

# Operating Instructions

**20 to 300 Mc/s OSCILLATOR**

Type TF 1247

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OPERATING INSTRUCTIONS No. EB 1247

for

20 to 300 Mc/s OSCILLATOR

TYPE TF 1247

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SCHEDULE OF PARTS SUPPLIED

1. One Oscillator Type TF 1247 complete with attached mains lead and valves, etc., as under:-

Valves:           One: Type QQV02-6 (6939), Double Beam-Tetrode.  
                  One: Type 5763, Beam Tetrode.  
                  One: Type 6X4, Full-wave Rectifier.  
                  One: Type 6AK5, Pentode.  
                  One: Type 5651, Voltage Stabilizer.

Fuses:           One: 2-amp, Cartridge.  
                  One: 150-mA, Cartridge.

Lamp:            One: 6.3-volt, 0.15-amp, M.B.C., Pilot Lamp.

2. One Instruction Book No. EB 1247.

The following item is an optional accessory for use with the oscillator and is supplied only if specially ordered.

50-ohm Matching Unit Type TM 5727; enables oscillator to be used as a 50-ohm general purpose test oscillator.

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DESCRIPTION

1.1 GENERAL

The 20 to 300 Mc/s Oscillator Type TF 1247 is primarily intended as a test-circuit energizing source for the Marconi Circuit Magnification Meter Type TF 1245; after the addition of an optional matching unit, it can also be used as a general-purpose wide-band oscillator for such applications as energizing an r.f. bridge.

To suit the Circuit Magnification Meter, the output circuit of the Oscillator is designed to operate into an inductive load of 2.5  $\mu$ H across which it will develop an output variable up to about 600 mV. However, so that the use of the Oscillator is not limited to this specialized application, a Matching Unit, Type TM 5727, is available to convert its low output impedance to a nominal 50 ohms; with the Matching Unit connected, the maximum output across a 50-ohm load is variable up to approximately 4 volts.

In its normal application the output of the Oscillator is monitored by the Q-Multiplier meter of the Circuit Magnification Meter; for this reason, no monitoring arrangements are included in the Oscillator itself.

1.2 DESIGN DETAILS

The general arrangement of the electrical circuit is shown on the Functional Diagram No. TLC 28412; the complete Circuit Diagram of the oscillator section is given on Drawing No. TC 27439 and of the power unit section on Drawing No. TC 27437.

Reference to these diagrams should assist the reader in fully understanding the circuit description in this section.

1.2.1 Oscillator Circuit

The output frequency is generated by a push-pull oscillator incorporating a double-tetrode valve, V201. A cross-coupled arrangement is used in which the resonant circuit is connected between the anodes of the valve. The frequency band is covered in six ranges; the appropriate range is selected by means of a front-panel control coupled to a turret on which are mounted the tuning inductors, L205 to L217, and their associated components. Tuning over each range is accomplished by means of capacitor C207.

1.2.2 Output Arrangements

By adjustment of the screen d.c. potential, the current through the valve, and therefore the level of oscillation, can be determined. The screen voltage control - designated OUTPUT LEVEL - is uncalibrated. Output level is monitored by a voltmeter on the TF 1245 Circuit Magnification Meter.

### 1.2.2 (continued)

The load which terminates the Oscillator output, i.e. the input inductance of the TF 1245, is 2.5  $\mu$ H. For convenience, the load is coupled to the Oscillator by means of a 50-ohm coaxial connecting cable. This means that the Oscillator is "looking into" an output system which is virtually a short-circuited line. It can be seen therefore, that the load reflected back to the oscillator will vary appreciably with frequency and will have a varying effect on the actual frequency of oscillation. The connecting cable would, if allowed, resonate at multiples of its quarter-wavelength frequency.

In order to keep these effects under control, the Oscillator is always coupled to the Circuit Magnification Meter by means of a coaxial lead, Type TM 5725, of specially chosen length - this lead is supplied with the latter instrument. The length of this is such that cable resonances would occur at 110 and 220 Mc/s. The ranges which embrace these frequencies are ranges C (80 to 120 Mc/s) and E (180 to 240 Mc/s). These resonances are overcome by increasing the effective lead length by means of 50-ohm coaxial cable (CA201 and CA202) added between the output coupling loops, L207 and L213, and the R.F. OUTPUT socket on ranges C and E respectively. The effect of these added cable lengths is to move the cable resonance outside the frequency coverage of the particular ranges. These additional cable lengths are mounted internally on the r.f. oscillator tuning inductor turret.

To enable the Oscillator to be used as a 50-ohm source, an optional Matching Unit, Type TM 5727, is available. This accessory takes the form of a coaxial cable with a short-circuit matching stub. Its electrical characteristics are such that, as far as effective length and prevention of cable resonance is concerned, the Unit simulates the special coaxial lead TM 5725 terminated by the input inductance of the Circuit Magnification Meter. The output socket of this unit is a type BNC.

### 1.2.3 Power Supply Circuit

The mains transformer has a double-wound primary which is tapped to allow operation from mains supplies within the ranges 100 to 150 volts and 200 to 250 volts.

The oscillator h.t. and l.t. are derived from a built-in power unit. The screen and anode supplies are obtained from a conventional series-regulator circuit whose positive output is strapped to earth; and the heater voltages for all valves are taken from two 6.3-volt windings on the mains transformer.



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## INSTALLATION

The Oscillator Type TF 1247 is dispatched with all valves in their holders and with its mains-input circuit adjusted for immediate operation from 240-volt, 40- to 100-c/s supplies, unless otherwise specified at the time of ordering.

The instrument can be adjusted for operation from any supply voltage within the ranges 100 to 150 volts and 200 to 250 volts. To check or alter the settings of the mains transformer tappings, refer to Section 2.1 which follows.

### 2.1 MAINS INPUT ARRANGEMENTS

#### 2.1.1 General

The mains transformer has a double-wound primary, and its two tapped sections are connected in series-parallel for 100- to 150-volt operation, or in series for 200- to 250-volt operation.

The mains input to the transformer is carried on two fly-leads connected by screws to a mains tapping panel. Attached to the tapping panel is a pierced reference plate which is reversible and marked with a selection of voltages. On one side of the plate, the voltages are applicable to the 100- to 150-volt range; on the other to the 200- to 250-volt range.

The two main sections of the primary are connected together by a link or links; these links are used to join the appropriate solder-tag terminals which are mounted directly on the transformer coil. To change from one major voltage range to the other, the linking between the transformer tags is altered; to change by increment within one of the major voltage ranges, the position of the screw-secured fly-leads on the tapping panel is altered. Diagram TLC 27612/1, included after page 8, shows in schematic form, the method of adjusting the mains transformer.

The fly-lead connections to the mains tapping panel can be viewed through a transparent plastic cover on the rear case panel. To gain access to the tapping panel, release the single, captive screw which secures the cover to the case panel.

To examine the link connections on the transformer coil, remove the rear case panel as follows: detach the two screws holding the panel to the back of the instrument; detach the two screws on the underside at the rear of the instrument. The panel can then be removed and the transformer will be seen mounted adjacent to the mains tapping panel.

#### 2.1.2 Operation from 200- to 250-volt, 40- to 100-c/s Supplies

To adjust the instrument to operate from 200- to 250-volt supplies, connect the link on the transformer coil as shown in Fig. 1 of TLC 27612/1.

2.1.2 (continued)

Then adjust the fly-lead connections, as necessary, to suit the local supply voltage.

2.1.3 Operation from 100- to 150-volt, 40- to 100-c/s Supplies

To adjust the instrument to operate from 100- to 150-volt supplies, connect the links on the transformer coil as shown in Fig. 2 of TLC 27612/1. Then adjust the fly-lead connections, as necessary, to suit the local supply voltage.

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OPERATION

3.1 SWITCHING ON AND WARMING UP

Be sure that the instrument is correctly adjusted to suit the particular supply to which it is to be connected. Then proceed as follows :-

- (1) Connect the mains lead to a supply socket. The lead is permanently attached to the instrument and is cleated, when not in use, by two spring clips on the rear case-panel.
- (2) Switch ON by means of the SUPPLY switch. The pilot lamp should now glow.

Before proceeding further, wait two or three minutes for the valves and internal circuits to warm up. If a very high order of stability is required, extend this period to approximately half an hour.

3.2 SETTING OUTPUT FREQUENCY AND LEVEL

3.2.1 Tuning

The Oscillator covers frequencies from 20 to 300 Mc/s in six ranges as follows :-

RANGE	FREQUENCY COVERAGE
A	20 to 40 Mc/s
B	40 to 80 Mc/s
C	80 to 120 Mc/s
D	120 to 180 Mc/s
E	180 to 240 Mc/s
F	240 to 300 Mc/s

To set the Oscillator to a particular frequency: switch the control to the required range; tune to the desired frequency; and read the frequency on the tuning dial arc appropriate to the RANGE setting selected.

It should be remembered that the frequency calibration is only accurate, for reasons explained in Section 1.2.2, when the output is correctly terminated. For details of output termination, refer to Sections 3.3 and 3.4.

NOTE: The black dots on the tuning dial denote those frequencies at which the Capacitance-Inductance Conversion Chart on the Q-Meter may be used.

3.2.2 Adjusting Output Level

Adjust the uncalibrated OUTPUT LEVEL control to give an output level suitable for application to associated equipment. The output can be applied to (i) the Marconi Circuit Magnification Meter TF 1245, or (ii) a 50-ohm load. These applications and the output levels available are discussed in Sections 3.3 and 3.4 respectively.

3.3 USE WITH CIRCUIT MAGNIFICATION METER TF 1245

The main function of this Oscillator is to provide a test-circuit energizing voltage for the Circuit Magnification Meter TF 1245, and, in this role, may be considered as an integral part of that instrument. Therefore, it has been found expedient to include the relevant operational procedure for the Oscillator in the handbook for the Circuit Magnification Meter.

When used with the TF 1245, the Oscillator output level is continuously variable up to a maximum of about 600 mV. This full-output level enables the maximum Q-reading multiplication factor of x0.9 to be attained adequately.

3.4 USE AS A 50-OHM SOURCE

In addition to its use with the TF 1245, the Oscillator can be employed as a general-purpose test source having a nominal output impedance of 50 ohms. To obtain this condition, it is necessary to couple the optional Matching Unit Type TM 5727 to the R.F. OUTPUT socket of the Oscillator.

With a 50-ohm load connected to the Matching Unit output socket, the voltage developed across the load is continuously variable up to a maximum of approximately 4 volts dependent on frequency.

The Matching Unit has a 50-ohm BNC output socket. Listed below are reference numbers given by several authorities and manufacturers to some of the BNC plugs that will fit the outlet :-

Great Britain, Air Ministry:	10H/20935
Films & Equipments Ltd.:	UG-88/U
	UG-913/U
Belling & Lee Ltd.:	L.1331/FP
	L.1331/RFP
Transradio Ltd.:	BN.1/5
	BN.7/5
United States, Military No.:	UG-88/U
	UG-913/U

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MAINTENANCE

4.1 FUSES

The mains input circuit to the oscillator is protected by two fuses. One is in series with the mains transformer primary and the other is in the h.t. secondary centre-tap line. Both are standard 1-inch long, 1/4-inch diameter cartridge fuses. The fuse in the primary is rated at 2 amps, and the fuse in the h.t. secondary at 150 mA. Both fuses are accessible at the rear of the instrument and can be replaced without removing the rear case-panel.

4.2 ACCESS TO COMPONENTS

4.2.1 General

The valves may normally be replaced without special selection. The power supply valves, V1 to V4, are immediately accessible on removing the rear case panel as described in Section 4.2.2, paragraph (1). The oscillator valve is accessible after removing the oscillator unit cover as described in Section 4.2.3.

4.2.2 Removal of Power Unit

- (1) Remove the rear case panel after detaching four screws; two of the screws hold the panel to the back of the instrument and the remaining two are on the underside at the rear.
- (2) Detach the two screws, one on either side of the power unit, which hold the chassis to the main framework of the instrument. The chassis can then be withdrawn.

The unit remains attached to the instrument, however, by the leads soldered to the power-unit connection panel. The length of the leads is sufficient to permit all normal maintenance operations to be carried out. Should it be necessary to remove the unit completely, unsolder the seven leads from the panel; note the cable-form colour sequence for subsequent replacement.

4.2.3 Removal of Oscillator-Unit Cover

- (1) Remove the power unit as described in Section 4.2.2 but do not unsolder the leads from the power-unit connection panel.
- (2) Detach the case top-panel by undoing the four screws holding it to the top of the instrument.
- (3) Remove the eight screws, ~~four at the top and four at the bottom~~, which secure the oscillator-unit cover in position. The cover can then be withdrawn.

## 4.3 WORKING VOLTAGES

The voltages given in this section for guidance when servicing the instrument were obtained from a representative TF 1247; the voltmeter used was an Avometer Model 8, which has a resistance of 20,000 ohms/volt.

All voltages should be measured with the correct supply voltage applied to the appropriate transformer-primary tapping (e.g., 240 volts applied to the 240-volt tap).

All measurements are made with respect to chassis unless otherwise stated.

Mains transformer, h.t. secondary:	350-0-350 V a.c.
" " LT1 (between pins 4 and 5 of V2):	6.3 V a.c.
" " LT2 (connector panel tag 3):	6.3 V a.c.
H.T. stabilized (connector panel tag 4):	-220 V d.c.

## 4.4 ADJUSTMENT OF PRESET CONTROLS

The level of the stabilized h.t. voltage from the power unit is adjusted by potentiometer RV1. With the correct voltage applied to the mains inlet, RV1 is set to give -220 V d.c. at connector panel tag 4.

The only other preset controls are the tuning inductors associated with ranges A and B. If it is found at any time that the calibration is in error, the inductor cores should be adjusted to give the best compromise calibration accuracy over the whole range.

The tuning inductors for the remaining ranges are fixed air-cored and are not intended as adjustable components. It is permissible, however, to alter the physical configuration of the range-C and range-D inductors in order to effect adjustment to the frequency calibration.

It is important that, for reasons explained in Section 1.2.2, the r.f. output is always correctly terminated. This termination must be either the Circuit Magnification Meter or the optional Matching Unit, itself loaded with 50 ohms resistance.

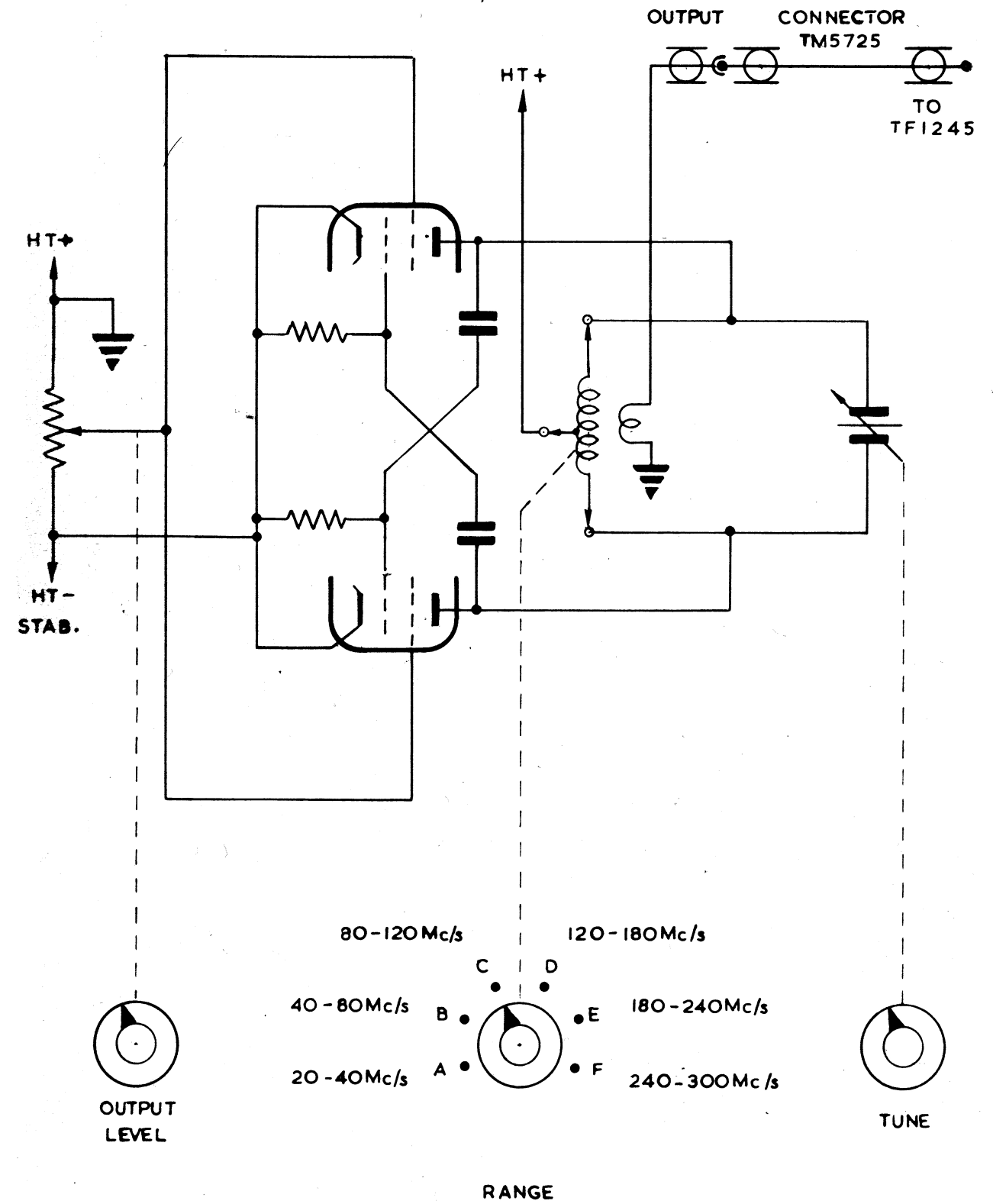
To adjust the inductors, first remove the oscillator unit cover as described in Section 4.2.3. It is then advisable to remove the bottom case-panel by undoing the two remaining screws from the underside of the instrument. The tuning assembly 'in circuit' at any particular setting of the RANGE switch is at the bottom of the turret disk.







FUNCTIONAL DIAGRAM  
 OF  
 20 TO 300 Mc/s OSCILLATOR  
 TYPE TF1247



FUNCTIONAL DIAGRAM OF  
 20 TO 300 Mc/s OSCILLATOR TYPE TF1247

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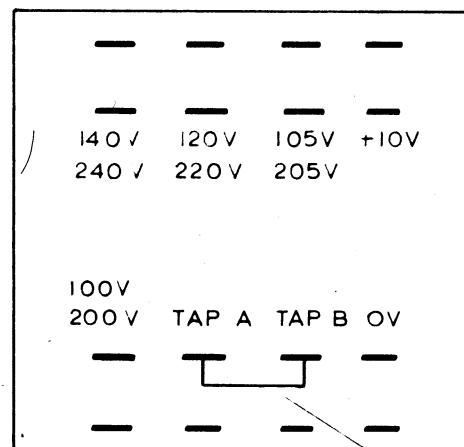
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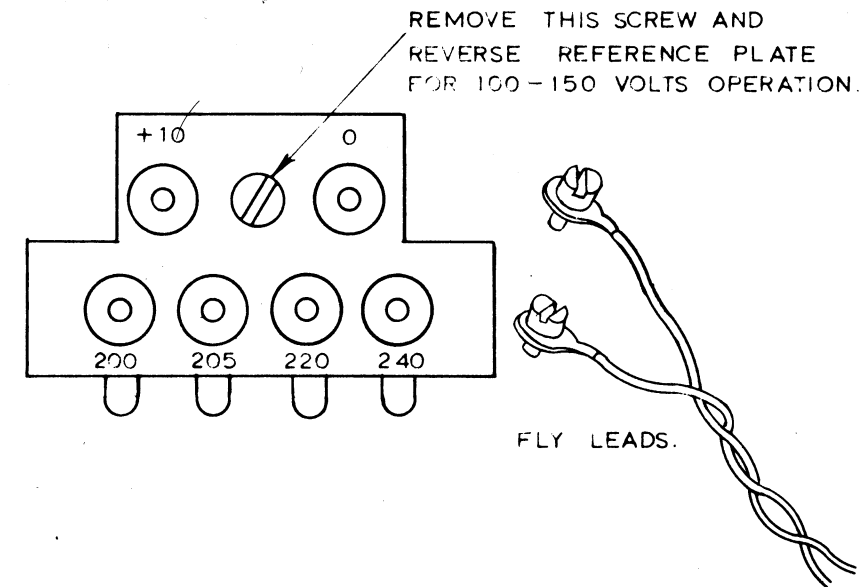
MAINS INPUT CONNECTIONS  
100-150/200-250 VOLT PRI.  
TRANSFORMERS.

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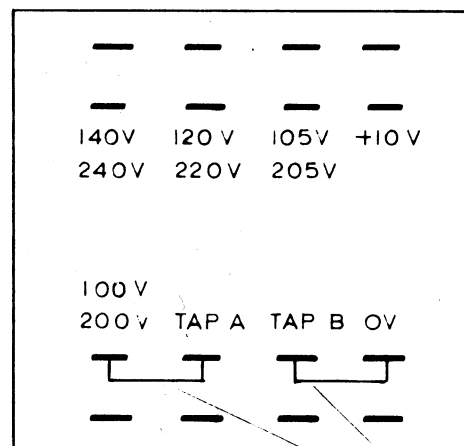


FOR  
200-250 VOLTS  
MAINS SUPPLIES

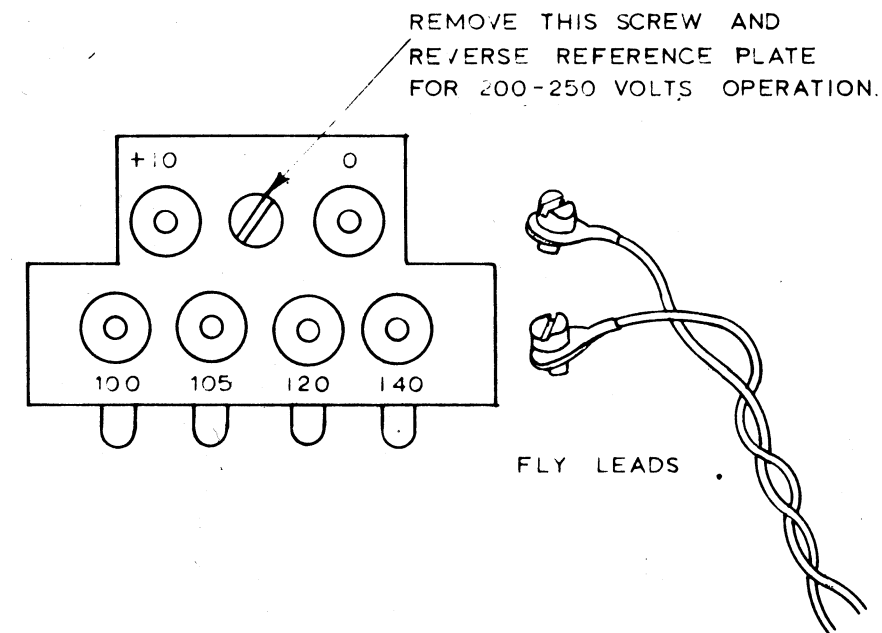


**FIGURE 1.**

SOLDERED LINK.



FOR  
100-150 VOLTS  
MAINS SUPPLIES



**A** ARRANGEMENT OF PRIMARY  
 SOLDER TAG CONNECTIONS  
 ON MAINS TRANSFORMER.

**B** MAINS TAPPING PANEL  
 CONNECT THE FLY-LEADS TO GIVE  
 A COMBINATION TO SUIT MAINS VOLTAGE  
 ONE FLY-LEAD MUST GO TO EITHER '+10' OR '0' TAP

**FIGURE 2.**

SOLDERED LINKS.

MAINS INPUT CONNECTIONS.