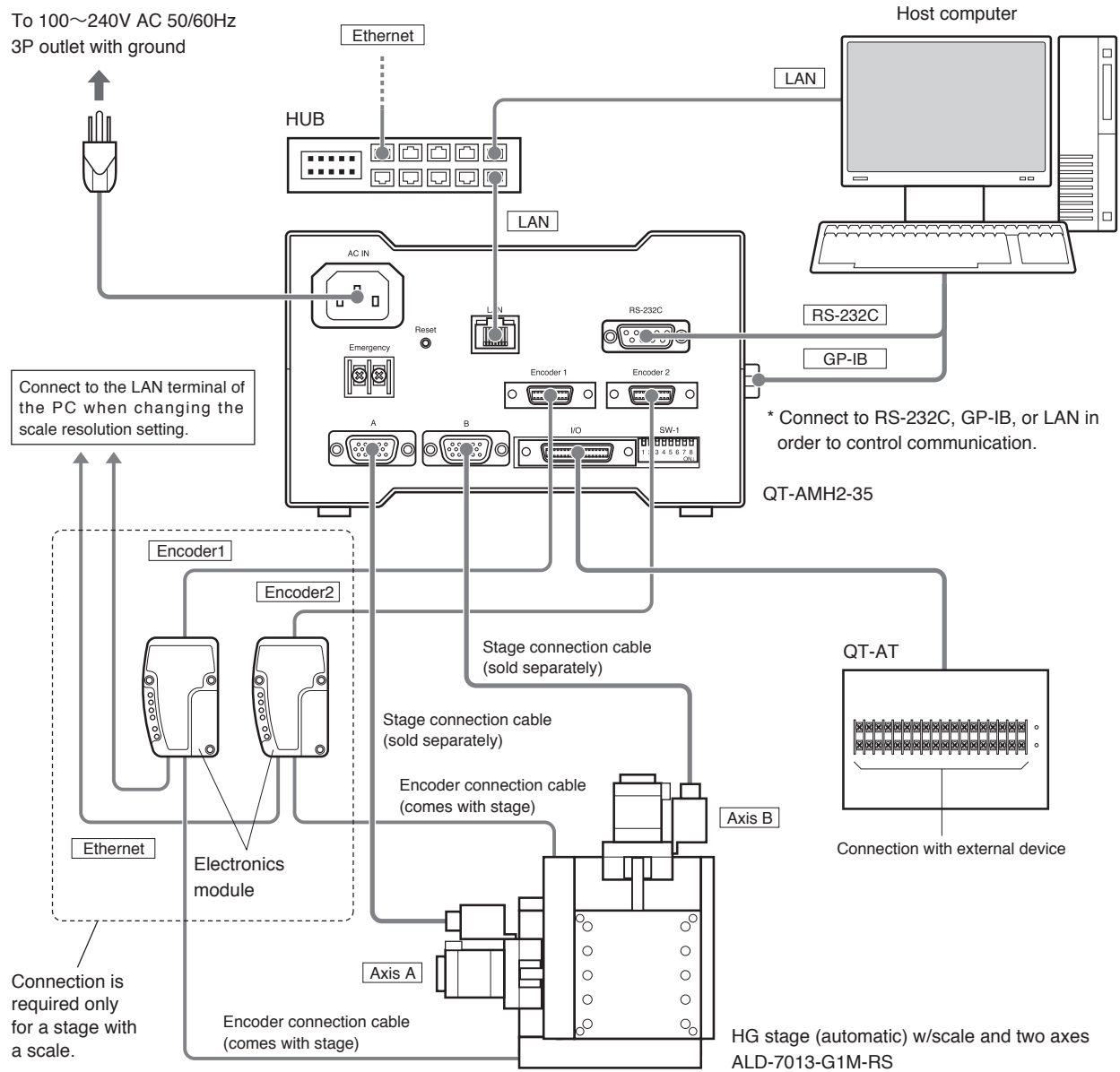
⚠ **CAUTION**

The Dip SW (SW8) must be set to ON (P.15) in order to make the emergency stop function valid.

5 Connection

The following diagram is an example of connecting the QT-AMH2-35 to our HG stage (automatic) with a scale and two axes. The stage can be controlled if a control box (QT-AK) or a host computer is connected.

- An encoder connection cable is required only with a stage attached with a scale.
- The connection between the electronics module and LAN is required only if you are going to change the setting of the scale resolution. If you are using the QT-AMH2-35 with the two axes of our HG stage (automatic) attached with a scale, the setting does not have to be changed as the factory default setting can be used.

To 100～240V AC 50/60Hz 3P outlet with ground

Ethernet

HUB

Host computer

LAN

LAN

AC IN

Reset

Emergency

Encoder 1   Encoder 2

RS-232C

RS-232C

GP-IB

A   B   I/O   SW-1

* Connect to RS-232C, GP-IB, or LAN in order to control communication.

QT-AMH2-35

Connect to the LAN terminal of the PC when changing the scale resolution setting.

Encoder1

Encoder2

Stage connection cable (sold separately)

Stage connection cable (sold separately)

Encoder connection cable (comes with stage)

QT-AT

Axis B

Connection with external device

Ethernet

Electronics module

Axis A

Connection is required only for a stage with a scale.

Encoder connection cable (comes with stage)

HG stage (automatic) w/scale and two axes
ALD-7013-G1M-RS

⚠ CAUTION

- When turning the power of the main unit ON, be sure that the stage is connected. Turning the power ON or operating the device without connecting the stage may result in damaging the drive circuit.
- Before connecting the power plug to the outlet, be sure that the power switch is set to OFF. Also, make sure that the power switch is set to OFF when connecting the stage and/or host computer.
- The RS-232C, GP-IB, and LAN interfaces cannot be used at the same time. (Proper operation cannot be made when they are used at the same time.)
- The stage connection cable and communication cable to connect the computer do not come with this device.

6 Installation

Install the QT-AMH2 / QT-AMH2-35 using the following method.
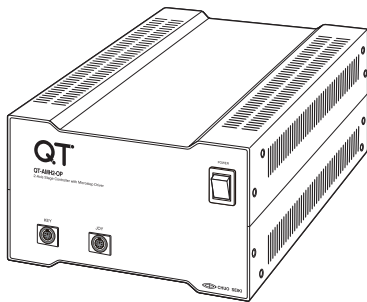
Install horizontally   Install vertically
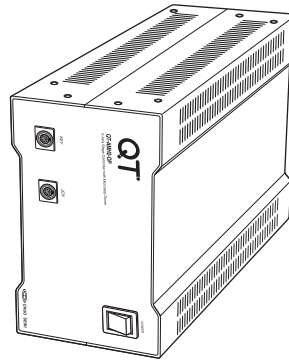
⚠ Precautions on heat dissipation

When setting two or more units side by side, leave a space of 2cm or more between them. Never place one unit on top of another as it will overheat and lead to faulty operations or damage the device. If you must place one unit over another unit, use a rack and leave sufficient space between the units.

2cm or more
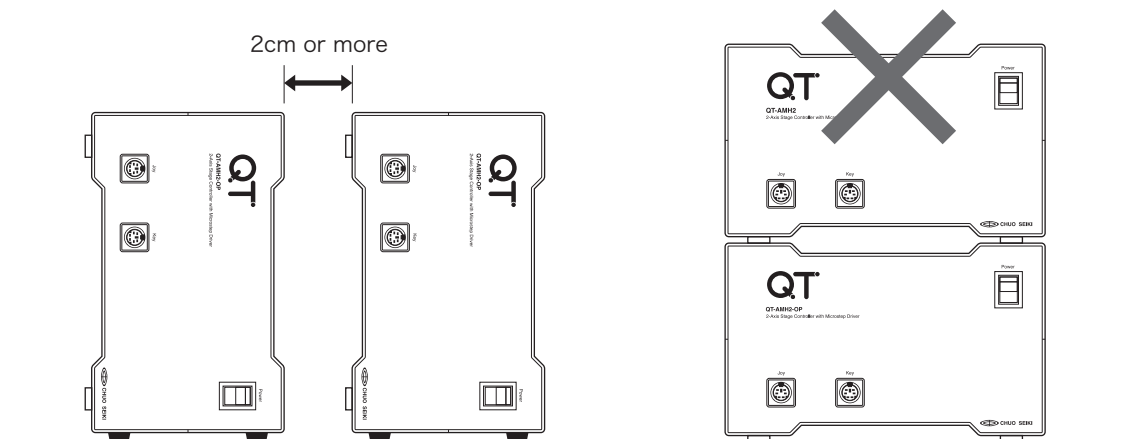
Attaching the Rubber Feet

If you are going to set the device vertically, attach the rubber feet at the four corners of the bottom surface.
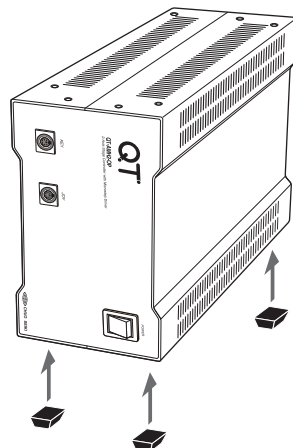
7 Setting the Dip SW

Items such as the limit sensor logic of the stage, communication setting, communication line check, and emergency stop terminal input are set with the Dip SW.

⚠ CAUTION

Be sure to change the setting with the power of the main unit turned OFF.

QT-AMH2/QT-AMH2-35

The following list indicates the functions and operating status of the Dip SW. Set the switch to ON (or OFF) as indicated on the switch.

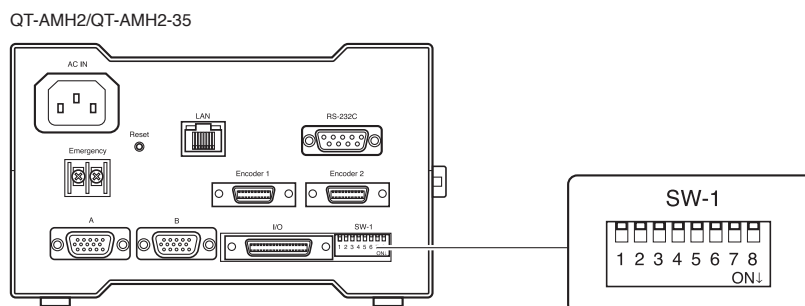| SW No.	Function	OFF	ON
1	Axis A limit sensor logic	Normal close (B contact operation) *	Normal close (A contact operation)
2	Axis B limit sensor logic	Normal close (B contact operation) *	Normal close (A contact operation)
3	Not used	*	
4	Not used	*	
5	Not used	*	
6	Communication setting	9600, 8 PN, S1, CR+LF *	Setting for Parameter No.51, 53
7	Communication line check (echo back)	Invalid *	Valid
8	Changing of emergency stop terminal input	Invalid *	Valid

* Switch position by factory default

⚠ CAUTION

- Do not change the unused switches from the factory default setting.
- When performing "Selection of connecting stage" with Parameter No.04, the above Dip SW "1" and "2" do not have to be set.

Dip SW functions

[SW 1,2] Limit sensor logic

This is to set the limit sensor logic for Axis A and Axis B. This functions only when Parameter No.04 is set to "00". If Parameter No.04 is set to a value other than "00", the settings for these switches are neglected and the operating status will be in accordance to the setting of Parameter No.04.

⚠ CAUTION

The Parameter No.04 setting is given priority over the settings of these switches. If Parameter No.04 is set to a value other than "00", please be very careful and set an accurate value. If an inaccurate value is set, an overrun error may occur as the limit sensor may not function.

[SW 3,4,5] Not used

Please do not change these unused switches from the factory default settings.

[SW 6] Communication setting

Select the RS-232 default value if you want to control communication.

When this switch is set to ON, operation will be made according to the set status of Parameter No.53 and No.51. The default setting for Parameter No.53 is "2,0,0,0" (=9600bps, 8bit, no parity, stop bit 1) and that for Parameter No.51 is "0" (=CF + LF). For details, see Parameter No.53 and No.51.

When the switch is set to OFF, the operation status will be baud rate = 9600bps, bit length = 8, parity bit = none, stop bit = 1, delimiter = CR + LF, regardless of the settings for Parameter No.53 and No.51.

[SW 7] Communication line check (echo back test)

The check does not function when the switch is set to OFF.

Setting the switch to ON disconnects the communication line from the internal section of the controller and echoes back the character string from the computer. This function is used to check if the character string from the computer is output to the RS-232 port. Set the switch to ON. Use a communication software and enter characters from the keyboard. If the same characters are displayed on the communication software screen, it means that the RS-232C port is working properly. If the characters do not appear on the screen, there may be a problem on the computer side.

This function conforms only to an RS-232C interface. (It does not conform to LAN or a GB-IB interface.)

Regardless of the communication setting in the controller, this check functions according to the communication setting on the computer side.

[SW 8] Changing of emergency stop terminal input

Set this switch to OFF to disable input of the emergency stop input terminal.

The input of the emergency stop input terminal becomes valid when the switch is set to ON and "emergency stop status" is entered when the emergency stop input terminal is released, and "normal operation status" (not emergency stop) is entered when the terminal is short-circuited.

For details, refer to "4. Emergency Stop Input Terminal" (P.12).

8 Parameters

8.1 Parameter List

The following is a list of parameters that are used with the QT-AMH2 / QT-AMH2-35. For details about each parameter, read "Details of Parameters" on the following page.

No.	Axis	Function	Specified Range	Default	Remarks
01	Each axis	Origin sensor logic	0 to 2	1	
02	Each axis	Pre-origin sensor logic	0 to 2	2	
03	Each axis	Origin return mode	0 to 9	1	
04	Each axis	Stage selection	00 to 99	00	*1
05	Each axis	Origin return start direction & end position	0 to 3	0	
06	Each axis	Designation of used axis	0 to 3	1	
07	Each axis	Origin return speed selection	0 to 1	0	
08	Each axis	Low speed for origin return	10 to 500,000	500	
09	Each axis	High speed for origin return	10 to 500,000	3,000	
10	Each axis	Accelerating/decelerating time for origin return	1 to 1,000	100	
11	Each axis	Origin return offset	-99,999,999 to +99,999,999	0	
12	Each axis	[+] direction origin return range	0 to 99,999,999	0	
13	Each axis	[-] direction origin return range	0 to 99,999,999	0	
14	Each axis	[+] direction soft limit	-99,999,999 to +99,999,999	0	
15	Each axis	[-] direction soft limit	-99,999,999 to +99,999,999	0	
16	Each axis	Backlash correction	0 to 999	0	
18	Each axis	Motor rotation direction	0 to 1	0	
19	Each axis	Unit display of control box (QT-AK)	0 to 7	0	*2
20	Each axis	Stage resolution	1 to 1,000,000	1	
22	Each axis	Selection of S-shape range speed width upon S-shape drive	0 & 100 to 250,000	0	
23	Each axis	Selection of drive pulse output method	0 to 1	0	
24	Each axis	Selection of drive pulse input method	0 to 2	0	
25	Each axis	Number of steps for arbitrary step pulse	-1 to +99,999,999	0	
26	Each axis	Output setting of arbitrary coordinate pulse	-99,999,999 to +99,999,999	0	
51	All axis	Delimiter setting	0 to 3	0	
52	All axis	GP-IB address seetting	01 to 15	07	*3
53	All axis	RS-232C setting		2,0,0,0	
54	All axis	Emergency stop release method setting	0 to 1	1	
55	All axis	Selection of stop method	0 to 1	1	
56	All axis	Reproduction of coordinate value after reboot	0 to 1	0	
57	All axis	Number of reply bytes setting for a command with response request	0 to 2	2	
58	All axis	Buzzer sound upon QT-AK key operation	0 to 1	1	
60	All axis	Maintaining control box (QT-AK) setting status	0 to 1	0	
70	Each axis	Selection of scale pulse input method	0 to 4	4	*3
73	Each axis	In-position width setting	0 to 99,999,999	0	*3
75	Each axis	Scale resolution setting	0 to 1,000,000	0	*3
76	Each axis	ON/OFF of scale movement amount correction	0 to 1	0	*3
77	Each axis	Positioning complete time out	0 to 10,000	10,000	*3
78	Each axis	Number of retries for positioning complete	0 to 1,000	1,000	*3

*1 Cannot be used with specially-ordered stages made by Chuo Precision or stages made by other manufacturers.

*2 Changes can only be made by QT-AK. (The specified value cannot be changed by remote control.)

*3 Parameter exclusively for QT-AMH2 and QT-AMH2-35.

8.2 Specifying Parameters

Parameters can be specified directly from the control box or with the communication command from the host computer. The following section describes how to specify parameters using each method.

Specifying directly from the control box: See "PRM Mode (Parameter Setting)" on P26.
Specifying using the communication command: " P: "

8.3 Details of Parameters

01: Origin sensor logic & use/not use

Selection of using or not using the origin sensor and the selection of the origin sensor logic. When using the origin sensor, specify according to the origin sensor logic of the Stage being used.

No.	Item	Specified	Contents	Default
01	Origin sensor logic	0	Not used	1
		1	NO	
		2	NC	

NO: Normal open (A connection) NC: Normal close (B connection)

02: Specifying the pre-origin sensor logic

Selection of using or not using the pre-origin sensor and the selection of the pre-origin sensor logic. When using the pre-origin sensor, specify according to the pre-origin sensor logic of the Stage being used.

No.	Item	Specified	Contents	Default
02	Pre-origin sensor logic	0	Not used	2
		1	NO	
		2	NC	

NO: Normal open (A connection) NC: Normal close (B connection)

03: Specifying the origin return mode

Specify the sensor type used upon origin return and the method. The operation during origin return will differ according to the setup. For details on the mode for origin return, see "Origin Return Operation" on P.15.

No.	Item	Specified	Contents	Default
03	Origin return mode	0	Origin/Pre-origin/Z phase (when origin and pre-origin overlaps)	1
		1	Origin/Pre-origin (when origin and pre-origin overlaps)	
		2	Origin/Z phase	
		3	Origin	
		4	Limit/Z phase	
		5	Limit	
		8	Origin return to an origin point of coordinate value zero set with a software (performs backlash correction)	
		9	Origin return to an origin point of coordinate value zero set with a software (same movement as absolute "0")	

04: Selection of connecting stage

The sensor logic and home return mode of the connected stage can be set in one batch operation with this parameter.
If there is an indication in "stage product number" for a stage made by Chuo Precision, please set that value.
If there is no indication of a product number, or if the stage is made by a different manufacturer, set "00". If "00"

is set to this parameter, operation will be made according to Parameter No. 01 to 03, and "Limit Sensor Logic Setting" of the Dip SW.

⚠ **WARNING**

The function of this parameter conforms only to the standard automatic stage that is introduced in our catalogue. It does not conform to specially-ordered stages made by Chuo Precision or stages made by other manufacturers. If one of these stages is connected, be sure that the parameter is set to "00" (or left unset).

It is very dangerous when a stage made by a different manufacturer is connected and the parameter is set to "00" (left unset), as the overrun prevention function may not work.

Chuo Precision shall not be liable for injuries, losses, or damages caused by setting the parameter to a value other than "00" upon using a stage made by a different manufacturer. In addition, the warranty is invalid for any damages resulting from such a case.

⚠ **CAUTION**

When this parameter is turned valid (when set to a value other than "00"), the system will neglect the limit sensor logic set with Dip SW "1" or "2" (the setting of this parameter is prioritized). Therefore, please be very careful to set an accurate value. If an inaccurate value is set, an overrun error may occur as the limit sensor may not function. For details on the Dip SW, refer to "9. Setting the Dip SW" (P.21).

No.	Item	Set Value	Stage Product No.	Default
04	Selection of connecting stage (Selection of product number and setup value of a Chuo Precision stage)	51	ALS/ALD/ALZ/ALV-30 "x" -HM	00
			ALS/ALZ/-305-CM	
		36	MSS-300B-OP, All MSS devices	
			ALS/ALD/ALZ- "xxxx" -G "x" M	
		31	ALS/ALD/ALZ- "xxx" -H "x" M	
			ALV- "xxx" -H "x" M	
			ATS/ATD- "xxx" -HM	
			MMU-40X/X-Y/Z, -H1	
			MMU-60X/X-Y/Z/V, -H1	
			MM-40GU/GL/GD	
			MM-60GU/GL/GD	
			ARS-436-HM	
			ARS-636-HM	
			MM-40 "x"	
			MM-60 "x"	
			ARS-336-HM	
		14	ALS/ALD/ALZ- "xxx" -E "x" P "x"	
			ALS/ALD/ALZ- "xxx" -C "x" P "x"	
			ALS/ALD/ALZ- "xxx" -H "x" P "x"	
			ALV- "xxx" -H "x" P "x"	
			ATS/ATD- "xxx" -HP	
			HGS-300X/XY	
		11	ARS-936-HP	
			ARS-136-HP	
		00	Do not specify	

- Product numbers indicated as "xxx" differ depending on factors such as the stage size. If the product number at the front and rear matches, enter the setup value. If you are uncertain, please contact our Sales Department.
- If the product number of the stage you are using is uncertain, not indicated in the list, or made by a manufacturer other than Chuo Precision, be sure to set the parameter to "00" and set Parameter No.01, 02, 03 along with the Dip SW (SW1 and SW2).
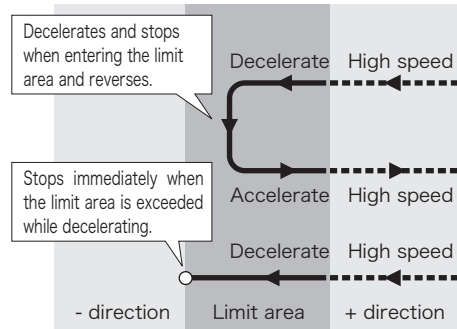
9 | Origin Return Operation

When the stage limit sensor or origin sensor is detected during a origin return operation, the stage will stop in the following ways.

Stopping at a limit (stage sensor)

When a limit is detected during a origin return operation (prior to detecting the origin point), the speed will decelerate and then stop. When the limit is exceeded during the decelerating process, the stage will stop immediately and the origin return operation will be cancelled.

⚠ CAUTION

A Limit Overrun error indicated on the right side may occur depending on the speed specified for high speed origin return.

Decelerates and stops when entering the limit area and reverses.

Stops immediately when the limit area is exceeded while decelerating.

Stopping at origin point

For QT-AMH2 / QT-AMH2-35, origin return is an operation that determines the reference point using the stage sensor, and the method for stopping at origin point is as follows.

The origin point area is entered from the + limit direction. The movement will decelerate and stop after passing through the origin point area, then reverse to the + limit direction. It will then stop where the origin point area is detected.

After exiting the origin point area, it decelerates, stops, reverses, and then detects the origin point area again and stops.
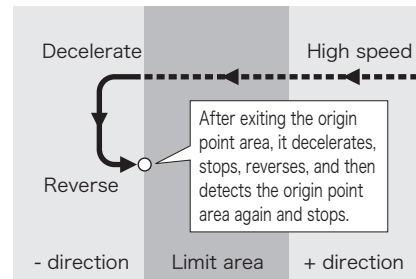

Additional information on figures describing the origin return operation

The origin return mode is described using the following figures on the following page. The direction of the arrow indicates the direction of movement. Deceleration, acceleration, and reverse operations are performed at the corner sections (R section).

1. Example of Stop → Accelerate → High speed

[Figure indication]   [Actual movement]
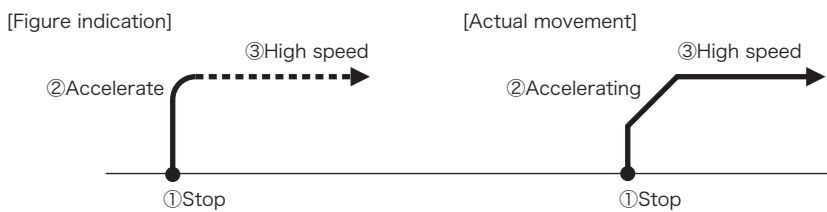
2. Example of Stop → Low speed → Accelerate → High speed

[Figure indication]   [Actual movement]
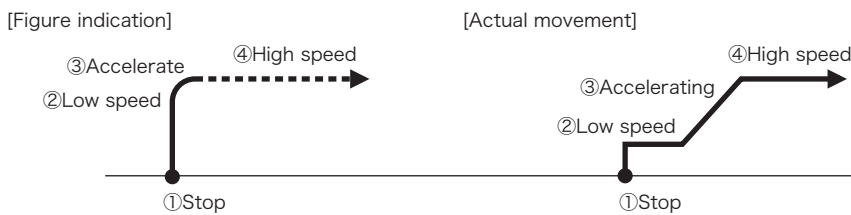
Movement during the origin return operation (when using just the origin point)

The following movement is made when returning to origin point with MSS connected to the controller.
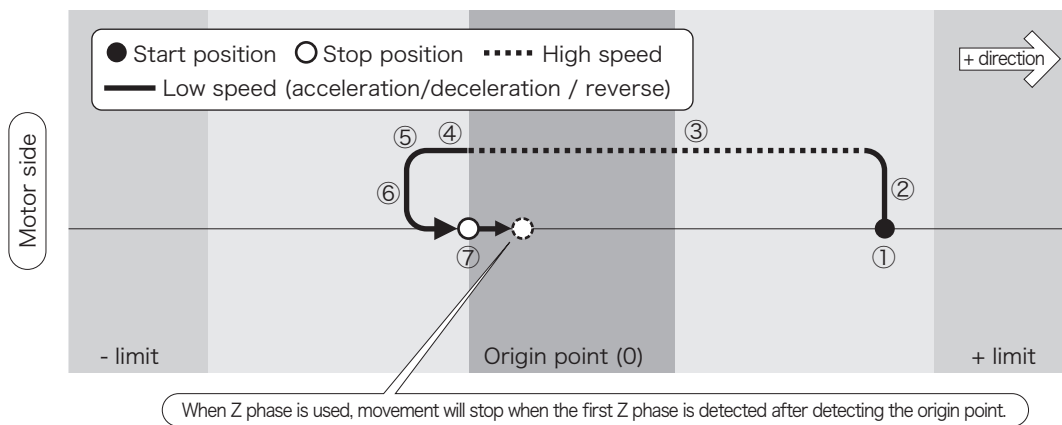The movement will be different depending on the position of the stage when the origin return operation begins.

Item	Set Value
Origin sensor	Use (2)
Pre-origin sensor	0 (not used)
Origin return mode	(3)
Origin return start direction	0 (- (CCW))
	Returned position: Edge of - side
Origin return offset	0

Item	Set Value
+ (CW) direction origin return range	0
- (CCW) direction origin return range	0
+ (CW) direction soft limit	0
- (CCW) direction soft limit	0
Backlash correction	0
Direction of motor rotation	0 (normal rotation)

☐ indicates the specified value when Parameter 04 is specified to "36".

1) Origin return from between origin point and +limit

[Movement] ①Start→②Accelerate→③High speed→④Decelerate→⑤Low speed→⑥Reverse→⑦Stop

When Z phase is used, movement will stop when the first Z phase is detected after detecting the origin point.

2) Origin return from within the origin point range

[Movement] ①Start→②Reverse→③Stop (low speed throughout the entire process)

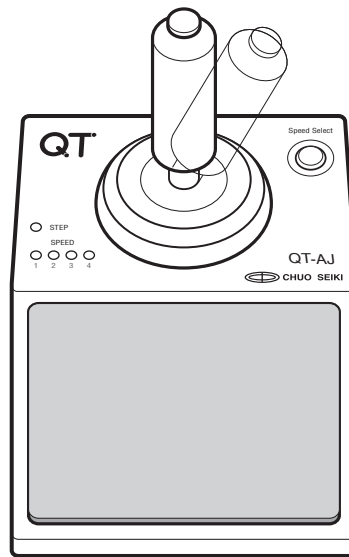* The stop position when using Z phase is the same as that of 1).
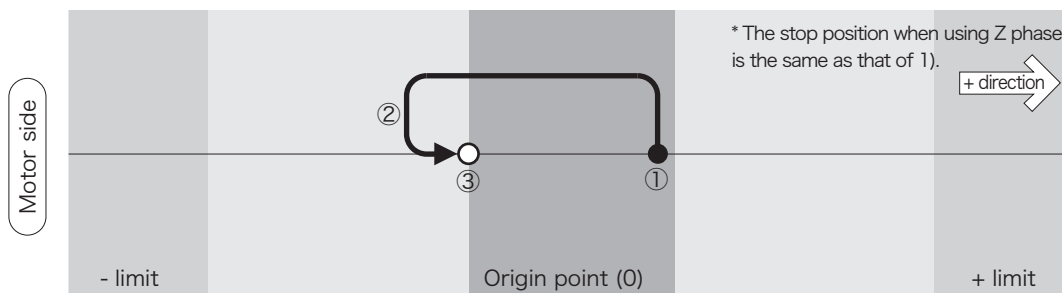
3) Origin return from between -limit and origin point

[Movement] ①Start→②Accelerate→③High speed→④Decelerate→⑤Low speed→⑥Reverse→⑦Accelerate→⑧High speed→⑨Decelerate→⑩Low speed→⑪Reverse→⑫Reverse→⑬Stop

* The stop position when using Z phase is the same as that of 1).
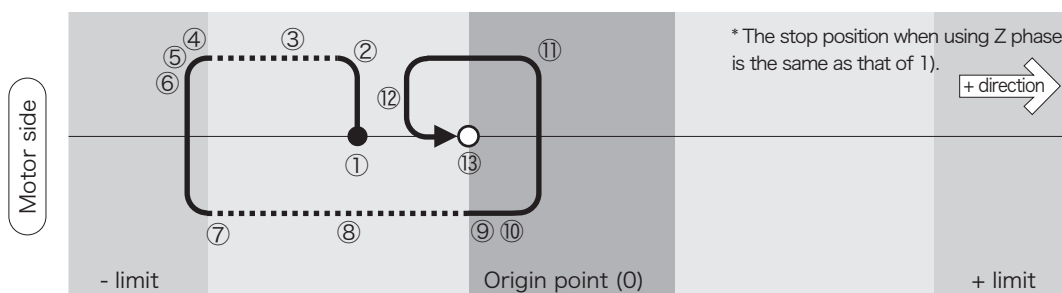
10 Using the Joy Stick (QT-AJ)

Switching between JOG feed and STEP feed

Pressing the button on the tip of the joy stick switches the feed mode between JOG and STEP. The STEP lamp illuminates during STEP mode but the lamp goes off during JOG mode.

One-pulse feed

By pressing the button at the tip and inclining the joy stick, movement is made by one pulse in the inclined direction.

Change in speed

Press the Speed Select button and select the moving speed. The selected speed (SP1 to SP4) can be checked with the Speed lamp. Moving speed is specified in the SPD mode (P.27).

JOG feed

Tilting the lever to the left and right moves Axis A. Tilting the lever to the front and back moves Axis B. The moving speed can be controlled by the tilted angle.
- The maximum moving speed is the one specified with "SP1" in the control box or with "D: command".
- Both Axis A and Axis B can be moved depending on the direction the lever is tilted and the speed for moving both axes controlled by the tilted angle.

STEP feed

To perform STEP feed, press the button during JOG feed to switch to STEP feed and tilt the lever to the direction you want to move. Movement will be made to the tilted direction by step and stop.

11 Using the Control Box (QT-AK)

By using QT-AK (optional), you can perform various moving operations, parameter settings, teaching, etc. This section describes some functions related to the joy stick (QT-AJ).

Display upon turning the power ON

When the power of the QT-AMH2 / QT-AMH2-35 is turned ON, the version of the system is first displayed (approx. 1 sec.) and then enters JOG mode.
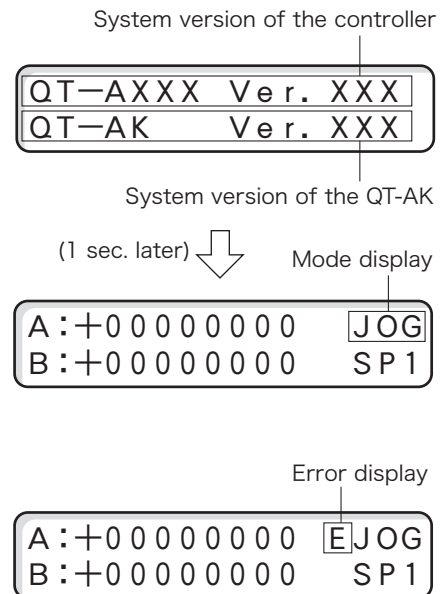The version you are currently using is displayed.

In JOG mode, "JOG" is displayed on the upper-right side. This status enables you to JOG feed, move to other modes, specify parameters, etc.

Error display

When the limit sensor logic specified in QT-AMH2 / QT-AMH2-35 differs from the limit sensor logic of the connected stage, "E" appears in the screen to indicate an error,
When an error is indicated, check the limit sensor logic of the stage you are using and set it properly.

System version of the controller

```
QT—AXXX  Ver. XXX
QT—AK    Ver. XXX
```

System version of the QT-AK

(1 sec. later) ⬇   Mode display

```
A:＋00000000    JOG
B:＋00000000    SP1
```

Error display

```
A:＋00000000  E JOG
B:＋00000000    SP1
```

12 Menu Screen

The MENU screen appears by pressing [MENU] during JOG mode, STP mode, or ABS mode. If the current mode is different from the above modes, the MENU screen can be displayed by pressing [STOP] and the [MENU].
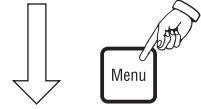
The above key operations may differ slightly depending on the current mode or screen that is specified.

```
A:+00000000    JOG
B:+00000000    SP1
```

Menu

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

MENU selection

1. The eight modes shown in the figure are displayed in the MENU screen.
2. The cursor moves to the side by pressing [+] or [-] located on the left and right side, The cursor moves up and down by pressing [+] or [-] located on the top and bottom.
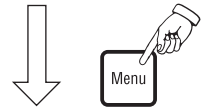3. Move the cursor to the target mode and press [Ent].

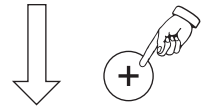Details on each mode are described in the following pages.

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```
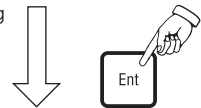
Menu

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

+

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

(Example: Selecting ABS mode)

Ent

```
A:+00000000    ABS
B:+00000000    SP1
```

(Example: ABS mode screen)

13 JOG Mode

JOG Mode Screen

JOG mode is entered when the power is turned ON or by selecting JOG from the menu. During JOG mode, "JOG" is displayed on the upper-right section of the screen.

- When in a different mode, JOG mode can be entered by selecting [Stop] → [Menu] → [Ent].
- The mode can be switched between JOG mode and STP mode by pressing [J/S].

Mode Display

```
A:+00000000    JOG
B:+00000000    SP1
```

Axis Mark Coordinate   Speed Group No.
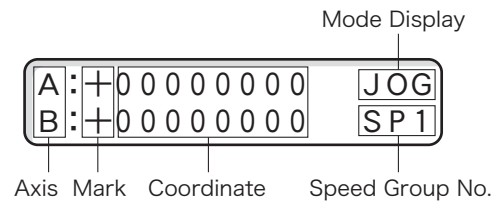
The above key operations may differ slightly depending on the current mode or screen being set.

Operations in JOG Mode

The direction of the motor (or direction of the stage movement) is set to rotate in the CW direction (direction in which current values are added on) using the [+] key by default. However, the direction can be reversed by specifying a parameter (No. 18). Change the direction if there are inconsistencies between the direction of the stage movement and the transition keys ([+] & [-]).
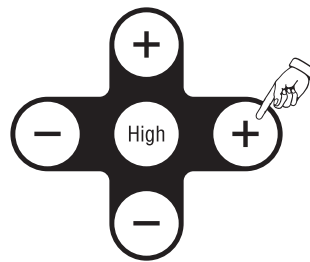
1. Low-speed JOG feed

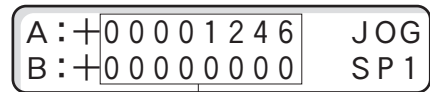Axis A: Press [+] or [-] located on the left and right.
Axis B: Press [+] or [-] located on the top and bottom.
Movement will be made at low speed while the bottom key is pressed.
The current value will appear on the screen.
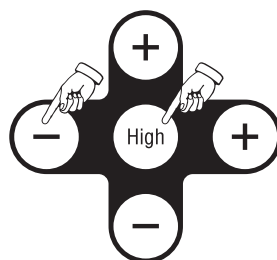
Screen display during JOG feed

```
A:+00001246    JOG
B:+00000000    SP1
```

The current coordinate is displayed during the transition

2. High-speed JOG feed

When [High] is pressed during low-speed JOG feed (moving by pressing [+] or [-]), the movement will change to high speed.
If only the [High] key is released, the movement will return to low speed. The current value is displayed on the screen.

②Accelerates to high speed when pressed simultaneously

③Decelerates to low speed by releasing [High]

①Starts movement

High speed

Low speed Acceleration Deceleration Low speed

④Stops when released

25
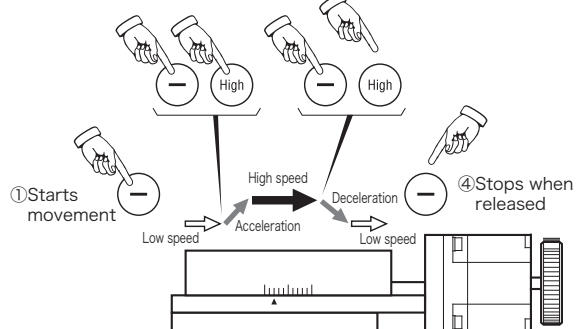
14 PRM Mode (Setting Parameters)

Specify the contents of the parameters that are used in the QT-AMH2-OP.

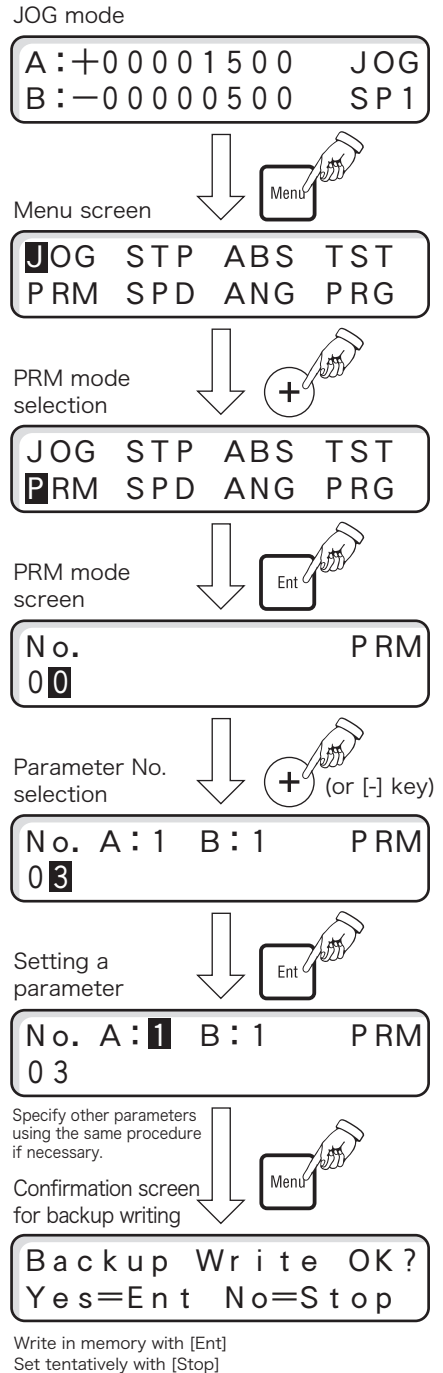This section describes the method for specifying parameters from the control box. For more information on parameters, see "Parameters" (P.17) and "Details on Parameters" (P.18).

Controlling PRM (Parameters)

1. Confirm that the mode is JOG, STP, or ABS.
2. Press [Menu] and display the Menu screen.
3. Move the cursor to "PRM" using [+] located on the side and press [Ent].
4. The PRM (Parameter) Setting screen will appear.
   When an arbitrary number is specified in "Parameter No.", the current specified content will appear on the right side. Select a parameter using the following keys.
   Digit selection: [+] or [-] on the left and right
   Value selection: [+] or [-] on the top and bottom
5. When the parameter you want to set is displayed, press [Ent].
6. Move the cursor to the item selection and enter a value.
   Item selection: [+] or [-] on the left and right
   Value setting: [+] or [-] on the top and bottom
   Use the following keys to specify parameters for each axis.
   Go to the next item: [Ent]
   Back to the previous item: [High]
7. Press [Ent] when the setting is completed. The cursor will move to the next item.
   If you are going to continue specifying other parameters, repeat the above steps (4 to 7).
8. Press [Menu] when all parameters are specified. A confirmation screen for "backup writing" to flash memory will appear. If you want to write to flash memory, press [Ent]. If not, press [Stop].
   - The specified value is valid even if you do not write it to flash memory. However, it will return to the previous setting when the power is turned OFF and ON again (or when the "RESTA:" command is executed).
9. The mode will return to the JOG mode.

Returning the specified parameter to the default setting

All parameters will be reset to the default setting of the system by pressing the Reset switch on the main unit or by executing the "RESET:" command.

JOG mode

```
A:＋00001500    JOG
B:－00000500    SP1
```

Menu screen

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

PRM mode selection

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

PRM mode screen

```
No.              PRM
00
```

Parameter No. selection

(or [-] key)

```
No. A:1  B:1    PRM
03
```

Setting a parameter

```
No. A:1  B:1    PRM
03
```

Specify other parameters using the same procedure if necessary.

Confirmation screen for backup writing

```
Backup  Write  OK?
Yes＝Ent  No＝Stop
```

Write in memory with [Ent]
Set tentatively with [Stop]

15 SPD Mode (Setting Speed)

Specify the low speed, high speed, and accelerating/decelerating time for moving the stage in four speed groups. The specified contents are reflected in speed group numbers "SP1" to "SP4" and each axis can be assigned a certain speed.

| Item	Setting Range	Default
Axis: Speed Group No.	A1 (SP1) to A4 (SP4)	A1 (SP1)
L: Low speed	10pps to 500,000pps	500pps
H: High speed	10pps to 500,000pps	3,000pps
T: Accelerating/decelerating time	1ms to 1,000ms	100ms

- The value for A1 (SP1) becomes the transition speed for "D:" command during communication control (reciprocal rewriting). A2 (SP2) to A4 (SP4) can also be specified from communication control "D02:" to "D04:".
- The accelerating/decelerating time specified here also becomes decelerating time upon decelerating and stopping using the stop command "L:" or [Stop] key. The value also becomes the accelerating/decelerating time when reversing at a limit or the decelerating time upon stopping.

SPD Mode Operations

1. Confirm that the mode is JOG, STP, or ABS.
2. Press [Menu] and display the Menu screen.
3. Move the cursor to "SPD" using [+] located on the side and press [Ent].
4. The SPD mode screen displaying the current settings will appear.
5. Specify each item in order.
   [+] or [-] on the left and right: Moves the digit.
   [+] or [-] on the top and bottom: Specifies a value.
   [Ent]: Go to the next item.
   [High]: Back to the previous item.
6. Press [Ent] every time an item is specified. This will save the setting and move the cursor to the next item.
7. Press [Menu] when all items are specified.
   A confirmation screen for "backup writing" to flash memory will appear. If you want to write into flash memory, press [Ent]. If not, press [Stop].
8. The mode will return to JOG mode.

JOG mode

```
A:＋00001500     JOG
B:－00000500     SP1
```
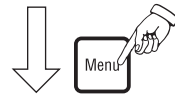
Menu

Menu screen

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```
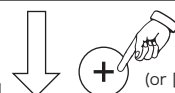
＋

SPD mode selection

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

Ent

SPD mode screen

```
AXIS＝A1  L＝000500
H＝003000    T＝0050
```

＋ (or [-] key)

SPD mode setting

```
AXIS＝A1  L＝001000
H＝005000    T＝0150
```

Menu

Confirmation screen for backup writing

```
Backup  Write  OK?
Yes＝Ent  No＝Stop
```

Write in memory with [Ent]
Set tentatively with [Stop]
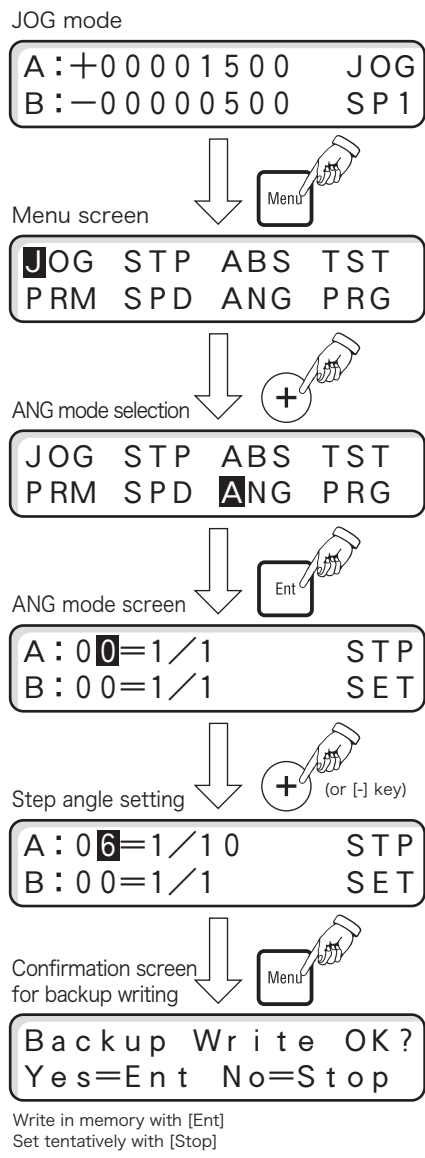
16 ANG Mode (Setting Step Angle)

Specify the turning angle of the motor per onestep against a partition number of a full step. The following are the step angles that can be specified.

Setup No.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Partition No.	1	2	2.5	4	5	8	10	20	25	40	50	80	100	125	200	250

▨ Default

Setting Angle Mode

1. Confirm that the mode is JOG mode.
2. Press [Menu] and display the Menu screen.
3. Move the cursor to "ANG" using [+] located on the side and press [Ent].
4. The ANG mode screen will appear.
   The cursor will go to the value specified for Axis A ("02" is specified by default).
5. Specify the step angle for Axis A using [+] or [-] on the top and bottom
6. Press the [Ent] key when Axis A is specified or when you do not want to change the setting for Axis A.
7. The cursor will go to Axis B so specify Axis B in the same procedure.
8. Press [Menu] when all axes are specified.
   A confirmation screen for "backup writing" to flash memory will appear. If you want to write into flash memory, press [Ent]. If not, press [Stop].
9. The mode will return to JOG mode.

JOG mode

```
A:＋00001500    JOG
B:－00000500    SP1
```

Menu screen

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

ANG mode selection

```
JOG  STP  ABS  TST
PRM  SPD  ANG  PRG
```

ANG mode screen

```
A:00=1／1      STP
B:00=1／1      SET
```

Step angle setting

```
A:06=1／10     STP
B:00=1／1      SET
```

Confirmation screen for backup writing

```
Backup  Write  OK?
Yes＝Ent  No＝Stop
```

Write in memory with [Ent]
Set tentatively with [Stop]

17 Home (Origin Return)

This function returns the stage to its origin point. The direction and method for returning to origin point are specified in the parameter of the main QT-AMH2-OP unit. For details, see "Parameters" (P.17) and "Origin Return Operation" (P.20).

The origin return function is valid in the JOG and STP modes.

Origin Return (HOM) Operation

1. Confirm that the mode is JOG mode or STP mode.
2. Press [Home].
3. When the Origin return mode screen (HOM) appears, select the axis to return to the origin point.
   Axis selection: [+] or [-] on the left and right.
   Value setting: [+] or [-] on the top and bottom. (Select "1" for origin return)
4. The origin return operation will start by pressing [Ent] after specifying the above items.
5. The movement will stop when the origin point is detected and coordinate "0" will appear. The mode will return to one prior to performing the origin return operation.

JOG mode (STP mode)

```
A:＋00001500    JOG
B:－00000500    SP1
```

Home
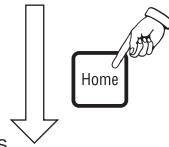
Selection of
origin return axis

```
A:1  B:0        HOM
```

Select "1" for origin return and "0" for other.

Origin return error

"Er" appears on the screen indicating that the origin return operation has failed. When an error occurs, all keys other than the [Stop] key become invalid.

The origin return error status can be released by pressing the [Stop] key. The cause of the origin return error must be eliminated (by checking the sensor/sensor logic, mode, decreasing the speed for returning, etc.) before starting the operation again.

```
A:－10305078 Er HOM
B:＋00000000
```

Origin return error indication (Axis A)

CHUO PRECISION INDUSTRIAL CO., LTD.

The contents of this manual are subject to change without notice. In addition, we may reform the product itself without notice.