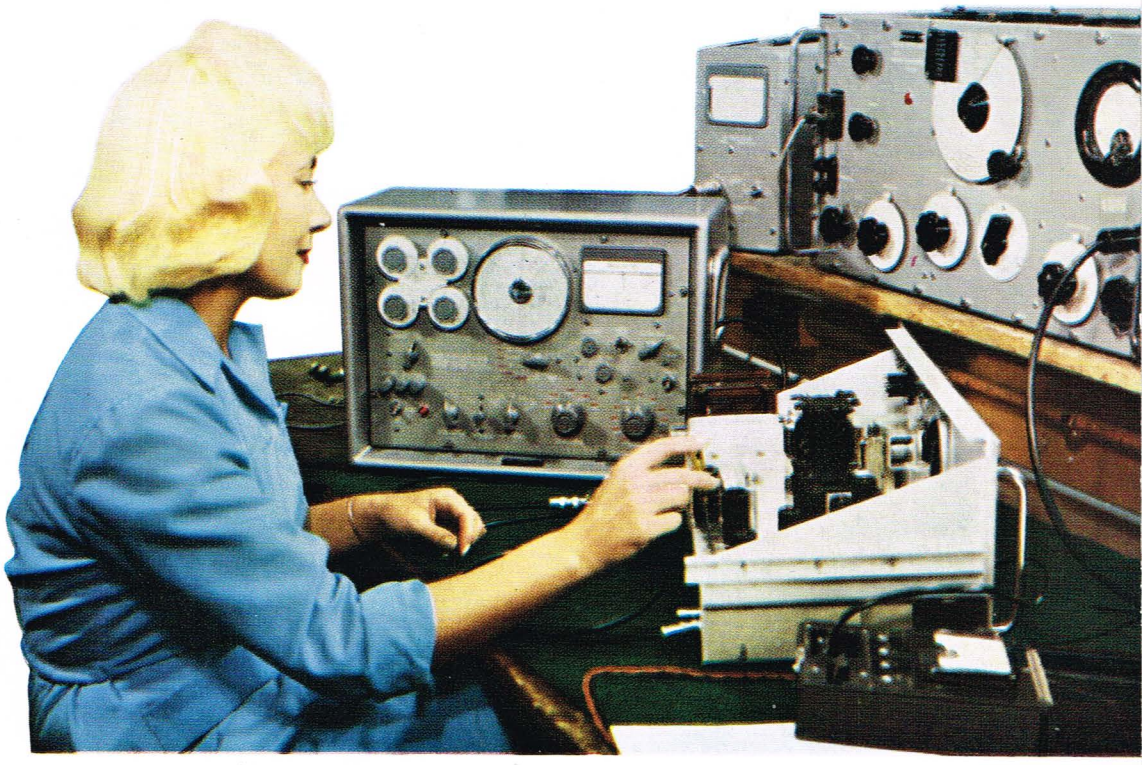
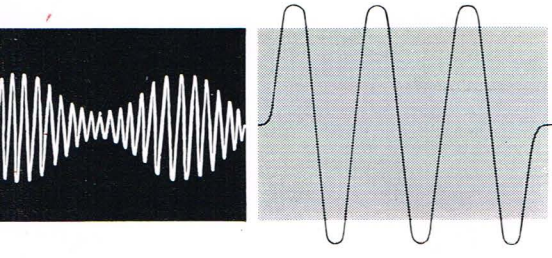


Photographed by courtesy of Marconi's Wireless Telegraph Co. Ltd., Basildon.



Signal Generators and Accessories
Noise Generators
Oscillators and Accessories

SIGNAL GENERATORS AND ACCESSORIES

General-Purpose Generators	Frequency Range	Model	Output	Features	Page
TF 144H	10 kc/s to 72 Mc/s	TF 144H Standard Signal Generator	0·2 μV to 2 V 50 and 75 Ω	A.M. up to 80% Crystal check facilities	**12**
TF 867	15 kc/s to 30 Mc/s	TF 867 Standard Signal Generator	0·4 μV to 0·4 V 13 Ω 4 μV to 4 V 75 Ω	A.M. up to 100% Crystal check facilities	**14**
TF 867/2	15 kc/s to 37 Mc/s	TF 867/2 Standard Signal Generator		Alternative version with crystal lock system and extra-fine tuning	
TF 995A/2M	1·5 to 220 Mc/s	TF 995A/2M F.M./A.M. Signal Generator	0·1 μV to 0·1 V 52 Ω 0·1 μV to 0·2 V 75 Ω	F.M. up to 75 kc/s deviation A.M. up to 50% Crystal check facilities	**16**
TF 995A/3/S		TF 995A/3/S F.M./A.M. Signal Generator		Military version of A/2M with extra-high output for i.f. alignment	**18**
TF 995A/5		TF 9995A/5 F.M./A.M. Signal Generator		Narrow-deviation model for mobile radio testing. Has extra-fine tuning, low spurious f.m., and three mod. frequencies	**18**
TF 1066B & B/1	10 to 470 Mc/s	TF 1066B and B/1 F.M. Signal Generator	0·2 μV to 0·2 V 50 Ω	F.M. up to 100 kc/s deviation; incremental tuning to ± 100 kc/s. Also a.m. up to at least 40% TF 1066B/1 is rack-mounting version	**20**
TF 1066B/2 & B/3	400 to 555 Mc/s	TF 1066B/2 and B/3 F.M. Signal Generator		Special single-range model with crystal check facilities and f.m. deviation up to 300 kc/s. TF 1066B/3 is rack-mounting version	
TF 801D/1	10 to 470 Mc/s	TF 801D/1 A.M. Signal Generator	0·1 μV to 1 V 50 Ω	Both models: Sine a.m. up to 90%; also pulse mod. Crystal check facilities TF 801D/1/S isspecial military version	**22**
TF 801D/1/S	10 to 485 Mc/s	TF 801D/1/S A.M. Signal Generator			
TF 801A/1	10 to 310 Mc/s	TF 801A/1 Signal Generator	2 μV to 0·2 V 75 Ω	Sine a.m. up to 80%; also squarewave and pulse mod.	**24**
TF 1064A	68 to 108, 118 to 185, and 450 to 470 Mc/s	TF 1064A V.H.F. Signal Generator	0·5 μV to 10 mV 50 Ω	F.M.: 3·5 and 10 kc/s fixed deviation for TF 1064A; 10 kc/s fixed and 0 to 15 kc/s variable for A/2 A.M. (TF 1064A only): 30% fixed depth I.F. crystal output; also 1,000-c/s output	**26**
TF 1064A/2	30 to 50, 118 to 185, and 450 to 470 Mc/s	TF 1064A/2 V.H.F. Signal Generator			
TF 1060	450 to 1,250 Mc/s	TF 1060 U.H.F. Signal Generator	0·15 μV to 445 mV 50 Ω	Sine a.m. and pulse mod. TF 1060/2 has extra-fast pulse rise time	**28**
TF 1060/2	450 to 1,200 Mc/s	TF 1060/2 U.H.F. Signal Generator			
TF 1145	450 to 1,900 Mc/s	TF 1145 U.H.F. Signal Generator	0·15 μV to 445 mV 50 Ω	Sine a.m. and pulse mod.	**30**
TF 1058	1,600 to 4,000 Mc/s	TF 1058 U.H.F. and S.H.F. Signal Generator	0·1 μV to 445 mV 50 Ω	Squarewave a.m. and pulse mod. F.M. up to 6 Mc/s sweep	**32**
OA 1248	1,700 to 2,300 Mc/s	OA 1248 U.H.F. Test Set	0·1 μV to 445 mV 50 Ω	Squarewave a.m. F.M. up to 20 Mc/s sweep	**34**
	Incorporates signal generator, receiver and noise generator.				
TF 1061	3,500 to 6,000 Mc/s	TF 1061 S.H.F. Signal Generator	0·15 μV to 140 mV	Squarewave a.m. and pulse mod. F.M. up to 10 Mc/s sweep Motor-driven tuning	**36**
TF 890A/1 & A/3	8,500 to 9,680 Mc/s TF 890A/3 is specially calibrated for optimum performance at 9,375 Mc/s	TF 890A/1 Radar Test Set	+ 6 dBm to − 54 dBm at waveguide outlet	Measures transmitter frequency, power and spectrum; receiver bandwidth, sensitivity and recovery time; aerial v.s.w.r.	**38**
	Incorporates c.w. and f.m. signal generator, wavemeter, power monitor, directive-feed assembly, and spectrum analyser with c.r.t. display.				

Special-Purpose Generators	Frequency Range	Model	Output	Features	Page
TF 1167	3·1, 6·2, 9·3 Mc/s	TF 1167 Telegraph Test Generator	2 μV to 200 mV 75 Ω	On/off, f.s.k. and diplex keying Also a.m. up to 100%	**42**
TF 1143	3·1, 3·1011, 3·101775 Mc/s	TF 1143 I.S.B. Two-Signal Test Generator	Carrier − 16 to − 26 dB, sidebands + 4 to + 16 dB ref. ¼ and 1 W p.e.p. 75 Ω	Output represents 3·1 Mc/s pilot carrier and sideband frequencies of 1,100 c/s and 1,775 c/s	**43**

SIGNAL GENERATORS AND ACCESSORIES (continued)

Accessories	Function	Model	Features	Page
TF 1349	Used with TF 1060/2 Generator for transponder testing in range 1,000 to 1,060 Mc/s	TF 1349 Secondary Surveillance Radar Test Set	Comprises pulse generator and differential r.f. attenuator	**44**

NOISE GENERATORS

	Frequency Range	Model	Noise Output	Output Impedance	Page
TF 1106	1 to 200 Mc/s	TF 1106 (Series) Noise Generator	0 to 14 dB ref. thermal noise	71 or 52 Ω	**46**
TF 1237	1,700 to 2,300 Mc/s	TF 1237 Noise Generator *Part of U.H.F Test Set OA 1248*	15·25 dB ref. thermal noise	50 Ω	**47**

OSCILLATORS AND ACCESSORIES

Very-Low-Frequency Oscillators	Frequency Range	Model	Output	Features	Page
TF 1382	0·0033 c/s to 1 kc/s	TF 1382 Low-Frequency Generator	0 to 15 V peak-to-peak into 2·5 kΩ	Sine, square, or ramp waveforms	**48**

R-C Oscillators	Frequency Range	Model	Output	Features	Page
TF 1101	20 c/s to 200 kc/s	TF 1101 R-C Oscillator	Up to ⅔ W 600 Ω	Built-in filter gives output with negligible distortion at 1 kc/s	**49**
TF 1267	50 c/s to 500 kc/s	TF 1267 Transmission Test Set	0 to 50 dBm into 75, 140, or 600 Ω	Combined T.M.S., V.F.O., and multi-range voltmeter	**50**
TF 1370	10 c/s to 10 Mc/s	TF 1370 Wide-Range R-C Oscillator	Up to 3·16 V, 75, 100 and 600 Ω Up to 31·6 V below 100 kc/s	Also squarewave output up to 100 kc/s	**51**

Beat-Frequency Oscillators	Frequency Range	Model	Output	Features	Page
TF 885A/1	25 c/s to 12 Mc/s	TF 885A/1 Video Oscillator	Up to 1 W 1,000, 300, and 100 Ω	From 50 c/s to 150 kc/s, can be switched to give squarewave output	**53**

Sweep Generators	Frequency Range	Model	Output	Features	Page
TF 1099 & /1	100 kc/s to 20 Mc/s	TF 1099 and /1 20-Mc/s Sweep Generator	0·3 to 3 V 75 Ω	Sweep output, variable up to 20 Mc/s in width, for precision video response measurement Differential measuring facilities	**54**
TF 1104	5 kc/s to 40 Mc/s 41 to 68, 80 to 110 and 150 to 216 Mc/s	TF 1104 Television Sweep Generator	100 μV to 100 mV 50 Ω above 41 Mc/s 2·5 kΩ below 40 Mc/s	Combined sweep generator and c.r.o. Sweep width: 500 kc/s to 10 Mc/s	**56**
TF 1104/1	5 kc/s to 45 Mc/s 50 to 115, and 150 to 216 Mc/s	TF 1104/1 Television Sweep Generator	100 μV to 100 mV 50 Ω above 50 Mc/s 2·5 kΩ below 45 Mc/s		

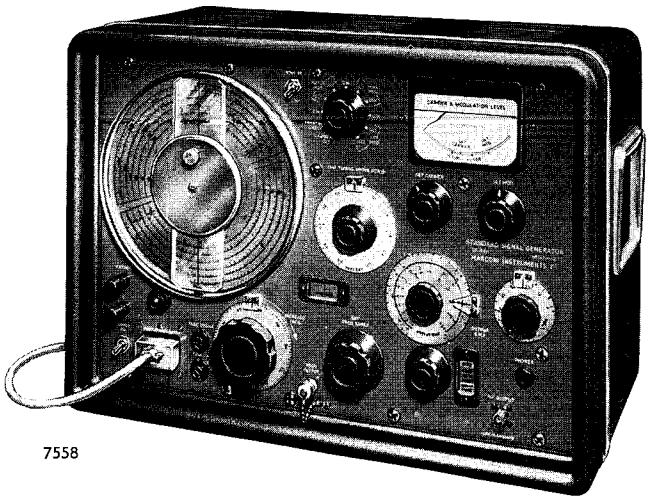
Special-Purpose Oscillators	Frequency Range	Model	Output	Features	Page
TF 1168	90 to 110 kc/s	TF 1168 (Series) High Discrimination Oscillator	20 μV to 2 V 75 Ω	Crystal standardized centre frequency	**57**
TF 1168/1	140 to 160 kc/s				
TF 1168/2	550 to 660 kc/s				

Accessories	Attenuation	Model	Frequency Range	Features	Page
TF 338C	0 to 105 dB at 600 Ω 2W max.	TF 338C A.F. Attenuator	d.c. to 100 kc/s	Continuously variable	**58**
TF 1073A (Series)	0 to 100 dB at 75 or 50 Ω 0·25 W max.	TF 1073A (Series) R.F. Attenuator	d.c. to 150 Mc/s	Variable in 1-dB steps Double-screened construction	**59**

MARCONI INSTRUMENTS

Standard Signal Generator

Type TF 144H (Series)



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- **Frequency range: 10 kc/s to 72 Mc/s**
- **Stability: 0·002%**
- **High discrimination**
- **Good r.f. waveform at all frequencies**
- **Protected thermocouple level monitor**
- **Rack-mounting and military versions available**

THIS IS a completely new signal generator; yet it has all the desirable attributes of its famous predecessors. Smaller and lighter, and with many new features that greatly improve its utility value, the TF 144H has, nevertheless, the robust simplicity that has been so important a factor in the traditional popularity of the TF 144 series.

APPLICATIONS

The TF 144H is an a.m. signal generator suitable for the standard measurements and tests on receivers in the m.f., h.f., and lower v.h.f. bands. Having unusually good frequency stability and a high-discrimination tuning system, it is particularly suitable for narrow-band response measurements. The accuracy of its output level and the purity of its generated signal facilitate accurate, reliable measurement of sensitivity and signal-to-noise ratio.

As a general-purpose r.f. source, the signal generator can fill the role of a standard of r.f. voltage and frequency; or its high output can be utilized for such purposes as driving an r.f. bridge.

TUNING SYSTEM

The tuning system is simple and of conventional form familiar to most users. Much attention, however, has been given to such aspects as operator convenience and clarity of indication.

The frequency range is divided into twelve switch-selected bands, each having a frequency cover of rather more than 2:1. Thus, a large effective scale length is obtained on the main tuning dial, which carries a separate scale for each band. The reading discrimination on this dial is such that a 2% frequency change on any band occupies more than a quarter of an inch of scale length. It is also significant that the medium-wave broadcast band coincides with a single tuning band of the signal generator.

An 8:1 reduction drive from the main tuning control permits easy and precise adjustment. The control knob also carries a dial calibrated with a linear logging scale of 100 divisions over the total circumference. As the variable tuning system follows a straight-line-frequency law on most bands, the logging scale provides the means of accurate interpolation between the direct calibration marks on the main tuning dial. Excellent discrimination is obtained by the use of this dial; four divisions correspond to a frequency change of about 1%.

For greater convenience the instrument is also fitted with an electrically coupled incremental frequency control calibrated directly in % frequency change. This control covers 1% and has a travel of 315°. With it, frequency changes of 0·01% can easily be discriminated.

Full use of this discrimination is possible, for the instrument has exceptionally good frequency stability. The use of fully regulated d.c., l.t. and h.t. supplies is an important factor in attaining this stability and in the reduction of spurious hum modulation.

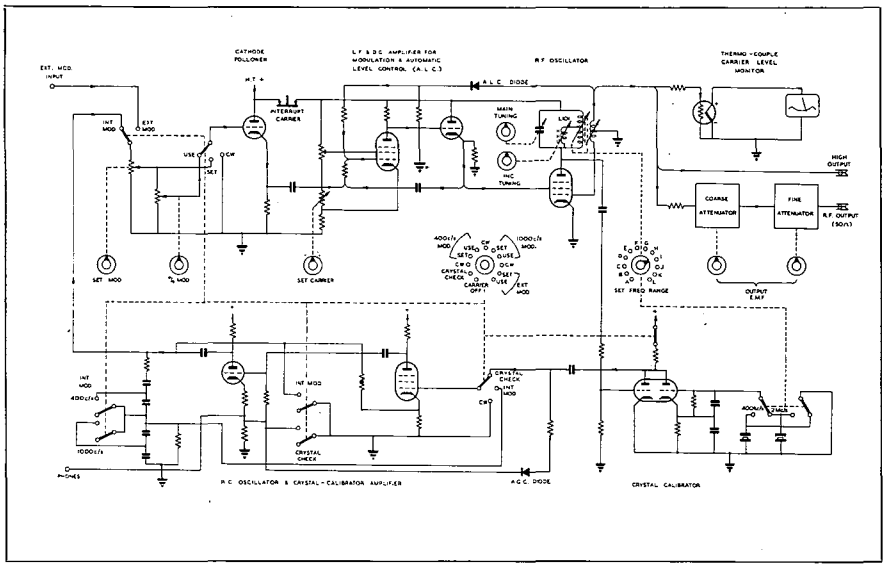
To enable a high order of absolute accuracy to be obtained, the signal generator has a built-in crystal calibrator with two crystal frequencies, 400 kc/s and 2 Mc/s, automatically selected by the band-change switch. A double mixer system is used to provide check points over the entire carrier frequency range. The crystal-calibrator circuit includes an a.g.c. system so that the audio volume of the heterodyne beat note does not vary widely over the tuning range of the signal generator.

OUTPUT LEVEL

The output level is variable over the range 2 μV to 2 volts by means of coarse and fine resistive step attenuators calibrated in voltage and decibels. The carrier level control, used in conjunction with ±0·5-dB calibration marks on the level meter, allows continuous interpolation between the 1-dB steps of the fine attenuator. A plug-on 20-dB pad is supplied to extend the output range down to 0·2 μV.

The output impedance is 50 ohms with a v.s.w.r. better than 1·2:1. Matching to higher impedance loads merely requires the use of a single series resistor. A matching pad for 75-ohm output impedance and a composite dummy aerial and d.c. isolating unit are available as accessories.

The level of the signal applied to the attenuators is monitored by a thermocouple voltmeter. This gives a high order of absolute accuracy regardless of frequency. But the common disadvantage of the thermocouple —fragility—has been overcome in this instance by special circuit design. The circuit is so arranged that the thermocouple cannot be damaged by any form of misuse of the



Functional Diagram of TF 144H

instrument. Automatic level control applied to the r.f. oscillator contributes to the thermocouple protection and largely eliminates the need for level-correction adjustment as the frequency is changed.

A high-level output is also available from a separate socket. The voltage from this outlet is not variable by the attenuators but is monitored by the carrier-level meter.

MODULATION

Amplitude modulation can be applied to the carrier from an internal or external source at any depth up to 80%. It is monitored by means of the thermocouple meter in conjunction with a calibrated potentiometer.

POWER SUPPLIES

The instrument is basically intended for a.c. mains operation; but provision is also made for operation from external batteries.

RACK MOUNTING ARRANGEMENTS

The TF 144H is normally supplied in a case for bench use; but, if desired, the case may be removed and the signal generator mounted in a standard 19-inch rack. The panel is the correct size and is ready drilled for rack mounting.

A rack-mounting version—TF 144H/1—fitted with a rack-type dust cover is available as an alternative to the standard instrument.

MILITARY VERSIONS

The TF 144H/S and H/1S (Joint Service Reference Nos. CT 452 and 453) are special military versions of the TF 144H and H/1, and are distinguished by a fully sealed meter and a Plessey Mk. IV mains input plug.

SPECIFICATION

Frequency

RANGE: 10 kc/s to 72 Mc/s, 12 bands.

MAIN TUNING: Straight-line frequency law on 8 bands. Linear logging scale on slow-motion drive divides the main scale into nearly 400 divisions per band.

CALIBRATION ACCURACY: 1%.

INCREMENTAL TUNING: Calibrated directly in % frequency change. Discrimination: 1 division = 0·01%. Total cover: 1%. Accuracy: 10% of incremental reading. For use at carrier frequencies above 80 kc/s only.

CRYSTAL CHECK: 400-kc/s and 2-Mc/s crystals selected automatically by band switch. Accuracy: 0·005%.

STABILITY: 0·002% in a 10-minute interval after warm-up.

Output

IMPEDANCE: 50 ohms; v.s.w.r. better than 1·2:1.

VOLTAGE: Calibrated output: 2 μV to 2 volts e.m.f. High output: 2 volts at low impedance. Low outputs down to 0·2 μV using 20-dB Pad TM 5573.

COARSE ATTENUATOR: Eleven 10-dB steps.

FINE ATTENUATOR: Ten 1-dB steps; interpolation by carrier-level control and meter.

ATTENUATOR ACCURACY: 2% at low frequencies. Response flat within ±0·5 dB to 72 Mc/s.

LEVEL MONITOR: Protected-thermocouple voltmeter. Accuracy: 0·5 dB absolute.

STRAY RADIATION: Negligible; permits full use of lowest output.

Modulation

DEPTH: 0 to 80%, monitored by carrier-level meter and calibrated control. Accuracy: 3% modulation.

INTERNAL A.M.: 400 c/s and 1 kc/s, switch selected.

EXTERNAL A.M.: Frequency characteristic: flat within ±1 dB from 20 c/s to 20 kc/s or −3 dB to 2% of the carrier frequency, whichever is the lower. Input requirements: Approximately 6 volts into 25 kΩ for 80% modulation.

SPURIOUS A.M. ON C.W.: Less than 0·1% depth.

SPURIOUS F.M. ON C.W.: Deviation less than ±0·0001% of the carrier frequency.

SPURIOUS F.M. ON A.M.: At carrier frequencies below 30 Mc/s, deviation with 30% a.m. is less than ±0·01% of the carrier frequency or ±100 c/s, whichever is the higher.

Power supply

A.C. mains or external batteries.

A.C. MAINS: 200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s, 80 watts. Models supplied ready for immediate 100- to 150-volt operation if specified at the time of ordering.

BATTERIES: L.T.: 6 volts, 2 amps. H.T.: 240 volts, up to 50 mA, depending on setting of controls.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
13 in	19 in	11 in	70 lb
(33 cm)	(48·3 cm)	(27·9 cm)	(30·4 kg)

Accessories supplied

Output Lead, 50-ohm, TM 4969; 3 ft long; BNC plug at each end.

20-dB Attenuator Pad, 50-ohm, TM 5573; one end, BNC plug; other end, BNC socket.

Mains Lead, TM 4726/77; 6 ft long; for a.c. mains operation.

Accessories available

Matching Pad, 50- to 75-ohm, TM 5569; one end, BNC plug; other end, Belling-Lee L734/P plug.

Composite *Dummy Aerial and D.C. Isolating Unit*, TM 6123; one end, BNC socket; other end, screw terminals. For general receiver testing or for use on circuits with d.c. potentials up to 350 volts.

Battery Lead, TM 6122; 6 ft long; terminated with accumulator clips for l.t., wander plugs for h.t.

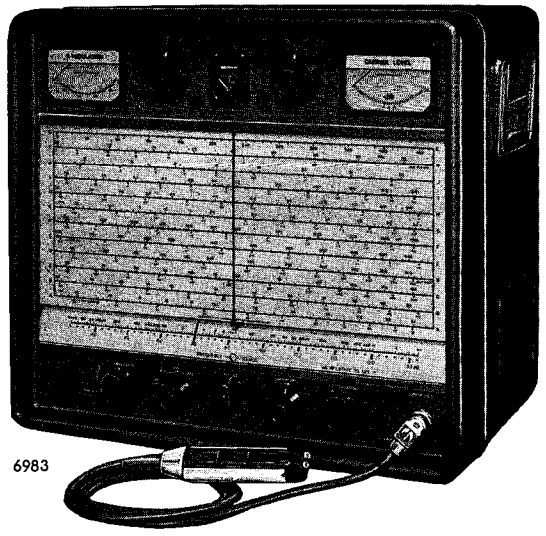
Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Standard Signal Generator

Types TF 867 and TF 867/2



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- **Frequency range: 15 kc/s to 30 Mc/s**
- **High-quality r.f. output from master-oscillator/tuned-amplifier circuit**
- **Built-in crystal calibrator**
- **Automatic level control**
- **Sinewave a.m. monitored and variable to 100%**
- **Alternative model has extended frequency range and crystal-lock system**

THE MARCONI TF 867 is a precision laboratory instrument covering the frequency range 15 kc/s to 30 Mc/s and giving an output which is continuously variable from 4 volts to 4 μV at a source impedance of nominally 75 ohms; at the alternative source impedance of 13 ohms the output is variable from 0·4 volt to 0·4 μV. A dummy aerial is incorporated for general receiver testing.

Amplitude modulation up to 100% may be applied at 400 or 1,000 c/s by an internal oscillator, or modulation may be applied externally at frequencies between 50 c/s and 10 kc/s, subject to certain limitations at low carrier frequencies.

Features of the design are the inclusion of a crystal-controlled oscillator for frequency calibration checking and the provision of an expanded wide-view frequency scale giving a discrimination of about 1 part in 10,000 of the total scale length. In addition, particular attention has been given to freedom from unwanted frequency modulation, to the production of deep amplitude modulation at low distortion levels and to the maintenance of constant output level with changing carrier frequency.

The TF 867 has the Air Ministry Reference No. 10S/16392.

APPLICATIONS

The high discrimination, output stability, and attenuator accuracy of this generator make it particularly suitable for precision response measurements on networks and filters; low spurious f.m. enables it to be used as a reliable signal source for noise measurements on f.m. equipment; and its low-distortion deep amplitude modulation can be utilized for distortion measurements on receivers and amplifiers.

The TF 867/2 is an alternative version of the basic generator and has special features of particular value when testing narrow-band communication receivers. To allow image-rejection measurements to be made over the whole of the 3- to 30-Mc/s h.f. band, the tuning range of the generator extends to 37 Mc/s. Measurement of very narrow bandwidths is facilitated by an extra-fine tuning control. Also, instead of the crystal calibrator in the basic model, there is a crystal lock system by which—at every 1-Mc/s point—the carrier can be brought under crystal control to give complete freedom from drift.

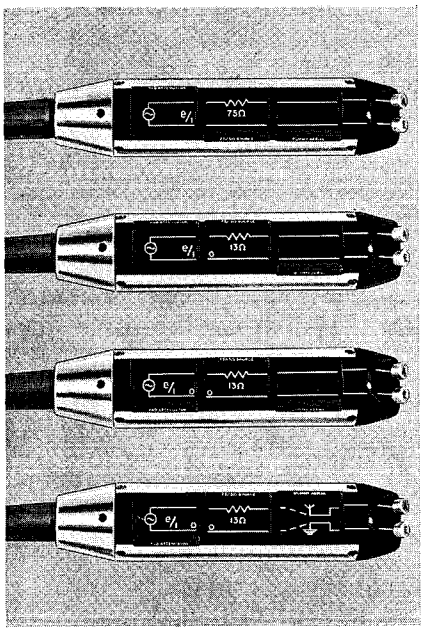
OSCILLATOR AND AMPLIFIER

The TF 867 carrier range is covered in eleven bands, the circuit elements of the r.f. oscillator and of the tuned output stage—which are separated by a buffer—being contained in two drums ganged together and rotated by a single band-selecting control. The output is monitored by two meters, one indicating the carrier level and the other the modulation depth. Modulation is applied to the output valve and is continuously variable from 0 to 100%, the indicated depth being by absolute measurement and independent of any indirect calibration associated with the level of the applied modulating voltage.

A crystal check oscillator is switched automatically into circuit on plugging head telephones into a checking jack and provides beats whereby the carrier may be set up at 1-Mc/s intervals over the greater part of the frequency range.

OUTPUT ARRANGEMENTS

A cylindrical terminating unit of novel design, attached to the output cable, provides three basic output conditions—source impedances of 75 ohms or 13 ohms, or a



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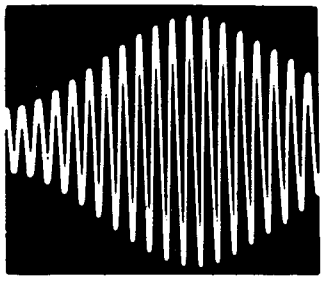
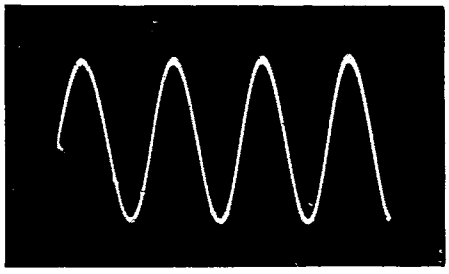
Views of terminating unit showing the four different output conditions which can be selected

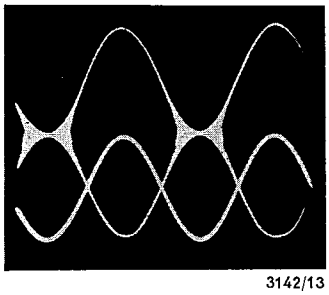
TYPICAL OSCILLOGRAMS



24-kc/s carrier modulated at 1 kc/s



15-kc/s carrier unmodulated



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320-kc/s carrier modulated at 400 c/s; input on lower beam

dummy aerial for general receiver testing—a particular feature being that the fundamental circuit arrangement in use is illustrated by a line diagram which changes with the switching of the unit.

The output level is determined by means of the carrier meter, a direct-reading 2-dB-step resistive attenuator and a pad attenuator in the terminating unit; irrespective of load, the calibration indicates the effective source e.m.f. in both voltage and in decibels relative to 1 μV.

POWER SUPPLY

A feature of the power supply arrangements is the design of the transformer tapping system. The mains on-off switch—which incorporates a pilot lamp—is surrounded by a removable escutcheon indicating the main voltage range for which the transformer is adjusted. A similar escutcheon on the transformer discloses the precise voltage tapping and at the same time makes the necessary connections. To change from one voltage range to the other the escutcheons are themselves interchanged.

SPECIFICATION for TF 867

Carrier frequency

RANGE: 15 kc/s to 30 Mc/s in eleven bands.

CALIBRATION ACCURACY: ±1%.

STABILITY: After warm-up, the drift in a 10-minute period is, typically, less than 0·005% for carrier frequencies up to 3·2 Mc/s and less than 0·01% from 3·2 to 30 Mc/s.

Crystal check

FUNDAMENTAL ACCURACY: ±0·01% at 20°C. Between 0°C and +40°C the change does not exceed ±0·015% of the actual frequency at 20°C.

INTERPOLATION ACCURACY: ±0·1%.

Scale discrimination

Approx. 1 part in 10^4 of total scale length.

Output

VOLTAGE: 0·4 μV to 4 volts.

IMPEDANCE: 75 ohms nominal for outputs from 2 to 4 volts.

75 ohms for outputs from 4 μV to 2 volts.

13 ohms for outputs from 0·4 μV to 0·4 volt.

ACCURACY: Below 3 Mc/s: ±0·25 dB or ±0·1 μV;

3 to 10 Mc/s: ±0·5 dB or ±0·2 μV;

10 to 30 Mc/s: ±1·0 dB or ±0·5 μV;

whichever is the greater, subject to certain limitations given in Operating Instructions.

Modulation

INTERNAL SINEWAVE: 400 and 1,000 c/s.

FREQUENCY ACCURACY: ±5%.

AMPLITUDE: 0 to 100%, variable and monitored.

EXTERNAL MODULATION CHARACTERISTIC: ±2 dB from 50 c/s to 10 kc/s except below 1·5 Mc/s, where filtering and tuned circuit decrement limit distortionless modulation as below:—

Carrier Freq. in kc/s	*Max. Mod. 0–80%*	*Freq. in c/s 80–100%*
18–32	400	250
32–70	1,000	400
70–150	2,000	1,000
150–320	5,000	3,000
320–700	7,500	4,500
700–1,500	10,000	6,000

HUM AND NOISE LEVEL: 46 dB below 30% mod.

SPURIOUS F.M.: Less than 200 c/s deviation at 30% a.m.

Radiation

Less than 1 μV/m stray field.

Power supply

100 to 125 volts and 200 to 250 volts, 40 to 100 c/s; 110 watts.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
18 in (46 cm)	21 in (53 cm)	14½ in (37 cm)	106 lb (48 kg)

Accessories supplied

Output Cable and Terminating Unit Assembly, TM 3959A.

Two *Jack Plugs* for Crystal Check and Ext. Mod. input sockets.

SPECIFICATION for TF 867/2

The TF 867/2 is an alternative version of the basic instrument and is available to special order. It differs from the TF 867 in the following respects:—

Carrier frequency

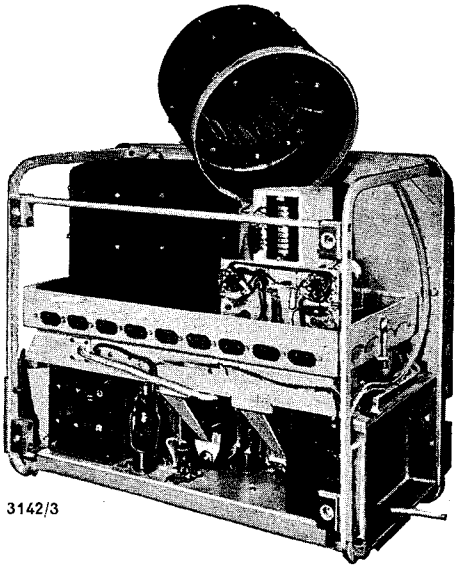
RANGE: 15 kc/s to 37 Mc/s in twelve bands.

Crystal locking

The carrier can be locked at 1-Mc/s intervals to harmonics of the built-in crystal oscillator; this facility replaces the crystal check system of the TF 867.

Modulation

As for TF 867 over the range 15 kc/s to 30 Mc/s. On the additional band, 30 to 37 Mc/s, the TF 867 specification does not apply but, in practice, a maximum modulation depth of about 50% is available.



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Rear view of instrument with r.f. cover and one turret removed

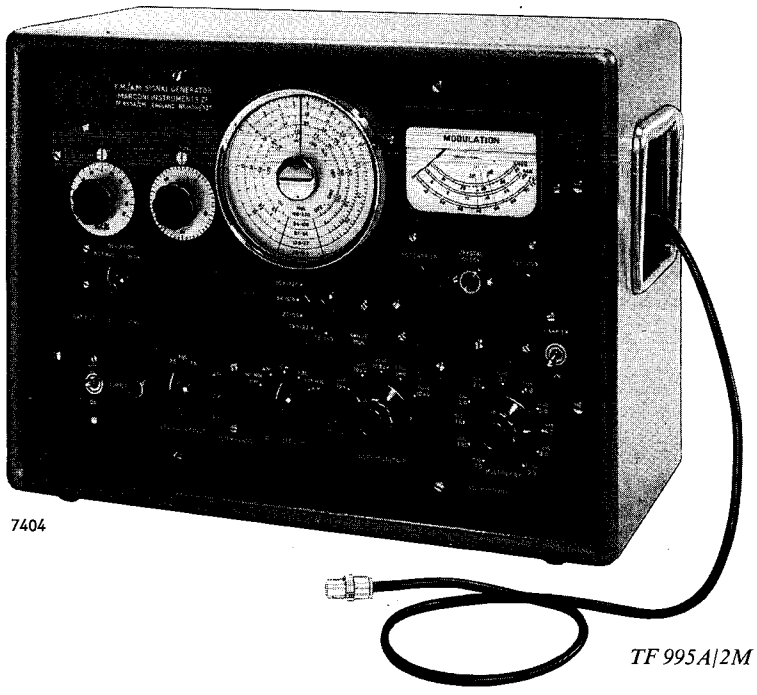
Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

F.M./A.M. Signal Generator

Type TF 995A (Series)



TF 995A/2M

- **Frequency range: 1·5 to 220 Mc/s**
- **Built-in crystal calibrator**
- **Direct-reading incremental frequency control**
- **Output range: 200 mV to 0·1 μV**
- **F.M. or a.m.; also simultaneous f.m. and a.m.**

THE MARCONI TF 995A/2M is a compact, lightweight instrument for both a.m. and f.m. measurements in the range 1·5 to 220 Mc/s. It is built on the accumulated experience of more than eight years progressive development of the well-known TF 995 series and represents a new standard of all-round utility in this class of general-purpose signal generators.

The frequency range is covered in five bands and there are crystal check facilities from 13·5 Mc/s upwards. In conjunction with the plug-on Terminating Unit and 20-dB Pad—the latter, an optional accessory—output is continuously variable from a minimum of 0·1 μV to a maximum of 100 mV at 52 ohms and 200 mV at 75 ohms. Modulation, obtained either from an internal 1,000-c/s oscillator, or from an external source, is variable to maximum deviations ranging from 25 to 600 kc/s for f.m., or to depths up to 50% for a.m.

The TF 995A/2M has the Air Ministry Reference No. 10S/17626.

APPLICATIONS

This versatile generator provides comprehensive test and alignment facilities for a.m. and f.m. receivers in the v.h.f. and h.f. bands. It has crystal check points for accurate calibration of tuning dials, slow-motion drive and direct-reading incremental tuning for precision bandwidth measurements, monitored f.m. deviation and a.m. depth for signal-to-noise measurement, and simultaneous f.m. and a.m. for limiter and discriminator testing.

The TF 995A/3/S is a ruggedized adaptation of the basic generator and has been developed primarily for military use; the TF 995A/5 is a special narrow-deviation model of particular interest to users of v.h.f. mobile equipment. The distinguishing features of both these models are described in detail on subsequent pages and are set out in the supplementary specifications.

R.F. OSCILLATOR

The r.f. oscillator has a fundamental range of 4·5 to 9·16 Mc/s; the output frequency is obtained by means of harmonic multipliers and, below 13·5 Mc/s, a heterodyne system. The built-in crystal calibrator, which provides fourteen check points on each of the four upper bands, is automatically switched on by plugging headphones or other beat-note monitor into the front-panel telephone jack. The directly calibrated incremental control varies the d.c. bias applied to the f.m. reactor valve associated with the r.f. oscillator; its frequency cover varies from ±50 to ±400 kc/s, depending on the r.f. band in use.

OUTPUT

The output is derived via two 75-ohm ladder attenuators having a total range of 100 dB; one covers 80 dB in 20-dB steps and the other covers 20 dB in 2-dB steps. The SET CARRIER control, used in conjunction with the calibrated level meter, allows continuous interpolation between the steps of the fine attentuator. The direct output from the generator has a source impedance of 75 ohms and an open-circuit voltage range of 2 μV to 200 mV; by using the plug-on Terminating Unit supplied, outputs within the range 1 μV to 100 mV are available at source impedances of both 75 and 52 ohms. A 20-dB Pad is also available and, when fitted between the output cable and the Terminating Unit, enables low outputs down to 0·1 μV to be obtained.

Temporary interruptions of output can be made by means of a carrier on/off switch in the h.t. supply to the r.f. oscillator and multipliers.

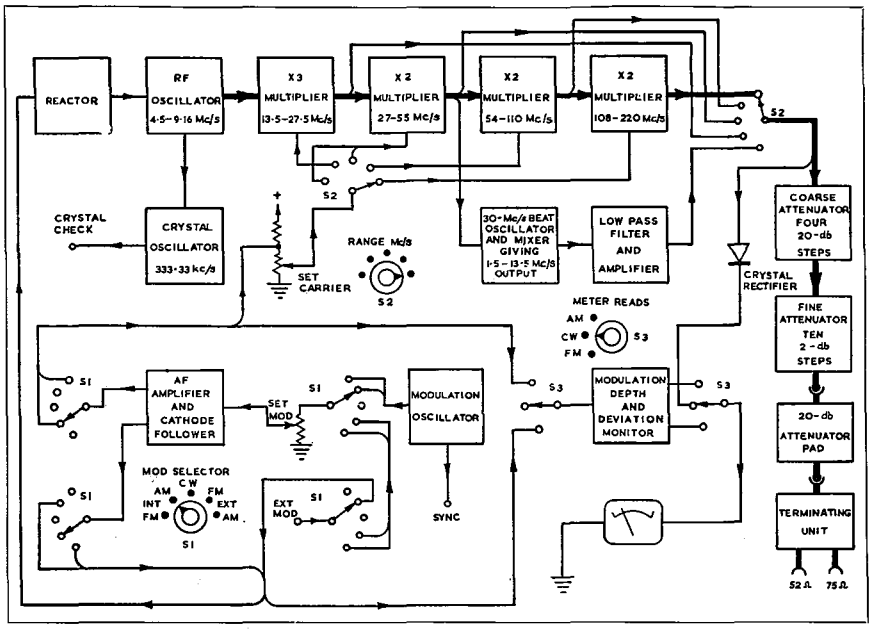
MODULATION

Frequency modulation is applied to the r.f. oscillator by means of the reactor valve; the reactor is fed from the a.f. source via an attenuation system ganged to the main tuning control in order to maintain constant deviation at all carrier frequencies in every band. The normal deviation ranges on all bands are 25 kc/s and 75 kc/s but switching is provided which enables the deviation to be increased proportionally with increase in

carrier frequency multiplication, the maximum deviation on the highest band being $75 \times 8 = 600$ kc/s; on the 1·5- to 13·5-Mc/s band the maximum deviation obtainable is 150 kc/s.

Amplitude modulation, which can be set to any depth up to 50%, is applied to the highest-frequency, i.e., last harmonic multiplier which is in operation for the particular r.f. output band in use; this method helps to reduce the spurious frequency modulation often encountered when modulating an r.f. oscillator directly.

Simultaneous amplitude and frequency modulation is obtained by setting up the instrument for internal a.m. and then applying f.m. from an external source. Carrier level, a.m. depth, and f.m. deviation can each be monitored on the front-panel meter. The design of the monitoring circuits is such that, with the Generator set up for simultaneous a.m. and f.m., both percentage depth and deviation can be read independently.



Block Schematic Diagram of TF 995A/2M

SPECIFICATION for TF 995A/2M

Frequency

RANGE: 1·5 to 220 Mc/s in five bands:

(1) 1·5 to 13·5 Mc/s
(2) 13·5 to 27·5 Mc/s
(3) 27 to 55 Mc/s
(4) 54 to 110 Mc/s
(5) 108 to 220 Mc/s

CALIBRATION ACCURACY: From 13·5 to 220 Mc/s the calibration of the main frequency dial is accurate to within 1%; a higher frequency accuracy than this can be obtained using the built-in crystal calibrator which provides fourteen check points, to an accuracy of 2 parts in 10^4, on each of the four higher-frequency bands. From 1·5 to 13·5 Mc/s the frequency calibration has an average accuracy of 3%.

INCREMENTAL CONTROL: The incremental frequency control has a cover of ±50 kc/s on band 2, ±100 kc/s on bands 1 and 3, ±200 kc/s on band 4, and ±400 kc/s on band 5. The calibration is accurate to within 10%.

Output

VOLTAGE: Coarse and fine 75-ohm attenuators, connected in cascade, provide—in conjunction with the 52- and 75-ohm outlets of a terminating unit—a source e.m.f. variable in 2-dB steps from 1 μV to 100 mV. The r.f. level meter carries a ±1-dB calibration to allow interpolation between the 2-dB attenuator steps. The accuracy of the joint indication of the attenuators and level meter is within 1 dB ±0·25 μV up to 100 Mc/s, and within 2 dB ±0·25 μV up to 220 Mc/s.

HIGH OUTPUTS: Source e.m.f.'s up to 200 mV at an impedance of 75 ohms are obtained direct from the generator output cable.

LOW OUTPUTS: Source e.m.f.'s down to a nominal 0·1 μV at impedances of both 52 and 75 ohms are obtained by inserting 20-dB Attenuator Pad TM 5552 between the generator output cable and Terminating Unit.

Modulation

F.M.: Normal deviation continuously variable from 0 to 25 kc/s and 0 to 75 kc/s on all bands; the accuracy at maximum deviation at 1,000 c/s is ±5% of f.s.d., with a possible additional variation of ±10% due to valve aging or random replacement. High deviation of × 2 normal is also available on bands 1 and 3, × 4 normal on band 4, and × 8 normal on band 5. Internal modulation at 1,000 c/s, with modulation distortion not exceeding 2% at maximum deviation. External modulation characteristic flat within 1 dB, 50 c/s to 15 kc/s, with respect to 1,000 c/s.

SPURIOUS F.M. ON C.W.: At carrier frequencies below 100 Mc/s the spurious f.m. due to hum does not exceed 50 c/s deviation; and at frequencies between 100 Mc/s and 220 Mc/s it does not exceed 100 c/s deviation.

A.M.: Internal at 1,000 c/s to a depth variable up to 50% with distortion not exceeding 6% at 30% depth. External modulation characteristic flat within 1 dB, 50 c/s to 10 kc/s.

SYNCHRONIZING SIGNAL: A nominal 100-volt high-impedance output from the internal 1,000-c/s oscillator is available at the front panel.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 65 c/s; 65 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
13 in (33 cm)	17½ in (44 cm)	8½ in (22 cm)	33 lb (15 kg)

Accessories supplied

Terminating Unit, TM 5551; 75 ohms in, 52 and 75 ohms out; BNC connectors.

Two *Coaxial Free Plugs*, Type BNC; one 50 ohm, one 75 ohm; for Terminating Unit outlets.

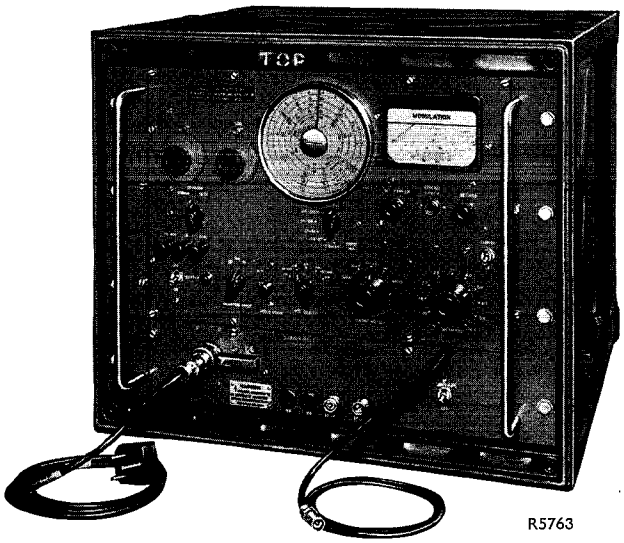
Jack Plug, STC Type 4006; for crystal check socket.

Accessories available

20-dB Attenuator Pad, TM 5552; for use between output cable and Terminating Unit; BNC connectors.

F.M./A.M. Signal Generators

Type TF 995A/3/S



R5763

Type TF 995A/5

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- **Ruggedized version for military use**
- **Extra-high output for i.f. alignment**
- **Wide range of output connectors**

THE TF 995A/3/S is the military version of the 995A series of Signal Generators; its Joint-Service designation is CT 402. Basically, the instrument is similar in performance to the A/2M model, but a number of modifications have been introduced which make it particularly suitable for field use. Its case embodies shock-absorbent mountings and with its screw-on panel-cover protects the instrument during storage or transit. The built-in power unit has been re-designed so that adjustment to suit different supply voltages is made at the front panel.

A further feature of this version is the inclusion of an auxiliary i.f. amplifier unit. This auxiliary unit is assembled together with the main instrument in the same case and, between 1·5 and 6 Mc/s, can be used to provide an extra-high output for such applications as the initial alignment of i.f. amplifiers.

The accessories supplied include an extensive range of output connectors terminated in a variety of commonly used plugs and sockets. Secure stowage for all accessories is provided on the underside of the case lid.

SPECIFICATION for TF 995A/3/S

The TF 995A/3/S differs from the TF 995A/2M in the following respects:—

Output

I.F. AMPLIFIER: At carrier frequencies between 1·5 and 6 Mc/s, high outputs up to approx. 1 volt source e.m.f. at a nominal impedance of 75 ohms can be obtained by connecting the I.F. Amplifier in series with the normal output of the Generator.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
17 in (44 cm)	20½ in (58 cm)	17½ in (45 cm)	78 lb (35 kg)

Accessories supplied

Terminating Unit, TM 5551—see previous page for details.

20-dB Attenuator Pad, TM 5552—see previous page for details.

Mains Lead, ITB 134891; 60 inches long.

Output Lead, TM 5562/1; 36 inches long; one end, BNC plug; other end, BNC socket.

Output Adaptors, set of five, comprising TM 5562, TM5563, TM 5564, TM 5571 and TM 5571/1; each 8 inches long and with BNC plug at one end; other ends are respectively BNC plug, Burndept socket type 45945, crocodile clips, Belling-Lee plug type L734/P, and miniature Pye plug type 732560.

Spare Fuses, two, 5-amp glass cartridges.

- **Narrow-deviation model for mobile radio testing**
- **Stepped and extra-fine incremental tuning**
- **Less than 25 c/s spurious f.m.**
- **Three modulation frequencies**

THE TF 995A/5 is a further development of the basic A/2M model. Its main differences —narrow-deviation f.m., negligible spurious modulation, high-discrimination incremental tuning with both stepped and continuous control, and two extra modulation frequencies—have been specifically introduced to meet the latest test requirements for v.h.f. mobile f.m. and a.m. equipment. A successor to the well-known TF 995A/4, this new model features improved a.m. performance in respect of monitoring accuracy and purity of modulating wave-form.

Particular attention has been paid in this model to reduction of spurious hum and noise modulation; and, as a result, it is fully suitable for applications such as two-generator testing of adjacent-channel rejection on modern receivers. Exceptional freedom from higher-order a.m. harmonics makes it possible to meet the exacting requirements of two-signal tests in which the

'interfering' generator is amplitude modulated, and where the receiver is designed for systems using channel spacing of 25 kc/s or less.

The carrier on/off switch, which allows the generator output to be temporarily interrupted without affecting the output impedance, facilitates a number of two-signal receiver tests such as intermodulation and blocking, which involve the simultaneous use of signal generators.

NARROW DEVIATION

The two basic deviation ranges are 0 to 5 kc/s and 0 to 15 kc/s on all bands. As in the normal A/2M version, there is provision for increasing the deviation proportionally with increase in carrier frequency multiplication, a maximum of 120 kc/s being obtainable on the top band. Switch-selected internal modulation frequencies of 400 c/s, 1 kc/s, and 1·5 kc/s are available for both f.m. and a.m. F.M. deviation and a.m. depth are both indicated with an accuracy of 5%.

PRECISION TUNING

The precision tuning required for testing narrow-band systems is facilitated by the inclusion of a fine tuning control having a coverage of about 24 kc/s on the top band and proportionally less on the lower bands.

In addition, small, known changes in carrier frequency can be made by means of two directly-calibrated incremental frequency controls; one of these controls gives stepped adjustment while the other allows continuous interpolation between steps. On the two highest bands, the stepped control provides shifts of 20 and 40 kc/s in either direction and the calibration marks on the continuous control are only 1 kc/s apart; on the lower bands, the total shift is determined by a simple division of the reading on both dials.

Excellent frequency stability has been achieved by the liberal use of temperature compensation components: after warm-up, drift is no greater than 0·002% in a 10-minute period; this is equivalent to less than 400 c/s per minute at a carrier frequency of 200 Mc/s.

The tuning facilities on the TF 995A/5 are unusually comprehensive and allow bandwidth measurements to be made with speed and accuracy. The two right-hand controls, one coarse, one fine, are for initial frequency setting. The two left-hand controls are for making known frequency changes relative to the centre frequency chosen with the right-hand controls.

SPECIFICATION for TF 995A/5

The TF 995A/5 differs from the TF 995A/2M in the following respects:—

Frequency

FREQUENCY STABILITY: After warm-up, drift is not greater than 0·002% in a 10-minute period, except on the lowest band.

FINE TUNING CONTROL: A fine tuning control is provided; this has an arbitrary calibration and a total cover of approximately 24 kc/s on band 5, 12 kc/s on band 4, 6 kc/s on bands 3 and 1, and 3 kc/s on band 2.

INCREMENTAL CONTROLS: Both stepped and continuously variable calibrated controls are provided. The stepped control enables the carrier frequency to be shifted by ±40 and ±20 kc/s on bands 5 and 4, ±20 and ±10 kc/s on bands 3 and 1, and ±10 and ±5 kc/s on band 2. The continuous control has a cover of ±0·75 of one increment of the stepped control on any band, e.g., cover is ±15 kc/s on bands 5 and 4.

Modulation

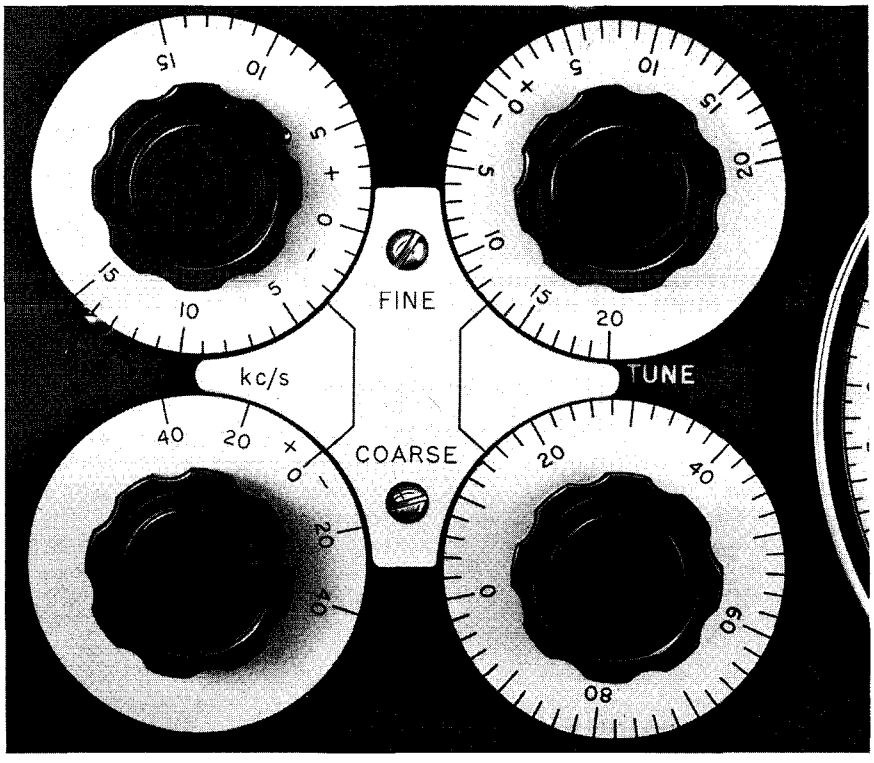
F.M.: Normal deviation continuously variable from 0 to 5 kc/s and 0 to 15 kc/s on all bands; accuracy and high deviation as for TF 995A/2M. Internal modulation at 400 c/s, 1 kc/s, or 1·5 kc/s; distortion and external modulation characteristic as for TF 995A/2M.

SPURIOUS F.M. ON C.W.: The spurious f.m. due to hum does not exceed 25 c/s deviation at any carrier frequency. The unusually low level of spurious noise modulation allows full use of the Generator for adjacent channel testing on receivers designed for systems employing channel separations as small as 22·5 kc/s.

A.M.: Internal at 400 c/s, 1 kc/s, or 1·5 kc/s; depth and distortion as for TF 995A/2M. External frequency characteristic (with input adjusted for constant modulation meter reading) is flat within 0·5 dB from 100 c/s to 10 kc/s.

A.M. DEPTH INDICATION: Accurate to within 5% modulation.

SYNCHRONIZING SIGNAL: Available at 400 c/s, 1 kc/s, or 1·5 kc/s.



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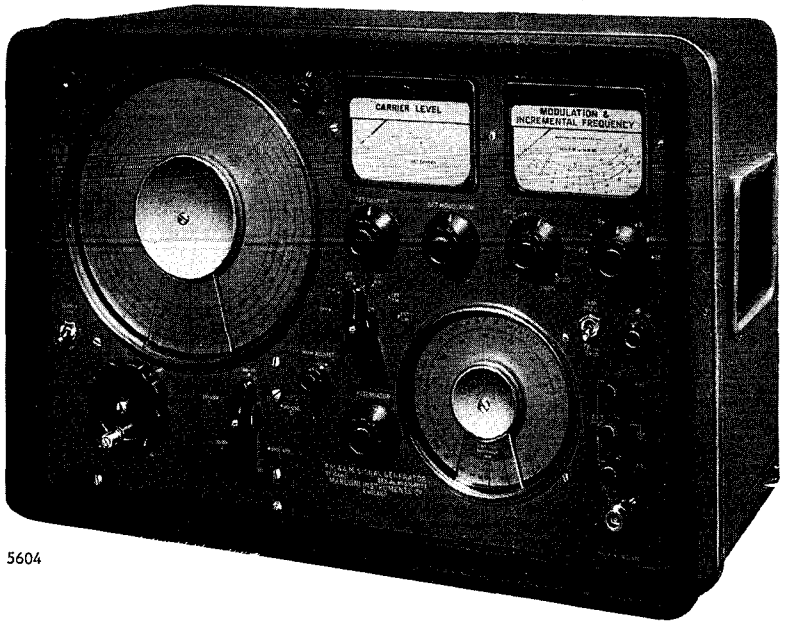
Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

F.M. Signal Generator

Type TF 1066B (Series)



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TF 1066B

- **Frequency range: 10 to 470 Mc/s**
- **Carrier generated directly at output frequency**
- **Frequency stability: 0·0025%**
- **Stepped as well as continuously-variable incremental tuning**
- **Internal modulation at 1 and 5 kc/s**

THE MARCONI F.M. Signal Generator TF 1066B covers the range 10 to 470 Mc/s. Direct carrier-frequency generation without multipliers ensures the complete absence of spurious sub-harmonics in the output, and its direct-reading incremental tuning system brings a new standard of ease and accuracy to bandwidth measurement.

The TF 1066B is the latest model in the highly successful 1066 series of precision f.m. generators. While retaining all the basic characteristics and advantages of its predecessors, this new model's stability and purity of signal are further enhanced by the use of a rigid cast r.f. box and a transistor-regulated d.c. filament supply for the r.f. oscillator; and there are additional preset potentiometers to simplify setting up and to enable you to choose your own values of stepped incremental shift.

F.M. deviation is variable up to 100 kc/s and a.m. depth up to at least 40%. Modulation can be applied internally at 1 or 5 kc/s, or externally between 30 c/s and 15 kc/s. For both internal and external modulation, f.m. deviation or a.m. depth is directly indicated.

The open-circuit output voltage is continuously variable from 0·2 μV to 200 mV and is derived via a source impedance of 50 ohms; the level of output is controlled by a piston attenuator equipped with a 4½-inch dial bearing two scales, one calibrated directly in units of voltage and the other in decibels relative to 1 μV.

APPLICATIONS

Although the prime function of the TF 1066B is the production of c.w. and f.m. signals it can, in addition, provide amplitude-modulated outputs. These dual modulation facilities, coupled with its wide frequency and output ranges, make the TF 1066B outstanding as a general-purpose instrument capable of the broadest application.

It will perform all the exacting tasks required of a precision f.m. generator in testing and aligning v.h.f. and u.h.f. f.m. receivers, whether for broadcast or communication systems, fixed or mobile. Of special advantage in bandwidth measurement is its direct-reading incremental tuning facility, the stepped control being particularly suitable for rapid spot checks during production testing.

OTHER VERSIONS

The TF 1066B/2 is a special version of the Signal Generator covering 400 to 555 Mc/s in a single band with crystal check points every 1 and 10 Mc/s; other major differences include a deviation range of up to 300 kc/s and an external modulation frequency range of 100 c/s to 100 kc/s.

The TF 1066B/1 and B/3 are rack-mounting versions of the TF 1066B and B/2 respectively.

R.F. OSCILLATOR

The heart of the TF 1066B Generator is its craftsman-built r.f. unit employing the Marconi-patented system of contactless waveband selection in a highly developed form. It is this system, supported by such measures as fully stabilized h.t. and l.t. supplies, which yields the excellent frequency stability figure of 0·0025% over a 10-minute period; this is equivalent to a drift or less than 800 c/s per minute at 300 Mc/s — a point of performance that allows the user to take full advantage of the incremental tuning facilities even when making protracted measurements.

INCREMENTAL TUNING SYSTEM

An outstanding feature of the TF 1066B is its incremental tuning system by which small, precise changes can be made in carrier frequency, either continuously variable or stepped, and read directly from a panel meter. The stepped control provides six preset incremental shifts up to ±100 kc/s —a feature which greatly facilitates rapid checking of receiver bandwidth during production testing. Both incremental frequency controls vary the d.c. applied to the reactor used for frequency modulation.

In addition to the incremental tuning arrangements there is a fine frequency control for setting the Generator accurately to the centre frequency of a narrow-band system under test.

MODULATION

Frequency modulation is applied via a ferrite reactor coupled to the oscillator tuned circuit. For amplitude modulation, variation of carrier amplitude is obtained by applying the modulating voltage directly to the anode of the r.f. oscillator.

Modulation is monitored by a meter with two scales, both of which indicate either f.m. deviation in kc/s or a.m. depth in percentage, depending upon the type of modulation in use.

SPECIFICATION

Frequency

RANGE: 10 to 470 Mc/s in five bands:

10 to 22 Mc/s	110 to 240 Mc/s
22 to 48 Mc/s	240 to 470 Mc/s
48 to 110 Mc/s	

MAIN TUNING: Controlled via precision slow-motion drive. Total scale length, approximately 60 inches.

CALIBRATION ACCURACY: 1%.

FINE TUNING: Uncalibrated control provides cover of approximately 25 kc/s.

FREQUENCY STABILITY: After warm-up, 0·0025% or better in 10-minute period.

ATTENUATOR REACTION: Negligible below 50 mV; not greater than 0·1% above.

INCREMENTAL FREQUENCY CONTROL: Carrier shift is variable from −100 to +100 kc/s by continuous and stepped control. The stepped control has three negative and three positive shift positions, each with independent preset adjustment, and one zero shift position. Shift is monitored by meter with two ranges, −20 to +20 kc/s and −100 to +100 kc/s.

INCREMENTAL ACCURACY: Direct accuracy varies inversely with carrier frequency from within 10% to 20% of f.s.d.

Using correction chart supplied, accuracy at all carrier frequencies is within 10% of f.s.d.

SPURIOUS SIGNALS: Total harmonic content is less than 10%. There are no subharmonics.

R.F. output

LEVEL: The source e.m.f. is continuously variable from 0·2 μV to 200 mV. The attenuator dial shows the source e.m.f. both directly and in decibels relative to 1 μV. The dial cursor can be positioned to indicate voltage across a 50-ohm load instead of source e.m.f.

OUTPUT ACCURACY: Incremental, 0·2 dB; overall, 2 dB.

SOURCE IMPEDANCE: 50 ohms; v.s.w.r. not greater than 1·25:1 using the 20-dB Pad, TM 4919, or 1·6 using the 6-dB Pad, TM 4919/1.

STRAY RADIATION; Negligible; permits full use of lowest output.

Frequency modulation

INTERNAL: Modulation frequencies: 1 and 5 kc/s. Deviation variable to 100 kc/s maximum and indicated on two meter ranges, 0 to 20 kc/s and 0 to 100 kc/s.

EXTERNAL: Modulation frequency range: 30 c/s to 15 kc/s. Deviation as for INTERNAL. Input requirements: 25 volts across 5 kΩ for 100 kc/s deviation.

DEVIATION ACCURACY: Direct accuracy for internal modulation varies inversely with carrier frequency from within 7% of f.s.d. to within 20% of f.s.d.; using correction chart supplied, accuracy at all carrier frequencies is within 7% of f.s.d. Accuracy over external modulation frequency range is within 5% of accuracy at 1 kc/s.

A.M. ON F.M.: Typically, less than 5% modulation depth at maximum deviation.

RESIDUAL F.M.: The f.m. due to hum and noise is less than 100 c/s deviation.

Amplitude modulation

INTERNAL: Modulation frequencies: 1 and 5 kc/s. Modulation depth variable up to at least 40% and indicated on two meter ranges, 0 to 20% and 0 to 100%.

EXTERNAL: Modulation frequency range: 30 c/s to 15 kc/s. Modulation depth as for INTERNAL. Input requirements: 10 volts across 1 MΩ for 40%.

MODULATION DEPTH ACCURACY: ±2% modulation on 0 to 20% range. ±5% modulation on 0 to 100% range.

F.M. ON A.M.: For 30% a.m., varies typically from 2 kc/s at 10 Mc/s to 60 kc/s at 100 Mc/s.

RESIDUAL A.M.: The a.m. due to hum and noise is better than 50 dB below 30% modulation.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 60 c/s; 90 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
14½ in (37 cm)	23½ in (60 cm)	10½ in (27 cm)	54 lb (24·5 kg)

Accessories supplied

Coaxial Free Plug, Type N, for r.f. output socket.

Accessories available

Output Lead, 50-ohm, TM 4824; 36 inches long; Type N plug both ends.

Attenuator Pad, 6-dB, 50-ohm, TM 4919/1; one end, Type N socket; other end, Type N plug.

Attenuator Pad, 20-dB, 50-ohm, TM 4919; one end, Type N socket; other end, Type N plug.

Matching Unit, 50-ohm to 75-ohm, TM 4918; one end, Type N socket; other end, Belling-Lee L 734/P plug.

Matching Unit, 50-ohm unbal. to 300-ohm bal., TM 4916; one end, Type N socket; other end, solder tags.

D.C. Isolating Unit, TM 4917; one end, Type N socket; other end, crocodile clips,

Coaxial Fuse, Type TM 5753; prevents damage to the Signal Generator attenuator through accidental application of r.f. or h.t. power to the circuit under test. Useful in transmitter/receiver testing.

Overload Protection: Burns out at 0·4 watt.

Insertion Loss: Nominally 0·5 dB.

V.S.W.R.: 1·35 or less when terminated with a matched 50-ohm load. 1·6 or less when terminated with TF 1066B attenuator via 20-dB Pad, TM 4919.

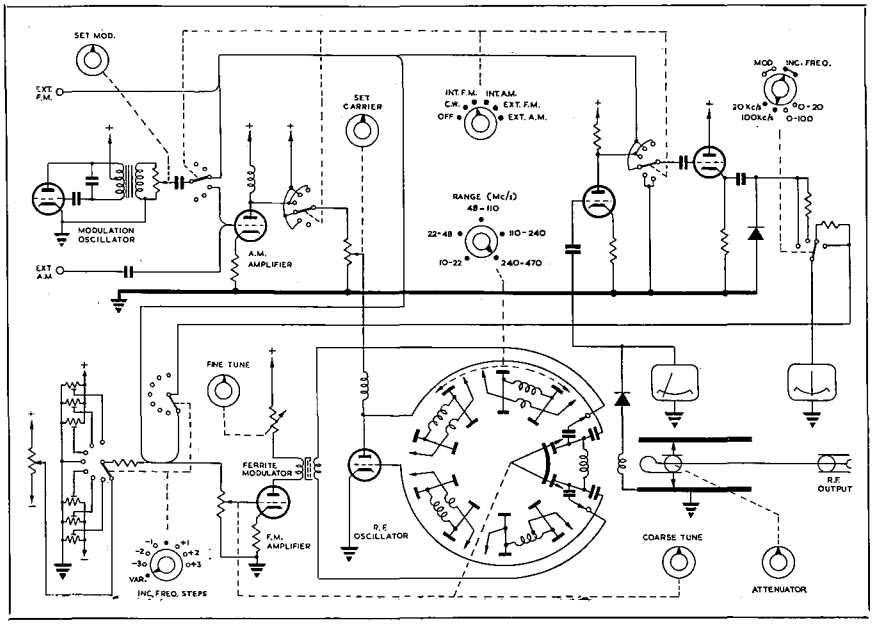
Connectors: Type N.

Fuse: $\frac{1}{16}$ amp Littelfuse Cat. No. 361.062. 10 spares are supplied.

Dimensions: Length, 4⅞ in; dia. $\frac{13}{16}$ in.

Marconi Instruments Ltd.

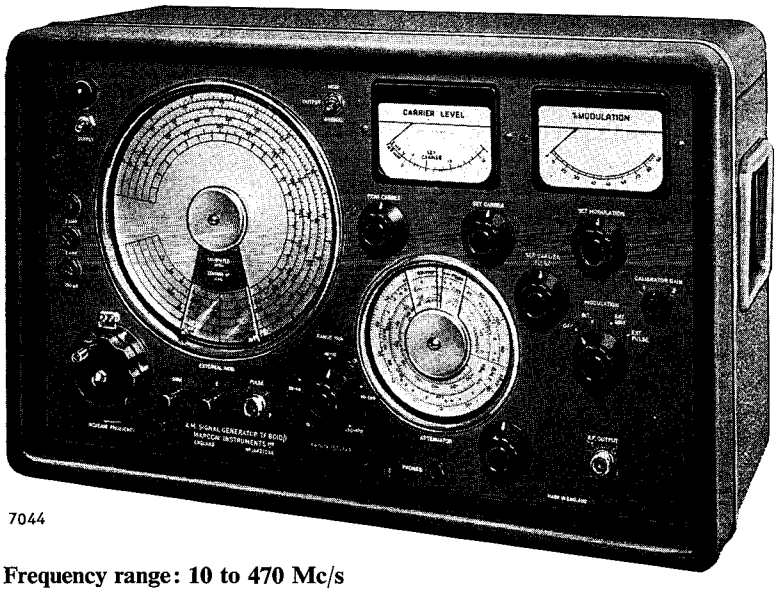
St. Albans, Hertfordshire, England



Functional Diagram of TF 1066B

MARCONI INSTRUMENTS

A.M. Signal Generator Type TF 801 (Series)



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Type TF 801D/1

- **Frequency range: 10 to 470 Mc/s**
- **Automatic level control**
- **Built-in crystal calibrator**
- **Spurious f.m. less than 0·001% of carrier frequency**
- **Less than 0·005% drift in 10 minutes**
- **Alternative military version and simplified 10- to 310-Mc/s model**

THE TF 801D/1 is the latest development in the Marconi 801 series of precision a.m. generators. Like its predecessor, TF 801D, the salient features of this new version include crystal check points every 5 Mc/s throughout its 10- to 470-Mc/s tuning range, exceptionally low spurious f.m. and drift, and a high-quality 50-ohm output with a v.s.w.r. of 1·2 or less. An additional advantage is that the level of pulse-modulated outputs is indicated with an accuracy approaching that obtained with c.w. outputs.

Its carrier level is directly indicated and continuously variable from 0·1 μV to 1 volt. Amplitude modulation can be applied internally at 1,000 c/s or externally from 30 c/s to 20 kc/s; in each case, modulation depth is monitored and variable up to 90%. External pulse modulation may also be applied at p.r.f.'s up to at least 50 kc/s via a d.c. coupled modulating circuit.

The main tuning dial is hand calibrated directly in frequency and, with its approximately 70 inches of scale, allows fast and accurate reading; a movable cursor enables the dial to be standardized against the 5-Mc/s crystal check points. The auxiliary incremental dial—driven from the main tuning control—allows precise and easy interpolation for bandwidth measurements. To aid testing of extremely narrow-band receivers, a dual-range, fine/extra-fine frequency trimmer is fitted. Output stability during tuning is ensured by an automatic level control system.

The circuit design includes a tuned push-pull power amplifier following the master oscillator and gives an output of unusual purity. Modulation is applied to the power amplifier without disturbance to the operating parameters of the master oscillator—the low incidental f.m. and good response to pulse modulation are due to this arrangement. As well as conventional h.t. stabilization, there is a transductor-regulated filament supply for the r.f. oscillator to ensure that mains variation has negligible effect on frequency.

APPLICATIONS

The TF 801D/1 provides a high-grade test signal for networks, circuits and equipment in the v.h.f. band. It can be used for measuring sensitivity, bandwidth, image rejection, or general testing of a.m. or pulse modulation receivers; for i.f. alignment; for driving bridges and slotted lines; for aerial and transmission-line investigations.

The TF 801D/1/S (Joint-Service Reference No. CT 394A) is a special military version of the Signal Generator. In addition to mechanical differences such as fully sealed meters, it is distinguished from the TF 801D/1 by an extended frequency range of up to 485 Mc/s, and a carrier on/off switch.

The TF 801A/1, which is fully described on a later page, is an alternative model meeting the requirements for a simpler a.m. generator with a narrower frequency range than the TF 801D/1.

R.F. CIRCUITS

The TF 801D/1 master oscillator, which employs a disk-seal triode in a derived Colpitts circuit, is followed by a twin-tetrode push-pull power amplifier. Both oscillator and amplifier have ganged turret-type tuning systems with contactless capacitance switching. Tuning within any one band is by means of the two capacitor rotors—one in each turret—which are common to all bands; the ganging link between oscillator and amplifier rotors is variable and forms an independent control for peaking the amplifier tuning. Over the whole of the first four bands, the automatic level control system allows retuning without the necessity for re-peaking; only at the higher frequencies, and when maximum freedom from f.m. is essential, need the peaking be reset. A level switch, controlling the h.t. supply to the r.f. oscillator, makes extra-high outputs available for such purposes as driving r.f. bridges.

The output level from the r.f. amplifier is monitored by the crystal-rectifier panel meter before application to the continuously-variable piston attenuator. The scale marking of this meter, in conjunction with the calibration of the attenuator dial, gives a total output range of 143 dB.

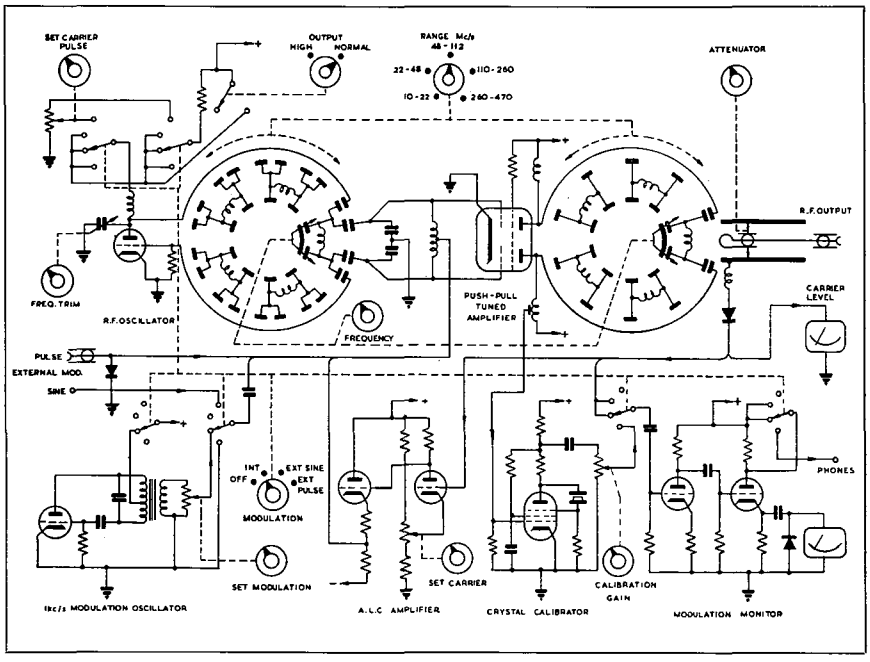
The crystal calibrator can be brought into use for c.w. outputs only, the h.t. supply to the crystal oscillator being switched on automatically when a telephone plug is inserted into the crystal check phones jack.

MODULATION

Internal modulation is obtained by switching the output of the internal a.f. oscillator to the grids of the power amplifier via a variable potentiometer which controls the modulation depth. The a.f. oscillator is of the LC type and combines circuit simplicity with low distortion.

For external modulation, the internal oscillator is switched out of circuit and the signal from the external source is introduced via terminals or a coaxial socket on the front panel.

Modulation depth is monitored by a separate panel meter directly calibrated from 0 to 90%. The meter indication is produced by rectification of the output from a two-stage amplifier. Since the input to this amplifier is derived directly from the demodulation of the r.f. input to the attenuator, the indication of modulation depth is based on a system of absolute measurement; it is thus independent of any indirect calibration associated with the level of modulating voltage applied to the power amplifier.



Functional Diagram of TF 801D/1

SPECIFICATION for TF 801D/1

Frequency

RANGE: 10 to 470 Mc/s in five bands.

TUNING CONTROL: The main dial has a total scale length of approximately 70 inches. Calibration every 2 Mc/s between 110 and 260 Mc/s; every 5 Mc/s above 260 Mc/s. The incremental dial has a uniform 0–100 calibration and makes 30 turns over each band.

FINE FREQUENCY CONTROL: A separate dual-range fine frequency control allows precise frequency setting for checks on highly selective receivers.

CALIBRATION ACCURACY: Using crystal calibrator, within ±0·2% over entire frequency range.

RESETTABILITY: Better than ±0·1% after initial warm-up.

CRYSTAL CALIBRATOR: Provides check points every 5 Mc/s over entire range. Accuracy better than 0·01% at normal ambient temperatures. Cursor on main dial adjustable to allow standardization of calibration.

FREQUENCY STABILITY: After warm-up, drift is not greater than 0·005% in a 10-minute period at ambient temperatures between 15° and 35°C. Following band-switching, a further stabilizing period is required.

R.F. Output

LEVEL: 0·1 μV to 1 volt source e.m.f. Attenuator dial shows source e.m.f. in voltage units and in decibels relative to 1 μV, power in decibels relative to 1 mW in 50 ohms, and power relative to thermal noise in a 10-kc/s bandwidth.

VOLTAGE ACCURACY: ±1 dB overall for c.w. outputs up to 0·7 volt e.m.f. Level during mark periods of pulse modulation is within ±2 dB of corresponding c.w. output. Automatic level control stabilizes output during tuning.

SOURCE IMPEDANCE: 50 ohms; v.s.w.r. not greater than 1·2.

STRAY RADIATION: Negligible; permits receiver sensitivity measurements down to 0·1 μV.

Modulation

INTERNAL SINE A.M.: Modulation frequency: 1,000 c/s ±10%. Depth monitored and variable up to 90% at carrier levels of 1 mW and below.

EXTERNAL SINE A.M.: Modulation frequency range: 30 c/s to 20 kc/s. Modulation depth as for internal. Input requirements for 90% modulation: 1 to 5 volts, depending on frequency, across 1 MΩ.

MODULATION MONITOR ACCURACY: ±10% of full-scale.

ENVELOPE DISTORTION: Less than 5% at 30% internal modulation; less than 10% at 50% modulation.

EXTERNAL PULSE MODULATION: Recurrence frequency range: 50 c/s to 50 kc/s. Minimum pulse width varies between 1 μsec at 470 Mc/s and 10 μsec at 10 Mc/s. Combined rise and decay time less than 4 μsec from 40 to 260 Mc/s; and less than 1 μsec from 260 to 470 Mc/s. Carrier suppression at least 20 dB below peak pulse output. Input requirements: Positive pulses of 50 volts across 1 MΩ.

INCIDENTAL F.M. ON A.M.: Deviation less than 0·001% of carrier frequency at 30% a.m.

RESIDUAL A.M.: The a.m. due to hum and noise is better than 40 dB below 30% modulation.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 100 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits. Filament regulation stabilizes oscillator frequency against mains voltage variation.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
14½ in	23½ in	10½ in	67 lb
(37 cm)	(60 cm)	(27 cm)	(31 kg)

Accessories supplied

Two *Coaxial Free Plugs*, Type N; for r.f. output and pulse mod. input sockets.

Accessories available

Output Lead, 50-ohm, Type TM 4824; 36 inches long; Type N plug both ends.

Output Lead, 50-ohm, TM 4824/1; 54 inches long; Type N plug both ends.

Attenuator Pad, 6-dB, 50-ohm, Type TM 4919/1; one end, Type N socket; other end, Type N plug.

Attenuator Pad, 20-dB, 50-ohm, Type TM 4919; one end, Type N socket; other end, Type N plug.
Matching Unit, 50-ohm to 75-ohm, Type TM 4918; one end, Type N socket; other end, Belling-Lee Type L734/P plug.
Matching Unit, 50-ohm to 75-ohm, TM 5548; one end, Type N socket; other end, Burndept PR 4D plug.
Matching Unit, 50-ohm to 75-ohm, TM 5549; one end, Type N socket; other end, Plessey Major CZ 71060 plug.
Matching Unit, 50-ohm unbalanced to 300-ohm balanced, TM 4196; one end, Type N socket; other end, solder tags.
D.C. Isolating Unit, Type TM 4917; one end, Type N socket; other end, crocodile clips.
Coaxial Fuse, Type TM 5753; prevents damage to the Signal Generator attenuator through accidental application of r.f. or h.t. power to the circuit under test. Particularly useful in transmitter/receiver testing:

Overload Protection: Burns out at 0·4 watt.
Insertion Loss: Nominally 0·5 dB.
V.S.W.R.: 1·35 or less when terminated with a matched 50-ohm load. 1·6 or less when terminated with TF 801D/1 attenuator.
Connectors: Type N.
Fuse: $\frac{1}{16}$ amp Littelfuse Cat. No. 361,062. 10 spares are supplied.
Dimensions: Length, $4\frac{7}{8}$ in; diameter, $\frac{13}{16}$ in.

SPECIFICATION for TF 801D/1/S

The TF 801D/1/S differs from the TF 801D/1 in the following respects:—

Frequency

RANGE: 10 to 485 Mc/s in five bands.

Modulation

EXTERNAL SINE A.M.: Modulation frequency range: 30 c/s to 50 kc/s. Modulation depth and input requirements as for TF 801D/1.
EXTERNAL PULSE MODULATION: Carrier suppression at least 20 dB below peak pulse output from 10 to 250 Mc/s on first four ranges and from 250 to 470 Mc/s on top range. Other characteristics as for TF 801D/1.
INCIDENTAL F.M. ON A.M.: Deviation less than 0·001% of carrier frequency at 30% a.m. up to 470 Mc/s.

Accessories supplied

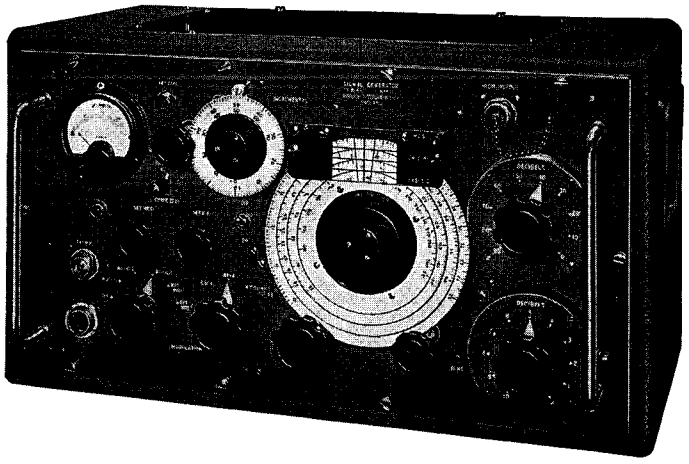
Two *Coaxial Free Plugs*, Type N; for r.f. output and pulse mod. input sockets.
One *Mains Lead*, Type 3429/1.

Accessories available

As for TF 801D/1.

SIGNAL GENERATOR

Type TF 801A/1



4047

- **Frequency range: 10 to 310 Mc/s**
- **Sinewave, squarewave and pulse a.m.**
- **Three internal modulation frequencies**
- **R.F. circuits included in modulation feedback loop**

SIGNAL GENERATOR Type TF 801A/1 (Air Ministry Reference No. 10S/16370) covers the frequency range 10 to 310 Mc/s in four bands. It has two separate r.f. outlets: one, unmonitored, gives a c.w. output of not less than 1 volt; the other, monitored, a c.w. or a.m. 75-ohm output variable in 1-dB steps from 200 mV to 2 μV. Sinewave or squarewave modulation of the monitored output may be applied internally at 400, 1,000, or 5,000 c/s; alternatively, the monitored output may be sinewave, squarewave, or pulse modulated from an external source within the modulation frequency range 50 c/s to 50 kc/s. The instrument is directly calibrated in terms of frequency and incorporates an incremental tuning control.

OSCILLATOR

The r.f. oscillator circuit embodies a system of contactless waveband selection, which avoids the effects of variable r.f. contact resistance. The use of a buffer-modulator stage results in low spurious frequency modulation and a good response to pulse modulation. For sinewave modulation, an overall feedback system minimizes distortion.

A disk-seal, turret-tuned r.f. oscillator operates on fundamentals throughout. It is coupled direct to the high outlet and to an untuned grounded-grid modulator stage which operates in class A for c.w. or sinewave outputs, or in class C for squarewave or pulse outputs. The modulator output feeds the normal outlet via a 0- to 100-dB attenuator cascade comprising two resistive ladder networks having 10- and 1-dB steps respectively.

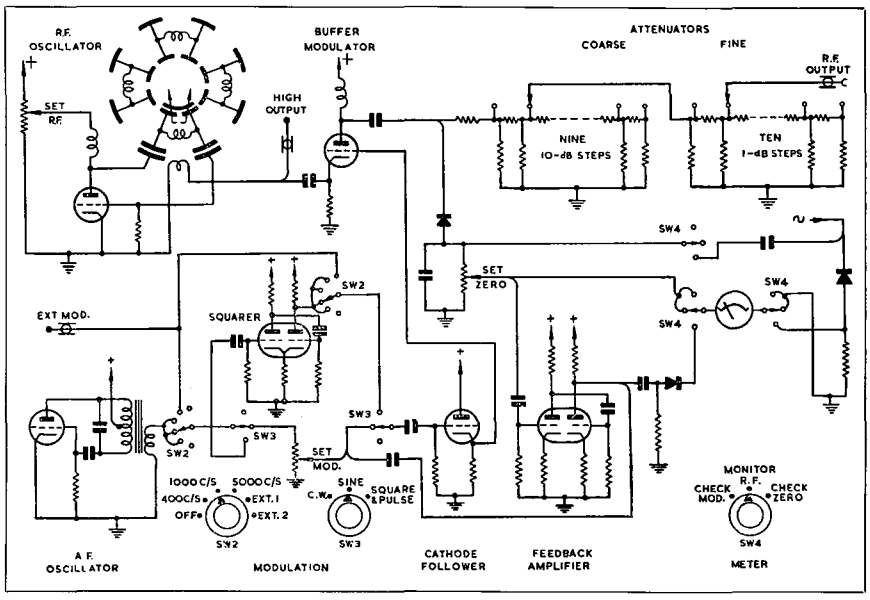
MODULATION

For sinewave modulation, the output of the three-frequency internal oscillator or the external modulating signal is applied, via a cathode follower, to the grid of the modulator stage; for squarewave or pulse modulation, a squaring stage is introduced before the cathode follower. With internal or external sinewave modulation, the demodulated r.f. output signal derived from the crystal

rectifier monitoring circuit is applied, via a two-stage feedback amplifier, to the cathode follower in phase opposition to the original modulating signal.

MONITORING

The monitor system can be switched to indicate the r.f. level at the input of the attenuator or sinewave modulation depth by rectifying the demodulated r.f. signal at the output of the modulation feedback amplifier. The sensitivity of the r.f. monitor circuit can be standardized against an internal reference circuit.



Functional Diagram of TF 801A/1

SPECIFICATION for TF 801A/1

Frequency

RANGE: 10 to 310 Mc/s in four bands of 10 to 25, 24·5 to 60, 55 to 150, and 145 to 310 Mc/s.

CALIBRATION ACCURACY: 1%.

STABILITY: After a warming-up period of 30 minutes, drift on any band is not more than ±0·1% per hour when measured at a point 75% up from the low-frequency end of the band.

Attenuated output

DATUM LEVEL: 200 mV ±1 dB from 10 to 100 Mc/s and ±2 dB from 100 to 310 Mc/s.

RANGE: 0 to −100 dB, relative to 200 mV, in 9 steps of 10 dB and 10 steps of 1 dB. Accuracy of each 10-dB step, ±0·5 dB up to 150 Mc/s and ±1 dB above. Accuracy of 1-dB steps, ±0·5 dB overall.

IMPEDANCE: Nominally 75 ohms.

High output

A separate outlet provides an unmonitored c.w. output of not less than 1 volt.

Sinewave modulation

INTERNAL: 400, 1,000 and 5,000 c/s, monitored and continuously variable to a depth of 80%.

EXTERNAL: As above, but at frequencies within the range 50 c/s to 50 kc/s. An input of approximately 15 volts r.m.s. is required to produce a depth of 80%.

ACCURACY OF MONITOR: ±10% of the meter reading for depths of 30% and over, and ±3% modulation depth at depths less than 30%.

SPURIOUS F.M. CONTENT: For 30% a.m. at 10 kc/s, the spurious f.m. is not greater than 5 kc/s up to 100 Mc/s and 15 kc/s at 250 Mc/s.

HUM AND NOISE LEVEL: At least 40 dB down relative to 30% a.m.

Squarewave modulation

INTERNAL: 400, 1,000 and 5,000 c/s with a mark/space ratio of nominally 50/50.

EXTERNAL: As above, but at frequencies within the range 50 c/s to 50 kc/s. A sinewave or squarewave input of approximately 30 volts peak is required to produce full modulation.

CARRIER SUPPRESSION: The r.f. mark/space amplitude ratio is not less than 40 dB at 100 Mc/s and below; the ratio falls to not less than 35 dB at 300 Mc/s.

External pulse modulation

Pulse modulation can be produced from positive-going pulse inputs within the frequency range 50 c/s to 50 kc/s and of lengths between 2 μsec and squarewave; approximately 40 volts peak pulse is required to produce full modulation with a carrier suppression as quoted for squarewave.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal soldered links, 40 to 100 c/s. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. The instrument can also be operated from 180-volt, 500-c/s supplies.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
11½ in (29 cm)	21 in (53 cm)	11½ in (29 cm)	57 lb (26 kg)

Accessories supplied

Coaxial Free Plug, Belling-Lee L734/P; for use with attenuated r.f. output socket.
Two *Coaxial Free Sockets*, F. & E. type RFS-1-CF; for use with high output and ext. mod. plugs.
Mains Lead for supply input plug.

Accessories available

Coaxial Lead for attenuated r.f. output, TM 5098; 36 inches long; one end, Belling-Lee plug; other end, Pye miniature socket.
Coaxial Lead for high output, TM 5098/3; 36 inches long; one end, F. & E. socket; other end, Pye miniature socket.

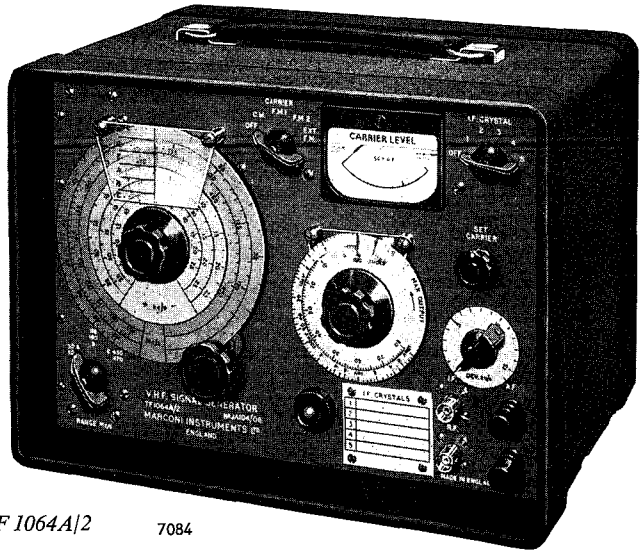
Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

V.H.F. Signal Generator

Types TF 1064A and TF 1064A/2



TF 1064A/2 7084

- **R.F. ranges: 68 to 108, 118 to 185, and 450 to 470 Mc/s; low range of "A/2" model is 30 to 50 Mc/s**
- **Specially designed for mobile radio testing**
- **A.F. tone source and five-frequency i.f. crystal oscillator incorporated**
- **Sinewave f.m. on both models and sinewave a.m. on TF 1064A**

THE TF 1064A and TF 1064A/2 are composite r.f., i.f., and a.f. signal sources for the mobile radio bands. This new 'A' series, which has the added refinement of stabilized filament supplies, covers most of the mobile bands in use throughout the world, the r.f. ranges of the TF 1064A being generally applicable to the British and European bands, and the A/2 model to those of North and South America.

The TF 1064A has internal f.m. at fixed deviations of 3·5 and 10 kc/s, and also 30% a.m. The A/2 has internal f.m. at deviations of 10 kc/s fixed and 0 to 15 kc/s variable, and also external f.m. Good frequency stability and a low value of spurious f.m. on c.w. or a.m. outputs are notable features of the performance, while fully stabilized l.t. and h.t. supplies ensure that mains variation has a negligible effect on carrier frequency and deviation.

On both models, the i.f. oscillator gives a selection of five customer-chosen spot frequencies between 290 kc/s and 16 Mc/s. Frequency is controlled by plug-in crystals which can be supplied to special order—see Specification. Fixed-depth 1,000-c/s a.m. can be applied to the i.f. signal.

The outputs of the r.f. generator, i.f. oscillator and 1,000-c/s a.f. oscillator are each available at a separate panel outlet.

APPLICATIONS

Although the TF 1064A and A/2 form complete self-contained units, they have been designed as complementary instruments to the TF 1065 Transmitter and Receiver Output Test Set. Together, Signal Generator and Test Set provide comprehensive facilities for testing f.m. and a.m. mobile transmitter/receiver equipment, their compactness and portability making them particularly suitable for field use. Receiver sensitivity and image rejection, bandwidth and i.f. alignment, signal-to-noise ratio and quieting, discriminator linearity and symmetry, are examples of tests that can be made using the Signal Generator in conjunction with the TF 1065 or other suitable output indicator.

R.F. OUTPUT

The output of the r.f. generator section is delivered via a 50-ohm piston attenuator with direct-reading voltage and dB scales for both source e.m.f. and p.d. The r.f. tuning arrangement includes a direct-reading incremental control which allows the small frequency changes required for bandwidth measurement to be made with precision.

I.F. OUTPUT

The holders for the i.f. crystals are readily accessible without removing the instrument from its case, and up to five crystals can be plugged in and selected by means of a switch. The i.f. oscillator can be used to facilitate precise tuning of the r.f. generator to the centre frequency of a receiver under test: with the i.f. oscillator output loosely coupled to the receiver i.f. amplifier, correct tuning of the r.f. generator is indicated by zero beat note in the receiver output.

A.F. OUTPUT

The output of the 1,000-c/s a.f. oscillator, in addition to modulating the r.f. and i.f. signals, is available for general audio test purposes—for example, as a constant-level transmitter modulating signal.

ACCESSORIES

As well as the i.f. oscillator crystals, there are six other accessories which can be supplied for use with the TF 1064A or TF 1064A/2. These additional optional items consist of an output lead, a 50- to 75-ohm matching unit, and 20- and 6-dB pads for the r.f. output; an i.f. level control; and an a.f. monitor and attenuator.

The Output Lead, TM 4969, comprises a 50-ohm coaxial cable, 42 inches long and terminated at both ends with BNC plugs. Matching Unit, Type TM 5569, is for use when testing 75-ohm equipment and has a BNC input socket and a Belling-Lee output plug. Using either the 20-dB Pad, TM 5573, or the 6-dB Pad, TM 5573/1, especially low signal levels and/or an improved output v.s.w.r. can be obtained; both of these accessories comprise a single pi network of resistors housed within a small metal cylinder fitted with a BNC plug and socket.

The accessory available for the i.f. output is Level Control Unit, TM 5570. This item, which is for use when a reduced i.f. output is required, consists of a variable potentiometer mounted in a small metal case fitted with a BNC plug and socket.

The last accessory (not applicable to TF 1064A/2) is A.F. Monitor and Attenuator TM 5567. Basically, it consists of a calibrated rectifier-type a.c. voltmeter shunted by a fixed-ratio 10:1 potentiometer. In addition to the two input terminals there are three output terminals. By connection to the appropriate output terminals, either the full voltage shown on the meter, or one-tenth of the voltage, can be obtained.

SPECIFICATION

R.F. output

FREQUENCY RANGES:

	TF 1064A	*TF 1064A/2*
A:	68 to 108 Mc/s	30 to 50 Mc/s
B:	118 to 185 Mc/s	118 to 185 Mc/s
C:	450 to 470 Mc/s	450 to 470 Mc/s

TUNING CONTROL: The main dial has a total scale length of approx. 27 inches.

CALIBRATION ACCURACY: 0·5%.

FREQUENCY STABILITY: The generator is designed for use with narrow-band receivers and has good short-term stability.

ATTENUATOR REACTION: Negligible over the calibrated output range.

INCREMENTAL FREQUENCY CONTROL:

TF 1064A	*TF 1064A/2*
±25 kc/s on Range A	±25 kc/s on
±50 kc/s on Range B	all ranges
±100 kc/s on Range C	

INCREMENTAL ACCURACY:

TF 1064A	*TF 1064A/2*
Generally within 10% of full scale	Generally within 15% of full scale

SPURIOUS SIGNALS: There are no sub-harmonics at carrier frequencies between 68 and 185 Mc/s; on the highest range the f/3 sub-harmonic is approximately 15 dB down (12 dB on TF 1064A/2).

OUTPUT LEVEL: 0·5 μV to 10 mV source e.m.f., continuously variable. The attenuator dial shows directly, and in decibels relative to 1 μV, (*a*) source e.m.f. and (*b*) volts across a 50-ohm load. Uncalibrated higher outputs of at least 200 mV (100 mV across 50 ohms) are also obtainable.

OUTPUT ACCURACY: 2 dB.

SOURCE IMPEDANCE: Nominally 50 ohms.

V.S.W.R.: *TF 1064A:* Better than 1·5. *TF 1064A/2:* Better than 2·0. Using 20-dB Pad TM 5573, v.s.w.r. is better than 1·15 on both models.

STRAY RADIATION: Permits full use of lowest output.

Modulation (R.F. Output)

INTERNAL 1,000-C/S F.M.:

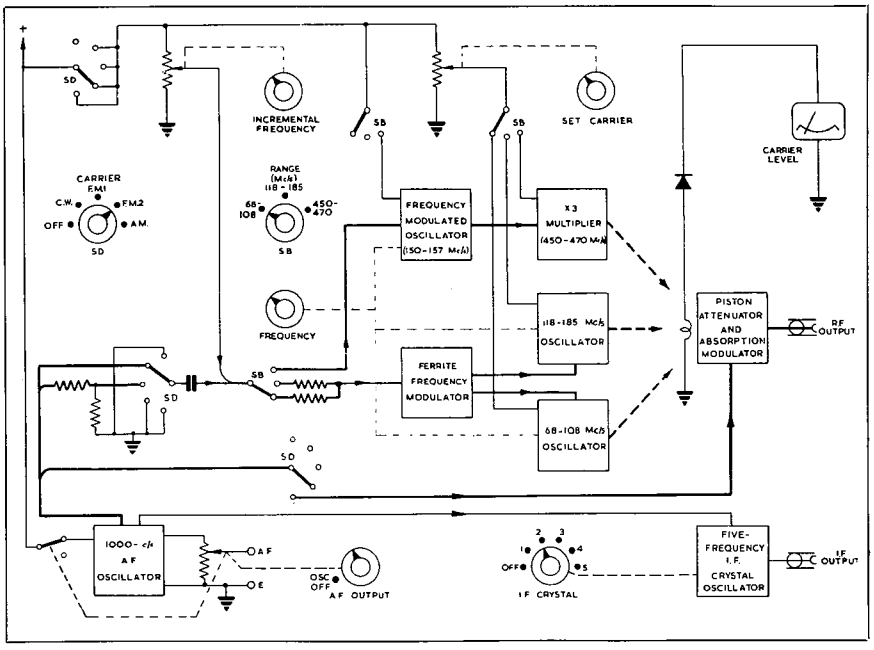
TF 1064A

Fixed deviation: 3·5 and 10 kc/s.

TF 1064A/2

Fixed deviation: 10 kc/s.

Variable deviation: 0 to 15 kc/s.



Functional Diagram of TF 1064A

EXTERNAL F.M. (TF 1064A/2 only): At the lower modulation frequencies, up to 10 volts input across 600 ohms gives 10 kc/s deviation.

DEVIATION ACCURACY: In general, better than 10% for fixed deviation and 10% of full-scale for variable deviation.

SPURIOUS A.M. ON F.M.: Typically, less than 1% modulation depth at maximum deviation.

RESIDUAL F.M.: The f.m. due to hum, noise, and microphony is, typically, less than 100 c/s deviation in a quiet location.

INTERNAL 1,000-C/S A.M. (not applicable to TF 1064A/2): Nominally 30% fixed depth.

SPURIOUS F.M. ON A.M.: Typically, less than 100 c/s at levels below 3 mV.

I.F. output

CRYSTAL FREQUENCIES: The i.f. crystal oscillator will function at any frequency between 290 kc/s and 16 Mc/s. Five switch-selected sockets are provided for crystals. Crystals are not supplied, but may be ordered separately—see Accessories Available.

FREQUENCY ACCURACY: In general 0·01%, but dependent on the crystal in use.

OUTPUT LEVEL: Greater than 100 mV across a 1-kΩ load.

MODULATION: The crystal oscillator can be amplitude modulated by internal 1,000-c/s source for signal identification.

A.F. output

FREQUENCY: 1,000 c/s.

OUTPUT LEVEL: *TF 1064A:* 0 to approx. 1·25 volts e.m.f., continuously variable. *TF 1064A/2:* 0 to approx. 2 volts e.m.f., continuously variable.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 30 watts. The TF 1064A is normally supplied adjusted for the range 200 to 250 volts, and the A/2 version for 100 to 150 volts.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
8½ in (21·5 cm)	12 in (31 cm)	8½ in (21·5 cm)	26 lb (12 kg)

Accessories supplied

Two *Coaxial Free Plugs*, Type BNC, 50-ohm; for use with r.f. and i.f. output sockets.

Accessories available

I.F. Oscillator Crystals: B7G base, MWT Type QO 1655 series for TF 1064A; miniature 2-pin, MWT Type QO 1670 series for TF 1064A/2. Frequencies to be specified.

Output Lead, TM 4969.

50- to 75-ohm Matching Unit, TM 5569.

20-dB Attenuator Pad, TM 5573.

6-dB Attenuator Pad, TM 5573/1.

I.F. Level Control Unit, TM 5570.

A.F. Monitor and Attenuator, TM 5567 (not applicable to TF 1064A/2).

Full information on the above items is given on the previous page.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

U.H.F. Signal Generator

Types TF 1060 and TF 1060/2

5678

- **Frequency range: 450 to 1,250 Mc/s**
- **Direct calibration for both frequency and output**
- **Thermistor bridge level monitor**
- **Sinewave and pulse a.m.**
- **-/2 model has 100-mμsec pulse rise time**

SIGNAL GENERATOR TF 1060 covers the frequency range 450 to 1,250 Mc/s in one continuous band. Frequency is read directly from a clear and open scale on its 8-inch dial and there are comprehensive incremental tuning arrangements providing an unusually high order of discrimination.

The maximum power output changes with frequency and varies from at least 1 mW at 450 Mc/s to approximately 100 mW at 1,250 Mc/s. The design of the TF 1060 allows the user to obtain the full available output of the r.f. oscillator via a piston attenuator which at all times shows both the source e.m.f. and power to a 50-ohm load on a single directly calibrated dial.

Other features of the TF 1060 are its fundamental method of level monitoring by means of a thermistor bridge, and a stabilized power supply which contributes in large part to the excellent stability of the r.f. oscillator—after warming-up, the frequency drift is less than 0·005% over a 10-minute period.

The Generator includes provision for 1,000-c/s, fixed 30% depth, internal a.m. and also external pulse modulation at recurrence frequencies up to at least 50 kc/s.

The TF 1060/2 is a special 450- to 1,200-Mc/s version, giving improved pulse modulation performance with rise times of less than 100 mμsec. In freedom from radiation, however, it falls a little short of the basic model and this may limit its use at the lowest output levels. This version is primarily designed for use with the Secondary Surveillance Radar Test Set, TF 1349.

APPLICATIONS

With its high output facilities, the TF 1060 is invaluable for driving bridges, slotted lines, etc.; at the other extreme, with its minimum output of −160 dB relative to 1 watt (a source e.m.f. of 0·15 μV), the Generator is equally useful for testing the most sensitive receivers.

Its excellent stability and pulse modulation characteristics, high discrimination and freedom from spurious harmonic output make it suitable for tests on u.h.f. radar and navigational equipment, Band V television, tropospheric-scatter and mobile communication systems.

PRECISION TUNING

As well as the main dial with its 21-inch directly-calibrated scale, there are two further features which combine to allow the most precise setting of carrier frequency. First, there is the incremental dial which gives a degree of discrimination such that, at the centre of the tuning range, a movement of ¼ inch on the periphery of the incremental dial represents a frequency change of only 250 kc/s. In addition, for final tuning, there is an extra-fine frequency control with a total cover which varies from approximately 20 kc/s at the low-frequency end of the tuning range to some 100 kc/s at the high-frequency end.

OUTPUT ARRANGEMENTS AND MONITOR SYSTEM

Two piston attenuators are fed from the coaxial-line oscillator. One of these forms the output attenuator; the other carries in its pick-up head the power-sensitive element of the thermistor-bridge level monitor. Each is fed directly from the oscillator and varying the position of the pick-up head in one does not alter the input level to the other.

The function of the SET CARRIER control is to vary both the setting of the monitor attenuator and the position of the cursor against which the dial of the output attenuator is read. In use, after making a substantial change in frequency with its consequent change in oscillator power, the SET CARRIER control is adjusted to restore standard deflection on the monitor meter. This action automatically moves the output attenuator cursor by an amount corresponding to the change in monitor attenuator setting. Since this change is equal to the change in oscillator power, the validity of the attenuator dial calibration is maintained.

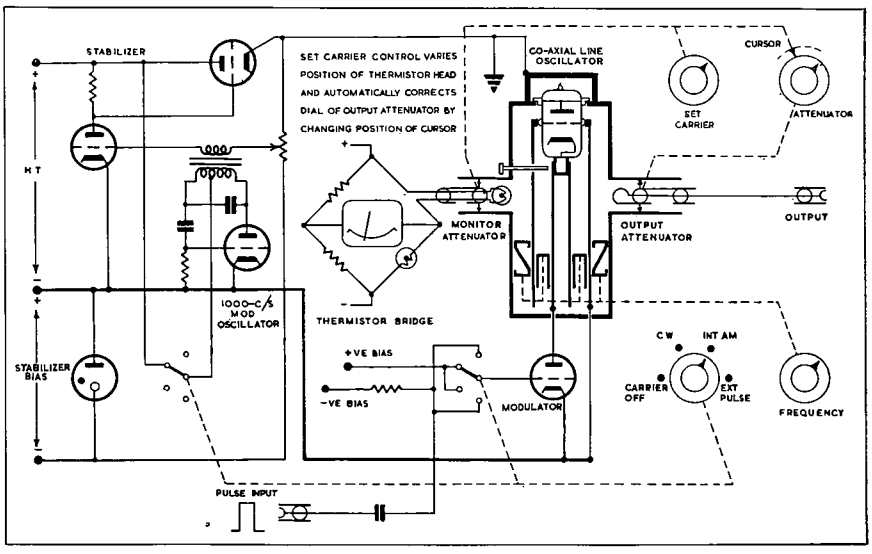
To the user, the system is one of the utmost simplicity. Following normal signal

generator practice, the operator merely standardizes the monitor meter deflection with the SET CARRIER control and then turns the single front-panel control marked ATTENUATOR until its associated dial indicates the required output.

MODULATION CIRCUITS

30% amplitude modulation of the r.f. output is achieved by switching-in a 1,000-c/s oscillator, the output from this oscillator being applied to the grid of the amplifier in the series-regulator h.t. stabilizer circuit.

Pulse modulation is effected by means of a parallel-strapped double-triode connected in series with the cathode of the r.f. oscillator. With the Generator function switch set to PULSE, the modulator valve is biased beyond cut-off and all r.f. oscillation ceases. The application of positive-going modulating pulses to the PULSE INPUT socket results in corresponding cancellations of the internal bias; in consequence, there is a pulsed r.f. output with complete carrier supression during the between-pulse periods.



Functional Diagram of TF 1060

SPECIFICATION for TF 1060

Frequency

RANGE: 450 to 1,250 Mc/s (66 to 24 cm) in one band.

MAIN TUNING CONTROL: The main dial has a scale length of approximately 21 inches and is directly calibrated in frequency. The incremental dial has a uniform 0–100 calibration and makes 110 turns over band; the kilocycles per division are indicated on the main dial and vary from approximately 20 to 200 kc/s.

FREQUENCY ACCURACY: 1%.

INCREMENTAL ACCURACY: 5%.

FINE TUNING CONTROL: Dial has arbitrary numerical calibration with a total cover rising with carrier frequency from approximately 20 kc/s to 100 kc/s.

FREQUENCY STABILITY: After warm-up, the drift is less than 0·005% in a 10-minute period.

ATTENUATOR REACTION: Negligible below 10 μW; less than 0·05% above.

SPURIOUS SIGNALS: Total harmonic content is less than 2%.

R.F. output

LEVEL: The output is continuously variable from −160 to at least −30 dB relative to 1 watt, *i.e.*, a source e.m.f. range of 0·15 μV to 445 mV. The maximum output increases with frequency and on a typical Generator rises to:

20 mW (E.M.F. = 2·0 volts) from 600 to 800 Mc/s;
30 mW (E.M.F. = 2·45 volts) from 800 to 1,000 Mc/s;
100 mW (E.M.F. = 4·5 volts) from 1,000 to 1,250 Mc/s.

The attenuator dial is direct-reading under all conditions and shows both source e.m.f. and—for power to a 50-ohm load—decibels relative to 1 watt.

OUTPUT ACCURACY: Incremental, 0·2 dB; overall, 2 dB.

SOURCE IMPEDANCE: 50 ohms; v.s.w.r. less than 1·8:1, or 1·2:1 using 10-dB Pad, TM 5554.

STRAY RADIATION: Negligible; permits full use of lowest output.

Modulation

INTERNAL SINE A.M.: 1,000 c/s at a nominal 30%.

EXTERNAL PULSE MODULATION: 1 μsec or longer; recurrence frequency range, 50 c/s to 50 kc/s.

Input requirements: Positive pulses of not less than 30 volts across 10 kΩ.

F.M. ON A.M.: Typically, for 30% a.m., f.m. varies from 125 kc/s at 450 Mc/s to 350 kc/s at 1,250 Mc/s.

RESIDUAL A.M.: The a.m. due to hum and noise is better than 40 dB below 30% modulation.

RESIDUAL F.M.: The f.m. due to hum and noise is less than 2·5 kc/s deviation.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 85 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
13½ in	19½ in	24 in	64 lb
(34 cm)	(50 cm)	(61 cm)	(29 kg)

Accessories supplied

Coaxial Free Plug, Type N, for r.f. output socket.

Coaxial Free Plug, Type 83, for ext. mod. pulse input socket.

Accessories available

Output Lead, 50-ohm, TM 4726/12; 36 inches long; Type N plug both ends.

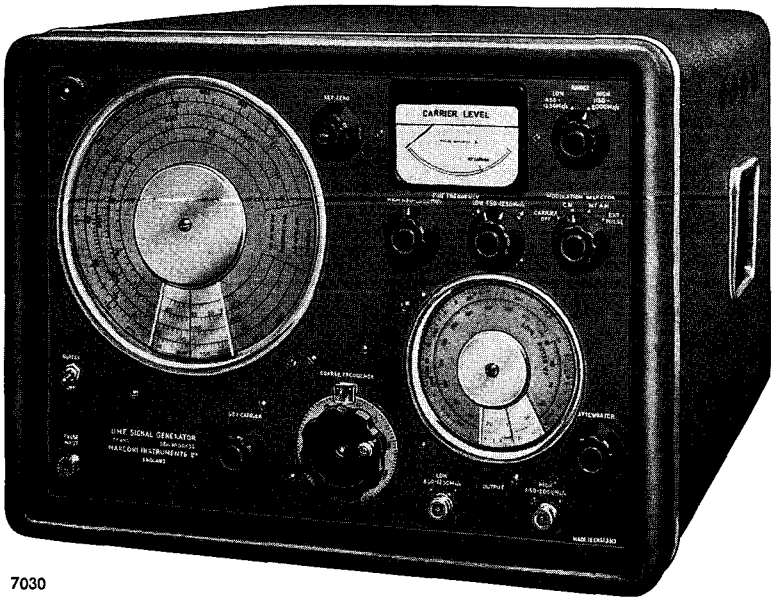
Attenuator Pad, 10-dB, 50-ohm, TM 5554; one end, Type N plug; other end, Type N socket.

Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

U.H.F. Signal Generator Type TF 1145



7030

- **Frequency range: 450 to 1,900 Mc/s**
- **Direct calibration for both frequency and output**
- **Thermistor-bridge level monitor**
- **Sinewave and pulse a.m.**

THIS new u.h.f. generator has the same excellence of stability, discrimination, pulse characteristics and purity of output as the TF 1060, but extends these advantages up to 1,900 Mc/s.

The maximum power output specified is 1 mW, but considerably higher outputs are available over much of the band. The design of the TF 1145 allows the user to obtain the full available output of the r.f. oscillator via a piston attenuator which at all times shows both the source e.m.f. and power to a 50-ohm load on a single directly-calibrated dial.

Other features of the TF 1145 are its fundamental method of level monitoring by means of a thermistor bridge, and a stabilized power supply which contributes in large part to the excellent stability of the r.f. oscillator—after warming-up, the frequency drift is less than 0·005% over a 10-minute period.

The Generator includes provision for external pulse modulation at recurrence frequencies up to at least 50 kc/s, and also internal 1,000-c/s a.m. at fixed 30% depth.

APPLICATIONS

With its high-grade performance over a frequency range for which two generators are normally required, the TF 1145 can be used for a variety of precision tests on 50- and 25-cm radars, u.h.f. television and communication systems. Its high output is invaluable for driving slotted lines or energizing bridges, while at the other extreme its minimum output of 0·15 μV e.m.f. and low leakage make it equally suitable for testing the most sensitive receivers.

R.F. OSCILLATORS

Separate coaxial-line oscillator units employing disk-seal triodes are used on each band, the low-frequency unit resonating in the quarter-wave mode and the high-frequency unit in the three-quarter-wave mode. Both units are tuned by non-contacting annular plungers which are ganged together and actuated by a single front panel tuning control; the required band is selected by switching the h.t. to the oscillator valves.

As well as the main dial, which has an effective scale length of about 42 inches, there are two further features that combine to allow the most precise setting of carrier frequency: an incremental tuning dial which is attached to the main frequency control and turns through over 10,000 sub-divisions as the Generator is tuned throughout one band, and an extra-fine frequency control which allows the Generator frequency to be set accurately to peak response of a narrow-band system under test.

OUTPUT AND MONITOR

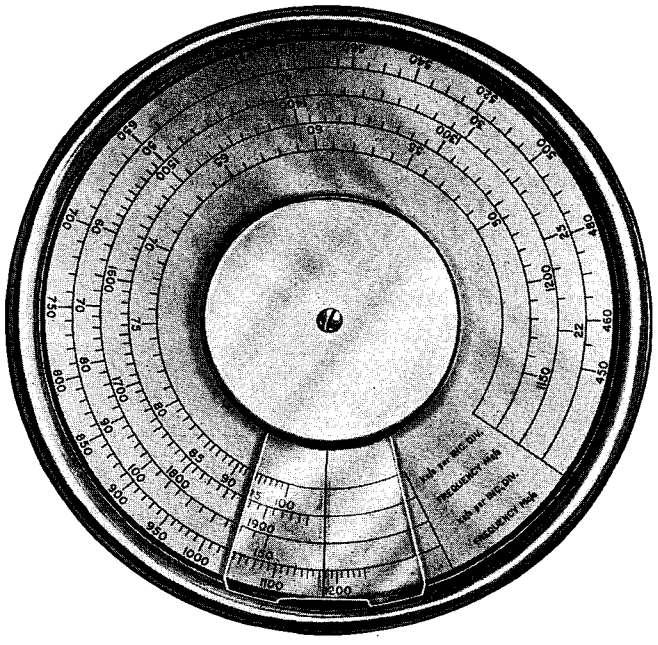
Each oscillator unit feeds two piston attenuators, one of which delivers the output to a Type N coaxial socket, while the other carries in its pick-up head the power-sensitive element of the temperature-compensated thermistor-bridge level monitor. Both of the monitor attenuators are adjusted by the SET CARRIER control, which also determines the position of the cursor on the dial of the output attenuator control; therefore, as the

power output from the particular oscillator in use varies with tuning, adjustment of the SET CARRIER control to maintain standard deflection on the monitor meter automatically repositions the cursor of the output attenuator dial so that the new level is correctly indicated.

MODULATION CIRCUITS

Amplitude modulation of the r.f. output is achieved by switching in a 1,000-c/s oscillator, the output from this oscillator being applied to the grid of the amplifier in the series-regulator h.t. stabilizer circuit. The consequent variations in the supply to the anode of the r.f. oscillator produce modulation of the output to a depth which remains virtually constant at 30% over the whole of the tuning range.

Pulse modulation is effected by means of a parallel-strapped double-triode connected in series with the cathode of the r.f. oscillator in use. With the Generator function switch set to PULSE, the modulator valve is biased beyond cut-off and all r.f. oscillation ceases. The application of positive-going modulating pulses to the EXT MOD coaxial inlet results in corresponding cancellations of the internal bias; in consequence, there is a pulsed r.f. output with complete carrier suppression during the between-pulse periods.



The large main tuning dial is directly calibrated in frequency and also shows the frequency change caused by turning the separate incremental dial through one division.

SPECIFICATION

Frequency

RANGE: 450 to 1,900 Mc/s in two bands:
450 to 1,250 Mc/s;
1,150 to 1,900 Mc/s.

MAIN TUNING CONTROL: The main dial has a total scale length of approximately 42 inches and is directly calibrated in terms of frequency. The incremental dial has a uniform 0–100 calibration and makes 110 turns over band; the kilocycles per division are indicated on the main dial and vary from 20 to 100.

FREQUENCY ACCURACY: 1%.

INCREMENTAL ACCURACY: 5%.

FINE TUNING CONTROL: Dial has uniform 0–10 calibration with a total cover varying from approximately 40 kc/s to 200 kc/s, depending on carrier frequency.

FREQUENCY STABILITY: After warm-up, the drift is less than 0·005% in a 10-minute period.

ATTENUATOR REACTION: None below 10 μW; less than 0·05% above.

HARMONIC DISTORTION: Total harmonic content is less than 2%.

R.F. output

LEVEL: The output is continuously variable from −160 to at least −30 dB relative to 1 watt, i.e., a source e.m.f. range of 0·15 μV to 445 mV.

The attenuator dial is direct reading under all conditions and shows both source e.m.f. and—for power to a 50-ohm load—decibels relative to 1 watt.

OUTPUT ACCURACY: Incremental, 0·2 dB; overall, 2 dB.

SOURCE IMPEDANCE: 50 ohms; v.s.w.r. 1·5:1 or better.

STRAY RADIATION: Negligible: permits full use of lowest output.

Modulation

INTERNAL SINE A.M.: 1,000 c/s at a nominal 30%.

EXTERNAL PULSE MODULATION: 1 μsec or longer; recurrence frequency range, 50 c/s to 50 kc/s.

Input requirements: Positive pulses of not less than 30 volts across 10 kΩ.

F.M. ON A.M.: For 30% a.m., typical deviations are: 125 kc/s at 450 Mc/s, 350 kc/s at 1,250 Mc/s, and 600 kc/s at 1,900 Mc/s.

RESIDUAL A.M.: The a.m. due to hum and noise is better than 40 dB below 30% modulation.

RESIDUAL F.M.: The f.m. due to hum and noise is less than 6 kc/s deviation at 1,900 Mc/s.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
13½ in (34 cm)	19½ in (50 cm)	24 in (61 cm)	71 lb (32 kg)

Accessories supplied

Coaxial Free Plug, Type N, for r.f. output socket.

Coaxial Free Plug, Type 83, for ext. mod. pulse input socket.

Accessories available

Output Lead, 50-ohm, TM 4726/12; 36 inches long; Type N plug both ends.

Attenuator Pad, 10-dB, 50-ohm, TM 5554; one end, Type N plug; other end, Type N socket.

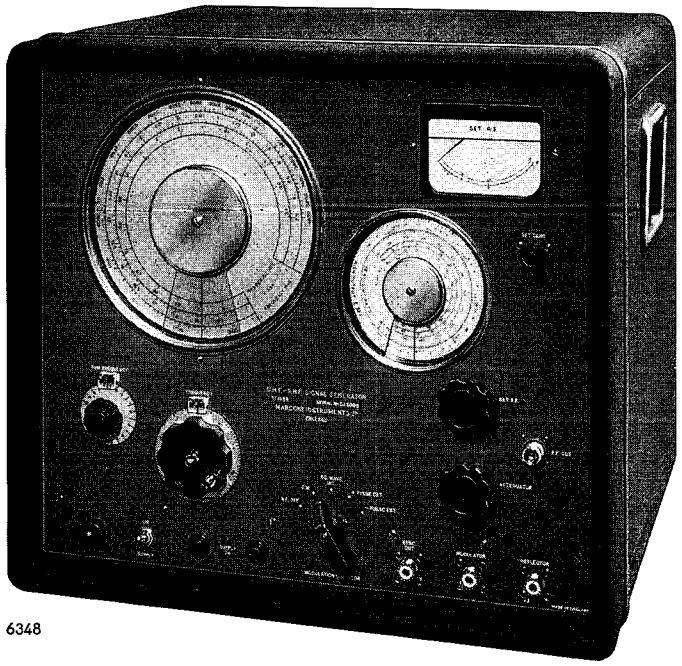
Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

U.H.F. and S.H.F. Signal Generator

Type TF 1058



6348

- **Frequency range: 1,600 to 4,000 Mc/s**
- **Klystron oscillator with automatic tracking**
- **Direct calibration for both frequency and output**
- **Thermistor-bridge level monitor**
- **Squarewave and pulse a.m.; also f.m.**

THE TF 1058 is a highly stable signal generator covering the frequency range 1,600 to 4,000 Mc/s in a single band. Its main tuning dial has a scale length of approximately 22 inches and is directly calibrated in both frequency and wavelength.

By means of a built-in precision piston attenuator, the output is variable over a range of 135 dB from a calibrated maximum of 1 mW into 50 ohms; that is, a source e.m.f. range of 0·445 volt to approximately 0·1 μV. The attenuator dial is directly calibrated and shows both the output power to a 50-ohm load in terms of decibels relative to 1 watt and the source e.m.f. in units of voltage; supplementary decibel scales are included to indicate power output at the highest frequencies. A temperature-compensated thermistor bridge is used as level monitor.

Amplitude modulation can be applied from either an internal squarewave generator or an external source of positive- or negative-going pulses; external frequency modulation to a maximum deviation of 3 Mc/s can also be applied.

APPLICATIONS

With its a.m., f.m., and pulsed outputs, the TF 1058 can be used for a wide variety of precision tests on u.h.f. links and mobile communication equipment, S-Band radar and navigation systems. Comprehensive incremental tuning facilities and excellent frequency stability equip it for the most exacting determinations of bandwidth and frequency response. And its high output with 1,000-c/s squarewave modulation make it ideal as a driving source for slotted lines in impedance, v.s.w.r., and transmission-line characteristic measurements.

TUNING

The r.f. power is generated by a coaxial-line klystron oscillator tuned by simultaneously varying the effective length of a short-circuited resonant line and the klystron reflector voltage.

An incremental tuning dial provides the operator with the means of interpolating between the main scale markings with a high degree of accuracy; one division of the incremental dial calibration is equivalent to 0·05% of the main-dial scale length. An additional fine-tuning control with a range of a few hundred kilocycles per second is connected into the reflector voltage-control circuit to enable the operator to peak the tuning accurately to the centre frequency of a narrow-band system under test.

Careful design, coupled with the inherent stability of this type of oscillator, has reduced the frequency drift to the very low figure of 0·001% for a 10-minute period; the user is thus able to take full advantage of both the fine and incremental tuning arrangements even when making protracted measurements.

OUTPUT

The output is drawn from the oscillator via a piston attenuator while a thermistor-bridge monitor is separately coupled to the oscillator by a second attenuator of the same type. The normal progressive changes in oscillator power, which occur as the instrument is

tuned through its frequency range are compensated for by the adjustment of the monitor attenuator to keep the pointer of the meter at a reference mark; this action also adjusts the output attenuator relative to its dial so that the validity of the output dial reading is automatically maintained.

Output levels in excess of 1 mW can be obtained by setting the attenuator dial to an uncalibrated maximum-coupling position. At some carrier frequencies, outputs of up to 50 mW can be obtained at this setting.

MODULATION

The internally generated 1,000-c/s squarewave is applied to a switching valve in the cathode circuit of the klystron oscillator. A 100-volt synchronizing signal with a steep leading edge is available at a front-panel socket when the instrument is switched for internal modulation.

Positive- or negative-going modulating pulses may be applied at any repetition frequency between 50 c/s and 4 kc/s. The specified range for r.f. output pulse duration is 10 to 100 μsec, but, at many carrier frequencies, pulse outputs with durations of as little as 0·5 μsec can be obtained. The instrument also delivers 50-volt positive-going synchronizing pulses, initiated by the externally derived modulation pulses.

The reflector of the klystron is a.c. coupled to a socket on the front panel so that external frequency modulation can be applied.

SPECIFICATION

Frequency

RANGE: 1,600 to 4,000 Mc/s (18·75 to 7·5 cm) in one band.

MAIN TUNING CONTROL: The main dial has a scale length of approximately 22 inches and is calibrated in both frequency and wavelength. The incremental dial has a uniform 0–100 calibration and makes 19 turns over the band; megacycles per division are indicated on the main frequency dial and vary from approximately 0·6 to 3·5 Mc/s.

FREQUENCY ACCURACY: 1%.

FREQUENCY STABILITY: After warm-up, the drift is less than 0·001% in a 10-minute period.

R.F. output

LEVEL: The output is continuously variable from −165 to at least −30 dB relative to 1 watt; i.e., a source e.m.f. range of approx. 0·1 μV to 445 mV.

The attenuator dial shows both source e.m.f. and—for power to a 50-ohm load—decibels relative to 1 watt.

Uncalibrated outputs of the order of 10 to 50 mW are obtainable at most frequencies.

OUTPUT ACCURACY: After setting level meter in accordance with chart in instruction book, 2 dB up to 3,000 Mc/s and 4 dB from 3,000 to 4,000 Mc/s.

SOURCE IMPEDANCE: 50 ohms.

STRAY RADIATION: Negligible; permits full use of lowest output.

Amplitude modulation

INTERNAL SQUAREWAVE: 1,000 c/s.

EXTERNAL PULSE: 10 to 100 μsec; recurrence frequency range: 50 to 4,000 c/s. Input requirements: positive or negative pulses of not less than 50 volts across 220 kΩ.

SYNCHRONIZING OUTPUT: Positive-going with a sharp leading edge.

External frequency modulation

MODULATION FREQUENCY RANGE: 50 c/s to 20 kc/s. Maximum sweep varies from approx. 3 to 6 Mc/s, depending on centre frequency.

INPUT REQUIREMENTS: 6 volts across 220 kΩ for 1 Mc/s sweep.

Power supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 140 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
18 in (46 cm)	20½ in (52 cm)	17½ in (45 cm)	62 lb (27 kg)

Accessories supplied

Coaxial Free Plug, Type N, for r.f. output socket.

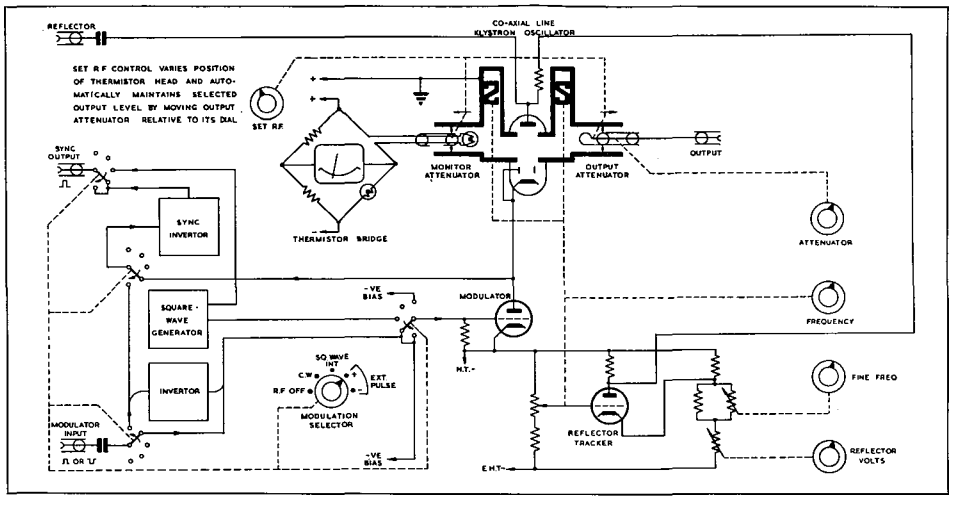
Three *Coaxial Free Plugs*, Type 83, for modulation in, sync out, and reflector sockets.

Accessories available

Output Lead, 50-ohm, TM 4726/12; 36 inches long; Type N plug both ends.

Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

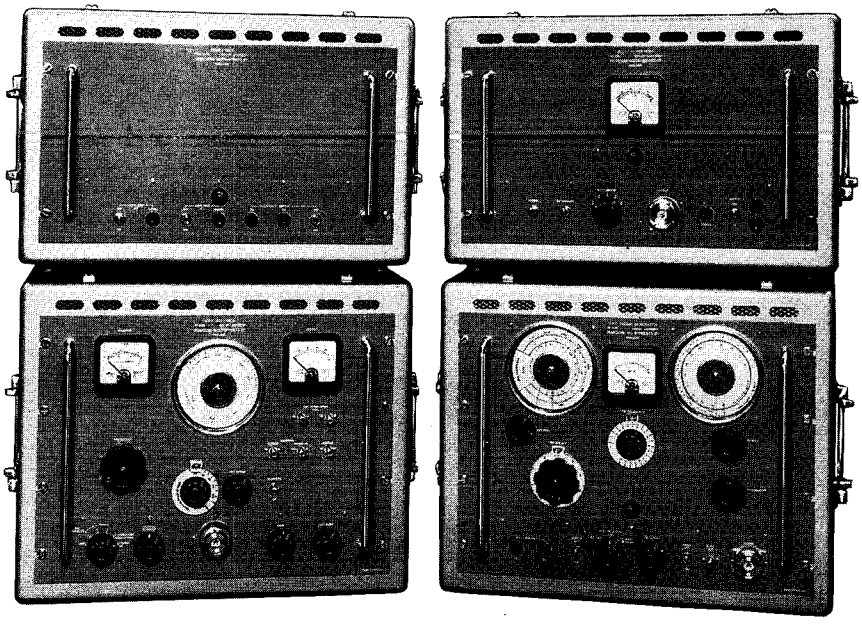


Functional Diagram of TF 1058

MARCONI INSTRUMENTS

U.H.F. Test Set

Type OA 1248



7588 Series

- **Frequency range: 1,700 to 2,300 Mc/s**
- **Comprises receiver, signal generator and noise generator**
- **For r.f. testing on multi-channel u.h.f. links**

THE OA 1248 provides comprehensive testing facilities for the r.f. stages of radio link equipment in the 1,700- to 2,300-Mc/s band. It comprises three separate instruments: U.H.F. Receiver Type TF 1234, U.H.F. Signal Generator Type TF 1235 (or TF 1235/1), and U.H.F. Noise Generator Type TF 1237. Each instrument is entirely self-contained and can also be supplied individually.

APPLICATIONS

Gain, frequency response, and other routine measurements can be made with the Signal Generator, which provides c.w., frequency-swept, and squarewave a.m. outputs. The a.m. output is particularly useful for driving slotted lines in such applications as impedance measurement and aerial matching; the frequency-swept output has a sweep width variable up to approximately ± 3 Mc/s on the TF 1235 and ± 10 Mc/s on the TF 1235/1, and can be used in conjunction with an oscilloscope for response analysis of amplifiers and filters.

The Receiver is suitable for such applications as comparative level measurements when used in conjunction with an external attenuator, or noise factor evaluation when used with the Noise Generator. It also provides frequency markers for calibrating the c.r.o. sweep display during response measurements.

BENCH OR RACK MOUNTING

The instruments are normally supplied in splash-proof transportable cases for bench operation, but are also available with dust covers for mounting in a standard 19-inch rack.

RECEIVER

The TF 1234 Receiver is a superhet employing a coaxial-line oscillator and a crystal mixer, and has an i.f. bandwidth of 20 Mc/s centred on 70 Mc/s. It provides a fixed marker at 70 Mc/s and a pair of movable markers, one on each side of the fixed one.

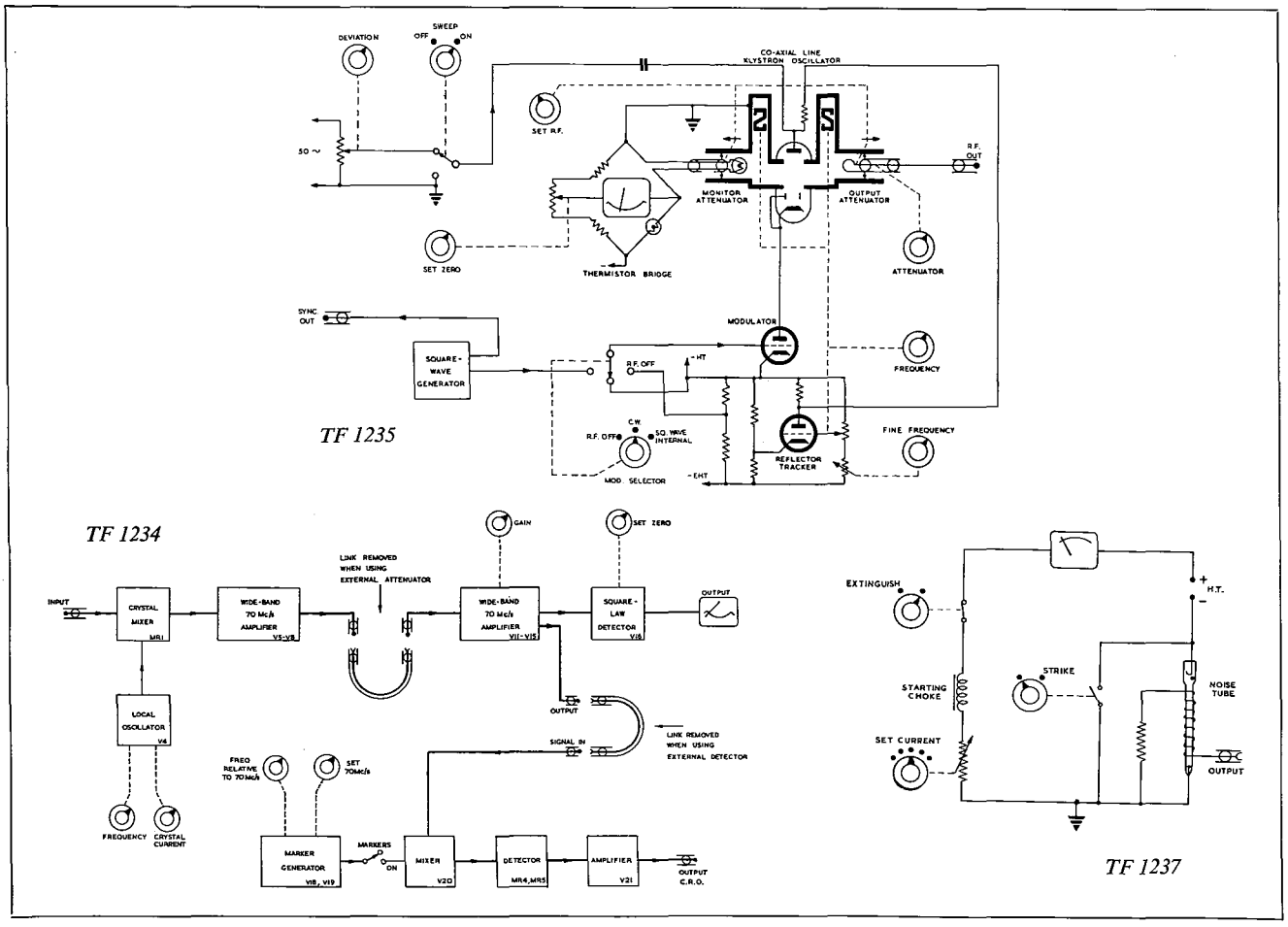
To allow connection to external apparatus, both the input and output of the i.f. amplifier are routed via movable coaxial links on the front panel. The Receiver has a square-law detector feeding its output meter—a useful feature for noise measurements.

SIGNAL GENERATOR

The TF 1235 (or 1235/1) Signal Generator employs a coaxial-line klystron oscillator. The r.f. output can be squarewave amplitude-modulated from a 1-kc/s internal source, or sinewave frequency-modulated at the mains supply frequency. In the TF 1235, a deviation of up to approximately ± 3 Mc/s is obtained by varying the klystron reflector voltage, while in the TF 1235/1 an electromechanical system is used, giving a deviation of up to at least ± 10 Mc/s.

NOISE GENERATOR

The TF 1237 Noise Generator produces a fixed-level noise signal derived from an argon-filled noise tube with helical output coupling. The Generator has a very stable output, and its change in v.s.w.r. from the 'struck' to the 'extinguished' condition is sufficiently small to obviate appreciable measurement errors.



Functional Diagrams of OA 1248

ABRIDGED SPECIFICATIONS

U.H.F. RECEIVER TYPE TF 1234

Frequency range
1,700 to 2,300 Mc/s.

Input impedance
50 ohms.

Intermediate frequency
70 Mc/s.

I.F. bandwidth
±5 Mc/s, flat to within ±0·5 dB; ±10 Mc/s at −6 dB.

I.F. gain
Variable up to approximately 110 dB.

Second detector
Square law.

Power supply
Separate Power Unit, Type TM 5477, will operate from 200 to 250 volts and 100 to 150 volts, 40 to 100 c/s.
Full specification available on request.

U.H.F. SIGNAL GENERATOR TYPES TF 1235 AND TF 1235/1

Frequency
RANGE: 1,700 to 2,300 Mc/s.
ACCURACY: ±1%.
STABILITY: After warm-up, drift is less than 0·001% in a 10-minute period.
HARMONIC CONTENT: Less than 2%.

Calibrated output
LEVEL: Variable from −165 to −30 dB relative to 1 watt.
ACCURACY: ±2 dB.
SOURCE IMPEDANCE: 50 ohms.

High output
Uncalibrated up to about 20 mW or above.

Sweep-frequency modulation
SWEEP FREQUENCY: Mains-supply frequency.
SWEEP WIDTH: TF 1235: Continuously variable up to approximately ±3 Mc/s. TF 1235/1: Continuously variable up to at least ±10 Mc/s.

Amplitude modulation
1,000-c/s squarewave.

Power supply
180 to 250 volts and 100 to 150 volts, 40 to 100 c/s.
Full specification available on request.

U.H.F. NOISE GENERATOR TYPE TF 1237

Frequency range
1,700 to 2,300 Mc/s.

Noise power output
Fixed level between +15 and +15·5 dB relative to thermal noise level.

Output impedance
50 ohms.

V.S.W.R.
Better than 1·25:1 with tube on, and 1·5:1 with tube extinguished.

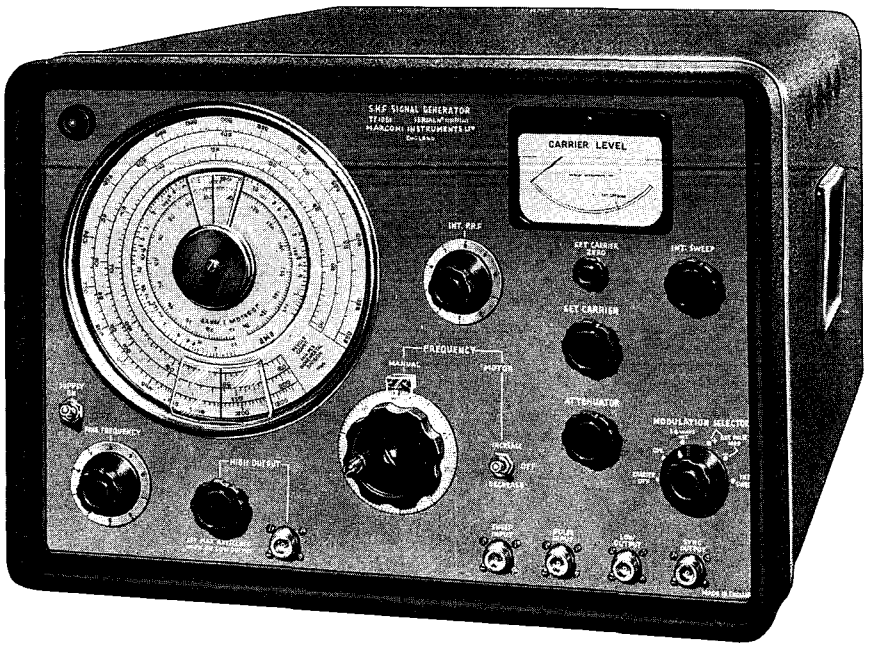
Power supply
200 to 250 volts and 100 to 150 volts, 40 to 100 c/s.
For full specification, see page 47.

Accessories supplied
Three *Mains Leads*, Type ZD 01914; 3-core, 6 ft long; one for each unit.
Three *Coaxial Free Connectors*, Marconi Type H1; one for each unit.
One *Coaxial Lead*, Type TM 5863; 50-ohm, 4 ft long; Marconi H1 connectors both ends.
Two *Coaxial Free Sockets*, P.O. No. 1; for Signal Generator and Receiver.
Two *Coaxial Links*, Type TM 5864; P.O. No. 1 socket both ends; for Receiver.
One *6-way Cable*, Type TM 5698, and one *12-way Cable*, Type TM 5699; each 6 ft long; to link Receiver and Power Unit.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

S.H.F. Signal Generator Type TF 1061



R7600

- **Frequency range: 3,500 to 6,000 Mc/s**
- **Motor-driven tuning**
- **Direct calibration for both frequency and output**
- **Thermistor bridge level monitor**
- **Squarewave and pulse a.m.; f.m. and 10-Mc/s sweep**

THE PRECISION PERFORMANCE of Marconi signal generators is now available up to 6,000 Mc/s with the introduction of the TF 1061. An important feature in the design of this new model is the use of motor-driven tuning, allowing rapid frequency changes to be made while retaining the advantage of low-geared high-discrimination control. Manual incremental tuning facilities enable small accurately known changes to be made, and there is an extra-fine control for exact frequency settings.

Power output is controlled by a piston attenuator over a range of 140 dB from a calibrated maximum of 0·1 mW into 50 ohms, that is, a source e.m.f. range of 0·15 μV to 0·14 volt. Both source e.m.f. and power to a 50-ohm load are directly indicated, and a temperature-compensated thermistor bridge is used as a level monitor. Uncalibrated high outputs are available at a separate outlet.

Modulation facilities comprise internal squarewave a.m. variable from 300 c/s to 12 kc/s, external pulse modulation, internal sweep up to 10 Mc/s, and external f.m.

APPLICATIONS

Stable frequency, accurate output and versatile modulation make the TF 1061 widely applicable to precision testing on microwave links, navigation systems, mobile radio and s.h.f. radar systems. Its incremental tuning and wide sweep modulation enable bandwidth and response measurements to be made with ease. And its high output with variable-frequency a.m. equip it as a driving source for slotted lines in impedance, v.s.w.r., and transmission-line characteristic measurements.

R.F. OSCILLATOR

The r.f. power is generated by a coaxial-line klystron oscillator in which the effective length of a short-circuited resonant line and the klystron reflector voltage are varied simultaneously by the tuning control to produce the required output frequency. The use of temperature-compensation, together with the inherent stability of this type of oscillator, has reduced the frequency drift to less than 0·001 % in a 10-minute period.

OUTPUT MONITORING

The oscillator feeds two piston attenuators, one of which delivers the output to a Type N coaxial socket, while the other feeds the power-sensitive element of the temperature-compensated thermistor-bridge level monitor. The monitor attenuator is adjusted by

the SET CARRIER control, which also determines the position of the cursor on the dial of the output attenuator; therefore, adjustment of the SET CARRIER control to compensate for the normal progressive changes in oscillator power that occur as the oscillator is tuned, automatically repositions the cursor of the output attenuator dial so that the new level is correctly indicated.

MODULATION

The internal squarewave modulation generator operates at a frequency variable from 300 c/s to 12 kc/s, its output being applied to a switching valve connected in the cathode circuit of the klystron oscillator. A synchronizing signal with a steep leading edge is available at a front-panel socket when the instrument is switched for internal modulation.

Positive- or negative-going modulation pulses may be fed to an input socket on the front panel at any repetition frequency between 50 c/s and 12 kc/s. R.F. output pulses from approximately 1 to 100 μsec long are obtainable, and the instrument also delivers positive-going synchronizing pulses with leading edges coincident with those of the externally derived modulating pulses.

A sinusoidal sweep of up to ±5 Mc/s at the supply frequency can be applied electromechanically to the r.f. oscillator, the output characteristic being maintained within ±0·25 dB throughout the sweep. External f.m. can be applied to the klystron reflector via an a.c. coupled front-panel socket.

PROVISIONAL SPECIFICATION

Frequency

RANGE: 3,500 to 6,000 Mc/s (8·6 to 5 cm) in one band.

MAIN TUNING CONTROL: The main tuning dial has a scale length of approximately 22 inches and is calibrated in both frequency and wavelength. The incremental dial has a uniform 0–100 calibration and makes 43 turns over the band; megacycles per division are indicated on the main tuning dial.

The tuning control can be motor driven or turned manually.

FREQUENCY ACCURACY: 1%.

FINE TUNING CONTROL: Dial has uniform 0–10 calibration with a total cover of up to 5 Mc/s, depending on carrier frequency.

FREQUENCY STABILITY: After warm-up, drift is less than 0·001% in a 10-minute period.

R.F. output

RANGE: Continuously variable from −180 to −40 dB relative to 1 watt; *i.e.* a source e.m.f. range of 0·15 μV to 140 mV.

Uncalibrated high outputs up to 10 mW are available at separate outlet.

OUTPUT ACCURACY: Incremental, 0·2 dB; overall, 2 dB.

SOURCE IMPEDANCE: 50 ohms nominal at calibrated outlet. V.S.W.R. better than 2:1.

STRAY RADIATION: Negligible: permits full use of lowest output.

Modulation

INTERNAL SQUAREWAVE A.M.: 300 c/s to 12 kc/s, continuously variable.

EXTERNAL PULSE MODULATION: Pulse length variable from approximately 1 μsec to 100 μsec. P.R.F. range: 50 c/s to 12 kc/s. Input requirements: positive or negative pulses of not less than 20 volts across 5 kΩ.

SYNC OUTPUT: Positive pulse with sharp leading edge coincident with that of the modulating pulse.

INTERNAL SWEEP MODULATION: Deviation variable up to ±5 Mc/s at mains supply frequency. Output flat to within ±0·25 dB.

EXTERNAL F.M.: Maximum deviation: approximately ±3 Mc/s. Modulation frequency range: 50 c/s to at least 20 kc/s.

Power Supply

180 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 140 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and Weight

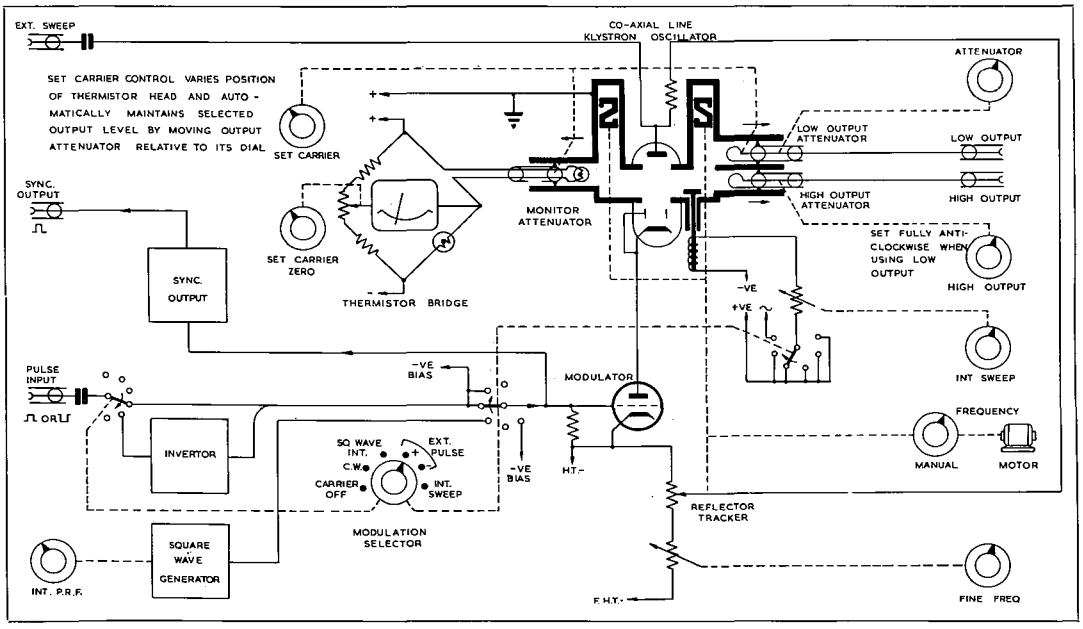
Height	*Width*	*Depth*	*Weight*
14 in	20½ in	14 in	62 lb
(35·5 cm)	(52 cm)	(35·5 cm)	(28 kg)

Accessories supplied

Coaxial Free Plug, Type N, for r.f. output socket.

Three *Coaxial Free Plugs*, Type 83, for modulation in, sync out, and reflector sockets.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

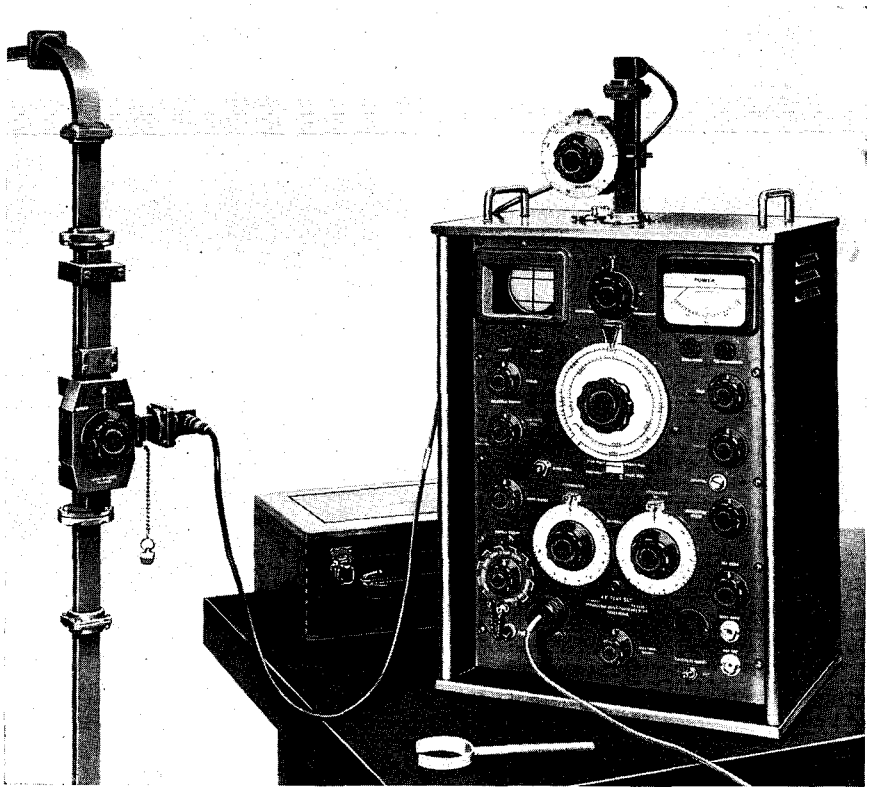


Functional Diagram of TF 1061

MARCONI INSTRUMENTS

Radar Test Set

Types TF 890A/1 and TF 890A/3



R4262/1 *Coupling into the main waveguide run of the equipment under test is by means of a directive feed assembly and flexible coaxial coupling.*

- **Frequency range: 8,500 to 9,680 Mc/s**
- **Complete test facilities for 3-cm radar installations**
- **Klystron signal generator**
- **Thermistor power monitor**
- **Spectrum analyser with c.r.t. display**
- **Directive-feed assembly for v.s.w.r. checks**

THE RADAR TEST SET Type TF 890A/1 combines in one compact unit, a cavity wavemeter covering the frequency range 8,500 to 9,680 Mc/s, a thermistor power monitor, a c.w. and f.m. klystron signal generator, and a spectrum analyser complete with c.r.t. display.

APPLICATIONS

The Test Set is a general-purpose instrument for checking the essential characteristics of the transmitters, receivers, and aerial systems of installations operating in the 3-cm band It enables overall performance and fault-finding checks to be made on complete radar equipments, including the investigation of transmitter frequency, power, and spectrum; aerial v.s.w.r.; receiver sensitivity, bandwidth, a.f.c. operation, and recovery time.

The TF 890A/3 is a special version of the instrument, primarily intended for testing airborne search radar equipment. The dial calibrations of the two waveguide attenuators on the Test Set are supplemented by individually drawn charts providing greater accuracy at 9,375 Mc/s or adjacent frequencies. Also recorded for the user is the combined attenuation, at the same frequency, of the flexible coupling and the directive feed assembly that link the Test Set to the radar. As a further measure, the power monitor is tested for optimum accuracy at 9,375 Mc/s.

BASIC ARRANGEMENT

The waveguide assembly incorporated in the Test Set has three arms; the 'thermistor arm" the 'klystron arm', and a short input or output 'coupling arm' leading to the top of the Test Set, where external connection can be made. These three arms meet at a three-position 120° Y-junction guide switch, which allows full coupling to be established between any two arms and provides attenuated coupling to the third via an aperture.

Mounted in turn along the thermistor arm are the cavity wavemeter, a crystal detector-mixer, a calibrated attenuator, and the thermistor load of the r.f. power monitoring circuit.

The klystron arm carries a second calibrated attenuator and the klystron oscillator. This arm serves as a signal generator for receiver testing and can provide a c.w. output or a signal frequency-modulated either by an internal low-frequency sawtooth or by an internal pulse waveform synchronized with the radar p.r.f.

When the Test Set is employed as a spectrum analyser, an internal double superheterodyne receiver is brought into use and has its output displayed on the c.r.t. The klystron, frequency modulated, functions as the first local oscillator of this receiver.

CRYSTAL DETECTOR-MIXER

Coupled to the thermistor arm, this acts in two ways. Firstly, it provides a detected output which is amplified and fed to the c.r.t.; this produces on the screen a curve, or a string of curves, showing the variation of output from the klystron as it is modulated by the sawtooth waveform. Secondly, the crystal acts as the mixer for the spectrum analyser receiver, which also has its output applied to the c.r.t.

A switch, mounted on the front panel, enables the detected output of the crystal to be disconnected, eliminating the curves due to klystron output from the c.r.t. display.

WAVEMETER

A cavity absorption wavemeter is coupled to the waveguide of the thermistor arm. The tuning control of the cavity has a four-range dial calibrated from 8,500 to 9,680 Mc/s. The wavemeter can be used to measure the frequency of signals from the internal klystron or an external source.

If it is tuned to within the sweep produced by the sawtooth frequency modulation of the klystron, the wavemeter indicates its resonant frequency on the c.r.t. trace by its effect on the detected klystron signal. This enables measurements to be made, either of the bandwidth, or of the interval between minima, when a receiver response, or a transmitter pulse spectrum, respectively, is displayed on the Test Set.

THERMISTOR LOAD

Complete with matching facilities, this terminates the thermistor arm. A bead thermistor, mounted in the waveguide, forms one arm of a bridge circuit which is unbalanced when the bead reacts to r.f. power; this causes a meter, mounted on the front panel, to indicate the power. The meter is calibrated from 0·1 to 2 mW, and the reference level of 1 mW is at half-scale.

ATTENUATORS (Internal)

One is placed so that it determines the level of r.f. power reaching the bead thermistor. The other enables the output from the klystron to be adjusted. Each attenuator comprises a resistive vane inserted longitudinally in the guide with its surfaces parallel to the electric field; the position of the resistive vane is varied by means of a front-panel control calibrated in decibels at 8,800 and 9,400 Mc/s.

KLYSTRON OSCILLATOR

This is mounted at the end of the klystron arm. By means of front-panel controls, the resonator can be mechanically tuned and the reflector voltage can be adjusted. A three-position switch allows the selection of a c.w. output, a slow frequency-sweep produced by sawtooth modulation, or a fast frequency-sweep produced by pulse modulation.

The sawtooth modulating voltage is obtained from a time-base circuit which simultaneously provides the horizontal deflection voltage for the c.r.t. The sweep duration of the time-base can be set between 33·3 and 100 msec, and the modulating voltage applied to the klystron reflector is adjustable in amplitude. The frequency-sweep of the klystron signal can be arranged to cover the passband of a radar receiver, and, by feeding the second-detector output of the receiver to the Test Set, the response can be amplified and viewed on the c.r.t.; a socket is provided on the front panel for this purpose.

The pulse modulating voltage is obtained from an auxiliary circuit which is connected to the time-base generator; the rectangular pulse which is produced has a leading edge variable in relation to the commencement of the time-base cycle. When the selector switch is set for this arrangement, the time-base frequency is automatically increased and can be synchronized with pulse signals having a recurrence frequency between 300 and 3,000 c/s. The frequency-sweep created by the leading edge of the rectangular pulse can be used to produce a dummy echo response in a radar receiver at a virtual range determined by the timing of the leading edge. This dummy echo can be used to check a.f.c. alignment and receiver recovery time.

SPECTRUM ANALYSER

The r.f. transmitter pulse under test is fed (attenuated) into the Test Set and mixes at the crystal with the output from the klystron; the latter is frequency-modulated by the sawtooth waveform, and the frequency sweep is set so that the klystron output mixes in turn with the various frequency-distributed components of the transmitter pulse to produce the first intermediate frequency of the receiver. Amplification takes place at the first intermediate frequency, 40 Mc/s; the signals are converted to the second i.f., 2 Mc/s; then, after detection, they are finally amplified and displayed on the c.r.t. The X-deflection voltage for the c.r.t. is provided by the time-base circuit which is also the source of the klystron frequency modulation, and therefore a synchronized picture of the form of the transmitter-pulse spectrum is obtained.

POWER SUPPLY

The power input arrangements can easily be adjusted at the front panel to suit differing public a.c. supplies, or 180 volts 500 c/s.

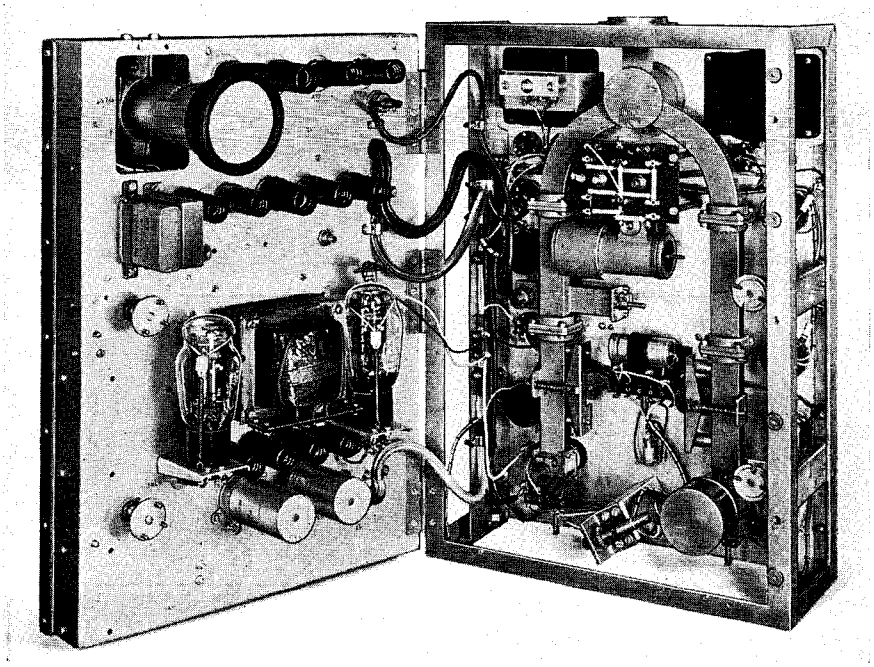
ACCESSORIES SUPPLIED

The accessories for use with the Test Set are supplied in a polished hardwood carrying case and include a calibrated variable waveguide attenuator, a directive feed assembly, and a flexible coupling consisting of a length of coaxial cable with two waveguide-coaxial transformers. These accessories enable connection to be made between the radar installation to be tested and the plain 'bolted' type coupling flange, of internal size 0·9×0·4 inch, situated at the top of the Test Set.

The calibrated variable attenuator has a range of at least 30 dB, and can be inserted in series with the Test Set when additional attenuation of the input or output signal is required.

The directive feed assembly normally supplied, Type TM 4129C, is fitted with Joint-Service 'screwed ring' couplings and is suitable for insertion in installations employing waveguide of internal size 0·9×0·4 inch. There are two other types of directive feed assembly, either of which can be supplied as an alternative if specified at the time of ordering: one, Type TM 4129D, is similar to Type TM 4129C but is fitted with American JAN Type UG-39/U square 'bolted' flanges; the other alternative, Type TM 4129B/1M, is similar to Type TM 4129C but fitted with Admiralty pin-locating couplings and suitable for insertion in installations employing waveguide of internal size 1·0×0·5 inch.

Each type of directive assembly, when inserted in the main waveguide run of a radar installation, can be switched so that



Interior view of TF 890A/1 with case removed and chassis hinged open. 3717/1

it passes to the Test Set a fraction of the forward power, or the return power, in the waveguide. The power diverted in this way has a level approximately 20 dB below the forward power, or approximately 10 dB below the return power, in the main guide. The values of these attenuations of the forward and return power are given more precisely by a chart included in the separate instruction manual supplied for the directive feed assembly. Signals from the Test Set are fed to the radar installation, through the directive feed assembly, with similar attenuation. The assembly may be inserted in waveguide runs carrying up to 50 watts mean forward power, and up to 12·5 watts mean return power.

The TF 890A/1 can be supplied with a detachable cover which, when in position for storage or transit, protects the front panel and controls; if required, this optional addition, which includes simple modifications necessary on the instrument, should be specified at the time of ordering.

SPECIFICATION for TF 890A/1

Frequency range

8,500 to 9,680 Mc/s (3·53 to 3·10 cm) except that, above 9,660 Mc/s, the upper frequency limit of signal-generator and spectrum-analyser operation is dependent upon the individual klystron fitted.

Directive feed assembly

FORWARD AND RETURN POWER COUPLING ATTENUATION: Nominally 20 and 10 dB respectively. An attenuation/frequency chart is supplied; accuracy, ±0·75 dB.

DIRECTIVITY, *when measuring return power:* 40 dB, with matching pillar adjusted at the operating frequency.

MAXIMUM MEAN POWER: 50 watts forward, 12·5 watts return.

Flexible coupling

Nominally 5 dB attenuation. Actual value, measured at 8,800 and 9,400 Mc/s to an accuracy of ±0·5 dB, marked on coupling.

Variable attenuators

RANGE: Not less than 30 dB; 1-dB divisions.

CALIBRATION ACCURACY:

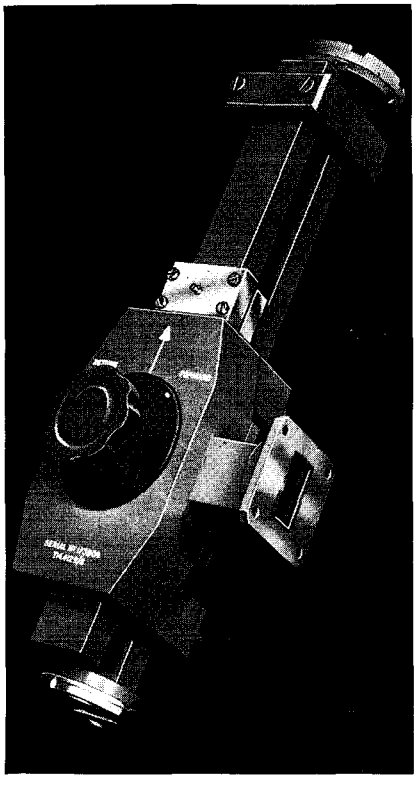
±1 dB at 8,800 and 9,400 Mc/s.

±2 dB at other frequencies.

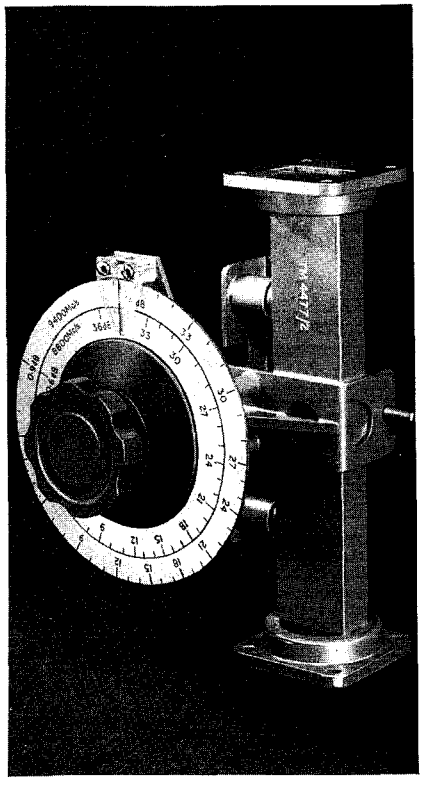
MAXIMUM DISSIPATION: 2 watts.

Waveguide switch aperture

Nominally 30 dB attenuation. An attenuation/frequency chart is supplied.



R4106/1



R5225

The accessories include three available types of directive-feed assembly, one of which is shown on the left, and a variable attenuator (right). These, together with the Test Set and its flexible coupling accessories, form a most versatile equipment for microwave testing.

Wavemeter

RANGE: 8,500 to 9,680 Mc/s; 5-Mc/s divisions.

CALIBRATION ACCURACY: ±3 Mc/s.

DISCRIMINATION: 2 Mc/s.

Power monitor

METER SCALE: 0·1 to 2 mW. 1 mW at mid-scale; also marked at −9, −6, −3, 0, and +3 dB relative to 1 mW.

ACCURACY OF THERMISTOR BRIDGE AND METER: ±0·5 dB at 9,100 Mc/s, at 1 mW; ±1 dB at other frequencies, at 1 mW.

RANGE, *at the waveguide coupling to Test Set:* +33 dB to −10 dB relative to 1 mW, *i.e.*, 2 watts to 0·1 mW.

FORWARD POWER RANGE, *using directive feed assembly and flexible coupling*: +47 dB to nominally +15 dB relative to 1 mW (50 watts to nominally 32 mW).

The lower limit depends upon the particular attenuation quoted for the directive feed assembly and flexible coupling supplied.

RETURN POWER RANGE, *using directive feed assembly and flexible coupling*: +41 dB to nominally +5 dB relative to 1 mW (12·5 watts to nominally 3 mW).

The lower limit depends upon the particular attenuation quoted for the directive feed assembly and flexible coupling supplied.

VOLTAGE STANDING-WAVE RATIO: The minimum forward power required for the measurement of a v.s.w.r. of 1·2 is 0·4 watt.

Signal generator

OUTPUT RANGE, *at waveguide coupling to Test Set:* +6 dB to −54 dB relative to 1 mW, assuming a klystron output of 4 mW; this is subject to variation with frequency, and the performance of individual klystrons.

OUTPUT RANGE, *using directive feed assembly at FORWARD, flexible coupling, and external variable attenuator:* Nominally −21 dB to −109 dB relative to 1 mW. This range is subject to the variations of the previous item, and also depends upon the particular attenuation quoted for the directive feed assembly and flexible coupling supplied.

TYPE OF OUTPUT:

(i) C.W.

(ii) Frequency modulated by sawtooth waveform. Sweep duration 33·3 to 100 msec.

(iii) Frequency modulated by a pulse waveform which can be synchronized from 300 to 3,000 c/s. Sweep

rate preset at approximately 30 Mc/s per μsec. The pulse has a delay adjustable from not greater than 1 μsec to not less than 60 μsec.

Spectrum analyser

I.F. CIRCUITS: First i.f., 40 Mc/s. Second i.f., 2 Mc/s. Overall bandwidth, approximately 50 kc/s at −3 dB.

SWEEP DURATION: 33·3 to 100 msec.

PULSE WIDTH RANGE: 0·1 to 2·0 μsec.

SENSITIVITY: A c.w. signal of −10 dB relative to 1 mW, at the waveguide coupling to the Test Set, produces a deflection of approximately 1 inch on the c.r.t.

OSCILLOSCOPE: The c.r.t. and its amplifier may be used to display a radar receiver i.f. response and other responses derived in conjunction with the type (ii) output of the Signal Generator.

Dimensions and weight

TEST SET:

Height	*Width*	*Depth*	*Weight*
21½ in (55 cm)	16 in (41 cm)	10½ in (27 cm)	60 lb (27·5 kg)

ACCESSORIES IN CASE:

Height	*Width*	*Depth*	*Weight*
5½ in (14 cm)	13 in (33 cm)	10½ in (27 cm)	15 lb (7 kg)

Power supply

110, 115, 180, 210, 230, or 250 volts, ±7·5%; 45 to 650 c/s.

Accessories supplied

Two *Coaxial Free Plugs*, F & E, Type JP1-250-CCT, for 2nd detector and sync input sockets.

Accessory Case, TM 4142A, containing: *Mains Lead*, TM 2560AR; *Variable Attenuator*, TM 4477/2; two *Waveguide-Coaxial Transformers*, TM 4725/1; *Coaxial Lead*, TM 4650/1; set of *Shims and Bolts*; and one *Directive Feed Assembly*, TM 4129C, with fittings and spanner.

Accessories available

Directive Feed Assembly, TM 4129D or TM 4129B/1M, described on an earlier page; either of these can be supplied in place of standard version TM 4129C if specified when ordering.

Detachable Front-Panel Cover, Type 265/TF 890A.

SPECIFICATION for TF 890A/3

The TF 890A/3 differs from the TF 890A/1 in the following respects:

Directive feed assembly and flexible coupling

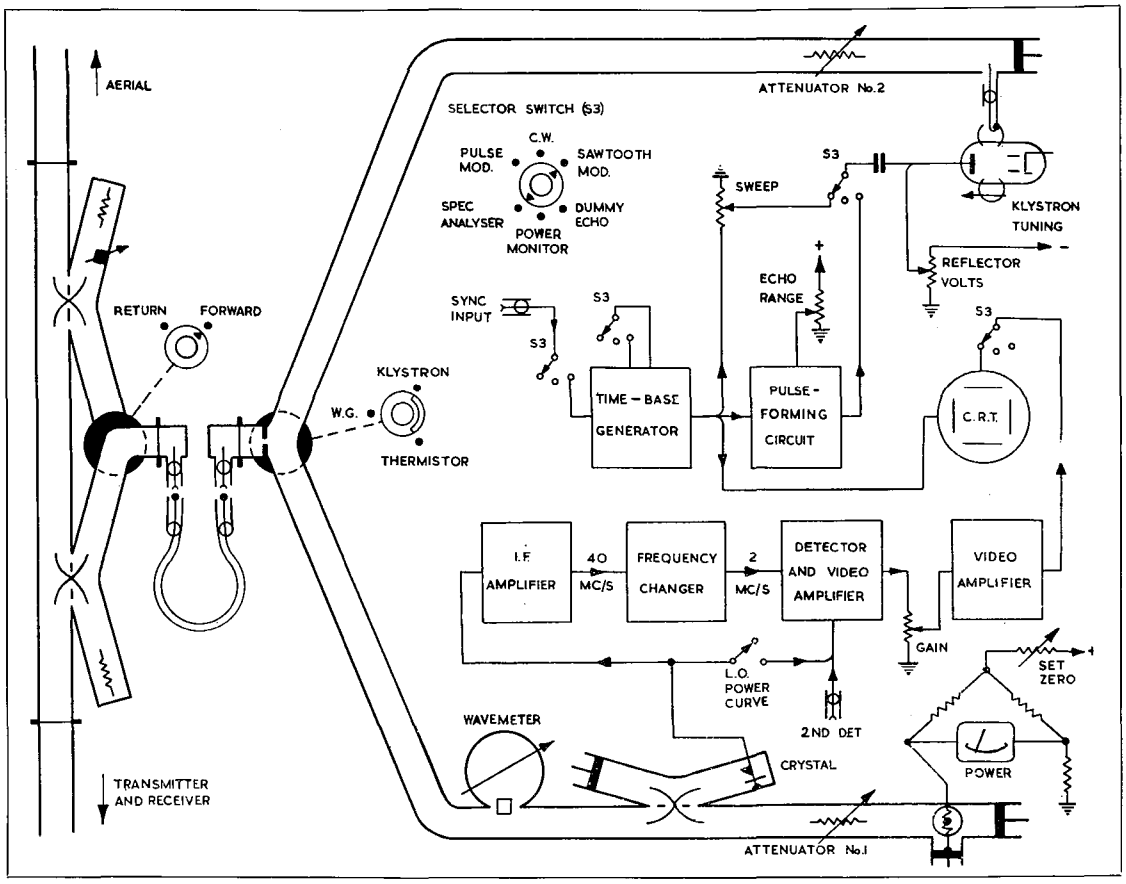
The values of the combined directive coupling attenuation and flexible coupler attenuation, measured at 9,375 Mc/s for forward and return power coupling, are recorded for the user; accuracy, ±0·5 dB.

Variable attenuators

CALIBRATION ACCURACY: Charts provided give the two attenuators in the Test Set an accuracy of ±1 dB at 9,375 Mc/s.

Power monitor

ACCURACY OF THERMISTOR BRIDGE AND METER: ±0·5 dB at 9,375 Mc/s, at 1 mW.



Functional Diagram of TF 890A/1

Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Telegraph Test Generator Type TF 1167

7587

Generator Unit

- **Carrier frequencies: 3·1, 6·2, and 9·3 Mc/s**
- **On/off, f.s.k. and diplex keying up to 500 bauds**
- **F.S.K. shift up to 1,200 c/s**
- **For testing and setting up h.f. telegraph receivers**

THIS GENERATOR delivers high-quality keyed r.f. signals at stable carrier frequencies of 3·1, 6·2, and 9·3 Mc/s. On/off, frequency-shift, or frequency-shift diplex (twinplex) keying can be selected, or the carrier can be sinewave amplitude modulated. The equipment comprises a generator unit and a power unit, each suitable for rack mounting. It has the Admiralty Reference No. AP 1035304/1 and the Air Ministry Reference No. 10S/16749.

APPLICATIONS

The instrument is primarily designed for the overall testing of h.f. telegraph receivers under a wide range of keying conditions: it can, for example, be used with a telegraph distortion measuring set or the Marconi Short-Element Fault Counter TF 1263 to assess the extent to which a receiver distorts teleprinter characters or to determine the minimum input required to meet a specified error rate; it enables a functional check to be made of the recording stages and a.f.c. circuits; and, by utilizing the sinewave a.m. output with 100% modulation, it facilitates accurate setting of the receiver signal bias control. For h.f. transmitters using the conventional 3·1-Mc/s input frequency, the Generator provides a convenient telegraph test drive in such applications as checking the transmitter radiated bandwidth.

VERSATILE KEYING

Either an internal or external keying signal can be employed. The internal signal is in the form of a squarewave at the mains supply frequency and having a keying speed of 100 bauds in the case of 50-c/s supplies. External electronic keying can be applied from an electronic test sender providing squarewave or sinewave, single- or double-current signals; alternatively, external mechanical keying can be employed by making direct connection to the contacts of a hand key, relay, 5-unit sending head, or Wheatstone morse transmitter. The maximum external keying speed is 500 bauds.

In the case of f.s.k. diplex working, both channels can be keyed externally, or one internally and one externally; the two keying signals may be combined according to either the Code 1 or Code 2 system.

When using single-channel f.s.k., a selective fading effect can be simulated by means of a panel control for reducing the level of the lower-frequency signal. Frequency shift is directly indicated and continuously variable up to 1,200 c/s for both simple and diplex f.s.k.

SPECIFICATION

Carrier frequencies: 3·1, 6·2, and 9·3 Mc/s.

Frequency stability: Better than ±0·001% for mains variation up to ±10% over an ambient temperature range of 20° to 50°C.

Output

LEVEL: Source e.m.f. variable from 2 μV to 200 mV; adjustment is made in steps of 20 dB and 1 dB, and by means of a continuous interpolating control.
ACCURACY: ±1 dB ±0·2 μV.
IMPEDANCE: Nominally 75 ohms.

C.W. on/off keying

SPACE SUPPRESSION: Approximately 60 dB at 3·1 Mc/s, 50 dB at 6·2 Mc/s, and 45 dB at 9·3 Mc/s.

Frequency-shift keying

SHIFT: Continuously variable up to 1,200 c/s for simple f.s.k. or 1,200 c/s overall for diplex keying. Control calibrated every 50 c/s.
SPURIOUS A.M.: Less than 12% modulation depth.

Keying speed: External, up to 500 bauds. Internal, baud speed equal to twice mains supply frequency.

Telegraph bias distortion: Less than 5%.

External sinewave a.m.: Can be applied at any depth up to 100%.

Power supply: 200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s, 80 watts. Models supplied ready for immediate 100- to 150-volt use if specified at the time of ordering.

Dimensions and weight

GENERATOR UNIT:

Height	*Width*	*Depth*	*Weight*
10½ in (27 cm)	19 in (48·5 cm)	12½ in (32 cm)	23 lb (10·5 kg)

POWER UNIT:

10½ in (27 cm)	19 in (48·5 cm)	12½ in (32 cm)	32 lb (14·5 kg)

Accessories supplied

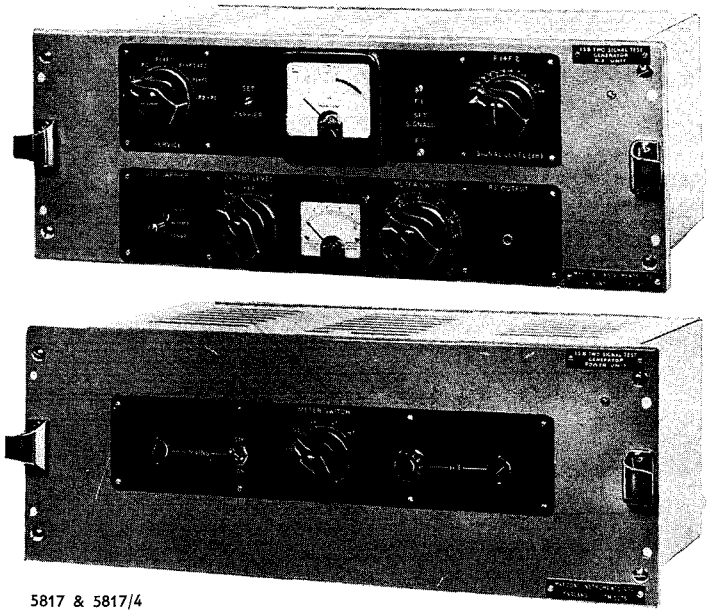
Coaxial Free Socket, Type Z 540155; for r.f. output plug.
Three *Telephone Plugs*, P.O. Type 316; for keying and modulation jacks.
Mains Lead, TM 2560 AR; 3-core, 6 ft.
Two *Power Unit/R.F. Unit Interconnecting Leads*; one 8-way, MX 2154C/32A; one 6-way, MX 2154C/32B.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

I.S.B. Two-Signal Test Generator

Type TF 1143



5817 & 5817/4

- **3·1-Mc/s pilot carrier with upper-sideband tones of 1,100 and 1,775 c/s**
- **For two-tone testing on s.s.b. or i.s.b. transmitters**
- **Crystal controlled frequencies**
- **Output monitored and variable relative to ¼ and 1 watt p.e.p.**

SPECIALLY DESIGNED for two-tone testing h.f. single-sideband and independent-sideband transmitters, the TF 1143 provides two equal-amplitude sideband signals together with a pilot carrier at the standard i.f. of 3·1 Mc/s.

The sideband frequencies are 3·1011 and 3·101775 Mc/s; their combined peak envelope power is variable in 2-dB steps from −16 to +4 dB relative to reference levels of ¼ watt and 1 watt into 75 ohms. In addition to these two signals, a third output component is available at the carrier frequency of 3·1 Mc/s; its level is independently variable between − 16 and −26 dB relative to either the ¼-watt or 1-watt p.e.p.

This Generator has the Admiralty Reference No. AP.1034804/1.

APPLICATIONS

Transmitter linearity — a major factor in determining the quality of an independent-sideband link—can be assessed in terms of intermodulation distortion with the aid of this Test Generator. It simulates the output of a 3·1-Mc/s i.s.b. drive unit under two-tone test conditions, and hence enables the transmitter to be checked or aligned in the absence of a drive unit. Distortion introduced by the transmitter may be conveniently measured with the Marconi H.F. Spectrum Analyser, OA 1094 Series. The provision of a pilot-carrier signal facilitates the measurement of carrier compression in the transmitter and allows investigation of the effect of the carrier on intermodulation distortion.

CRYSTAL OSCILLATORS

The signal components are derived from three similar crystal oscillators and are combined in resistance-bridge hybrid networks. The three outputs can be selected singly, in pairs, or all together by means of a service switch; the peak envelope power of the composite signal, or the level of the individual sideband and carrier components, can be checked on a panel meter. A second switched meter allows feed currents and the h.t. voltage to be checked without interruption of output.

RACK OR BENCH MOUNTING

The Generator comprises an r.f. unit and power unit designed for 19-inch rack mounting, but supplied complete with cases for bench use.

SPECIFICATION

Output frequencies

3·1011 Mc/s and 3·101775 Mc/s, representing sideband frequencies of 1,100 c/s and 1,775 c/s respectively; also 3·1 Mc/s, representing the pilot carrier.

Frequency stability

±0·003% for mains variation up to ±6% and ambient temperature variation up to ±15°C.

Output level

The peak envelope power of the combined 3·1011- and 3·101775-Mc/s components is variable in 2-dB steps from −16 to +4 dB relative to reference levels of ¼ watt and 1 watt in 75 ohms. Level indication is by calibrated attenuator and panel meter. The level of the 3·1-Mc/s signal is continuously adjustable from −16 to −26 dB relative to either of the p.e.p. reference levels.

Intermodulation distortion

The level of any 3rd- or 5th-order intermodulation product, relative to either of the two equal-level sideband signals, is less than −50 dB on the ¼-watt range and less than −40 dB on the 1-watt range.

Power supply

200 to 250 volts, or, if specially ordered, 100 to 125 volts; 50 to 60 c/s; 150 watts.

Dimensions and weight

	Height	*Width*	*Depth*	*Weight*
R.F. UNIT:				
	7 in (18 cm)	19 in (49 cm)	11 in (29 cm)	20 lb (9 kg)
POWER UNIT:				
	7 in (18 cm)	19 in (49 cm)	11 in (28 cm)	36 lb (15 kg)

Accessories supplied

Coaxial Free Socket, Type P.O. No. 5; for r.f. output plug.

Mains Lead, TM 2560BH; 3-core, 6 feet long.

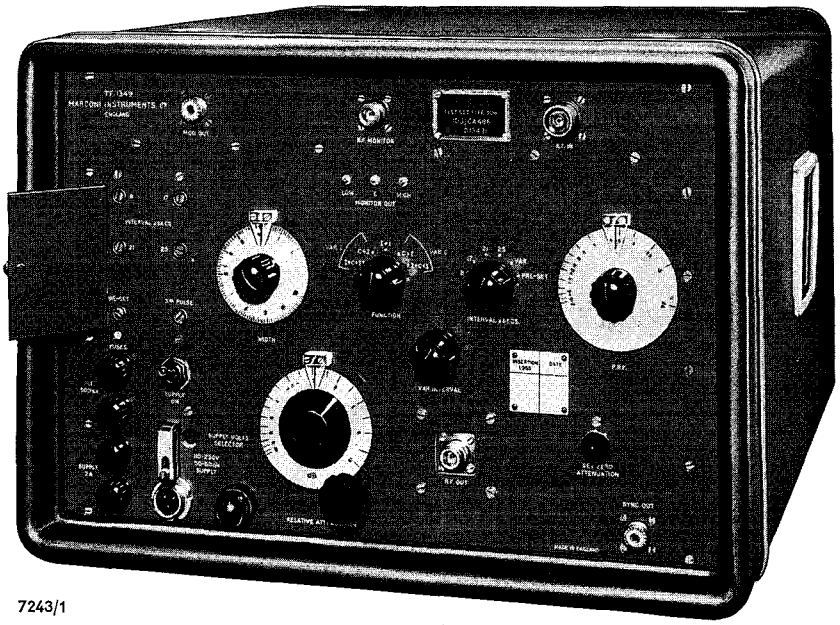
Interconnecting Lead, 8-way; links power unit and r.f. unit.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Secondary Surveillance Radar Test Set

Type TF 1349



7243/1

- **Used with signal generator for transponder testing**
- **Combined pulse generator and differential r.f. attenuator**
- **Pulse coding to Civil Modes A, B, C and D**
- **Double or triple pulses**

THE TF 1349 is a pulse generator and differential attenuator which has been developed in conjunction with the Ministry of Aviation (Civil) as part of their Secondary Surveillance Radar programme. When operated with the U.H.F. Signal Generator Type TF 1060/2, it is suitable for testing the receiver section of a transponder, and in particular the side-lobe suppression characteristics as standardized by I.C.A.O.

The Test Set generates video pulse trains, consisting of two or three pulses, at a repetition frequency which is continuously variable in one range from 250 to 2,000 per second. Pulse widths can be varied from 0·5 to 2 μsec. The spacing can be selected by a switch, either to give preset intervals corresponding to Civil Modes A, B, C and D, or continuously variable up to 30 μsec. These pulse trains modulate the signal generator, which is set to the required r.f. frequency, and the resultant pulse-modulated r.f. signal is fed back to the Test Set and passed through a differential attenuator. This enables the relative amplitude of one pulse in a double-pulse train, or one or two pulses in a treble-pulse train to be varied by plus or minus 10 dB with respect to the other. The variable pulses can be either the control or the interrogate pulses, as determined by a selector switch.

The resultant r.f. signal obtained at the output socket of the Test Set can, if required, be monitored, by feeding the output into the built-in crystal detector with its following video amplifier. The output from the amplifier can be observed with a suitable oscilloscope such as the Marconi Type TF 1330. A trigger pulse for the oscilloscope is provided at a sync output socket and occurs 5 μsec before the first r.f. pulse.

The instrument is mains operated from a 110- to 120- or 200- to 250-volt 50-c/s single-phase supply, and has been designed so that the signal generator can be mounted above the Test Set, thus forming a compact unit.

PROVISIONAL SPECIFICATION

Modulating pulses

WIDTH: 0·5 to 2 μsec, continuously variable.

RISE AND DECAY TIMES: Not greater than 0·1 μsec.

AMPLITUDE: Between 40 and 50 volts, positive-going, into 10 kΩ.

PULSE TRAINS: Switch-selected groups:

Control and double interrogate pulses.
Control and single interrogate pulses.
Double interrogate pulses.

SPACING: *Interval between datum pulse and 2nd pulse:* Switch selected: 8, 17, 21, 25 μsec, and preset within range 5 to 30 μsec. Continuously variable: from 5 to 30 μsec.

Position of 3rd pulse: Preset within range −5 to +15 μsec relative to datum pulse.

REPETITION FREQUENCY: 250 to 2,000 pulse trains per sec, continuously variable.

Differential attenuator

ATTENUATION: *Path A:* continuously variable up to ±10 dB relative to path B.

Path B: fixed at approximately 30 dB.

CODING: Individual control (C) and interrogate (I) pulses are automatically routed via paths A or B, depending on the position of the Function selector, as follows:

Function Selector	*Pulse Train*	*Atten. Path*
1	ICI	ABA
2	CI	BA
3	II	BB
4	CI	AB
5	ICI	BAB

PASS-BAND: Approximately 35 Mc/s wide, centred on 1,030 Mc/s.

IMPEDANCE: 50 ohms.

Sync pulses

TIMING: 5 μsec ±0·1 μsec before datum modulating pulse.

WIDTH: Between 1 and 5 μsec.

RISE TIME: Not greater than 0·25 μsec.

AMPLITUDE: Not less than 5 volts, positive going, across 10 kΩ.

R.F. monitor

COMPRISES: Crystal detector and amplifier, with outputs connected to front-panel test points.

OUTPUTS: (*a*) Low-level wide-band; direct from crystal detector.

(*b*) High-level; from amplifier. Provides not less than 400 mV across 1·5 MΩ with 50 μμF in shunt when r.f. input to monitor is 2·5 mV.

General

POWER SUPPLY: 110 to 120 volts and 200 to 250 volts, 50 to 60 c/s.

WORKING TEMPERATURE: 10°C to 35°C ambient.

DIMENSIONS:	*Height*	*Width*	*Depth*
	13½ in (34 cm)	20 in (51 cm)	22½ in (57 cm)

Accessories supplied

Mains Lead; 6 ft long; fitted with Plessey Mk IV socket to mate with front-panel inlet.

Video Coaxial Lead; 5 ft long; Type 83 plug both ends. For modulation-pulse output.

Video Coaxial Lead; 5 ft long; Type 83 plug to AP 1400 socket. For sync output.

R.F. Coaxial Lead; 4 ft long; Type N plug to Type N socket. For r.f. input.

R.F. Coaxial Lead; 4 ft long; Type N plug both ends. For r.f. output.

R.F. Attenuator; 50 ohms, 9 dB ±0·25 dB; Type N plug to Type N socket.

R.F. Attenuator; 50 ohms, 3 dB ±0·25 dB; Type N plug to Type N socket.

Coaxial Adaptor; Type N socket to Type C plug.

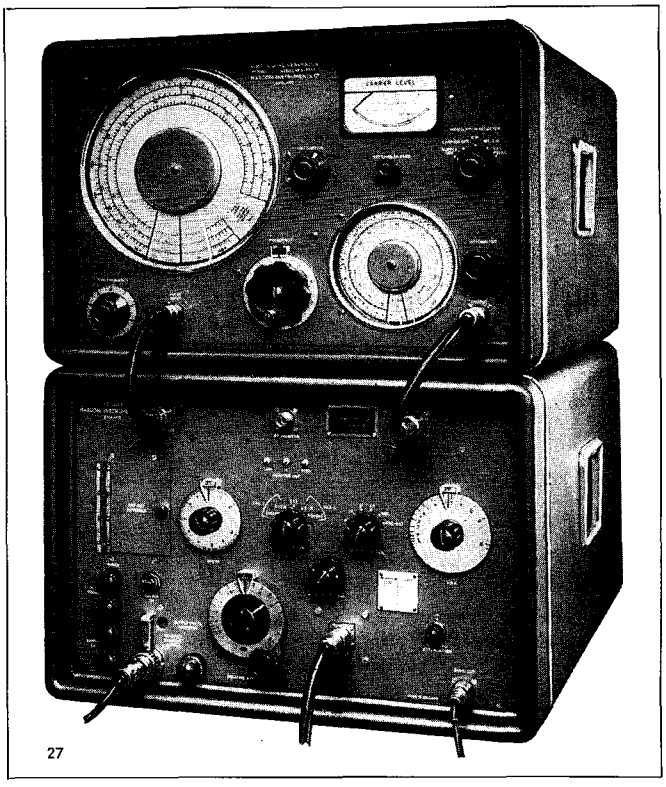
All accessories are stowed in a recess in the rear of the case.

Spares

Two *Mains Fuses* and two *H.T. Fuses;* stowed with accessories.

Marconi Instruments Ltd.

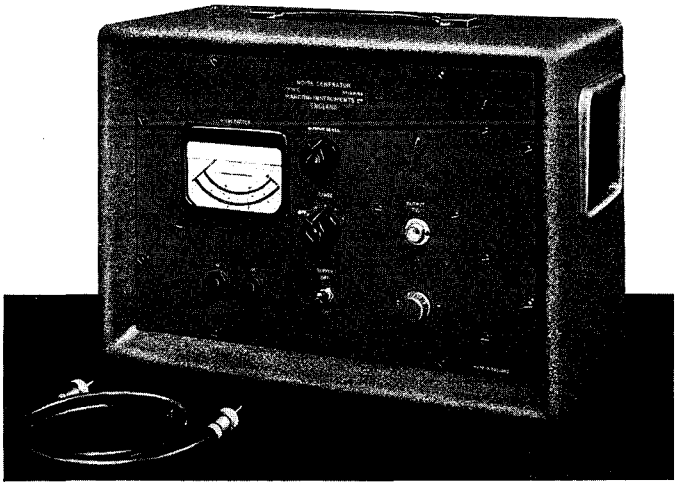
St. Albans, Hertfordshire, England



The TF 1349 with Signal Generator TF 1060/2. A self-contained assembly providing double or triple r.f. pulse trains coded for secondary radar transponder testing.

MARCONI INSTRUMENTS

Noise Generator Type TF 1106 (Series)



R4495

- **Frequency range: 1 to 200 Mc/s**
- **Direct noise factor calibration**
- **52 or 71 ohms output impedance**

THE MARCONI TF 1106 series of Noise Generators provide standard noise outputs in the range 1 to 200 Mc/s.

The series of four instruments offers a choice of mains input circuit to suit either 100- to 125-volt or 200- to 250-volt a.c. supplies and a choice of either a 52- or 71-ohm output impedance.

APPLICATIONS

These Generators are used for determining the noise factor of a.m. and f.m. receivers working in the h.f. or v.h.f. band.

The noise factor of a receiver may be regarded as a measure of the effectiveness of design of the input stage or stages. It can be obtained by dividing the signal-to-noise ratio at the receiver input by the signal-to-noise ratio at its output and is expressed either as a simple factor F or in decibels as $10 \log_{10} F$ dB. Marconi TF 1106 Noise Generators are directly calibrated in noise factor and reduce noise-factor evaluation to a simple routine operation.

The measurement is carried out by first checking the output level of the receiver due to internal noise when no input is applied, then injecting a signal from the Noise Generator of sufficient amplitude to double the output from the receiver. The meter reading and range setting of the Noise Generator then give the noise factor of the receiver.

NOISE DIODE

The noise energy is generated by a noise diode having a tungsten filament. The heating current is variable to control the emission of the valve and is supplied via a separate step-down transformer. The diode anode is maintained at a sufficiently high positive potential with respect to the filament to ensure that all the electrons liberated from the filament reach the anode.

ADJUSTABLE OUTPUT

In operation, the diode acts as a stable source of noise energy whose magnitude is directly proportional to the anode current. The latter is monitored by a moving-coil meter and is adjusted by means of the OUTPUT LEVEL control — a continuously variable resistor in series with the primary of the filament transformer. Coarse variation of diode anode current is achieved by altering the setting of the RANGE switch; this not only changes the value of resistance in series with the secondary of the filament transformer but also changes meter sensitivity.

SPECIFICATION

Noise output calibration

0 to 30 in four ranges; 0 to 5, 0 to 10, 0 to 15, and 0 to 30. Maximum permissible output dependent on output impedance—see table below.

Accuracy

±0·5 dB.

Frequency range

1 to 200 Mc/s.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12 in (30·5 cm)	17 in (43 cm)	8½ in (21·5 cm)	21 lb (9·5 kg)

Accessories supplied

Coaxial Free Plug, F & E Type JP1-250-CCT, for noise output socket.

Accessories available

Output Lead, 70-ohm, TM 4726/6 for TF 1106 or /1; 60 inches long; F & E plugs both ends.

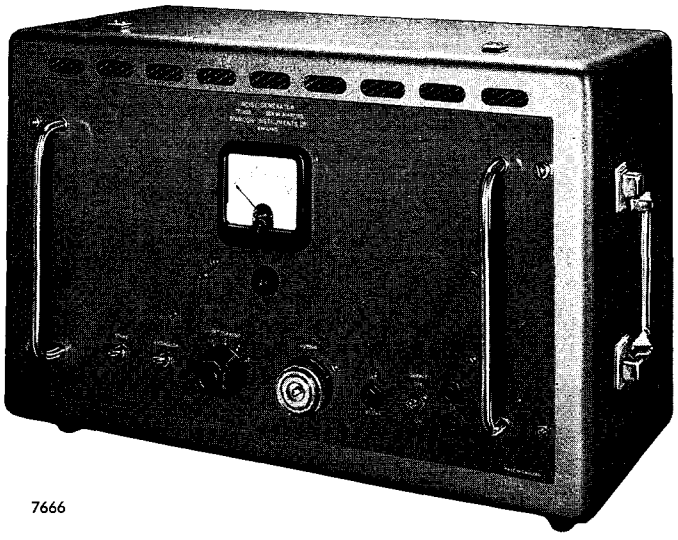
Output Lead, 52-ohm, TM 4726/11 for TF 1106/2 or /3; 36 inches long; F & E plugs both ends.

Model	Output Impedance	Maximum Noise Output	Power Supply
TF 1106	71 ohms	28	200 to 250 volts, 45 to 65 c/s
TF 1106/1	71 ohms	28	100 to 125 volts, 45 to 65 c/s
TF 1106/2	52 ohms	20	200 to 250 volts, 45 to 65 c/s
TF 1106/3	52 ohms	20	100 to 125 volts, 45 to 65 c/s

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

U.H.F. Noise Generator Type TF 1237



7666

- **Frequency range: 1,700 to 2,300 Mc/s**
- **Fixed-level output for noise factor measurement between 0 and 20 dB**
- **50 ohms output impedance**

THE TF 1237 generates a fixed-level u.h.f. noise signal at a source impedance of 50 ohms.

APPLICATIONS

It is designed for noise factor measurement on amplifiers and receivers for multi-channel links and other systems operating in the band 1,700 to 2,300 Mc/s.

The method employed for measuring the noise factor of an equipment entails comparison of its output noise power, due to thermal-input and internal noise, with that produced when a known additional input noise is applied from the Noise Generator; noise factor is then evaluated by means of a simple calculation. This system can be used to measure noise factors from 0 to about 20 dB.

For comparing the noise power outputs, any suitable indicator with a square-law detector may be used. Specially designed for this purpose, as well as for many other tests on 1,700- to 2,300-Mc/s link equipment, is the Marconi U.H.F. Receiver TF 1234, described on page 34.

BENCH OR RACK MOUNTING

The TF 1237 is normally supplied in a splash-proof transportable case for bench operation, but is also available with a dust-cover for mounting in a standard 19-inch rack.

DISCHARGE TUBE

The noise source comprises an argon-filled discharge tube having a long, narrow-bore, ionization chamber surrounded by a coaxial-line assembly. Noise energy generated within the tube is induced in a nickel-plated helix which surrounds the tube and forms the centre conductor of the line.

One end of the coaxial line is terminated in a 50-ohm load which acts as the source impedance when the tube is extinguished; the other end of the line feeds the Marconi u.h.f. pattern output connector.

CONSTANT OUTPUT

The tube current is monitored by a panel meter and can be adjusted by means of a series stepped control. Standard noise output level is obtained with this control set to produce a meter deflection anywhere between maximum and minimum calibration marks.

The noise output is not appreciably affected by the ambient temperature. The effect of mains variation is negligible as long as the tube discharge current is maintained above the minimum value.

SPECIFICATION

Noise output

POWER: Fixed between the limits 15 and 15·5 dB relative to thermal noise level.

STABILITY: Variation of noise output with frequency, and with normal ambient temperature and mains voltage changes, does not exceed ±0·2 dB.

SOURCE IMPEDANCE: 50 ohms.

V.S.W.R.: Better than 1·25:1 with the noise tube operating. Better than 1·5:1 with the tube extinguished.

Frequency range

1,700 to 2,300 Mc/s.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s. Models supplied ready for immediate 100- to 150-volt use if specified at the time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
14 in	21 in	12 in	40 lb
(35·5 cm)	(53·5 cm)	(30·5 cm)	(18 kg)

Accessories supplied

Coaxial Free Connector, Marconi u.h.f. pattern, with locating ring and socket/plug adaptor pin.

Mains Lead, Type ZD 01914; 3-core; 6 ft long.

Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Low-Frequency Generator Type TF 1382

7423

- **Frequency range; 1 cycle in 5 minutes to 1 kc/s**
- **Waveforms; Sine, Square, and Ramp**
- **Separate reference or trigger output at 0°, 90° and 180°**
- **Internal change-over relay at lower frequencies**
- **Single-shot operation for timer applications**

THIS GENERATOR delivers any of three switch-selected waveforms—sine, square, or ramp—and is continuously variable over the frequency range 0·0033 c/s to 1 kc/s. This frequency range is covered in five overlapping bands. A built-in relay with heavy-duty change-over contacts wired to the front panel is operated by the squarewave output at frequencies of up to 1 c/s; this enables external devices to be switched on and off in a cyclic manner at the operating frequency.

The usefulness of this instrument as a timer is greatly increased by the provision of facilities for 'single-shot' operation. The timing cycle is initiated by a switch on the front panel, by an externally-generated pulse or by external shorting contacts.

APPLICATIONS

In the medical field, the TF 1382 is particularly suited to testing the amplifiers and pen recorders of e.e.g.'s and e.c.g.'s. It may be used for the cyclic control of electro-stimulation equipment, or as an accurate general-purpose treatment timer.

Industrial applications include: the precise control of variable-speed motors; its use as a timer for multiple camera exposures; or, in conjunction with a suitable controller, the provision of linear rates of change in temperature, movement, etc.

Typical laboratory uses are: testing servo systems and computers; life testing of relays and circuit breakers; overload testing of capacitors. It can be used in nuclear reactor and flight simulators; as an external time-base for v.l.f. oscilloscopes, or as a drive for x-y plotting systems; and in conjunction with a reactance modulator, for sweeping filter-network responses.

WAVEFORM SYNTHESIS

The TF 1382 employs an unconventional method of sinewave generation in that the waveform is electronically synthesized.

The basic waveform is a sawtooth or ramp, which is available as one of the output waveforms. Rectification of the sawtooth produces a triangular waveshape (not available as an output). The triangular wave is then shaped by a circuit using zener diodes which modify the waveform to produce a sinewave. The squarewave output is derived from the triangular waveform via a bistable switching circuit.

SPECIFICATION

Ranges

FREQUENCY: 0·0033 c/s to 1 kc/s in five bands.

TIME: 5 minutes to 0·001 second per cycle.

Frequency accuracy

±5%.

Frequency stability

±2·5% including normal mains fluctuations.

Waveforms

Sine, square and ramp.

DISTORTION: Sine: harmonic distortion less than 5%. Square: no overshoot; 50/50 mark-space ratio within 5%. Ramp: linear to within 5%.

OUTPUT LEVEL: Continuously adjustable from 0 to 15 volts peak-to-peak, into a 2·5-kΩ load.

OUTPUT STABILITY: Constant within ±5% over entire range.

Switching facility

Heavy-duty contacts of internal change-over relay energized by squarewave up to 1 c/s are wired to three front-panel terminals for control of external equipment.

Markers

Phase markers for reference or triggering purposes are available at 0° and 180° from a front-panel outlet. These markers have a fixed amplitude of approximately 10 volts across a 50-kΩ load. A second outlet provides 90° markers having a similar amplitude.

Single-shot operation

A single cycle of either square or ramp waveform may be initiated manually, or by an externally generated pulse, or by external shorting contacts.

PULSE REQUIREMENTS: 10 volts minimum of not less than 2 μsec duration.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 100 c/s; 35 watts. Models supplied ready for immediate 100- to 150-volt use if specified at the time of ordering.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12½ in (32 cm)	8½ in (21·6 cm)	14½ in (37 cm)	20 lb (9·1 kg)

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

R-C Oscillator

Type TF 1101

5324

- **Frequency range: 20 c/s to 200 kc/s**
- **Thermistor stabilized oscillator**
- **No zero setting required**
- **60 dB step attenuator**
- **0·1% distortion at 1 kc/s using built-in filter**

A WIDE FREQUENCY RANGE together with high output, purity of waveform, and frequency stability, are primary requirements in any high-quality general-purpose oscillator. All of these features are combined in this compact Marconi R-C Oscillator, which has the Air Ministry Reference No. 10S/17703.

APPLICATIONS

The frequency coverage of 20 c/s to 200 kc/s with ⅔-watt output at low distortion can be put to good use in a variety of applications ranging from audio work to carrier telephony testing. For distortion measurements on high-quality audio amplifiers, a built-in band-pass filter can be connected in series with the output to provide a 1-kc/s test tone with harmonic content less than 0·1%.

Frequency response measurements are facilitated by the semi-logarithmic frequency scale which gives the same order of setting accuracy at all frequencies, the overall frequency characteristic of ±0·5 dB, and the virtual absence of switching transients between ranges.

SIMPLICITY

Easy and convenient to use, there is no zero-setting procedure to be followed before commencing operation. The large tuning dial has an effective scale length of over 48 inches and ensures excellent discrimination. The panel meter and 60-dB step attenuator are direct reading both in source e.m.f. and, for a 600-ohm load, in decibels relative to 1 mW.

QUALITY

Fundamentally, the instrument comprises a two-stage thermistor-stabilized Wien-bridge oscillator in which the capacitive elements are varied by the frequency control and the resistive elements by the range switch. Even-order harmonics and hum are minimized by the use of a push-pull transformer-coupled output stage; at high frequencies the quality of output is maintained by the provision of a ferrite-cored output transformer. A high order of frequency stability is assured by a carefully designed oscillatory circuit and a series-stabilized power supply.

SPECIFICATION

Frequency

RANGE: 20 c/s to 200 kc/s in four ranges of 20 to 200 c/s, 200 c/s to 2 kc/s, 2 to 20 kc/s, and 20 to 200 kc/s.

ACCURACY: ±1% ±1 c/s.

STABILITY: ±0·15% after warm-up.

RESPONSE: For any given setting of the output controls, the output level remains constant to within ±0·5 dB from 20 c/s to 200 kc/s.

Output

Direct: Continuously-variable up to 20 volts for external loads of 600 ohms or greater.

Via the 600-ohm attenuator: Continuously-variable up to 20 volts source e.m.f. in seven steps with maxima of 20 mV, 60 mV, 200 mV, 600 mV, 2 volts, 6 volts, and 20 volts.

The instrument is also calibrated from −60 to +28 dB relative to 1 mW to show the power delivered to an external 600-ohm load.

Distortion

Via the 600-ohm attenuator: Less than 0·5% between 50 c/s and 20 kc/s; outside this range, less than 1%.

Direct: As above except that, for frequencies higher than 50 kc/s, distortion may rise to 1·5% if load less than 1 kΩ.

Filtered: At 1 kc/s, using the built-in band-pass filter, less than 0·1% with reduced output.

Hum

200 c/s to 200 kc/s: −60 dB.

20 c/s to 200 c/s: −50 dB.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 100 c/s; 85 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12¼ in (31 cm)	8½ in (21·5 cm)	14¾ in (37·5 cm)	30 lb (13·5 kg)

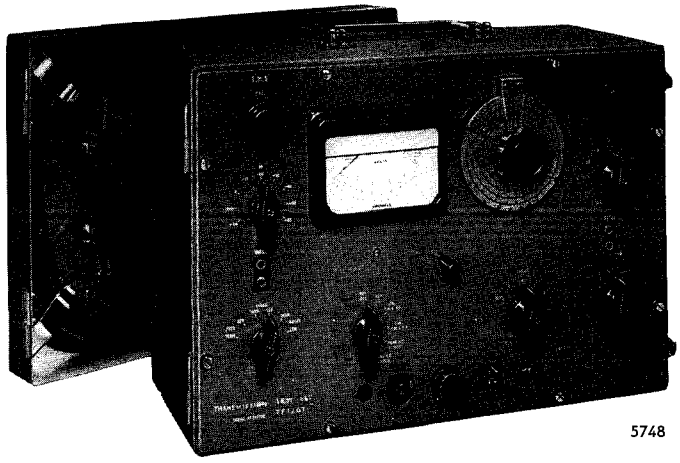
Marconi Instruments Ltd.

St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Transmission Test Set

Type TF 1267



5748

- **Combined T.M.S., V.F.O., and multi-range voltmeter**
- **Measures levels, loss or gain in 75-, 140-, and 600-ohm transmission circuits**
- **Frequency range: 50 c/s to 500 kc/s**
- **Balanced or unbalanced, terminated or unterminated measuring facilities**

THE TF 1267 performs three main functions: measurement of signal levels in the frequency range 50 c/s to 500 kc/s; generation of signals in the same range; and measurement of d.c. and a.c. voltages. It has the Air Ministry Reference No. 10S/17675.

APPLICATIONS

Primarily designed for baseband testing on multi-channel radio and line transmission equipment, the Test Set consists of a single, compact unit. It can be used for routine level checking or transmission loss and gain measurements on lines, networks, and modulation-frequency stages in both communication and broadcast systems.

TRANSMISSION MEASURING SET

The Transmission Measuring Set (T.M.S.) section measures from +25 down to −70 dBm in balanced or unbalanced impedances of 75, 140, or 600 ohms. Either 'level' or 'loss' measurements may be made, i.e., by direct bridging across the circuit or by breaking the circuit and using the T.M.S. as a matching load.

The T.M.S. is a precision untuned voltmeter accepting frequencies from 50 c/s to 500 kc/s in two overlapping ranges, each with its own input transformer. The required input impedance is selected by means of switched transformer tapping points, and the signal is taken to a three-stage feedback amplifier via a step attenuator. The rectified output of the amplifier is displayed on the panel meter, whose reading added to the attenuator setting gives the signal level in dBm.

VARIABLE FREQUENCY OSCILLATOR

The Variable Frequency Oscillator (V.F.O.) covers the 50-c/s to 500-kc/s range in four bands. It comprises a two-valve thermistor-stabilized R-C oscillator with a cathode-follower output. Tappings on the output transformer arrangement may be switch-selected to suit load impedances of 75, 140, or 600 ohms, balanced or unbalanced. Output level is adjustable from 0 to − 50 dBm by means of a continuous control and a step attenuator.

VOLTMETER

The Multi-Range Voltmeter measures up to 500 volts d.c. and 10 volts a.c. A percentage scale, calibrated to ±50% relative to 0·5 volt d.c., is provided for checking valve feeds on Marconi link equipment or similar apparatus.

A function selector enables the instrument to be set for calibration of the T.M.S., for standardizing the V.F.O. output, and for making transmission gain or loss measurements using both V.F.O. (to send) and T.M.S. (to receive). The selector also forms the range switch for the voltmeter.

SPECIFICATION

Transmission measuring set

FREQUENCY RANGE: 50 c/s to 20 kc/s, and 2 kc/s to 500 kc/s, switch-selected.

AMPLITUDE RANGE: +25 to −70 dBm.

MEASUREMENT ACCURACY (at 1 kc/s):
±0·25 dB, from +20 to 0 dBm.
±0·5 dB from 0 to −20 dBm.
±0·75 dB from −20 to −40 dBm,
±1 dB from −40 to −60 dBm.

FREQUENCY RESPONSE: 50 c/s to 20 kc/s: within ±0·5 dB relative to 1 kc/s for levels down to 0 dBm; the l.f. response falls progressively at lower levels and is typically −1·5 dB at 50 c/s, −60 dBm.
2 kc/s to 500 kc/s: within ±0·5 dB relative to 300 kc/s for all levels.

INPUT IMPEDANCE: 75, 140, or 600 ohms, balanced or unbalanced, terminated or unterminated.

Variable frequency oscillator

FREQUENCY RANGE: 50 c/s to 500 kc/s in four bands.

OUTPUT LEVEL: Continuously variable from 0 to −50 dBm; accuracy better than 0·5 dB at 1 kc/s after standardization against T.M.S.

LOAD IMPEDANCES: 75, 140, and 600 ohms, balanced or unbalanced.

HARMONIC CONTENT: Less than 2%.

FREQUENCY CHARACTERISTIC:
Within 0·5 dB from 50 to 500 c/s,
Within 0·5 dB from 500 c/s to 5 kc/s,
Within 0·5 dB from 5 to 50 kc/s,
Within 1 dB from 50 to 500 kc/s.

Multi-range voltmeter

RANGES: Full-scale deflections, 0·1, 1, 50, and 500 volts d.c., and 10 volts a.c.

PERCENTAGE SCALE: Reads −50% to +50% with reference to 0·5 volt d.c.

VOLTMETER RESISTANCE: 10 kΩ/volt on d.c. ranges, 5 kΩ/volt on a.c. range.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 100 c/s. Models supplied ready for immediate use from 100 to 150 volts if specified at time of ordering.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12½ in (32 cm)	16½ in (42 cm)	8½ in (22 cm)	24½ lb (11 kg)

Accessories supplied

Mains Lead, W 46496/B, Sh. 1, Ed. A; 3-core; 6 feet long.

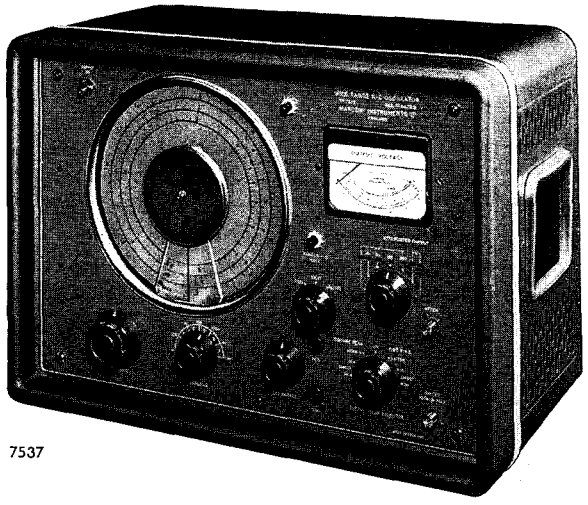
Two *TMS/VFO Connecting Leads*, W 46497/B, Sh. 1, Ed. A; coaxial; 9 feet long.

Voltmeter Input Lead, W 46495/B, Sh. 1, Ed. A; 2-core; 6 feet long.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Wide Range R-C Oscillator Type TF 1370



7537

- **Frequency range (sinewave): 10 c/s to 10 Mc/s**
- **1 mV to 3·16 volts at 75, 100 or 600 ohms via attenuator**
- **High outputs up to 31·6 volts below 100 kc/s**
- **Squarewaves up to 100 kc/s**
- **Dual-ratio slow-motion drive**

THE TF 1370 is a general-purpose sinewave generator covering the audio and video frequency bands. It also delivers a high quality squarewave output at frequencies between 10 c/s and 100 kc/s.

APPLICATIONS

The oscillator is primarily a signal source for measurements and tests on a.f. and v.f. amplifiers and networks. With its three output impedances—600, 100, and 75 ohms—it is very suitable for use with transmission lines, filters, attenuators, etc.

Among other applications as a sinewave generator is that of providing the excitation voltage for a.f. and r.f. bridges. And the quality of the squarewave output also renders the instrument particularly effective for such purposes as rapid testing of audio amplifier bandwidth.

SINEWAVES

The wide-range Wien-bridge oscillator* covers 10 c/s to 10 Mc/s in six decade bands. The top band, with its exceptionally wide cover of 1 to 10 Mc/s and stable output characteristic, is ideal for response testing in the video and lower h.f. bands. A single scale is used for the four lower bands and separate scales for the two upper bands; this gives a total scale length of 105 inches and makes a 1% change in frequency easily discernible. Speed and precision of tuning are reconciled by a dual-ratio control, 3:1 for rapid adjustment and 18:1 for fine tuning.

Outputs from 1 mV to 3·16 volts are available via a switched attenuator covering 60 dB in 10-dB steps. The signal level applied to the input of the attenuator is continuously variable and is monitored by a meter calibrated in open-circuit voltage and decibels. The output impedance can be set to 75, 100 or 600 ohms, as required.

Low outputs down to 10 μV at 75 or 5 ohms can be obtained by using the ×100 Attenuator Pad available as an optional accessory.

High outputs up to 31·6 volts, at frequencies up to 100 kc/s, are delivered at a separate outlet; this output is controlled by a switched potential divider with a continuously variable input and the meter indicates the voltage across the load. Switching to a higher frequency band during high-output operation automatically lights a warning lamp to show that this is not a permissible condition.

* Patent provisional spec. No. 33189/60

SQUAREWAVES

Squarewave outputs up to 31·6 volts peak are available at frequencies up to 100 kc/s. The warning lamp facility provided for high-output sinewave operation also applies for squarewaves if a higher-frequency band is selected. Output arrangements are similar to those for sinewaves except that the meter indicates the peak amplitude with respect to zero, *i.e.* half the peak-to-peak voltage.

Both sag and mark/space ratio are adjustable by front panel presets. Below 50 c/s, the sag can be adjusted to zero for any particular load; above 50 c/s, one zero setting is valid for all loads. The mark/space preset enables the ratio to be brought exactly to 50/50 or to be varied to about 30/70.

RACK MOUNTING FACILITIES

The standard instrument is housed in a case for bench use. The front panel is, however, the correct size and ready drilled for mounting in a standard 19-inch rack. A rack-mounting version — TF 1370/1 — fitted with dust cover and panel rails, is also available.

SPECIFICATION

Frequency

RANGE: *Sinewaves:* 10 c/s to 10 Mc/s in six decade bands.

Squarewaves: 10 c/s to 100 kc/s in four decade bands.

ACCURACY (at 20°C): ±2% ±1 c/s.

LONG-TERM STABILITY: After warm-up, ±0·2% up to 100 kc/s, and ±0·5% up to 10 Mc/s, including normal supply voltage variation.

ATTENUATOR REACTION (on load): Switching to 3-volt attenuator step: 0·1% shift at 10 Mc/s. Adjusting from 1/10th to full scale: 0·15% at 10 Mc/s. Shift is proportionately less at lower frequencies.

Sinewave output

RANGE: *Via attenuator:* 1 mV to 3·16 volts e.m.f. at switch-selected impedances of 75,

100, and 600 ohms unbalanced. Controlled by attenuator with six 10-dB steps and potentiometer in conjunction with level monitor. Attenuator accuracy: within ±1 dB overall on resistive load.

Outputs from 10 μV to 31·6 mV at 75 and 5 ohms are available by using ×100 Attenuator Pad TM 6454.

Direct: Up to 31·6 volts p.d. across loads of 2 kΩ or greater, at frequencies up to 100 kc/s. Two ranges, up to 10 and 31·6 volts, provided by switched potential divider and potentiometer in conjunction with level monitor. Nominal impedances: 950 ohms on 10-volt range, 15 ohms in series with 500 μF on 31·6-volt range.

RESPONSE: 50 c/s to 100 kc/s: within ±0·25 dB, falling by about 0·25 dB at 10 c/s.

100 kc/s to 10 Mc/s: within ±0·5 dB for outputs up to 1 volt loaded; within ±1 dB for outputs up to 3 volts loaded.

DISTORTION FACTOR: Less than 0·4% from 100 c/s to 100 kc/s, less than 1% from 10 c/s to 4 Mc/s, less than 3% at 10 Mc/s.

HUM: Less than 0·1% of full-scale output above 10 mV.

D.C. CONTENT: Less than 2% of full-scale output.

Squarewave output

RANGE: 1 mV to 3·16 volts peak, via attenuator; and up to 31·6 volts peak direct. Other details as for sinewave output except that source impedance is increased by 300 ohms at the maximum output step of the attenuator.

RESPONSE: As for sinewave output.

RISE TIME: 0·65 μsec or less at full-scale output; 0·2 μsec or less at ⅓ full-scale output.

SAG: 5% approx. in a 2-kΩ load at 10 c/s; can be adjusted to zero by panel preset.

MARK/SPACE RATIO: 50/50 ±5%; can be adjusted to exactly 50/50 by panel preset.

Level monitor

VOLTAGE SCALES: 0 to 31·6 and 0 to 10; indicate r.m.s. sinewave voltages and peak squarewave with respect to zero.

DECIBEL SCALE: 0 to −20 with respect to f.s.d.; also 0-dB reference points indicating 1 volt peak-to-peak sinewave or squarewave in 75-ohm load.

ACCURACY: ±3% of full scale for sinewaves up to 1 Mc/s; additional ±2% of reading for squarewaves and for sinewaves up to 10 Mc/s.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 45 to 65 c/s, 150 watts. Maximum permissible voltage variation: ±7½%. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering.

Temperature range

5° to 45°C.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
14 in	20 in	11¼ in	38 lb
(35·6 cm)	(50·8 cm)	(28·5 cm)	(17·1 kg)

Accessories supplied

Coaxial Free Plug, Type BNC, 75-ohm; for use with either output socket.

Accessories available (to special order)

Unbalanced-to-Balanced Transformer, 600 to 600/200/150 ohms, Type TM 6221.

Connections: BNC 75-ohm socket for input; terminals for outputs, centre-tap, and earth.

Insertion loss at 1 kc/s: 0·3 dB approx.

Balance: ±2%.

Response: 20 c/s to 50 kc/s, ±0·2 dB; 10 c/s to 100 kc/s, ±1 dB.

Distortion factor (loaded, and fed by TF 1370 with 3 volts e.m.f.): 70 c/s to 10 kc/s, not exceeding 0·5%; 10 kc/s to 100 kc/s, not exceeding 1%.

1-kc/s Band-Pass Filter, Type TM 6222; to provide a 1-kc/s output with very low distortion.

Connections: Input, BNC 75-ohm socket; output, terminals.

Impedance: 600 ohms ±10% when terminated by 600 ohms.

Insertion loss on tune: Not exceeding 1 dB.

3-dB pass band: ±75 c/s approx.

Distortion factor (loaded, and fed by TF 1370): Not exceeding 0·02%, feeding 250 mV to load; not exceeding 0·1%, feeding 1 volt to load.

×100 Attenuator Pad, Type TM 6454.

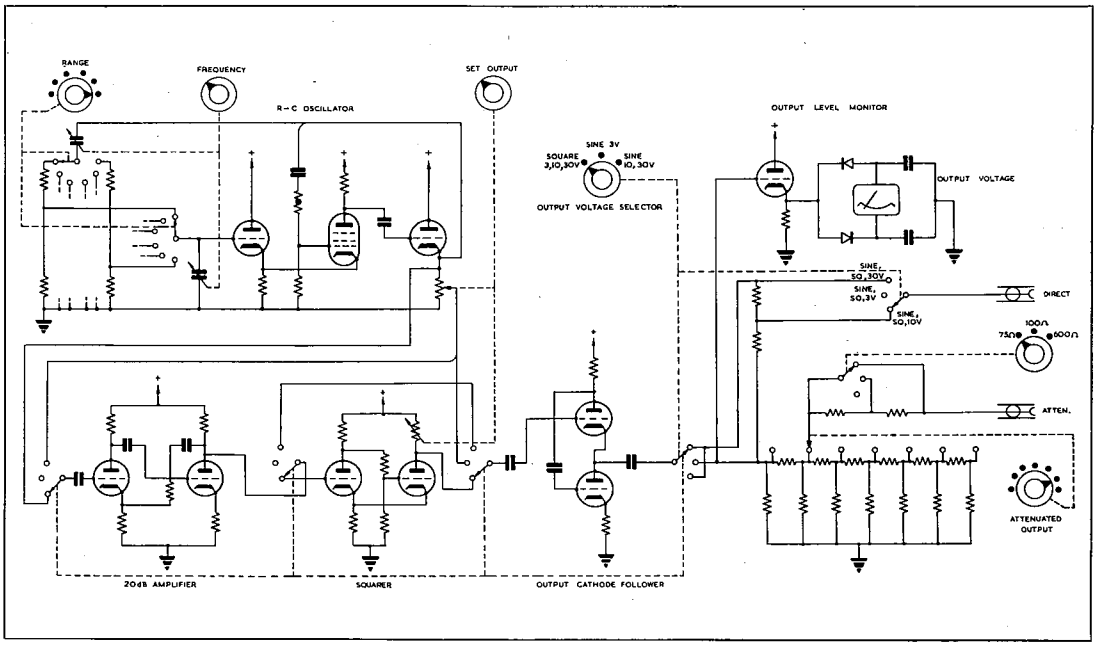
Connections: Three BNC 75-ohm sockets.

Loss: 40 dB ±1 dB (max. input, 6 volts).

Impedance: Input, 75 ohms; outputs, 75 and 5 ohms.

75-ohm Coaxial Lead, Type TM 4726/136; 3 feet long; with BNC 75-ohm free plugs to connect any of the above accessories to the instrument.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

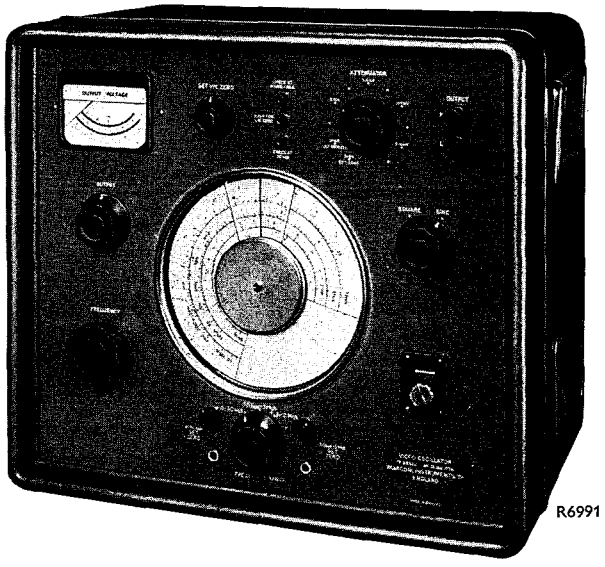


Functional Diagram of TF 1370

MARCONI INSTRUMENTS

Video Oscillator

Type TF 885A/1



- **Frequency range: 25 c/s to 12 Mc/s**
- **1 watt into 1,000 ohms**
- **31·6 volts to 316 μV**
- **Built-in step attenuator**
- **Sinewave or squarewave outputs**

THE VIDEO OSCILLATOR Type TF 885A/1 has a frequency cover extending from 25 c/s to 12 Mc/s. Over the whole of this extremely wide range, the maximum power output is 1 watt into 1,000 ohms. There is a built-in resistive step attenuator and the output range is 31·6 volts to 316 μV. Between 50 c/s and 150 kc/s, the instrument can be switched to give squarewaves instead of its normal sinewave output.

The TF 885A/1 has the Joint-Service Reference No. 6625-99-932-4976.

APPLICATIONS

The oscillator is a wide-range standard test signal source for general laboratory use. Its calibrated attenuator facilitates accurate gain or loss measurements on active and passive networks. The purity of the output waveform permits the use of the instrument for such measurements as amplifier linearity and intermodulation. Radio frequency applications include measurements on m.f. and h.f. receivers.

The high output available at all frequencies permits the use of the oscillator for direct driving of power output stages or similar purposes.

FUNCTIONAL ARRANGEMENT

Internally, the TF 885A/1 comprises two distinct and separate systems. It is the result of a new and realistic approach to the problem of wide-band signal generation; up to 5 Mc/s there are two bands using the well-tried beat frequency oscillator system; from 5 to 12 Mc/s there is a third band covered by a stable single-valve r.f. oscillator. The tuning of either system is accomplished with one control knob and, on all bands, the output frequency is read directly from the large hand-calibrated dial. For the b.f.o., or lower- and middle-frequency scales, there are push-button standardization facilities, one scale being set up against the frequency of the supply mains, the other against an internal 50-kc/s check circuit.

OUTPUT SYSTEM

The output from the mixer of the b.f.o. system is fed to a three-stage, frequency-corrected R-C coupled amplifier; the output from the 5- to 12-Mc/s oscillator is fed to a gang-tuned r.f. amplifier. Depending upon which frequency band has been selected at the front panel, the output from one or other of the amplifiers is fed to the valve-voltmeter level indicator and output attenuator.

SQUAREWAVES

With the instrument switched to produce a squarewave output, the first two valves of the R-C amplifier function as a squarewave generator triggered by the sinewave output from the mixer.

SPECIFICATION

Frequency

RANGE: Sine: 25 c/s to 12 Mc/s in three ranges of 25 c/s to 30 kc/s, 30 kc/s to 5 Mc/s, and 5 to 12 Mc/s.

Square: 50 c/s to 150 kc/s in two ranges: 50 c/s to 30 kc/s, and 30 to 150 kc/s.

ACCURACY: ±2% ±2 c/s when the oscillator has reached thermal equilibrium.

STABILITY: With stable ambient temperature, the maximum drift after initial warming is of the order of 30 c/s, 1 kc/s, and 5 kc/s on the low, medium and high ranges respectively.

Output

RANGE: For sinewaves, a continuously-variable OUTPUT control, calibrated valve voltmeter, and ATTENUATOR switch give output voltages ranging from 31·6 volts to 316 μV. For squarewaves, the OUTPUT control and valve volt-meter are inoperative and the maximum output is 32 volts peak. For both sinewaves and squarewaves, the ATTENUATOR switch can be turned to (i) give a direct output of 1 watt maximum into an external 1,000-ohm resistive load; or (ii) shunt the output terminals with an internal 1,000-ohm load and give a maximum open-circuit voltage of 31·6 volts; or (iii) give a maximum open-circuit voltage of 10 volts by feeding the output terminals from a tap on the internal 1,000-ohm load; or (iv) introduce a 100-ohm ladder network with 10-dB steps giving maximum open-circuit voltages ranging from 3·16 volts to 1 mV, *i.e.* +130 dB to +60 dB relative to 1 μV.

LEVEL MONITOR: The built-in valve voltmeter has three scales—0 to 10 volts, 0 to 35 volts, and 0 to −20 dB. The accuracy of the meter is ±4% of the reading above half-scale and ±2% of f.s.d. below half-scale.

HARMONIC CONTENT: Individual harmonics are in general less than 3% between 100 c/s and 5 Mc/s, and less than 6% above 5 Mc/s, at maximum rated output into a resistive load. Power supply ripple components are less than 1% at f.s.d. on the voltmeter.

FREQUENCY CHARACTERISTIC: With the normal rated load, the output level remains substantially within 1 dB over any one frequency range.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 100 c/s; 175 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
18 in (46 cm)	21 in (53 cm)	14½ in (37 cm)	77 lb (35 kg)

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

20-Mc/s Sweep Generator

Types TF 1099 and TF 1099/1

R7035

- **For precision video response measurement**
- **Sweep variable up to 20 Mc/s**
- **Crystal controlled markers**
- **Differential measurement facilities for maximum accuracy**

THE TF 1099 is a high-quality video-frequency sweep generator which, in conjunction with a suitable oscilloscope, such as the Marconi TF 1159, enables response measurements to be made with a discrimination exceeding 0·01 dB.

The sweep starts at a frequency of less than 100 kc/s and extends to an upper frequency that is continuously variable up to 20 Mc/s; the lower frequency limit is locked to the start of the sweep in order to ensure a steady display on the c.r.o. The level of the frequency-swept signal is variable from 0·3 to 3 volts peak-to-peak, and the selected output level is held constant to within ±0·1 dB—a factor that contributes materially to a high order of measurement accuracy. A 250-volt time-base drive, synchronized with the sweep frequency, is provided for connection to the X-plates of the c.r.o., and a series of marker pips at 1-Mc/s intervals is available for superimposing on the display to facilitate accurate frequency identification.

APPLICATIONS

Designed initially for the precise alignment of monochrome- or colour-television transmitter and studio equipment, the Generator is equally applicable to any video response measurement where the highest order of accuracy is required.

As well as providing facilities for conventional response measurement involving the display of the frequency-swept output of the apparatus under test, the TF 1099 includes special circuits for precision differential measurement. For the differential method, the overall gain of the apparatus under test is reduced to unity by means of an external attenuator, and the outputs of the Sweep Generator and the apparatus are both sampled; the two signals are then combined and the amplified difference voltage is displayed on the c.r.o. In this way, the effects of the inevitable small variations in sweep level are entirely eliminated and the response curve obtained can, with confidence, be attributed solely to the apparatus under test. This method is particularly useful in allowing the user to take full advantage of the high discrimination facilities of the Sweep Generator in the investigation of nominally flat sections of a response curve.

For measuring the frequency response of circuits with a high output impedance, a special probe is available as an optional accessory for use in place of the normal output probe—see Accessories available.

Electrically, the alternative model, TF 1099/1, is identical to the TF 1099. It differs only in that whereas the TF 1099 is supplied in a pressed steel case for normal bench use and is fitted with a 6-foot mains lead, the '/1' version has neither case nor mains lead and is intended for mounting in a standard 19-inch rack.

TIME-BASE GENERATOR

A Miller-transitron oscillator generates a linear sawtooth waveform of about 250 volts amplitude for direct connection to the X-plates of an oscilloscope. The sawtooth frequency can be synchronized internally with the mains supply frequency or externally with 50- to 60-c/s trigger pulses, e.g., the field sync pulses of a television system.

FREQUENCY SWEEP CIRCUITS

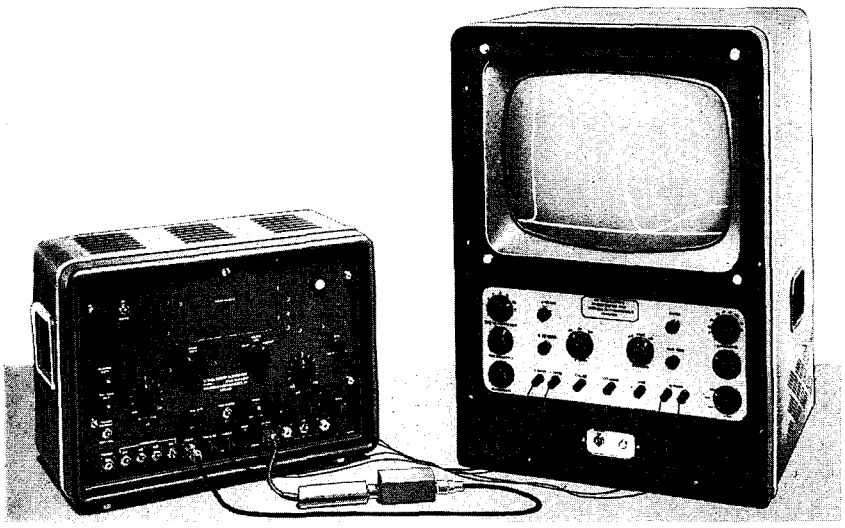
The swept oscillator is frequency modulated over a nominal maximum range of 60 to 80 Mc/s by means of a ferrite reactor driven by a variable fraction of the time-base sawtooth voltage. The final swept-frequency signal is derived from a frequency-changer stage in which the outputs from the swept oscillator and a 60-Mc/s local oscillator are mixed; the difference-frequency output, after amplification, is applied to an a.f.c. circuit which, by controlling the d.c. component of the sawtooth current in the ferrite modulator, locks the low-frequency end of the sweep at 100 kc/s or below. Alternate sawtooth sweeps are blanked off in order to provide a base line, or reference level, on the c.r.o.

OUTPUT CIRCUITS

The frequency-changer is followed by a three-stage video amplifier and a 75-ohm output attenuator; this consists of four sections of 2, 4, 6, and 8 dB respectively which can be individually switched into circuit to give a total attenuation of 20 dB in 2-dB steps. The output voltage from the final amplifier is sampled, rectified, and fed back as a.g.c. to a variable-mu buffer amplifier between the swept oscillator and the mixer.

MARKER PULSES

The frequency-swept signal from the output amplifier is applied to the control grid of a heptode whose first and second grids are connected to a 5-Mc/s crystal-controlled



R7036

Using a large screen oscilloscope together with the TF 1099 Sweep Generator to display the transmission characteristic of a video band-pass filter. The size and clarity of c.r.t. presentation allow the user to take full advantage of the Sweep Generator performance for detailed response analysis.

oscillatory circuit; the anode load consists of two resonant circuits, tuned to 1 and 2 Mc/s respectively. Zero beats are produced as the sweep signal passes through each multiple of 5 Mc/s, and voltage maxima occur across the tuned circuits when the swept frequency differs by 1 or 2 Mc/s from the nearest crystal harmonic; thus marker signals are produced at 1-Mc/s intervals from 1 to 20 Mc/s. After rectification, the marker pulses are available at a separate outlet for use as a frequency scale on the c.r.o.; the scale may take the form of brightening pulses on the display or, in the case of a double-beam oscilloscope, as deflection pulses on the second trace. The 5-Mc/s pulses, being derived from zero beats, appear to flicker and are therefore immediately identifiable.

DETECTOR PROBES

Two probe units are provided for converting the frequency-swept video signal to a variable d.c. voltage which, after amplification in the main body of the instrument, is suitable for application to a c.r.o. One probe, which includes a 75-ohm termination, is designed for connection to the output of the apparatus under test; the other provides a through connection to the input of the apparatus and samples the sweep signal at that point. Individually, the outputs from the probes can be used to display the frequency response of the apparatus under test and the sweep generator respectively. For differential measurements the two outputs, which are of opposite polarity, are balanced in a differential mixer circuit; any small deviation in response from level unbalances the mixer, and the resultant deflection on the c.r.o. can be measured with the highest discrimination, and with an accuracy that is independent of both the frequency response and output stability of the sweep generator.

OSCILLOSCOPE

The Marconi L.F. Oscilloscope, TF 1159, with its 17-inch screen, high resolution, and excellent frequency response, is ideally suited for displaying video responses in conjunction with the TF 1099; in the absence of this oscilloscope, which is fully described on page 65, any other high-grade c.r.o. may be employed.

Any imperfections in the frequency response of the particular oscilloscope chosen will, of course, detract from the accuracy of the Sweep Generator. Since this defect normally takes the form of a falling-off in low-frequency response, a c.r.o. l.f. correction is fitted to the Sweep Generator; by use of this control the falling response of the c.r.o. can be compensated for before making a measurement.

SPECIFICATION

Frequency-swept output

FREQUENCY RANGE: Lower limit locked to a frequency not exceeding 100 kc/s; upper limit continuously variable up to 20 Mc/s.

OUTPUT LEVEL: Continuously variable from 0·3 to 3 volts peak-to-peak by means of a switched attenuator covering 20 dB in 2-dB steps and a continuous control with a range of 2 dB. Accuracy of level indication: ±0·25 dB. The selected output level is held constant to within ±0·1 dB throughout the sweep.

OUTPUT IMPEDANCE: 75 ohms.

HARMONIC DISTORTION: Less than 2% at all frequencies.

Time base

REPETITION RATE: 50 to 60 c/s. Time base may be triggered internally from main supply or externally from 50- to 60-c/s sync pulses.

OUTPUT FOR C.R.O. X DEFLECTION: 250 volts max.

Frequency markers

Marker pips at a nominal level of 1 volt peak are provided at 1-Mc/s intervals throughout the sweep frequency range; every 5th pip is crystal-controlled and is distinct in appearance.

Detector probes

Two probe units are supplied for detecting the input and output signals of the apparatus under test: the input probe provides a through connection for the sweep signal; the output probe has a 75-ohm terminating impedance. With the swept-signal output of the TF 1099 set to 1 volt, a differential voltage of approx. 0·2 volt is produced by a change in response of 0·2 dB from level.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s; 140 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

	Height	*Width*	*Depth*	*Weight*
TF 1099:				
	13½ in (35 cm)	19½ in (50 cm)	11 in (28 cm)	53 lb (24 kg)
TF 1099/1:				
	12½ in (32 cm)	19 in (48 cm)	10 in (26 cm)	38 lb (17 kg)

Accessories supplied

Coaxial Free Plug, Type 83; for use with trigger input socket.

Coaxial Output Lead, TM 4726/18; 6 feet long; Type 83 plug at each end; for use with sweep output socket.

Input Probe Assembly, TM 5332; cable, 6 feet long; Type 83 fixed socket for connection to sweep output lead; signal to unit under test available at Type 83 fixed plug.

Output Probe Assembly, TM 5331; cable, 6 feet long; Type 83 fixed plug for connection to output of unit under test.

Accessories available

High-Impedance Probe, TM 5997; for measuring response of high-impedance circuits. Input impedance: 30 kΩ with 4 μμF in shunt. Fitted with spear point and earthing clip for connection to output of unit under test; supplied complete with attached lead, 3 feet long.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

Television Sweep Generator

(V.H.F. Alignment Oscilloscope)

Types TF 1104 and TF 1104/1

S573

- **Combined sweep generator and c.r.o.**
- **For v.h.f., i.f., and v.f. response analysis**
- **Sweep width variable up to 10 Mc/s**
- **Crystal-controlled frequency markers**

THE TF 1104 is designed primarily for frequency response measurements on television and f.m. receivers operating in v.h.f. bands I, II, and III.

It comprises a frequency-swept generator for connection to the input of the r.f., i.f., or video stages of the receiver, and a c.r.o., synchronized with the sweep frequency, for viewing the receiver output.

The TF 1104/1, an alternative model, is similar to the TF 1104 except that the r.f. and i.f. ranges are slightly modified to suit receivers operating in American bands.

APPLICATIONS

In addition to television response measurement, the display can be used in applications such as the adjustment of discriminators in f.m. receivers and the matching of aerials to transmission lines. Internally-generated calibration 'pips' can be superimposed on the display for precision tuning and bandwidth adjustments.

The maximum output of 100 mV coupled with the high sensitivity of the Y amplifier enables the user to make direct tests on r.f. or i.f. tuned transformers, that is, without the need for them to be connected into receiver or amplifier circuits.

By virtue of its wide range of time-base frequencies and its sensitive Y amplifier, the instrument can also be used as a conventional oscilloscope.

V.H.F., I.F., AND V.F. OUTPUTS

Outputs covering the v.h.f. bands are delivered, via a piston attenuator, from a fundamental swept oscillator without the use of multipliers. I.F. or video outputs are obtained from the same outlet by switching a unity-gain mixer into circuit after the attenuator. The i.f. range is 10 to 40 Mc/s—or 10 to 45 Mc/s on the '/1' version—and the v.f. range is 5 kc/s to 10 Mc/s.

CALIBRATION

Marker 'pips' are derived from two alternative sources: a single 'pip', corresponding to the operating frequency of a variable marker-oscillator, can be positioned on the trace by the frequency control of this oscillator, or a series of 'pips' at intervals of 0·5, 1, or 5 Mc/s can be produced by a three-frequency crystal-controlled oscillator.

Relative amplitudes within the displayed response can be assessed from the c.r.t. graticule. A true base line for such amplitude measurements is provided by gating off the swept oscillator during the fly-back period.

EXTERNAL DISPLAY

If required, the screen display can be reproduced on an external oscilloscope; for this purpose, the outputs from the X and Y amplifiers are made available at sockets on the front panel.

SPECIFICATION

Frequency range

R.F. RANGES: TF 1104; 41 to 68 Mc/s, 80 to 110 Mc/s, and 150 to 216 Mc/s, *i.e.* covering British Bands I, II, and III.
TF 1104/1; 50 to 75 Mc/s, 75 to 115 Mc/s, and 150 to 216 Mc/s, *i.e.*, covering American Bands I, II, and III.
I.F. RANGE: TF 1104; 10 to 40 Mc/s. TF 1104/1; 10 to 45 Mc/s.
V.F. RANGE: 5 kc/s to 10 Mc/s.

Output

RANGE: Nominally 100 μV to 100 mV e.m.f.; the output attenuator is continuously variable and has an arbitrary numerical calibration.
SOURCE IMPEDANCE: Nominally 50 ohms on the three r.f. ranges and 2·5 kΩ on the i.f. and v.f. ranges.

Sweep width

Variable from 500 kc/s to 10 Mc/s.

Calibrator

A continuously-variable marker oscillator may be set to provide a 'pip' corresponding to a known frequency at any point on the trace. A three-frequency crystal oscillator provides markers at intervals of 5, 1, and 0·5 Mc/s.

Time base

12 to 50 c/s for sweep-frequency displays; 12 c/s to 10 kc/s for general oscilloscope use.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal link, 40 to 100 c/s; 55 watts. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Fuses in both mains and h.t. circuits.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12⅛ in (32 cm)	9 in (22·5 cm)	15 in (38 cm)	26 lb (11·8 kg)

Accessories supplied

Two *Coaxial Free Plugs*, Belling-Lee Type L 734/P; for use with swept output and Y input sockets.
Two *Wander Plugs*, Belling-Lee Type L 378/4; for use with X and Y output sockets.
Trimmer-Adjusting Tool, TB 27100.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

High Discrimination Oscillator

Type TF 1168 (Series)

R5361

- **Frequency range: 90 to 110 kc/s**
- **2 c/s discrimination at mid-band**
- **Crystal-standardized centre frequency**
- **For 2nd-i.f. alignment in h.f. communication receivers**

THE TF 1168 (Air Ministry Reference No. 10S/16549) offers exceptionally high discrimination tuning over the range 90 to 110 kc/s.

APPLICATIONS

It is specifically designed for use on h.f. communication receivers having a second i.f. of 100 kc/s, and forms a standard signal source of accurately known frequency and output level for general i.f. testing. Its primary function is precision alignment of a.f.c. and signal discriminator stages, but its excellent discrimination also makes it suitable for the measurement of crystal filter response in receivers and transmitter drive units.

The TF 1168/1 and /2 are special versions with centre frequencies of 150 kc/s and 600 kc/s respectively, instead of 100 kc/s. The tuning range is ±10 kc/s for the TF 1168/1 and ±50 kc/s for the TF 1168/2 model.

VARIABLE FREQUENCY OSCILLATOR

The TF 1168 has three frequency ranges, giving maximum variations of ±100 c/s, ±1 kc/s, and ±10 kc/s, respectively, relative to a centre frequency of 100 kc/s. The centre frequency can be standardized against an internal 100-kc/s crystal oscillator or against an external standard injected by way of a panel plug; a magic-eye tuning indicator is used as the beat detector.

Four variable capacitors, connected in parallel, form the tuning elements of the variable L-C oscillator; three of these serve as the wide, medium, and narrow range controls, while the fourth gives a means of bringing the centre frequency exactly to 100 kc/s. The oscillator circuit is housed in a heavy-gauge brass compartment which not only provides effective screening but, by virtue of its high thermal inertia, promotes excellent frequency stability.

OUTPUT ARRANGEMENTS

Output is delivered via a source impedance of 75 ohms and is adjustable in 1-dB steps over a source e.m.f. range of +26 to +126 dB relative to 1μV; there is also a continuously variable control which can be used in conjunction with ±1 dB calibration marks on the set-level meter to interpolate between the steps of the attenuator.

The input to the attenuator is monitored by a crystal voltmeter. With the meter reading standardized by means of the set-level control, the attenuator calibration is valid at all settings.

SPECIFICATION for TF 1168

Frequency

Continuously adjustable up to ±10 kc/s, relative to a centre frequency of 100 kc/s, in three ranges as follows:
0 to ±100 c/s, calibrated at 2-c/s intervals,
0 to ±1 kc/s, calibrated at 20-c/s intervals,
0 to ±10 kc/s, calibrated at 200-c/s intervals.

Calibration accuracy

±1% of the maximum frequency swing on each range.

Frequency stability

Better than 0·01% per hour after a warming-up period of 30 minutes.

Output level

Source e.m.f. continuously adjustable from +26 to +126 dBμV, i.e., 20 μV to 2 volts. Adjustment is made in 10-dB and 1-dB steps and by a continuous interpolating control.

Output accuracy

±0·5 dB at any attenuator setting.

Source impedance

Nominally 75 ohms.

Power supply

200 to 250 volts, or 100 to 150 volts after adjusting internal links, 40 to 100 c/s. Models supplied ready for immediate 100- to 150-volt use if specified at time of ordering. Consumption approximately 80 watts.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
12½ in (32 cm)	27½ in (70 cm)	10½ in (27 cm)	88 lb (40 kg)

Accessories supplied

Two *Coaxial Free Sockets*, Type Z 540155; for r.f. output and standardizing-signal input plugs.
Mains Lead, TC 23305; 5 feet long.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

A.F. Attenuator

Type TF 338C

6236

- **D.C. to 100 kc/s**
- **0 to 105 dB continuously variable**
- **600 ohms characteristic impedance**

SPECIFICATION

Attenuation

RANGE: 0 to 105 dB.

ACCURACY: ±0·2 dB.

FREQUENCY CHARACTERISTIC: Frequency errors are negligible in the audio frequency range. Using screened, low-capacitance external connections, the error does not exceed 10% of the scale reading up to 100 kc/s.

Impedance

INPUT: With correct output termination, 600 ohms ±2% for attenuations greater than 4·5 dB.

OUTPUT: For attenuations greater than 25 dB, 600 ohms ±1%. When the step switch is set to 0, approximately 1,800 ohms.

TERMINATION: An internal 600-ohm terminating resistor may be switched into circuit when required.

Loading capacity

MAXIMUM INPUT: 2 watts.

Dimensions and weight

Height	*Width*	*Depth*	*Weight*
8 in	10½ in	6½ in	9 lb
(20 cm)	(26 cm)	(16·5 cm)	(4 kg)

THE MARCONI TF 338C is a 600-ohm attenuator continuously variable over a range of 105 dB; although primarily intended for audio use, it has an acceptable performance up to 100 kc/s. It has a decibel scale which is virtually linear and affords a high order of discrimination. Basically, the unit is designed to work directly into an impedance of 600 ohms; but, as an added facility, there is an internal 600-ohm terminating resistor which can be switched into circuit if required.

The TF 338C has the Air Ministry Ref. No. 10L/16559.

APPLICATIONS

This attenuator is immediately applicable to a wide variety of telecommunication measuring techniques. It is especially useful where an accurate level control is required for use with l.f. oscillators. Other important applications are measuring gain and frequency response of amplifiers, evaluating transmission efficiency of transformers and filters, and generally extending the range and utility of other test equipment.

STEPPED AND VARIABLE SECTIONS

The TF 338C divides naturally into two main sections. The first is a continuously variable section with a maximum attenuation of 25 dB; the second is an 80-dB section with four switch-selected 20-dB steps.

The continuously variable section is similar in conception to a ladder network in which the series elements are wound on a common former, the design having the advantage that a linear scale of decibels is obtained with the use of only one sliding contact. The 20-dB steps following this section are of conventional design and are controlled by a switch having additional guarding contacts to reduce the shunting effect of stray capacitance at high attenuations.

INPUT AND OUTPUT IMPEDANCE

The attenuator is not reversible. With the correct output termination, or a step-switch setting other than 0 dB, the input impedance is constant at 600 ohms over the greater part of the working range, that is, down to the 4·5-dB setting, after which it falls steadily dropping by about 25% when the instrument is set to zero.

The output impedance is constant at 600 ohms for attenuations above 25 dB, increasing to about 1,800 ohms at zero attenuation. With the terminating resistor switched into circuit, and the instrument set to zero attenuation, the terminating resistor is in parallel with the resistance of the continuously variable section of the attenuator.

CONSTRUCTION

The internal elements are screened from external fields by an alloy case of modern design. Fitted with a flexible carrying handle, the case has a recessed front panel which affords protection to the controls.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

MARCONI INSTRUMENTS

R.F. Attenuator Type TF 1073A (Series)

7074

- **D.C. to 150 Mc/s**
- **1 dB steps**
- **75 or 50 ohms impedance**
- **Double-screened construction**

THESE four r.f. attenuators are variable in 1-dB steps from 0 to 100 dB; they offer a choice of 75 or 50 ohms impedance, with or without terminating resistors.

Direct reading without the use of correction charts, they have a basic construction giving an exceptionally flat frequency characteristic; they are almost as accurate and easy to use at v.h.f. as they are at d.c. Using the full 100 dB at 100 Mc/s, the maximum error does not exceed 0·6 dB; even at 150 Mc/s, they have a most acceptable performance. Conceived and designed as separate pieces of apparatus for general-purpose use, each Attenuator is an instrument in its own right —not just a component which must be built on to the equipment with which it is to be employed. The Attentuators are housed in modern Marconi-style cases which are at once functional, distinctive, and pleasing in appearance.

The TF 1073A has a characteristic impedance of 75 ohms; the TF 1073A/1, 50 ohms. Input powers up to a maximum of 0·25 watt may be applied to the Attenuators. This represents a level of over 4 volts r.m.s. at 75 ohms.

The TF 1073A/2S and A/3S are alternative 75- and 50-ohm versions developed primarily for military use. They are fitted with a quick-release cover to protect the front panel when not in use. Electrically, they differ from the A and A/1 models in having individually switched series-input and shunt-output terminating resistors.

The A/2S model has the Joint-Service Reference No. CT421.

APPLICATIONS

These attenuators allow accurately known changes of output to be obtained from video or r.f. oscillators. They can be used in measuring amplifier gain, transmission loss of networks, frequency response of filters, power-level tests on transmitters and generally extending the usefulness of other test equipment.

PRECISION NETWORKS

Two separate sections in cascade form the basis of the Attenuator. The first section has an attenuation range of 80 dB in 20-dB steps; the second has a range of 20 dB in independent 1-dB steps, only one network being in circuit for any given switch position. Resistive networks of high accuracy are employed in both sections and careful design has resulted in a constancy of characteristic impedance combined with accurate attenuation at v.h.f. At minimum attenuation the sections are switched to positions where a direct through connection is obtained with no shunt loading.

The two attenuating sections are enclosed within separate screening boxes contained in the outer case. The networks of both sections are switched so that clockwise rotation of the control knobs produces a decrease in attenuation, *i.e.* an increase in output; in this respect the controls function in a similar manner to those normally found on the attenuators of signal generators. At the fully clockwise position of the switches, all the attenuating networks are completely withdrawn from circuit, leaving a direct connection between the input and output plugs; this condition presents an insertion loss which is low at v.h.f. and becomes virtually zero at lower frequencies.

SPECIFICATION

Attenuation range

100 dB, in 1-dB steps. Provided by coarse and fine controls; one giving 80 dB in 20-dB steps; the other giving 20 dB in 1-dB steps.

Frequency range

0 to 100 Mc/s; usable to 150 Mc/s with reduced accuracy.

Characteristic impedance

TF 1073A and A/2S: 75 ohms.
TF 1073A/1 and A/3S: 50 ohms.
TF 1073A/2S and A/3S have individually switched series-input and shunt-output terminating resistors equal in value to the characteristic impedance.

Accuracy at 100 Mc/s

Each step of the coarse section introduces 20 dB ±0·2 dB, but the cumulative error due to these steps never exceeds ±0·5 dB. Each step of the fine section is independent and introduces the nominal attenuation ±0·2 dB.

Power input

Inputs up to a maximum of 0·25 watt can be applied.

Dimensions and weight

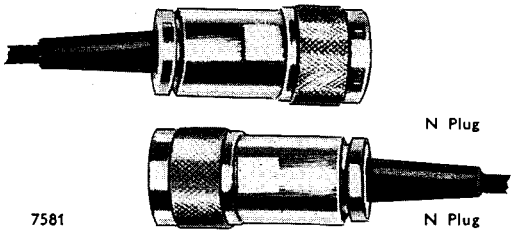
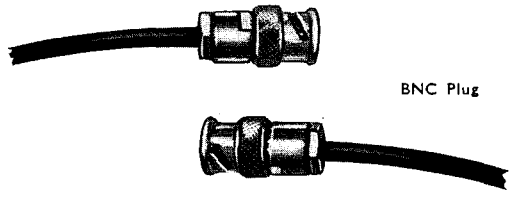
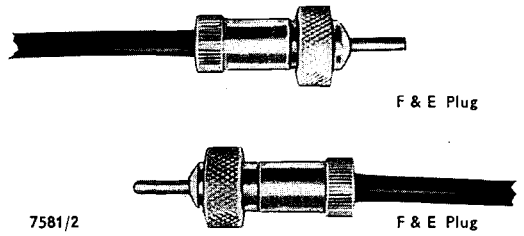
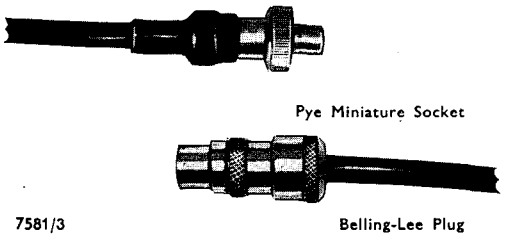
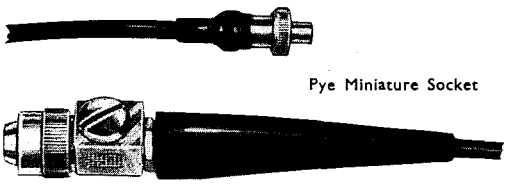
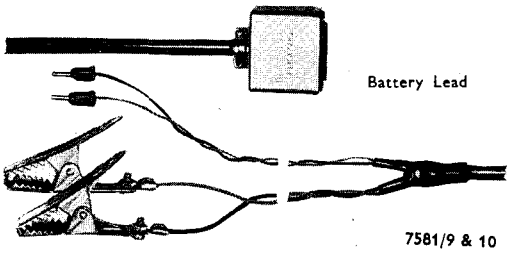
Height	*Width*	*Depth*	*Weight*
8 in (20·5 cm)	10½ in (26·5 cm)	7 in (18 cm)	7½ lb (3·4 kg)

Accessories supplied

TF 1073A and A/1: Two *Coaxial Free Plugs*, Type BNC.
TF 1073A/2S and A/3S: Two *Coaxial Free Sockets*, Joint-Service Style SR4G. Free plugs and sockets are suitable for use with double-screened coaxial cable.

Marconi Instruments Ltd.
St. Albans, Hertfordshire, England

ACCESSORIES

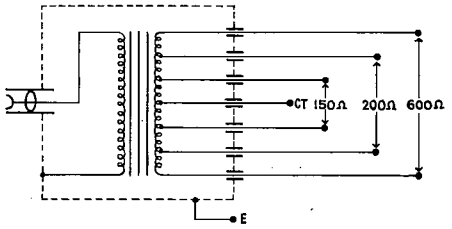
LEADS	TYPE	IMPEDANCE	LENGTH	FOR USE WITH
 7581	TM 4824	50 Ω	36 in	TF 1066B TF 801D (Series)
	TM 4726/12	50 Ω	36 in	TF 1060, TF 1145, TF 1058
	TM 4824/1	50 Ω	54 in	TF 801D (Series)
 7581/1	TM 4969	50 Ω	42 in	TF 1064A (Series)
	TM 4726/136	75 Ω	36 in	TF 1370
 7581/2	TM 4726/11	52 Ω	36 in	TF 1106/2 & /3
	TM 4726/6	70 Ω	60 in	TF 1106 & /1
 7581/3	TM 5098	75 Ω	36 in	TF 801A/1
 7581/4	TM 5098/3	75 Ω	36 in	TF 801A/1
 7581/9 & 10	TM 6122	—	72 in	TF 144H

ACCESSORIES

MATCHING UNITS

TM 4916

TM 5569



Circuit TM 6221

TYPE	IMPEDANCE	CONNECTORS	FOR USE WITH
TM 5569	50–75 Ω	BNC Plug Belling-Lee Plug	TF 1064A -/2 TF 144H
TM 4918	50–75 Ω	N Socket Belling-Lee Plug	TF 1066B TF 801D (Series)
TM 4916	50–300 Ω Balanced	N Socket Solder Tags	TF 1066B TF 801D (Series)
TM 5549	50–75 Ω	N Socket Plessey Major CZ71060 Plug	TF 801D (Series)
TM 5548	50–75 Ω	N Socket Burndept PR4D Plug	TF 801D (Series)
TM 6221	75–600/200/150 Ω Balanced	BNC Socket Screw Terminals	TF 1370

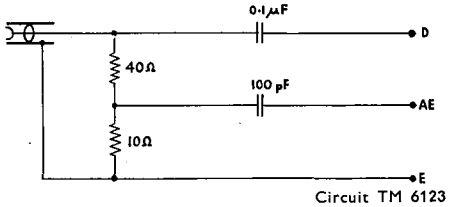
ATTENUATOR PADS

TM 5552

7581/5 TM 4919

TYPE	ATTENUATION AND IMPEDANCE	CONNECTORS	FOR USE WITH
TM 5552	20 dB, 75 Ω	BNC	TF 995A (Series)
TM 4919	20 dB, 50 Ω	N	TF 1066B TF 801D (Series)
TM 4919/1	6 dB, 50 Ω	N	TF 1066B TF 801D (Series)
TM 5573	20 dB, 50 Ω	BNC	TF 1064A -/2
TM 5573/1	6 dB, 50 Ω	BNC	TF 1064A -/2
TM 5554	10 dB, 50 Ω	N	TF 1060 TF 1145
TM 6464	40 dB, 75 Ω in, 75 and 5 Ω out	BNC	TF 1370

D.C. ISOLATING UNITS

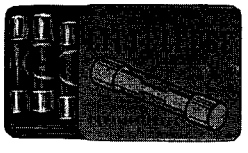


Circuit TM 6123

TM 6123 — A composite dummy aerial and d.c. isolating unit for use with TF 144H. Assists general receiver testing and allows the Generator to be used on circuits at d.c. potentials up to 350 volts.

TM 4917 — For use with TF 1066B and TF 801D (Series). Allows the Generator to be used for testing circuits at d.c. potentials up to 300 volts.

COAXIAL FUSE

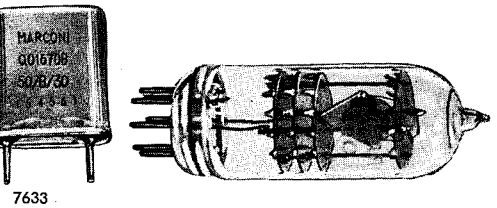


7581/6 TM 5753

TM 5753 — For use with TF 1066B and TF 801D (Series). Prevents damage to the Signal Generator attenuator through accidental application of r.f. or h.t. power to the circuit under test. Particularly useful in transmitter/receiver testing.

Rating	0·4 watt.
Insertion Loss	Nominally 0·5 dB.
V.S.W.R.	1·35 or less when terminated with a matched 50-ohm load. 1·6 or less when terminated with Generator attenuator via 20 dB Pad TM 4919.
Connectors	Type N.
Fuse	$\frac{1}{16}$ amp. Littelfuse Cat. No. 361.062. 10 spares are supplied.
Dimensions	Length $4\frac{7}{8}$ in; dia. $\frac{13}{16}$ in.

CRYSTALS



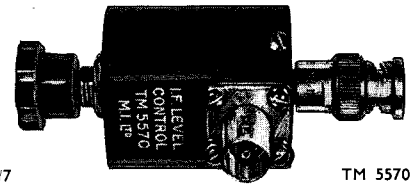
7633

M.W.T. Type QO 1655 (Series), B7G based, for i.f. oscillator in TF 1064A.

M.W.T. Type QO 1670 (Series), miniature 2-pin, for i.f. oscillator in TF 1064A/2.

ACCESSORIES

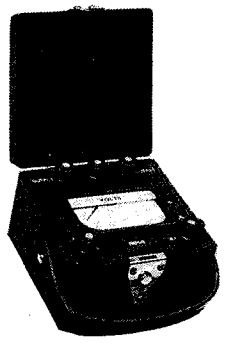
I.F. LEVEL CONTROL UNIT



7581/7 TM 5570

TM 5570 — For use with TF 1064A -/2 to reduce i.f. output; consists of a variable potentiometer in a small metal case fitted with BNC connectors.

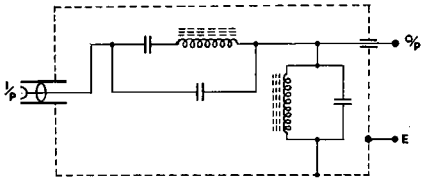
A.F. MONITOR & ATTENUATOR



7581/8 TM 5567

TM 5567 — For use with TF 1064A. Consists of an a.c. voltmeter shunted by a 10:1 potentiometer, with two input terminals and three output terminals giving the full voltage shown on the meter or one-tenth.

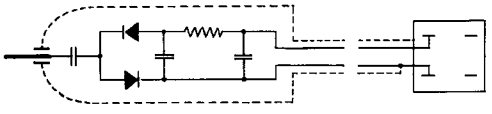
1-kc/s BAND PASS FILTER



Circuit TM 6222

TM 6222 — For use with TF 1370. Provides a very low distortion output at 1 kc/s. BNC input socket, screw terminals for output.

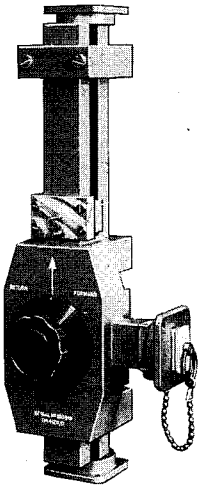
HIGH-IMPEDANCE PROBE



Circuit TM 6222

TM 5997 — For use with TF 1099 -/1 when measuring response of high-impedance circuits. Input impedance: 30 kΩ with 4 μμF in shunt. Fitted with spear point and earthing clip for connection to output of unit under test; supplied with 3 ft lead.

DIRECTIVE FEED ASSEMBLIES



7632 TM 4129D

For use with TF 890A/1. Each assembly, when inserted in the main waveguide run of the radar installation, allows a fraction of the forward or return power in the waveguide to be passed to the Test Set; alternatively it enables signals from the Test Set to be fed to the radar installation.

TM 4129D — For insertion in installations employing waveguide of internal size 0·9×0·4 inch, with American JAN Type UG-39/U square "bolted" couplings.

TM 4129 B/1M — For 1·0×0·5 inch waveguide, with Admiralty pin-locating couplings.