ANOTRONIC.™ COMWEB

user guide
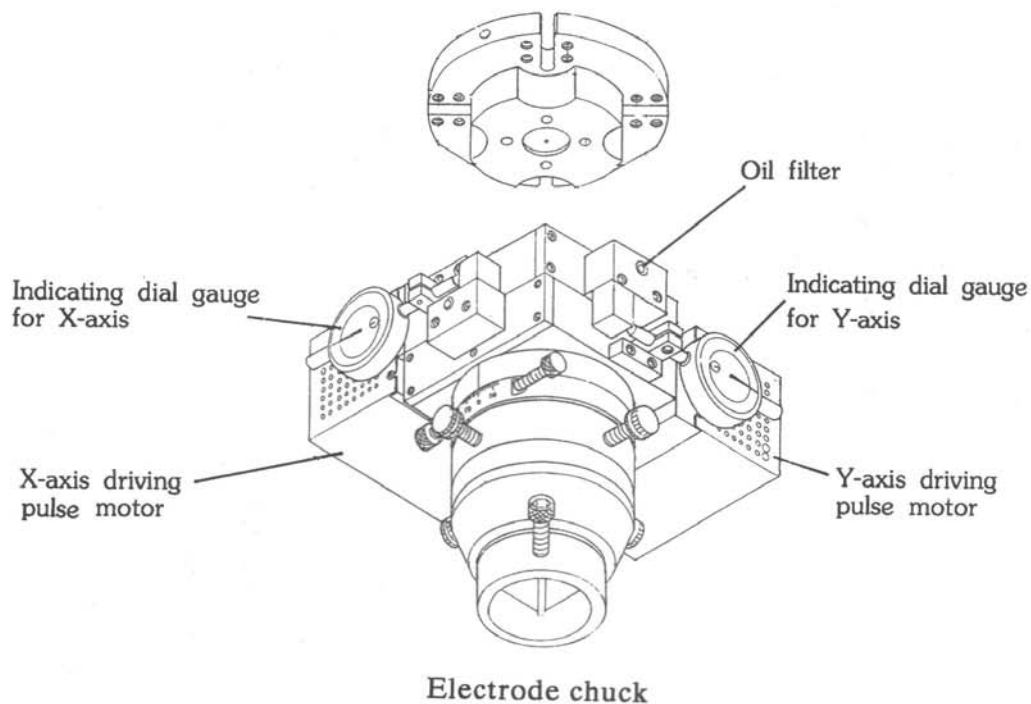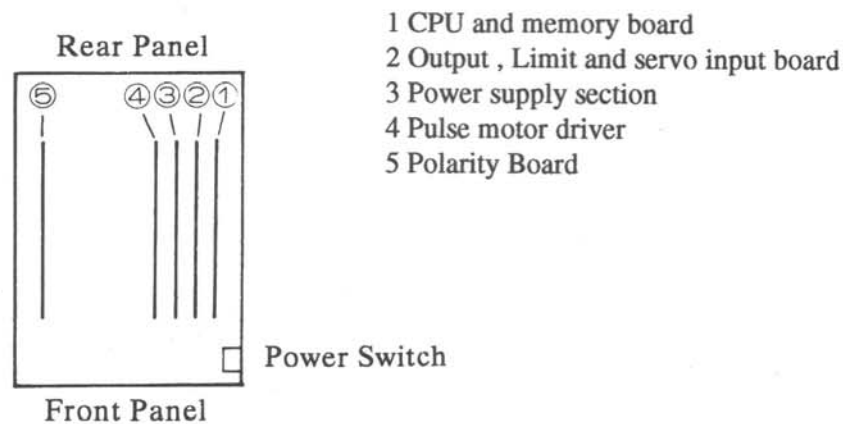
COC-200

ANOTRONIC LTD.™

The purpose for this instruction manual is to explain the principal function and operation procedures for Orbit-Cut System.

The users are recommended to read this manual carefully, and understand it thoroughly, before using the system, Thus you will find that the system is very accessible and you will make the best of it. Thank you.

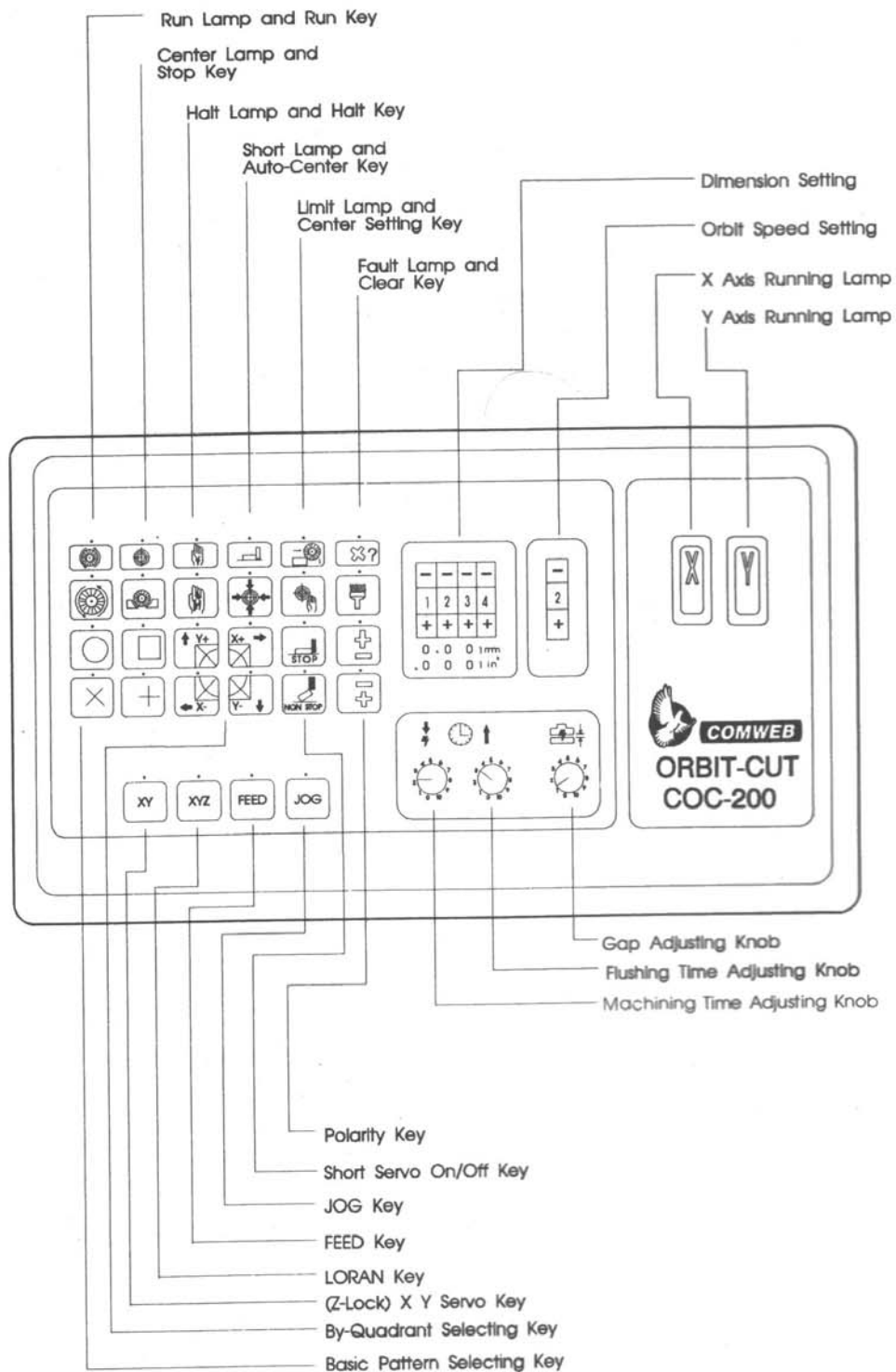# 1. DESCRIPTION OF COMPONENTS ON THE HEADS OF ORBIT-CUT SYSTEM

Electrode chuck

TOP-VIEW OF CONTROL BOX

Rear Panel

Front Panel

1 CPU and memory board
2 Output , Limit and servo input board
3 Power supply section
4 Pulse motor driver
5 Polarity Board

Power Switch

2. PANEL AND INDICATIONS OF COC-200

Run Lamp and Run Key

Center Lamp and Stop Key

Halt Lamp and Halt Key

Short Lamp and Auto-Center Key

Limit Lamp and Center Setting Key

Fault Lamp and Clear Key

Dimension Setting

Orbit Speed Setting

X Axis Running Lamp

Y Axis Running Lamp

COMWEB
ORBIT-CUT
COC-200

Gap Adjusting Knob

Flushing Time Adjusting Knob

Machining Time Adjusting Knob

Polarity Key

Short Servo On/Off Key

JOG Key

FEED Key

LORAN Key

(Z-Lock) X Y Servo Key

By-Quadrant Selecting Key

Basic Pattern Selecting Key

2

3. DESCRIPTION OF KEYS:

(1) FUNCTION SELECTING KEYS:

| XY | XYZ | FEED | JOG |

JOG 1.JOG.mode: Work head is moved in the specified direction as long as any of By-Quadrant selecting keys is depressed.

FEED 2.FEED mode: Work head is moved in the specified direction with the dimension set.

XYZ 3.LORAN mode: The mode is used together with servo system. Work head describes the figure ..(X.Y.Z.) specified by the basic pattern and By Quadrant selecting Keys and moves within the dimension set in maching.

XY 4.Z-LOCK mode: This mode is used while both X and Y axis are machining in Lateral direction. ..(X.Y.)

Caution : In this mode, the Z axis must be locked.

(2) BASIC PATTERN SELECTING KEYS:

These Keys are used to specify the figures on the buttons in LORAN and Z-LOCK modes.
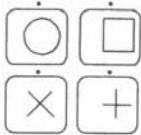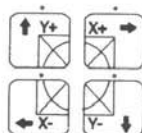
Basically, There are five figures , (1) circle, (2) square, (3) ''X'', (4) ''+'' and, (5) Hexagon available.

The circle, square, ''X'' and ''+''can be used in combination with By-Quadrant Selecting Keys.

(3) BY-QUADRANT SELECTING KEYS:

2nd quadrant   [Y+ ↑] [X+ →]   1st quadrant

3nd quadrant   [← X-] [Y- ↓]   4th quadrant

These Four buttons are used to distinguish the direction of movement in JOG and Feed modes and the quadrant in which machining is made in LORAN (X.Y.Z.) or Z-LOCK (X.Y.) Mode.
The following are examples of quadrant specified in LORAN (X.Y.Z.) and X.Y. Servo Mode.

Basic Pattern Key	By-Quadrent Selecting Key	The operation track in LORAN (X,Y,Z,) Mode	The operation track in X, Y, Servo Mode
			5°
			45°
			5°
			5°
			5°
			5°

4

Basic Pattern Key	By-Quadrant Selecting Key	The operation track in LORAN (X.Y.Z.) Mode	The operation track in X.Y. Servo Mode

Basic Pattern Key	By-Quadrant Selecting Key	The operation track in LORAN (X.Y.Z.) Mode	The operation track in X.Y. Servo Mode

6

Basic Pattern Key	By-Quadrant Selecting Key	The operation track in LORAN (X.Y.Z.) Mode	The operation track in X.Y. Servo Mode
○ □ / ✕ ＋	(quadrants)	←	←
○ □ / ✕ ＋	(quadrants)	↓	↓
○ □ / ✕ ＋	(quadrants)	←→	←→
○ □ / ✕ ＋	(quadrants)	↕	↕
○ □ / ✕ ＋	(quadrants)	⬡ (hexagon)	✕ (six-direction)

NOTICE:

1. The Z axis must be locked, when system is operation in X.Y. Servo mode.

2. In LORAN (X.Y.Z.) Mode, the GAP Voltage, Machining Time and Flushing Time are controlled by E.D.M. Servo system.

3. In X.Y. Servo mode the GAP Voltage, Machining Time and Flushing Time control Function are transferred to control box of Orbit-Cut System.

4. In LORAN mode, any combination other then the examples given above is mal-functional. The Fault lamp will Light up.

5. In Z-LOCK mode, any combination of quadrants can be used without fault.

6. However, circle plus all the four quadrants provides hexagon movement in either LORAN or Z-LOCK mode.

Caution : Hexagon cannot be specified as a particular quadrant.

(4) SHORT SERVO ON AND SHORT SERVO OFF KEYS:

Whether neglect or adopt contact signal (Short) depends on these two Keys. IN-JOG and FEED mode, the contact sensing circuit can monitor the movements of electrode and workpiece. If work head is moved with electrode kept in contact with workpiece, the electrode or workpiece will be damaged.

When the [STOP] is depressed, the work head will be stopped with contact occurred.

On the other hand, if the [NON STOP] is depressed, the work head will not be stopped with contact occurred.

(5) POLARITY SELECTING KEYS:
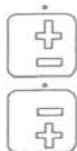
Since the Orbit-Cut System is provided with a servo board, which can give polarity information to servo detector.

Moreover, in order to know the machining condition, the gap between the electrode and the workpiece must be detected, Be sure to connect accessory wires for detection.

The white copped wire is connected to electrode, while the black-copped connected to work table. The polarity may change, depend upon the materials of electrode and workpiece.

Adjust the polarity selecting keys with respect to the polarity set by E.D.M.

Depress [+/−] while the polarity of electrode is "+" and that of workpiece is "-".

On the other hand, depress [−/+] while the polarity of electrode is "-" and that of workpiece is "+".

(6) DIMENSION SETTING:
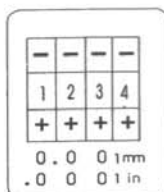
This switch is used to set the amount of displacement or orbiting in FEED, LORAN or Z-LOCK mode. In FEED mode, the range of setting can be from 1 to 9999 um, and in LORAN and Z-LOCK modes, it can be from 2 to 9999 um. Each increment is 1 um.

The travel of numerical controlled work head is 10 x 10 mm. Care must be taken not to make setting which is large enough to actuate the limit switch.

(7) ORBIT SPEED SETTING:
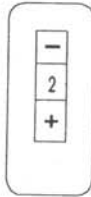
This switch is used to set operation speed in JOG and LORAN modes. The setting can be made from 0, the maximum speed, to 9, the minimum speed, in 10 steps.

(8) COMMAND KEYS:

1. RUN KEY :

This key is used to start LORAN or Z-LOCK operation and restart from depressing the Halt Key.

2. Stop Key :

This key is used to terminate LORAN or Z-LOCK operation. When this Key is depressed, the operation will not terminate immediately, but continue to more for a tied time until the work head returns to the operation start point (center).

3. Halt Key:

As stated above, the LORAN operation will not stop immediately if stop key is depressed. While instant stop is required for some reasons, the Halt Key can be depressed. For restarting the operation from the point where it is stopped, the Run Key is depressed.

4. Auto-Center Key:

A) Depressing this key, the work head will move along X-axis and Y-axis to its absolute center then terminate and center lamp lights up.

B) It can search the center of workpiece from electrode when the center lamp lights up, depress ⊕ Key the work head will move with electrode to contact with workpiece then find out the absolute center of workpiece, the center lamp is flashing when the center searching.

In this case, the contact sensing switch on the E.D.M. must be on.

5. Center Setting Key :

This key is used to change the position of absolute center point to a new one in some special conditions during machining.

When the work head is moved in FEED or JOG mode, the Center lamp goes off, indicating the work head is out of the center.

In this case, depressing the Center Setting Key light up the Center lamp, and the present position is defined as the center for LORAN and Z-LOCK motion.

6. Clear Key :

This system is provided with various protective functions. When any of Short, Limit and fault lamps lights. up, the unit will terminate all the operations to avoid Further faults .

In this case, the operator must determine the cause, before depressing the Clear Key, and reset the command after remedying this condition.

This Key is used when any of Basic Patterns or By-Quadrants has to be changed in LORAN or Z-LOCK mode.

In machining process, this key is ineffective. While the Basic Pattern of the By-Quadrant must be changed, depress Stop Key [icon] first, depress this key second, and reset the command for machining again.

(9) INDICATING LAMPS:

1. Run Lamp :
This lamp is lighted up, with the unit run, and extinguished with it stopped.

2. Center Lamp :

This lamp lights up when:
a) The work head is returned to the center after the operation in LORAN mode is completed.

b) The work head is returned to the center after the machining in Z-LOCK mode is completed.

c) The work head is returned to the center by depressing [icon] after the power is turned on,

d) depress [icon] to define present position as center after the movement in JOG or FEED mode is completed.

This lamp is extinguished when
a) The work head is not yet returned to the center after power is turned on.
b) Machining is made in LORAN or Z-LOCK mode.
c) The work head is moved in JOG or FEED mode.
d) The new center is not yet defined after the movement is JOG or FEED mode is completed.

3. Halt Lamp :
This lamp light up when Halt Key is depressed, indicating that the unit is terminated temporarily and ready for start.

4. Short Lamp :
The lamp lights up when the electrode is brought into contact the workpiece during operation in center, JOG or FEED mode if the Short Servo On Key is depressed. With this lamp lighted up, the unit is automatically terminated and ready for receiving new command.

5. Limit Lamp
This lamp light up whenever the stroke of work head is over limit during operation in any mode.

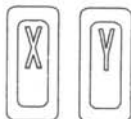Depressing the Clear Key [icon] will extinguish this lamp.

6. Fault Lamp :

This lamp lights up when
a) The Run Key is depressed before any command is selected.
b) Illegal command is given.
c) The computer of the unit is faulty.
Depressing Clear Key will extinguish this lamp.
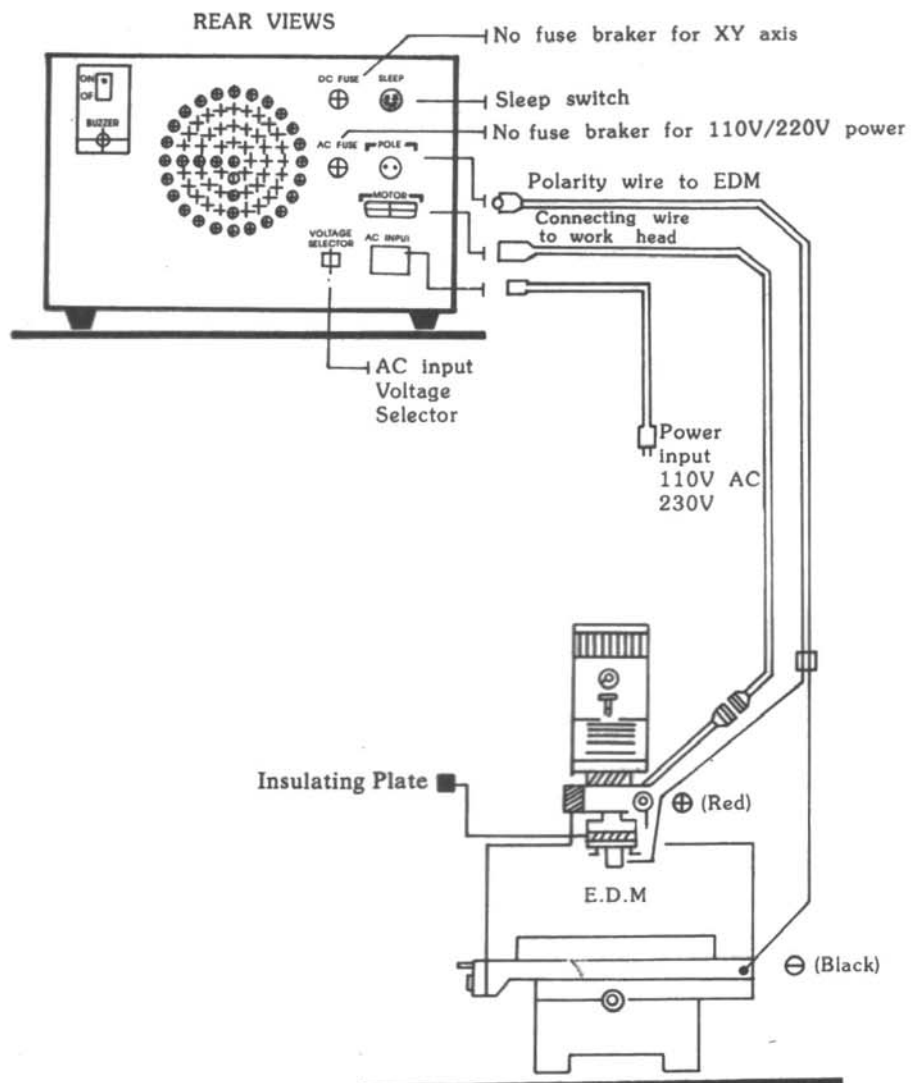
7. X,Y axis Running lamps :

These two lamps are used to indicate whether the work head is moved along X-axis or Y-axis.

(10) SERVO CONTROL SYSTEM :

1. Machining Time Adjusting Knob.
2. Flushing Time Adjusting Knob.
3. Voltage Over Gap Adjusting Knob.

Please refer to item (8), (9) and (10) in operating instruction.

4. DESCRIPTION OF REAR PANEL AND CONNECTING WIRES

REAR VIEWS

No fuse braker for XY axis

Sleep switch

No fuse braker for 110V/220V power

Polarity wire to EDM

Connecting wire to work head

AC input Voltage Selector

Power input 110V AC 230V

Insulating Plate

⊕ (Red)

E.D.M

⊖ (Black)

5. OPERATING INSTRUCTION FOR ORBIT-CUT SYSTEM
(1) FUNDAMENTAL OPERATION:

1. Turn on Main-power switch.

2. Depress Polarity Selecting Key in accordance with the polarity set the power supply of EDM.

3. Depress the Short Servo On Key.

4. Depressing the Auto-Center Key, the Run lamp will light up. Then the work head proper will move approximate 5 mm in the left along the oblique direction towards the operator (i,e -X, -Y direction), and once again return 5 mm from the position of limit switch to the center position, where upon the center lamp will light up. This means that the work head have returned to the center.

5. Instruction for the Short Lamp:
a) If the Short lamp lights up during the above operation, there is a short circuit between the electrode and the workpiece. In this case, first remedy the short circuit, then depress the Clear Key ☐ to put out the short lamp, finally depress the Auto-Center Key again.
b) The other condition is that if there is no direct short circuit between electrode and workpiece, then it may be caused by the power supply of EDM.

In this case, depress the Short Servo Off Key ☐ , put out the Short lamp by depressing the Clear Key ☐ and once again depress auto-Center Key, then the work head will return to the center.

After the Center lamp light up, be sure to depress Short Servo On Key ☐ If this is not done, all the LORAN motion will continue even if a short circuit occurs between the electrode and the workpiece, causing the electrode to be damaged or bent.

Therefore, it is important to depress the Short Servo on Key ☐ after the operation for returning to the center is completed.

(2) MACHINING:
1. Choose either the Z-LOCK mode (lateral Servo) or LORAN mode in accordance the type of machining.
   The following are some available machining types which can be chosen in Z-LOCK mode.
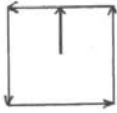
   For general finishing other than the above, choose the LORAN mode.

   Please refer to the figures shown in function examples in page 4.
2. Select a program with respect to the shape of electrode and the type of machining.
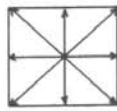
The method of using each program is as follows:

a) Method of using basic pattern program.

(i) LORAN operation :
Used when a quadrangular electrode having right angle in each corner is required. In this case the movement of the electrode is in the 90°direction.
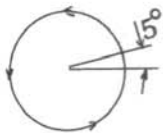
(ii) Z-LOCK operation :
An accurate ACUTE angle can be get when above electrode is used for lateral finishing. In this case the movement of the electrode is in the 45° direction.
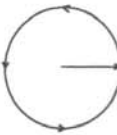
(iii) LORAN Operation:
Use when a round or general shaped electrode which does not have right angle in its corners. In this case the electrode will shift equal amount in each direction.

(iv) Z-LOCK operation :
Used with above electrode in lateral finishing.
In this case the circumference of a circle is divided into 72 divisions. The work head will move sequentially from center toward circumference.
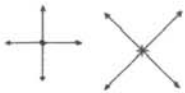
(v)
These two programs are used in Z-LOCK mode when an accurate compensation in machining is required. The programs can be used in accordance with a By-Quadrant program.

b) Methods of using By-Quadrant Pattern program.
This program is used together with a Basic Pattern program either while performing corner machining or while performing accuracy compensation in the X-axis or Y-axis.

### These methods are introduced as follows:
1. Method of using a By-Quadrant Pattern in Z-LOCK mode :
   First, select one Basic Pattern program. Then, it can be used together with at most three By-Quadrant Pattern programs freely.

2. Method of using a By-Quadrant Pattern in LORAN mode :
   First, select one Basic Pattern program, it can be used together with at most two By-Quadrant Pattern programs freely.

These connections conform to the following rules :

The Basic Patterns of ⬭ , ⬜ , or ⊠ is used combining adjacent By-Quadrant Patterns from I - IV. IN other words, it is not possible to combine oblique patterns such as I-III and II-IV.

For the pattern of ⊞ on the other hand, the combinations of oblique By-Quadrant Pattern are possible and those of adjacent By-Quadrant Pattern are incorrect.

As mentioned previously, this program is used together with the Z-LOCK mode to perform accurate compensation in the X-axis or Y-axis. For instance, if it is necessary to perform accurate compensation in X direction alone, select ⬚→ only. To perform both left and right accurate compensation for the electrode, i.e. in the $\pm$ X directions, select ⬚→ and ⬚ Alternately, to perform both forward and backward accurate compensation for the electrode i.e. in the $\pm$ Y directions, select II and IV.

(3) SET THE MOVING AMOUNT TO DIMENSION SETTING :
Before setting the moving amount, be sure to confirm that Center lamp is alight . It is unable to set the moving amount while the Run lamp is still alight.

The amount can be set up to a maximum of 9.999 mm, however the movement strobe of the work head from the center is a maximum of 4.999 mm. Consequently, if the amount is set to be more than 5 mm, the Limit lamp will light up. In this condition depress Clear Key put out Limit lamp, Then depress the Auto-Center Key. After the Center lamp light up, reset the amount to a maximum of 4.999 mm.

(4) SET THE ORBIT SPEED :
Usually, the orbit speed is set to be 0. When a large electrode is used for machining, however, set it to be 1 or 2.

(5) TURN ON RUN KEY :
The run lamp light up and the work head start operation.
Although it depends on the type of EDM. Anyway, the ORBIT-CUT System can not be operated before turning on the MAIN POWER SW power of EDM unit.

1. Fault lamp :
This lamp lights up when an erroneous program setting occurs. Depress the Clear Key to put out this lamp and reset a new program.

2. Stop key :
When this key is depressed, work head will return to the center of its orbiting motion and the Center lamp will light up.

3. Halt Key :
This key is used to terminate the orbiting motion of the system. When this key is depressed, the Halt lamp will light up and the work head will stop (Will not return to center), Restart the work head by means of Run Key.

4. Center Setting Key :

This key is used to change absolute center position which is set by means of Auto-Center Key, The operation procedures are as follows.

a) Set FEED mode.
b) Set the amount of movement through the Dimension Setting Key.
c) When one of the By-Quadrant selecting keys is depressed, the work head will shift the amount set in any of the +X, -X, -Y, or +Y direction from the absolute starting point (center), and the Center lamp will go out.
d) Depress Center Setting Key. The Center lamp will light up and the about point to which the center of the work head has shifted will be defined as a new center.

The Center Setting Key is used generally when it is necessary to machine over a stroke of 5 mm or more by using the lateral servo in the Z-LOCK mode. For instance, when the staring point position is in the -X direction, the stroke for machining is only 4.999 mm by using former method and now it is allowed to perform lateral machining up to a stroke of 9.999 mm.

5. Clear Key :

This key is used to put out the Short lamp, Limit lamp or Fault lamp, and is also used while changing the program. If the Short , Limit or Fault lamp is alight, it will be unable to receive any of the control messages unless the lamp is put out first.

(6) FEED OPERATION :

This operation is used when the work head shifted a fixed amount from the absolute starting point to a new starting point in the +X, -X, +Y or -Y direction.

The operation procedures are shown as follows:

1. Depress Auto-Center Key and the work head returns to its absolute starting point.
2. Depress FEED Key.
3. Set the amount of shift by Dimension setting.
4. Depress the By-Quadrant selecting Key corresponding to intended direction for shift.
5. Upon the By-Quadrant selecting Key begin released, the Run lamp will light up and begin to shift. When the Run lamp is extinguished, the shift will be completed.
6. Depress Center setting Key and Center lamp light up. The present position of work head becomes the new center.

Caution : For some type of EDM, the Short lamp will remain alight, prevention the above operation from tabbing place. In this condition, first confirm that there is no short circuit between the electrode and the workpiece, then depress the Short Servo Off Key and perform the above operation. Once the operation is completed, however, be sure to depress Short Servo On Key. If

this is not done, the electrode will not stop as a result of a short circuit occurring between the electrode and the workpiece, resulting in the electrode damaged or bent.

(7) JOG OPERATION :

This operation is used to position the end face. The operation procedure is shown as follows:

1. Depress Auto-Center Key.
2. Depress JOG Key.
3. Keep the distance between the electrode and the workpiece to be about 0.2 to 0.3 mm by moving the work table of EDM. (Caution : No dirt is permitted between the contact surfaces of the electrode and the workpiece to influence the touching sensitivity.)
4. Depress the By-Quadrant selecting Key, the electrode will move until it comes into contact with the workpiece, the Short lamp will light up and the electrode will stop. This point becomes the reference point of the end face.
5. Depress Clear Key to extinguish Short lamp.
6. Depress Center Setting Key and the reference point becomes the new center.

Caution: Be sure to depress Short Servo On Key during above operation. If the Short Servo Off Key is depressed, the electrode will not stop in the event of a short circuit occurring between the electrode and the workpiece resulting in the electrode damaged or bent.

(8) VOLTAGE OVER GAP ADJUSTING KNOB :

This knob is used for adjusting the machining voltage while performing lateral servo machining. When this knob is turned to number "0", the voltage will fall, and conversely when the knob is turned to number "10" the voltage will rise.

When the maching voltage falls, the machining speed is increases, however, the machining gap is reduced. This causes defective flushing and results in abnormal discharges. While the voltage rises, the machining speed is reduced and the gap is increased. This provides good flushing and stable machining.

(9) FLUSHING TIME ADJUSTING KNOB :
(SIMILAR TO SKIPPING HEIGHT CONTROL)

This knob gives flushing time control during the lateral servo machining in Z-LOCK mode. The number "0" corresponds to the minimum back time. While the number "10" corresponds to the maximum.

The relations between the control position and the flushing are as follows.

Control Position	Flushing time
0	0.5 sec
5	2.5 sec
10	3.2 sec

(10) MACHINING TIME ADJUSTING KNOB :
## (SIMILAR TO SKIPPING TIME CONTROL)
This knob gives machining time adjustment during lateral servo machining in Z-LOCK mode. When this knob is turned to Off, the continuous machining time, while the number "10" corresponds to the maximum.

The relations between control position and machining are as follows:

Control Position	Machining time
0 (OFF)	Keep up machining without flushing
2	0.5 sec
5	2 sec
10	4 sec

(11) MACHINING IN Z-LOCK MODE :
**Procedure for end face machining :**
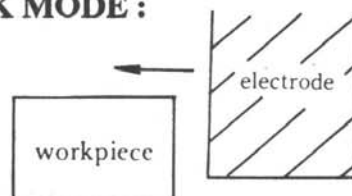
1. With the Z-axis locked, move the worktable in the X-axis or Y-axis and determine the reference point on the end face with respect to the machining direction of the electrode.

2. Move the electrode back by a fixed amount from the reference point of the end face in the machining direction. (Unless there is a gap between the electrode and the workpiece, however, lateral servo machining will not take place.)

3. Lock the spindle of EDM.

4. Select Z-Lock mode.

5. Set the program
program example :
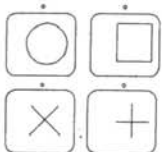**a) Machining in +X direction**
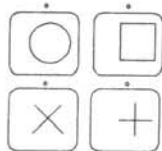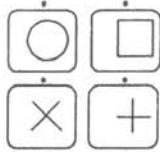
Basic Pattern

By-Quadrant Pattern

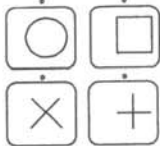**b) Machining in -X direction**

Basic Pattern

c) Machining in +Y direction

Basic Pattern

## d) Machining in -Y direction

Basic Pattern

6. Set the amount of machining by Dimension setting Key (including the fixed amount back from the reference point in item.).
7. Turn on the discharge switch of EDM.
8. Depress the Run Key.

OPERATING PROCEDURE FOR THE MACHINING STROKE IS 5 mm OR MORE :

1. Set the work head to the absolute starting point (center) by depressing the Auto-center Key.
2. Choose the FEED mode.
3. Set the dimension to 4500 um.
4. Depress the By-Quadrant selecting Key corresponding to the opposite direction for machining.
5. Depress Center setting Key after the movement is completed (The Center lamp lights up).
6. Perform machining according to the sequence outlined in the previous items.

OPERATION PROCEDURE FOR BORING :
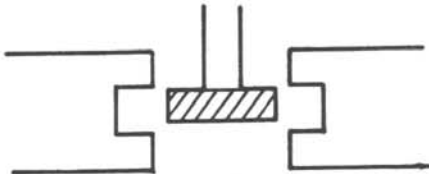
1. Drill a hole which is somewhat larger than the electrode in workpiece by using the LORAN mode before boring.
2. The electrode is put in the specified depth into the hole and the spindle is fixed.
3. Choose the Z-LOCK mode.
4. Set the program.
5. Set the amount for machining to Dimension setting. (The clearance between the hole and the electrode must be added.)
6. Turn on the Discharge switch on EDM.
7. Depress Run Key.

Caution : The machining will be carried out symmetrically around the center during boring, hence, the maximum machining amount will be 5 mm.

(12) MACHINING IN LORAN MODE :
(ORBIT CUTTING)

The features for orbiting motion are better flushing conditions, higher machining efficiency, preventing build-ups of debris and deformation in boring a deep hole :
This method is used extremely effective in boring a deep hole or a non-through hole.

The operation procedures are as follows.

1. Depress the LORAN Key.
2. Depress the Auto-center Key.
3. Depress the Basic Pattern selecting Key.
4. Set the orbiting amount to dimension setting and the orbiting speed to Orbit speed setting.
5. Depress Run Key.

MAINTENANCE NOTICE :

1. Apply Lubricant Oil to machine head daily / regularly.
2. Lubricant Oil assignment :
I.S.O. 150 serials or the same class Oil.
Recommend : MATSUMURA No 150.

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