Service Manua Direct drive automatic Turntable System ORDER NO. SD7704-1219

Direct drive automatic Turntable System SL-1650 (M)



Specifications

Specifications are subject to change without notice for further improvement.

Tracking error angle:

Effective mass:

Offset angle:

Adjustable stylus

pressure range:

Head shell weight:

Friction:

Turntable section

Type:

Direct Drive Automatic Turntable System,

Automatic start, Automatic return, Automatic

shut-off, Multiple play with convenient

"memo-gram" Knob, Repeat play and Manual play

Drive method: Direct Drive

Motor:

Back Electromotive Force Frequency

Generator servo DC motor

employing one chip IC

Turntable platter: Turntable speeds:

Aluminum die-cast, 33 cm (13")

33-1/3 and 45 r.p.m. Pitch controls:

Individual adjustment controls, 10%

adjustment range

Wow and flutter: 0.03% W.R.M.S. (JIS C5521)

±0.042% Weighted zero to peak

(DIN 45507)

Rumble:

-50 dB (DIN 45539A)

-70 dB (DIN 45539B)

Tonearm section -

Type:

Overhang:

Universal tubular arm, staticbalanced type

Effective length:

230 mm (9-1/16") 15 mm (19/32")

General

Power supply:

AC 120 V, 50 or 60 Hz

Power consumption:

Cartridge weight range: 5 to 11 g

Dimensions:

17.5 x 45.3 x 36.5 cm

 $(H \times W \times D)$ Wegiht:

(6-7/8 x 17-12/16 x 14-3/8 inches)

7 mg (horizontally and vertically)

Within +3° [at the point of 145 mm

within +1° (at the point of 55 mm

0 to 3 g (stylus pressure direct reading

center

pressure)

22 g (6.0 g cartridge weight 1.75 g stylus

(5-45/64") from the

(2-3/16") from the

9.0 kg (19.8 ibs.)

21.5°

type)

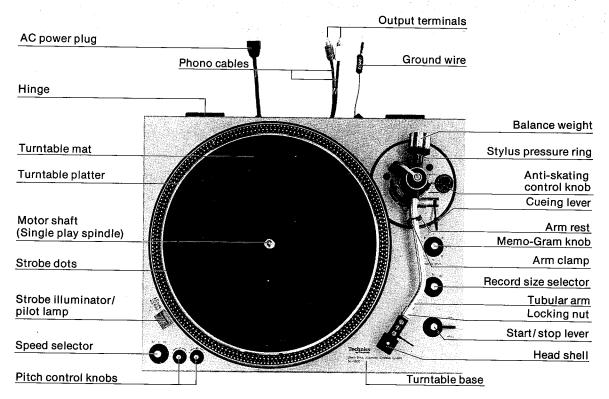


Panasonic Company Division of Matsushita Electric Corporation of America One Panasonic Way, Secaucus, New Jersey 07094

Matsushita Electric of Hawaii, Inc. Matsushita Electric of Canada Ltd. 320 Waiakamilo Road, Honolulu, Hawaii 96817

40 Ronson Drive, Rexdale, Ontario, Canada M9W 1B5

■ Parts identification



■ Assembly and set-up

Apply two or three drops of oil to the motor shaft using the furnished oil container. (See Fig. 2)

Although the unit has been lubricated before shipping from the factory, apply a few drops of oil to the motor shaft for assurance. After that, application of two or three drops of oil once every 2000 hours' operation or so is sufficient. The time interval is much longer than that of the former type motors (200 - 500 hours), so do not apply too much oil, nor more frequently than necessary. Never use any other type of oil.



- 1. Remove headshell and balance weight.
- 2. Clamp tone arm to the arm rest.
- 3. Remove turntable platter.
- Close dust cover.
- 5. Turn unit upside down taking special care not to damage or scratch the dust cover.
- 6. Remove the 4 legs and the 6 screws from bottom cabinet (main base) (Fig. 1).

- 7. Holding the player firmly with both hands, to prevent separation of upper section (turntable base) from lower section (main base), turn it carefully upwards.
- 8. Remove the 4 screws from the protective top panel (Fig.
- 9. Unplug the 3 plug-in connectors (main base).
- 10. To remove the turntable base from the main base bottom section, turn cueing lever upward (cueing position) and move tone arm towards center of spindle. Top section can be lifted up easily. (Fig. 3).

Note:

The turntable horizontaliy to the panel face is already adjusted before shipment. If deviated, correct it by means of the adjust

screws using a 5mm box spanner.

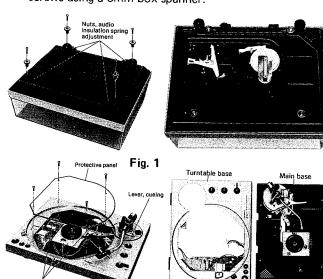


Fig. 3

■ Adjustments

Adjustment of the arm lift height (See Figs. 4 and

The arm lift height (distance between the stylus tip and record surface when cueing lever is raised) has been adjusted at the factory before shipping to approximately 15 to 18mm.

If the clearance becomes too narrow or too wide because of the physical size of the different cartridges on the market turn the adjustment screw clockwise or counterclockwise, at the same time pushing the arm lift down.

Clockwise ratation

-distance between the record and stylus tip is reduced.

Counterclockwise rotation

distance between the record and stylus tip increases.

Note:

As the adjusting screw has a hexagon head, be sure to make the adjustment while depressing the arm lift.

Adjustments for automatic start and automatic return positions (See Fig. 6)

Should the tonearm not function correctly, make adjustments according to the follwing procedures.

Adjustment for automatic start position

(Remove the rubber cap.)

In cases where the stylus tip descends outside of the record.

Move clockwise.

In cases where the styus tip descends onto halfway of a recorded piece.

- Move counterclockwise

Adjustment for automatic return position

(Remove turntable sheet.)

In cases where the tonearm tends to return befor the playing has finished.

- Move clockwise.

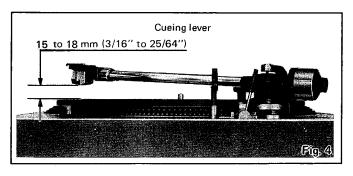
In cases where the tonearm fails to return after the last groove of the record.

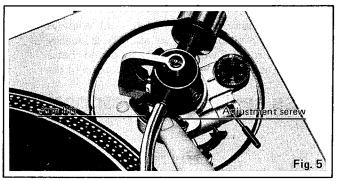
- Move counterclockwise.

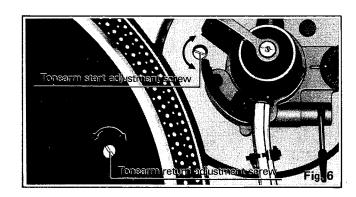
Speed adjustment (with pitch control knobs) (See Figs. 7, 8 and 9)

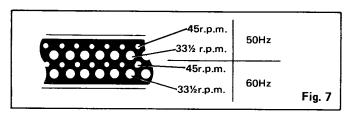
Strobe dots are set on the tapered rim of the turntable platter according to the power frequency and the number of revolutions of the records. Make adjustment, referring to strobe dot indication. (See Fig. 7)

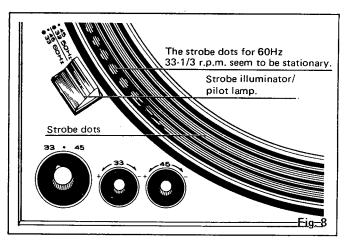
- 1. Set the speed selector to the number of revolutions to be adjusted. (See Fig. 8)
- 2. Release the arm clamp and raise the cueing lever.
- 3. Move the tonearm to a slight extent towards the turntable platter.
 - The strobe illuminator/pilot lamp will be lit for illuminating the strobe dots.
- 4. While turning the pitch control knobs either to "+" side or "-" side, adjust to such an extent that the strobe dots of the turntable look as if they were stationary.











The state under which the strobe dots seem to be stationary represents the correct speed. (See Fig. 8)

"+" direction

This increases the speed of the turntable rotation, and the strobe dot pattern seems to flow in the same direction as the rotational direction of the turntable platter.

"-" direction

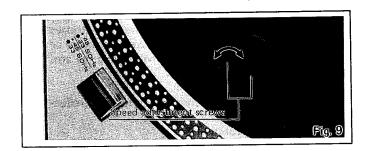
This decreases the speed of the turntable rotation, resulting in a state opposite to that in the "+" direction.

Note:

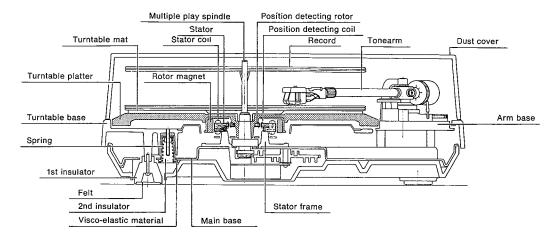
Strobe dot pattern.

The strobe illuminator/pilot lamp of this unit employs the commercially available power source. The frequency of such power source, when actually measured, has a fluctuation of about 0.2%. As such a fluctuation of the

- power source affects the strobe illuminator, the strobe dot pattern also seems to fluctuate to a certain extent. But the unit is not affected by the fluctuations of the power source, since a D.C. motor is employed.
- 5. If the desired speed can not be obtained by the variable pitch controls, turn the speed adjusting screws with a screw driver for further adjustments. (See Fig. 9)



■ Cross section of motor portion and double insulator



■ Operation principles of the SL-1650

This unit, like the SL 1300 has a rational motor structure, and its drive control circuit is the B.F.G. type (Back TECHNICAL EXPLANATION electromotive force frequency generator) which is constructed on a single integrated circuit (IC) chip (AN630). The following is a block diagram of the IC (AN630) for which the operating principle will be briefly explained.

■ Operating principle

The back electromotive force, which is generated by the drive coil winding according to the rotation of the motor, is detected and converted to a frequency signal that is proportional to the number of revolutions.

Conversion is performed by a wave-shaping circuit and a logic circuit (This is referred to as the B.F.G. method). This frequency signal is compared with a standard signal by means of a frequency-voltage conversion circuit which converts it to a voltage signal in order maintain a constant number of revolutions. After removing unnecessary

frequency components, with the operational-amplifier active filter, from this voltage signal, it controls the current flow in three differential switching circuits. As a result, the flow of current in the drive coil winding is always constant maintaining the correct rotational speed. Control of the rotational speed can be performed by means of adjusting the standard signal generator circuit according to the rotational speed adjustment circuit.

■ Explanation of each part

1. B.F.G. METHOD (BACK ELECTROMOTIVE FORCE FREQUENCY GENERATOR)

Making use of the back electromotive force that is generated in the drive coil winding of the motor as a frequency generator, the frequency of the frequency generator is converted to the number of revolutions for the turntable.

After shaping the wave form of this back electromotive force, it is composed logically, and a frequency is generated that is proportional to the number of revolutions. This is the use of the B.F.G. Making use of the drive coil winding, frequency generator coil windings and magnets are not necessary, yielding a motor structure that is very compact.

2. FREQUENCY-VOLTAGE CONVERSION CIRCUIT

Being composed of a trapezoldal wave generating circult, a pulse generating circuit and a sampling integration circuit, the B.F.G. output frequency is converted to a voltage, and control output voltage is generated in order to maintain the rotational speed of the turntable at a constant level.

3. OPERATION CONTROL CIRCUIT

The operation control circuit functions as a control output voltage control keeping the rotational speed of the turntable constant with regard to the start of turntable operation and the operation of the mechanism. With this circuit, transient response characteristics and starting characteristics are very good.

4. OPERATIONAL AMPLIFIER (OP AMP) ACTIVE FILTER

Because of using an operational amplifier in the active filter, an ideal filter operation is possible.

As a result, such high performance as a signal-to-noise (SN) ratio of 60 dB (IEC-B) and a wow-and-flutter level of 0.03% (WRMS) have been achieved.

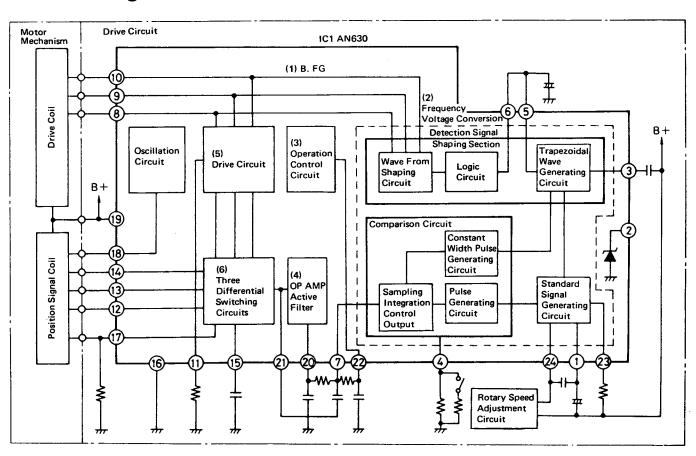
5. DRIVE CIRCUIT

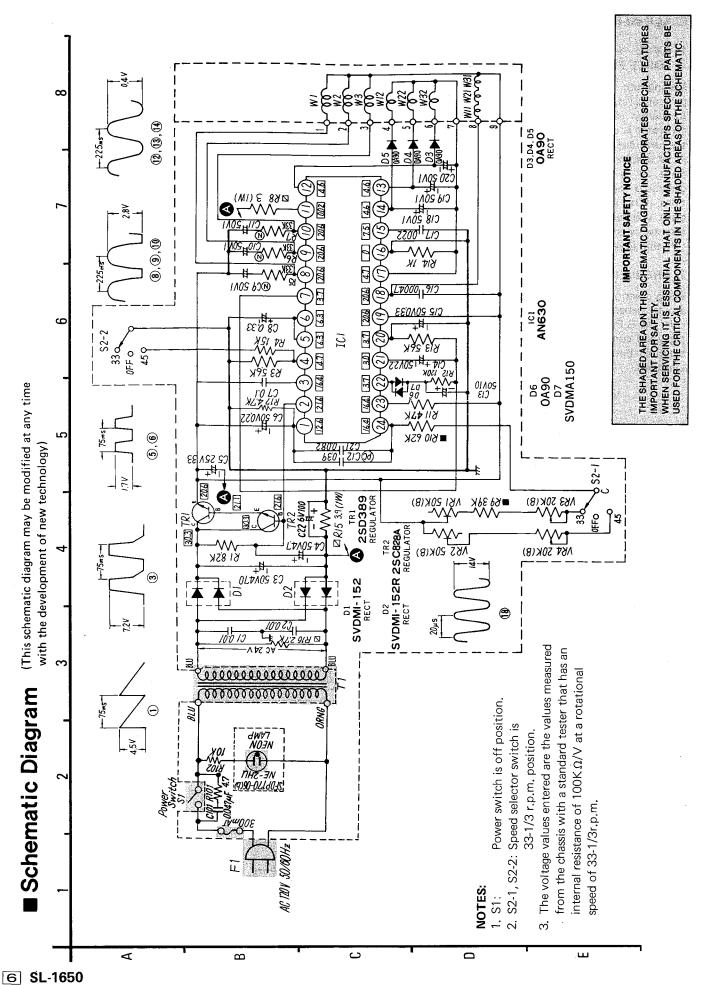
By incorporating a large capacity power transistor in the integrated circuit, a starting torque of 1 kg-cm can be obtained. By means of this large starting torque, prompt starts have been realized.

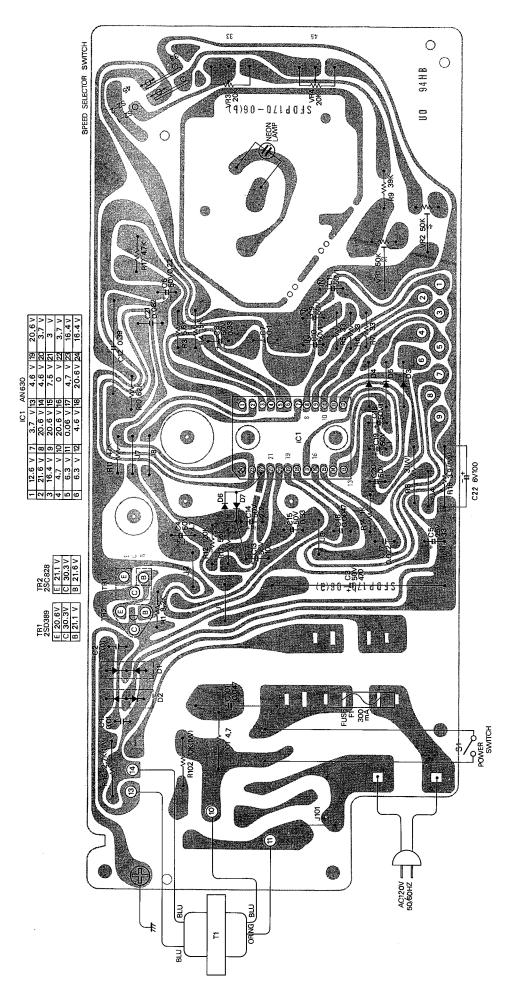
6. THREE DIFFERENTIAL SWITCHING CIRCUITS

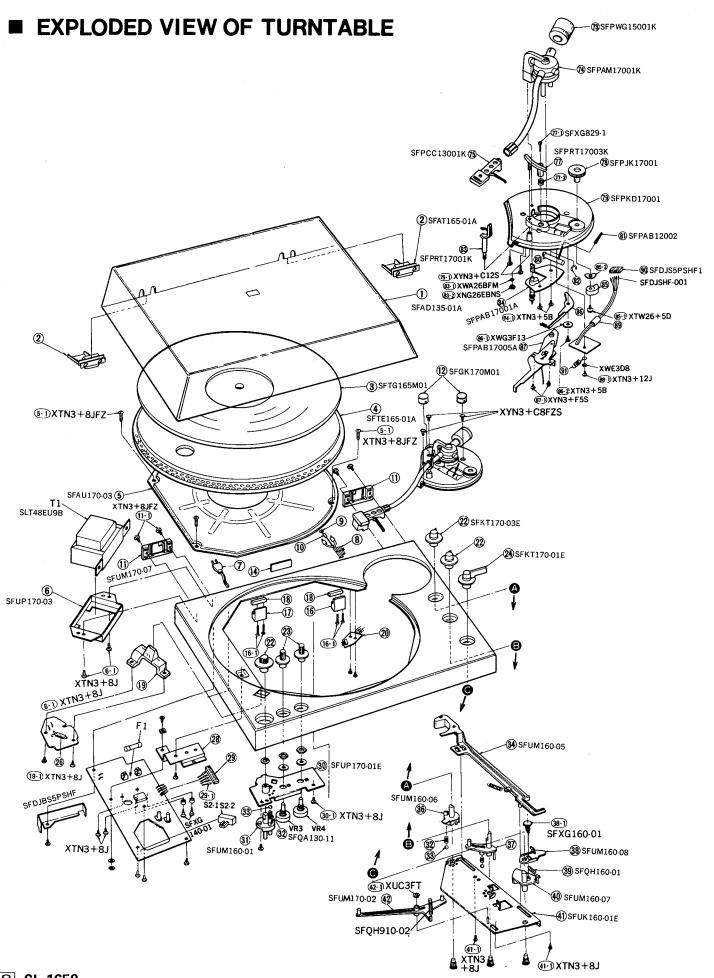
By means of the signal from the position signal coil, the starting circuit power transistor selector operates, obtaining smooth rotation.

■ Block diagram

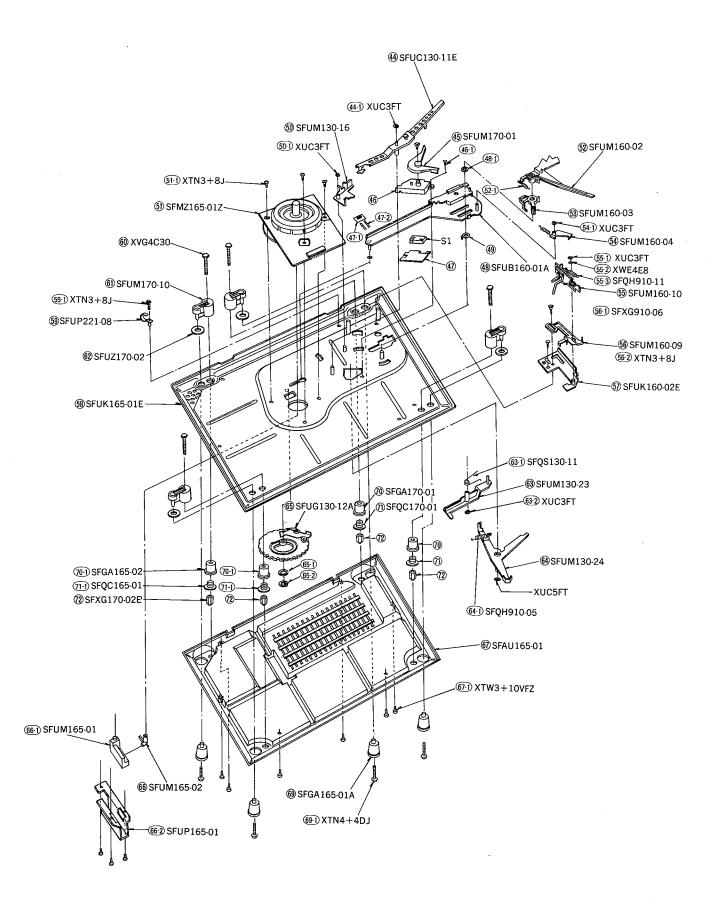








■ EXPLODED VIEW OF TURNTABLE



■ REPLACEMENT PARTS LIST

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Important Safety Notice	Components identified by shaded arealnave special characteristics important for safety. Why components lies only manifacture? Sepecified parts.	Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.	Part Name & Description	INTEGRATED CIRCUIT	Integrated Circuit	TRANSISTORS	Transistor Transistor	DIODES	Diode Diode	Diode	TRANSFORMER	Power Transformer	FUSE	(0.8A (Fuse)	VARIARI F RESISTORS	50KΩ, Pitch controls 20KΩ, Speed adjustment		Micro Switch Power Speed selector Switch	RESISTORS	1/4W, ± 5%, 1/4W, ± 5%, 1/4W, ± 5%, 1/4W, ± 5%, 1/4W, ± 5%,	н н н 2%,%,%,	1/4W, 1/4W,	1W, ± 5%, 1W, ± 5%,	$4.K\Omega$, $1/4W$, $\pm 5\%$, Carbon 4.7Ω , $1/2W$, $\pm 5\%$, Carbon $10K\Omega$, $1W$, $\pm 5\%$, Metallic
	entified by shaded area have e only manufacturer's specif	Part numbers are indicated on most mechan Please use this part number for parts orders.	Part No.		AN630U		2SD389A-0 2SC1328-T		RVD10DC2 RVD10DC2R	SVDMA150		Sut48EU9B		XBA2F03NU100		EVLV3AS15B54 EVHGMAF15B24		\$1. S2-2 SFDSAH76503 Speed selector Switch		ERD251.822 ERD251.562 ERD251.153 ERD251.330 ERXIAN.383	ERO25CKF3902 ERO25CKF6202 ERD25TJ473	ERD25TJ124 ERD25TJ563 ERD25TJ102	ERX1ANJ3R9 ERG1ANJ272	ERD2513472 ERD50T34R7 ERG1ANJ103
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Part No.		SFGA1/0-01 SFGA165-02	SFQC170-01	SFQC165-01	SFXG170-0ZE	SEPWG BOOLK	SFF AMILYOUTK	SFPRT17003K	SFXG829-1	SFQA829-03	SFPJK17001	SFPKD17001	SYN+C1ZS	SFPJL00101K	SFFAB12002	SFPRT17001K	XWA26BFM	XNG26EBNS	SFPAB17001A	X1N3+5B	SFPJK17002	XIWZ6+5U	SFEW 13003 SEPSH17001	XWG3F13	XTN3+5B	SFPAB17005A	XYN3+F5S	XTN3+12J	SFG182910Z SEDISEPSHE1	SFPSP17003			SFNU165M01	SFVA165M01Z	SEVS185-01A SEVS135-02	SFW0010	SFWE154A1	SFPEV7800	SFCZV8800	SFYF05A06	SEKUISSIMULE		SEHP165M01	SEHH165-01	SEHH165-02	SEHD165-01	SFHD165-02	SFHS170-02	SFHS165-01	SFYF60A60	SFYF45A50	ה ה	SEHH165.03
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Part Name & Description		Cam, Repeat Cam, Selector	Cam, Start B	Spring	Cam, Start A	Plate, Operation	Screw	Cuting riste	Spring, Catting Plate	Actuating Plate Ass'y	Circlip	Lever, Cut	Screw	Cover, Micro Switch	Screw	Connector	Terminal	Operating Plate Ass'y	Circlip	Washer	Support, Switch	Circlip	D.D. Motor	Screw	Spring	Support, Index Plate	Lever, Repeat	Circlip	Plate, Sensing	Washer	Spring	Support, Start Plate	Screw	Screw	Plate, Auxiliary Plate	Plate, Main Base Clompor Cord	Screw	Hexagon Bolt	Support, Insulation	Felt, Insulation	Plate, Gear Setting	Spring, Gear Setting	Circlip 1 Sing Suitab	Carina I aga	Spring, Level	Mother Masher	Vasier	Plate. Spindle	Cam, Spindle	Holder, Spindle cam	Bottom Cover	Screw	
Part No.		SFUM160-06 SFUM160-01	SFUM160-08	SFQH160-01	SFUM160-07	SFUK160-01E	X1N3+8J	XIIC3FT	SFQH001-02	SFUC130-11E	XUC3FT	SFUM170-01	X1N3+8B	SFUM170-08	XTN3+8J	SFUR 170-06 SED 13130-03	SED 12478	SFUB160-01A	XUCSFT	SFXW130-13	SFUM130-16	XUC3FT	SFMZ165-01Z	X NG+8J	SFUM160-02	SFUM160-03	SFUM160-04	XUC3FT	SFUM160-10	XWE4E8	SFQH910-11	SFUM160-09	SFXG910-06	XTN3+8J	SFUK160-02E	SFUK165-01E	XTN3+8.1	XVG4C30	SFUM170-10	SFUZ170-02	SFUM130-23	SF0S130-11	XUC3F1	SFUMI30-24	SFURS 10-05	SFUGISO-IZA	XIICSET	SFUM165-02	SFUM165-01	SFUP165-01	SFAU165-01	X W3+ UV F Z	
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■ PACKING PARTS

