

mitsubishi

**MOTION CONTROLLER
(SV13)**

*A30TU type Teaching unit
Operating Manual*

type A171SCPU, A273UHCPU

REVISIONS

The manual number is given on the bottom left of the back cover.

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INTRODUCTION

Thank you for purchasing the Mitsubishi Motion Controller/Personal Machine Controller. This instruction manual describes the handling and precautions of this unit. Incorrect handling will lead to unforeseen events, so we ask that you please read this manual thoroughly and use the unit correctly.

Please make sure that this manual is delivered to the final user of the unit and that it is stored for future reference.

Precautions for Safety

Please read this instruction manual and enclosed documents before starting installation, operation, maintenance or inspections to ensure correct usage. Thoroughly understand the machine, safety information and precautions before starting operation.

The safety precautions are ranked as "Warning" and "Caution" in this instruction manual.



WARNING

When a dangerous situation may occur if handling is mistaken leading to fatal or major injuries.



CAUTION












When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries, or physical damage.

Note that some items described as cautions may lead to major results depending on the situation. In any case, important information that must be observed is described.

For Safe Operations





1. Prevention of electric shocks

 **WARNING**

-  Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
-  Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
-  Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the control unit and servo amplifier are charged and may lead to electric shocks.
-  When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc. Failing to do so may lead to electric shocks.
-  Always ground the control unit, servo amplifier and servomotor with Class 3 grounding. Do not ground commonly with other devices.
-  The wiring work and inspections must be done by a qualified technician.
-  Wire the units after installing the control unit, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
-  Never operate the switches with wet hands, as this may lead to electric shocks.
-  Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
-  Do not touch the control unit, servo amplifier or servomotor terminal blocks while the power is ON, as this may lead to electric shocks.
-  Do not touch the internal power supply, internal grounding or signal wires of the control unit and servo amplifier, as this may lead to electric shocks.







2. For fire prevention

 **CAUTION**

-  Install the control unit, servo amplifier, servomotor and regenerative resistor on inflammable material. Direct installation on flammable material or near flammable material may lead to fires.
-  If a fault occurs in the control unit or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fires may occur.
-  When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fires.
-  Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fires.

3. For injury prevention

CAUTION

-  Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
-  Do not mistake the terminal connections, as this may lead to destruction or damage.
-  Do not mistake the polarity (+/-), as this may lead to destruction or damage.
-  The servo amplifier's heat radiating fins, regenerative resistor and servo amplifier, etc., will be hot while the power is ON and for a short time after the power is turned OFF. Do not touch these parts as doing so may lead to burns.
-  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.













4. Various precautions

Strictly observe the following precautions.

Mistaken handling of the unit may lead to faults, injuries or electric shocks.

(1) System structure

CAUTION

-  Always install a leakage breaker on the control unit and servo amplifier power source.
-  If installation of a magnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the magnetic contactor.
-  Install an external emergency stop circuit so that the operation can be stopped immediately and the power shut off.
-  Use the control unit, servo amplifier, servomotor and regenerative resistor with the combinations listed in the instruction manual. Other combinations may lead to fires or faults.
-  If safety standards (ex., robot safety rules, etc.,) apply to the system using the control unit, servo amplifier and servomotor, make sure that the safety standards are satisfied.
-  If the operation during a control unit or servo amplifier error and the safety direction operation of the control unit differ, construct a countermeasure circuit externally of the control unit and servo amplifier.
-  In systems where coasting of the servomotor will be a problem during emergency stop, servo OFF or when the power is shut OFF, use dynamic brakes.
-  Make sure that the system considers the coasting amount even when using dynamic brakes.
-  In systems where perpendicular shaft dropping may be a problem during emergency stop, servo OFF or when the power is shut OFF, use both dynamic brakes and magnetic brakes.
-  The dynamic brakes must be used only during emergency stop and errors where servo OFF occurs. These brakes must not be used for normal braking.
-  The brakes (magnetic brakes) assembled into the servomotor are for holding applications, and must not be used for normal braking.
-  Construct the system so that there is a mechanical allowance allowing stopping even if the stroke end limit switch is passed through at the max. speed.

 **CAUTION**

- ⚠ Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- ⚠ Use wires and cables within the length of the range described in the instruction manual.
- ⚠ The ratings and characteristics of the system parts (other than control unit, servo amplifier, servomotor) must be compatible with the control unit, servo amplifier and servomotor.
- ⚠ Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- ⚠ There may be some cases where holding by the magnetic brakes is not possible due to the life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Parameter settings and programming

 **CAUTION**

- ⚠ Set the parameter values to those that are compatible with the control unit, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- ⚠ The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode, servo amplifier and servo power unit. The protective functions may not function if the settings are incorrect.
- ⚠ Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- ⚠ Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- ⚠ Set the servomotor encoder type (increment, absolute position type, etc.) parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- ⚠ Set the servomotor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- ⚠ Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- ⚠ Use the program commands for the program with the conditions specified in the instruction manual.
- ⚠ Set the sequence function program capacity setting, device capacity, latch validity range, I/O assignment setting, and validity of continuous operation during error detection to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- ⚠ Some devices used in the program have fixed applications, so use these with the conditions specified in the instruction manual.
- ⚠ The input devices and data registers assigned to the link will hold the data previous to when communication is terminated by an error, etc. Thus, an error correspondence interlock program specified in the instruction manual must be used.
- ⚠ Use the interlock program specified in the special function unit's instruction manual for the program corresponding to the special function unit.

(3) Transportation and installation

⚠ CAUTION

- ⚠ Transport the product with the correct method according to the weight.
- ⚠ Use the servomotor suspension bolts only for the transportation of the servomotor. Do not transport the servomotor with machine installed on it.
- ⚠ Do not stack products past the limit.
- ⚠ When transporting the control unit or servo amplifier, never hold the connected wires or cables.
- ⚠ When transporting the servomotor, never hold the cables, shaft or detector.
- ⚠ When transporting the control unit or servo amplifier, never hold the front case as it may fall off.
- ⚠ When transporting, installing or removing the control unit or servo amplifier, never hold the edges.
- ⚠ Install the unit according to the instruction manual in a place where the weight can be withstood.
- ⚠ Do not get on or place heavy objects on the product.
- ⚠ Always observe the installation direction.
- ⚠ Keep the designated clearance between the control unit or servo amplifier and control panel inner surface or the control unit and servo amplifier, control unit or servo amplifier and other devices.
- ⚠ Do not install or operate control units, servo amplifiers or servomotors that are damaged or that have missing parts.
- ⚠ Do not block the intake/outtake ports of the servomotor with cooling fan.
- ⚠ Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the control unit, servo amplifier or servomotor.
- ⚠ The control unit, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- ⚠ Securely fix the control unit and servo amplifier to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- ⚠ Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.
- ⚠ Store and use the unit in the following environmental conditions.

Environment	Conditions	
	Control unit/servo amplifier	Servomotor
Ambient temperature	0°C to +55°C (With no freezing)	0°C to +40°C (With no freezing)
Ambient humidity	According to each instruction manual.	80%RH or less (With no dew condensation)
Storage temperature	According to each instruction manual.	-20°C to +65°C
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist.	
Altitude	1000m or less above sea level.	
Vibration	According to each instruction manual.	

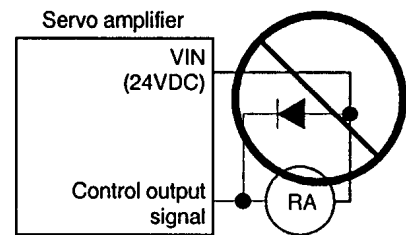
 **CAUTION**

- ⚠ When coupling with the synchronization encoder or servomotor shaft end, do not apply impact such as by hitting with a hammer. Doing so may lead to detector damage.
- ⚠ Do not apply a load larger than the tolerable load onto the servomotor shaft. Doing so may lead to shaft breakage.
- ⚠ When not using the unit for a long time, disconnect the power line from the control unit or servo amplifier.
- ⚠ Place the control unit and servo amplifier in static electricity preventing vinyl bags and store.
- ⚠ When storing for a long time, contact the Service Center or Service Station.

(4) Wiring

 **CAUTION**

- ⚠ Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servomotor.
- ⚠ After wiring, install the protective covers such as the terminal covers to the original positions.
- ⚠ Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.
- ⚠ Correctly connect the output side (terminals U, V, W). Incorrect connections will lead the servomotor to operate abnormally.
- ⚠ Do not connect a commercial power supply to the servomotor, as this may lead to trouble.
- ⚠ Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.
- ⚠ Do not connect or disconnect the connection cables between each unit, the encoder cable or sequence expansion cable while the power is ON.
- ⚠ Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables coming off during operation.
- ⚠ Do not bundle the power line or cables.



(5) Trial operation and adjustment

 **CAUTION**

- ⚠ Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- ⚠ Extreme adjustments and changes may lead to unstable operation, so never make them.

(6) Usage methods

⚠ CAUTION

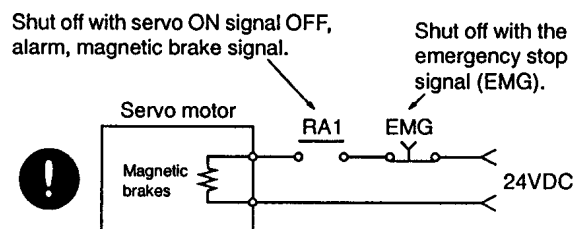
- ⚠ Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the control unit, servo amplifier or servomotor.
- ⚠ Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.
- ⚠ The units must be disassembled and repaired by a qualified technician.
- ⚠ Do not make any modifications to the unit.
- ⚠ Keep the effect or magnetic obstacles to a minimum by installing a noise filter or by using wire shields, etc. Magnetic obstacles may affect the electronic devices used near the control unit or servo amplifier.
- ⚠ Use the units with the following conditions.

Item	Conditions
Input power	According to the separate instruction manual.
Input frequency	According to the separate instruction manual.
Tolerable momentary power failure	According to the separate instruction manual.

(7) Remedies for errors

⚠ CAUTION

- ⚠ If an error occurs in the self diagnosis of the control unit or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
- ⚠ If a dangerous state is predicted in case of a power failure or product failure, use a servomotor with magnetic brakes or install a brake mechanism externally.
- ⚠ Use a double circuit construction so that the magnetic brake operation circuit can be operated by emergency stop signals set externally.
- ⚠ If an error occurs, remove the cause, secure the safety and then resume operation.
- ⚠ The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)











(8) Maintenance, inspection and part replacement

⚠ CAUTION




- ⚠ Perform the daily and periodic inspections according to the instruction manual.
- ⚠ Perform maintenance and inspection after backing up the program and parameters for the control unit and servo amplifier.
- ⚠ 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.

 **CAUTION**

-  Do not touch the lead sections such as ICs or the connector contacts.
-  Do not place the control unit or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
-  Do not perform a megger test (insulation resistance measurement) during inspection.
-  When replacing the control unit 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.
-  Do not short circuit, charge, overheat, incinerate or disassemble the batteries.
-  The electrolytic capacitor will generate gas during a fault, so do not place your face near the control unit or servo amplifier.
-  The electrolytic capacitor and fan will deteriorate. Periodically change these to prevent secondary damage from faults. Replacements can be made by the Service Center or Service Station.



(9) Disposal

 **CAUTION**

-  Dispose of this unit as general industrial waste.
-  Do not disassemble the control unit, servo amplifier or servomotor parts.
-  Dispose of the battery according to local laws and regulations.

(10) General cautions








 **CAUTION**

-  All drawings provided in the instruction manual show the state with the covers and safety partitions removed to explain detailed sections. When operating the product, always return the covers and partitions to the designated positions, and operate according to the instruction manual.
-  Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment. All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples. Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

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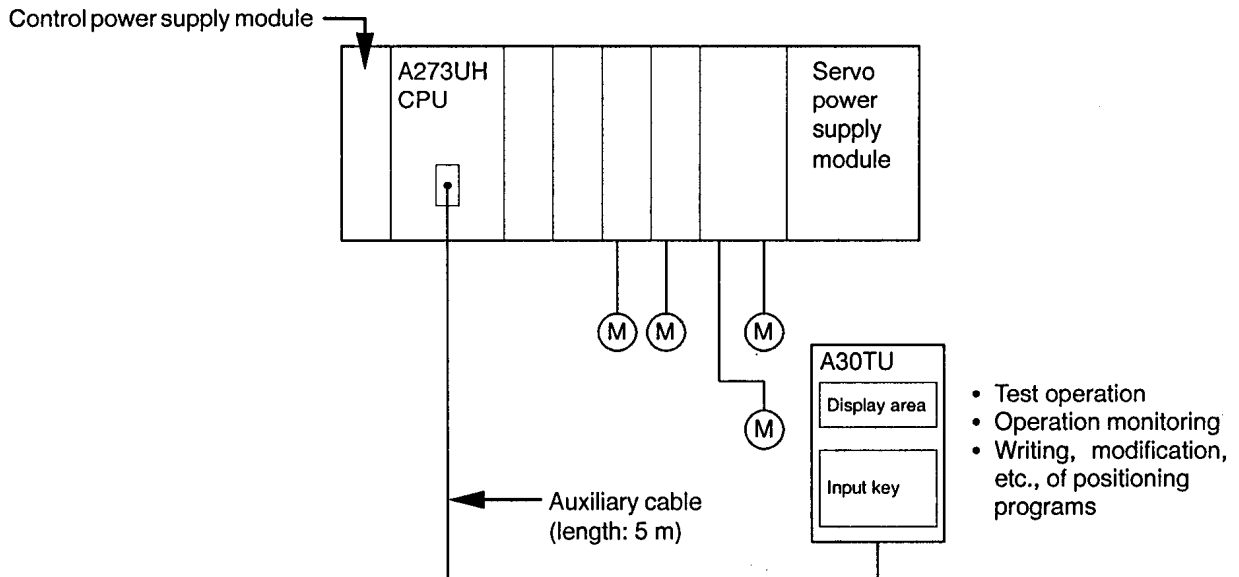
1. GENERAL DESCRIPTION

Drawing No.

Mode		Function		1-1
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This manual covers the specifications, handling, and operation procedures for the A30TU teaching unit (hereafter referred to as "A30TU").

The A30TU teaching unit can be connected to the A273UHCPU/A171SCPU (OS name: SV13...real mode) motion controller to perform test operations, operation monitoring, and writing of positioning programs.



The configuration and main base unit name are different from those shown above when the A30TU is connected to an A171SCPU motion controller.

CAUTION

- ⚠ All settings and control procedures should be executed within the ranges specified in this manual.
- ⚠ In order to prevent servo system CPU problems, an external safety circuit should be installed.
- ⚠ As some of the components mounted on the PCBs (printed circuit boards) are susceptible to static electricity, either the work table or the worker should be grounded when handling the PCBs. The PCB conductive areas and electrical components should not be touched directly.

1.1 A273UHCPU & A171SCPU Compatibility with the A30TU

A273UHCPU and A171SCPU compatibility with the A30TU depends on the OS name and version.

When used with the A273UHCPU, compatibility can be checked at the CPU's LED display. The version is displayed at power ON and when the LED display reset switch is pressed.



A30TU can be connected if "U" is displayed. If "U" is not displayed (blank), the A30TU cannot be connected.

When used with the A171SCPU, compatibility can be checked at the IBM-PC (SW2SRX-GSV13PE).

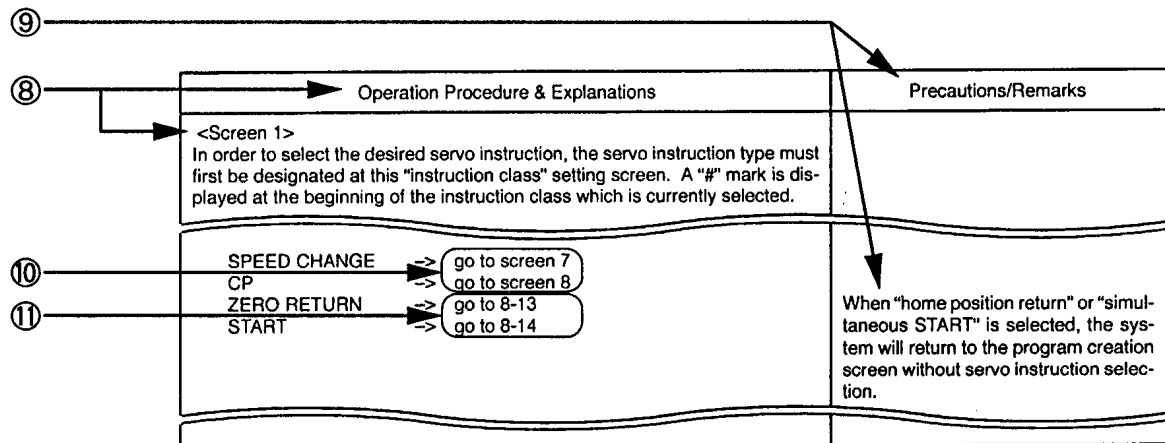
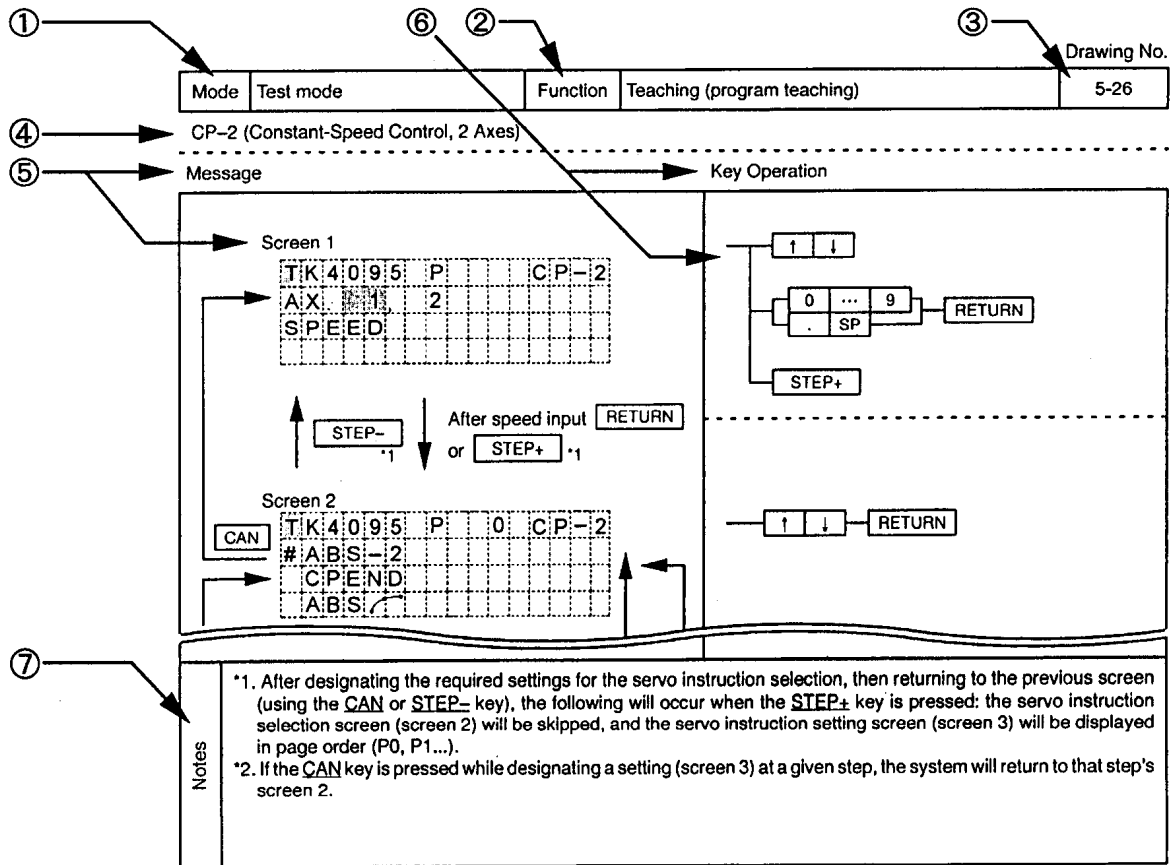
* If the version is incompatible with the A30TU, install the A30TU compatible system data (SW2SRX-SV13V, SW2SRX-SV13K or SW0SRX-SV13M) from the system FD to the A273UHCPU or A171SCPU using the IBM-PC. Connection of the A30TU will then be possible.

1.2 Guide to Using the Manual

Drawing No.

Mode		Function		1-2
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The layout format used in this manual is explained below.



Mode		Function		1-2.1
------	--	----------	--	-------

No.	Description
①	• The selected mode (data, program, monitor, test) is indicated.
②	• The function or item selected at the mode's initial screen is displayed.
③	• The number of the screen where the function or item is explained is displayed here. • A "[O-O]" number is also displayed here as shown at item ⑩.
④	• Item ② details are displayed here.
⑤	• The screen content (message) for the function in question is displayed here.
⑥	• Keys which are operative with the item ⑤ screen are indicated, and the operation procedure is shown.
⑦	• Notes related to the displayed screen are shown here.
⑧	• Operation procedure details for the item ⑤ screen are displayed here.
⑨	• Notes and supplementary information related to item ⑧ are displayed here.
⑩	• The screen number of the next operation is displayed here. (Operation within same function or item)
⑪	• The item number (③) of the next operation is displayed here. (Operations with different item Nos.)

* The numbers shown at the right in the table of contents are screen numbers. Searches for given items in the table of contents should be conducted using the item ③ entries on each page.

2. FUNCTION LIST

Drawing No.

Mode		Function		2-1
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2.1 Function List

Mode	Item	Description	①	②	
Test mode	Present value setting	Zero return	Home position returns occur in accordance with the home position return parameter data settings.	▲	○
		Present value change	The feed present value is changed to the designated present value.	▲	○
	JOG operation		JOG operation is executed at the designated axis (override setting possible).	▲	○
	Teaching	Address teach	The present value is written to the designated program address. JOG operation is executed at the designated axis (override setting possible).	▲	○
		Program teach	Present values are written to addresses while the program is being created.	▲	○
	Program operation		Program operation is executed by designating the program number. Registered program numbers are executed in a continuous manner.	▲	○
	PC test		Used to forcibly set PC devices: Y,M,D,W, etc.	▲	○
	Servo ON/OFF	All-axes servo ON/OFF	All-axes servo ON/OFF executed.	▲	○
Designated axis servo ON/OFF		Servo ON/OFF switching occurs at the designated axis only.	▲	○	
Monitor mode	Address		The feed present value at 3 axes is monitored.	○	○
	Error		Error (minor, major, servo) monitoring of 3 axes.	○	○
	Axis monitor		Data for one axis is monitored.	○	○
	Common monitor		Data other than axis data is monitored.	○	○
	Specified monitor		Monitoring is designated by designating a Y,M,D,W, etc. device number.	○	○
	Torque trace		Effective torque and maximum torque are checked.	○	○
	Servo motor		Servo data is monitored.	○	○
	Scroll monitor		Effective program number and error number are monitored.	○	○
Data set	System settings		System settings data are checked or initialized.	—	○
	Axis data		Fixed parameters are checked or changed. Servo parameters are checked or changed. Home position return data is checked or changed. JOG data is checked or changed.	△	○
	Parameter block		Each parameter block is checked or changed.	△	○
	Limit switch		Each limit switch is checked or initialized.	—	○
	All-Clear		All parameter data is cleared.	—	○
	Auxiliary function		Backlight, buzzer ON/OFF switching, and language selection.	▲	○
Program	Readout		Program readouts are executed by designating the program number.	○	○
	Writing		Program writing/modification occurs after a program readout.	▲	○
	Deletion		Deletion is possible in program number units.	▲	○
	Sort		Program area is sorted.	▲	○
	Copy		Copying is possible in program number units.	▲	○
	All-Clear		The program area is cleared.	▲	○

① Indicates whether or not operation can be performed at A30TU.

② Indicates whether or not operation can be performed at IBM-PC (SW2SRX-GSV13PE).

○ . . . Key operation is possible.

△ . . . Key inputs at this item are ignored when the enabled/disabled switch is set to "disabled".

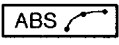
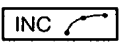
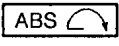
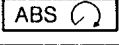
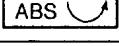
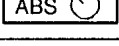
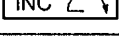
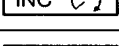
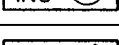
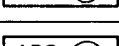
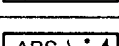
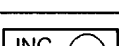
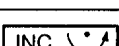

▲ . . . When the enabled/disabled switch is set to "disabled", key operation related to data checks are possible, but those related to data changes are ignored.

— . . . Key operation is impossible.
Execute the operation at IBM-PC (SW2SRX-GSV13PE).

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Mode		Function		2-2
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2.2 Instruction Code List

Positioning Control	Instruction Symbol	Processing Details	A30TU (SV13)	IBM-PC (SW2SRX-GSV13PE)	Remarks		
Linerar control	1 axis	ABS-1	Absolute 1-axis positioning	○	○		
		INC-1	Incremental 1-axis positioning	○	○		
	2 axes	ABS-2	Absolute 2-axis positioning	○	○		
		INC-2	Incremental 2-axis positioning	○	○		
	3 axes	ABS-3	Absolute 3-axis positioning	○	○		
		INC-3	Incremental 3-axis positioning	○	○		
	4 axes	ABS-4	Absolute 4-axis positioning	○	○		
		INC-4	Incremental 4-axis positioning	○	○		
Circular interpolation control	Auxiliary point designation	ABS 	Absolute circular interpolation by auxiliary point designation	○	○		
		INC 	Incremental circular interpolation by auxiliary point designation	○	○		
	Radius designation	ABS 	Absolute circular interpolation by radius designation; less than CW 180 °	○	○		
		ABS 	Absolute circular interpolation by radius designation; more than CW 180 °	○	○		
		ABS 	Absolute circular interpolation by radius designation; less than CCW 180 °	○	○		
		ABS 	Absolute circular interpolation by radius designation; more than CCW 180 °	○	○		
		INC 	Incremental circular interpolation by radius designation; less than CW 180 °	○	○		
		INC 	Incremental circular interpolation by radius designation; more than CW 180 °	○	○		
		INC 	Incremental circular interpolation by radius designation; less than CCW 180 °	○	○		
		INC 	Incremental circular interpolation by radius designation; more than CCW 180 °	○	○		
	Center point designation	ABS 	Absolute circular interpolation by center point designation; CW	○	○		
		ABS 	Absolute circular interpolation by center point designation; CCW	○	○		
		INC 	Incremental circular interpolation by center point designation; CW	○	○		
		INC 	Incremental circular interpolation by center point designation; CCW	○	○		
	Fixed-pitch feed	1 axis	FEED-1	1-axis fixed-pitch feed START	○	○	
		2 axes	FEED-2	2-axis linear interpolation fixed-pitch feed START	○	○	
3 axes		FEED-3	3-axis linear interpolation fixed-pitch feed START	○	○		
Speed switching control		VSTART	Speed switching control START	○	○		
		VEND	Speed switching control END	○	○		
		VABS	Absolute designation of speed switching point	○	○		
		VINC	Incremental designation of speed switching point	○	○		

Mode		Function		2-2.1
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Positioning Control	Instruction Symbol	Processing Details	A30TU (SV13)	IBM-PC (SW2SRX-GSV13PE)	Remarks	
Speed control	Forward	VF	Speed control, forward START	○	○	
	Reverse	VR	Speed control, reverse START	○	○	
Speed control II	Forward	VVF	Speed control, forward START II	○	○	
	Reverse	VVR	Speed control, reverse START II	○	○	
Speed & position control	Forward	VPF	Speed & position control, forward START	○	○	
	Reverse	VPR	Speed & position control, reverse START	○	○	
	Restart	VPSTART	Speed & position control, restart	○	○	
Position follow-up control	PFSTART	Position follow-up control	○	○		
Constant-speed control	CPSTART1	1-axis constant speed control START	○	○		
	CPSTART2	2-axis constant speed control START	○	○		
	CPSTART3	3-axis constant speed control START	○	○		
	CPSTART4	4-axis constant speed control START	○	○		
	CPEND	Constant-speed control END	○	○		
Repetition of same control (used with speed switching control & constant-speed control)	FOR-TIMES	Designates start of repeat range	○	○		
	FOR-ON					
	FOR-OFF	Designates end of repeat range	○	○		
NEXT						
Simultaneous START	START	Simultaneous START	○	○		
Zero return	ZERO	Zero return START	○	○		

○ ... All test mode (teaching) and program mode operations, etc. are operative.

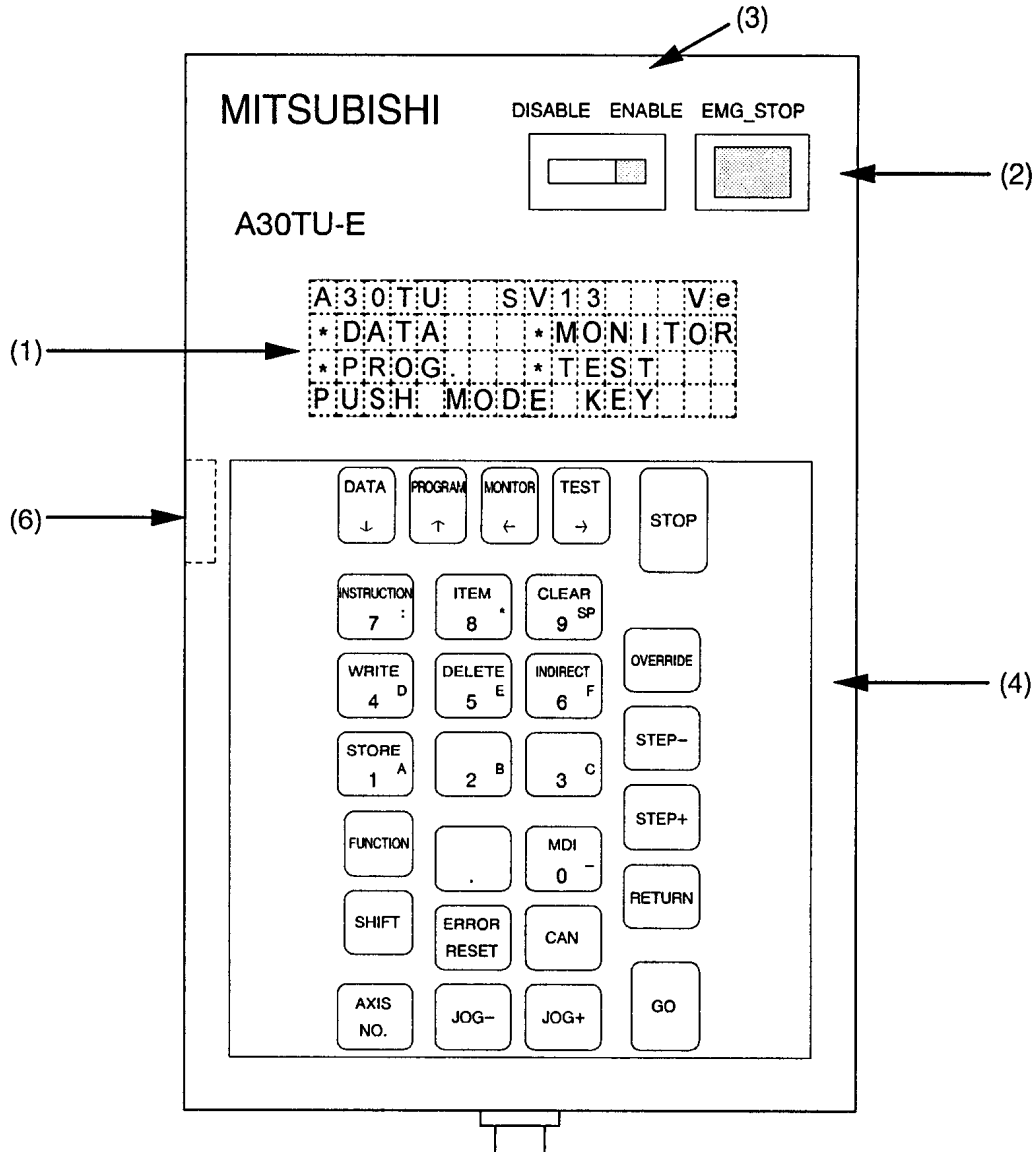
△ ... Operative, but program content is not displayed in test mode and program operations (copy, all clear, sort).

3. GUIDE TO THE A30TU AND IT'S KEYS

Drawing No.

Mode		Function		3-1
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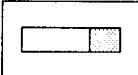
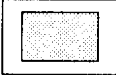











Appearance of A30TU (Teaching Unit)






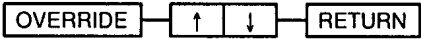






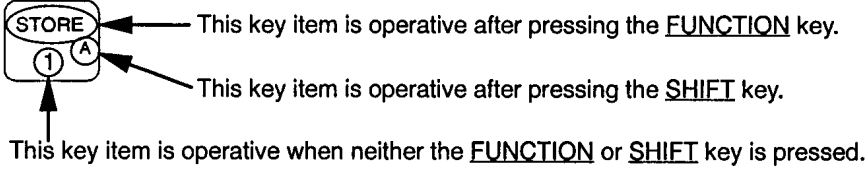


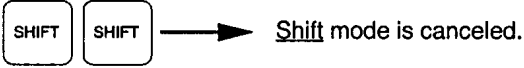
- (1) Display area
4 lines x 16 characters liquid crystal display. Equipped with a backlight automatic OFF function and contrast adjusting dial.
- (2) Emergency stop key
Shuts OFF servo power, stopping all motion.
- (3) Enabled/Disabled switch
Enables and disables teaching box operation.
- (4) Control keys
These are the teaching box control keys.
- (5) Internal alarm
Buzzer sounds at key inputs and when an alarm occurs. The key input alarm can be switched OFF if desired.
- (6) Contrast adjusting dial
Adjusts the display screen contrast.

Mode	Function	3-2
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





Control Key Explanations

Key	Explanation
<p>DISABLE ENABLE</p> 	<p>Enables and disables teaching box operation. When set to "disabled", test mode and data change key operations will be disabled.</p>
<p>EMG_STOP</p> 	<p>Shuts OFF all power, causing an immediate stop on all axes. *1</p>
<p>DATA</p> 	<p>The function stated on the upper half of the key is for the <u>data</u> setting mode, and becomes operative after the FUNCTION key has been pressed. The meaning of the symbol on the lower half of the key <u>↓</u> varies according to the operation being executed (override value change, or position alignment by numeric input, etc.).</p>
<p>PROGRAM</p> 	<p>The function stated on the upper half of the key is for the <u>program</u> mode, and becomes operative after the FUNCTION key has been pressed. The meaning of the symbol on the lower half of the key <u>↑</u> varies according to the operation being executed (override value change, or position alignment by numeric input, etc.).</p>
<p>MONITOR</p> 	<p>The function stated on the upper half of the key is for the <u>monitor</u> mode, and becomes operative after the FUNCTION key has been pressed. The meaning of the symbol on the lower half of the key <u>←</u> varies according to the operation being executed (position alignment by numeric input, or switch variable value change, etc.).</p>
<p>TEST</p> 	<p>The function stated on the upper half of the key is for the <u>test</u> mode, and becomes operative after the FUNCTION key has been pressed. The meaning of the symbol on the lower half of the key <u>→</u> varies according to the operation being executed (position alignment by numeric input, or switch variable value change, etc.).</p>
<p>STOP</p> 	<p>Executes a START and STOP at program operations and when designating present value settings, etc.</p>
<p>AXIS NO.</p> 	<p>Designates the axis number. After pressing this key, a numeric value between <u>1</u> and <u>32</u> must be input. (<u>1</u> to <u>8</u> for A273UHCPU 8-axis specs.; <u>1</u> to <u>32</u> for A273UHCPU 32-axis specs.; <u>1</u> to <u>4</u> for A171SCPU)</p>
<p>CAN</p> 	<p>Used to switch to a higher level screen. The "higher level" screen can be the previous screen or a function/mode selection screen.</p>
<p>ERROR RESET</p> 	<p>Executes an error reset.</p>
<p>FUNCTION</p> 	<p>When an MDI, STORE, WRITE, DELETE, INDIRECT, INSTRUCTION, ITEM, or CLEAR key input is required, press the FUNCTION key, then press the appropriate key from <u>0</u> to <u>9</u>. The FUNCTION key must also be pressed before pressing the DATA, PROGRAM, MONITOR, and TEST keys.</p>
<p>SHIFT</p> 	<p>The SHIFT key must be pressed in order to execute <u>=</u>, <u>A</u>, <u>B</u>, <u>C</u>, <u>D</u>, <u>E</u>, <u>E</u> <u>:</u>, <u>#</u>, <u>SP</u> inputs.</p>
	<p>Insert/overwrite switching in the program mode is possible using the FUNCTION key plus <u>.</u> key. The function indicated by the symbol on the lower half of the key is used to enter a decimal point in numeric data. When using the upper half of the key for speed type inputs, the SHIFT key must first be pressed.</p>
<p>Notes</p>	<p>*1: Note that if the teaching unit is disconnected from the RS-422 connector while a teaching unit emergency stop is in effect, the emergency stop status will be cancelled. If an emergency stop function that applies to the system as a whole is required, it must be provided separately.</p>

Mode		Function	3-2.1
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Key	Explanation																																																				
	<p>JOG operation is executed in the address increase direction while this switch is pressed. Operation stops when the switch is released.</p>																																																				
	<p>JOG operation is executed in the address decrease direction while this switch is pressed. Operation stops when the switch is released.</p>																																																				
	<p>Used to execute JOG speed changes during JOG operations. After pressing this key, use the \downarrow, \uparrow keys to select the desired value from the override table, then press the <u>RETURN</u> key.</p> <div style="text-align: center;">  </div>																																																				
	<p>Used during teaching operations for movement between points and monitor screen switching, etc.</p>																																																				
																																																					
	<p>Used as the "data set" key for function selections, override selections, teaching, program operations, and present value changes.</p>																																																				
	<p>Used as the "execute" or "START" key.</p>																																																				
 	<p>Used as the "data set" key for function selections, override selections, teaching, program operations, and present value changes.</p> <div style="text-align: center;">  </div>																																																				
 key operation	<p>When the <u>SHIFT</u> key is pressed, "S" is displayed at the top left of the screen. When the shift mode is canceled, the display returns to its original status. The shift mode is canceled when another key is pressed after pressing the <u>SHIFT</u> key.</p> <div style="text-align: center;">  </div> <p>The shift mode is only valid for the key which is pressed immediately after pressing the <u>SHIFT</u> key. In cases where consecutive key inputs require the <u>shift</u> mode, the <u>SHIFT</u> key must be pressed before each key input.</p> <div style="text-align: center;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>T</td><td>K</td><td>4</td><td>0</td><td>9</td><td>5</td><td>E</td><td></td><td>A</td><td>B</td><td>S</td><td>-</td><td>1</td></tr> <tr><td>1</td><td>-</td><td>2</td><td>1</td><td>4</td><td>7</td><td>4</td><td>8</td><td>3</td><td>6</td><td>4</td><td>8</td><td>u</td></tr> </table> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>S</td><td>K</td><td>4</td><td>0</td><td>9</td><td>5</td><td>E</td><td></td><td>A</td><td>B</td><td>S</td><td>-</td><td>1</td></tr> <tr><td>1</td><td>-</td><td>2</td><td>1</td><td>4</td><td>7</td><td>4</td><td>8</td><td>3</td><td>6</td><td>4</td><td>8</td><td>u</td></tr> </table> </div>	T	K	4	0	9	5	E		A	B	S	-	1	1	-	2	1	4	7	4	8	3	6	4	8	u	S	K	4	0	9	5	E		A	B	S	-	1	1	-	2	1	4	7	4	8	3	6	4	8	u
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Mode		Function	3-2.2
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Key	Explanation																																																																																																																														
 key operation	<p>When the <u>FUNCTION</u> key is pressed, "F" will be displayed at the top left of the screen. When the function mode is canceled, the screen returns to its original status.</p> <p>   →  key input. </p> <p>   →  key input. </p> <p>   → <u>Function</u> mode is canceled. </p> <div style="display: flex; justify-content: space-around; align-items: center;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>P</td><td>K</td><td>4</td><td>0</td><td>9</td><td>5</td><td></td><td></td><td></td><td></td><td>A</td><td>B</td><td>S</td><td>-</td><td>1</td></tr> <tr><td>A</td><td>X</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>S</td><td>P</td><td></td><td>6</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td></td><td>0</td><td>0</td></tr> <tr><td></td><td></td><td></td><td>1</td><td>-</td><td>2</td><td>1</td><td>4</td><td>7</td><td>4</td><td>8</td><td>3</td><td>6</td><td>4</td><td></td><td>8</td><td>u</td></tr> </table>  <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>F</td><td>K</td><td>4</td><td>0</td><td>9</td><td>5</td><td></td><td></td><td></td><td></td><td>A</td><td>B</td><td>S</td><td>-</td><td>1</td></tr> <tr><td>A</td><td>X</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>S</td><td>P</td><td></td><td>6</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td></td><td>0</td><td>0</td></tr> <tr><td></td><td></td><td></td><td>1</td><td>-</td><td>2</td><td>1</td><td>4</td><td>7</td><td>4</td><td>8</td><td>3</td><td>6</td><td>4</td><td></td><td>8</td><td>u</td></tr> </table> </div>	P	K	4	0	9	5					A	B	S	-	1	A	X					1									S	P		6	0	0	0	0	0	0	0				0	0				1	-	2	1	4	7	4	8	3	6	4		8	u	F	K	4	0	9	5					A	B	S	-	1	A	X					1									S	P		6	0	0	0	0	0	0	0				0	0				1	-	2	1	4	7	4	8	3	6	4		8	u
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A30TU Reset	When the CPU is reset by pressing the CPU RESET key, the A30TU is also reset, after which operation must be restarted from the initial display.																																																																																																																														

Mode		Function		3-3
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Key Inputs Which are Always Valid

When the system is operating, the disabled/enabled status of certain keys varies according to the operation in question. The keys shown below, however, are always valid.

CAN Used to cancel the current operation and return to a higher level screen. Although the “higher level” screen is generally the previous screen, there are exceptions. This key input is ignored when an operation is being executed.

Example:

T	J	O	G								
S	P			6	0	0	0	0	0	0	0
O	V	E	R	R	I	D	E		1	0	0
1	:	-	2	1	4	7	4	8	3	6	4
									8	:	u



T	1	J	O	G		5	P	C	T	E	S	T		
2	T	E	A	C	H	6	S	V	O	.	O	N		
3	P	R	O	G	.	O	P	E	R	A	T	I	O	N
4	P	.	V	A	L	.	S	E	T	T	I	N	G	

ERROR RESET Used for error resets.

Example:



!	E	X	E	C	U	T	E	.	E	R	R	.	R	E	S

STOP Used to stop servo operation.

Example:



!	D	E	.	S	T	O	P	:						

DATA Used to switch from the current mode to the data set mode. When the current mode is the test mode, the test mode cancel screen (5-2) will be displayed before proceeding to the data set mode. This key input is ignored when an operation is being executed.

Example:



D	.	D	A	T	A	.	S	E	T	T	I	N	G	.
1	:	A	X	.	D	A	T	A	:					
2	:	P	.	B	L	O	C	K	:					
3	:	S	.	U	B	.	F	U	N	C	T	I	O	N

PROGRAM Used to switch from the current mode to the program mode. When the current mode is the test mode, the test mode cancel screen (5-2) will be displayed before proceeding to the program mode. This key input is ignored when an operation is being executed.

Example:



P	.	P	R	O	G	R	A	M	:						
1	:	R	E	A	D	.	W	R	.	D	E	L	E	T	E
2	:	S	O	R	T	:									
3	:	C	O	P	Y	.	4	:	A	L	L	.	C	L	R

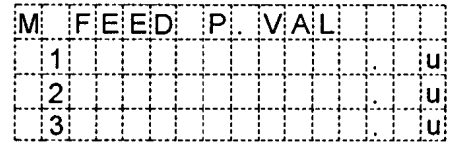
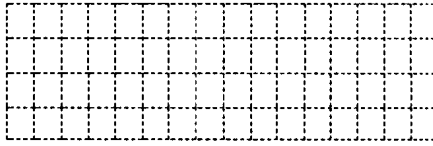
Mode	Function	3-3.1
------	----------	-------

MONITOR

Used to switch from the current mode to the monitor mode.

When the current mode is the test mode, the test mode cancel screen (5-2) will be displayed before proceeding to the monitor mode. This key input is ignored when an operation is being executed.

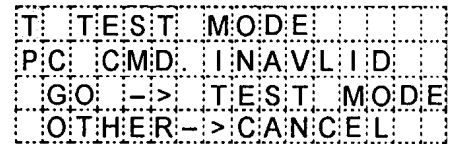
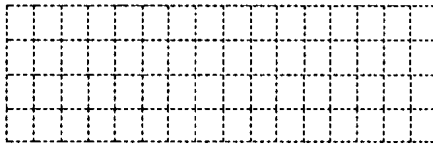
Example:



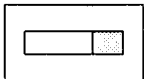
TEST

Used to switch from the current mode to the test mode. This key input is ignored when an operation is being executed.

Example:



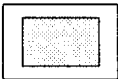
DISABLE ENABLE



The teaching box keys can be designated as disabled or enabled.

This disabled/enabled key status does not affect monitor mode operation, but in the test and program modes it can disable all keys except those which are always enabled (CAN key, etc.).

EMG_STOP



Used to shut OFF the servo power and stop all motion.

Mode		Function		3-5
------	--	----------	--	-----

Display of Units

The units for address displays in each mode are displayed as follows.

Unit display examples

<μm: u>

T	JOG								
S	P.		1	2	3	4	.	0	0
O		V		E		R		R I D E	
1			1	2	3	4	5	6	u

<Inches: i>

T	JOG								
S	P.		1	2	3	.	4	0	0
O		V		E		R		R I D E	
1			1	.	2	3	4	5	6 i

<Degrees: °>

T	JOG								
S	P.		1	2	3	.	4	0	0
O		V		E		R		R I D E	
1			1	.	2	3	4	5	6 °

<Pulses: P>

T	JOG								
S	P.		1	2	3	4	0	0	
O		V		E		R		R I D E	
1			1	2	3	4	5	6	P

4. STARTING THE SYSTEM

4.1 Selecting the Mode

Drawing No.

Mode	Selecting The Mode	Function	4-1
------	--------------------	----------	-----

Messages and Procedures at System Start

Message

The message at the top of the screen will continue to scroll from right to left until a mode key is pressed.
 Note : The OS version is displayed at the locations marked by an asterisk.

Operation Procedure & Explanations

Data set mode selection:

---▶ Go to 7-1

Program mode selection:

---▶ Go to 8-1

Monitor mode selection:

---▶ Go to 6-2

Test mode selection:

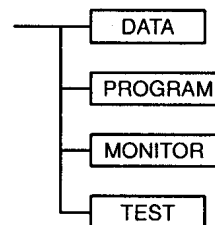
---▶ Go to 5-1

All key inputs except for the mode selection keys shown above, the STOP key, and the ERROR RESET key are ignored at this mode selection screen.
 If the A30TU has been installed at a system with an incompatible OS, the following will be displayed:

```

    C P U タイ プ   ガ   チ   カ   イ   マ   ス
    ( W R O N G   C P U   T Y P E )
    
```

Key Operation



The FUNCTION key must be pressed before pressing the mode key.