

Radio Frequency Signal Generator E2

Instruction Manual

ADVANCE ELECTRONICS LIMITED

INSTRUMENT DIVISION

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TELEPHONE: 01-500.1000 TELEGRAMS: ATTENUATE ILFORD

Introduction

Section 1

The E2 signal generator has a wide frequency range from 100kHz to 100MHz and an accurate attenuator system. It is designed to provide a degree of accuracy sufficient for all practical purposes in the measurement of selectivity and sensitivity in radio receivers. Provision is made for external modulation with low power input up to 10kHz, as well as for 400Hz 30% internal modulation. The frequency range covers the sound broadcasting and band 1 television frequencies on fundamentals.

Specification**Section 2****Frequency**

Directly calibrated in six ranges:—

Range

A: 30 to 100MHz D: 1 to 3MHz
B: 10 to 30MHz E: 300 to 1,000kHz
C: 3 to 10MHz F: 100 to 300kHz

Accuracy $\pm 1\%$

Output Voltage

Obtained at the end of the 75 Ω matched transmission line.
Continuously variable from 1 μ V to 100mV.
Accuracy of maximum output ± 3 dB.
Accuracy of step attenuator $\pm (3$ dB + 3 μ V).

Output Impedance

At the end of unterminated transmission line 75 Ω .
When terminated by TP1B Pad, three values are available:
37 Ω , 10 Ω , or 10 Ω through the standard all-wave dummy aerial.

Full R.F. Output Socket

Provides approximately 1V into 1,000 Ω load.

Internal Modulation

30% ($\pm 5\%$) at 400Hz ($\pm 10\%$).

External Modulation

0 to 80% from 10Hz to 4kHz, falling to 40% at 10kHz.
Input impedance is 50k Ω .

A.F. Output

Approximately 0 to 50V, 400Hz at high impedance.

R.F. Leakage

Typically 3 μ V.

Specification**Section 2****Valves**

One ECC91 (6J6); one 6SN7GT; one 6X5GT; one 11mm 6.5V pilot lamp.

Accessories

One termination pad and dummy aerial, TP1B; one shielded R.F. lead with plug and socket, PL28; one A.F. lead with plugs and crocodile clips, PL29.

Power Supply

105 to 125V and 210 to 250V, 45 to 65 Hz (a.c. only).
Consumption approximately 20W.

Special Models

E2E 110 to 125V, 140 to 160V and 220V, 40 to 100Hz.

Dimensions

13in. wide x 10 $\frac{1}{2}$ in. high x 8in. deep.
(33.0cm x 26.0cm x 20.3cm)

Weight

17 $\frac{1}{2}$ lb (8kg).

Finish

Dark blue metal case with leather carrying handle and light grey front panel.

Operation**Section 3****3.1 Supply Voltage**

The instrument is available in two versions to suit differing a.c. supplies. These are:

- E2: 105 to 125V, and 210 to 250V, 45 to 65 Hz.
E2E: 110 to 125V, 140 to 160V, and 220V, 45 to 65 Hz.

The standard model E2, is normally despatched with the supply voltage adjustment set for operation at 210 to 250V, that is, with tag 2 connected to tag 3. To adjust for 105 to 125V operation, remove the disc on the underside of the case and expose the tags on the supply transformer, remove the connection between tags 2 and 3, connect tag 1 to tag 2, and tag 3 to tag 4. Replace the cover disc.

3.2 Frequency Selection

A signal of any frequency between 100kHz and 100MHz is obtainable to an accuracy of $\pm 1\%$ by means of a directly calibrated scale and a 6-waveband selector switch.

3.3 Full R.F. Socket

Output at the FULL R.F. socket is approximately one volt and is not controlled by the attenuators. For the full output the load impedance should be not less than $1,000\Omega$. A cover is fitted over the FULL R.F. socket to prevent radiation from the socket causing false measurements at low signal levels.

3.4 R.F. Attenuators

When the ATTEN. R.F. socket is used the FULL R.F. socket must be closed with its cover.

The signal is controlled by two attenuators. The output from the oscillator section is fed first to the non-inductive VOLTAGE OUTPUT potentiometer, and then to the MULTIPLIER, a five-step attenuator calibrated: X1, X10, X100 μ V and X1, X10mV. Thus, multiplying the indication of the two controls the output is variable up to 100mV. The output impedance is 75Ω except on step X10mV when it varies from 65 to 75Ω according to the setting of the VOLTAGE OUTPUT attenuator.

Accuracy of Step Attenuator $\pm (3\text{dB} \div 3\mu\text{V})$

Accuracy of Maximum Output $\pm 3\text{dB}$

Operation**Section 3****3.5 Termination Pad TP1B**

In order to obtain the outputs stated, it is necessary for the output socket to be correctly terminated with a 75Ω load. Such a load is provided by the connector PL28 and the Termination Pad TP1B. The following outputs are obtainable from the TP1B:

- (1) output impedance 37Ω and voltage as indicated
- (2) output impedance 10Ω and voltage one-tenth of that indicated
- (3) output impedance that of a standard all-wave dummy aerial and voltage one-tenth of that indicated.

Refer to circuit diagram for circuit of TP1B.

At frequencies above 10MHz, the connection from the pad to the receiver should be as short as possible, and certainly not longer than three inches.

3.6 Audio Frequency Output

When the MOD switch is in the INT position the carrier output is modulated 30% at 400Hz. The A.F. control, which is combined with the supply on-off switch, varies the a.f. voltage (400Hz) available at the A.F. socket from 0 to 50V (high impedance load).

When the MOD switch is in the CW-EXT position the carrier is normally unmodulated. For external modulation inject an a.f. signal from an external source into the A.F. socket. It is important that the A.F. control is set at **MAXIMUM** when using an external source. External modulation is possible from 10Hz to 10kHz.

The maximum undistorted modulation is 80% at low frequencies, falling off as the frequency rises.

For modulation frequencies less than one-fiftieth of the carrier, maximum modulation is 80% at 4,000Hz falling to 40% at 10kHz.

Modulation depth % $(15 \times \text{input volts})$

Input impedance = $50,000\Omega$

3.7 Use of Connector PL29

This connector has crocodile clips at one end, and is supplied for a.f. testing and i.f. alignment.

3.8 Connection to Points of High Potential

It must be remembered that all outputs have low resistance paths to earth. Therefore if a signal is to be injected into apparatus at a point which has high potential to earth, a blocking capacitor must be inserted in series with the generator output.

Maintenance**Section 4****4.1 Removal and Replacement of Instrument Case**

Remove the dome nut from the rear of the case. Lay the instrument on its back and remove the four screws in the corners of the panel, each a little at a time. The instruments can then be lifted from the case.

To reassemble, lay the case on its back and replace instrument. Engage the threads of the corner screws, stand the instrument upright and carefully screw down the panel evenly, making sure that the back chassis bolt appears through its clearing hole in the case. The dome nut must then be replaced.

4.2 Access to R.F. Oscillator Valve

The ECC91 valve is in an internal screening box holding the oscillator assembly. To open this box remove the pilot lamp-bracket and undo the self-tapping screws on the edges of the box. Care must be taken not to disturb the trimmers and coil assembly. The trimmers **MUST ON NO ACCOUNT** be adjusted, as this will make the frequency calibration incorrect. The ECC91 oscillator valve may be replaced without appreciable effect on the calibration. To ensure reliable screening **ALL** screws must be replaced when the screen is refitted.

In all cases of difficulty the instruments should be returned to the factory for repair or adjustment.

**Components List and
Circuit Diagram****Section 5****RESISTORS**

(Erie type 9 unless specified)

Ref.	Description	Pt. No.	Ref.	Description	Pt. No.
R 1	39K \pm 10%	869	R20	91 Ω \pm 5%	3388
R 2	4.7K \pm 10%	1499	R21	220 Ω \pm 5%	8580
R 3	15K \pm 10%	117	R22	120 Ω \pm 5%	3646
R 4	22 Ω \pm 10%	4419	R23	180 Ω \pm 5%	1430
R 5	33K \pm 10%	1183	R24	91 Ω W.W. Pot's.	3754
R 6	1K \pm 10%	1175	R25	100 Ω \pm 5%	2021
R 7	3.3K \pm 10%	2736	R26	56 Ω \pm 5%	7142
R 8	100K \pm 5%	1270	R27	82 Ω \pm 5%	3387
R 9	100K \pm 10%	1270	R28	1K \pm 10%	1175
R10	1K \pm 5% ERIE8	6911	R29	100K \pm 10%	1270
R11	2.7M \pm 10%	7434	R30	1M \pm 10%	1171
R12	50K Carbon pot.	5276	R31	560 Ω \pm 10%	5143
R13	750 Ω \pm 5%	3386	R32	33 Ω \pm 10%	11979
R14	750 Ω \pm 5%	3386	R33	270 Ω \pm 5%	1843
R15	750 Ω \pm 5%	3386	R34	100 Ω \pm 5%	2021
R16	750 Ω \pm 5%	3386	R35	11 Ω \pm 5%	1824
R17	82 Ω \pm 5%	3387	R36	390 Ω \pm 10%	612
R18	91 Ω \pm 5%	3388	R37	12 Ω \pm 10%	1826
R19	91 Ω \pm 5%	3388	R38	10 Ω \pm 10%	671

CAPACITORS

Ref	Description	Pt. No.
C 1	... 528pF ... Plessey single gang	7368
C 2	... Wire trimmer	7810
C 3	... Wire trimmer	7810
C 4	... Wire trimmer	7810
C 5	... Wire trimmer	7810
C 6	... Wire trimmer	7810
C 7	... Wire trimmer	7810
C 8	... 100pF ... \pm 5% Silver mica	2758
C 9	... 1,000pF ... \pm 20% M/M Hunts	5325
C10	... Wire trimmer	7810
C11	... 1,000pF ... \pm 20% M/M Hunts	5325
C12	... 0.05 μ F ... 350 volts T.C.C. Tub. paper	7491
C13	... 0.05 μ F ... 350 volts T.C.C.	8090
C14	... } 16+16 μ F ... Hunts electrolytic	7014
C15		
C16	... 1,000pF ... \pm 20% M/M Hunts	5325
C17	... 1,000pF ... \pm 20% M/M Hunts	5325

C18	...	0.005 μ F	...	\pm 15% M/M Hunts	1524
C19	...	0.005 μ F	...	\pm 15% M/M Hunts	1524
C20	...	0.005 μ F	...	\pm 15% M/M Hunts	1520
C21	...	40pF	...	\pm 20% Ceramic	4824
C22	...	200pF	...	\pm 10% Hunts L1/2	5110

MISCELLANEOUS

Ref.		Description	Pt. No.
V 1	...	ECC91 R.F. Oscillator	7034
V 2	...	6SN7GT Modulator	5873
V 3	...	6X5G Rectifier	3150
T 1	...	Supply transformer	MT294
T 2	...	Mod. transformer	MT308
L 1	...	Coil, Osc.	100 to 300 kHz RF539
L 1c	...	Coil, Coupling	
L 2	...	Coil, Osc.	300 to 1 MHz RF538
L 2c	...	Coil, Coupling	
L 3	...	Coil, Osc.	1 to 3 MHz RF537
L 3c	...	Coil, Coupling	
L 4	...	Coil, Osc.	3 to 10 MHz RF536
L 4c	...	Coil, Coupling	
L 5	...	Coil, Osc.	10 to 30 MHz RF535
L 5c	...	Coil, Coupling	
L 6	...	Coil, Osc.	30 to 100 MHz Loop
L 6c	...	Coil, Coupling	
L 7	...	H.T. r.f. choke	C121
L 8	...	H.T. r.f. choke	C 16
L 9	...	L.T. r.f. choke	C 95
L10	...	L.T. r.f. choke	C 95
L11	...	Supply r.f. choke	C 83
L12	...	Termination pad coil	RF369
S1A	...	} .. Band change switch	16148
S1B	...		
S1C	...		
S2A	...	} ... Mod. switch	6849
S2B	...		
S3	...	Supply On/Off switch	Part of R12

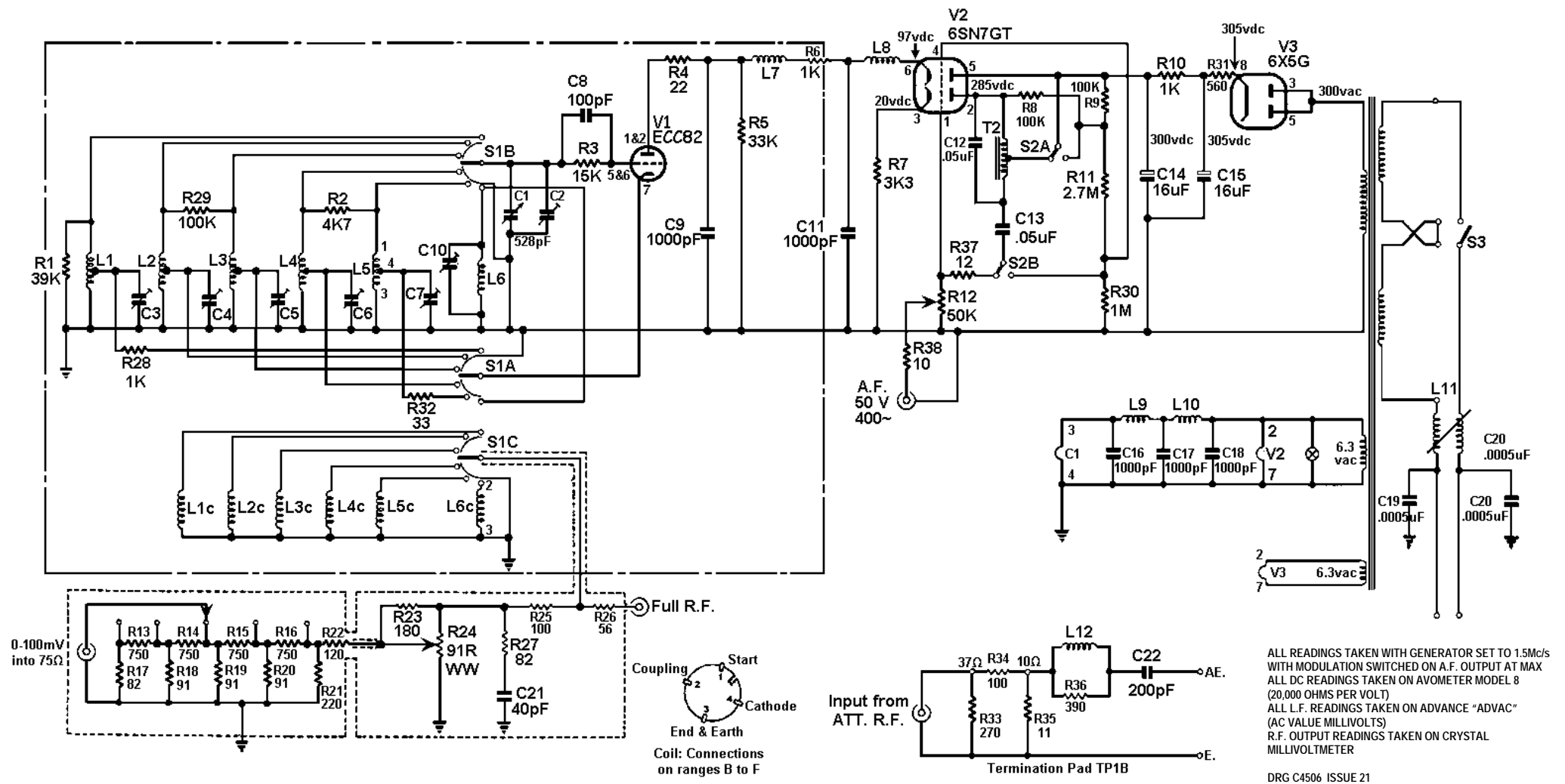
Guarantee and Service Facilities**Section 6**

This instrument is guaranteed for a period of one year from its delivery to the purchaser, covering the replacement of defective parts other than valves, semiconductors and fuses. Valve and semiconductors are subject to the manufacturers' guarantee.

We maintain comprehensive after sales facilities and the instrument can, if necessary, be returned to our factory for servicing. The Type and Serial Number of the instrument should always be quoted, together with full details of any fault and the service required. The Service Department can also provide maintenance and repair information by telephone or letter.

Equipment returned to us for servicing must be adequately packed, preferably in the special box supplied, and shipped with transportation charges prepaid. We can accept no responsibility for instruments arriving damaged. Should the cause of failure during the guarantee period be due to misuse or abuse of the instrument, or if the guarantee has expired, the repair will be put in hand without delay and charged unless other instructions are received.

OUR SALES, SERVICE AND ENGINEERING DEPARTMENTS ARE READY TO ASSIST YOU AT ALL TIMES.



EVERY EFFORT IS MADE TO KEEP THIS CIRCUIT UP TO DATE BUT THE RIGHT IS RESERVED TO ADJUST THE VALUES OR AMEND THE CIRCUIT WITHOUT NOTICE

Re-drawn Jan 2002 Chris Colebrook
Minor modifications Nov 2003 Jon Evans

Fig. 1 Circuit Diagram E2