

EDDYSTONE
HIGH STABILITY
COMMUNICATIONS RECEIVER
MODEL 880/2



500 kc/s. to 30.5 Mc/s.

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Eddystone 880/2 Receiver

The Eddystone model "880/2" is an HF communications receiver of unique design and construction, covering frequencies 500 kc/s to 30.5 Mc/s in thirty switched ranges. Provision is made for the reception of AM (A2 and A3), CW (A1) and SSB (A3a) signals and the receiver operates directly from all standard AC mains supplies, or, if these are not available, from any source capable of providing the necessary HT and LT voltages.

The special design of the "880/2" leads to a number of advantages, the most prominent of which are (a) capability of reading off the frequency to a high order of accuracy; (b) extremely low frequency drift, comparable in practice with crystal control; (c) ease of connecting receivers for diversity operation; and (d) reduction of stray radiation at any frequency to an extraordinarily low level.

The exceptional stability is brought about by using a double conversion technique, with the first oscillator crystal-controlled, and the second designed for very high thermal, electrical and mechanical stability. This second oscillator unit is tuned with a variable capacitor having a very accurate straight-line frequency law — hence the linear tuning scale, observable in the illustration — whilst the associated wiring is printed on a fibre-glass board. Permeability tuning is employed in the two radio-frequency stages.

Radiation has been reduced to an extremely low level, a feature of great importance where receivers are to be operated in close proximity to one another. High quality components are employed throughout and the receiver may be used for continuous operation in most climatic conditions.

Each of the thirty ranges has a nominal coverage of one megacycle, so giving a constant tuning rate regardless of the range in actual use. Bandspread is more than adequate for all purposes, the main tuning control having no fewer than twentyfour revolutions to cover each range. The presentation of the tuning scale is such that only the figures relative to the range in use are visible, and the accuracy of adjustment is within 1 kc/s at any frequency.

The "880/2" receiver is of robust construction. It is housed in a strong protective cabinet and may be used as a table model or mounted in a standard size rack. All panel controls are clearly marked and conveniently positioned for maximum ease of control. A small monitor speaker is fitted to the front panel and there are audio outlets for external speaker, telephone headset, and 600 ohm lines. The latter has its own independent output stage and a separate level control.

Output from the second oscillator is fed to the mixer through a coaxial cable link and it is a simple matter to substitute other links whereby one or more additional receivers can be controlled from this particular oscillator. Or, conversely, injection can be from an external oscillator. An AGC connection is brought out to the rear and receivers can be set up in dual diversity operation quickly and easily.

The companion "EP15" Panoramic Display Unit is designed for use in conjunction with the "880/2" receiver. It permits visual presentation of received signals and is capable of a high degree of resolution.

GENERAL INFORMATION

Frequency Coverage

The nominal coverage is from 500 kc/s to 30.5 Mc/s in thirty switched ranges. Each range has a coverage of 1 megacycle plus 100 kc/s overlap at each end so that the total coverage is from 400 kc/s to 30.6 Mc/s.

Range 1 covers 0.5 — 1.5 Mc/s (nominal)

Range 30 covers 29.5 — 30.5 Mc/s (nominal)

Intermediate Frequencies

First: Tuned over the nominal coverage of 2.5 — 3.5 Mc/s on all "odd" ranges except Range 1.

Tuned over the nominal coverage of 3.5 — 4.5 Mc/s on Range 1 and all "even" ranges.

Second: Fixed tuned to 500 kc/s with variable selectivity. The BFO is continuously variable over the range 500 kc/s \pm 7 kc/s by means of a panel control. A further control provides two pre-set injection frequencies for sideband selection in SSB reception. The SSB bandwidth is 3 kc/s. (An AGC position is provided, with long time constant and compensated delay, for SSB operation).

Valve Complement

V1	ECC189 (CV5331)	First RF Amplifier (Cascode)
V2	6BA6 (CV454)	Second RF Amplifier
V3	6AK5 (CV850)	First Mixer
V4	6BA6 (CV454)	Tuned IF Amplifier
V5	6AK5 (CV850)	Second Mixer
V6	5840 (CV3929)	Crystal Oscillator (EF732)
V7	5840 (CV3929)	Buffer/Multiplier (EF732)
V8	6U8 (CV5065)	Variable Frequency Oscillator and Reactance Control
V9	6C4 (CV133)	Buffer (VFO Isolation)
V10	6BA6 (CV454)	First 500 kc/s IF Amplifier

V11	6BA6 (CV454)	Second 500 kc/s IF Amplifier
V12	6AM6 (CV138)	Third 500 kc/s IF Amplifier
V13	6AL5 (CV140)	Noise Limiter/AGC Rectifier
V14	6489 (CV469)	AM Detector
V15	12AT7 (CV455)	Cathode Followers. (IF Output and CW/SSB Detector feed).
V16	12AT7 (CV455)	Meter Control/AF Amplifier
V17	6BE6 (CV453)	CW/SSB Detector
V18	12AU7 (CV491)	Line/Monitor AF Amplifiers
V19	6AM5 (CV136)	Monitor Output
V20	6AM5 (CV136)	Line Output
V21/ V22	OB2 (CV1833)	Voltage Stabilisers
D1	100SC2	Variable Capacity Diode (BFO)
D2/5	DD006	HT Rectifier (silicon diodes).

A 6AU6 (CV2524) valve is used in the crystal calibrator.

Scale Presentation

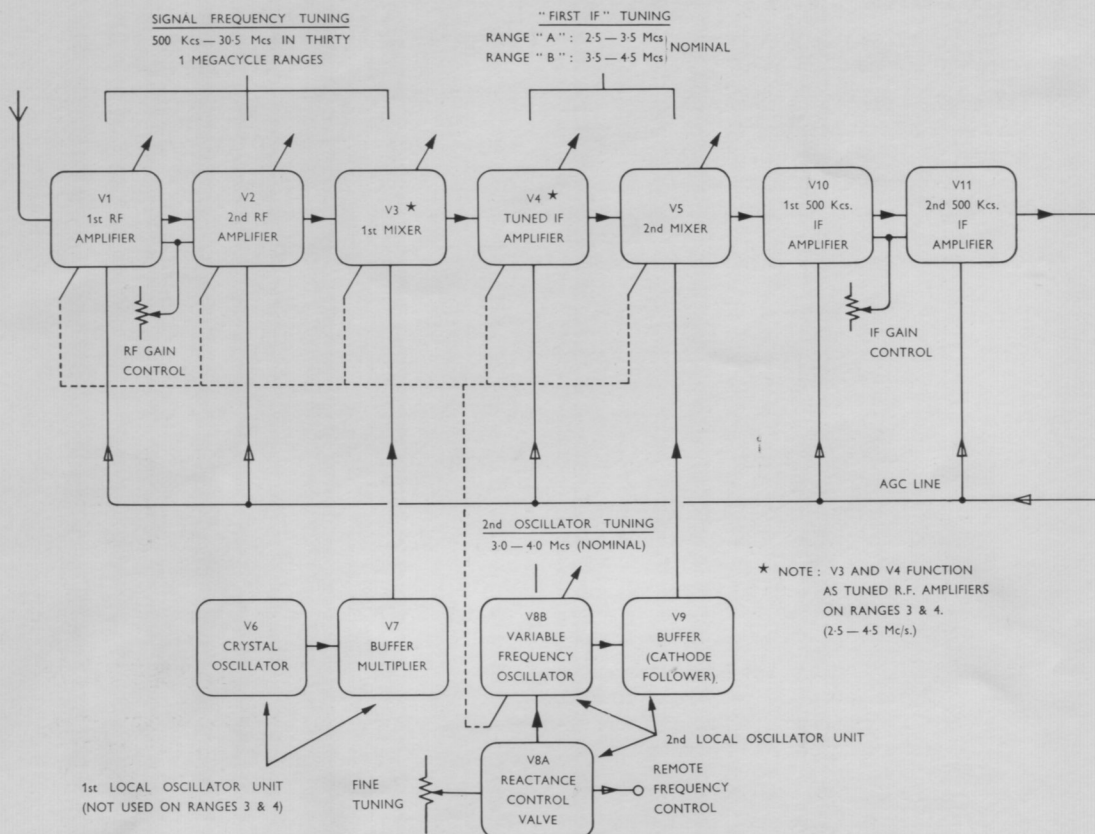
The end and centre frequencies of the range in use are clearly indicated in small windows on the main scale, which is marked at 100 kc/s intervals. A semi-circular scale below the main horizontal scale indicates frequencies directly in kilocycles and the frequency in use can be read off very accurately with ease.

Controls

The following controls are conveniently grouped on the front panel:—Wave Change: Tuning: Fine Tuning: Aerial Trimmer: Selectivity: AGC/Calibrator switch: RF Gain: IF Gain: AF Gain: Mode Switch: BFO Pitch: Bass Control: AF Filter in/out: NL on/off: Mains on/off: Monitor Loudspeaker on/off.

Also on the front panel are the Carrier Level Meter: Meter zero adjuster: jack for telephone headset, and 600 ohm line level control.

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Fine Frequency Control

A panel control knob permits very fine control of the oscillator frequency electronically — often an invaluable facility, particularly with s.s.b. signals. The same facility is available remotely over a pair of lines connected to terminals brought out at the rear.

Crystal Calibrator

A crystal calibrator giving marker points at 100 kc/s intervals throughout the entire tuning range is fitted as standard, for check purposes.

Carrier Level Meter

A moving coil instrument on the front panel

gives clear indications of relative carrier levels and is a useful aid to tuning.

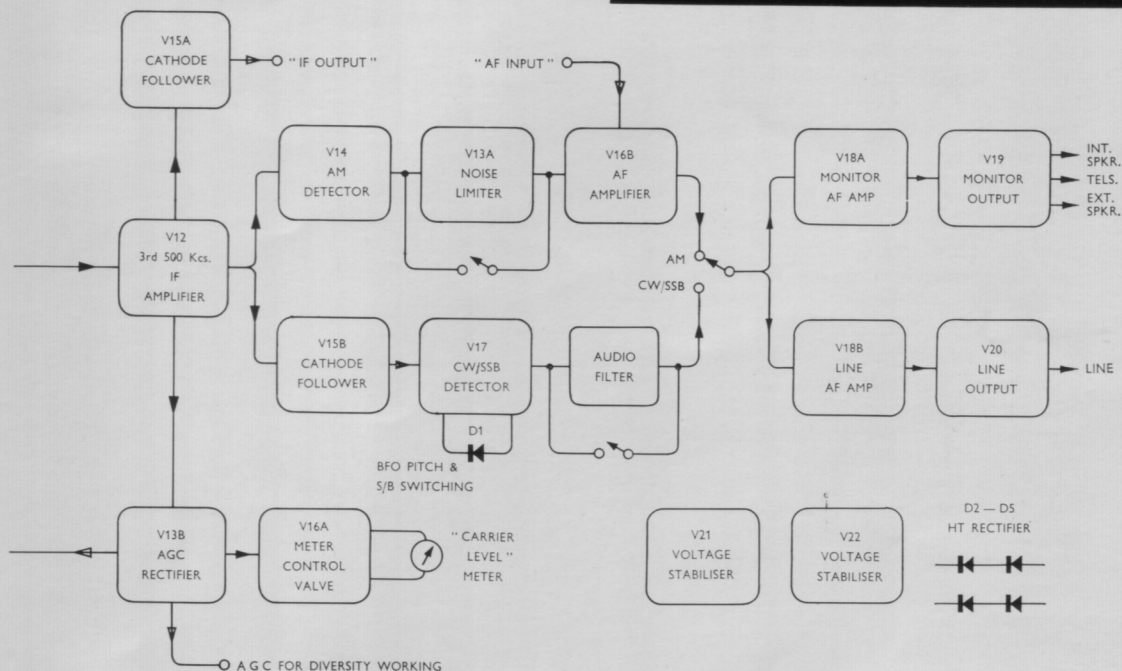
Power Supplies

Mains Operation: 100/125V or 200/250V AC 40–60 c/s (105VA).

External Power Supplies: 225V at 185mA for HT, 6.3V at 6.5A (approx) for LT.

Accessory Supplies: When running from AC mains the following supplies are available for powering ancillary equipment:—
HT: 225V at 15mA.
LT: 6.3V at 1.5A.

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Fusing:

The live side of the mains input is fused at 1.5A. When operation is from external power supplies, provision should be made for switching and fusing at the supply source.

Physical Details

Rack Mounted Version

Width	..	19" (48.3 cm).
Depth	..	20½" (52.1 cm).
Height	..	8¾" (22.2 cm).
Weight	..	87 lbs. (39.5 kg).

Table Mounted Version

Width	..	19½" (49.5 cm).
Depth	..	20½" (52.1 cm).
Height	..	9 7/16" (23.9 cm).
Weight	..	99 lbs. (44.9 kg).

Finish is two-tone grey, with chromium-plated handles.

PRINCIPLE OF OPERATION

Reference to the block schematic diagram shows that the IF/AF portion of the receiver is, in effect, a single conversion superheterodyne with two switched ranges. On the odd number ranges (excepting Range 1), the intermediate frequency section tunes Range "A", which is from 2.5 Mc/s to 3.5 Mc/s, and changes over to Range "B" — 3.5 Mc/s to 4.5 Mc/s — when an even number range (and also Range 1) is selected. The high stability local oscillator associated with this tuned intermediate-frequency section operates without switching and covers 3 Mc/s to 4 Mc/s. Tracking is 500 kc/s high on Range "A" and 500 kc/s low on Range "B". The constant second intermediate-frequency of 500 kc/s thus produced is amplified and fed to the following stages.

The radio frequency section can now be looked upon as a crystal controlled converter, accepting a given signal and converting the frequency to one within the range of the tunable IF section

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(2.5 to 4.5 Mc/s). Where the frequency of the incoming signal is itself within this range, no first oscillator is necessary and the receiver functions as a single superhet. In this case, the scale calibrations appear in red to avoid any possibility of confusion.

The Range Switch brings into circuit two fully tuned RF stages and the appropriate crystal to give the correct intermediate frequency. Except on Range 1, each crystal serves for two ranges. To give a practical example of the mode of operation, on Range 10, which accepts signals between 9.5 Mc/s and 10.5 Mc/s, the crystal injection frequency is 14 Mc/s. The resulting intermediate frequency band (also of course one megacycle wide) is then 4.5 to 3.5 Mc/s, which is accepted by Range "B" of the tunable IF section. On changing to Range 11 — 10.5 Mc/s to 11.5 Mc/s — the same crystal functions as on Range 10, but now obviously the intermediate frequency runs from 3.5 Mc/s to 2.5 Mc/s and this time Range "A" of the IF amplifier is brought into action.

All necessary switching — RF, IF and crystal — is ganged to the main wavechange switch, whilst tuning of the RF stages is ganged to the main tuning control. All radio frequency and intermediate frequency stages are permeability tuned. For convenience, an overlap of 100 kilocycles is provided at each end of the tuning range, and, on Range 1, this extends the lower frequency coverage to 400 kc/s. In general, it is advisable to operate within the normal one megacycle region of the tuning scale.

AVERAGE TECHNICAL FIGURES

Sensitivity at 3 kc/s bandwidth

At all frequencies above 1.5 Mc/s the sensitivity is better than 3 μ V for a 15 dB signal-to-noise ratio. Below 1.5 Mc/s a figure of 5 μ V obtains for the same conditions.

CW sensitivity is better than 1 μ V for a 15 dB signal-to-noise ratio except on Range 1 (2 μ V). Absolute sensitivity is better than 1 μ V.

IF Selectivity

Typical overall bandwidths for the "BROAD," "INTERMEDIATE" and "NARROW" positions are as follows:—

"BROAD"	14 kc/s at 6 dB down
	26 kc/s at 30 dB down
"INTERMEDIATE" ..	7 kc/s at 6 dB down
	15 kc/s at 30 dB down
"NARROW"	3 kc/s at 6 dB down
	9 kc/s at 30 dB down

Three crystal filters are available for incorporation in the "880/2" receiver. These are designated Filters "A," "B" and "C" and the overall bandwidths resulting from their use are tabled below. Filters "A" and "C" are fitted as standard but any two filters can be fitted to special order.

Filter "A"	400 c/s at 6 dB points
	3 kc/s at 30 dB points
Filter "B"	1200 c/s at 6 dB points
	4 kc/s at 30 dB points
Filter "C"	3 kc/s at 6 dB points
	6 kc/s at 30 dB points

Stability

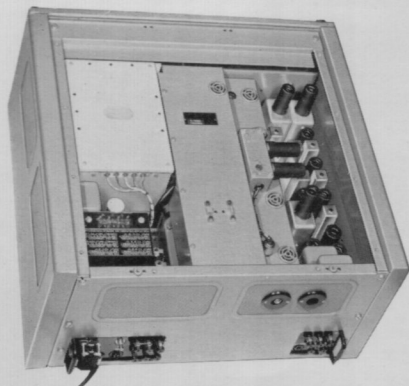
After four hours continuous operation, and with mains supply and ambient temperature constant, the frequency drift is of the order ± 20 cycles. Mains voltage variations of $\pm 10\%$ do not affect the frequency stability by more than ± 100 c/s.

Spurious Responses

All spurious responses, including first and second images, at all frequencies below 15 Mc/s, excepting Range 1, are at least 90 dB down. Above 15 Mc/s, the rejection is greater than 60 dB.

On Range 1, image rejection is greater than 60 dB. Intermediate frequency breakthrough is also greater than 60 dB down, except near 500 kc/s, where the figure becomes a function of the second intermediate frequency selectivity setting.

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Interior view of the "880/2" receiver. The RF and mixer stages are housed in the centre section; on the left is a fully screened compartment containing the high stability second oscillator; second IF and associated stages are on the right of the picture.

Scale Accuracy

Calibration is better than 1 kc/s, and re-setting accuracy within 500 c/s, at all frequencies.

Noise Factor

Ranges 2 — 30 6.

Cross Modulation

With a desired signal 60 dB above 1uV the interference produced by a signal 10 kc/s off tune and of strength 90 dB above 1uV will be at least 30 dB below the output of the desired signal.

Intermodulation

Two signals whose sum or difference frequency is equal to either the selected signal frequency or to the intermediate frequency, must each be of a level greater than 90 dB above 1uV to produce an output equal to that produced by a normal signal 20 dB above 1uV.

Blocking

With a desired signal 60 dB above 1uV, an interfering carrier 10 kc/s off tune must be of a level exceeding 100 dB above 1uV to affect the output by 3 dB.

AGC Characteristic

With AGC in operation, the audio output level does not change by more than 6 dB for a carrier variation of 100 dB above 3uV, above 2 Mc/s. Below 2 Mc/s, the figures are 6 dB change for 90 dB carrier variation, above 10uV.

Three selectable AGC time constants are provided. The approximate discharge times are as follows:—

AGC "FAST"	..	0.05 sec.
AGC "SLOW"	..	0.5 sec.
AGC "SSB"	..	10 secs.

AGC is brought out to a terminal at the rear for diversity working.

Audio Output

One output stage, intended for local monitoring, delivers up to 750 milliwatts to the internal panel-mounted speaker. An external speaker of 2.5 ohms impedance can be connected to the same source if desired. A jack on the front panel is for use with a telephone headset.

A second and independent output stage delivers up to 100 milliwatts to the 600 ohm line terminals, a separate level control being provided on the front panel.

Audio Response

The response of the audio stages is dependent on the position of the "Bass Switch." Normal response (maximum bass) does not deviate more than 6 dB between 100 c/s and 10,000 c/s. In the "minimum bass" position, the response is down some 30 dB at 100 c/s.

Distortion does not exceed 10% at an output of 0.5 watts into 2.5 ohms at 1,000 c/s. Hum level is negligible, being 47 dB below 0.5 watts.

Audio Input

The audio stages can be used separately if desired, a signal being introduced at a jack on the rear panel with a standard GPO type plug. The AM detector is then automatically disconnected. The Bass Switch and both AF controls function normally.

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Input Impedance

The aerial input is 75 ohms nominal unbalanced to a co-axial socket.

IF Output

The intermediate frequency of 500 kc/s is directly available at a coaxial socket with an impedance of 250 ohms (nominal) unbalanced, suitable for terminating impedances of between 75 and 300 ohms. With AGC in use, an output of 50mV across a 75 ohm load is obtained for an input signal of 3 microvolts. For panoramic reception, the Eddystone "EP15" Panoramic Display Unit matches the receiver and requires only a coaxial link from the IF output point.

Radiation

Particular care has been taken to reduce radiation to a very low level and the voltage across the aerial socket does not exceed 5uV at any frequency.

CONSTRUCTIONAL DETAILS

Chassis

Unitised construction is employed throughout, all sub-chassis being built around a central "RF frame" which is securely bolted to the two drive plates situated behind the front panel.

Six sub-chassis and two double screened boxes make up the main assembly which is of extremely robust construction when bolted together. The six sub-chassis are as follows:—

- First RF amplifier
- Second RF amplifier
- First mixer stage
- Tuned IF and second mixer stages
- IF/AF chassis
- Power unit chassis

All these and the two oscillator units are interconnected by means of a number of cable forms terminated in suitable plugs and sockets which allow units to be removed without resort to a soldering iron.

Both oscillator units and all sub-chassis except the power unit chassis are of brass, heavily silver plated and lacquered. The power unit chassis is of steel, suitably rustproofed and sprayed grey enamel.

Panel

The panel is a $\frac{1}{8}$ " steel plate with a diecast aluminium escutcheon surrounding the dial aperture. In the case of the table model a further escutcheon is fitted, being placed around and over the edge of the main panel, slightly increasing its dimensions. All control functions are clearly marked on the panel.

The chromium plated panel handles, besides their normal use for lifting the receiver, allow it to be placed face-down without damage to the panel controls.

Mounting Styles

The "880/2" can be supplied as a standard rack mounting unit or as a table mounting model. Either version can be converted to the other by removing certain parts of the existing cover and fitting replacement pieces to suit the desired type of mounting.

Instruction Manual

A comprehensive instruction manual is supplied with each receiver.

In the interests of continued improvement, we reserve the right to amend this specification without notice.



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