Manual No.

9007133-03

INSTALLATION MANUAL

6-AXIS INDUSTRIAL ROBOT

Model: AW8010

(Version No. : 1.0)

Date : JULY. 1, 1990

MATSUSHITA INDUSTRIAL EQUIPMENT CO., LTD.

This Manual describes installation, safety work guidance, and periodic checking on the Industrial Robot "AW8010"

The manual consists of:

Please see "Operation Manual" for operation on AW8010.

* Descriptions in this manual is subject to change without notice.

Chapter 1 Safety Manual

Important Matters (Extracted from the text)

◎ Work wearing a helmet, safety shoes, etc. without fail for protection of the body.

◎ Provide a fixed safety fence around working area of the robot manipulator.

◎ Install a rotating type warning signal light at the place where it can be easily seen to indicate the robot is live.

◎ Surely make ground on the robot with ground resistance less than 100 Ω.

◎ Provide a shading curtain effectively at the place to set and take out a work.

◎ Read thoroughly the Operation Manual before starting operation.

◎ Be sure to contact us if there is a high frequency generator at the vicinity of installing place of the robot.

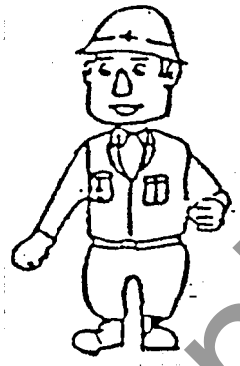
The industrial robot AW8010 is designed and manufactured with provisions of various safety means, but safety operation cannot be guaranteed only by them. Please observe the following procedure and also carry out further safety measures based on actual conditions at individual user side.

Basic procedures for safety operation are summarized as follows :

1. Observance of safety working
2. Improvement of working environment
3. Checking practice

Observance of safety working

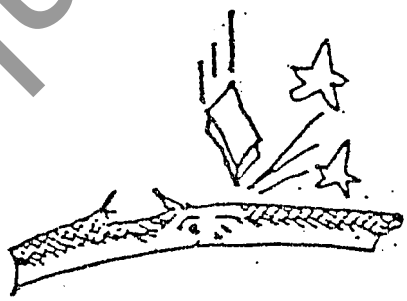
(1) Workers should wear a safety outfit such as a helmet, safety shoes, etc. for the operation.



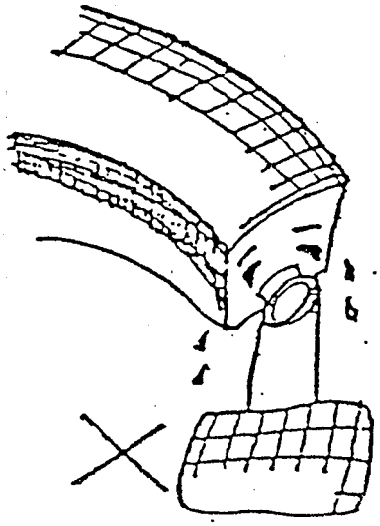
(2) Confirm that no person stays in operating area of the robot before turning on the power.

(3) When entering in operating area of the robot for check and maintenance, be sure to turn OFF power supply.

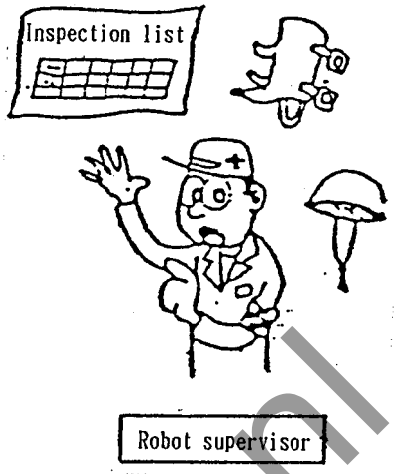
(4) Do not place a thing or step on the cable. When a damage of the cable is found, immediately replace it with a new one.



(5) Do not move forcibly the moving part or put a load more than allowable payload. Applying of unreasonable extreme force will cause degradation of accuracy and damage on parts.



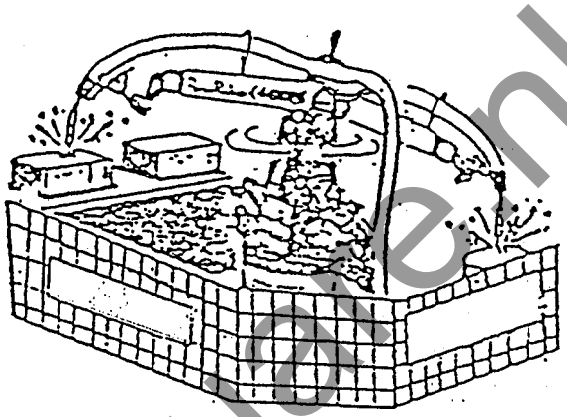
(6) Appoint the supervisor for the robot.
The supervisor has a responsibility for the execution of check and maintenance and safety training.



(7) A person who operates the AW8010 robot first time should carefully read the separate Operation Manual before starting operation.

Improvement of Working Environment

(1) Neatly arranged works, jigs, and tools are essential for safety working. Keep always the working space of the robot with a plenty free space for personnel engaging in check and maintenance or teaching to assure good footing.



(2) Install a fixed safety fence and warning board around the working space of the robot without fail. In order to prevent an accident of pressing a person between the fence and robot arm, it is desirable to install a safety fence more than 40cm apart from working space of the robot.
JIS's requirements for safety fences (proposed) are reproduced below.

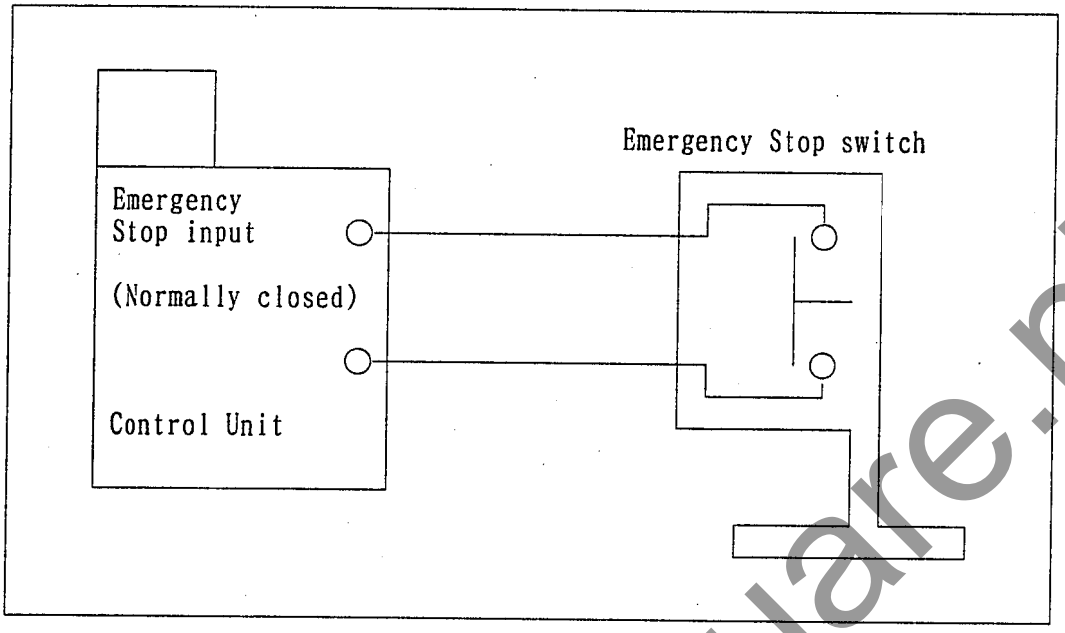
Safety fences, or the like

* A safety fence shall be rugged enough to bear external forces that may be applied to it during operation, and the environmental conditions, and be of such construction that it cannot be adjusted easily, removed, or climbed over, or prevents access to dangerous parts.
* A safety fence itself or the like shall not have any dangerous parts, such as sawtoothed of sharp edges, and projections.
* A safety fence or the like shall be a fixed type as a general rule.
* If a door or the like is provided in the safety fence or the like, door opening shall be interlocked with robot stoppage.

(3) Ground should be surely executed as instructed.
Ground resistance less than 100Ω is required.

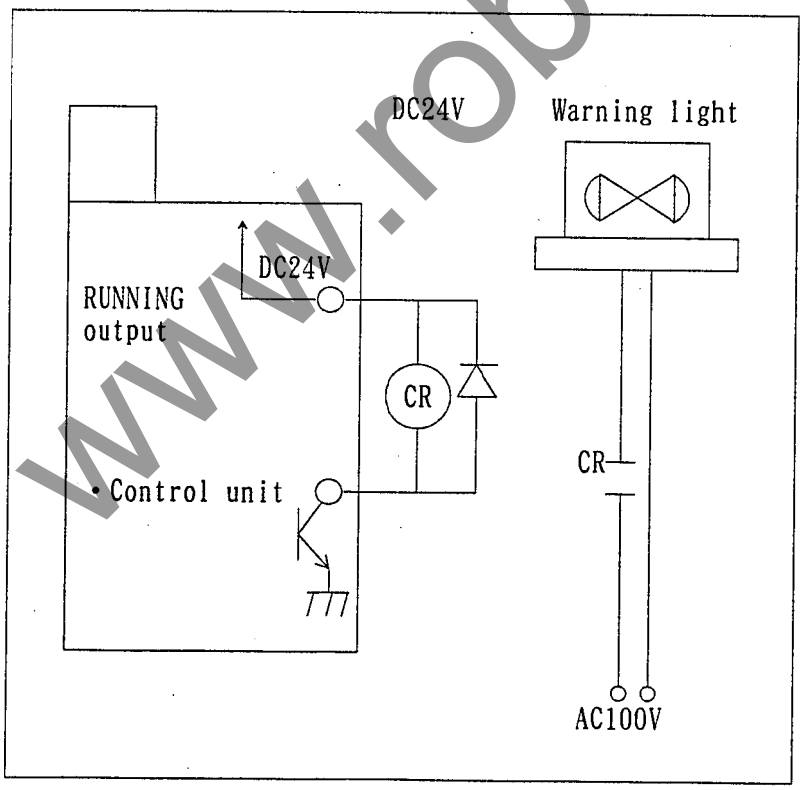
(4) The control unit should not be installed within operating area of the robot. The teaching pendant should also be hanged up on the control unit after completing teaching.

(5) Provide an Emergency Stop switch near the worker who is setting on or taking out a work.



○ How to connect Emergency Stop switch

(6) Be sure to install a rotating type warning signal light at the place where it can be easily seen, indicating the robot is live.
It warns workers around the robot.



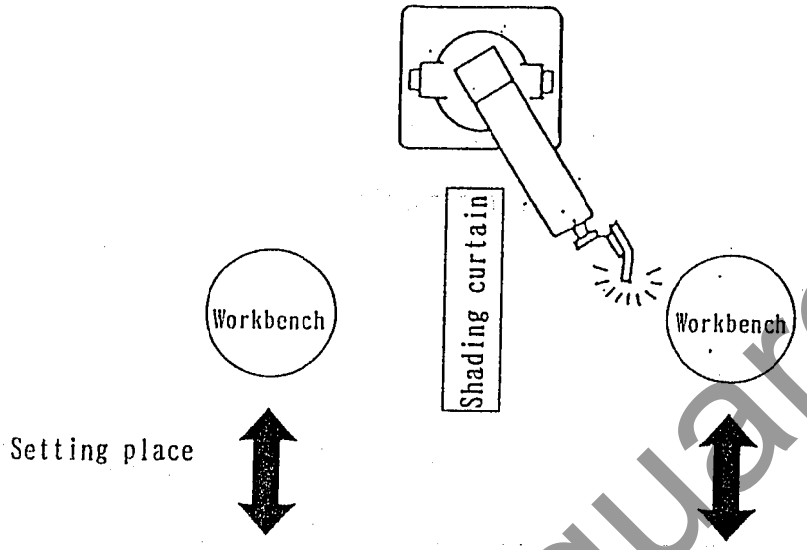
* The Running Output is ON when the robot is running (when the servo power supply is turned on).

Note :
The external relay CR should be 24VDC type.

○ How to connect Warning light

(7) Strong ultraviolet radiation is emitted during welding.

Install a shading wall (curtain) at the place to set on and taking out a work from a workbench to protect the worker from ultraviolet radiation.



(8) If a high frequency generator is near the installing place for the robot, be sure to contact us. High frequency wave accelerates degradation of dielectric strength. By making investigation on the influence of high frequency at our company, you can use the robot with confidence.

Checking practice

For the execution of the safety operation, daily check of mechanical condition and safety check are indispensable.

* As for daily check, please see the items on periodic checking.

(1) Every morning, be sure to carry out safety check before starting operation.

- Is no damage found on the safety fence?
- Aren't the warning board and warning signal light getting dirty or broken?
- Does the Emergency Stop switch work effectively?
- Is there anything unusual on working condition of the robot?
- Is there anything unusual on working condition of a jig?
- Is the workshop neatly arranged?

(2) If any unusual vibration or noise is generated during the operation of the robot, stop the operation and check the robot.

(3) If checking should be carried out on the robot under live condition due to an inevitable conditon, do it by two persons in a pair. Please pay a close attention in the case with one person at the front of the control unit making preparation for pressing the Emergncy Stop switch at any time and the other taking a fair distance from the robot.

Chapter 2. Basic Specifications of Robot

2-1 Table of specifications of robot manipulator

Item			Specification
Model No.			YA8011AM
Construction			Articulated
Degree of freedom			6 axes
Work-space envelop	Arm	Rotation	± 180° (With reference front)
		Upper arm	150° forward 90° rearward (with reference to vertical)
		Fore arm	60° upward 70° downward (With reference to upper arm)
	Wrist	Rotation	± 200°
		Bending	± 135° (With reference to forearm)
		Twisting	± 185°
Operating space	Sectional area of operating space of arm		3.25㎡×360°
	Back and forth operating distance of arm		+ 1,613～－1,188 mm (From center of rotating axis to center of bending axis)
	Vertical operating distance of arm		+ 2,093～－670 mm (From robot bottom to center of bending axis)
Momentary maximum speed	Arm	Rotation	150° / sec
		Upper arm	150° / sec
		Fore arm	150° / sec
	Wrist	Rotation	260° / sec
		Bending	260° / sec
		Twisting	400° / sec
Maximum allwable weight capacity			10 kg
Allowable load on wrist. Moment of inertia		Rotation	Less than 220kg－cm Less than 7.1kg－cm・S²
		Bending	Less than 220kg－cm Less than 4.3kg－cm・S²
		Twisting	Less than 100kg－cm Less than 1.3kg－cm・S²

Item			Specification
Repeatability (Positioning accuracy)			Within ± 0.1mm
Position sensor			Electronic, absolute
Driving power	Arm	Rotation	1500 W (AC servo motor)
		Upper arm	1500 W (AC servo motor)
		Fore arm	1500 W (AC servo motor)
	Wrist	Rotation	200 W (AC servo motor)
		Bending	200 W (AC servo motor)
		Twisting	200 W (AC servo motor)
Brake			All axes provided with brake
Ambient temperature and humidity			0～45 ℃, 20～90%RH (No condensation)
Protection at operating limits			1) Soft limit
			2) Hard limit
			3) Mechanical stopper (Basic three axes)
Play indicating lamp			Lights up at servo ON.
Color of paint			Rotating part : Gray (H-67), Upper arm and forearm : Ivory (H-14)
Installation position			Horizontal, Ceiling, Wall
External dimensions			Refer to outline drawing
Grouding			Robot exclusive grounding of 100Ω or less via control unit
Total weight of robot manipulator			390 kg

Note : The colors of paint are subject to change.

2-2 Table of specifications of control unit

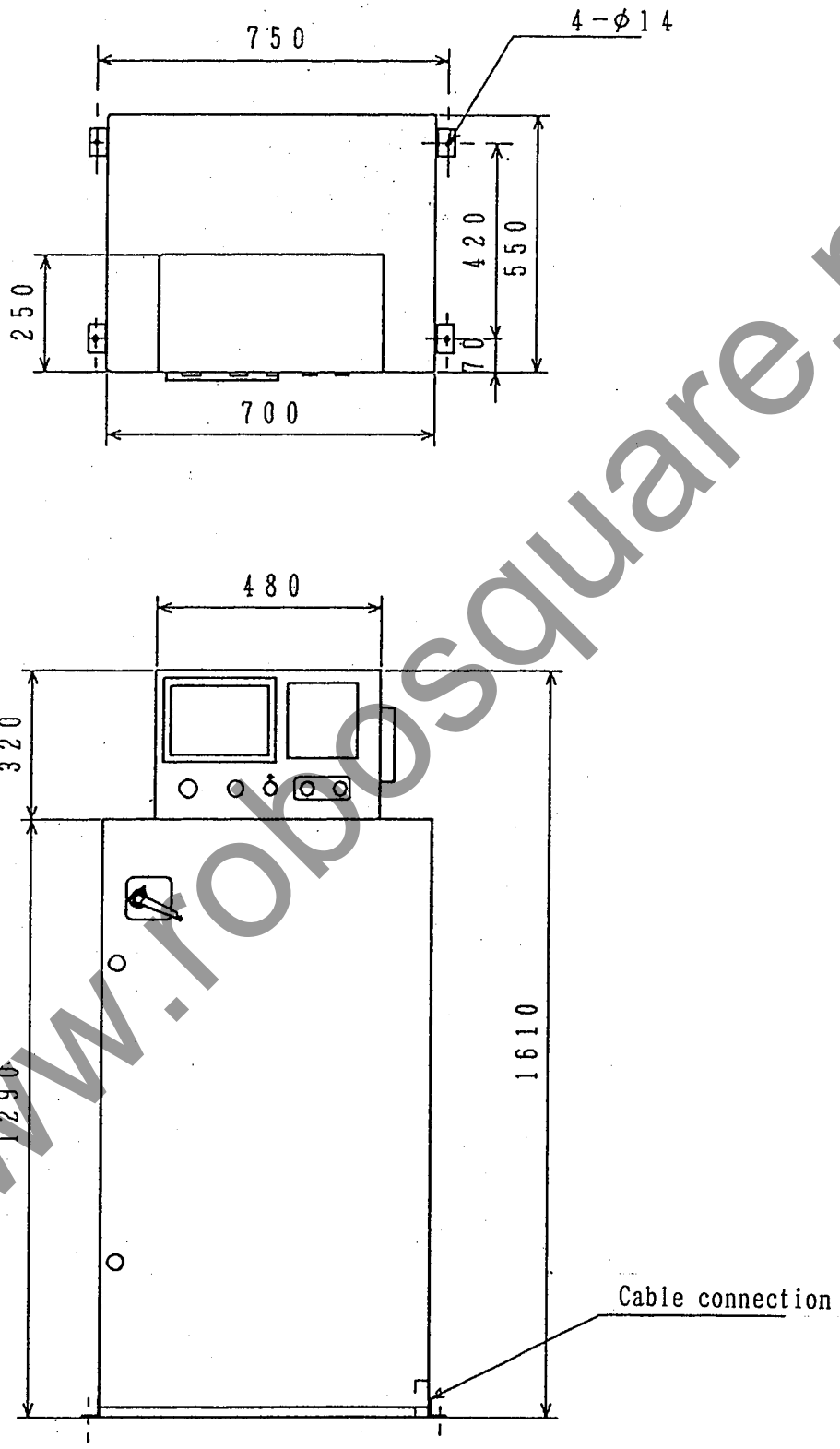
Classification	I t e m		Specification
	Model No.		YA8011AC
Control	Teaching method		By teaching and playback
	Path control method		by PTP and CP(linear and circular interpolation)
	Number of axes under control		6 axes simultaneously. Another optional 6 auxiliary axes (P.T.P.)
	Position sensing method		Electronic absolute pulse encoder
	Position control method		Of digital closed loop type
	Speed control method		For constant wire speed (under CP control)
Storage and display	Storage medium		IC memory (with battery backup)
	Storage capacity		4,000 points (2,000 steps, and 2,000 sequences)
	Operating mode		1)Teaching 2)Edit 3)Play 4)Initial setup 5)Tape/printer 6)Product data
	Number of program divisions		Max 999 (255 as standard)
	Number of job divisions		Max 999 (127 as stabdard)
	Edit protection function		Provided(Write inhibit symbol)
	Display method	Operation panel	9-inchi CRT and LED
		Teaching box	8 digit×1 line alphaneumerical display, LED
	External storage		Specified cassette tape recorder, specified floppy disk recorder, each of 3.5 inches, optional
	Printer		Printer interface incorporated. Printer software and printer optional. Specified (Printer to RS232C specification)
Teaching	Interpolation function		1)Liner interpolation 2)Circular interpolation(Three-dimensional plane) 3)P.T.P.
	Coordinate-system selecting function		1)Cartesian 2)Articulated 3)Tool 4)Cylindrical 5)User-defined

Classification	I t e m		S p e c i f i c a t i o n
Teaching	Wrist correcting function		Effective when Cartesian, tool, cylindrical, or user-defined system is selected.
	Speed setting method	During teaching	Maximum speed can be limited to within safespeed range from 0.01 to 30 m/minute (Set at 15 m/minute at factory)
		During playback	0.01－120 m/minute (Can be set by inputting numerical value directly)
	Welding-menu selection		1) 5 pairs of welding current and voltage values
			2) 6 weaving patterns
	Sequence		Part of sequences can be input through teaching box.
	Wire inching		Forward and reverse
	Pitch feed		0.2, 0.35, 0.5, 0.75, 1.00 mm
	Weaving method		By interpolation for 6 axes
	Weaving consitions		Amplitude : ± 20 mm or less Frequency : 5 Hz or less (All 6 axes) 10 Hz or less (Wrist, of simple harmonic motion) Holding time period at each end and center : 0.1－9.9 sec each
Tracing	Units of operation		Jobs, programs, steps
			Address search
	On-line fine adjustment		1)Welding current 2)Welding voltage 3)Speed
	Stepping back and forth		Stepping forward and backward possible
	Deletion ahead of teaching point		Possible
	Modifying function		1)Alteration(Position, speed, welding conditions) 2)Insertion 3)Deletion

Classification	I t e m		S p e c i f i c a t i o n	
E d i t	Kinds of edit commands		37 kinds	1)Input command 2)Branching command 3)Counter 4)Wait 5)Subroutine 6)Others
	Edit function		Copy, divide, merge, delete, insert, change, etc.	
	Edit during play		Job being performed, job not contained in program, and program can be edited	
P l a y	Designation of play conditions		Job, program, robot lock, I/O lock, arc lock	
	Designation of stop conditions		Job, program, step	
	Reserving function		Up to 16 jobs not being performed or reserved	
	Control function		Number of job executions, robot operating time period, arcing time period	
			Total operating time period (Cannot be reset)	
	Recovery from emergency stop		Possible (Origin search operation not required)	
	Switch to operation from within fence		Speed can be limited to within safe speed range from 0.01 to 30 m/minute	
E x t e r n a l c o n t r o l	Job selection input		General-purpose I/O	
	General-purpose I/O	Input	16 points(Optionally expandable up to 64 points)	
		Output	16 points(Optionally expandable up to 64 points)	
	Special-purpose I/O	Input	1)Start 2)Stop 3)Emergency stop 4)Cancellation of reserved job 5)Operation from within fence 6)Teaching possible 7)Selection of teaching 8)Selection of play mode	
		Output	1)During play 2)During stop 3)During emergency srop 4)Play mode 5)Teaching mode 6)Mode selection possible	

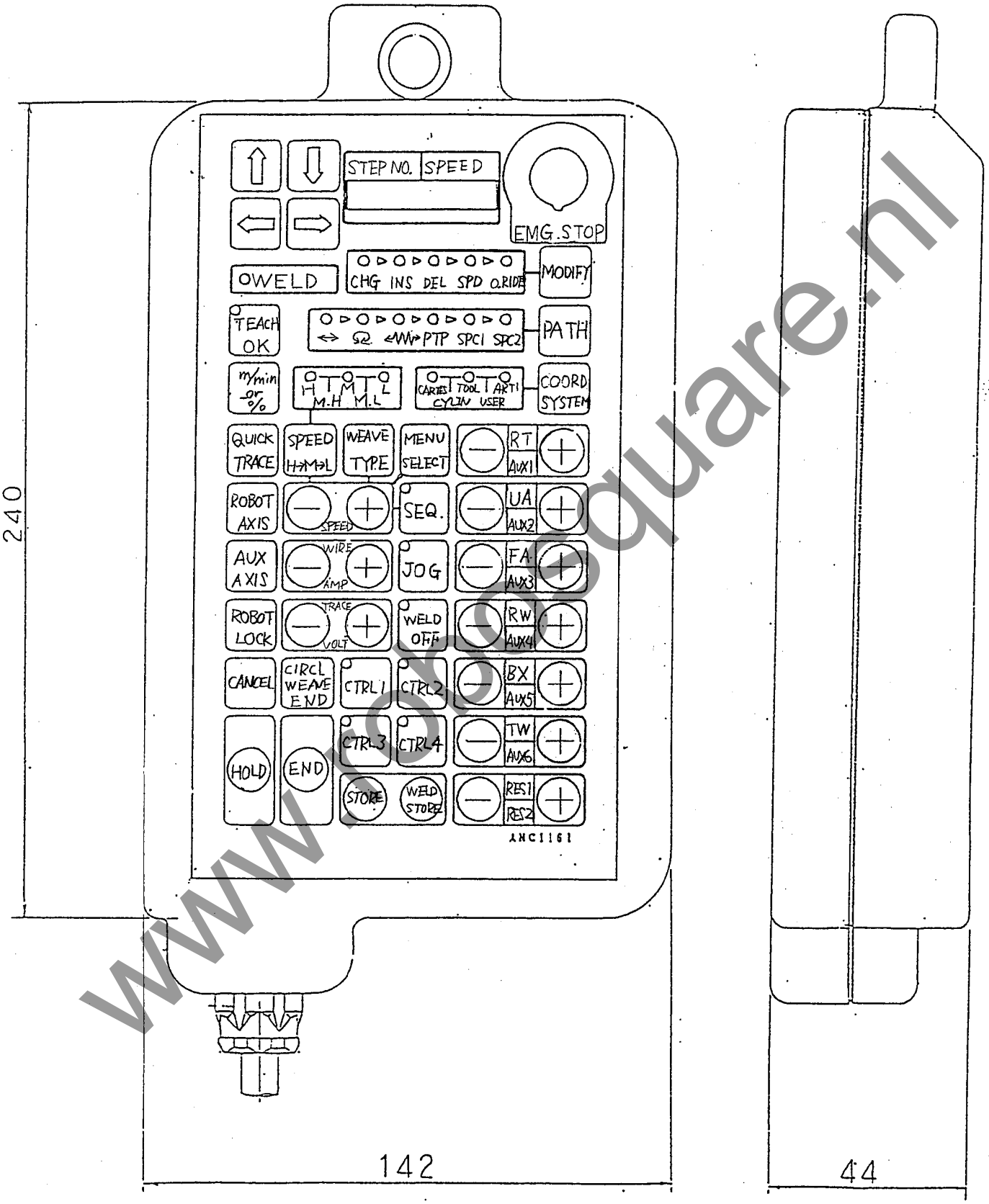
Classification	Item		Specification		
External control	I/O specification	Input	Photo coupler (By supplying and cutting off 24 VDC, 12 mA)		
		Output	Open collector (By AW-0660 method)		
	External communication		Software optional (via RS232C)		
Welding control	Welding current		256	Method selectable ; by inputting numerical value directly or by inputting code corresponding to equally divided part	
	Welding voltage		256		
	Speed output		256	Switching possible between general-purpose analog ports through software.	
	Welding I/O	Input	1)Welding current detection 2)Arc vanishing 3)Sticking wire 4)Torch in contact with other object 5)Wire break 6)Insufficient gas pressure		
		Output	1)Welding start 2)Gas valve control 3)Detection of sticking 4)Forward and reverse wire inching (Method in which inching speed is increased)		
	Method to set welding conditions		Five each of current and voltage values (menus) are set by inputting numerical values directly during initial setup. Menu is selecte during teaching. Numerical values are modified in edit mode.		
	Welding process		CO_2 (MAG), pulsed MAG, TIG, plasma, cut-wire, and MAG		
	Applicable welding power supplies			Wire diameter or output mode	
			350 RF	0.9	1.2
			500 RF	1.2	1.6
			160 HF		1.0
			350 HF	0.9	1.2
			500 HF	1.2	1.6
			350 HR	0.9	1.2
			500 HR	1.2	1.6
			350 ZC	0.9	1.2
			500 ZC	1.2	1.6
			350 HM	0.9	1.2
			500 HM	1.2	1.6
			350 HP	0.9	1.2
			200 HG	DC	AC
			300 TWX	DC	AC
			300 TR	DC	—

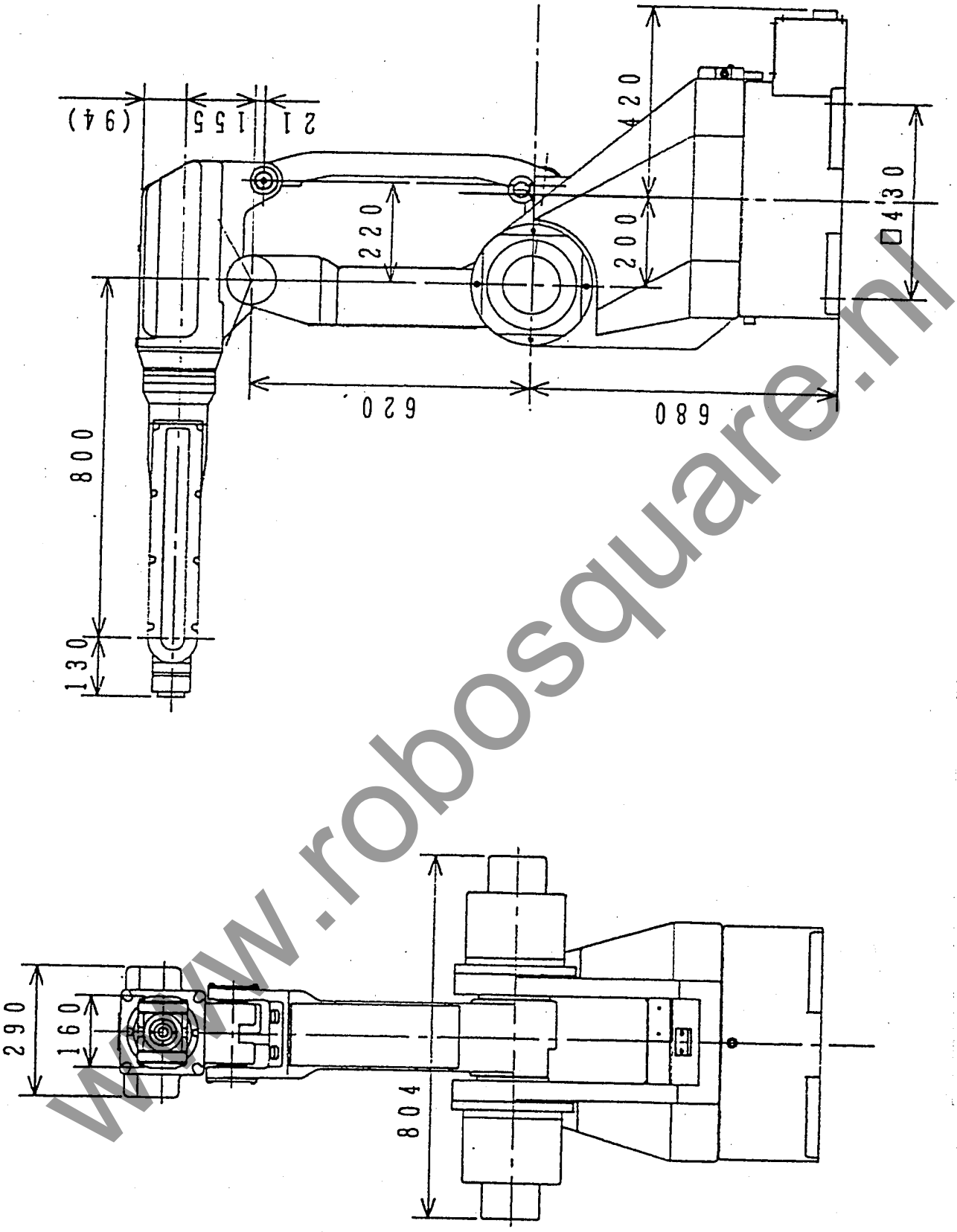
Classification	I t e m	S p e c i f i c a t i o n
Protecting function (Self-diagnosis)		1)Mechanical stopper 2)Overrun 3)Soft limit 4)CPU fault monitoring 5)Cable connection monitoring 6)Power supply fault 7)Abnormal panel temperature rise 8)Servo fault (Overspeed, overc urrent, sensor fault, overload) 9)Weldingfault 10)Misoperation
Physical	Construction	Totally enclosed box type
	Cooling method	Indirect air cooling (No ambient air can enter control unit)
	Ambient temperature humidity	0～45 ℃, 20～90%RH (No condensation)
	Power supply	φ3AC200・220V±10% 8 kVA
	Grounding	Robot exclusive grounding of 100Ω or less
	Color of paint	Light gray
	External dimensions (Approx.)	700 × 550 × 1610 (W×D×H)
	Weight	Approx. 180 kg (including teaching pendant and exclusive cable)
	Cable between robot manipulator and control unit	4 m exclusive cable with connector
	Teaching cable	10m (from CRT console)
	CRT console	Integral with control unit. Separate type optionally available (with cable)



External dimensions of control unit

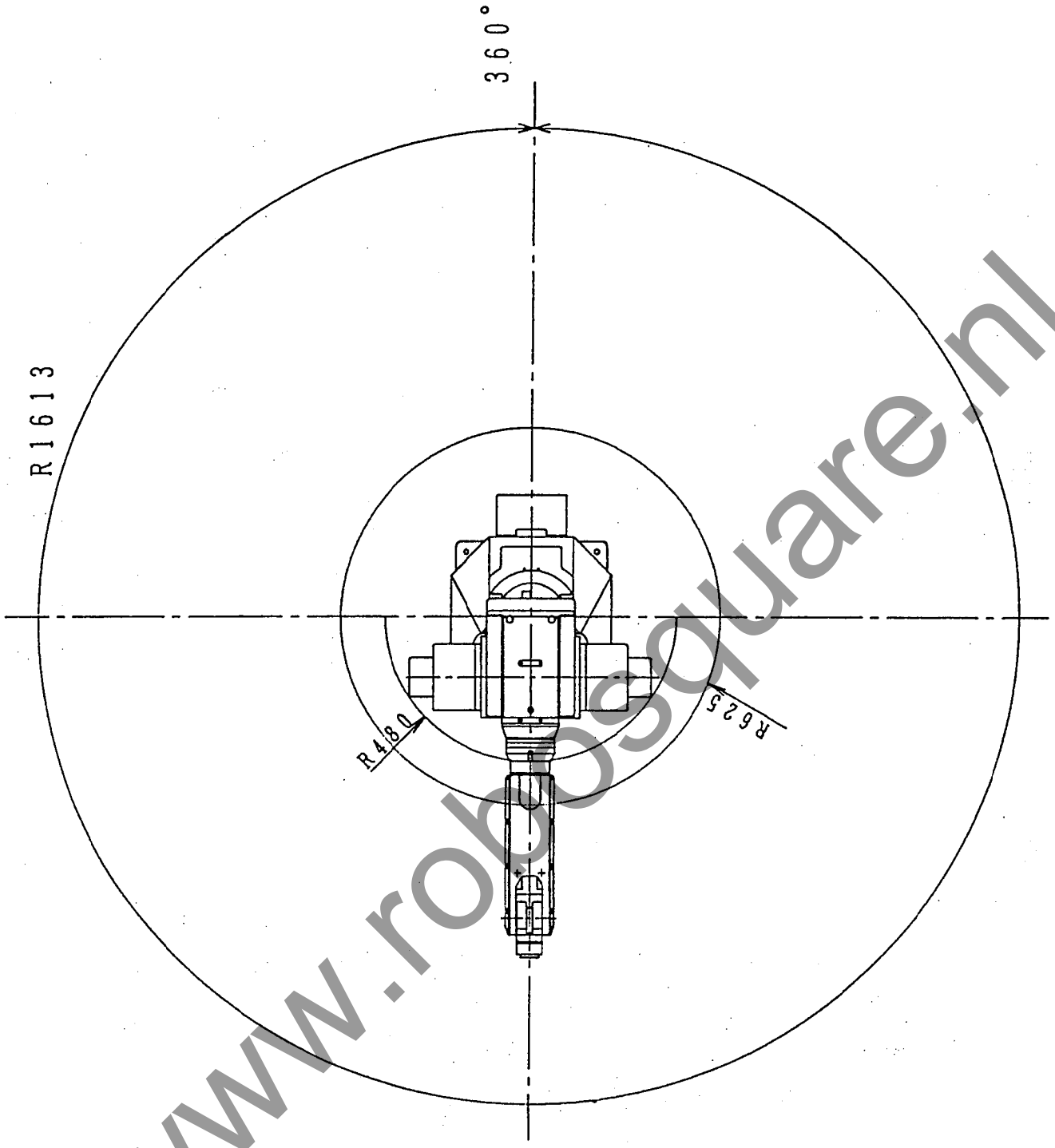
External view of teaching box



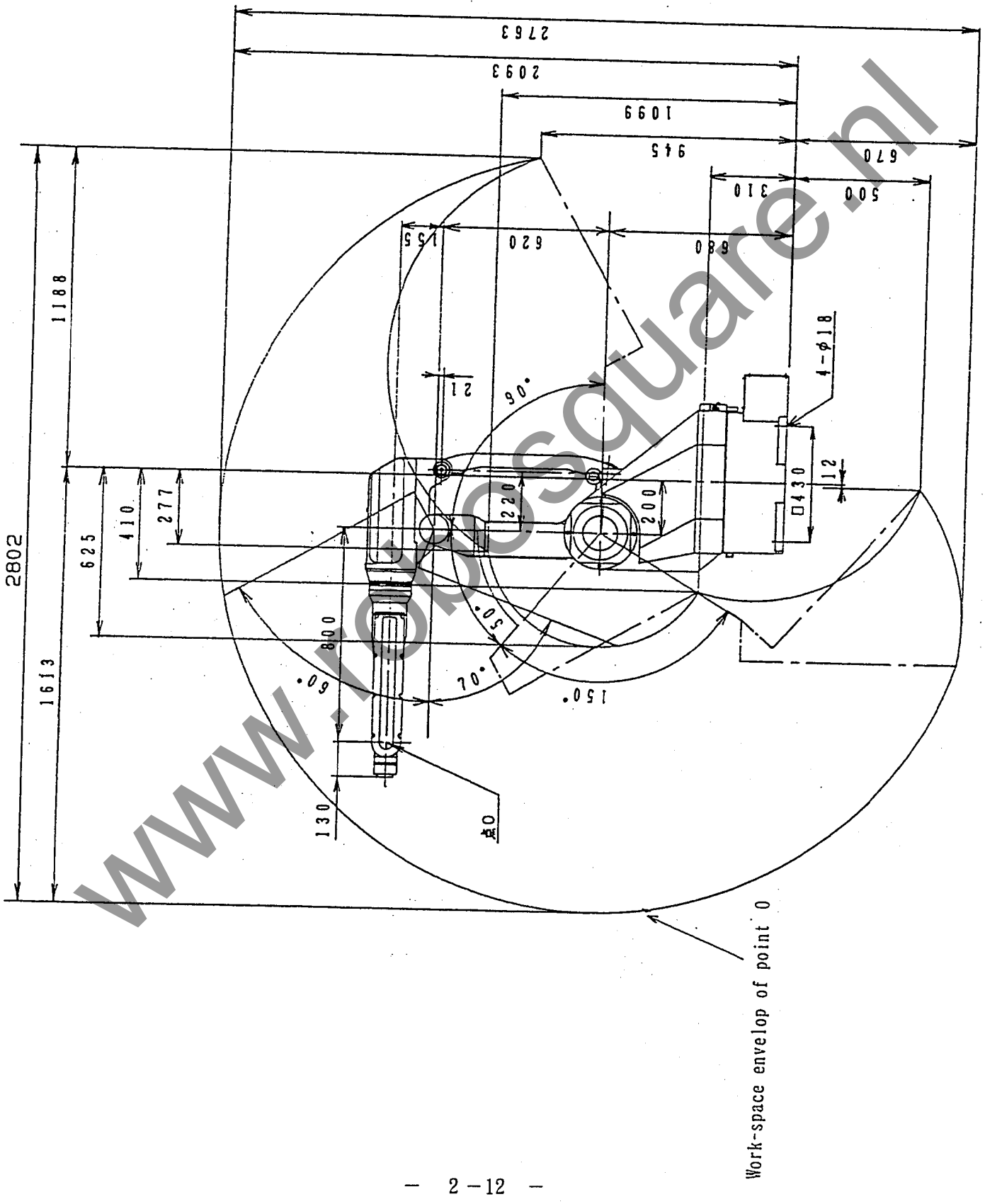


External dimensions of robot manipulator

2-4 Work-space envelop view



Work-space envelop view (1)



Work-space envelop view (2)

2-5 Maximum payload

(1) Limitaion of payload

Allowable payload of this robot is 10 kg or less for the load weight including the bracket hand to which the load is attached.

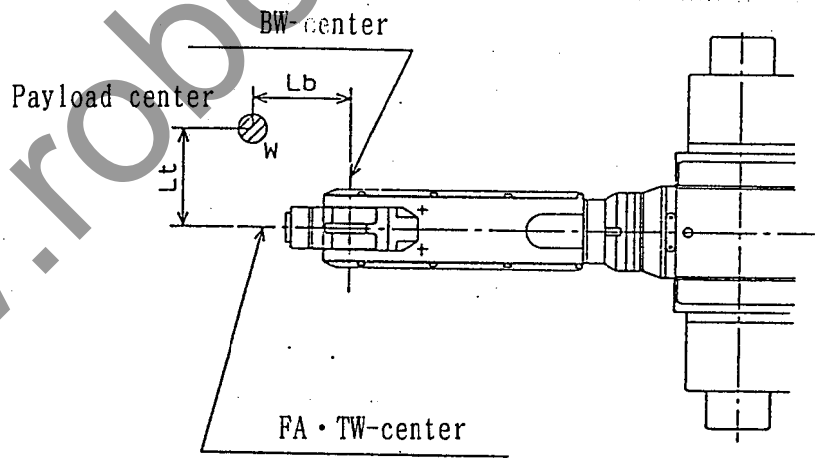
When the robot is used for arc welding, there may be no problem in general, but if it is used for handling, etc., the followiong limitation should be observed:

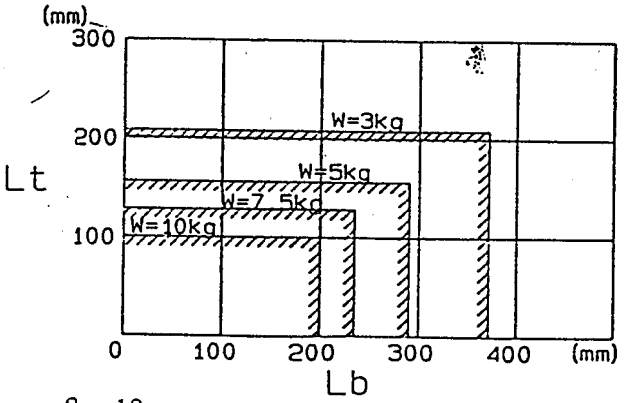
① Maximum load weight: 10 kg

② Eccentric load and load inertia should be kept within the value in the following table on rotating center of the respective axes.

	Eccentric load	Load inertia
RW axis	220 kg・cm or less	7.1 kg・cm・S² or less
BW axis	220 kg・cm or less	4.3 kg・cm・S² or less
TW axis	100 kg・cm or less	1.3 kg・cm・S² or less

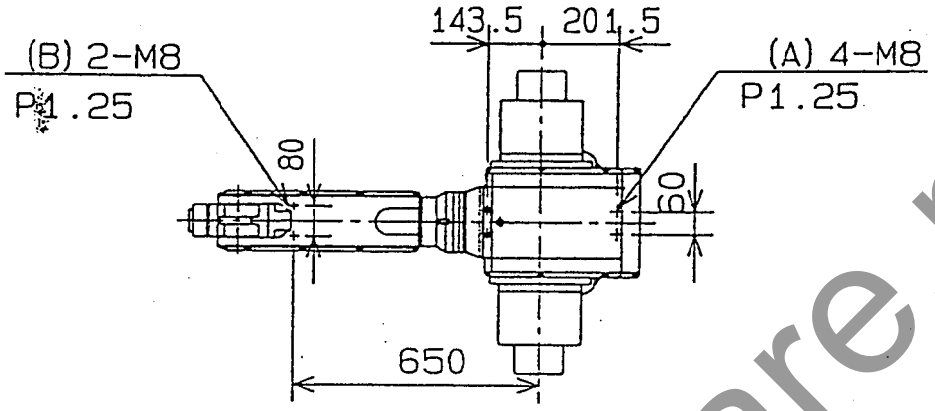
③ If the load is not so big, limition of mouting position are as follows



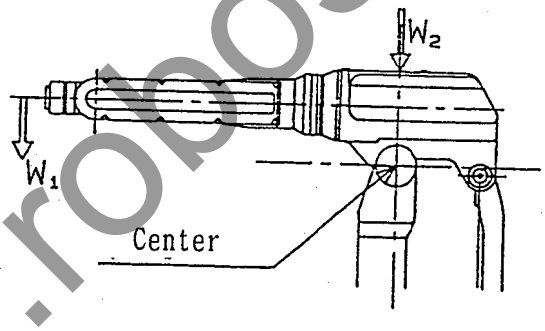


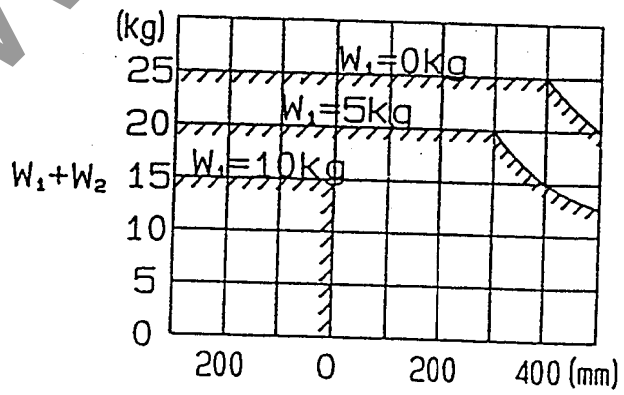
(2) Mounting jig on Forward arm

① Some jigs can be mounted on Forward arm with following two holes. (A), (B). This is convenient for handling application.



② For maximum weight (W_2) including jig on Forward arm and payload of wrist axis (W_1), refer to following figure.



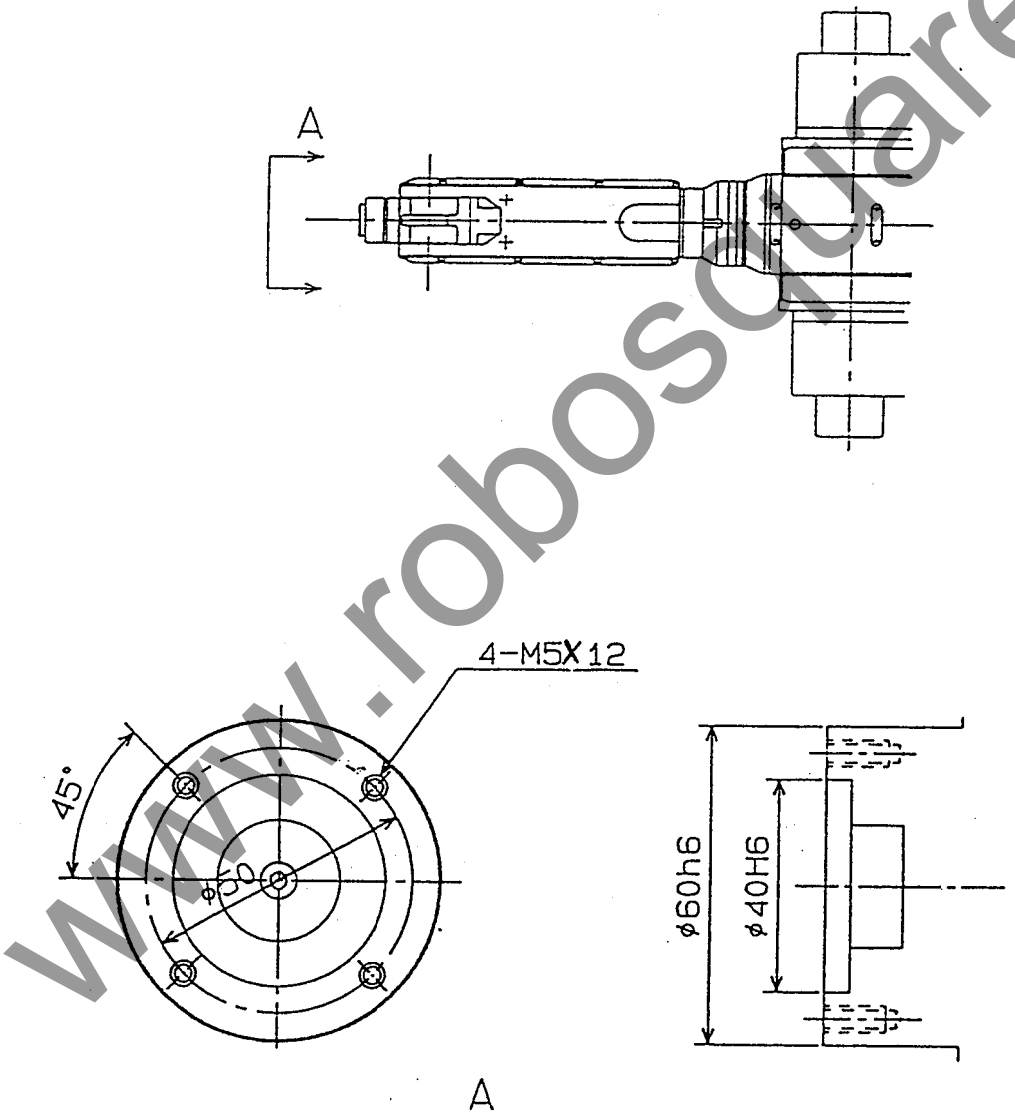


2-6 Use of mechanical fuse and mounting surface

Torch holder YA322UH is used for welding. For handling, etc., be sure to use a protective mount (mechanical fuse) in ordrer to prevent the robot and a jig from being damaged if the robot and the jig interfere with each other due to a misoperation or the like.

A dimensional drawing of the wrist flange on the robot is given below.

Using four M5 screws, install the peotective mount on the flange.



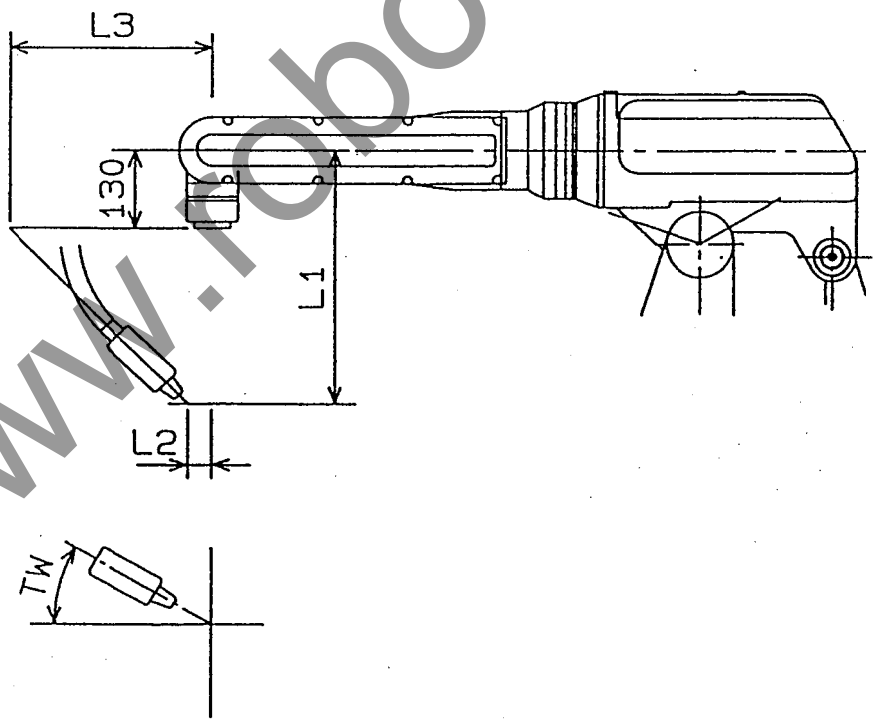
2-7 Torch offset

The robot controls the torch so that the torch tip interpolates (the torch tip interpolates linearly or circularly for constant speed).

After installing the torch, measure the following dimensions properly, and input the measurements as system setup data into the control unit.

The standard shipping values are as shown in the table below.

	At shipping	Applicable range
L 1	420	130～600
L 2	0	-100～100
L 3	385	1～999.99
T W	- 20°	-185° ～185°



View from beneath
(+ clockwise direction)

2-8 Accessories and robot-manipulator installation parts

○ Cable for connecting control unit

Name	Remarks	Quantity
Main control cable	4 m, with connector at each end (between control unit and robot manipulator)	1
Auxiliary control cable	4 m, with connector at each end (between control unit and robot manipulator)	1
Grouding cable	4 m, (ACC00002)	2

○ Accessories for control unit

Name	Code	Quantity
Teaching pendant	A8011UR	1 Set
Fuse	XBA2E10NR5U (1A)	2
Fuse	F7170-30A (30A)	1
Fuse	XBA2E63NS5 (6.3 A)	1
Cord for cassette tape recorder	RP020B1M (1m)	1
Door key		2
Power key		2

○ Parts for installing robot manipulator

Name	Remarks	Quantity
Bolt	M12×60	4
Washer	M12	8
Spring washer	M12	4
Eyebolt	M16	2

○ Manuals

Name	Remarks	Quantity
Instruction manual		1
Operating manual		1

Chapter 3 Installation Manual

3-1 Scope of work and place to install

(1) Scope of customer's work

(a) Base on which to install the robot.

(b) Foundation work for installation, concreting and coating work, piping work, and piping pit work.

(c) Primary power wiring work.

(d) Ground (Ground resistance 100Ω or less) work.

(e) Shielding-gas piping work.

(f) Interfacing and interconnecting work between jigs and control unit.

(2) Place to install

(a) Ambient temperature should be 0 - 45℃ and not to be exposed to direct sun-ray.

(b) The control unit must be installed out of scope of robot movement, but as close to it as possible.

(c) With little moisture, dust and/or soot.

(d) Without any ignitable or corrosive gases.

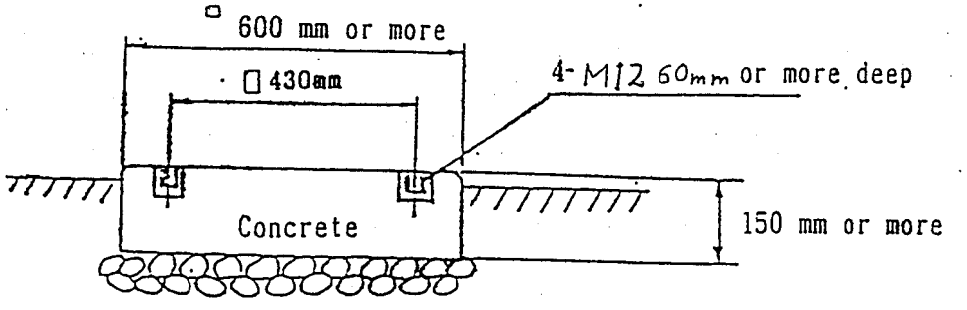
(e) No obstacle should lie in scope of robot movement.

(f) Easy to check and/or break up machine.

(g) Big shock and vibration should not be transmitted.

(h) Without big electric noise source around the robot.

If a big noise source, such as plasma or high frequency, is present around the installing place for the robot, inform us beforehand.



Example of foundation

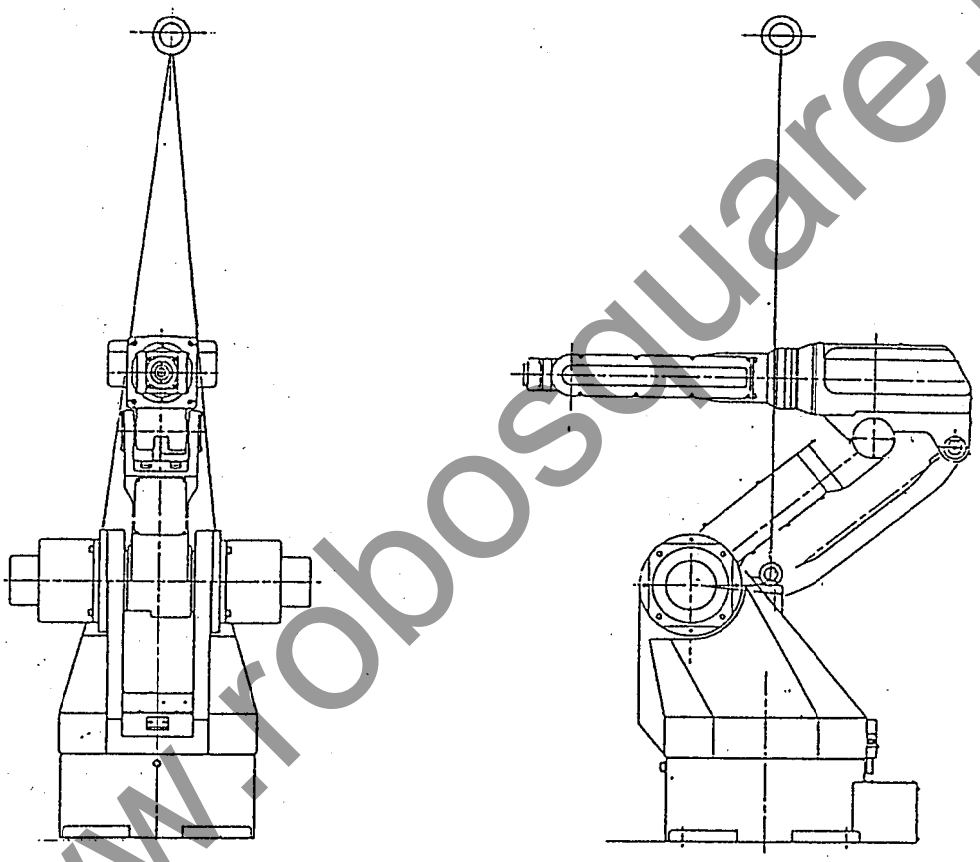
3-2 Transportation of robot manipulator

Use a crane when you transport the robot for installation and/ or movement.

How to hang the robot is as shown in the sketches below.

Use the attached two eyebolts and lift the robot by way of two wire hanging.

Avoid any transportation method that may give any force to an arm and motor of the robot on transportation.

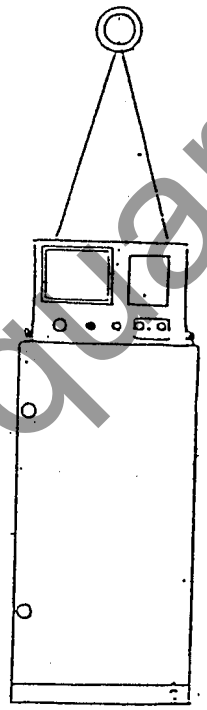


3-3 Transportation of control unit

Use a crane when you transport the control unit for installation and/ or movement. How to hang the control unit is as shown in the drawing below. Use two eyebolts attached to the unit, and lift the unit by two wire. When carrying the unit, pay attention not to give any shock on the control unit body, CRT operating panel, and the like.

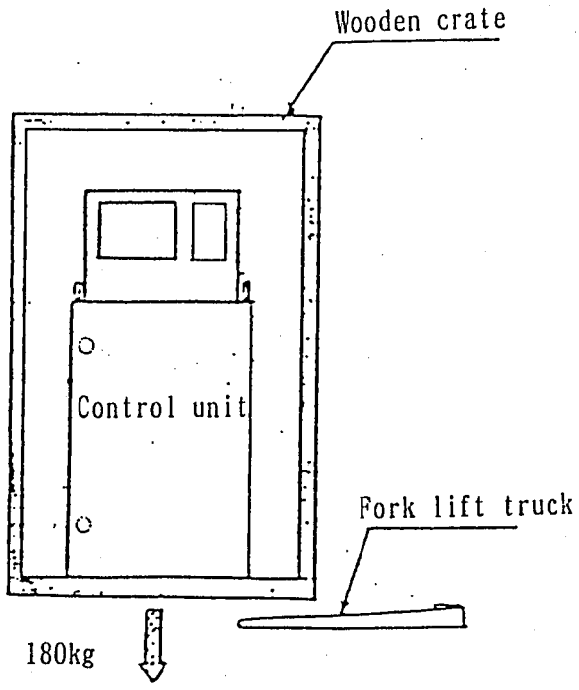
① Carrying by two wire hanging

Hook the eyebolts attached to the control unit.



② Carrying by fork lift truck

Carry the control unit in a wooden crate package.



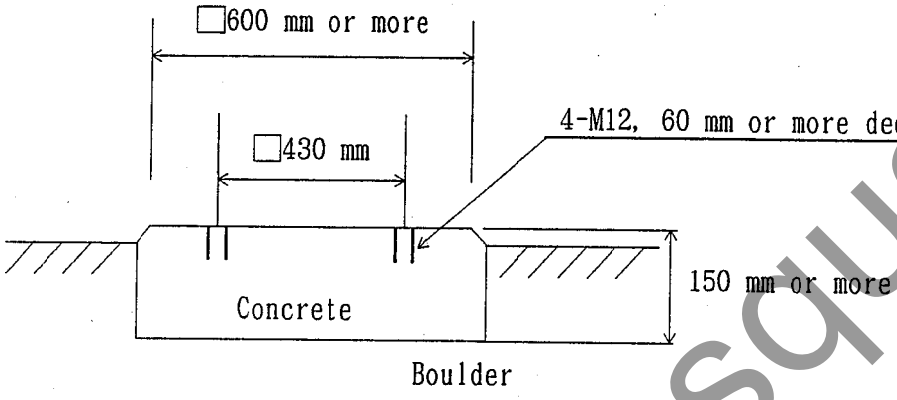
3-4 Installation of robot manipulator

Firmly install the robot manipulator.

(1) When a concrete floor is thicker than 150mm, it can be foundation as it is.

(2) When a concrete floor is thinner than 150mm, dig the place to install and make foundation as shown below.

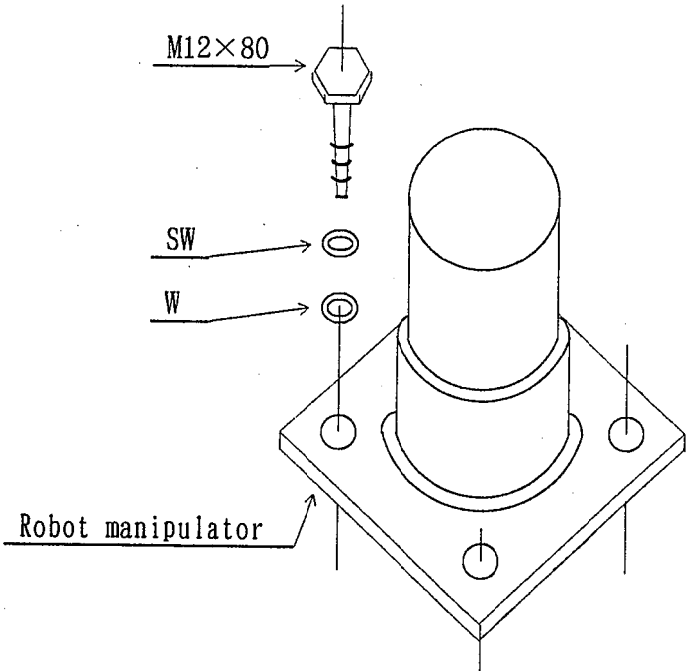
(3) If the flatness of the floor is poor, lay shims 100 mm or more square under the four corners of the robot base.



Example of foundation

(4) When you move the robot manipulator to the installation place, fix attached eyebolts to the base of the robot, hook the eyebolts and lift the robot. At this time, pay attention for the lifting chains not to touch any part of the robot manipulator.

(5) When the robot is in position, fasten it securely with 4 M20 bolts through the four holes in the corners.

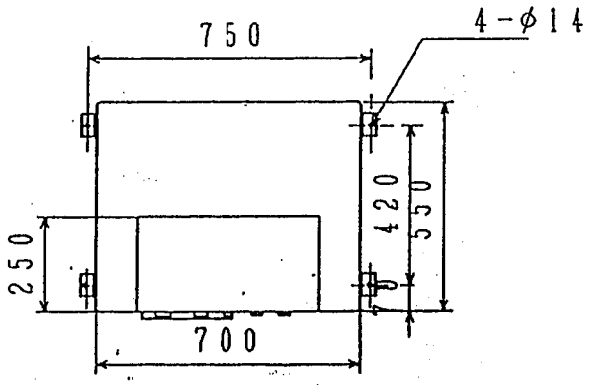


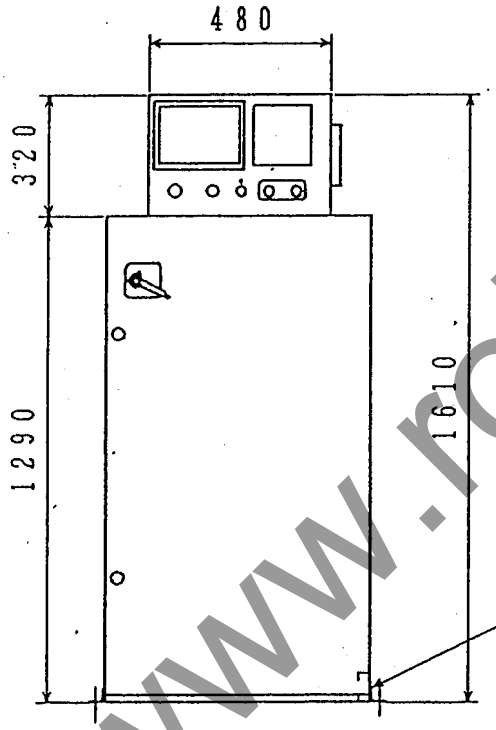
Installation of robot manipulator

3-5 Installation of control unit

Install the control unit body out of the scope of robot movement, but on a place where check and maintenance operations are easy to perform.

Fixing holes for the control unit are shown in the drawing below.



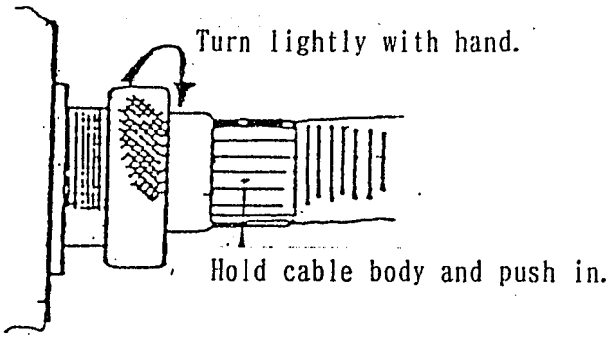


* If the control unit, work setting jig, etc. are to be set on the same steel plate, they need to be electrically isolated from each other.

Cable connection

3-6 Interconnection of the robot unit and the control unit

Connect the cable from the control unit to the robot manipulator, paying attention to the following:



Cable connection procedure

(1) Pay attention to male or female screw of the connector, and insert the plug with female screw to the plug socket with male screw.

(2) When inserting, hold the cable by hand and push in the cable with key direction, then, turn the screw lightly. If the screw gets heavy to turn, again push in the cable for lightly turning, thus effecting cable connection securely.

(3) Do not turn the screw with a strong force. It should be absolutely avoided.

If the direction of the key or male and female screws are reversed, strong force applied by screw will damage the connecting part.

(4) Confirm that the plug has been completely screwed in.

● Robot manipulator and control unit

The memory element of the control unit memorizes absolute origin (robot position control origin) of the robot manipulator with which the control unit forms a pair.

Therefore, the robot manipulator has a manufacturing number of the control unit which should be used in combination with that robot manipulator.

Make sure to use these in combination.

3-7 Connection of primary power supply cable

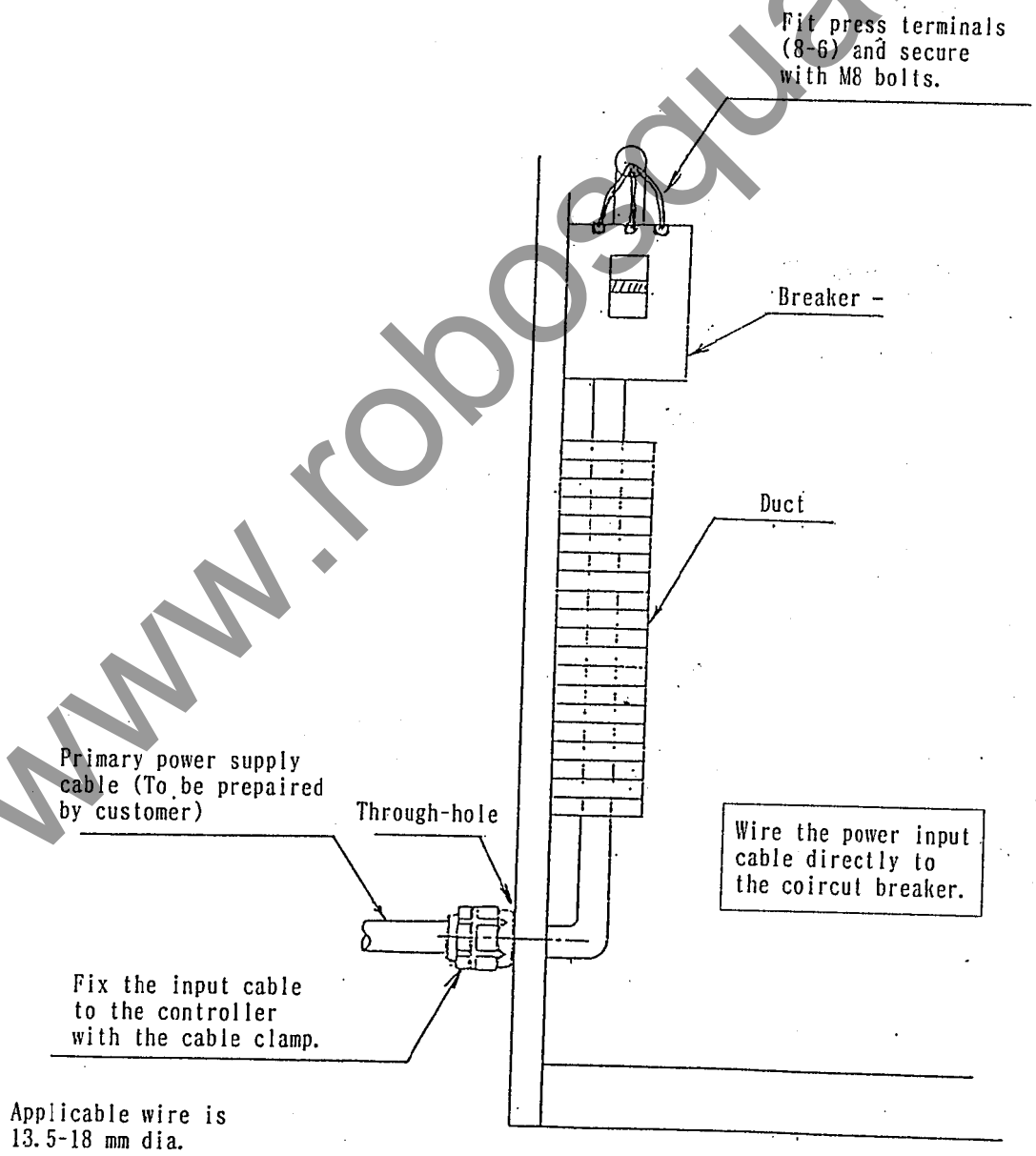
(1) Provide an independent breaker for the robot and make wiring.

(2) Use stable power source in separate supply line from those for welding power source and/or driving power source.

(3) Necessary power capacity is 200/220 VAC±10%, 3-phase, 50/60 Hz, 8 KVA or more.

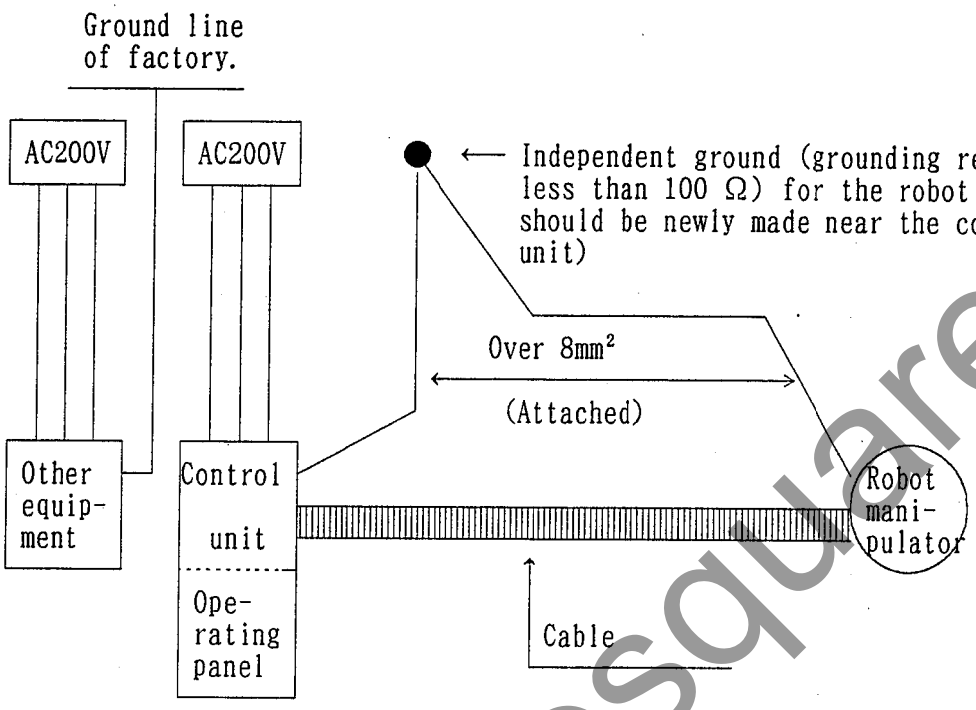
(4) Cabtire cable of at least 3.5mm² must be used for cabling.

(5) Insert the power input cable into the through-hole in the lower left-hand corner of the control unit, secure it with the cable clamp provided and connect it to the breaker in the upper left-hand part of the unit interior.



3-8 Ground

Make ground resistance less than 100 Ω for the robot independently, from ground terminals of the robot manipulator and control unit. Be sure to confirm that ground is executed properly.



The ground cable (green) attached to this flextube is intended for shielding, so be sure to ground the manipulator body and control unit with two ground cables provided (green, 8mm², and 4mm² each).

Ground

Notes:

(1) Use ground cables over 8mm². (Two pieces of green cables of 8mm² are attached as ground cable.)

(2) As for thickness of earth cable of other equipment, follow indication for each equipment.

(Example: Over 14mm² for welding power sources)

* Ground resistance less than 100 Ω should be done by a specialized electrician.

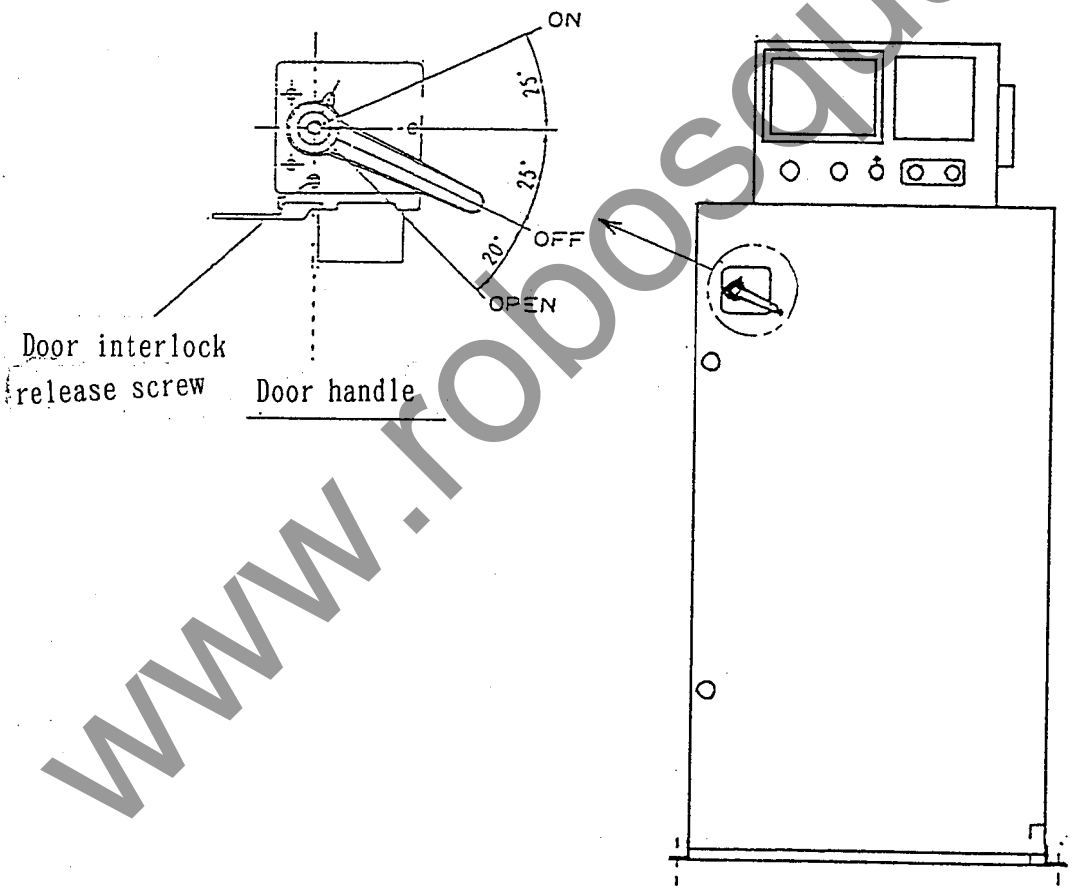
3-9 Door handle

Door handle is ON state on noumal usage.

Moving door handle makes the braker ON/OFF.

Operation

1. Turning handle to left makes the braker ON, and right for OFF.
2. When closing door, position should be not the braker condition.
3. When opening door at ON state, turn door interlock release screw by (-) screw driver.



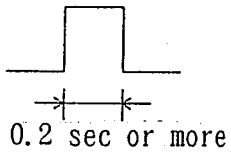
3-10 Connection with external equipment, and external control

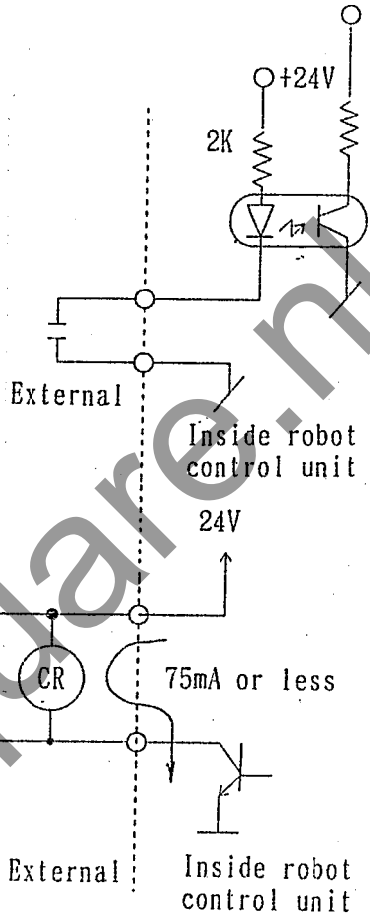
General-purpose inputs and outputs can be used by teaching a sequence in the edit mode.

(1) I/ O terminal equivalent circuits

◎ Input terminal equivalent circuit

* Receives non-voltage ON/OFF contact signal from outside.
* External relay contact to be connected … 1Ω or less, and 10 msec or less chattering.
* Input signal should have a pulse width of 0.2 sec or more.





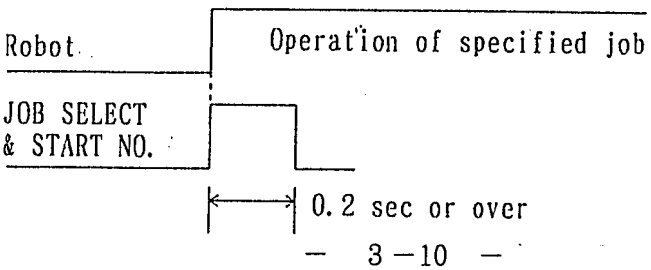
◎ Output terminal equivalent circuit

* Open-collector output
* Output rating: 24 VDC, 75mA
* Use a relay (CR) of a voltage rating of 24VDC and a coil current rating of 75mADC or less. Install a noise absorb diode D (100V, 1A).

(2) Kinds of I/O terminals (general and special purposes)

◎ External job starting (1)

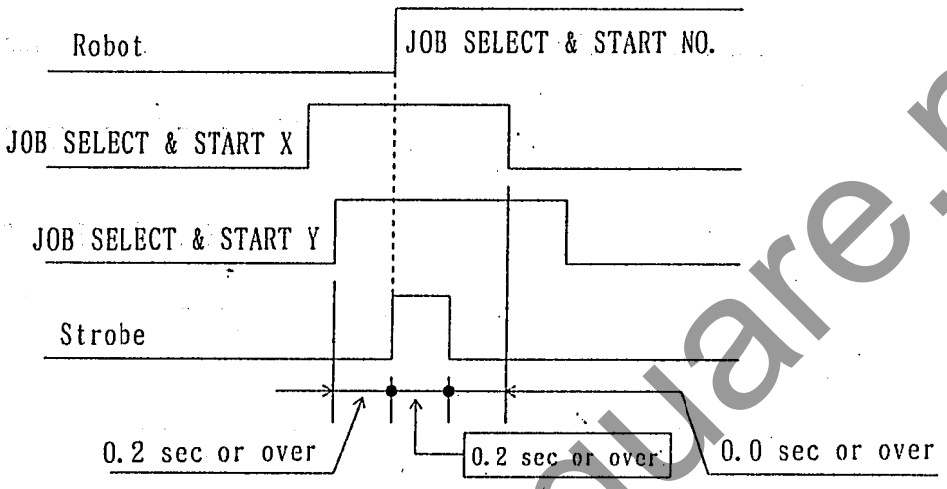
Where STROBE and COM terminals are short-circuited in advance, and then power supply is turned on: Seven kinds of jobs, 1, 2, 4, 8, 16, 32, and 64, can be started by short-circuiting their respective JOB SELECT & START NO. terminals and the COM terminal.



◎ External job starting (2)

Where the STROBE and COM terminals are open (not connected), and then power supply is turned on:

After short-circutiing a necessary JOB SELECT & START NO. terminal to the COM terminal, connect the STROBE terminal to the COM terminal.



(Specified job No.) = (Added numerical value of all the numbers on the JOB SELECT & START No. terminals short-circuited to the COM terminal)

JOB SELECT & START NO.	64	32	16	8	4	2	1	Specified Job No.
Example 1	○	○	○	○	○	○	○	Job 127
Example 2	○			○	○			Job 76
Example 3			○				○	Job 17
Example 4							○	Job 1

○ = Short-circuited to COM terminal

◎ Job reservation starting (1)

Where the STROBE and COM terminals are short-circuited, and then power supply is turned on:

Up to 7 jobs can be reserved by short-circuiting their respective JOB SELECT & START NO. terminals to the COM terminal setting an interval of 0.2 sec or more individually. However, a job with the same No. as those of unexecuted jobs and the job under execution cannot be reserved.

◎ Job reservation starting (2)

Where the STROBE and COM terminals are open (not connected), and then power supply is turned on:

After short-circuiting a necessary JOB SELECT & START NO. terminal to the COM terminal, short-circuit the STROBE terminal to the COM terminal setting an interval of 0.2 sec or more individually; then up to 16 jobs can be reserved.

However, a job with the same No. as those for unexecuted jobs and the job under execution cannot be reserved.

Welding control

◎ Two analog output terminals are provided for welding current and volfage control.

◎ When a specified applicable welding power supply is used, welding currrent and voltage can be set by inputting desired numerical values directly. Specified applicable welding power supplies

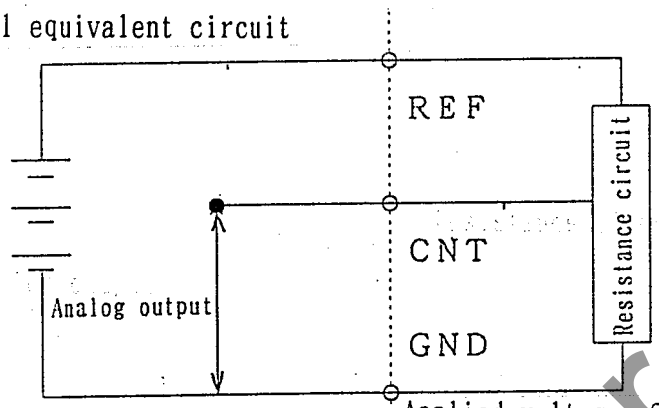
* YD-350HF2T10 or YD-350HFR2, a version of Pana Star HF350 (1.2, 0.9 dia.) built to robot specifications
* YD-500HFR2, a version of Pana Star HF500 (1.2, 1.6 dia.) built to robot specifications
* YD-160HF, a version of Pana Star HF160 (1.0, 0.8 dia.) built to robot specifications
* YD-350HA, a version of Pana Star HA350 (1.2, 0.9 dia.) built to robot specifications
* YD-500HA, a version of Pana Star HA500 (1.2, 1.6 dia.) built to robot specifications

In the case of the welding power supplies below, direct in-putting of welding current and voltage numerical values is possible with the specified welding process only.

* YD-350ZC3T11, a version of Pana auto ZC350 (1.2, 0.9 dia.) built to robot specifications (Pulsed MAG welding)
* YD-500ZC3T11, a version of Pana Auto ZC500 (1.2, 1.6 dia.) built to robot specifications (Pulsed MAG welding)
* YD-350ZXT13, a version of Pana Beauter ZX350 (1.2, 1.6 dia.) built to robot specifications (Pulsed MAG/MIG welding)
* YD-500ZXT13, a version of Pana Beauter ZX500 (1.2, 1.6 dia.) built to robot specifications (Pulsed MAG/MIG welding)

◎ When a welding power supply other than the specified ones is used, the welding current and voltage values can be set by inputting codes.
In this case, an applied voltage is divided into 255 equal parts before being output.

◎ Analog terminal equivalent circuit



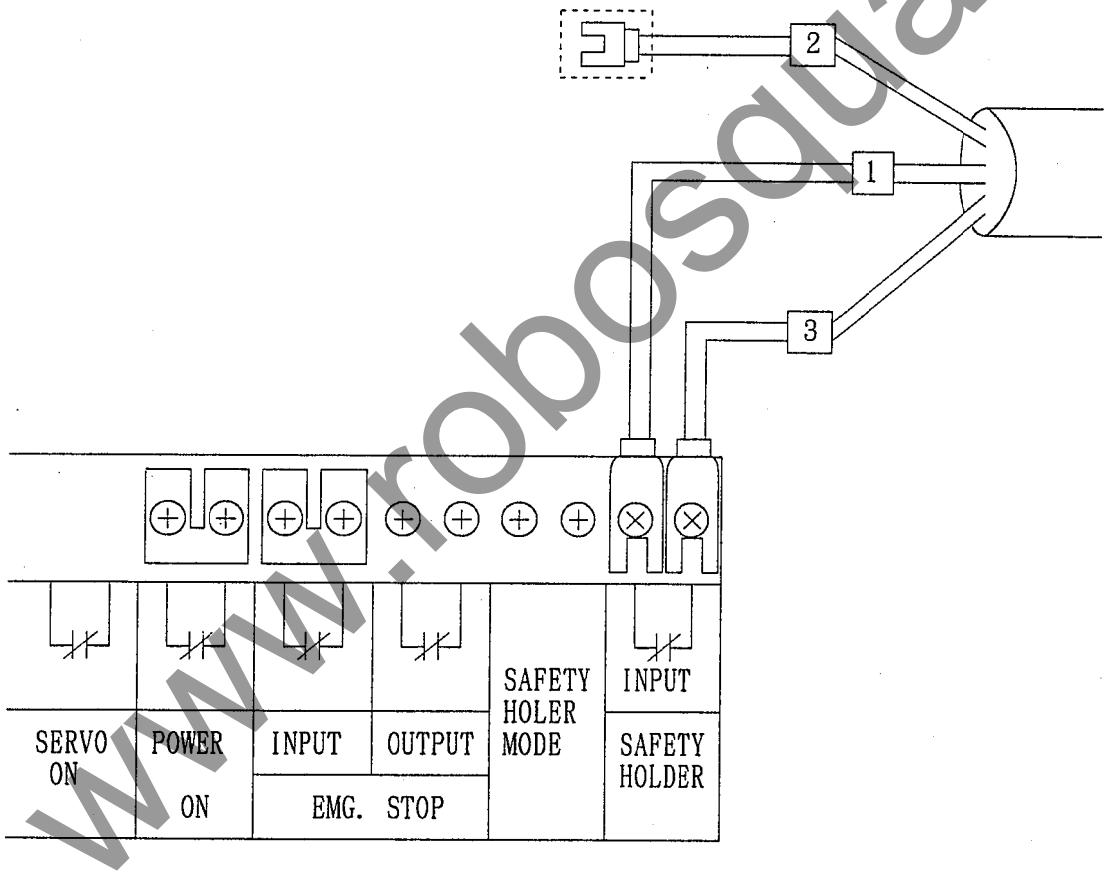
Applied voltage: 24VDC or less.
Output impedance: 2.2kΩ

◎ I/O terminal for exclusive use on welding
Six contacts for input and five contacts for output are provided independently from general-purpose I/O terminals. I/O command numbers are allocted as shown in the table below. Connect these terminals to the specified applicable welding power supply or the interface box.

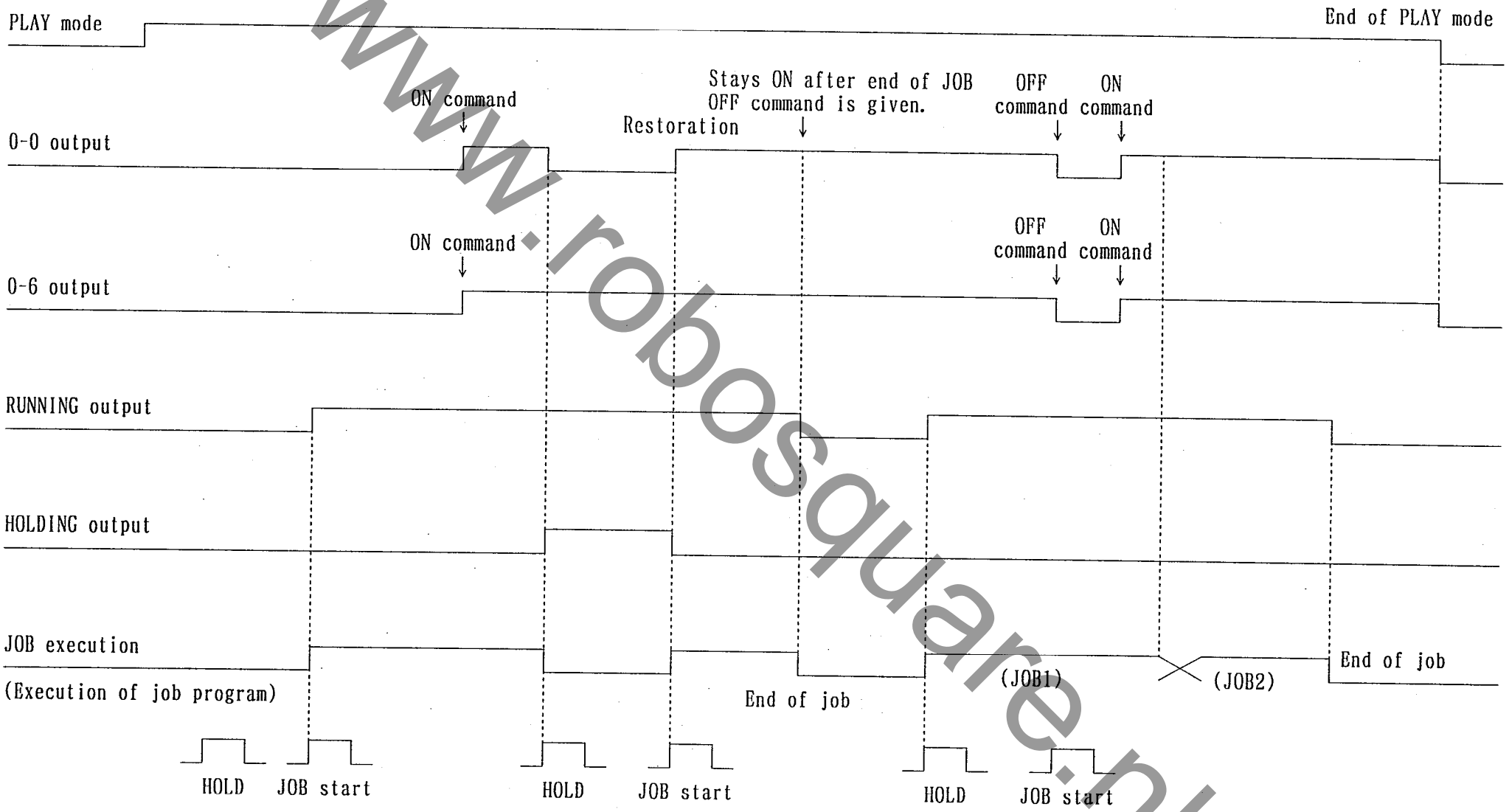
Item	Description	Exclusive command No.
Exclusive input	Current	H - 0 217
Abnormality input	No Arc.	H - 0 218
	Stick	H - 0 219
	Torch contact	H - 0 220
	No wire	H - 0 221
	No GAS. cient gas pressure	
Exclusive output	Torch on	0 - 0 / 1 209
	Gas valve	0 - 0 / 1 210
	Stick check	0 - 0 / 1 211
	Inching	0 - 0 / 1 212
	Inching Retract	0 - 0 / 1 213

A signal-line exclusive terminal for torch holder YA-322UH is provided for the AW8010. Connect the signal line from the torch holder to the safety holder input terminal of the sequencer board ZUEP5260□.

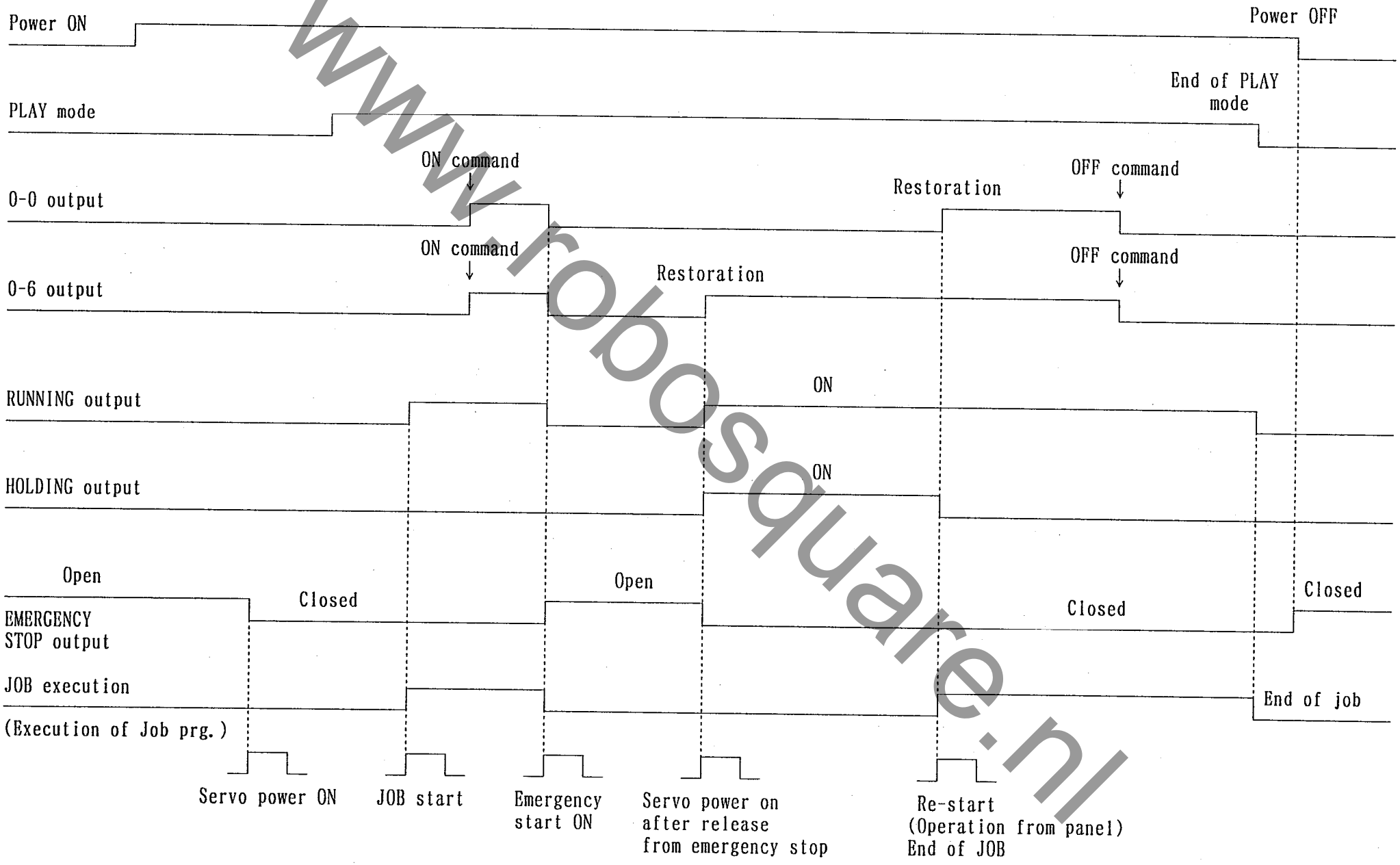
Sequencer board
(ZUEP5260□)



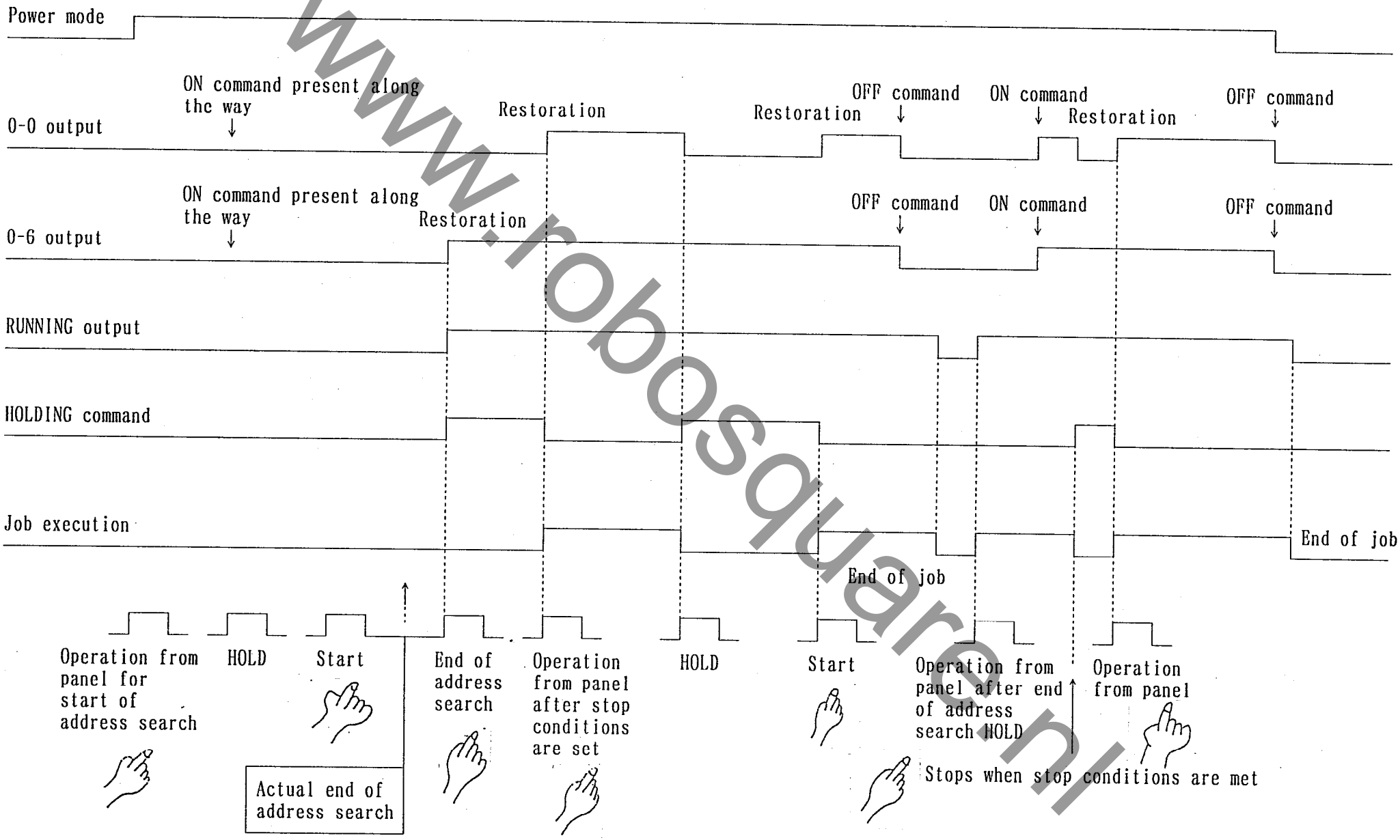
Flow chart of status outputs (1)
(For both internal and external control) (HOLD)



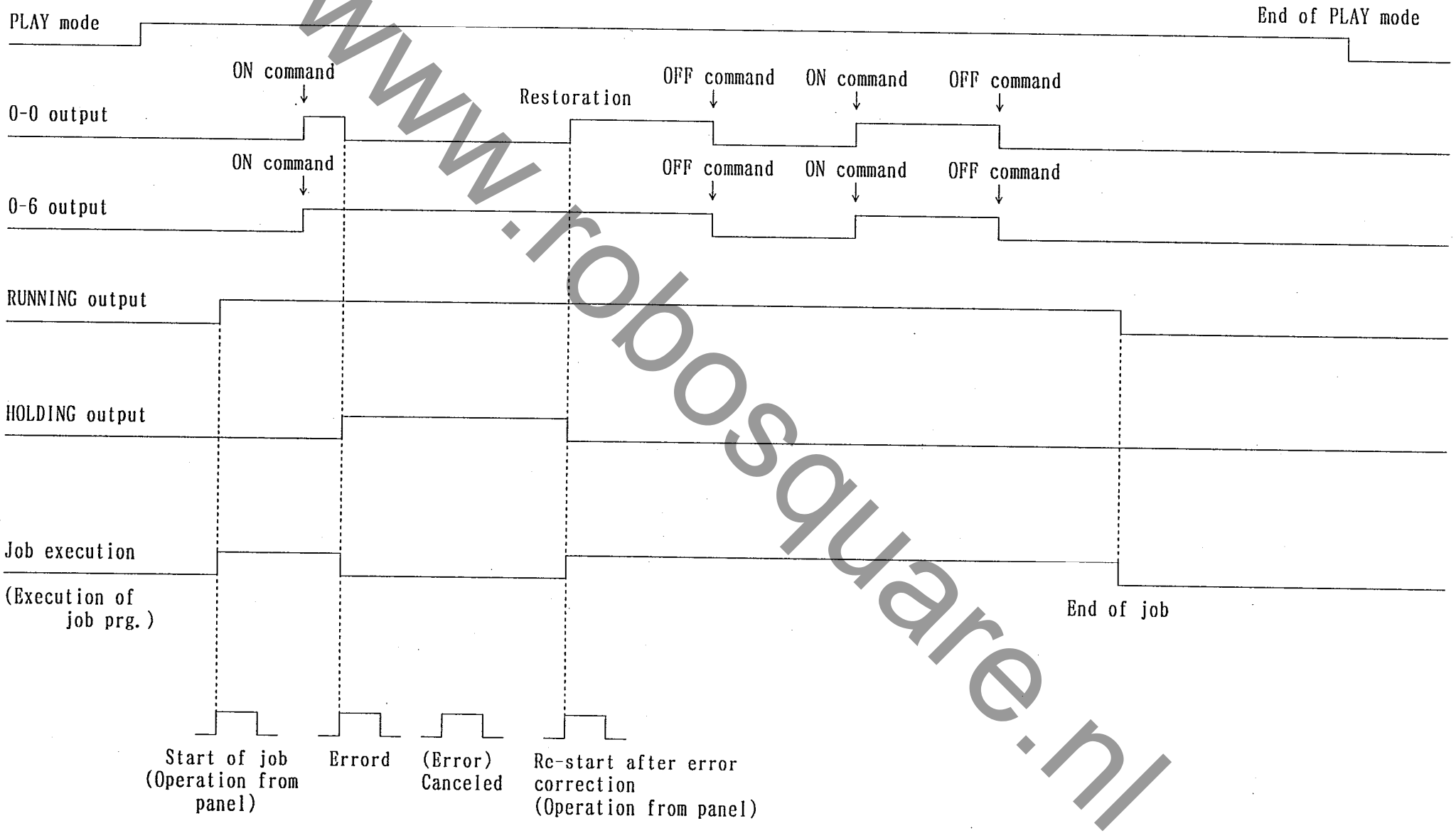
Flow chart of status outputs (2)
<EMERGENCY STOP>



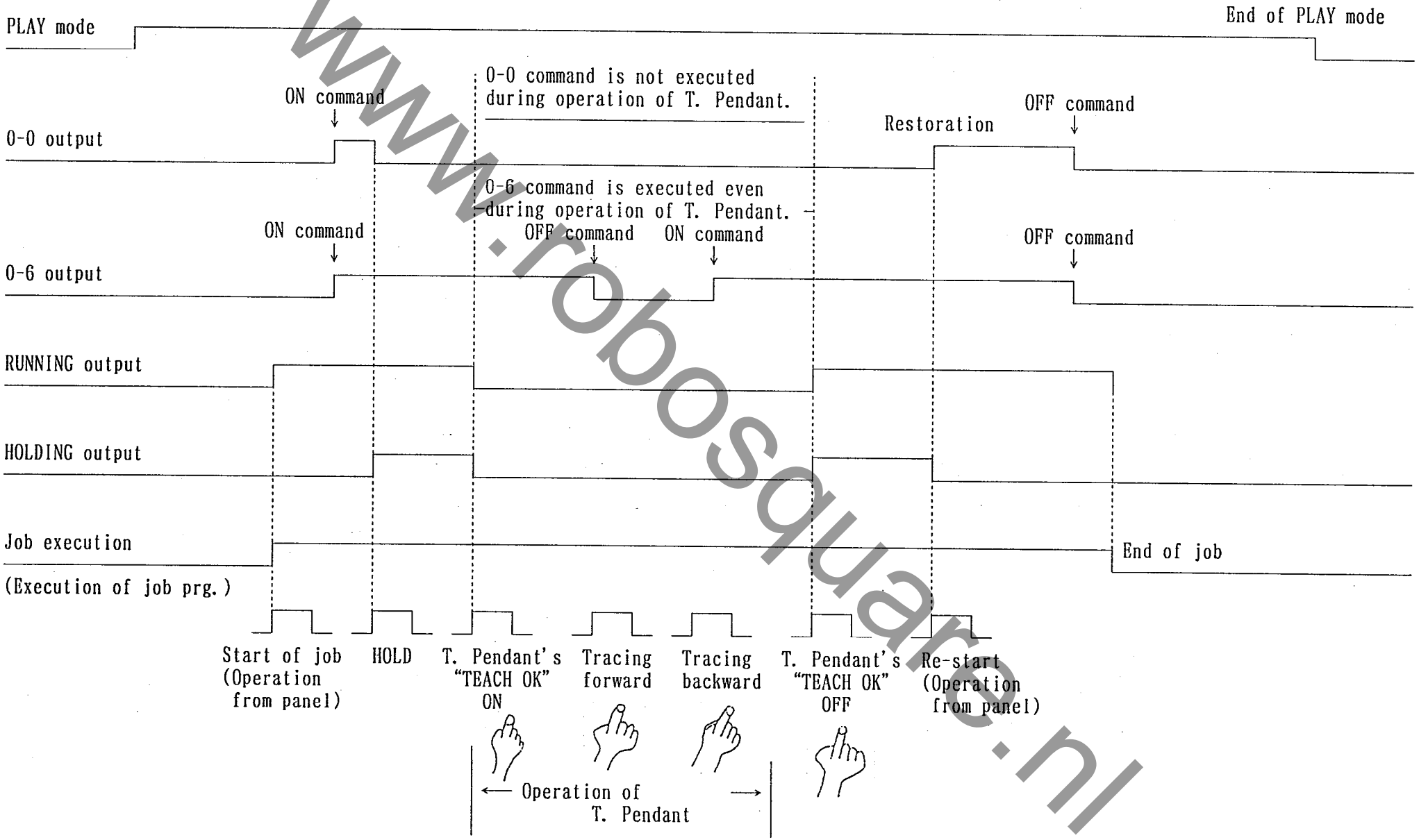
Flow chart of status outputs (3)
<Conditions for stopping address search>



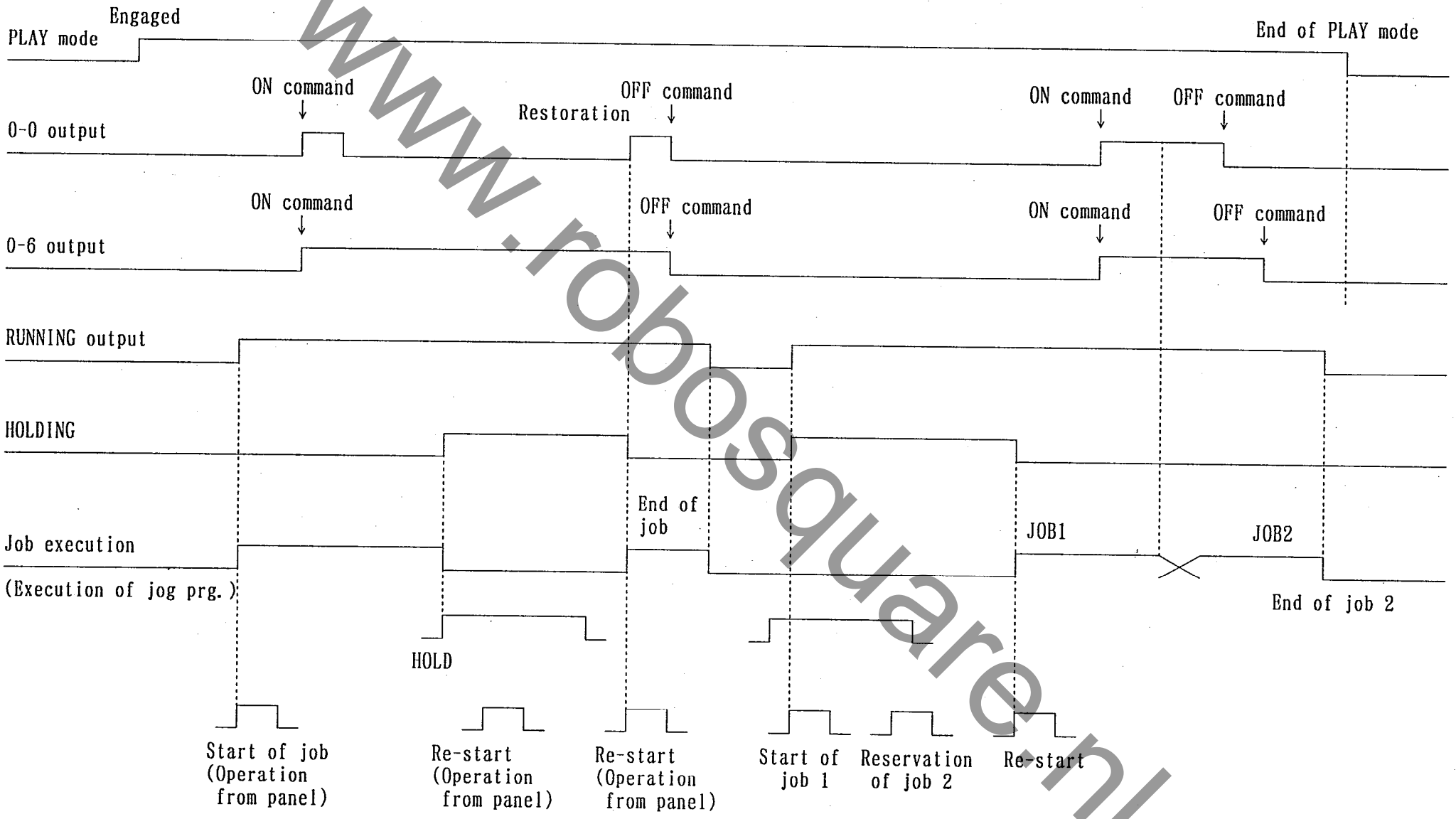
Flow chart of status outputs (4)
<In case of error>



Flow chart of status outputs (5)
<Tracing>

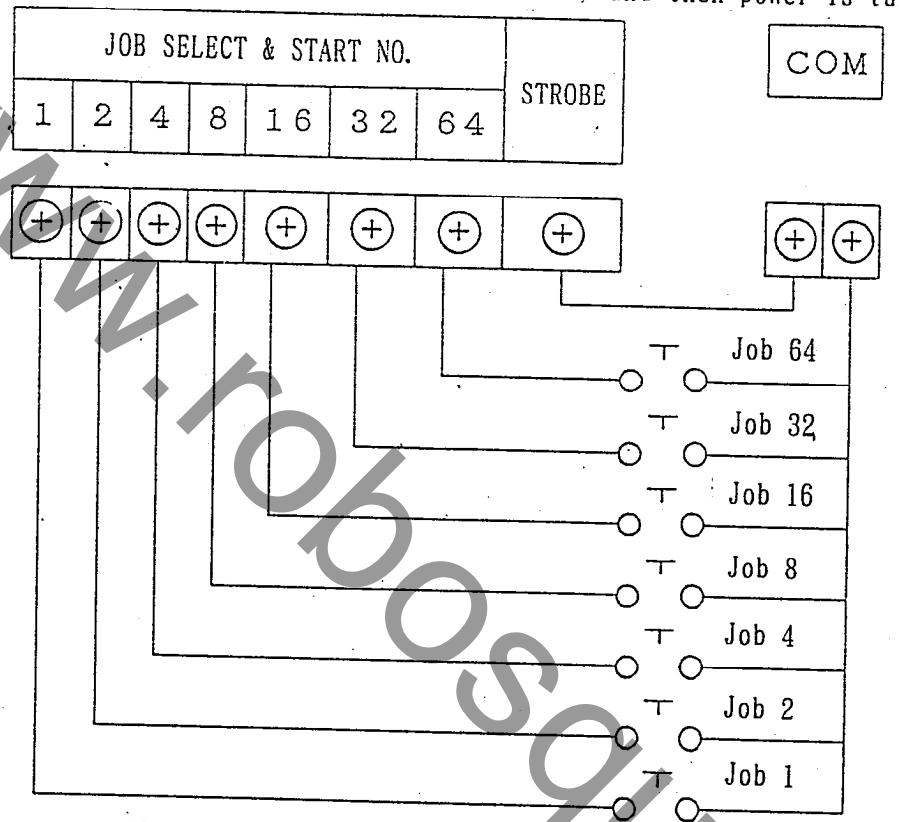


Flow chart of status outputs (6)
<HOLD and Job reservation>



(If a job has started, reservation of another job is accepted even during HOLD)

Timing of job reservation 1 (7-1)
(Where STROBE and COM terminals are short-circuited, and then power is turned on)



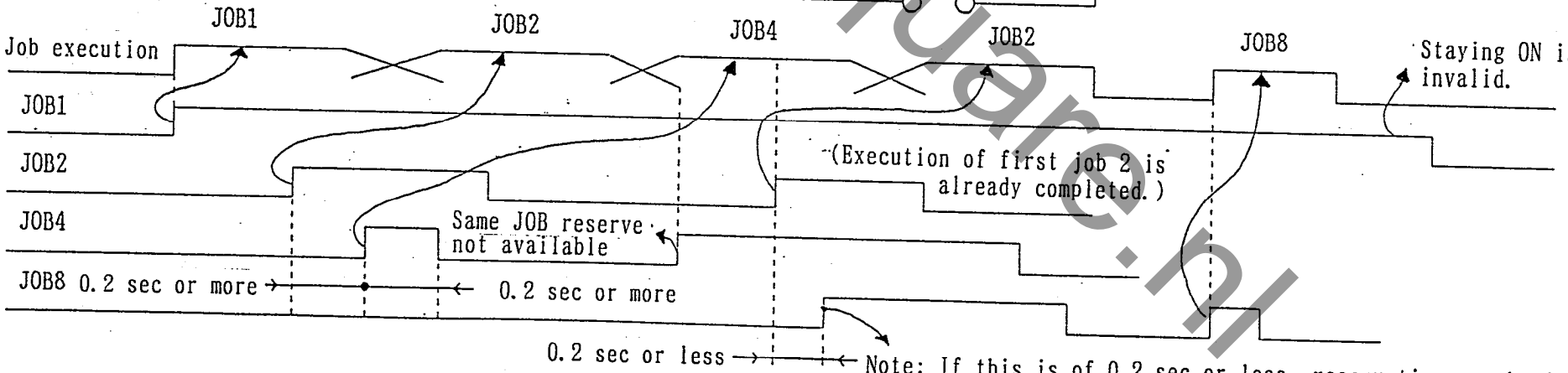
Notes:

(1) ON signal should have a pulse width of 0.2 sec or more.

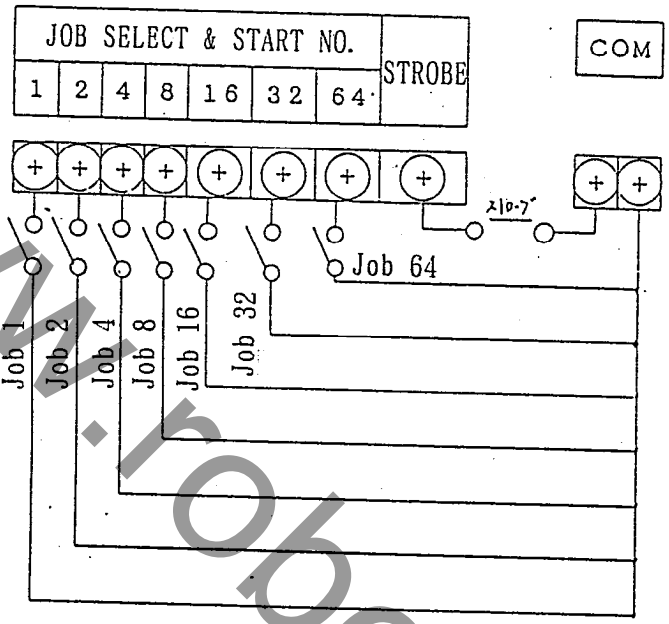
(2) The interval between any two ON signals should be 0.2 sec or more.

(3) If a signal stays on, it is accepted only the first time it turns on.

(4) A job with the same job No. as those for unexecuted jobs and the job being executed cannot be reserved.



Timing of job reservation 2 (7-2)
(Where STROBE and COM terminals are open, and then power is turned on)

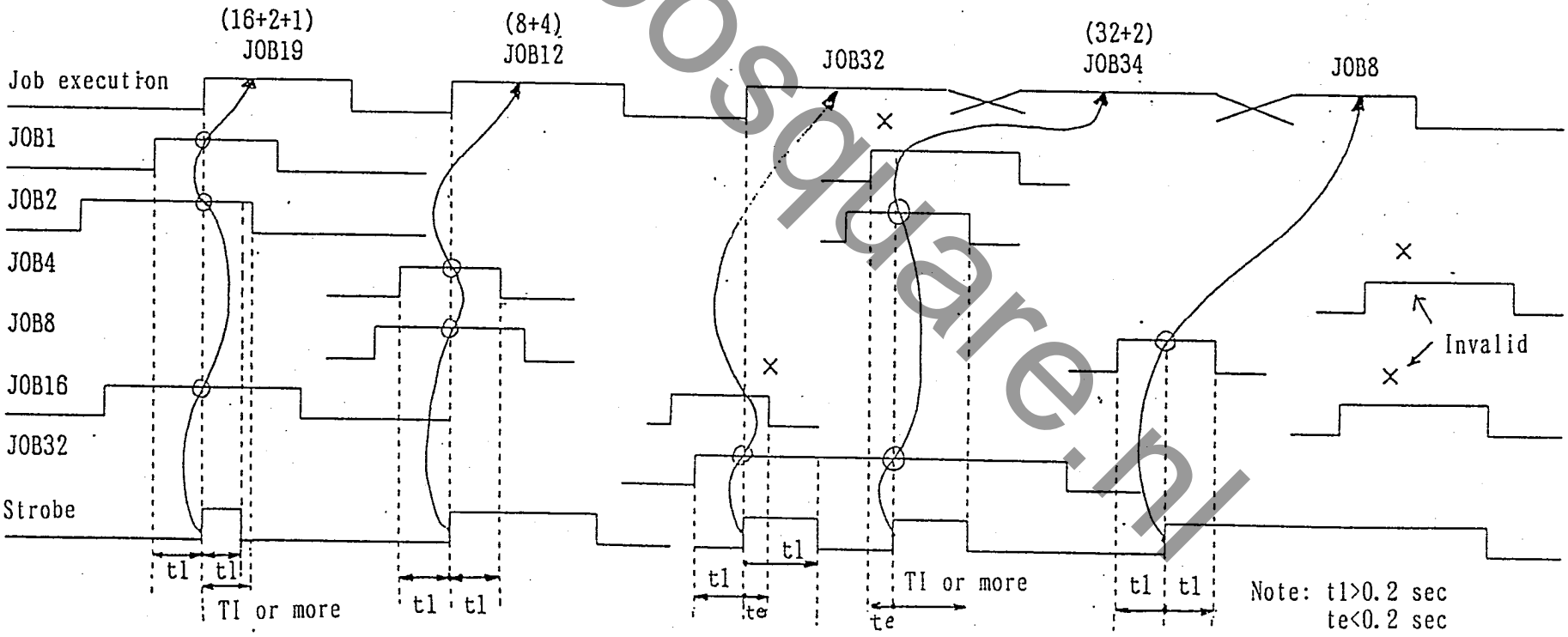


Note:

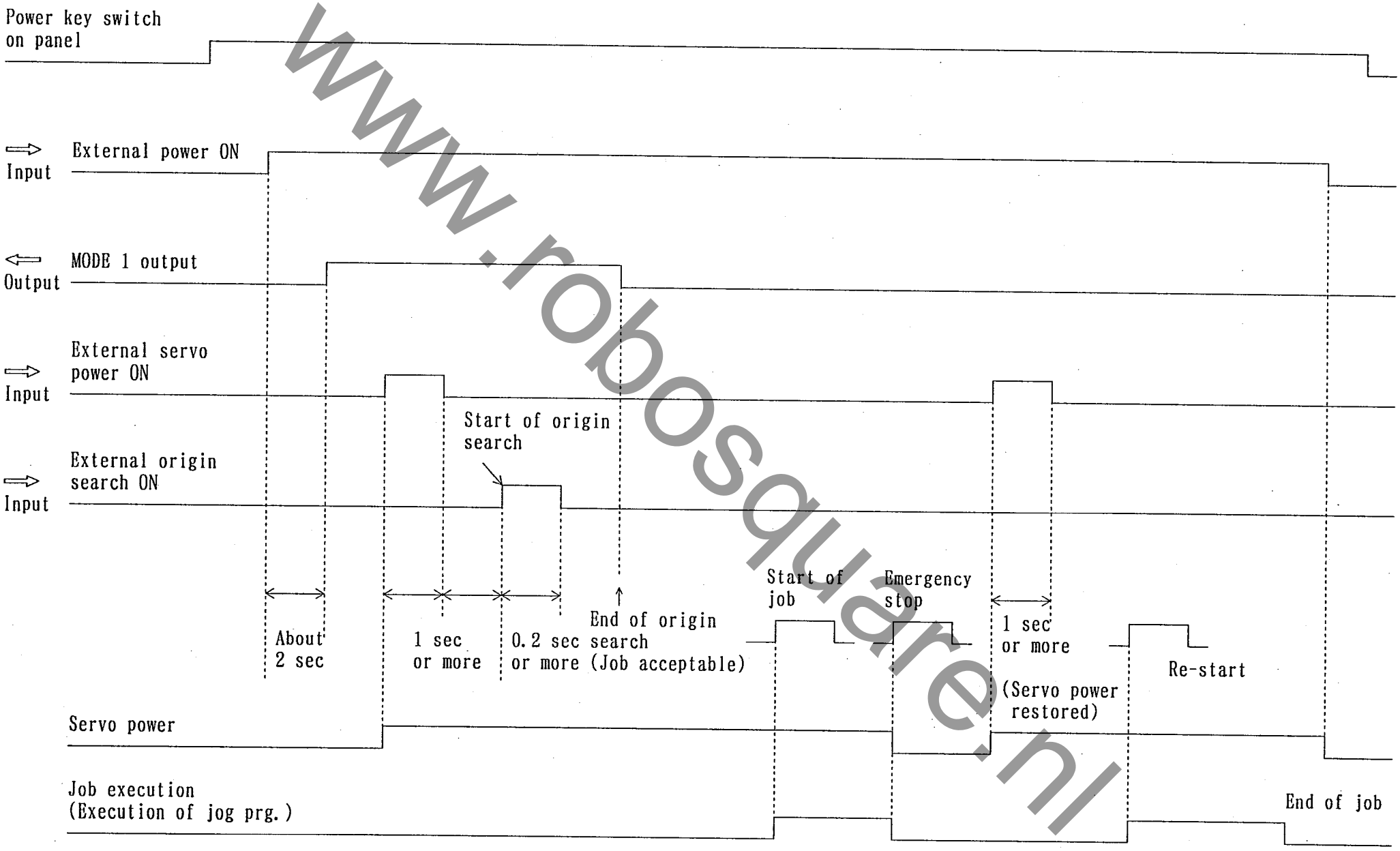
(1) Auailable JOB for execute or reserve is that it's number is summed up by JOB NO. with ON state at leading edge of strobe.

(2) The pulse width of a strobe, and the data holding time after the rise of a strobe need to be 0.2 sec or more each.

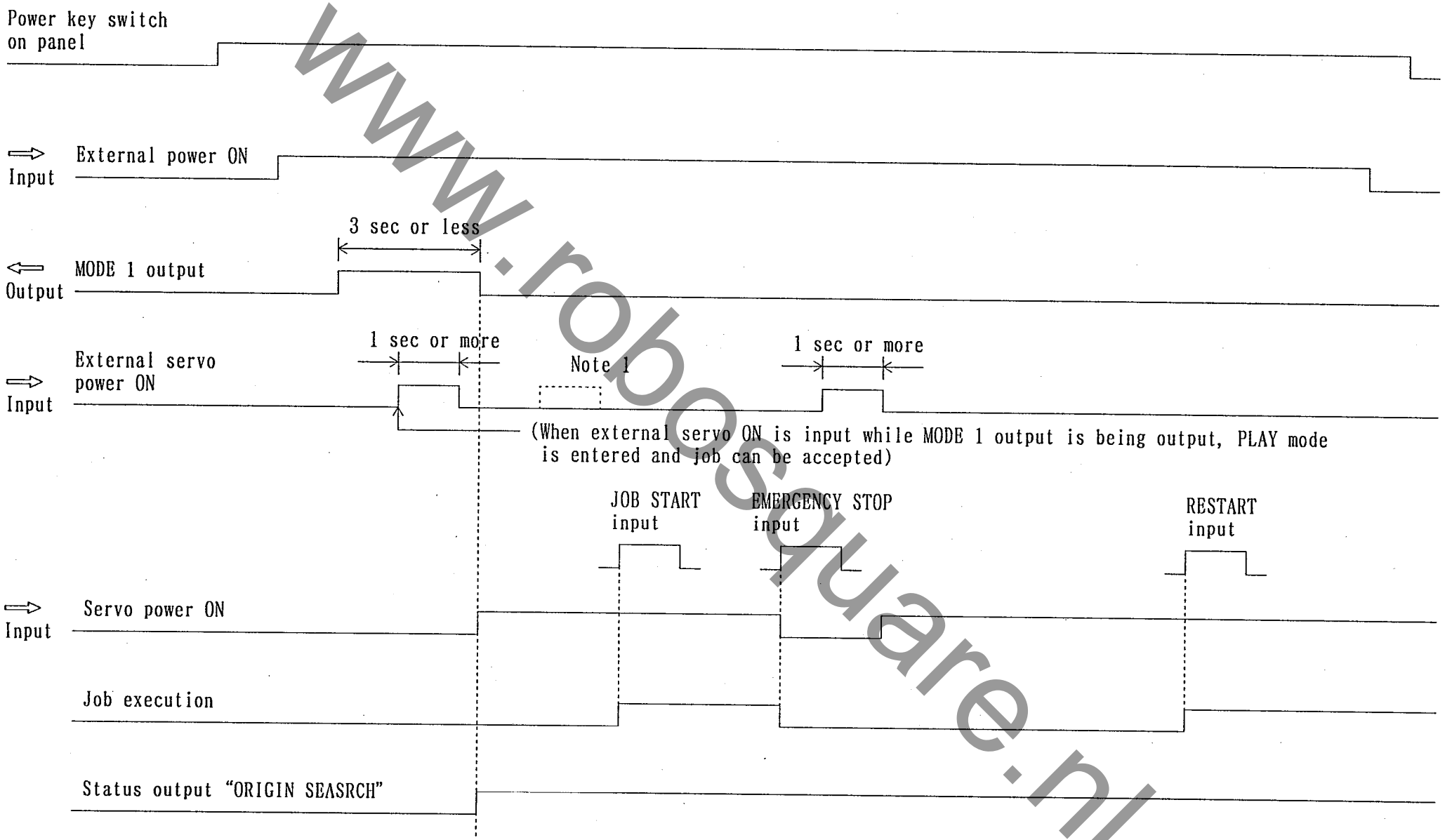
(3) A job with the same number as those for unexecuted jobs, and the job being executed cannot be reserved.



External power ON/ external origin search ON(8-1)

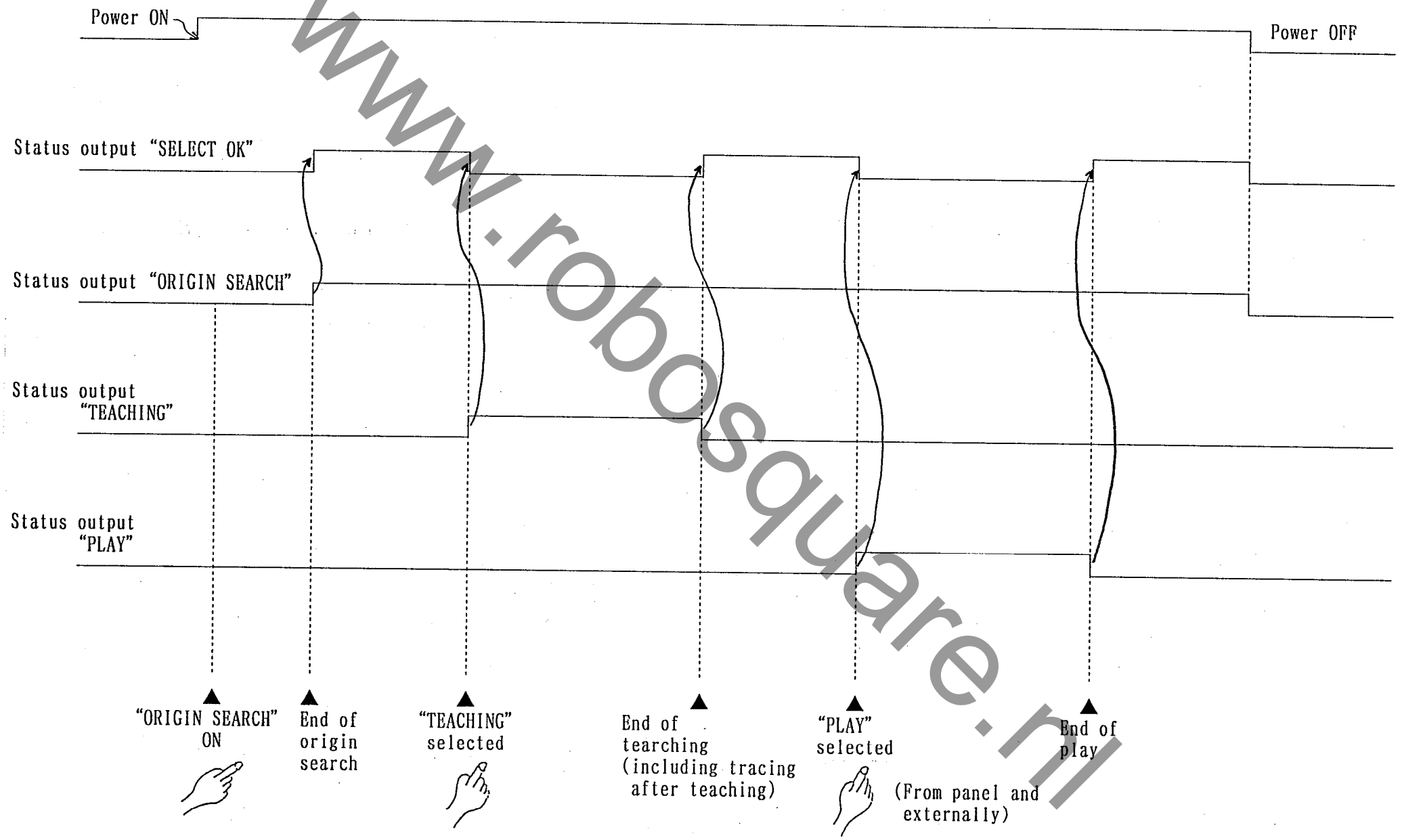


External power ON/ external origin search ON (8-2) quick start

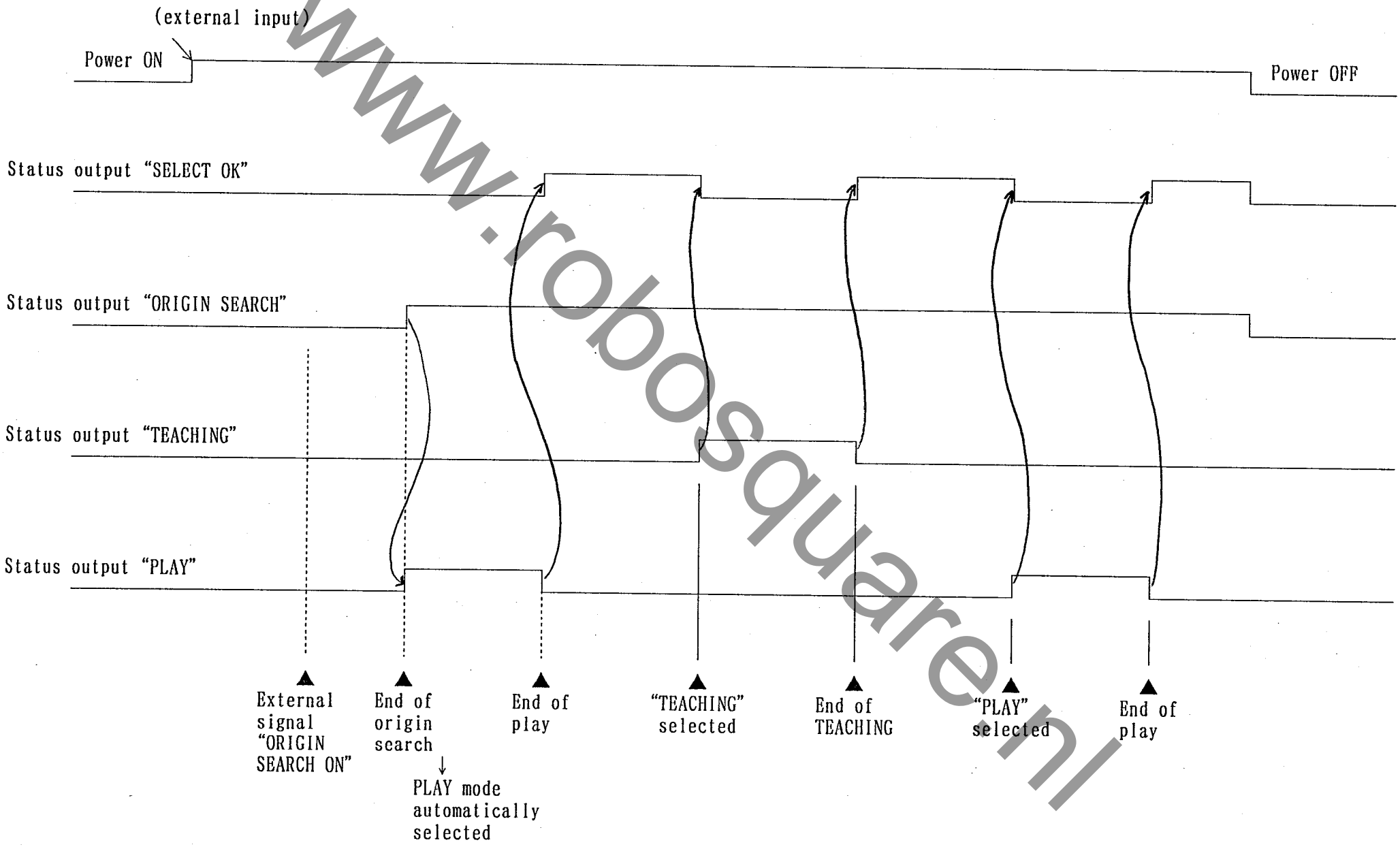


Note 1: If external servo power ON fails while MODE 1 output is being output, the servo power does not turn on and the End of Origin Search screen appears.

Status output 1 : Status outputs after origin search from panel (9)

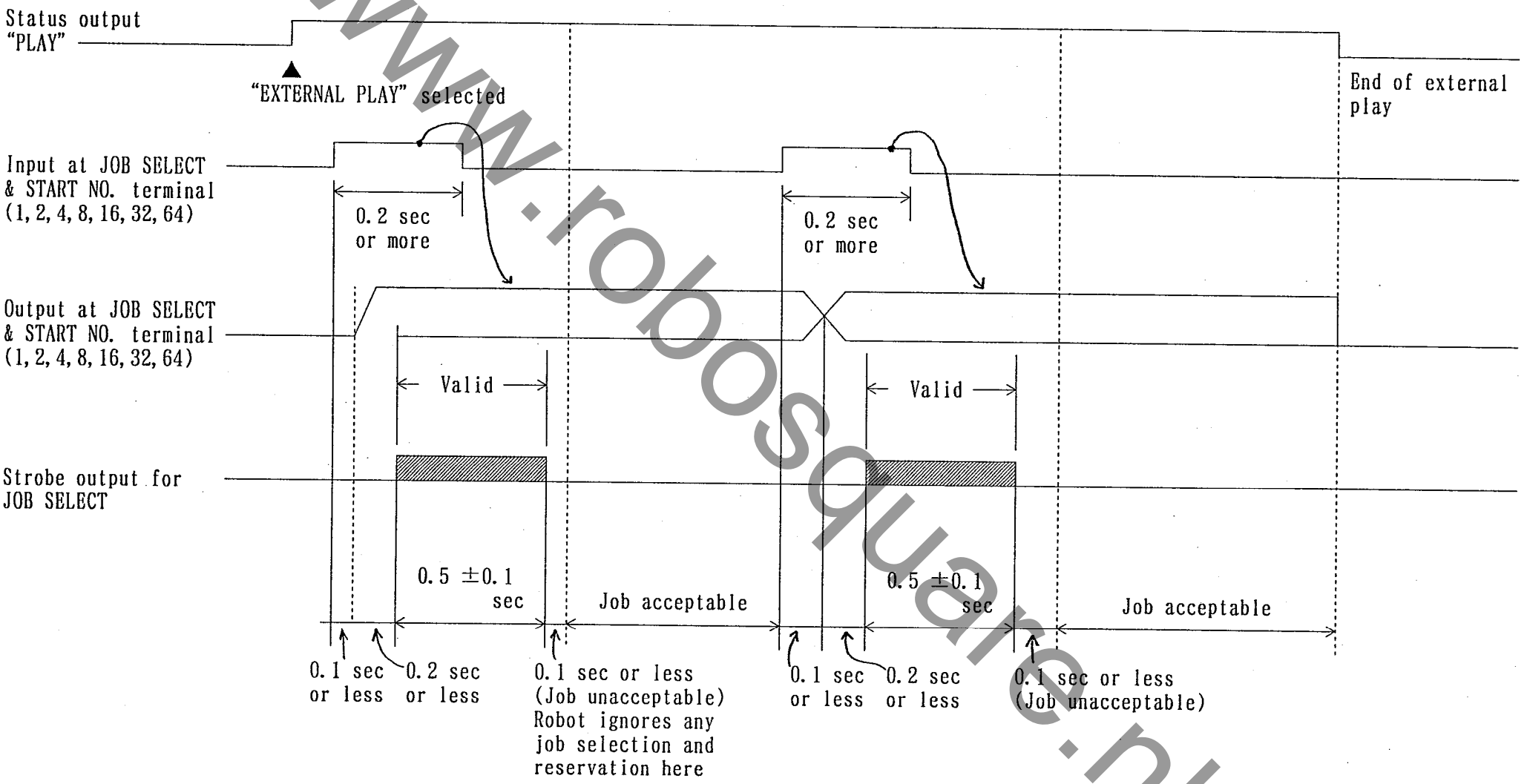


Status output 2 : Status outputs after extrenal origin search (10)



Timing of response to JOB SELECT & START (11)

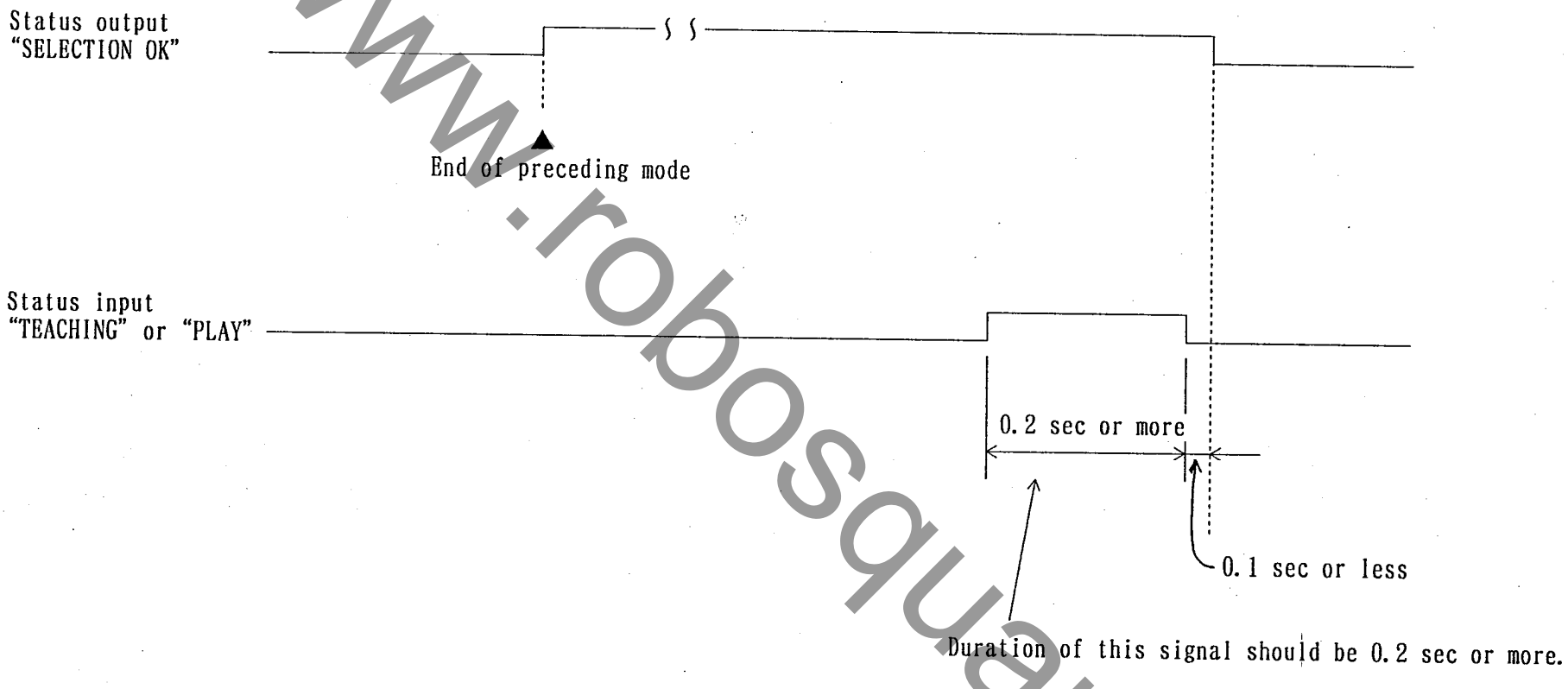
When a job No. is selected and reserved during external play, the reserved job No. is output (as answer) .



Notes : 1. Job select response output keeps, it's status until next Job select input.

2. Job select response output is available by extenal play mode, not by pannel mode.

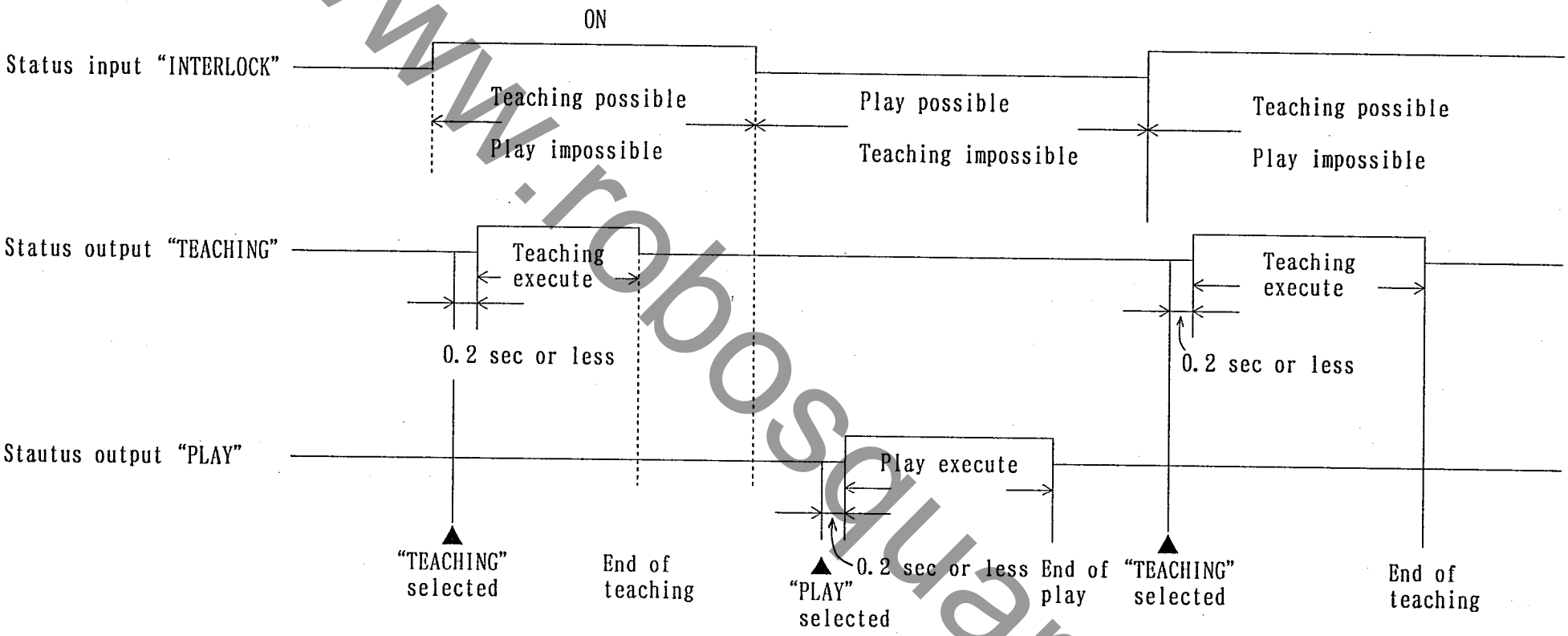
Timing of status input "TEACHING" or "PLAY (12)



Note: Status input "ORIGIN SEARCH" is currently not used.

Status input "INTERLOCK" (13)

This is an input for interlock with external equipment in the PLAY mode, for safe teaching operation.
INTERLOCK input is available only when it is set at VALID in the INITIAL SETUP mode.

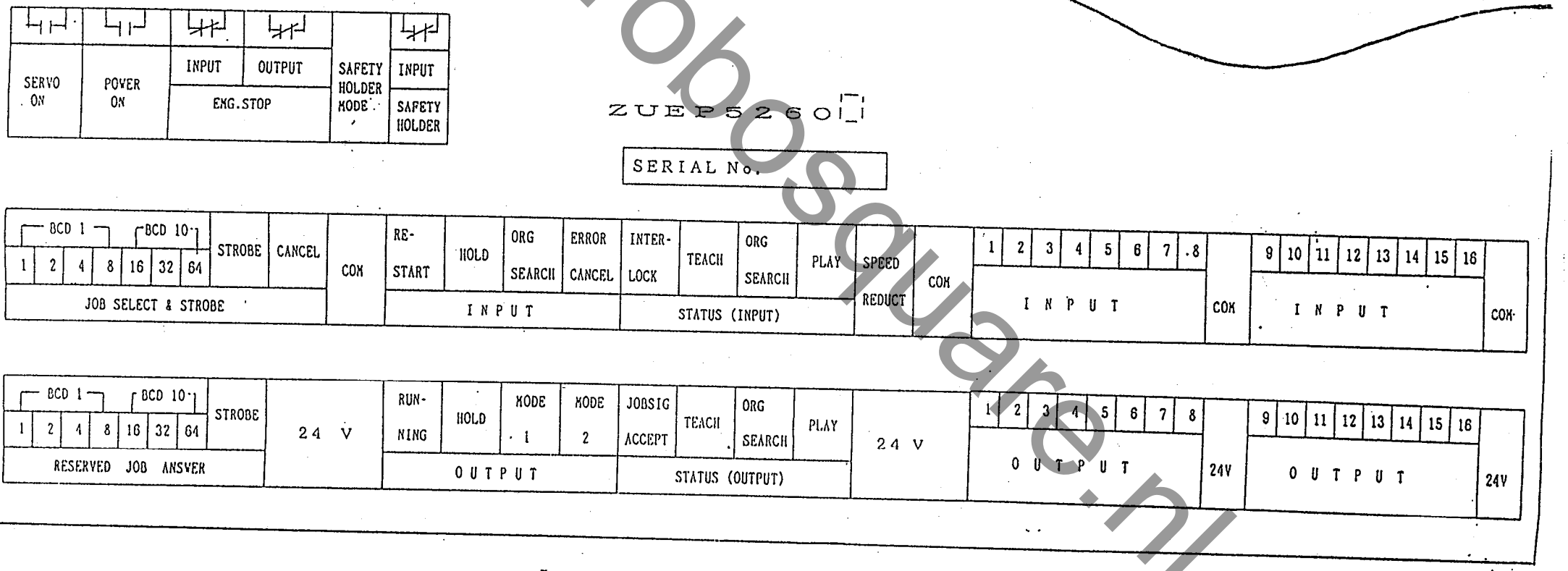


Notes:

1. Even if "INTERLOCK" input is turned OFF during teaching, the stauts output "TEACHING" stays ON.
   At the end of the teaching, the "TEACHING" output turns OFF.

2. Even if the INTERLOCK input turns ON during play, the staus output "PLAY" stays ON.
   At the end of the play, the "PLAY" output turns OFF.

3. If a status input "PLAY" occurs with "INTERLOCK" input ON, an error message "INTERLOCK IN EFFECT" appears.
   If a status input "TEACHING" occurs with "INTERLOCK" input OFF, an error message INTERLOCK IN EFFECT" appears.

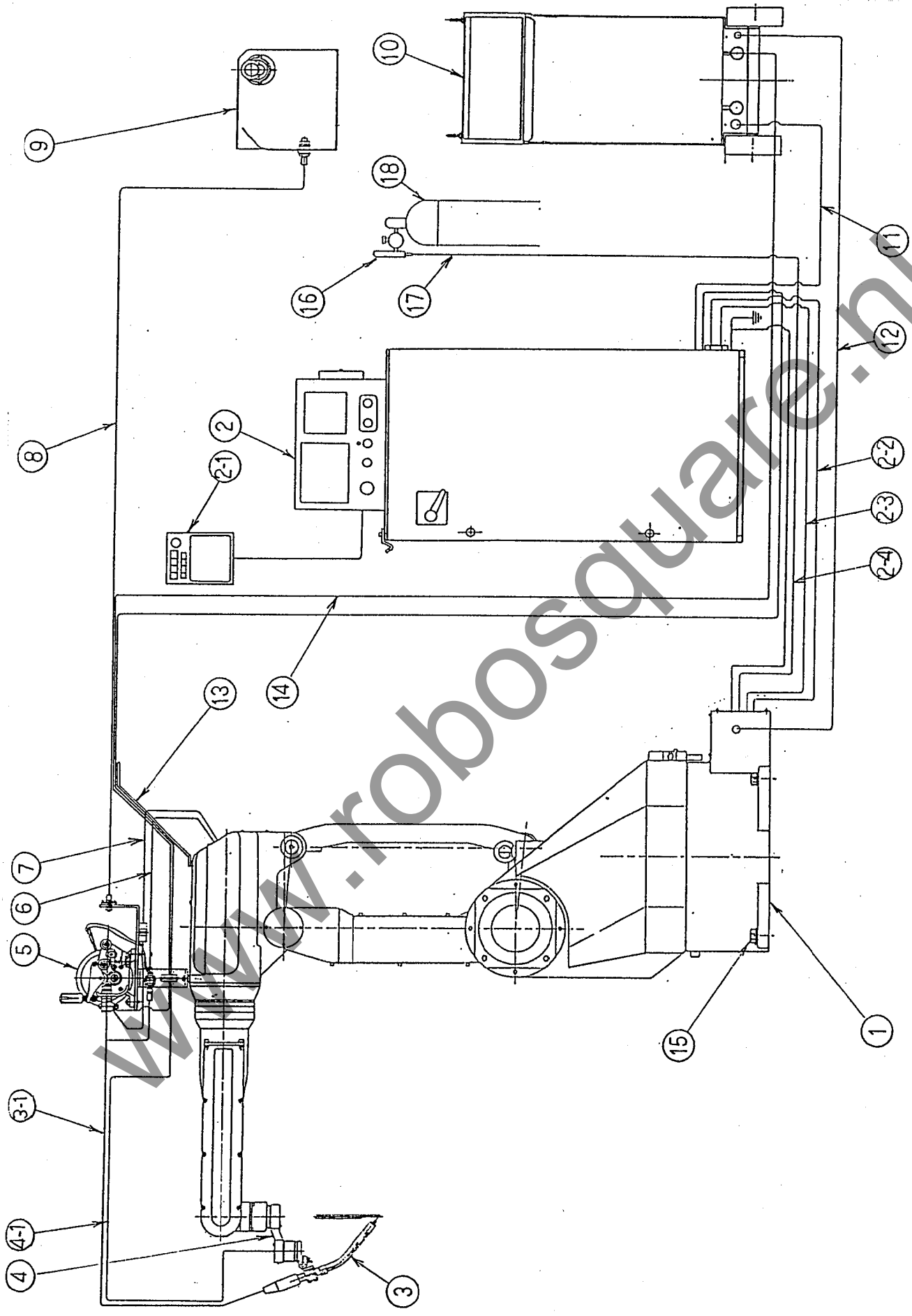


Input/Output terminals location on ZUEP5260

Chapter 4 Standard CO_2 Welding System

4.1 Basic system configuration

No.	Name of unit	Remarks
1	Manipulator	Included in robot
2	Control unit	Included in robot
2-1	Teaching pendant	Included in robot
2-2	Encoder cable	Included in robot
2-3	Motor cable	Included in robot
2-4	Ground cable	Included in robot
3	Welding torch	
3-1	Torch cable	
4	Safety holder	
4-1	Safety holder cable	
5	Wire feed motor	
6	Gas hose	
4	Motor cable unit	
8	Flexible conduit	
9	Wire reel stand	
10	Welding power supply	
11	Interface cable	
12	Control cable	
13	Torch cable fixing unit	
14	Power cable	
15	Fixed unit	
16	Gas valve	
17	Gas hose	
18	Gas cylinder	To be prepaired by customer



Basic system configuration

4-2 Centering the welding torch

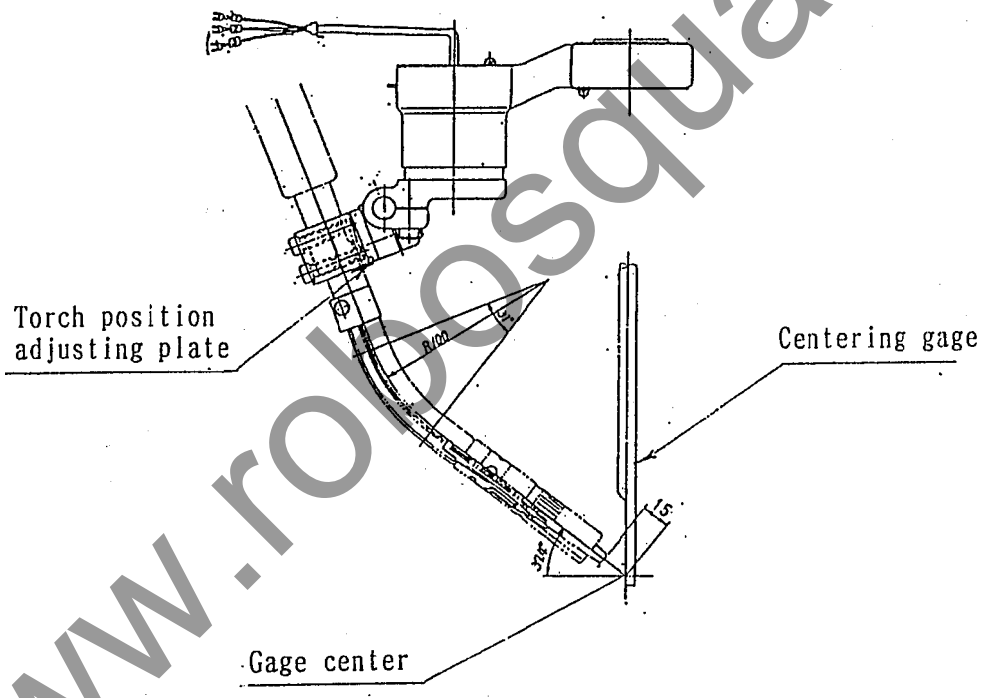
Install the centering gage provided on the torch holder.

Loosen bolts A and B shown below. Adjust the tip of the wire from the torch to the gage center by moving round bar C and torch position adjusting plate D, and tighten bolts A and B.

If the welding torch is not centered, the locus of torch tip is not circle when the torch wrist is rotated, It cause the torch tip to deviate from the target point.

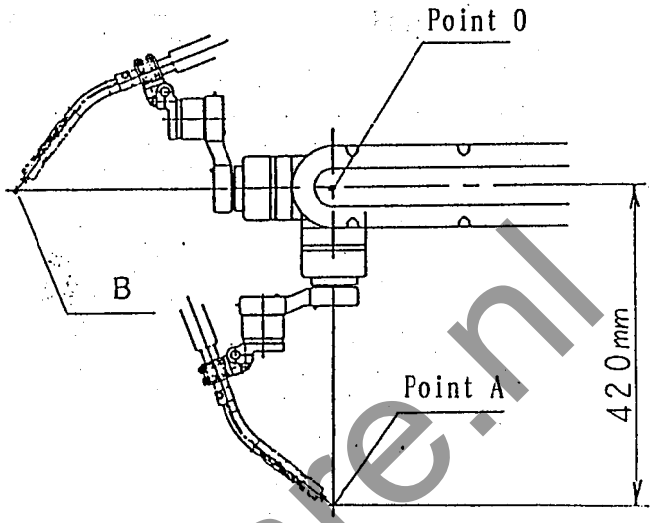
Therefore, surely center the torch.

Be sure to read the instruction manual for torch holder YA322UH.



4-3 Arcing spot

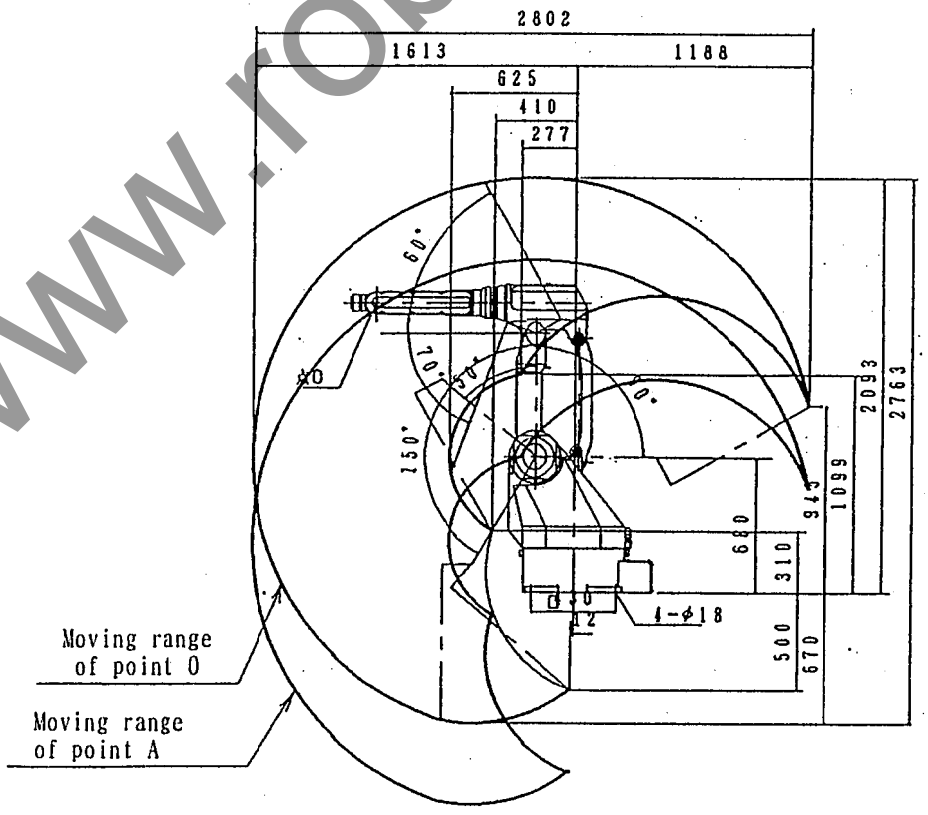
The drawing right side shows the moving range of center O of the wrist bending axis. When the standard torch is installed, the arcing spot is 420 mm apart from center O. When the wrist bending axis is downward, point A is the arcing (working) spot.



The moving range of point A is that center O parallel-shifted 420 mm downward, as shown below.

When the wrist bending axis is horizontal, the moving range of point B is that of point O parallel-shifted 420 mm forward.

As described above, the moving range of the arcing spot differs with the bending angle of the wrist bending axis, Thus, when determining the fixing position of a work, consider the bending angle of the torch.



4-4 Applicable welding power supplies and wire diameters

Unless otherwise specified, the AW8010 is adjusted at factory to:

Welding power supply: Pana Star 350HF

Applicable wire: 1.2 mm dia. (for welding mild steel)

① In the case of welding power supply Pana Star 350HF and 1.2 mm dia. wire

● Wire diameter/ gas selector switches

Operate the selector switches at the front of the welding power supply to set the wire diamter to 1.2 mm and the gas to CO_2 or MAG.

② In the case of welding power supply Pana Star 350 HF and 0.9 mm dia. wire

● The parts mentioned in the table below need to be ordered additionally.

Name	Code	Q'ty	Compatibility
Tip, 0.9 ϕ	TET00911	1	For Panasonic semiautomatic CO_2 torch
Conduit tube, 0.9 ϕ	TDT00919	1	For Panasonic semiautomatic CO_2 torch

● Changing components located along the wire path

Change the feed roller, conduit tube, and tip to those for 0.9 ϕ wire. These are the same as those for the standard semiautomatic welder.

● Wire diameter/ gas selector switches

Operate the selector switches at the front of the welder power supply to set the wire diameter to 0.9 ϕ and the gas to CO_2 or MAG.

③ In the case of other welding supplies

● Consult us beforehand.

If the welding system ordered is built to a welding power supply specified by you, refer to its manual.

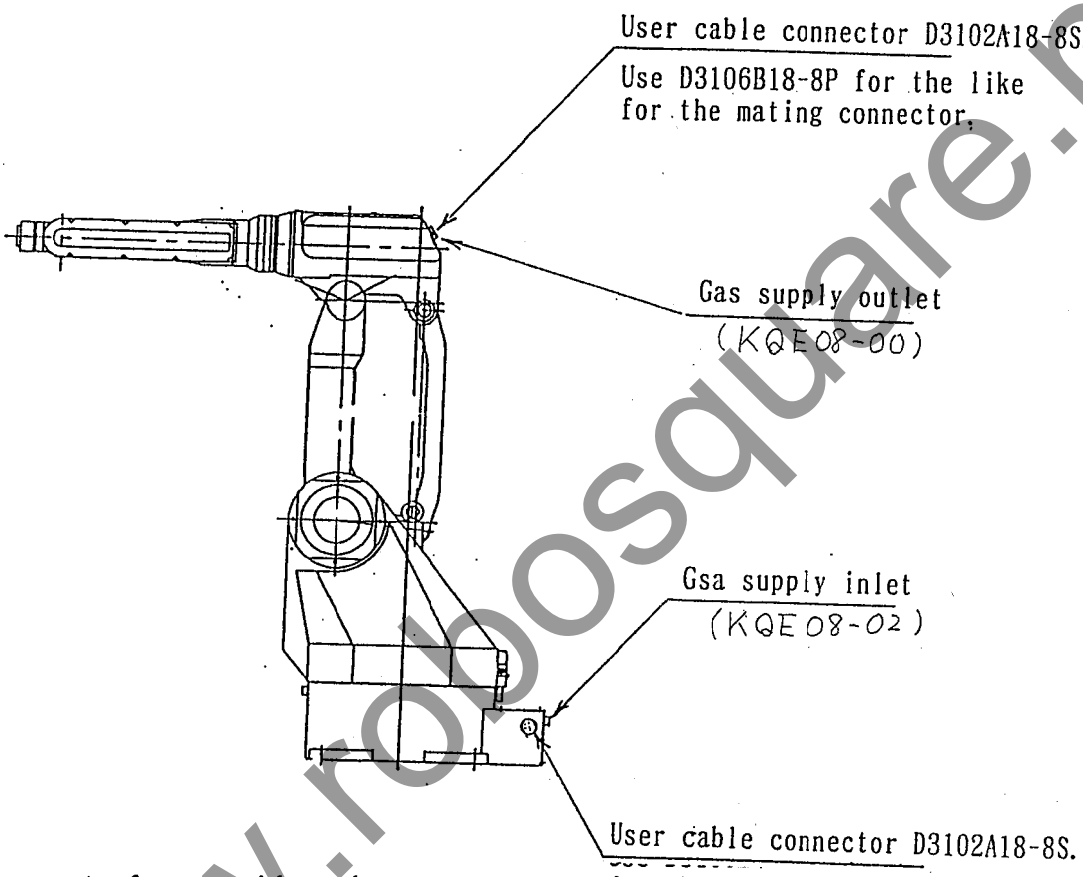
4-5 User cables and pipes

Eight (or six) cables and one gas hose for various system applications are stored in the manipulator. Use them to configure a system as compact as possible.

Allowable current in cable: Refer to the table below.

Maximum working pressure in gas hose: 6kgf / cm²

(Hose bore: 9 mm)



Arrangement of user cable and gas pipe.

Connector for user cable

Pin code	Signal code	Allowable current	Remarks
A	OPT 1	3A or less	Used during welding.
B	OPT 2	3A or less	
C	OPT 3	1A or less	For user
D	OPT 4	1A or less	
E	OPT 5	1A or less	
F	OPT 6	1A or less	
G	OPT 7	1A or less	
H	OPT 8	1A or less	

Chapter 5 Check and Maintenance Manual

In order to keep the robot safe and maintain initial performance for long time, make good manintenance.

Periodic checks consist of :

1. Daily check
2. Per 500 H (Every 3 months) check
3. Per 2,000 H (Annual) check

Necessary checking items on each check should be followed to the table on page 5 - 4.

Daily checking items are listed on the following page.

Checking interval is set on the basis of standard operation hours, and either "Months" or "Hours", which comes first, should be adopted as the base of checking interval.

As the "Hours", you should rely on hours in which the line was live.

Especially in every 2,000 hour (1 year) periodic check, we recommend you to ask our company's overall checking.

The periodic-checking agreement specified by us starts with every 2,000 hour (1 year) check.

5-1 Daily check

○Checking before turning on power

	Parts	Check point	Remedy	Remarks
1	Ground cables	* Looseness * Broken wire, damage	* Fasten again * Replace with new one	
2	Robot Manipu-lator	Stick of spatters & dusts	* Remove	Air blowing is prohibited, as dusts may enter gaps or cover, causing damages on robot.
		Broken bellows	Replace with new one	Leave it to our serviceman
		Chatter	Fasten again	When cause unclear, leave it to our serviceman
3	Safety fence	Breakdown	Repair	
4	Welding torch, nozzle tip	* Spatter * Worn tip hole	Remove desposition Replace with new one	Use Panasonic original parts
5	Workshop	Clean up and put in order		

○Checking After turning on power

* Turn on power after confirming that no one stays in scope of robot movement.

	Parts	Check point	Remedy	Remarks
1	Emergency stop switch	* Power is OFF immediately.	* Repair wire break * When cause unclear, leave it to our serviceman	Don't use it till repair is over
2	Margin pulse (with auxiliary axes only)	* Margin pulse % is 25 - 75 %.	* When origin marks (see next item) are aligned : Perform tracing and confirm no deviation is present. Then, play may be performed. * If margin is lower than 25 % or higher than 75 %, leave it to our serviceman.	
3	Origin mark	Origin markes are alligned after completion of origin search.	If not aligned, leave it to our serviceman.	Make preparation for pressing Emergency Stop swich at any time when approaching robot to check origin marks.
4	Robot manipu-lator	* Whether abnormal vibration or noise is generated when each axis is moved by MANUAL * Whether abnormal vibration or noise is generated with "PLAY"	* Leave it to our serviceman	Don't use it till repair is over
5	Fan	* Cooling fan at suction inlet of control unit is running. There is no dirt attached.	* Clean off	

5-2 Periodic checks

Interval		Check item	Means	Check points and Remedy
3 months	1 year			
○		Fixing bolt for robot	Wrench	Check for looseness. Retighten
	○	Connecting bolt for revolving and driving units	Wrench	Check for looseness. Retighten
	○	Motor mounting bolt	Wrench	Check for looseness. Retighten
	○	Harmonic drive	Torque wrench Visually	Check hramonic drive for external appearance Check for tighening torque Lubricate
	○	Limit switch	Screw-driver Wrench Gage	Check for looseness Retighten Check for gap Check for motion
○		Cannon connector	By touching	Check for looseness Retighten
	○	Motor(DC motor for auxiliary axis)	Scale Tester	Check brush Measure insualtion resistance
	○	Protection spring for wires in machine (for RT and UA axes)	Visually	Check for wear Apply grease
	○	Wires in machine. Connector	Visually Tester	Check for external appearance, and wire condition Test for continuity
○		Wrist	By touching	Turn wrist flange by hand to check for backlash
	○	Wrist bevel gear	Visually	Check teeth for wear Lubricate
○		Cover screw	Screw-driver Wrench	Check for looseness Retighten

Chapter 6 Spare Parts List

Recommended spare parts for the AW-8010 are shown in the tables below. Stock theseparts in suitable quantities as required.
The parts themselves fall into three distinct classes.
A: Consumables and parts with comparatively high rate of exchange
B: Mechanical units and parts with high frequency of motion
C: Important mechanical units

6-1 Robot manipulator parts

No.	Part name	Part code	Class	Recommended quantity	Quantity per M/C	Remarks
1	Limit switch	V-15-1B8	A	1	2	
2	timing belt	975-5M9	A	1	1	Unit part (without lead wire)
3	timing belt	350-5M9	A	1	2	
4	timing belt	300-5M9	A	1	1	
5	Grease	HC1	A	2 kg	—	For harmonic, bevel gear
6	TW gear 1	4A08378	B	1	2	
7	TW gear 2	4A08381	B	1	2	
8	BW gear 1	4A08368	B	1	1	
9	BW gear 2	4A08369	B	1	1	
10	Harmonic drive	SS20508011T	B	1	1	TW axis
11	Harmonic drive	RS20808011B	B	1	1	BW axis
12	Harmonic drive	HS2508011R	B	1	1	RW axis
13	Harmonic drive	SS50A08011F	B	1	1	FA/ UA axis
14	Harmonic drive	SS58A08011R	B	1	1	RT axis
15	Cross-roller bearig	CR9016AUUE1	B	1	1	RW axis
16	Cross-roller bearig	CR25025AUUE1	B	1	1	RT axis
17	Servo motor unit	USAREM02MA32	C	1	3	TW/ BW/ RW axis
18	Servo motor unit	USADED15MA12	C	1	3	FA/ RA/ RT axis

No.	Part name	Part code	Class	Recommended quantity	Quantity per M/C	Remarks
19	Rotary harness PG	1A00775	C	1	1	
20	Rotary harness M	1A00774	C	1	1	
21	Wrist harness	1A00776	C	1	1	
22	RT limit harness	4A09094	C	1	1	

6-2 Control-unit parts

No.	Part name	Part cod	Class	Recommended quantity	Quantity per M/C	Remarks
1	Fuse (3.0 A)	JG1-30	B	3	3	Servo power supply
2	Fuse (6.3 A)	XBA2E10NR5U	B	2	6	Servo amp., sequencer P board
3	Fuse (5 A)	XBA2E63NS5	B	1	1	Sequencer P board
4	Lithium battery	ER6CT	B	2	2	For backup