INSTRUCTION MANUAL

PIEZOELECTRIC PARTS FEEDERS (POWER-UP TYPE)

BOWL FEEDER, IN-LINE FEEDER

1993－7

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

Thank you for choosing Sanki's Piezoelectric Parts Feeder, a high-efficiency, energy saving unit that was the first of its kind on the world market.

This parts feeder does not require complicated adjustments when used with its exclusive controller (VVVF power supply unit). It is easily and efficiently operated using only the controller's adjustment knobs.

To optimize your use of the piezoelectric parts feeder, we recommend that you read through this manual completely before operating the unit.

CHAPTER 2

INSPECTING YOUR EQUIPMENT

When unpacking your parts feeder from its shipping crate, avoid excessive jolting or vibrations to the equipment.

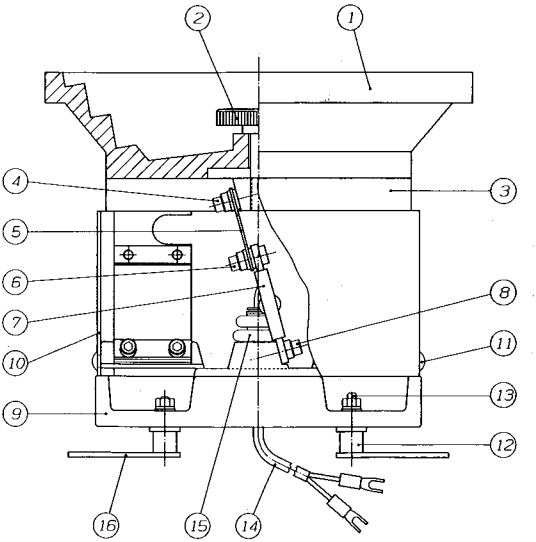
(1) Check to make sure that you have received all the components that you ordered, and that no equipment has been damaged during shipment.

(2) Make sure the ratings and capacities described on the feeder's nameplate match the specifications that you ordered.

CHAPTER 3

EXTERNAL COMPONENTS

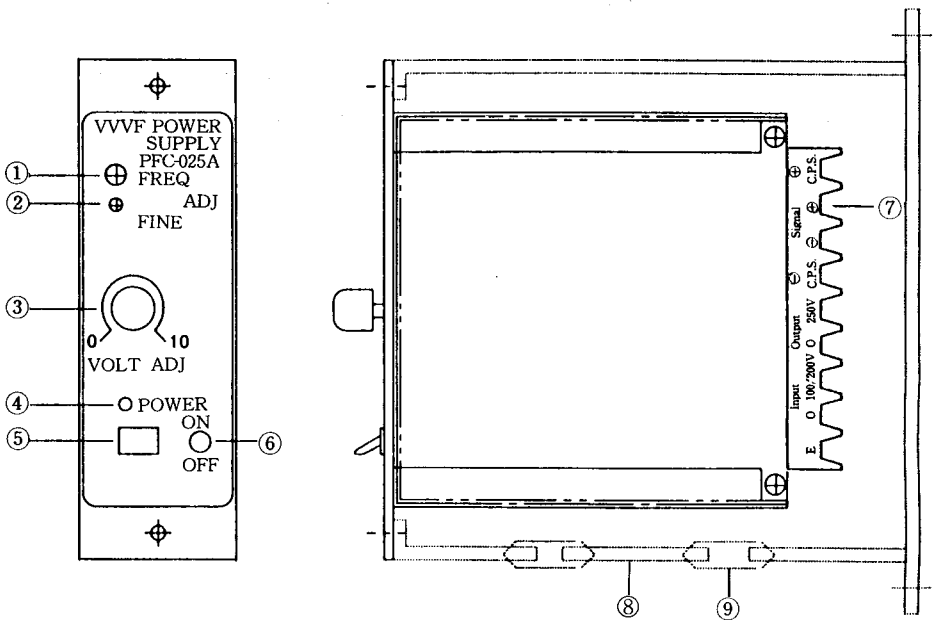
Figure 3.1 shows a cross-sectional view of the bowl of Sanki's PEF parts feeder with its major components labeled.



No.	Components
1	Bowl
2	Bowl clamping bolt
3	Top plate
4	Leaf spring mounting bolt
5	Leaf spring for vibration amplification
6	Bolt joining leaf spring and piezo-element
7	Piezoelectric element
8	Bolt joining piezo-element and bowl feeder's base
9	Base
10	Cover
11	Cover mounting bolt
12	Rubber leg for shock absorption
13	Rubber leg mounting bolt
14	One-meter power cord (3.3 ft)
15	Bushing
16	Setting plate

Figure 3.1 Cross-sectional view of the Piezoelectric Bowl Feeder

Figure 3.2 shows front and side views of the PFC-025A controller. Other models are similar.



No.	Description
1	Coarse frequency adjustment screw
2	Fine frequency adjustment screw
3	Voltage control knob
4	Power supply pilot lamp
5	Fuse
6	Power supply switch
7	Controller's terminal block
8	Controller box
9	2-ϕ22 hole die. (W/Blind rubber bushing)

Figure 3.2 Controller (PFC-025A) for Piezoelectric Parts Feeder

CHAPTER 4

STANDARD SPECIFICATIONS

4.1 SPECIFICATIONS FOR THE PIEZOELECTRIC BOWL FEEDERS.

Table 4.1 Specifications for the small-capacity Piezoelectric Bowl Feeders

Item \ Model	PEF-90A	PEF-120A	PEF-150A	Remarks
Bowl diameter (mm)	120 (4.8 in)	150 (6 in)	180 (7.2 in)	
Bowl model (cascade)	90-C$^{R}_{L}$-Aℓ	120-C$^{R}_{L}$-Aℓ	150-C$^{R}_{L}$-Aℓ	R : Clockwise L : Counter-clockwise
Piezoelectric element	TPF-1639A	TPF-2443A	TPF-3860A	
Number of elements	2	2	2	
Bowl capacity (ℓ /kg)	0.1/0.2	0.2/0.4	0.4/1.0	
Max. input voltage (MAX. V)	250±10%	250±10%	250±10%	
Resonance current (mA at 250V)	8	15	37	With bowl attached
Resonance frequency (Hz)	255	240	223	With bowl attached
Weight (kg)	1.6	3.9	6.6	With bowl attached

Note : The feeder's resonance frequency may vary slightly, depending on the installation conditions.

Table 4.2 Specifications for the large-capacity Piezoelectric Bowl Feeders

Item \ Model		PEF-190A	PEF-230A	PEF-300A	PEF-390A	Remarks
Bowl diameter (mm)	Cascade	250	320	410	500	
	Straight	190	230	300	390	
Bowl model	Cascade	190-C$^{R}_{L}$-Aℓ	230-C$^{R}_{L}$-Aℓ	300-C$^{R}_{L}$-Aℓ	390-C$^{R}_{L}$-Aℓ	R : Clockwise L : Counter-clockwise
	Straight	190-S$^{R}_{L}$-SUS	230-S$^{R}_{L}$-SUS	300-S$^{R}_{L}$-SUS	390-S$^{R}_{L}$-SUS	
Piezoelectric element		TPF-5086A	TPF-5086A	TPF-65100A	TPF-68105A	
Number of elements		2	3	3	4	
Bowl capacity (ℓ/kg)	Cascade	0.8/1.5	1.5/2.5	2.5/3.0	5/5	
	Straight	0.7/1.5	1.2/2.5	2.8/3.0	5/5	
Msximum input voltage (MAX, V)		250±10%	250±10%	250±10%	250±10%	
Resonanse current (mA at 250V)		65	90	155	165	With bowl attached
Resonance frequency (Hz)		210	165	152	115	With bowl attached
Weight (kg)		14	22	37	63	With bowl attached

Note: The feeder's resonance frequency may vary slightly, depending on the iostallation conditions

4.2 SPECIFICATIONS FOR THE PIEZOELECTRIC IN-LINE FEEDERS.

Table 4.3 Specifications for the Piezoelectric In-Line Feeders

Model / Item	PEF-L5A	PEF-L15A	PEF-L25A	PEF-L60A	PEF-L125A
Length, weight of parts track (mm/kg)	200/0.1	250/0.3	300/0.5	350/1.2	500/2.5
Piezo-electric elements	TPF-1639B	TPF-2443B	TPF-2443B	TPF-3860B	TPF-5086A
Number of element	2	2	2	2	2
Max. input voltage (Max. V)	0 − 250±10%				
Resonance current (mA at 250V)	5	8	8	17	24
Resonance frequency (Hz)	160	135	130	110	86
Weight (kg)	0.5	0.8	1.4	3.8	9.0

Table 4.4 Specification for the Piezoelectric In-Line Feeders

Item \ Model	PEF-L30AG	PEF-L75AG	PEF-L150AG	PEF-L200AG	PEF-L250AG
Length, weight of parts track (mm/kg)	300/0.6	400/1.5	500/3.0	600/4.0	700/5.0
Piezo-electric element	TPF-2443B	TPF-3860B1	TPF-3860B1	TPF-5086A	TPF-65100A
Number of elements	2	1	2	2	2
Max. input voltage (Max. V)	0 ~ 250V AC ±10%				
Resonance current (mA at 250V)	7	13	20	30	41
Resonance frequency (±10% Hz)	182	158	110	105	75
Weight (kg)	2.0	3.5	7.0	13	18

4.3 SPECIFICATIONS FOR THE PIEZOELECTRIC PARTS FEEDER'S CONTROLLERS.

Table 4.6 Controller Specifications

Model		PFC-025A	PFC-110A	PFC-170A
Function		The power supply unit of the piezoelectric parts feeder allows independent adjustment of voltage and frequency.		
Input	Voltage	100−220V ± 10% Vac		
	Frequency	50/60 Hz		
	Number of phases	Single phase		
Output	Rated current (mA)	25	110	170
	Voltage (V)	0−250 ± 10%		
	Voltage stability	Less than ± 5% (for input variation)		
	Voltage stability	Less than ± 5% (for load variation)		
	Frequency	60−300 Hz		
External control system		Non-voltage contact control from built-in direct current power supply, or non-contact control from externally supplied voltage. (12 Vdc to 24 Vdc)		
Operational temperature		0° to 40℃ (32° to 104°F)		
Operational hamidity		10−90% RH		
Weight (kg)		0.75	1.6	2.1

4.4 CONTROLLER-FEEDER COMBINATIONS

Table 4.7 Controller-Feeder Combinations

Item \ Model	PFC-025A	PFC-110A	PFC-170A
Bowl feeder	PEF-90A, 120A	PEF-150A−230A	PEF-300A, 390A
In-line feeder	PEF-L5A, L15A, L25A PEF-L30AG, L75AG	PEF-L60A, L125A PEF-L150AG,L200AG -L250AG	

CHAPTER 5

INS ALLATION

5.1 BOWL FEEDER

The feeder's vibrator body is mounted on four shock-absorbing rubber pads. These pads should be fixed on the base and mounting plates so that the vibrator is level. Standards for vibrator-to-bowl attachments are as follows:

Table 5.1 Bowl attachment standards

Vibrator	Bowl	Type of Attachment
PEF-90A	BOWL- 90-C^{R}_{L}-Aℓ	Center lock type (attached at one location)
PEF-120A	BOWL-120-C^{R}_{L}-Aℓ	
PEF-150A	BOWL-150-C^{R}_{L}-Aℓ	
PEF-190A	BOWL-190-C^{R}_{L}-Aℓ	
PEF-230A	BOWL-230-C^{R}_{L}-Aℓ	
PEF-300A	BOWL-300-C^{R}_{L}-Aℓ	Side lock type with mounting plate and bowl clamps at three locations
PEF-390A	BOWL-390-C^{R}_{L}-Aℓ	
PEF-150A	BOWL-150-S^{R}_{L}-SUS	Side lock type with bowl clamps at three locations
PEF-190A	BOWL-190-S^{R}_{L}-SUS	
PEF-230A	BOWL-230-S^{R}_{L}-SUS	
PEF-300A	BOWL-300-S^{R}_{L}-SUS	
PEF-390A	BOWL-390-S^{R}_{L}-SUS	

Note: After the feeder's bowl has been machined, it must be carefully balanced to compensate for the tooling weight of its outside attachments.

* If several bowl feeders having similar resonance frequencies are being used at the same time, install each one on separate racks with sufficient rigidity. When several large bowl feeders having similar reasonance frequencies are being used at the same time, the noise level can be reduced by making their mounting racks as rigid as possible.

5.2 IN-LINE FEEDER

In-line feeders are classified as follows according to their method of support.

Support Method	Model
Rigid-mounted type	PEF-L5A. L15A
Spring-mounted type	PEF-L25A. L60A. L125A.
Rubber pad-mounted type	PEF-L30AG. L75AG. L150AG L200AG. L250AG

Because the reliability of the fixed mounts depends on the rigidity of the mounting support rack, the support rack base should be designed as follows:

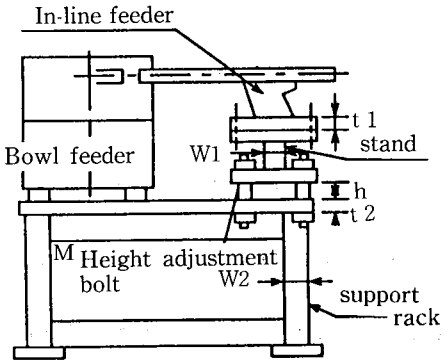
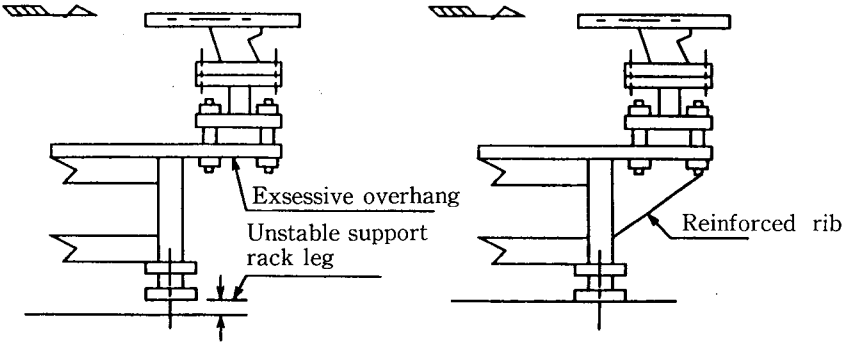


Figure 5.1 Bowl feeder support rack dimensions

(mm)

Model / Symbol	PEF-L5A to L25A	PEF-L60A and L125A
h	max. 30mm	max. 30mm
t1	min. 15mm	min. 19mm
t2	min. 15mm	min. 19mm
W1	□ or φ min. 50mm	□ or φ min. 75mm
W2	□ or φ min. 50mm	□ or φ min. 75mm
M	min. M8	min. M10

If the in-line feeder extends beyond the edge of the support rack when mounted on the base and rack, increase the rack's stability by using a reinforcement rib similar to the one shown in Fig. 5.2.



(a) Example of unstable support

(b) Example of support rid

Figure 5.2

5.3 CONTROLLER

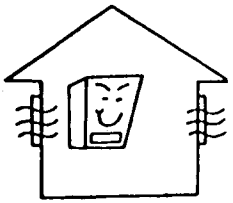
The PFC Series controllers for Sanki's piezoelectric parts feeders are designed so that they canbe mounted on a wall. Mount the controller securely using thc controller's mounting holes.

When selecting the installation site, observe the following environmental precautions:

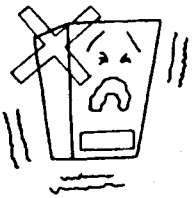
1) Ambient temperature at the installation site must not exceed a range of 0 C to 40 C. (32 to 104 F).
2) Do not install the controller in locations subject to high temperature/humidity levels, or which are exposed to high levels of dust and metallic particles.

3) Avoid sites that are exposed to corrosive or inflammable gases and accumulations of liquids such as grinding solutions.
4) Avoid areas that are exposed to vibration. Do not install near sources such as power switches that generate signal interference. Make sure the installation site has enough open space to allow for access to the feeder and related equipment for maintenance work and inspections.

Avoid environments subject to high temperature/humidity levels or excessive accumulations of dust and metallic particles. Ensure that the room has good ventilation.



Avoid areas that are subject to excessive vibration.



Make sure that temperature fluctuations at the installation site do not exceed a range of 0 to 40 ℃ (32 to 104 °F).

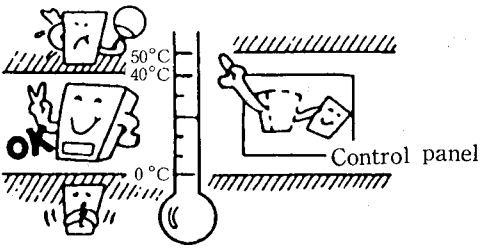


Figure 5.3 Installation pration precautions

CHAPTER 6

WIRING PRECAUTIONS

6.1 WIRING THE BOWL FEEDER TO THE CONTROLLER TERMINALS

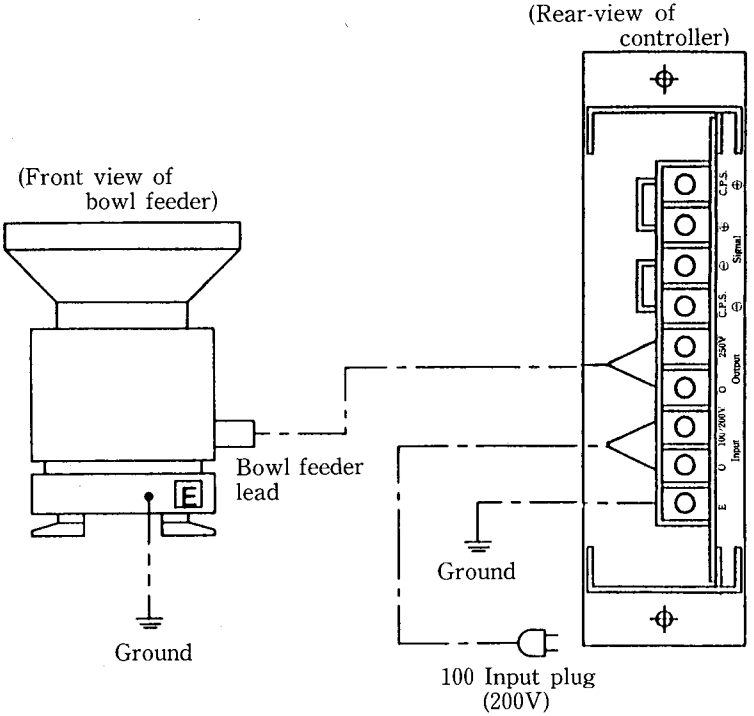


Figure 6.1 Piezoelectric parts feeder wiring illustration

(NOTES)

1. The controller's C.P.S. (+) and C.P.S. (−) terminals are for output of built-in power supply.
2. The above connection example illustrates a configuration where the power supply switch of the controller is used to turn the feeder on and off without use of an external signal.
3. C.P.S : Control power supply

Caution :

1. Do not connect cables from the power supply (100V or 200V) to the signal terminals or C.P.S. terminals, because such miswiring could damage the controller

2. For safe operation, be sure that the feeder is properly grounded via its E terminal.
3. When a photoelectric sensor is used with the feeder be sure to ground both the vibrator and the controller to avoid sensor malfunctions.

6.2 SAMPLE WIRING CONNECTIONS

The PFC-025A, PFC-110A, and PFC-170A controllers can accommodate either 100V or 200V power supplies without modification. Connect power supply cables to the input terminals of each controller. (See Figures. 6.2 thru 6.4 for sample connections.) The controllers use different signal terminals depending on the kind of external signal. Figures 6.2 thru 6.4 show typical connections. Be sure not to make or break a circuit on the input or output sides.

(1) Figure 6.2 shows sample connections when an external signal is not used.

1. Connect the power supply cables to the controller's proper input terminals.
2. Connect the lead cables of the feeder bowl's vibrator to the controller's output terminals.
3. Connect the controller's plus C.P.S. (+) terminal to the plus signal terminal (+).
4. Connect the controller's minus C.P.S. (−) terminal to the minus signal terminal (−).
5. Connect the controller's E terminal to ground.

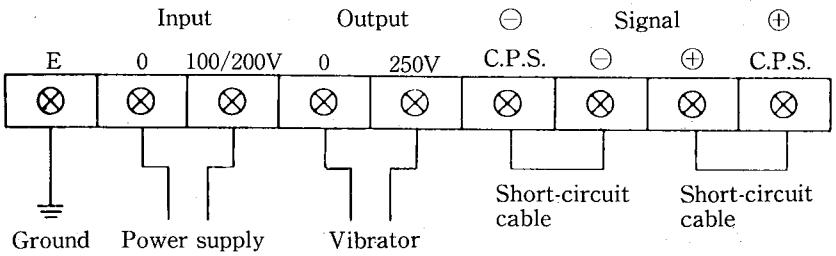


Figure 6.2 ON/OFF control by using a power supply switch

In above example, the vibrator is started and stopped by turning the controller's power supply switch on or off. If the vibrator must be turned on and off frequently, the connections shown in Figs. 6.3 or 6.4 are recommended.

(NOTE)

The gray lead cables near the terminal block are for power supply voltage when the power supply switch is turned on.

Rated current is max 100/100mA at 110/220V ac.

(2) Figure 6.3 illustrates a sample connection when a contact is used as the external signal.

1. Connect the power supply cables to the proper controller input terminals, the feeder's vibrator cables to the output terminals, and the ground cable to the E controller's terminal.
2. Connect the signal contact cables to the controller's plus C.P.S. (+) terminal and to the controller's plus signal terminal (+).
3. Connect the controller's minus C.P.S. (−) terminal to the minus signal terminal (−).

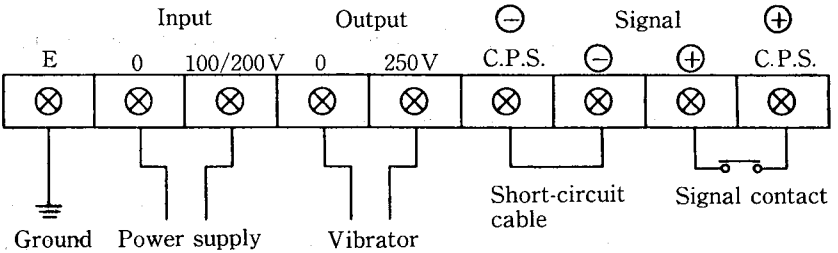


Figure 6.3 ON/OFF control using an external contact

In the above example, the vibrator is started when the signal contact is turned on, and stopped when it is turned off. At this time, the voltage and current applied to the contact are 12 Vdc — 10 mA.

(NOTE)

Do not connect a single signal contact to multiple controllers. Also, do not connect multiple signal contacts (connected in parallel), to multiple controllers. One signal, contact must be connected to one controller.

In addition, the signal contact should be dry (no voltage applied), and it should not be grounded.

(3) Figure 6.4 illustrates a sample connection when the external signal is a non-contact type voltage signal.

1. Connect the power supply cables to the controller's input terminals, the feeder's vibrator cables to the controller's output terminals. and the ground cable to the controller's E terminal.
2. Connect the positive external signal (+) to the controller's plus signal terminal (+), and the negative external signal (−) to the controller's minus signal terminal (−).

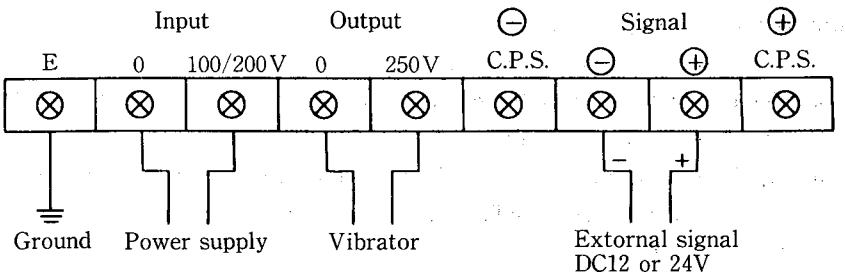


Figure 6.4 ON/OFF control using a non-contact signal

In the above example, 12 Vdc or 24 Vdc can be used as the external signal voltage. A maximum of 20mA can be applied.

(NOTE)

In this tvpe of connection, be sure not to connect the controller's minus C.P.S. (−) or plus (+) terminals to the signal terminal because such miswiring could damage the controller.

CHAPTER 7

PROCEDURE FOR A TEST RUN OF THE BOWL FEEDER

Double check to make sure that all cables to the feeder, the controller, and to the power supply have been properly connected. Particularly when an external signal is used, make sure that the positive and negative cables have been correctly connected.

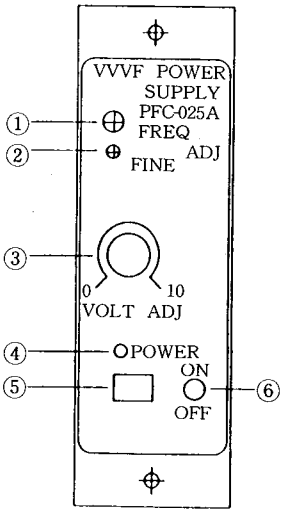
During the following explanation, refer to Fig. 7.1.

1. Put a small number of parts in the bowl.
2. Set the white point of the controller's voltage control knob 3 near the center of the scale (5th notch).
3. Applying a small Phillips or flathead screwdriver to the groove of the controller's fine frequency adjusting screw 2, turn the screw to the midpoint of its turning range.
4. Turn on the power supply switch 6. The power supply pilot lamp 4 will come on.
5. When an external signal is used, turn on the signal.
6. Applying a small Phillips or flathead screwdriver to the groove of the controller's coarse frequency adjusting screw 1, slowly turn the screw to a position where the vibration of the vibrator is at its maximum.
7. Further increase the vibration to its maximum amount by turning the fine frequency adjuster 2.

Note (1) Adjusting the controller is important for obtaining optimum performance from the piezoelectric vibrator. Therefore, be sure to adjust frequency carefully.

(2) After replacing the feeder's bowl or parts chute, readjust the frequency.

(3) Also, if the vibrator has to be reinstalled for any reason, readjust the frequency.



No.	Name
1	Coarse frequency adjusting screw
2	Fine frequency adjusting screw
3	Voltage control knob
4	Power supply pilot lamp
5	Fuse
6	Power supply switch

Figure 7.1 Names and location of the controller's external parts

8. Using the controller's voltage control knob 3, set the parts transfer speed to the required rate.
9. When an external signal is used, turn the external signal on and off to make sure that the vibrator starts and stops appropriately. (When the voltage is applied to the signal terminal, the vibrator starts. When no voltage is applied, it stops.)
10. We recommend that you measure the electric current to the vibrator to be sure it is at the proper level. Connect a meter between the appropriate controller terminal and the vibrator.

The above steps complete the adjustment process.

CHAPTER 8

PRECAUTIONS

(1) Don't make a megohmmeter check on any other terminals other than the feeder's input terminals and E terminal.

(2) Be sure to ground the feeder's E terminal and the controller's E terminal.

(3) If the vibrator is not grounded, the frequency of the vibrator may become unstable, making it difficult to adjust the frequency of the controller. Therefore, be sure to ground both the vibrator and the controller.

(4) Don't connect between the output terminals, or the controller may be damaged.

(5) Input voltage can be 100 Vac or 220 Vac. Input voltage of 230 Vac cannot be used.