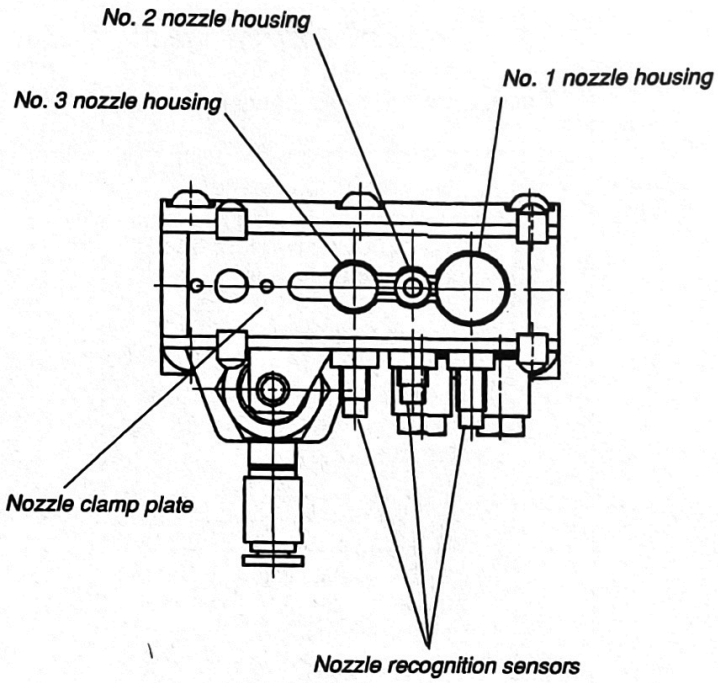
PRECISION (V)ANE-HEAD AND ANE STATION

OPERATION & SERVICE MANUAL



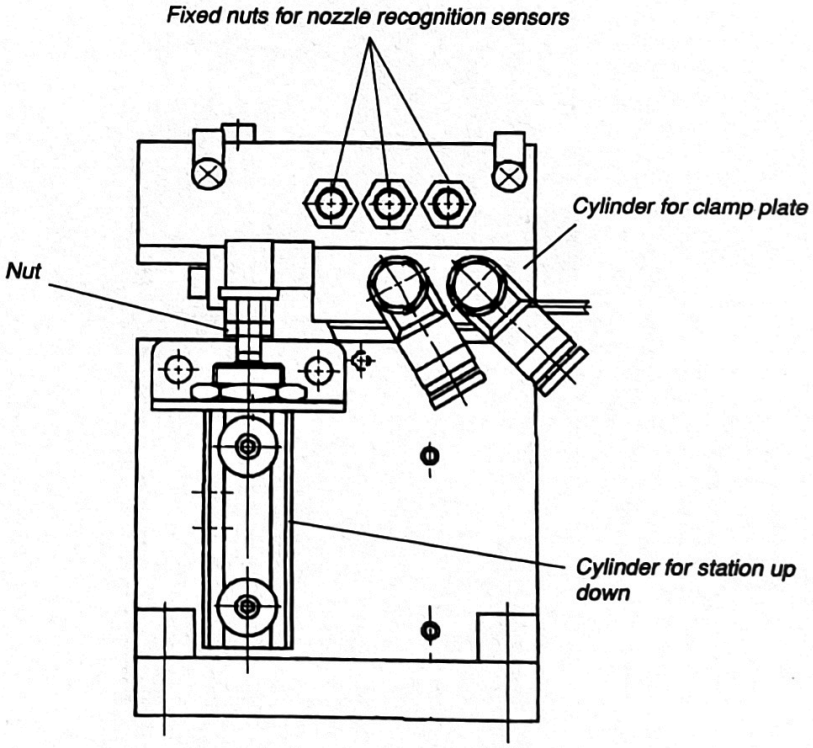


Fig. 1-3 Exterior of the ANE Station

1.2. Exterior and Names of Parts

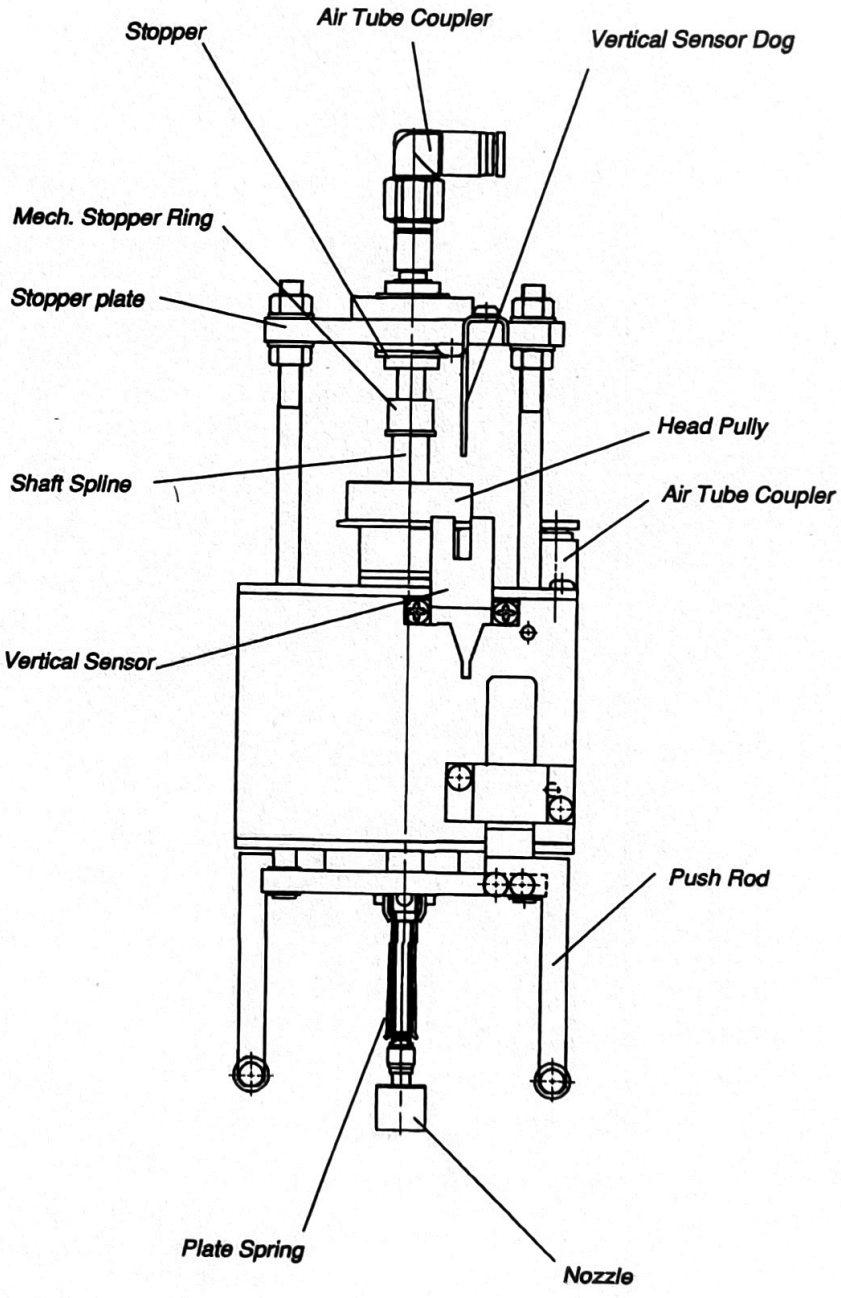


Fig. 1-2 Exterior of the (V)ANE- Head

(3) Mounting accuracy of the precision head
±0.1 mm (PCB, fiducial + fixed centering unit)

(4) Pickup capability
Pickup is possible from any unit other than the 8 mm and 12 mm Mecanical Drive Feeders.

(5) Size of electronic parts that can be picked up (ordinary QFP and PLCC parts)
No. 1 nozzle (Large): 16 sq. to 45 sq. mm
No. 2 nozzle (Small): 3 sq.to 16 sq. mm, long edge 18 mm x short edge 16 mm
No. 3 nozzle (Medium): 8 sq. to 32 sq. mm

By combining a precision head, a fixed centering unit and a fiducial, the following types of electronic parts can be mounted:
Square chips (3 sq. mm or larger)
Aluminum electrolytic capacitors (4.3 x 4.3 to 6.6 x 6.6 mm)
SOPs (6-pin to 28-pin)
PLCCs (maximum outer diameter size 45 sq. mm)
QFPs (maximum outer diameter size 45 sq. mm, 0.8 pitch)

SECTION 1 SPECIFICATIONS

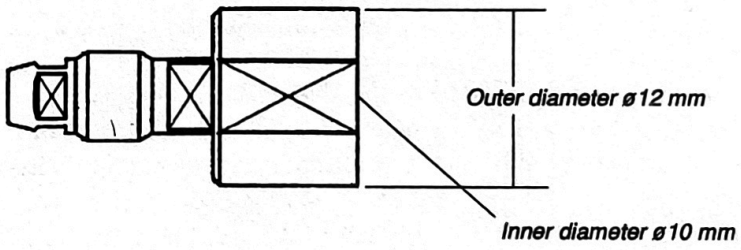
1.1. Features

Using the ANE station, nozzles on the precision (ANE) head and vision (VANE) head can be exchanged automatically. Moreover, the ANE head has exactly the same construction as the VANE head, except that it is not equipped with a PCB recognition camera, LED illumination, or a reflecting plate.
The (V)ANE-head must be installed at the no.3 position because it must reach the ANE-nozzle station for changing nozzles automatically.

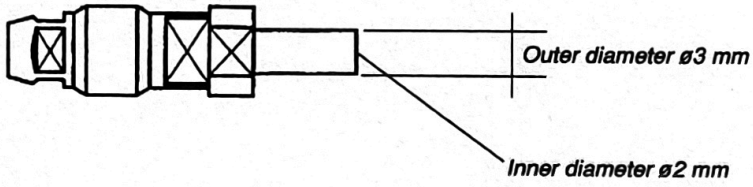
(1) Nozzle exchange time Approx. 2.5 seconds

(2) Types of nozzles

1) Large nozzle



2) Small Nozzle



3) Medium Nozzle

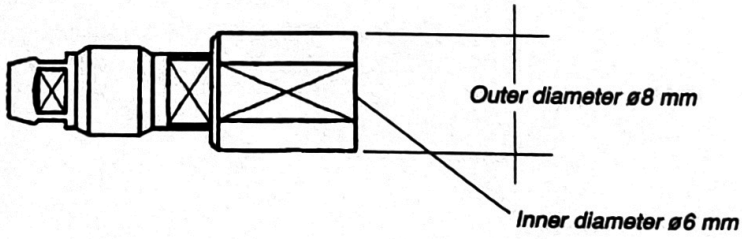


Fig. 1-1 Types of Nozzles

SECTION 3

MAINTENANCE AND REPAIR

3.1. Maintenance and Inspection

3.1.1. Mechanical sections

- Is there sufficient oil for the shaft spline of the (V)ANE head?
  → Add No. 1 or No. 2 machine oil. (Once every two weeks)
- Is there any foreign matter such as dust, grime, or chips adhering to the shaft spline of the precision head?
  → Remove it using tweezers or your fingers, and add oil. (Once every two weeks)
- Is there any water or oil adhering to the air passages inside the nozzles, shaft nozzles, or shaft splines of the (V)ANE head?
  → Clean the parts. (Once a week)
- Is there sufficient oil for the slide guide of the ANE station?
  → Add No. 1 or No. 2 machine oil. (Once every two weeks)
- Is there any foreign matter such as dust, grime, or chips adhering to the slide guide of the ANE station?
  → Remove it using tweezers or your fingers, and add oil. (Once every two weeks)

3.1.2. Electrical sections

Check the movements of each of the actuators (electromagnetic valves) and sensors. Use the function keys (F1 to F6) of the CSM to do this.

1) Actuators

Page	FKey	CRT Display	Movement	DO Port	Identifier
6	F1	H3DOWN	No. 3 head descends	DO40	T40
	F2	H3VAC	No. 3 head picks part	DO44	T44
8	F3	NZL(1)	Nozzle clamps	DO52	T52
	F4	NST.UP	Station ascends/descends	DO53	T53

2) Sensors

Role	DI Status	Contact Point	DI Port	Identifier
Nozzle clamps	Clamp 0	a	D56	N56
Station ascends	Ascend 0	a	D57	N57
No. 3 head descends	Descend 0	b	D60	N60
Nozzle 1 identifier exists	Exists 0	b	D70	N70
Nozzle 2 identifier exists	Exists 0	b	D71	N71
Nozzle 3 identifier exists	Exists 0	b	D72	N72

2.2.4. TIMER

Immediately after picking and placing a part, the (V)ANE head performs a mounting check. A small amount of time must be reserved so that the check can be carried out properly. With tall parts, in particular, make sure the value set allows enough time for the check.

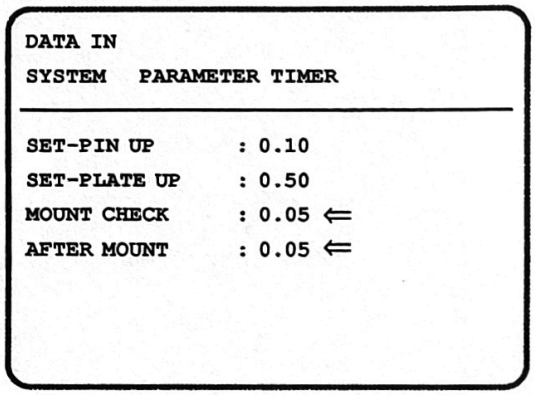


Fig. 2-6
TIMER Screen

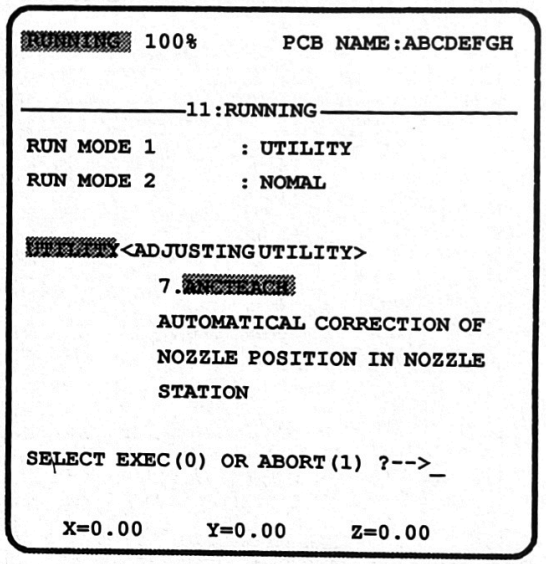
On the Main Menu screen, select the following:
3. DATA IN → 4. SYSTEM → 2. PARAMETER → 3. TIMER to display the screen shown in Fig. 2-6.

Normally, a value of about 0.05 is appropriate for the parameters indicated by the arrows in Fig. 2-6.

For the R data indicated by the arrow in Fig. 2-3, input the angle at which the chamfered surface of the width across flats of the nozzle is parallel to the conveyor (approximately 0.00°).

After using the precision head to input the teaching data for the XY data, enter "ANCTEACH" for the Utility Program indicated in Fig. 2-4. This initiates automatic input of the correct data. If automatic exchange of the nozzle does not work smoothly, better results can be achieved by running the "ANCTEACH" program in order to carry out fine adjustments of the positions.

Fig. 2-4
"ANCTEACH" Screen

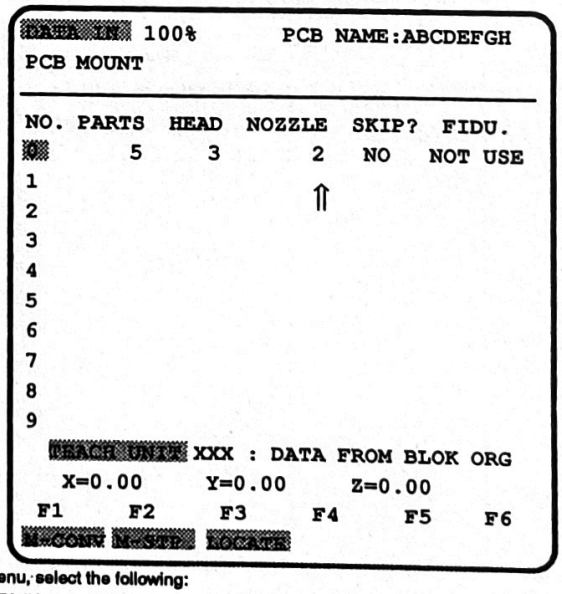


Select "1. RUNNING" on the Main Menu and enter "UTILITY" for the "RUN MODE 1" parameter. After pressing the RUN key, select "7. ANCTEACH".

2.2.3. Mount

When mounting electronic parts on the PCB, this determines which nozzle will be used.

Fig. 2-5
MOUNT Screen



On the Main Menu, select the following:
3. DATA IN → 1. PCB → F6. NEXT → 4. MOUNT, to display the screen shown in Fig. 2-5.

Enter the numbers for the No.1 to No. 3 nozzles in the locations indicated by the arrow in Fig. 2-5.

2.2. Automatic Exchange of Nozzles

By setting the data to the values shown in the table below, the nozzles of the precision head can be exchanged automatically, using the ANE station.

2.2.1. Machine configuration

Specify whether or not there is a station whose nozzle is to be replaced (the type of station).

Fig. 2-2 MACHINE CONFIG. Screen

```
DATA IN
SYSTEM        MACHINE CONFIG.
-------------------------------------------

CMU MODE            : ONLINE, OFFLINE
   •                        •
   •                        •
NOZZLE STATION      : VISION TYPE ⇐
   •                        •
   •                        •
```

On the Main Menu screen, select the following:
3. DATA IN → 4. SYSTEM → 1. MACHINE CONFIG. to display the screen shown in Fig. 2-2.

As indicated by the arrow in Fig. 2-2, enter "VISION TYPE" (vision head) or "AANC TYPE" (precision head) for the "NOZZLE STATION" parameter.

2.2.2. Position

Set the coordinates (X, Y, R) for each of the nozzles housed in the station.

Fig. 2-3 POSITION Screen

```
DATA IN
SYSTEM  PARAMETER  POSITION
-------------------------------------------

+SOFTLIMIT XY    :  584.66  561.45
           R     :  800.00
-SOFTLIMIT XY    :  -36.04  -35.55
           R     : -800.00
   •                    •
   •                    •
NOZZLE1 XYR      :  -20.35  532.61  0.00  ⇐
NOZZLE2 XYR      :  - 0.83  531.96  0.00  ⇐
NOZZLE3 XYR      :   19.66  531.65  0.00  ⇐
   •                    •
   •                    •
```

On the Main Menu screen, select the following:
3. DATA IN → 4. SYSTEM → 2. PARAMETER → 1. POSITION to display the screen shown in Fig. 2-3.

SECTION 2 OPERATION AND HANDLING

2.1. Manual Exchange of Nozzles

The nozzles can be exchanged manually.

Work Content	Checking/Reference
1. The nozzle can be removed by pulling it downwards. 2. When attaching a different nozzle, first set the rotation angle of the R axis to 0°. (Use the R+ and R- keys,or initiate a Return to Origin.) 3. With the nozzle shown in Fig. 2-1 oriented so that the width across the flats is facing front and rear, insert it into the shaft nozzle. When it is inserted all the way, it will be secured in position by a plate spring.	• **Apply light pressure on the nozzle in the vertical, front/back and left/right directions, and make sure it is securely held, with no looseness or rattling.**

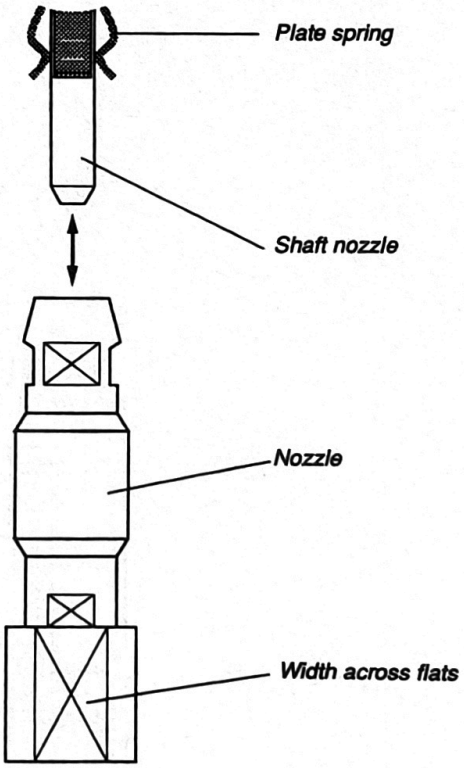


Fig. 2-1 Manual Exchange of Nozzles

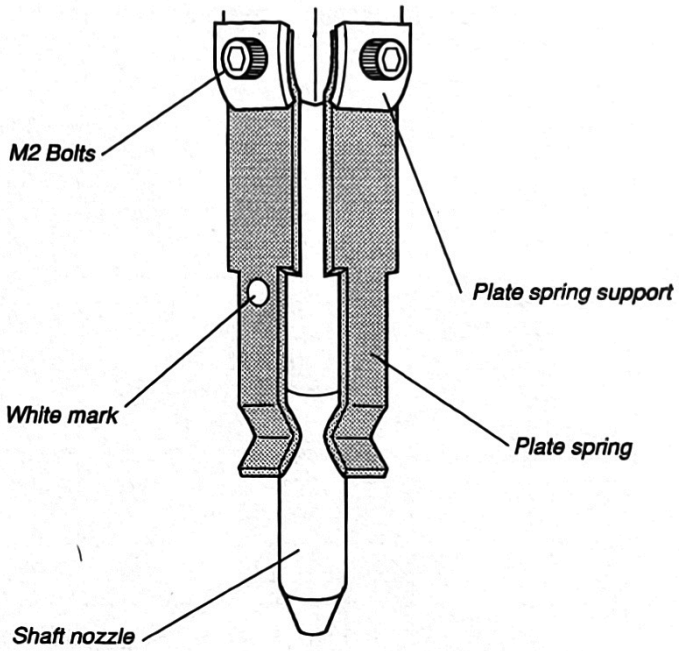


Fig. 3-2
Shaft Nozzle

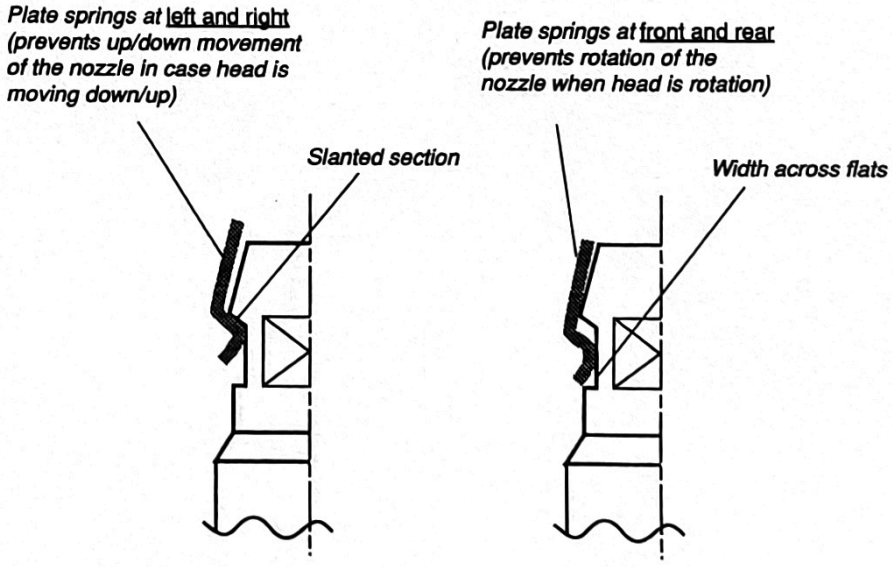


Fig. 3-3
Plate spring attachment positions

3.2.2. Erroneous automatic replacement of nozzles

If nozzles cannot be exchanged properly using the automatic exchange function, check the following items. Then re-adjust and replace the nozzles.

1) Housing position data for the No. 1 to No. 3 nozzles
Run the "ANCTEACH" program described earlier (Fig. 2-4), and correct the housing position data for the No. 1 to No. 3 nozzles. If the "ANCTEACH" program cannot be run, check the following items, starting with 2).

2) (V)ANE head nozzles
Check whether any signs of wear are visible in the area where the (V)ANE head shaft and nozzle fit together. If there are any signs of wear or damage, replace the nozzle.

3) V(ANE) head plate springs
Check the plate springs holding the nozzle in position to see if they are weakened or worn out, or if there are any signs of damage.

No.	Replacement Procedure
1	Pull the nozzle off of the (V)ANE head.
2	The plate spring is held in place, as shown in Fig. 3-2, by an M2 bolt. Remove the M2 bolt of the plate spring to be replaced.
3	Have a new plate spring ready. Attach the plate spring to the shaft nozzle, along with the plate for the plate spring support.
4	The plate springs at the front and back (when viewed from the front of the head) support the width across flats section of the nozzle, and prevent looseness or rattling when the nozzle rotates. The plate springs at the left and right support the slanted surface above the width across flats, and prevent looseness or rattling when the nozzle ascends or descends. Therefore, the plate springs being replaced should be attached at the positions shown in Fig. 3-3.
5	Pull the nozzle out and push it in a few times to see if excessive force is required to move it. Also check for looseness or rattling when the nozzle moves up and down or rotates.

3.2. Adjustments of the (V)ANE-head

3.2.1. Defective picking and placing

If problems occur when electronic parts are either picked up or placed, check the following items and read just if necessary.

1) Nozzle descent end position

Adjust the position of the nozzle descent end so that the difference in height between the end of the pushrod and the nut shown in Fig. 3-1 is approximately 3.2 mm. Then check to see if the nozzle comes in light contact with the top of the PCB which has been set in the proper position. Make sure that the stopper-plate is always in the horizontal position.

No.	Adjustment Procedure
1	Position the PCB on the conveyor, making sure there is no deflection or looseness.
2	Move the precision head over the PCB and lower the head nozzle. In order to have the tip of the nozzle lightly touch the PCB surface, use a wrench and move the nozzle descent end adjustment part shown in Fig. 1-2 up and down until the correct position is achieved.
3	Adjust so that the nozzle tip lightly touches the parts on the supply unit (Tray or Feeder) as well.

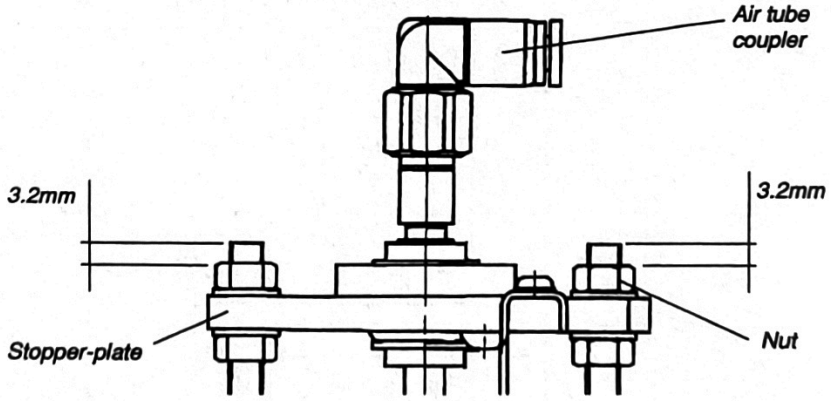


Fig. 3-1
Nozzle descent end position

2) Suction pressure sensor

The suction pressure generated when picking up parts differs depending on the type of electronic part and the inner diameter of the nozzle. Using a nozzle which is the appropriate size for the electronic parts actually being mounted, pick up the part and check which of the red LEDs lights: the H, M, or L lamp. The red LED which lights should be indicated in the data.

(Example: SOP --- H level, semi-fixed knob --- L level)

3) Trays

If trays are not securely fixed in position, or are slanted, parts may not be picked up correctly, because of false air sucktion.

4) Nozzles and jaws

Water or oil adhering to the precision head nozzles or fixed centering unit jaws can result in defects, so make sure that the nozzle is free from water or oil.

3.3.5. Position of the station ascent/descent sensor

The station ascent/descent sensor determines whether the station is currently ascending or descending. Check whether the value shown at A in Fig. 3-7 reads approximately 1.5 mm. Loosen the sensor attachment screw securing the sensor in position and adjust the position.

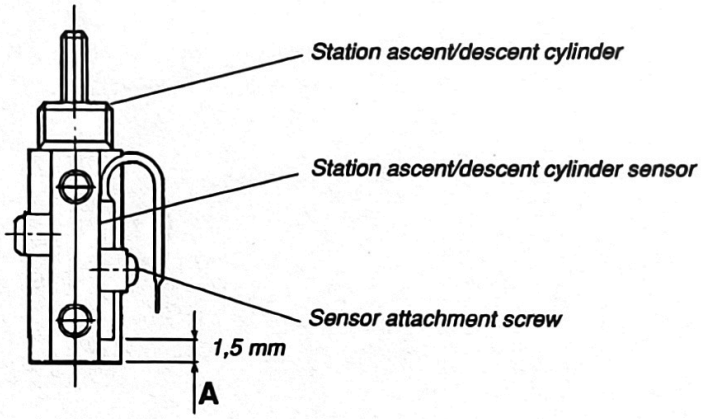


Fig. 3-7
Position of the station Ascent/Descent sensor

3.3.6. Position of the nozzle clamp sensor

The nozzle clamp sensor determines whether the nozzle is currently clamped or unclamped. Check whether the value shown at B in Fig. 3-8 reads 11-12 mm. Loosen the sensor attachment screw and adjust the position.

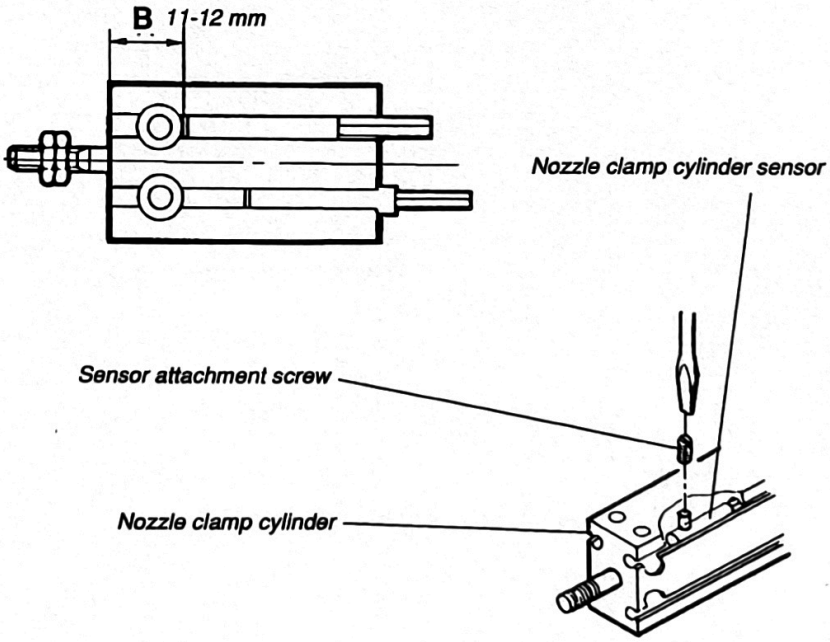


Fig. 3-8
Position of the nozzle clamp sensor

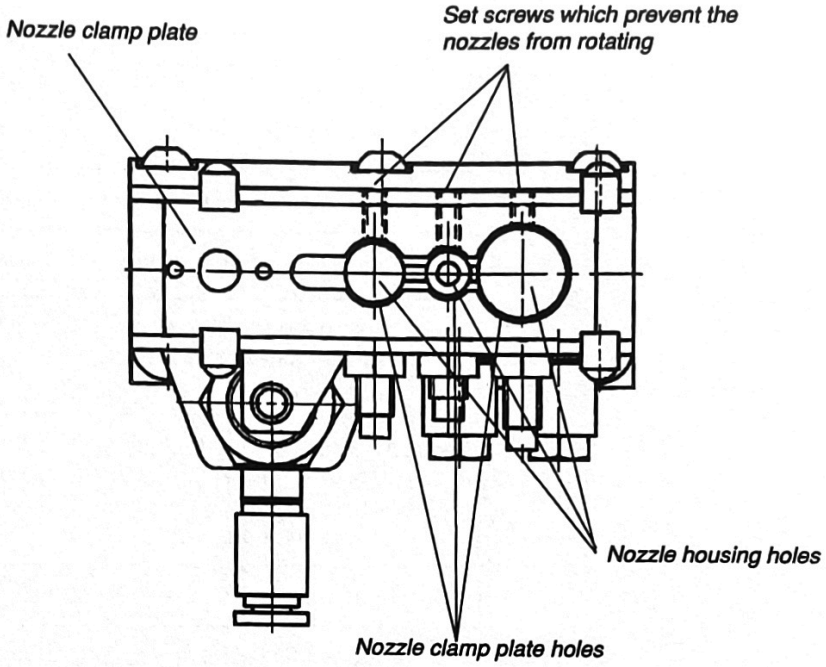


Fig. 3-6
Position of the nozzle clamp plate

3.3.3. Position of the set screws which prevent the nozzles from rotating

As shown in Fig. 3-6, each nozzle has a set screw which prevents it from rotating. If this set screw is poorly positioned, the nozzle will not be able to fit into the station, or may rotate during automatic operation, resulting in a "Nozzle Clamp Error" occurring. Fit the nozzle into the station and turn the set screw until it presses against the nozzle. Then turn it back by 1/4 to 1/3 of a turn, and leave it in that position. A screw lock agent should be applied to the set screws to keep them secured in position.

3.3.4. Position of the nozzle recognition sensor

The nozzle recognition sensor detects whether or not there is a nozzle in the nozzle housing area of the ANE station. Check whether a red LED lights when there is a nozzle in the station and goes out when there is no nozzle. If the red LED goes out even for a second when the nozzle is shaken inside the station, this must be considered as a defect.

No.	Adjustment Procedure
1	Insert the nozzle into its housing area in the ANE station.
2	Loosen the nut shown in Fig. 1-3. Rotate the cylindrical sensor and move it to the position where the red LED lights.
3	Move the nozzle forward and backward, left and right and make sure that the red LED does not go out.
4	Tighten the nut shown in Fig. 1-3 (approx. 15 kgf/cm).

3.3.2. Position of the nozzle clamp plate

Check whether the plate securing (clamping) the nozzle is properly positioned in relation to the nozzle housing position.

No.	Adjustment Procedure
1	Remove all of the nozzles on the ANE station.
2	Loosen the nut shown in Fig. 3-5. Turn the hexagon socket head bolt with a hexagon wrench to change the position of the nozzle clamp plate.
3	As shown in Fig. 3-6, adjust the position of the nozzle clamp plate until the centers of the three holes in the nozzle clamp plate appear to be lined up evenly with the three holes where the nozzles are housed.
4	Tighten the nut shown in Fig. 3-5.
5	Slide the nozzle clamp plate a number of times and check for gouging. Then, without clamping the nozzles, take each of the nozzles and see if it can be pulled out and pushed in smoothly by hand. With the nozzles clamped, make sure each nozzle is tightly secured.

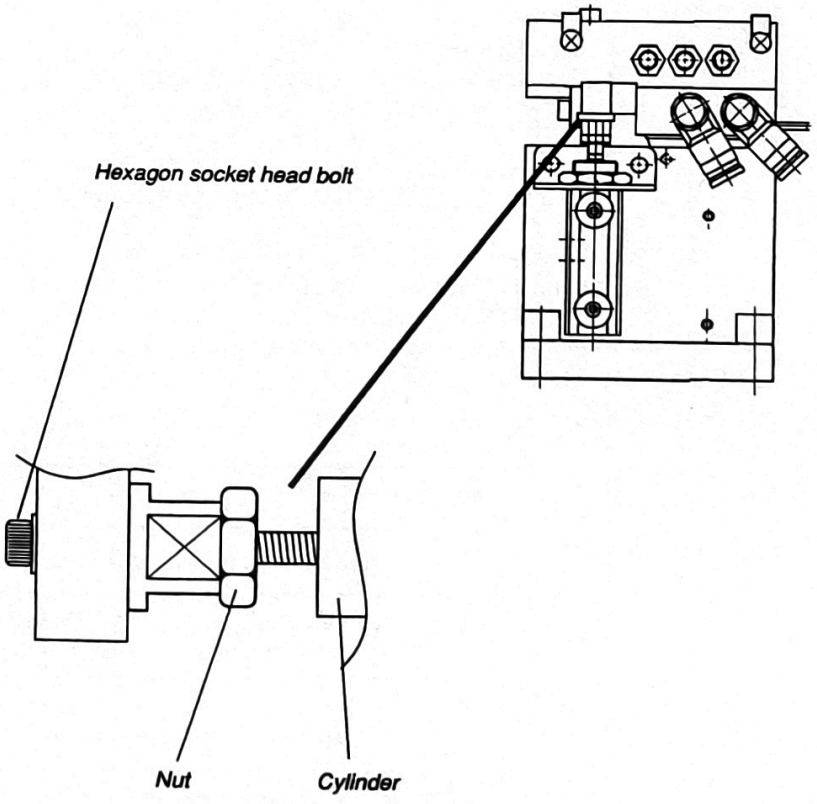


Fig. 3-5
Section where nozzle clamp position is adjusted

3.3. Adjustments of the ANE Nozzle Station

3.3.1. Height of the ANE station

The height of the (V)ANE-head and station in relation to each other is very important when nozzles are being exchanged automatically.

No.	Adjustment Procedure
1	Move the (V)ANE head to the point on the ANE station where the automatic nozzle exchange is to take place.
2	Raise the station and lower the head nozzle.
3	Loosen the nut indicated in Fig. 3-4. Turn the hexagon socket head bolt with a hexagon wrench to change the height of the station.
4	Adjust the height of the stopper until the mecanical stopper ring of the (V)ANE-head, shown in Fig. 1-2, arrives at (comes in contact with) the stopper.
5	Secure the nut shown in Fig. 3-4.
6	Raise and lower the (V)ANE-head nozzle several times, and make sure it moves correctly.

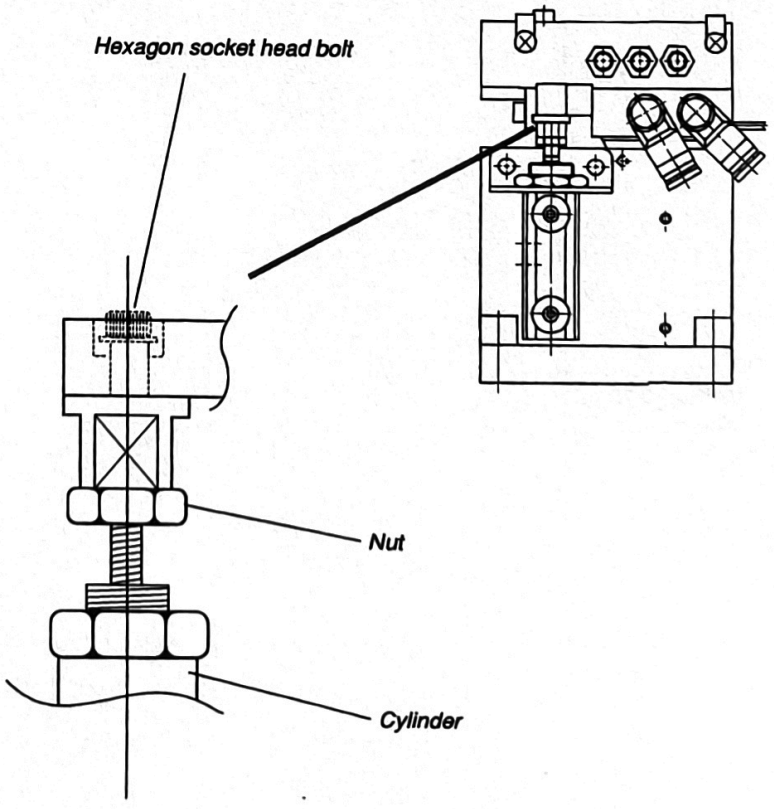
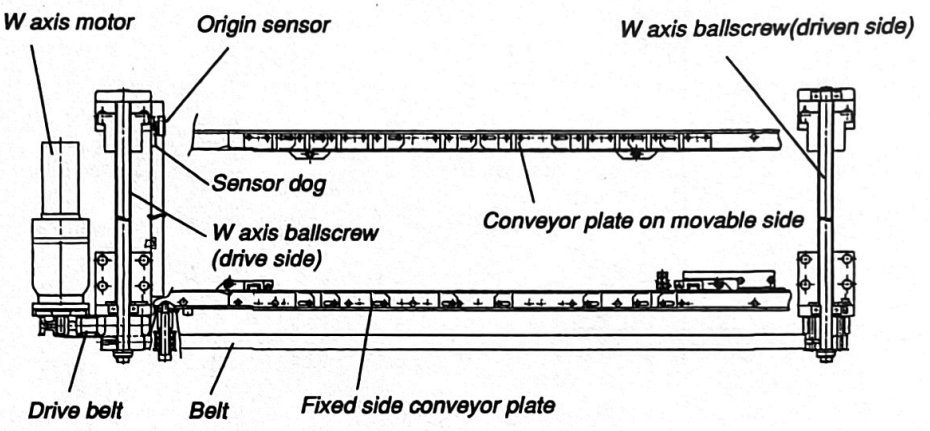


Fig. 3-4
Section where ANE station height is adjusted

1.2. Exterior and Names of Parts

1.2.1. Conveyor Width Auto-Adjusting Unit



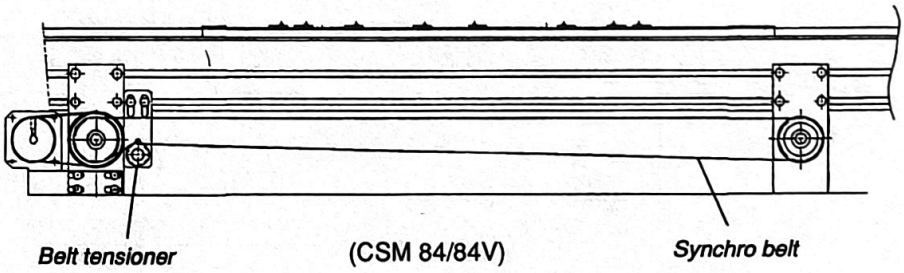
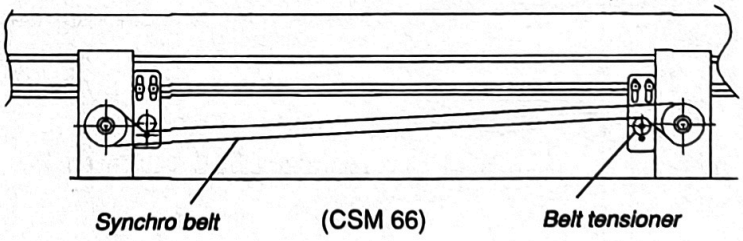
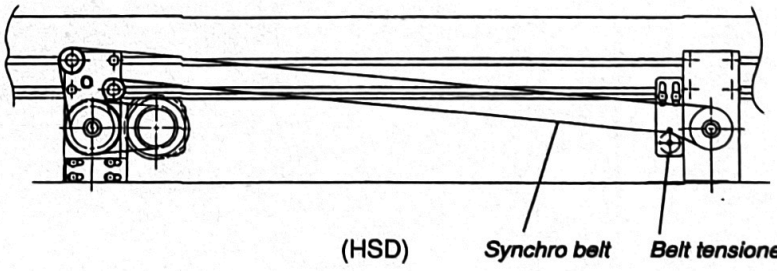


Fig. 1-1
External view





SECTION 1

SPECIFICATIONS

1.1. Features

The Conveyor Width Auto-Adjusting Unit is designed to allow automatic adjustment of the conveyor width to match the PCB width.
This feature is particularly useful in allowing efficient setups for small-lot multi-batch production.

(1) Minimum conveyor width	40 mm
(2) Maximum conveyor width	Based on individual specifications
(3) Conveyor width positioning accuracy	±0.1 mm
(4) Maximum travel speed	19.2 mm/sec
(5) Origin return speed	0.8 mm/sec
(6) Safety functions	Soft limits (impact prevention through data instructions)

NOTE

1. The conveyor extension and rear side positioning functions cannot be used simultaneously.
2. The two axes used to adjust the conveyor width are hereafter referred to as W axis.

CONVEYOR WIDTH AUTO-ADJUSTING UNIT

OPERATION & SERVICE MANUAL

3.3.7. Adjusting the speed controllers for the vertical movement of the station and the nozzle clamping.

Using the speed controller shown in Fig. 3-9, adjust the speed at which the station unit moves vertically, and the speed at which the nozzle clamping plates open and close. The various speed controllers are located at the left side, on the back of the machine. Adjustment is easier if the Utility program "SPEEDCON" is used in conjunction with the speed controllers. The following shows a guide for adjusting these speeds.

"First adjust the speed until the unit moves all the way to the end of the stroke and starts back without stopping. "

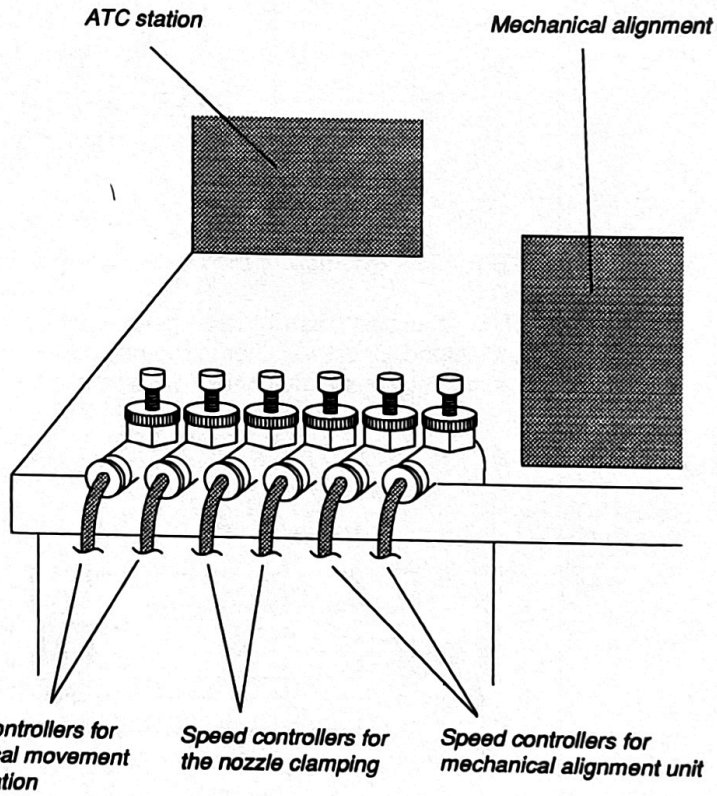


Fig. 3-9 Speed controllers for the vertical movement of the station and the nozzle clamping

1.2.2. W- Axis Driver Board

The driver board used for the W axis is the same one used for the R axis, so that the two axes are controlled by a single board. The board is housed inside the controller OF THE CSM unit.

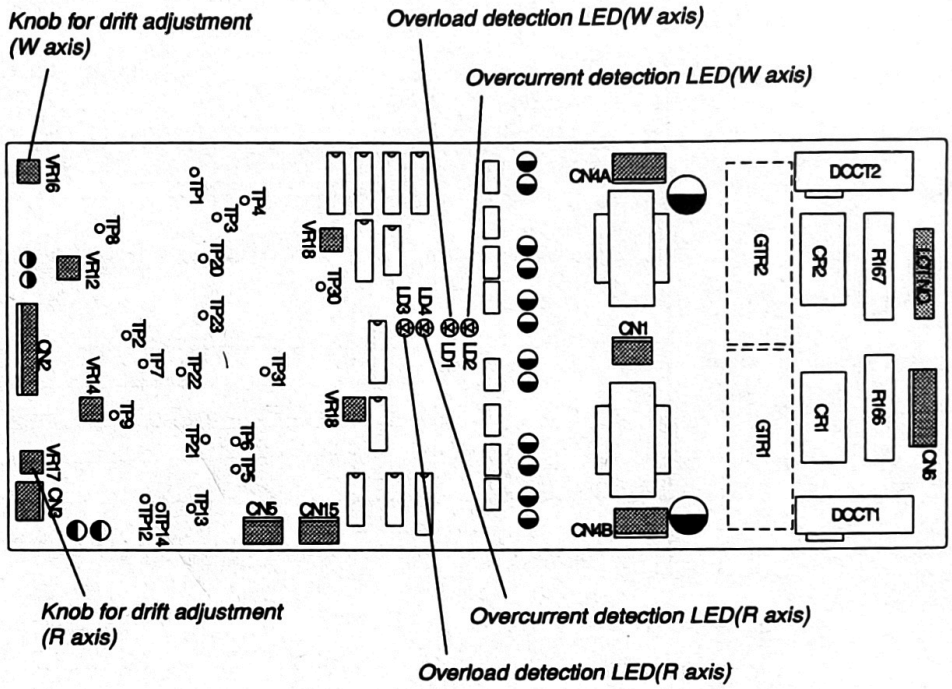


Fig. 1-2
W axis driver board

NOTE

For instructions on adjusting the drift, please refer to the instruction manual for the CSM (Chapter 6).

Conveyor Width Auto-Adjusting Unit

When the conveyor width has been automatically adjusted, press the Emergency Stop button. Set a PCB in place on the conveyor and check to make sure the clearance between the conveyor guides and the PCB is about 0.5-1.0 mm, and that the PCB moves smoothly from one end of the conveyor to the other. This check need only be done for the first PCB. If the conveyor width is too wide for the PCB, add the necessary correction to the value in the "PCB WIDTH" parameter shown in Fig. 2-2. If the conveyor is too narrow, subtract the necessary amount.

2.2.2. PCB SHAPE

Input the width (Y direction, scale mm) of the PCB to be used from that point in the "PCB WIDTH" parameter.
On the Main Menu screen, select the following to display the screen shown in Fig. 2-3: 3. DATA IN → 1. PCB → 6. PCB SHAPE.

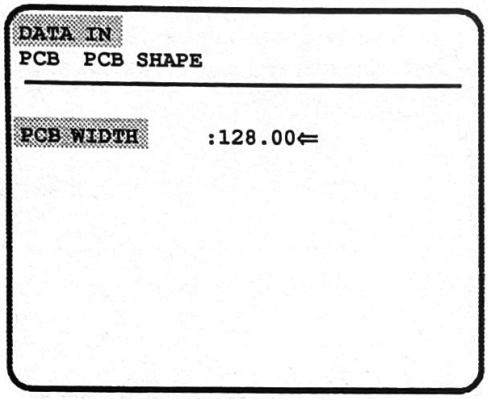


Fig. 2-3 PCB SHAPE screen

The value indicated by the arrow in Fig. 2-3 is 128.00 mm. This indicates that the width of the PCB is 128 mm.

2.2.3. Message Displayed During Automatic Operation

When the above data item has been specified, automatic operation begins. During automatic operation, the message shown in Fig. 2-4 is displayed.
On the Main Menu screen, select 1. RUNNING to display the screen shown in Fig. 2-4, and then press the RUN key.

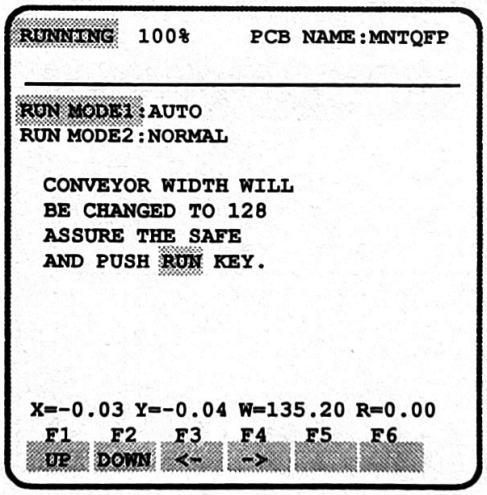


Fig. 2-4 Auto-Running screen

When the RUN key is pressed on the screen shown in Fig. 2-4, the conveyor starts to move automatically, and the width is set to 128 mm.

WARNING

Before Pressing The Run Key, Check To Make Sure There Are No Objects Such As Push-up Pins Which Will Bump Into The Conveyor When It Moves.

SECTION 2

OPERATION AND HANDLING

2.1. Manual Adjustment of the Conveyor Width

If a PCB or another object (a push-up pin, etc.) is digging into the conveyor during automatic operation or under other conditions, change the conveyor width manually to allow a margin of space.

(1) First, turn off the power supply to the mounter.
(2) Rotate the timing belt or the W axis screw shown in Fig. 1-1 to eliminate the object causing the problem.

2.2. Automatic Adjustment of the Conveyor Width

By specifying the data items listed below, this unit can be used to change the conveyor width automatically.

2.2.1. Offset

Input the conveyor width used when a return to the origin point is carried out (this is the initial width). Measure the actual conveyor width (mm) with a measuring tape and input the figure.

NOTE

1. The mechanical return to origin begins with the W axis.
2. The origin point for the W axis is located at the far back of the conveyor.

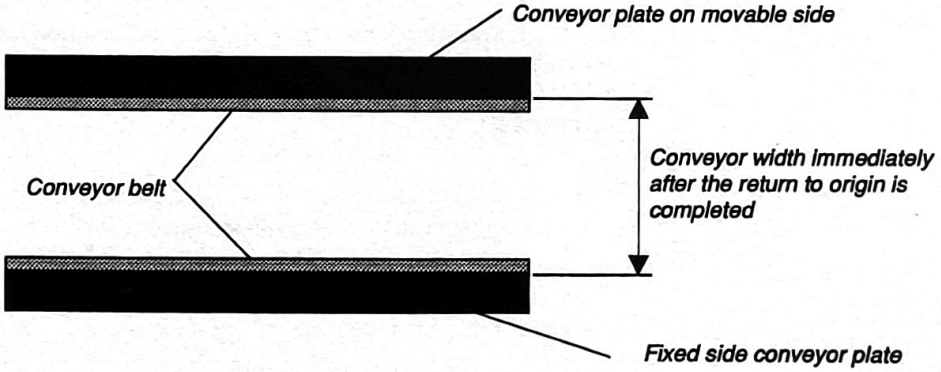


Fig. 2-1 Measuring the conveyor initial width

```
DATA IN
SYSTEM  PARAMETER  OFFSET
-------------------------------
MCH SHIFT XYR :0.00 0.00 0.00
CAMERA        :0.00 0.00
BEAM SENSOR   :95.52 -68.68
   .              .
   .              .
   .              .
TRACK WIDTH   :358.30⇐
   .              .
   .              .
   .              .
```

Fig. 2-2 OFFSET screen

On the Main Menu screen, select the following to display the screen shown in Fig. 2-2: 3. DATA IN → 3. SYSTEM → 2. PARAMETER → 2. OFFSET.
The arrow in Fig. 2-2 indicates that the conveyor width immediately following the return to origin is 358.30 mm.

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3.2. Corrective Action When Trouble Occurs

3.2.1. Conveyor Transport Defects

If PCBs cannot be transported properly because the automatically-adjusted conveyor width is too wide or too narrow for the PCB, change the "PCB WIDTH" parameter shown in Fig. 2-2.
To widen the conveyor, subtract a mm from the value set for the "PCB WIDTH" parameter, and to reduce the conveyor width, add a mm to the parameter value.

3.2.2. Problems With the W Axis\

The table below shows error messages and solutions for problems relating to the W axis.

Table3-2 Problems with the W Axis

Message	Meaning	Solution
7:Z MOTOR DRIVER ERR EMERGENCY	Abnormality detected in servo driver of W axis.	1. Check LEDs 1~4 shown in Fig.1-2, and determine if the problem is caused by an overload or excessive current. 2. If there is an overload, remove the object obstructing the conveyor when it moves. 3. If there is an overcurrent, check the motor, motor wire, harness and exterior view of driver board.
242:Z ENCODER ZERO NO GOOD	0 phase signal of encoder for W axis has not been input, so origin return is not possible.	1. Check the W axis motor encoder wire. 2. Replace the W axis motor.
243:Z DRIFT ADJUSTMENT NO GOOD EMERGENCY	Poor adjustment of W axis drift inhibits correct positioning.	Readjust drift of W axis.
252:Z FEEDBACK ERR EMERGENCY	Incorrect feedback for W axis.	1. Check encoder signal harness and connector for W axis. 2. Check motor and encoder for W axis. 3. Check W axis mechanical system.(deterioration, deformation, wearing away and sticking, etc.)

NOTE

1. In the error messages listed in Table 3-2, "Z" indicates the W axis.
2. If one of the above error messages appears, first turn off the power supply and check the conditions in effect. If the problem occurs frequently, please contact your nearest dealer or representative.

SECTION 3

MAINTENANCE AND REPAIR OF BREAKDOWNS

3.1. Maintenance and Inspection

3.1.1. Mechanical Sections

• Are there any electronic components or dirt adhering to the W axis ballscrew?
→ Remove them with tweezers or your fingers. (Once a day)

• Does the W axis ballscrew have sufficient grease?
→ Add the specified grease (Albania No. 2). (Once every two weeks)

• Is the W axis belt too loose?
→ Adjust the tension of the belt. (Once every six months)

NOTE

A belt that is too tight can cause problems. Adjust the tension to a point where the belt is just tight enough, without being loose.

3.1.2. Electrical Sections

1) Actuators
Using the optional YPU-SC hand-held keyboard, inspect the W axis to make sure it moves in the correct direction.

• Press the +Z axis key. → The axis moves to the rear when viewed from the front of the machine.
• Press the -Z axis key. → The axis moves to the front when viewed from the front of the machine.

NOTE

The keys used to drive the W axis are the ±Z keys.

2) Sensors
The origin point sensor for the W axis is operating correctly if the W axis returns correctly to its origin point.

Role	DI Status	Contact Point	Port	Identifier
W axis origin	1(when detects dog)	b	DI16	ZORG

Table3-1 Sensor