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It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson
In the village of Blunham, Bedfordshire.

OPERATING INSTRUCTIONS

STANDARD SIGNAL GENERATOR

TYPE TF 144.G.

MARCONI INSTRUMENTS LTD

LONDON ENGLAND

STANDARD SIGNAL GENERATOR

TYPE TF.144G

CONTENTS

SCHEDULE OF PARTS SUPPLIED

The complete equipment comprises the following parts:-

1. One Instrument Type TF.144G.
2. One Set of valves packed in sockets, viz:
   - Three - AC/P or ML4
   - One - UU5 or MU 12/14

   Lamp One - 6.3V,0.35A,M.E.S.
3. One Mains Lead fitted with 8 pole socket.
4. One Battery Lead fitted with switch and 8 pole socket.
5. One spare Thermocouple mounted on the attenuator cover plate.
6. One A.W. Dummy Aerial, Type TM.1758 fitted to screened lead with concentric screened socket.
7. One spare concentric screened socket.
8. One Instruction Book EB.144G.

GUARANTEE

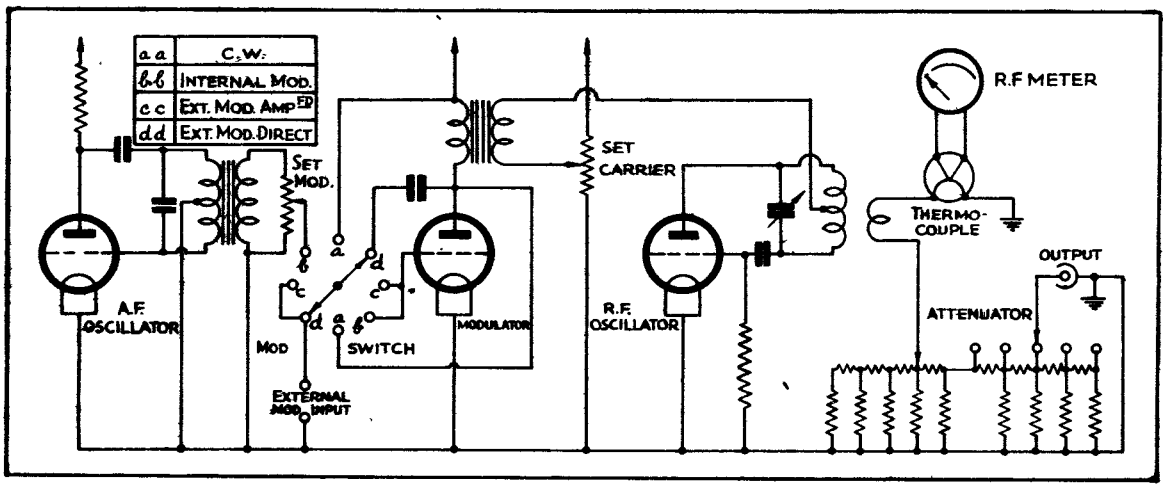
We guarantee this instrument free from defects in material, workmanship and design.

During a period of one year after date of despatch to the original purchaser we will make good any defects developing in parts of our own manufacture under proper use and arising from faulty design, workmanship or material, provided such parts are promptly returned to our laboratories and provided that neither they nor the apparatus of which they form part have been tampered with or modified.

1. INTRODUCTION

1.1 General. Methods of investigating the overall performance of Radio Receivers, such as on the lines laid down by the Radio Manufacturers' Association specifications, are well understood and are outside the scope of this Instruction Handbook. The following pages are, therefore, chiefly concerned with familiarising the user with the characteristics of Standard Signal Generator TF.144G. itself. In conjunction with the necessary accessories the Generator may also be employed for field strength measurements or for the evaluation of the constants of R.F. transmission lines.

1.2 Basic Arrangement. The standard instrument is designed for alternative A.C. mains or battery operation, covers a radio-frequency range of 85 kc/s to 25 Mc/s, gives a continuously variable output of one microvolt to one volt controlled by a calibrated attenuator and may, as required, be modulated either externally or by the internal 400 c/s oscillator. The R.F. current entering the attenuator is monitored by a meter on the panel. The skeleton schematic diagram below illustrates the essential arrangement:-



2. DETAILED DESCRIPTION

2.1 Radio Frequency Circuits. The complete R.F. oscillator system is housed in a cast aluminium screen and employs a triode valve in a Hartley circuit. The tuning coils for the various frequency ranges are mounted inside a cylindrical screen and switching is accomplished by rotating this unit bodily. Auxiliary contacts are arranged to short-circuit those coils out of use which otherwise might resonate. The tuning condenser is constructed in two sections, the wiring of the coil assemblies being such that a single section only is in use above 1.3 Mc/s while both are in operation at lower frequencies.

The calibrated tuning dial is attached directly to the main spindle and is rotated by a friction drive engaging its outer edge. Incremental

tuning is accomplished by rocking, over a small angle, the stator of the main condenser. The amplitude of R.F. oscillation is controlled by varying, by means of a potentiometer (SET CARRIER), the H.T. voltage supplied to the oscillator valve. The output attenuator is inductively coupled to the tuned circuit in series with a thermocouple operating a meter calibrated so that deflection to the SET CARRIER mark represents 1 volt across the attenuator. The slide wire section of the latter is similar to a constant-impedance ladder network and is designed so as to reduce the variation of input impedance with setting to approximately $\pm 1\%$; the scale is logarithmic and is calibrated in dB. above one microvolt in addition to voltage output. The slide wire is terminated by the input impedance of the multiplier which is arranged as a six-position ladder network having 20 dB steps. The internal output impedance is independent of the slide-wire setting except in the neighbourhood of maximum output on the highest multiplier range.

2.2 Modulation System. Modulation is applied to the anode of the R.F. Oscillator by the inclusion of the secondary of the modulation transformer in the anode supply circuit. The primary of the transformer, which is short-circuited in the C.W. position of the selector switch, is arranged so that it may be energised either directly from an external source or by the preceding triode modulator valve. The grid of this valve, in turn, may be controlled either from such an external source or by the output of the internal A.F. oscillator. The modulation depth is determined in each case by direct or indirect reference to the increase in R.F. current consequent upon heavy modulation, the SET MODULATION mark on the meter corresponding to 80% peak modulation with sinusoidal input. Since the indication is in R.M.S. terms, errors in peak modulation may arise where the applied external wave-form is complex. Errors from this source do not arise when employing internal modulation.

The tone source used for internal modulation consists of a triode oscillator operating in a Hartley circuit tuned to 400 c/s. The output from a secondary winding coupled to the oscillator coil is taken to two potentiometers in cascade, the second of which adjusts the input to the modulator valve and constitutes the calibrated PERCENT MOD. control. The preceding potentiometer, SET MOD; determines the input to this PERCENT MOD. potentiometer and must be adjusted to produce 80% modulation - the SET MODULATION mark on the meter - when the latter is at maximum; a condition brought about, in effect, by switching to SET on the modulation control switch.

When external modulation is used, modulation-depth must be controlled by adjusting the signal input voltage. In the AMPLIFIED position the input required is small, about 1 volt produces 15% modulation and the input impedance high, but for accurate fidelity determinations the DIRECT position must be used.

2.3 Power Supply. The internal power supply equipment for A.C. mains operation follows standard practice, using a full-wave valve rectifier with associated smoothing circuit. The supply leads to the generator are brought out at an 8-way plug on the panel, changeover from mains to external battery operation being accomplished by use of the appropriate lead and socket provided.

3. OPERATION

An illustrated Instruction Chart summarising the main operational data will be found affixed to the top of the instrument case.

3.1 Initial Adjustments. The instrument is normally supplied with the valves in position and with the mains transformer adjusted to the 230 volt tapping (40 to 100 c/s mains). Connection with the supply should be made to the input plug on the front panel via the cable and socket marked MAINS. In cases where the supply is other than 230 v. it is necessary to change the tappings on the mains transformer to suit. This necessitates removal of the case which may most easily be carried out, after extraction of the twelve coin-slotted screws from the edge of the panel, by turning the instrument over on its face so that it rests on the panel-rails; the cover can then be lifted off.

For battery operation the lead and socket engraved BATTERIES should be used, the batteries themselves being kept remote from the receiver under test to ensure complete freedom from radiation pick-up. The L.T. and H.T. batteries should be capable of supplying 4.0 volts at 3.5 amperes and 200 volts at 35 milli-amperes respectively.
Before switching on, verify that the multiplier is not set at the maximum range (protection against this is partially provided by the safety catch) and that the SET CARRIER control is turned to minimum. An adequate time should be allowed, before attempting to set up the instrument, for the valve cathodes to attain normal operating temperature.

3.2 Connection to Receiver. A screened cable, fitted with a concentric plug for insertion into the OUTPUT socket and terminated by an All-Wave Dummy Aerial Type TM.1758, is supplied for making connection to the receiver under investigation. This arrangement is suitable for normal measurements and comparative tests at all frequencies. The receiver should be earthed through a substantial conductor; the earth link to the generator is via the cable screen. For sensitivity measurements of great precision at the highest frequencies, a short screened cable of known characteristic should be used in conjunction with a low-resistance link between the earthy side of the concentric plug and the earth point of the apparatus under test. A spare cable connector is supplied with the instrument. The accuracy of the attenuator, and therefore of the output voltage, will be adversely affected if the external load impedance is less than the values stated in the table below, which also gives the values of internal impedance at the various multiplier settings:-

MULTIPLIER SETTING	INTERNAL OUTPUT IMPEDANCE	MINIMUM EXTERNAL LOAD IMPEDANCE (FOR 5% OUTPUT VOLTAGE DROP)
x1 Microvolts to x10 Millivolts	10Ω	200Ω
x100 Millivolts	52.5Ω	1000Ω

The safety catch is fitted to the multiplier to prevent accidental switching to the highest output range, as a load on this range of much less than 500Ω may damage the thermocouple.

3.3 Operation Unmodulated. Set the modulation control switch to C.W., the RANGE selector to the appropriate frequency range and the OUTPUT VOLTAGE control and MULTIPLIER to the required R.F. level. Adjust the FREQUENCY dial to the required frequency, with the INCREMENTAL TUNING dial at its centre zero, and bring up the SET CARRIER control until the meter reads SET CARRIER. Always temporarily reduce the output, by means of the SET CARRIER control, when operating the RANGE switch.

3.4 Incremental Tuning. This control is provided for obtaining fine frequency adjustment over a limited range at any given setting of the main tuning dial, as required for selectivity or incremental tuning determinations. After setting the FREQUENCY control it should be locked by means of the clamp knob provided. The range of adjustment now obtainable by rotating the INCREMENTAL TUNING dial from zero to either end of its scale is indicated by the hair-lines engraved on either side of the centre indicating line on the cursor of the main frequency dial. As the INCREMENTAL TUNING dial is divided into one hundred parts, each part represents, in terms of actual frequency change, one-hundredth of the total range on the main dial enclosed between the aforementioned outer hair-lines.

3.5 Internal Modulation 400 c/s. Adjust the R.F. conditions as previously described, then turn the SET MOD. control to minimum and re-set the modulation control switch to the SET position. Next adjust the SET MOD. control to bring the meter indication to SET MODULATION and finally turn the modulation control switch to NORMAL. The desired modulation depth can now be obtained by means of the PERCENT MOD. dial. As the radio-frequency oscillator anode swing does not vary very greatly with tuning, it is not essential to set up the carrier and modulation when the radio frequency is changed slightly; restoration of the R.F. meter reading by adjustment of the SET CARRIER control is sufficient to ensure accuracy of modulation depth within 5%.

3.6 External Modulation. Connect the source of modulation to the EXTERNAL MOD. terminals, the control switch being set to AMPLIFIED or DIRECT as required. The AMPLIFIED position is intended mainly for use with shallow modulation at medium frequencies, an input of 3 volts (into 1MΩ) being required to produce approximately 40% modulation. The DIRECT position must be used for deep modulation, for low modulation frequencies, and for all accurate fidelity measurements and requires an input of the order of 30 volts (into 6,000Ω) to produce 40% modulation. The frequency characteristic of the modulation system, with constant input, is in either case within the limits ± 2.5 dB from 50 to 10,000 c/s at any radio frequency between 100 kc/s and 25 Mc/s. At 1 Mc/s, with DIRECT modulation, it is within ±1dB from 30 to 10,000 c/s. The frequency characteristic is, of course, eliminated if the A.F. input voltage is adjusted so as to maintain the reading of the R.F. output meter. This, however, is not practicable in the AMPLIFIED position when working at considerable modulation depth as, at high or very low modulation frequencies, the input to the modulating valve might have to be increased to a point where overloading occurs. Modulation depth may be set either by reference to an external voltmeter across the modulation input terminals or by comparison, by means of the R.F. output meter, with that produced by the internal source. For the first method set the R.F. meter, with zero A.F. input, to the SET CARRIER mark by means of the SET CARRIER control and then note the A.F. input required to raise the indicator to the SET MODULATION mark. This corresponds to 80% modulation and lower modulation depths can be obtained by reducing the A.F. input proportionally.

For the second method, recommended for modulation depths above 30%, set up the instrument as described in section 3.5 (Internal Modulation) and note the reading of the R.F. output meter at the required modulation depth. Now switch to the external modulation source and, having checked that the R.F. output meter reads SET CARRIER with zero A.F. input, restore the meter reading to its previous indication by bringing up the A.F. input level.

SPECIAL NOTE: At low carrier frequencies both depth and frequency of modulation must be limited somewhat to avoid distortion of the modulation envelope. A schedule indicating these values is given below which, for convenience, includes figures relating to two ranges of frequencies lower than those covered by the standard instrument. When required, these are supplied in lieu of the normal highest pair of frequency ranges.

RANGE	CARRIER FREQUENCY	HIGHEST MODULATION FREQUENCY AT WHICH 80% MOD.CAN BE USED	MAXIMUM MOD DEPTH AT 5000 c/s.
20/40 kc/s	20 kc/s	500 c/s	20%
	40 kc/s	500 c/s	20%
40/85 kc/s	40 kc/s	500 c/s	20%
	85 kc/s	500 c/s	20%
85/200 kc/s	85 kc/s	1500 c/s	40%
	200 kc/s	2000 c/s	50%
200/500 kc/s	200 kc/s	2000 c/s	50%
	500 kc/s	5000 c/s	80%

In the above cases where the maximum depth which may be used is less than 80%, the modulation should be set as follows:- Note the input voltage required at 400 c/s (using EXTERNAL MOD. DIRECT), by the methods previously described, to produce the desired modulation depth. Then apply this same voltage at the higher modulation frequency; the resulting peak modulation will not be in error by more than 5% in most cases.

4. MAINTENANCE

4.1.Valves. All valves are of standard commercial types, with 4 volt heaters, as under :-

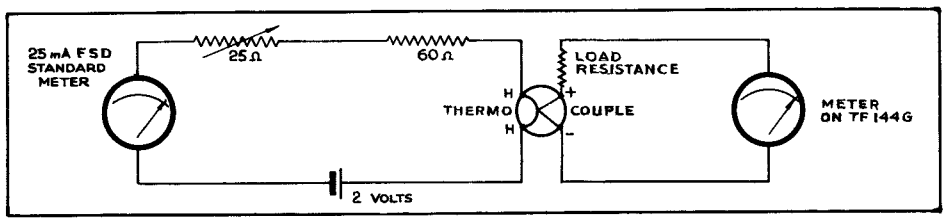
Triodes (3) = AC/P or ML4 - 5 pin.
Rectifier (1) = UU5 or MU 12/14 - 4 pin.

When replacing the R.F. oscillator, care should be taken that no serious disturbance of frequency calibration results. As the effect of such a change is likely to be more pronounced at the highest frequencies, a valve should be selected which introduces the least possible error at 25 Mc/s and which, also, is capable of giving the full normal output. Any departure from calibration on the part of the PERCENT MOD. dial as a result of replacing the R.F. oscillator valve will normally fall within the limits specified.

4.2 Contacts. All contacts are designed to have a self-cleaning action. Should symptoms of poor contact develop due to infrequent use, the best treatment is to operate the control in question a number of times until the trouble disappears.

4.3. Thermocouple Replacement. A spare thermocouple Type TA 13634 is supplied with each instrument, mounted on the outside of the multiplier cover plate, and replacement instructions will be found on the adjacent slide wire cover. All spare thermocouples have already been adjusted during manufacture and no further adjustments are normally needed; if required, however, a check may be made with the H terminals disconnected from the instrument and energised from a cell as shown below. The current required to produce deflection to the SET CARRIER mark (nominally 20mA) should lie between the limits 19.5mA and 20.5mA - if not, adjust the load resistance joined to the + terminal of the couple.

The increase in current for deflection to the SET MODULATION mark should lie between + 13.8% and + 16.2%. If outside of these limits, use as SET MODULATION mark the meter reading obtained with when an increase of 15% is applied in excess of the measured SET CARRIER figure.



The accuracy of the output voltage calibration of the Signal Generator depends directly, of course, on the accuracy of measurement of the standardising current. A B.S.1. 25 mA. D.C. meter will provide sufficient accuracy for normal purposes.

4.4 Exchange of Coil Units. In special cases additional coil units (each unit carrying two ranges) are supplied to extend the frequency cover of the instrument. These extra units, which are calibrated in terms of degrees on the frequency dial, must be substituted in the coil-drum for a unit or units covering a standard range. To make this exchange withdraw the instrument from its case and remove the cover-plate from the rear of the R.F. oscillator screening box. Next remove the horizontal strip carrying the rear bearing of the coil-drum shaft and also the two 2 BA nuts on the coil-drum. With the drum turned to such a position between ranges that the contacts are free, it can be withdrawn as a whole. Individual coil units are affixed to the drum by two 4 BA. screws at one end and a nut on a 4 BA stud at the other.

4.5 Service. Should it become necessary to return the instrument for service at any time, our Service Section will be assisted by the following procedure:-

(1) Write to - Service Department
Marconi Instruments Ltd.

LONDON,
ENGLAND

giving the fullest possible details of the fault or of the service required and quoting the Type number and Serial number of the instrument as engraved on the panel.
(2) Send the instrument complete with accessories and Instruction Book suitably packed to the above address and include a copy of the above letter describing the fault. This information will facilitate the work of our Service Section and expedite the return of the instrument.

5. SPECIFICATION

5.1 STANDARD SIGNAL GENERATOR TYPE TF.144G

CARRIER FREQUENCY RANGE:.....85 kc/s to 25 Mc/s in eight ranges

INCREMENTAL CONTROL:.....Range: at 1 Mc/s±1%.Discrimination: 0.02% frequency change (approx.)

OUTPUT VOLTAGE:.....Continuously variable from 1 microvolt to 1 volt. The output level in dB above 1 microvolt is also directly indicated.

Accuracy.....Below 4.5Mc/s:±10% ± 0.2 μV.
4.5 to 15 Mc/s:±15% ± 0.3 μV.
15 to 25 Mc/s:±25% ± 0.5 μV.

OUTPUT IMPEDANCE:.....1 microvolt to 100 millivolts:- 10Ω
100 millivolts to 1 volt:- 52.5Ω

INTERNAL MODULATION:.....An internal 400 c/s Oscillator provides modulation up to 75%.

Accuracy.....± 3% modulation depth.

EXTERNAL MODULATION:.....External modulation may be applied directly to the primary of the modulating transformer or to the grid of the modulating valve.

Input Impedance:.....Direct:- 6,000Ω approx. Amplified:-1MΩ approx.

Input for 40% Mod:.....Direct:- 30 volts approx. Amplified:- 3 volts approx.

Frequency Characteristic: (Up to 40% Mod).....Direct at 1 Mc/s:- ±1dB from 30 to 10,000 c/s. Amplified or direct at any radio frequency between 500 kc/s and 25 Mc/s: ± 2.5dB from 50 to 10,000 c/s. The frequency characteristic deteriorates at greater modulation depths and the latter are limited at low radio frequencies as tabulated on Page Six.

FREQUENCY MODULATION:.....Varies with tuning capacity and range. At 30% modulation the frequency modulation averages about 25 parts in 100,000.

HUM MODULATION:.....Not exceeding 0.2% at 50 c/s.

POWER SUPPLY:

Mains:.....200 - 250 volts, 40 - 100 c/s. Consumption approximately 40 watts.

Batteries: (External).....4 volts 3.5 amps. H.T:- 200 volts 30 mA max.

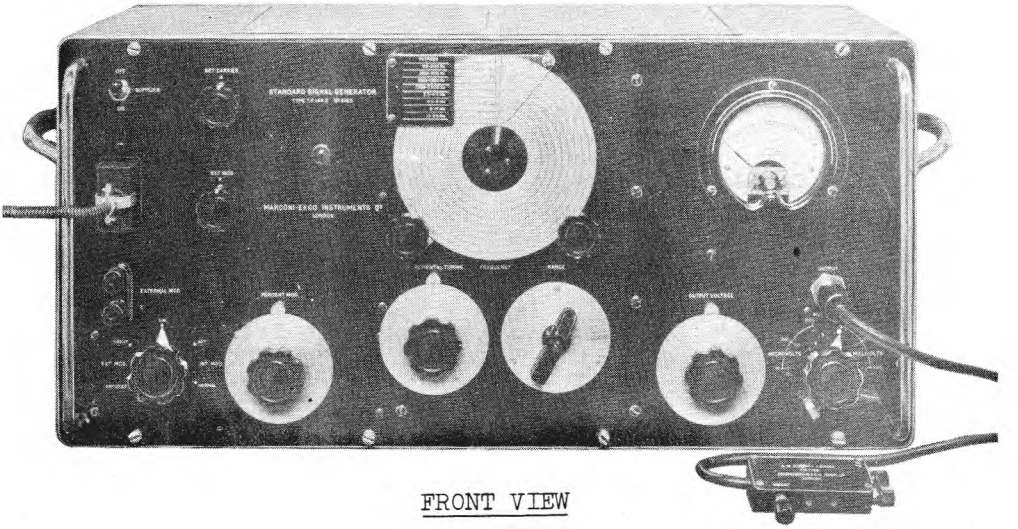
DIMENSIONS:.....$29\frac{1}{4}$" x $12\frac{1}{4}$" x 10" (over projections)

WEIGHT:.....93 lbs. approx, with accessories.

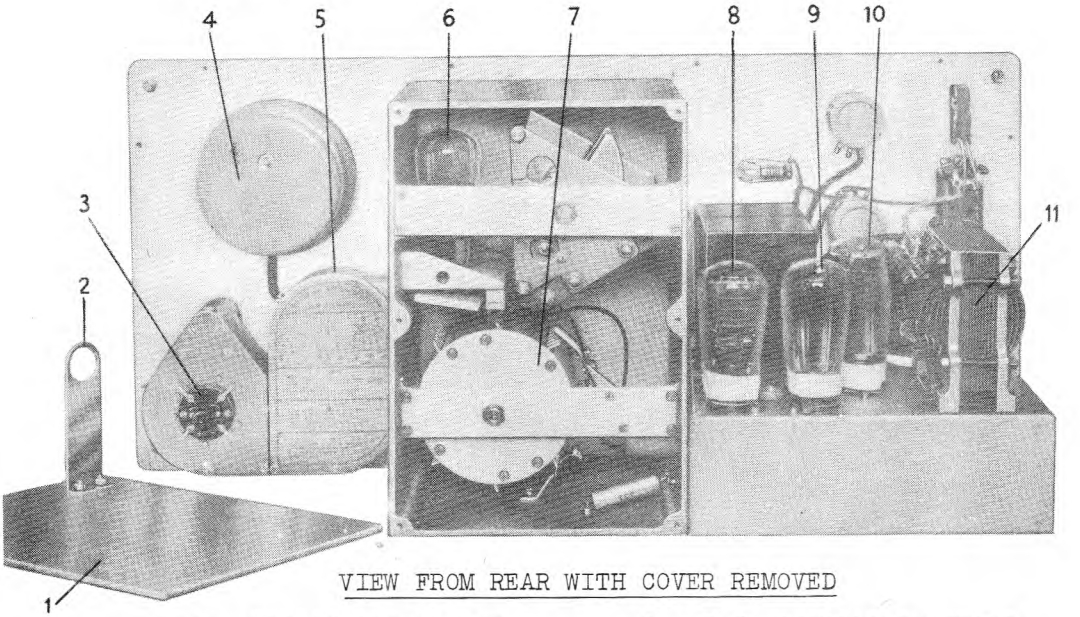
5.2 SPECIAL INSTRUMENTS: Below are tabulated, by their type numbers, Signal Generators of the TF.144G. class which incorporate certain departures from standard. With the exception of the variations described, these instruments substantially conform to the standard specification.

TYPE NUMBER	DEPARTURE FROM STANDARD
TF.144G/1	Frequency range 20 kc/s to 8 Mc/s
TF.144G/2	Frequency range 40 kc/s to 15 Mc/s
TF.144G/3	Standard range covering 85 kc/s to 25 Mc/s, but with overlap linking the six upper ranges.
TF.144G/4	1,000 c/s internal modulation in place of 400 c/s
TF.144G/5	Frequency Range 20 kc/s to 8Mc/s and Attenuator or Multiplier modified to have 150Ω Output to operate with special terminating unit.
TF.144G/6	Special rack-mounting model with mains inlet at rear. Internal modulation at 1,000 c/s.

6. ILLUSTRATIONS



FRONT VIEW



VIEW FROM REAR WITH COVER REMOVED

1. Oscillator Cover.
2. Valve Retaining Clip.
3. Spare Thermocouple.
4. Output Meter.
5. Thermocouple Replacement Data.
6. R.F. Oscillator Valve.
7. Coil Drum.
8. Modulator Valve.
9. A.F. Oscillator Valve.
10. Rectifier.
11. Mains Transformer.

SWITCHING (S2)	
DIAL READING	CONTACTS CLOSED
EXT MOD AMP.	1. 4. 8
EXT MOD. DIRECT	1 5. 6 7
C W.	7. 8
INT MOD SET	2. 8
INT MOD NORMAL	3 8.

T1 & C9 (400~)
OR
* T4 & C13 (1000~)

HT+

SET CARRIER

% MOD

SET MOD

THERMOCOUPLE

OUTPUT

MICROVOLTS

MILLIVOLTS

ATTENUATOR

CW
DIRECT EXT MOD AMPLIFIER
SET INT MOD NORMAL

EXT MOD.

L.T.

HT

P

GC

X

G

C

C

A.C.

P1.

A.C. MAINS PLUG

TRICEL 4 CABLE

BATTERY PLUG P2

HT

LT

SK1.

(5v) (0)

(100v) 200v

(110v) 220v

(120v) 240v

T3.

L.T.R.

L.T.

PL1

USED WITH L9 L10 & L11 ONLY

L4 - L11

L12

TF 144G & G4.

DRG No. TD. 9127 ISSUE 5

RESISTANCES R

INDEX	VALUE	REF Nº
R1	10,000 Ω ± 10% ½ WATT	10W/27
R.2	3300 Ω ± 10% ½ WATT	10W/6324
R 3	25,000 Ω VAR	10W/7846 10W/7887
R.4	10,000 Ω ± 10% ¼ WATT	
R.5	1,000 Ω ± 10% ½ WATT	10W/11678
R.6.	50,000 Ω VAR	10W/15669 10W/15670
R 7	22,000 Ω ± 10% ½WATT.	10W/1614
R.8.	5,000 Ω VAR	10W/15668 10W/7795
R 9.	1,000 Ω ± 10% ½WATT	10W/11678
R.10.	470 Ω ± 10% ½WATT	10W/875
R.11.	27 Ω ± 10% ½WATT	10W/1743
R.12	·22 MEG ± 10% ½WATT	10W/927
R.13	10,000 Ω ± 10% ½WATT	10W/27
R.14	3300 Ω ± 10% ½WATT.	10W/6324
R.15	1 MEG. ± 10% ½WATT	10W/130
R 16	94·5 Ω SPECIAL.	
R.17.	22·05 Ω SPECIAL.	
R.18	500 Ω SPECIAL	
R 19	22·05 Ω SPECIAL	
R.20	500 Ω SPECIAL	
R.21	·22 05 Ω SPECIAL	
R 22	500 Ω SPECIAL.	
R 23	22 05 Ω SPECIAL	
R.24	500 Ω SPECIAL	
R.25	22 05 Ω SPECIAL	
R 26	500 Ω SPECIAL.	
R.27	22·05 Ω SPECIAL.	
R.28	500 Ω SPECIAL	
R.29	22·05 Ω SPECIAL.	
R 30	500 Ω SPECIAL.	
R 31	22·05 Ω SPECIAL.	
R 32	500 Ω SPECIAL.	

RESISTANCES R

INDEx	VALUE	REF Nº
R.33	22·05 Ω SPECIAL	
R 34	500 Ω SPECIAL	
R 35	22·05 Ω SPECIAL	
R 36	500 Ω SPECIAL	
R 37	22·05 Ω SPECIAL	
R 38	500 Ω SPECIAL	
R 39	22 05 Ω SPECIAL	
R 40	670 Ω SPECIAL	
R 41	DETERMINE IN CALIBRATION	
R 42	1 Ω SPECIAL.	
R 43	99 Ω + 11 Ω	
R 44	99 Ω + 12·22 Ω SPECIAL	
R 45	99 Ω + 12 22 Ω SPECIAL	
R 46	99 Ω + 12·22 Ω SPECIAL	
R 47	99 Ω + 12 22 Ω SPECIAL	
R48	10000Ω ± 10% ½ W USE WITH L4 ONLY	10W, 27
R 49	15000Ω ± 10% ½ W USE WITH L5 ONLY	10W/11683
R 50	22,000Ω ± 10% ½ W USE WITH L6 ONLY	10W, 1614
R 51	27000Ω ± 10% ½W USE WITH L7 ONLY	10W/1482
R 52	27000Ω ± 10% ½W USE WITHL8 ONLY	10W/1482
R 53	47000Ω ± 10% ½W USE WITH L9 ONLY	10W/539
R 54	47000Ω ± 10% ½W USE WITH L10 ONLY	10W, 539
R 55	47000 Ω ± 10% ½W USE WITH L11 ONLY.	10W/539
R 56	47 000 Ω ± 10% ½W USE WITH L5 ONLY	10W/539
R 57	·27 MEG. ± 10% ½W USE WITH L9 ONLY	10W/589
R 58	47 000Ω ± 10% ½W	10W/539
R 59	220 Ω NOM. ½W ADJ. IN CAL.	
R 60	390 Ω 5% ½ W	10W/882

CONDENSERS C

INDEX	VALUE	REF Nº
C 1	·1μF ± 20% 350 v W	10C/11126
C 2	·01μF ± 25% 350 v W	10C/ 11123
C 3	·1μF ± 20% 350 v W	10C/ 11126
C.4	100μμF ± 15%	10C/96
C 5	1000μμF ± 2%	10C/3961
C 6	1μF ± 15% 350 v W	10C/14194
C 7	305μμF VARIABLE	10C/14157
C.8	125μμF VARIABLE	
C 9	·25μF 350 v W	
C 10	1μF ± 15% 350v W	10C/14194
C 11	·25μF 20% 350 v W	10C/11128
C 12	40μμF ± 2%	10C/3853
C 13	* ·1μF ± 20%	10C/14196
C 14	100μμF ± 2%	10C/10569
C 15	25 μF ELEC 25 v W	10C/12428
C 16	4μF ± 15% 350 v W	10C/2809
C 17	·1μF ± 20% 350 v W	10C/11126
C 18	20μμF ± 20% NOM DET IN CAL	10C, 10948
C 19	100μμF ± 15%	10C/96
C 20	100μμF ± 15%	10C/96
C 21	·002 μF ± 5%	10C/3957
C 22	·002 μF ± 5%	10C/3957
C 23	·1μF ± 20% 350 v W	10C/11126
C 24	·1μF ± 20% 350 v W	10C/11126
C25 & C26	8 - 8 μF 500 v W.	10C/14041
C 27	15μμF. USE WITH L9 ONLY	10C/5640
C 28	15μμF USE WITH L10 ONLY	10C/5640
C29	100 μμF USE WITH L11 ONLY.	10C/96
C30	400μμF ± 2%	10C/5456
C31	200μμF ± 2%	10C/11420
C32	20 μμF ± 20% NOM DET IN CAL	10C/10948

TRANSFORMERS T

T 1	OSCILLATOR COIL 400 ~	10K/1654
T 2	MODULATION TRANSFORMER.	10K/1653
T 3	MAINS TRANSFORMER 0/120v OR 0/240 v	10K/1652
T 4	*OSCILLATOR COIL 1000 ~	

INDUCTANCES "L"

L 1	H F CHOKE	10C/14156
L.2	H F CHOKE	10C/14193
L 3	SMOOTHING CHOKE	10C/4088
L.4	TUNING COIL 15 - 25 MC/S	10V/576
L.5	TUNING COIL 8 - 15 MC/S	
L 6	TUNING COIL 4·5 - 8 MC/S	10V/577
L.7	TUNING COIL 2·5 - 4·5 MC/S	
L.8	TUNING COIL 1300 - 2500 KC/S	10V/578
L 9	TUNING COIL. 500 - 1300 KC/S	
L 10	TUNING COIL 200 - 500 KC S	10V/579
L 11	TUNING COIL 85 - 200 KC/S	
L.12	COIL 50T 36 SWG D S C CU 3/8 DIA	10C/14192

VALVES V

V 1	VALVE ML 4	10E/17
V 2	VALVE ML 4	10E, 17
V 3	VALVE ML 4	0E/17
V 4	VALVE M U 12/14.	10E/9600

MISCELLANEOUS

S.1	SWITCH DP 'ON - OFF'	10F/2669.
S 2	SWITCH 5 POS 8 WAY	10F/2316
S 3	SWITCH D.P. 'ON - OFF'	10F/2235
M1	METER	
P1 & P2	PLUG 8 WAY FLAT PIN TYPE	
SK.1	SOCKET 8 WAY FLAT PIN TYPE	
Sk.2.	SOCKET. SINGLE POLE CONCENTRIC.	10A/17965
PL.1.	PILOT LAMP 6·5V. ·3 AMP	5L.