MARCONI
INSTRUMENTS

EB 893
4 - 10/56

OPERATING AND MAINTENANCE HANDBOOK

for

OUTPUT POWER METER

TYPE TF 893

MARCONI INSTRUMENTS LTD., ST. ALBANS HERTS., ENGLAND

CONTENTS

1. DESCRIPTION .... Page 4 - 5

GENERAL .... Sect 1.1.
DESIGN DETAILS .... Sect 1.2.

2. OPERATION .... Page 6 - 8

CONTROLS .... Sect 2.1.
MEASUREMENT PROCEDURE .... Sect 2.2.
VARIATION OF IMPEDANCE WITH D.C. CURRENT .... Sect 2.3.

3. MAINTENANCE .... Page 9 - 17

GENERAL .... Sect 3.1.
REMOVAL OF CASE .... Sect 3.2.
DISMANTLING THE INSTRUMENT .... Sect 3.3.
COMPONENTS OF SPECIALLY SELECTED VALUE .... Sect 3.4.
SCHEDULE OF TESTS .... Sect 3.5.
Introduction .... Sect 3.5.1.
Apparatus required .... Sect 3.5.2.
Insulation .... Sect 3.5.3.
Transformer D.C. Resistance .... Sect 3.5.4.
Iron Loss Balance Resistor .... Sect 3.5.5.
Input Impedance Accuracy .... Sect 3.5.6.
Frequency Characteristic .... Sect 3.5.7.
Meter Scale Shape .... Sect 3.5.8.
Overall Measurement Accuracy .... Sect 3.5.9.

APPENDICES

COMPONENT LAYOUT ILLUSTRATIONS .... MP 893-1 - 2
SPARES ORDERING SCHEDULE SCS/893
FUNCTIONAL DIAGRAM .... TBX 26266/1

CONTENTS (Continued)

COMPLETE CIRCUIT DIAGRAM.................. TCX 19723
TYPICAL FREQUENCY CHARACTERISTIC........ TBX 20486/1
TEST CIRCUITS.................................. TBX 26023
DECIBEL CONVERSION TABLE.................. EB SUPP-dB

SCHEDULE OF PARTS SUPPLIED

1. One Output Power Meter Type TF 893.

2. One Operating and Maintenance Handbook No. EB 893.

1. DESCRIPTION

1.1. GENERAL

The Marconi Output Power Meter Type TF 893 measures audio-frequency power levels within the range 20 μW to 10 watts and maintains its accuracy at both very high and very low frequencies. The input impedance is variable between 2.5 ohms and 20 kΩ; by suitable connection to the input, impedances of one-quarter the values quoted above can be obtained but with reduced power measurement accuracy. Provision is made for both balanced and unbalanced working.

The audio power is measured by a temperature-compensated constant-resistance multi-range rectifier voltmeter, the required input impedance being obtained by the use of a tapped transformer and a switched resistance-changing pad.

1.2. DESIGN DETAILS

The Meter measures the power delivered by an audio-frequency source into a load provided by the instrument itself. The wide power, impedance, and frequency ranges of the instrument are due primarily to two important features of design. These are (a) the use of switched resistive matching pads for selection of the significant figures of the input impedance value - a patented feature - and (b) decade multiplication of the input impedance value by means of a transformer having a tapped primary winding. This transformer has an English Electric wound-strip C core of an anisotropic magnetic alloy.

There are three panel-mounted controls - POWER RANGE, IMPEDANCE SELECTOR, and IMPEDANCE RANGE MULTIPLIER. The power ranges are 0 to 1 mW, 10 mW, 100 mW, 1 watt, and 10 watts; the first calibration is at 20 μW. A scale of decibels relative to 1 mW is also provided.

1.2. (Continued)

The overall impedance range of 2.5 to 20,000 ohms is covered in forty-eight steps arranged in two groups identified by the use of engraving in contrasting colours. The primary winding of the input (impedance matching) transformer is of low d.c. resistance, is isolated from the case, and is provided with a centre tap for push-pull working; the centre tap also allows impedances down to 0.625 Ω to be obtained, but with some falling off in performance.

The instrument is mounted in a portable case and is fitted with a hinged carrying handle, which swings down to support the case in a sloping position if so desired.

2. OPERATION

2.1. CONTROLS

Power Range Control The white mW figures associated with the POWER RANGE control refer to the full-scale deflection at each setting. The red dB figures indicate the decibels above 1 mW when the meter is reading 0 on its red scale. For any other meter reading the decibel indication on the meter should be added to the decibels indicated by the switch setting. At the 1 mW switch setting, the black -10 dB marking indicates decibels below 1 mW when the meter is reading 0 on its red scale. For any other meter reading at this switch setting, the decibel indication should be subtracted from 10 dB; the result obtained also being in terms of decibels below 1 mW.

Impedance Controls Each of six positions of the IMPEDANCE SELECTOR has two engraved values - a yellow figure above and a black figure below the control. The IMPEDANCE RANGE MULTIPLIER has alternate positions marked in black and yellow, every multiplication value being repeated in each colour.

This system is adopted in order to avoid awkward multiplying factors; and the impedance at any setting is given by multiplying together the IMPEDANCE RANGE MULTIPLIER setting and the same coloured figure at the setting of the IMPEDANCE SELECTOR control. For example, to set the power meter to 600 ohms, the IMPEDANCE SELECTOR should be set to 6/15 and the IMPEDANCE RANGE MULTIPLIER to x100-yellow. Whereas for an input impedance of 1,500 Ω, the IMPEDANCE SELECTOR should have the same setting - i.e. 6/15 - but the IMPEDANCE RANGE MULTIPLIER should be set to x100-black.

2.2. MEASUREMENT PROCEDURE

Note: Before making connection to the instrument, set the POWER RANGE switch to OFF in order to avoid possible damage to the meter.

2.2. (Continued)

Unbalanced Measurements

For normal unbalanced output measurements: connect the audio source under test to the INPUT terminals; set the impedance controls to give the required load impedance; adjust the POWER RANGE switch to give a convenient meter deflection; and read the power directly.

Balanced Measurements

To carry out measurements on balanced outputs, connect the centre tap of the output to the CT terminal on the Output Power Meter. The measurement may then be carried out as for unbalanced outputs.

Measurement at Low Impedance

To obtain impedances of 1/4 the value indicated at any setting of the IMPEDANCE controls, the power source should be connected between the CT terminal and either of the INPUT terminals. Loss of accuracy inevitably arises from this procedure as the input transformer is being operated in an out-of-balance condition. Some degree of improvement may be obtained by making two measurements - applying the power between the CT terminal and each of the INPUT terminals in turn - and taking the average.

Measurement of Source Impedance

To measure the internal impedance of any tone source, connect as for a normal power measurement, and adjust the IMPEDANCE controls for maximum indicated power. The impedance of the power meter is then equal to the impedance of the source.

2.3. VARIATION OF IMPEDANCE WITH D.C. CURRENT

The TF 893 is designed to measure a simple a.f. power and not a complex power that includes a d.c. component as well as the a.f.

2.3. (Continued)

component under investigation. The effect of any d.c. component is that of polarizing the core of the transformer and reducing the effective input impedance of the power meter. It is therefore recommended that the power meter should not be used where it is desired to simulate a high-impedance, unbalanced load if the d.c. component exceeds 5 to 10 mA. Such a case occurs when it is desired to use the output power meter in place of the output transformer of a single-ended output stage. The power meter can, however, be used for such a measurement on a push-pull stage, in this case, the only d.c. current that need be considered is the out-of-balance current.

3. MAINTENANCE

3.1. GENERAL

The following items (for details see APPENDICES, Page 19) are included in this handbook to assist in the maintenance of the Output Power Meter:-

Functional Diagram
Complete Circuit Diagram
Component Layout Illustrations - General and Interior Views
Spares Ordering Schedule with Circuit References

Before commencing the adjustment or replacement of component parts of the instrument, it is recommended that the user should familiarize himself with the details of design given in Section 1, DESCRIPTION, and illustrated in the Functional Diagram.

The complete Circuit Diagram shows all the electrical components contained in the instrument. The description of these components - their type, value, rating, etc., - is given in the Spares Ordering Schedule; this Schedule also lists certain selected mechanical components.

The physical location of the electrical components is shown in the Component Layout Illustrations.

3.2. REMOVAL OF CASE

To gain access to the interior of the instrument, first detach the two pivot bolts about which the anodized handle rotates; the handle may then be removed by springing out its side arms. Next, extract the 2-BA screw from the chromed plate on the base of the instrument; finally, remove the rear section of the case by giving it a light tap in the rearward direction with the palm of the hand.

3.3. DISMANTLING THE INSTRUMENT

All the electrical components are mounted on a sub-panel

3.3. (Continued)

secured to the front portion of the case. Normally, it should only be necessary to detach this sub-panel if it is desired to remove the meter or the input transformer.

To detach the sub-panel; (i) remove the control knobs after slackening the grub screws which secure them to their respective spindles; (ii) undo the nut securing the POWER RANGE switch to the front panel; (iii) remove the two countersunk-headed screws which secure the case feet to the front portion of the case; and (iv) unscrew the two 4-BA cheese-headed screws which are located above the meter terminals. The complete assembly may then be lifted clear of the case.

3.4. COMPONENTS OF SPECIALLY SELECTED VALUE

In the manufacturing data for the TF 893, certain of the components are designated for individual selection, the selection being carried out during the factory calibration of the instrument; this is necessary since the operating characteristics of the instrument have to conform to a quantitive specification including maximum and minimum limits of permissible error.

If, in servicing a TF 393, it is necessary to replace any of these components, it is also necessary, if the performance or accuracy of the instrument is not to be impaired, to repeat the factory calibration procedure by which the components were originally selected.

Section 3.5. gives a range of tests by which the main points of the performance of the instrument can be checked; this section also deals with the choice of value for individually selected components. TABLE I lists the circuit reference numbers of these components together with the numbers of the sections in which their selection is described.

3.4. (Continued)

TABLE 1

Component	Section Describing Selection
C1	3.5.7.
R1	3.5.4.
R2	3.5.4.
R3	3.5.4.
R4	3.5.4.
R5	3.5.4.
R6	3.5.4.
R7	3.5.4.
R8	3.5.4.
R9	3.5.4.
R26	3.5.5.
R37	3.5.8.

It will be appreciated that it may sometimes be necessary to reselect a selected component even though that component itself has not been found faulty and replaced in initial servicing operations.

To take an example, the resistance (R37) connected across the meter terminals is adjusted to correct for any slight differences in overall measurement accuracy as opposed to the accuracy of any particular range. Hence, if the meter is found to be faulty and is replaced, R37 may possibly require reselection in accordance with the procedure described in Section 3.5.8. to restore the sensitivity to its original value.

3.5. SCHEDULE OF TESTS

3.5.1. Introduction

The sections which follow give a range of tests by which the

3.5.1. (Continued)

main points of the performance of the instrument can be checked and are based on abstracts from the internal Factory Test Schedule TS 893.

The tests can be divided into two main categories, (a) those for measuring the input impedance of the power meter, and (b) those for measuring the overall power-reading accuracy.

(a) During the factory calibration of the instrument, the impedance is measured by means of an a.c. bridge as shown in Fig. 1 of Drawing No. TBX 26023 supplied with this handbook. As the total reactance referred to the primary of the transformer is negligible compared with the total referred resistance, for all settings of the IMPEDANCE controls, the impedance becomes:

$$Z = R_A \frac{R_C}{R_B}$$

and C_B is simply used as phase balance to correct for the small amount of reactive component that will, obviously, be present. Thus it can be seen that, if $R_C = R_B$, R_A indicates the value of the input impedance directly. It is these conditions that are assumed throughout the measurements described in the following sections although in practice it will probably be found convenient to alter the ratio R_C:R_B to obtain greater sensitivity at the extremes of the range.

(b) The circuit for obtaining the power reading accuracy is shown in Fig. 2 of TBX 26023. The value of R_E is made equal to the nominal impedance indicated by any particular setting of the IMPEDANCE controls. If the voltage (V) applied to the resultant network is known, the power dissipated in the load presented by the power meter alone is then given by:

$$P = \frac{V^2}{4R_E}$$

3.5.2. Apparatus Required

(a) Insulation Tester, 500 volt.

(b) Wheatstone Bridge.

(c) Variable Resistor, 30 kΩ.

(d) Detector.

(e) Decade Capacitor, 0 to 0.2 μF (C_B) (f) Two Standardized Resistance Boxes (R_B and R_C). (g) Standardized Decade Resistance Box (R_A, and also R_E).	For circuit reference see TBX 26023

(h) Audio Oscillator, 2-watt output minimum; **Marconi Types** TF 195 (Series) or TF 894 (Series).

(i) Standardized Monitor Voltmeter, 0 to 30 volts.

3.5.3. Insulation (Apparatus reqd: Item a)

Connect the insulation tester between either of the INPUT terminals and the E terminal and measure the insulation resistance. The resistance should be not less than 50 MΩ.

3.5.4. Transformer D.C. Resistance (Apparatus reqd: Item b)

Connect the test terminals of the wheatstone bridge to the INPUT terminals of the power meter. The total d.c. resistance of the portion of the primary winding in use and the associated padding resistor for any particular setting of the IMPEDANCE RANGE MULTIPLIER is given in TABLE 2 overleaf.

3.5.4. (Continued) TABLE 2.

IMPEDANCE RANGE MULTIPLIER setting	Total Resistance of Wdg. + Pad Resistor	Pad Resistor Circuit Ref.
x1 (Yellow)	0.48 Ω)	R8*
x1 (Black)	1.2 Ω)	R7
x10 (Yellow)	4.8 Ω)	R6
x10 (Black)	12.0 Ω)	R5
x100 (Yellow)	48.0 Ω) ±0.5%	R4
x100 (Black)	120.0 Ω)	R3
x1000 (Yellow)	480 Ω)	R2
x1000 (Black)	1200 Ω)	R1

* The resistor R8 is not normally required.

Before measuring the secondary resistance, disconnect one end of R26, set the IMPEDANCE SELECTOR to 8/20, and the POWER RANGE switch to OFF. Measure the resistance between the junction of R9/R10 and tag 20 of the transformer; the total resistance of the secondary winding and its pad resistor (R9) should be 791.2 Ω ±0.5%.

If the measured resistance is in error, adjust the associated pad resistors to bring the resistance within the limits quoted.

3.5.5. Iron Loss Balance Resistor (Apparatus reqd: Items c to h)

Connect the Output Power Meter to the test circuit shown in Fig. 1. of TBX 26023 - see also Section 3.5.1. (a). Remove the resistor R26 and in its place connect the 30-kΩ variable resistor - let this resistor be R_D. Set the IMPEDANCE controls to 1000 Ω and the POWER RANGE switch to 10W. With the bridge components

3.5.5. (Continued)

set so that $(R_A . R_C) / R_B$ = 1000Ω, adjust C_B and R_D for balance. Measure the value of R_D required to produce balance and,if necessary, select R26 to equal this value.

3.5.6. Input Impedance Accuracy (Apparatus reqd: Items d to h)

Connect the Output Power Meter to the test circuit shown in Fig. 1 of TBX 26023 - see also Section 3.5.1. (a). With the POWER RANGE switch set to 10 W, measure the input impedance at Power Meter settings of:

6.25,	8,	20,	40,
100,	250,	300,	400,
500,	600,	800,	1000,
2500,	8000,	10000, and	20000 ohms

In all cases, the actual impedance should be within ±5% of the nominal value.

Measure the impedance of the 4, 250, 800, and 10000 ohm steps at frequencies of 60 c/s and 10 kc/s. The measured impedance should be within ±5% of the nominal impedance.

This test does not include all the possible combinations of the two IMPEDANCE controls but it is sufficient to ensure that all steps are functioning correctly and that the actual impedance at every setting is within the ±5% limit.

3.5.7. Frequency Characteristic (Apparatus reqd: Items g, h, and i)

Connect the Output Power Meter to the test circuit shown in Fig 2 of TBX 26023 - see also Section 3.5.1. (b). Set the IMPEDANCE controls and R_E to 1000 Ω. Apply a voltage sufficient to produce a power reading of, say, 400 mW (in this case, the voltage required is 40 V r.m.s.). Vary the frequency over the range 50 c/s to 20 kc/s

3.5.7. (Continued)

and check that the response, with respect to 1 kc/s, is within ± 0.5 dB from 50 c/s to 10 kc/s and within ± 1 dB from 10 to 20 kc/s. If the frequency characteristic is in error, it may be corrected by adjustment of C1.

3.5.8. Meter Scale Shape (Apparatus reqd: Items g, h, and i)

Before checking the scale shape, it is advisable to set up the overall accuracy in the following manner. Connect the Output Power Meter to the test circuit shown in Fig. 2 of TBX 26023 - see also Section 3.5.1. (b). Set the IMPEDANCE controls and R_E to 1000 ohms. With the frequency at 1000 c/s apply 40 V r.m.s. to the R_E/TF 893 network and check that the meter indication is 400 mW ±5 mW. The accuracy of indication may be adjusted by shunting meter terminals 1 and 2 (or 2 and 3) with a suitable resistor (R37).

With the POWER RANGE switch set to the 100-mW range, vary the applied voltage in accordance with TABLE 3 and check that the power meter indication is within the limits quoted.

TABLE 3

Applied Voltage (r.m.s.)	Output Power Meter Reading (mW)
6.32	9.5 to 10.5
8.94	17.5 to 22.5
12.6	38 to 42
15.5	57 to 63
17.9	76 to 84
20.0	95 to 105

3.5.9. Overall Measurement Accuracy (Apparatus reqd: Items g, h, and i)

Connect the Output Power Meter to the test circuit shown in Fig. 2 of TBX 26023 - see also Section 3.5.1. (b). For various settings of the IMPEDANCE controls (as listed in TABLE 4) check the accuracy of the power readings produced by applying voltages as indicated in TABLE 4.

TABLE 4

IMPEDANCE Setting	Applied Voltage	Output Power Meter Reading
2.5 Ω	2 V	380 to 420 mW
6.25 Ω	2 V	135 to 185 mW
30 Ω	2 V	30.5 to 35.5 mW
100 Ω	20 V	0.95 to 1.05 W
500 Ω	20 V	175 to 225 mW
1500 Ω	20 V	63.3 to 69.9 mW
8000 Ω	16 V	7.6 to 8.4 mW
20000 Ω	8 V	0.76 to 0.84 mW

APPENDICES

COMPONENT LAYOUT ILLUSTRATIONS
Front View.................................MP 893-1
Interior Views.............................MP 893-2

SPARES ORDERING SCHEDULE WITH
CIRCUIT REFERENCES....................SOS/893

FUNCTIONAL DIAGRAM.......................TBX 26266/1
COMPLETE CIRCUIT DIAGRAM................TCX 19723
TYPICAL FREQUENCY CHARACTERISTIC......TBX 20486/1
TEST CIRCUITS.............................TBX 26023
DECIBEL CONVERSION TABLE................EB SUPP-dB

SPARES ORDERING SCHEDULE NO. SOS/893

WITH CIRCUIT REFERENCES

for

OUTPUT POWER METER TYPE TF 893

Applicable to Instruments
Serial Nos.

5032001 to 5032200
5156001 to 5156200
5223001 to 5223200
5270001 to 5270100
5322001 to 5322100

When ordering replacement parts, ALWAYS QUOTE THE TYPE NUMBER AND SERIAL NUMBER OF THE INSTRUMENT CONCERNED.

To specify the individual parts required, STATE FOR EACH PART THE QUANTITY REQUIRED AND THE APPROPRIATE SOS ITEM NUMBER.

For example, to order replacements for the 423.75-Ω Resistor, R12, and the Rotary Switch, S1, quote as follows:

Spares required for TF 893, Serial Number 000000

1 off, SOS Item 3
1 off, SOS Item 29

It is most important that the code "SOS" preceding each item number should not be omitted.

SOS Item No.	Circuit Ref.	Description	Works Ref.
	R1	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R2	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R3	Resistor Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R4	Resistor, Wire-Wound, value to suit Input Transformer, Forms part of Item 27.	
	R5	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R6	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R7	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R8	Resistor, Wire-Wound, value to suit Input Transformer. Forms part of Item 27.	
	R9	Resistor, Carbon, $\frac{1}{2}$W, value to suit Input Transformer.	
1	R10	Resistor, Wire-Wound, 200.65 Ω ±0.1%, 1W.	37-TF893
2	R11	Resistor, Wire-Wound, 200.65 Ω ±0.1% 1W	37-TF893
3	R12	Resistor, Wire-Wound, 423.75 Ω ±0.1%, 1W.	38-TF893
4	R13	Resistor, Wire-Wound, 423.75 Ω ±0.1%, 1W.	38-TF893
5	R14	Resistor, Wire-Wound, 449.0 Ω ±0.1%, 1W.	39-TF893
6	R15	Resistor, Wire-Wound, 449.0 Ω ±0.1% 1W.	39-TF893

SOS Item No.	Circuit Ref.	Description	Works Ref.
7	R16	Resistor, Wire-Wound, 472.5 Ω ±0.1%, 1W.	40-TF893
8	R17	Resistor, Wire-Wound, 472.5 Ω ±0.1%, 1W.	40-TF893
9	R18	Resistor, Wire-Wound, 1009.5 Ω ±0.1%, 1W.	41-TF893
10	R19	Resistor, Wire-Wound, 1009.5 Ω ±0.1%, 1W.	41-TF893
11	R20	Resistor, Wire-Wound, 624.0 Ω ±0.1%, 1W.	42-TF893
12	R21	Resistor, Wire-Wound, 1665 Ω ±0.1%, 1W.	43-TF893
13	R22	Resistor, Wire-Wound, 2726 Ω ±0.1%, 1W.	44-TF893
14	R23	Resistor, Wire-Wound, 5284 Ω ±0.1%, 1W	45-TF893
15	R24	Resistor, Wire-Wound, 1327 Ω ±0.1% 1W.	46-TF893
16	R25	Resistor, Wire-Wound, 1327 Ω ±0.1%, 1W.	46-TF893
	R26	Resistor, Carbon, $\frac{1}{2}$W value to suit Input Transformer.	
17	R27	Resistor, Wire-Wound, 854.5 Ω ±0.1%, 1 1/4W.	48-TF893
18	R28	Resistor, Wire-Wound, 854.5 Ω ±0.1%, 1 1/4W	48-TF893
19	R29	Resistor, Wire-Wound, 541 Ω ±0.1%, 1W.	49-TF893
20	R30	Resistor, Wire-Wound, 170 Ω ±0.1%, 1W.	50-TF893
21	R31	Resistor, Wire-Wound, 196 Ω ±0.1%, 1W.	51-TF893
22	R32	Resistor, Wire-Wound, 878 Ω ±0.1%, 1W.	52-TF893
23	R33	Resistor, Wire-Wound, 81.7 Ω ±0.1% 1W.	53-TF893

SOS Item No.	Circuit Ref.	Description	Works Ref.
24	R34	Resistor, Wire-Wound, 7120 Ω ±0.1% 1W	54-TF893
25	R35	Resistor, Wire-Wound, 3290 Ω ±0.1%, 1W.	55-TF893
26	R36	Resistor, Wire-Wound, 6200 Ω ±0.1%, 1W.	56-TF893
	R37	Resistor, Carbon, $\frac{1}{2}$W, value to suit meter sensitivity; shown connected between meter terminals 1 and 2 but may be connected between 2 and 3.	
	C1	Capacitor, nominally 0.001 μF, 200 V d.c; actual value determined during calibration.	
27		Transformer, Impedance Matching, includes Resistors R1 to R6.	TM4218
28		Meter Assembly, comprises 0 to 50 μA meter, bridge rectifier, and temperature-compensating resistors.	TM3970/23
29	S1	Switch, Rotary, 8 position, 2 pole, 2 wafer.	TC4428/310
30	S2	Switch, Rotary, 6 position, 2 pole, 1 wafer.	TC4428/311
31	S3	Switch, Rotary, 6 position, 2 pole, 1 wafer.	TC4428/312

MECHANICAL COMPONENTS

SOS Item No.	Circuit Ref.	Description	Works Ref.
32		Knob, for Item 29.	TB17848/2
33		Knob, for Item 30.	TB17848
34		Knob, for Item 31.	30-TF893

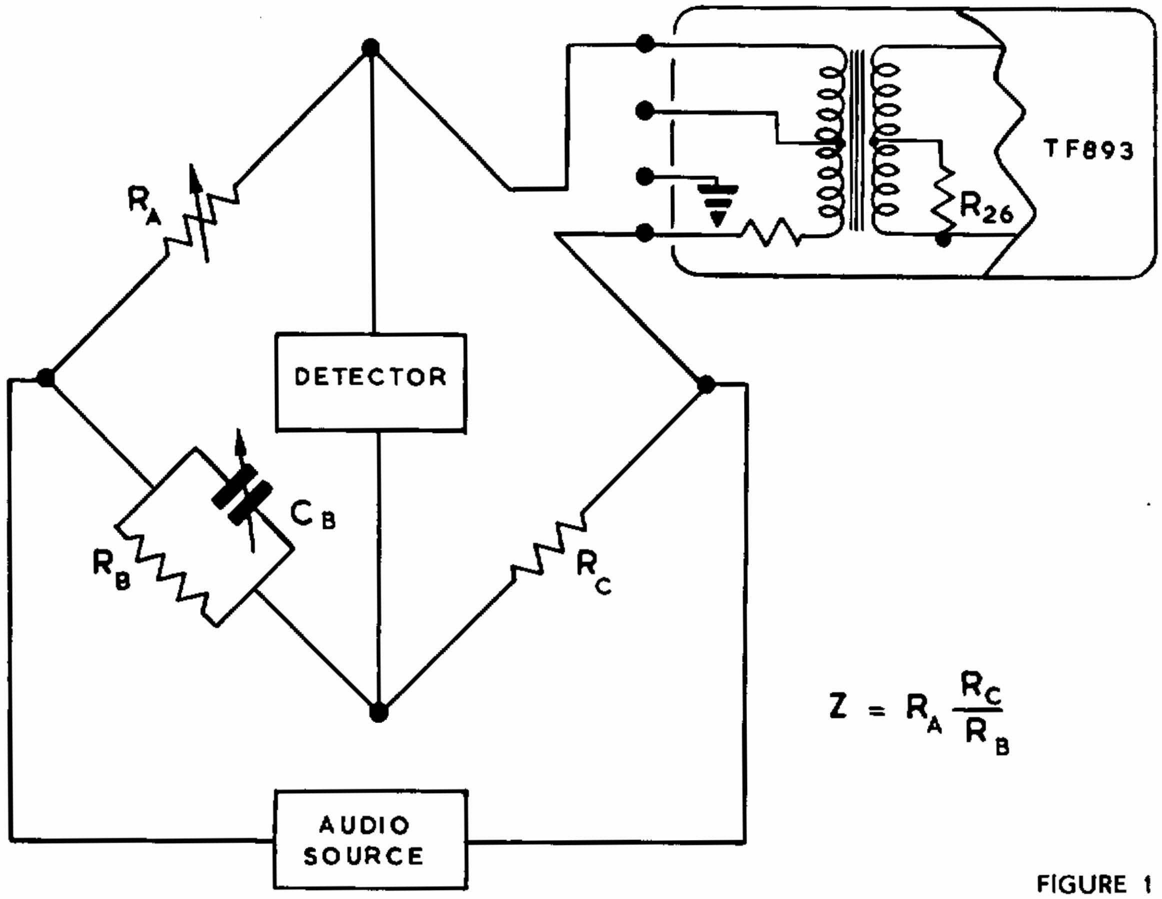
SOS Item No.	Circuit Ref.	Description	Works Ref.
		MECHANICAL COMPONENTS (Cont'd)	
35		Terminal, for INPUT and CT connections.	28-TF893
36		Terminal, for E connection.	29-TF893
37		Case front section; includes Item 38.	TE19724/1
38		Anodized edging strip, three section; included in Item 37.	TC18240
39		Chromed handle-securing plate, right-hand.	TA18738
40		Chromed handle-securing plate, left-hand.	TA18738/1
41		Chromed base-securing plate.	TA18738/2
42		Case feet, set of two, for Item 37.	TA22919
43		Case rear section.	TE19724/2
44		Case feet, set of four, for Item 43.	TA22919
45		Transformer support assembly, secured to Item 43.	TE19728/7 TE19728/8
46		Anodized carrying handle.	TB18736
47		Pivot bolts, set of two, for securing Item 46 to Items 39 and 40.	TB18737/1
48		Set of two hexagonal wrenches, for socket set-screws sizes 2- and 4-BA; complete in linen bag.	57-TF893
49		Operating and Maintenance Handbook.	EB893

DECIBEL CONVERSION TABLE

Ratio Down			*Ratio Up*	
VOLTAGE	*POWER*	*DECIBELS*	*VOLTAGE*	*POWER*
1·0	1·0	**0**	1·0	1·0
·9886	·9772	**·1**	1·012	1·023
·9772	·9550	**·2**	1·023	1·047
·9661	·9333	**·3**	1·035	1·072
·9550	·9120	**·4**	1·047	1·096
·9441	·8913	**·5**	1·059	1·122
·9333	·8710	**·6**	1·072	1·148
·9226	·8511	**·7**	1·084	1·175
·9120	·8318	**·8**	1·096	1·202
·9016	·8128	**·9**	1·109	1·230
·8913	·7943	**1·0**	1·122	1·259
·8710	·7586	**1·2**	1·148	1·318
·8511	·7244	**1·4**	1·175	1·380
·8318	·6918	**1·6**	1·202	1·445
·8128	·6607	**1·8**	1·230	1·514
·7943	·6310	**2·0**	1·259	1·585
·7762	·6026	**2·2**	1·288	1·660
·7586	·5754	**2·4**	1·318	1·738
·7413	·5495	**2·6**	1·349	1·820
·7244	·5248	**2·8**	1·380	1·905
·7079	·5012	**3·0**	1·413	1·995
·6683	·4467	**3·5**	1·496	2·239
·6310	·3981	**4·0**	1·585	2·512
·5957	·3548	**4·5**	1·679	2·818
·5623	·3162	**5·0**	1·778	3·162
·5309	·2818	**5·5**	1·884	3·548
·5012	·2512	**6**	1·995	3·981
·4467	·1995	**7**	2·239	5·012
·3981	·1585	**8**	2·512	6·310
·3548	·1259	**9**	2·818	7·943
·3162	·1000	**10**	3·162	10·000
·2818	·07943	**11**	3·548	12·59
·2512	·06310	**12**	3·981	15·85
·2239	·05012	**13**	4·467	19·95
·1995	·03981	**14**	5·012	25·12
·1778	·03162	**15**	5·623	31·62

DECIBEL CONVERSION TABLE

Ratio Down			*Ratio Up*	
VOLTAGE	*POWER*	*DECIBELS*	*VOLTAGE*	*POWER*
·1585	·02512	**16**	6·310	39·81
·1413	·01995	**17**	7·079	50·12
·1259	·01585	**18**	7·943	63·10
·1122	·01259	**19**	8·913	79·43
·1000	·01000	**20**	10·000	100·00
·07943	·006310	**22**	12·59	158·5
·06310	·003981	**24**	15·85	251·2
·05012	·002512	**26**	19·95	398·1
·03981	·001585	**28**	25·12	631·0
·03162	·001000	**30**	31·62	1,000
·02512	·0006310	**32**	39·81	1,585
·01995	·0003981	**34**	50·12	2,512
·01585	·0002512	**36**	63·10	3,981
·01259	·0001585	**38**	79·43	6,310
·01000	·0001000	**40**	100·00	10,000
·007943	·00006310	**42**	125·9	15,850
·006310	·00003981	**44**	158·5	25,120
·005012	·00002512	**46**	199·5	39,810
·003981	·00001585	**48**	251·2	63,100
·003162	·00001000	**50**	316·2	100,000
·002512	6·320 × 10^{6}	**52**	398·1	158,500
·001995	3·981 × 10^{6}	**54**	501·2	251,200
·001585	2·512 × 10^{-6}	**56**	631·0	398,100
·001259	1·585 × 10^{6}	**58**	794·3	631,000
·001000	10^{-6}	**60**	1,000	10^{6}
·0005623	3·162 × 10^{7}	**65**	1,778	3·162 × 10^{6}
·0003162	10^{-7}	**70**	3,162	10^{7}
·0001778	3·162 × 10^{8}	**75**	5,623	3·162 × 10^{7}
·0001000	10^{-8}	**80**	10,000	10^{8}
·00005623	3·162 × 10^{-9}	**85**	17,780	3·162 × 10^{8}
·00003162	10^{9}	**90**	31,620	10^{9}
·00001000	10^{10}	**100**	100,000	10^{10}
3·162 × 10^{6}	10^{11}	**110**	316,200	10^{11}
10^{-6}	10^{-12}	**120**	10^{6}	10^{12}
3·162 × 10^{-7}	10^{-13}	**130**	3·162 × 10^{6}	10^{13}
10^{-7}	10^{14}	**140**	10^{7}	10^{14}



$$Z = R_A \frac{R_C}{R_B}$$

FIGURE 1

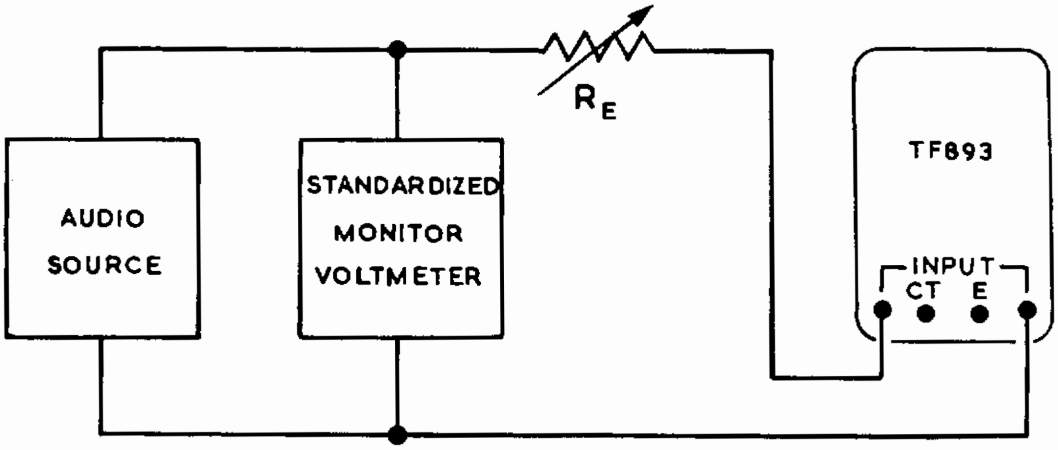


FIGURE 2

TEST CIRCUITS

TBX 26023


MARCONI INSTRUMENTS LTD
OUTPUT POWER METER
MILLIWATTS
TF893
POWER RANGE
Nº 1948128
IMPEDANCE RANGE MULTIPLIER
IMPEDANCE SELECTOR
INPUT
MADE IN ENGLAND

FRONT VIEW