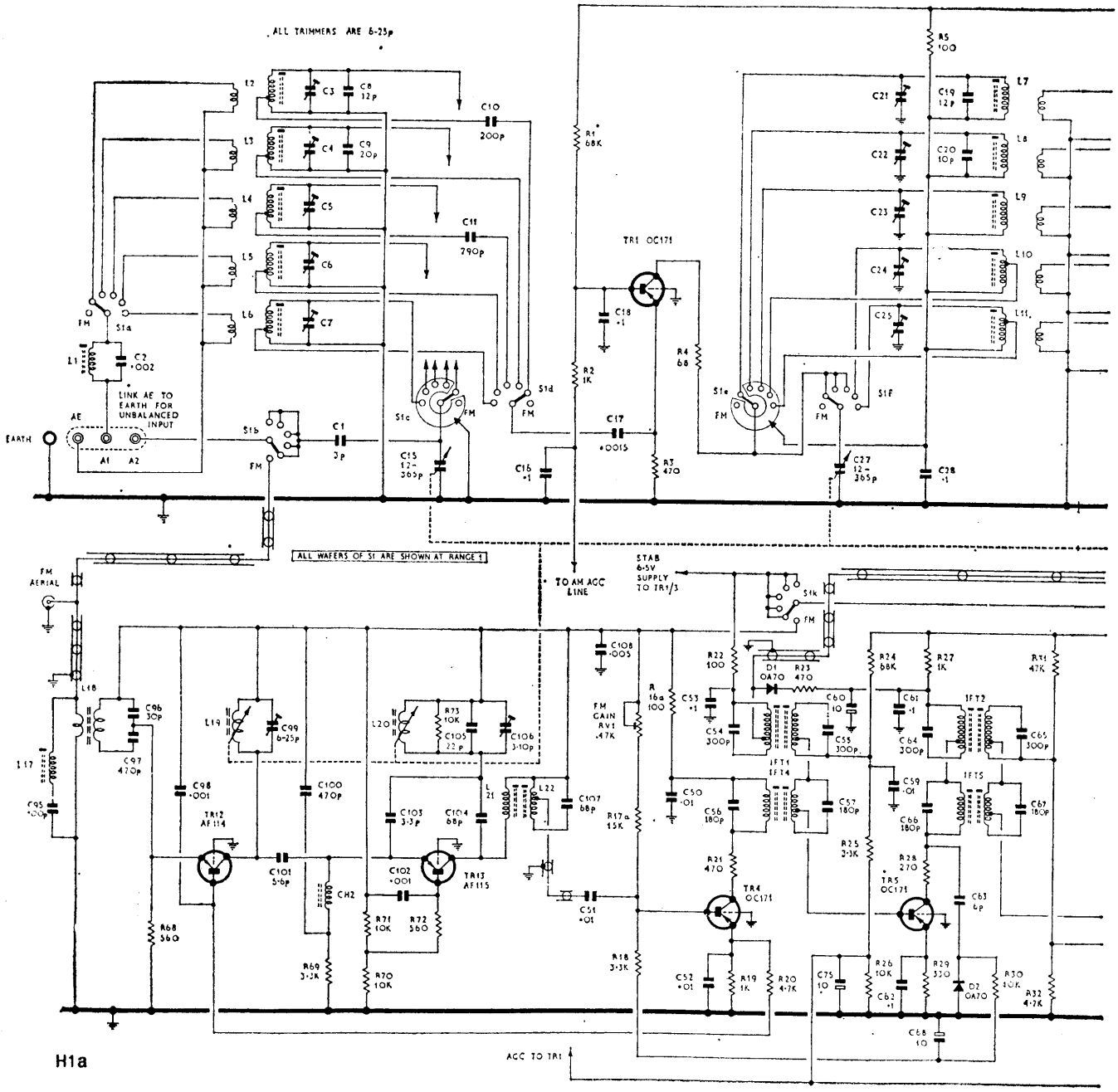
EDDYSTONE Model EB35

General Description: Fully transistorised A.M./F.M. receiver with power derived from battery or mains. Facilities for tape recorder, record player and private listening. Battery six 1·5 volts dry cells (type U2). Speaker 8 ohms.

Frequency Coverage: F.M., 88–108 Mc/s. Range 1, 8·5–22 Mc/s. Range 2, 3·5–8·5 Mc/s. Range 3, 1·5–3·5 Mc/s. Range 4, 550–1500 kc/s. Range 5, 150–350 kc/s.

Alignment: Figures quoted for sensitivity, etc., in the instructions that follow are based on the assumption that new batteries are in use. *Test equipment required:* Signal generator(s) covering the two intermediate frequencies (465 kc/s. and 10·7 Mc/s.), the A.M. range (150 kc/s.–22 Mc/s.) and the F.M. band 88–108 Mc/s. Output meter matched to 8 ohms with plug to mate with telephone socket.

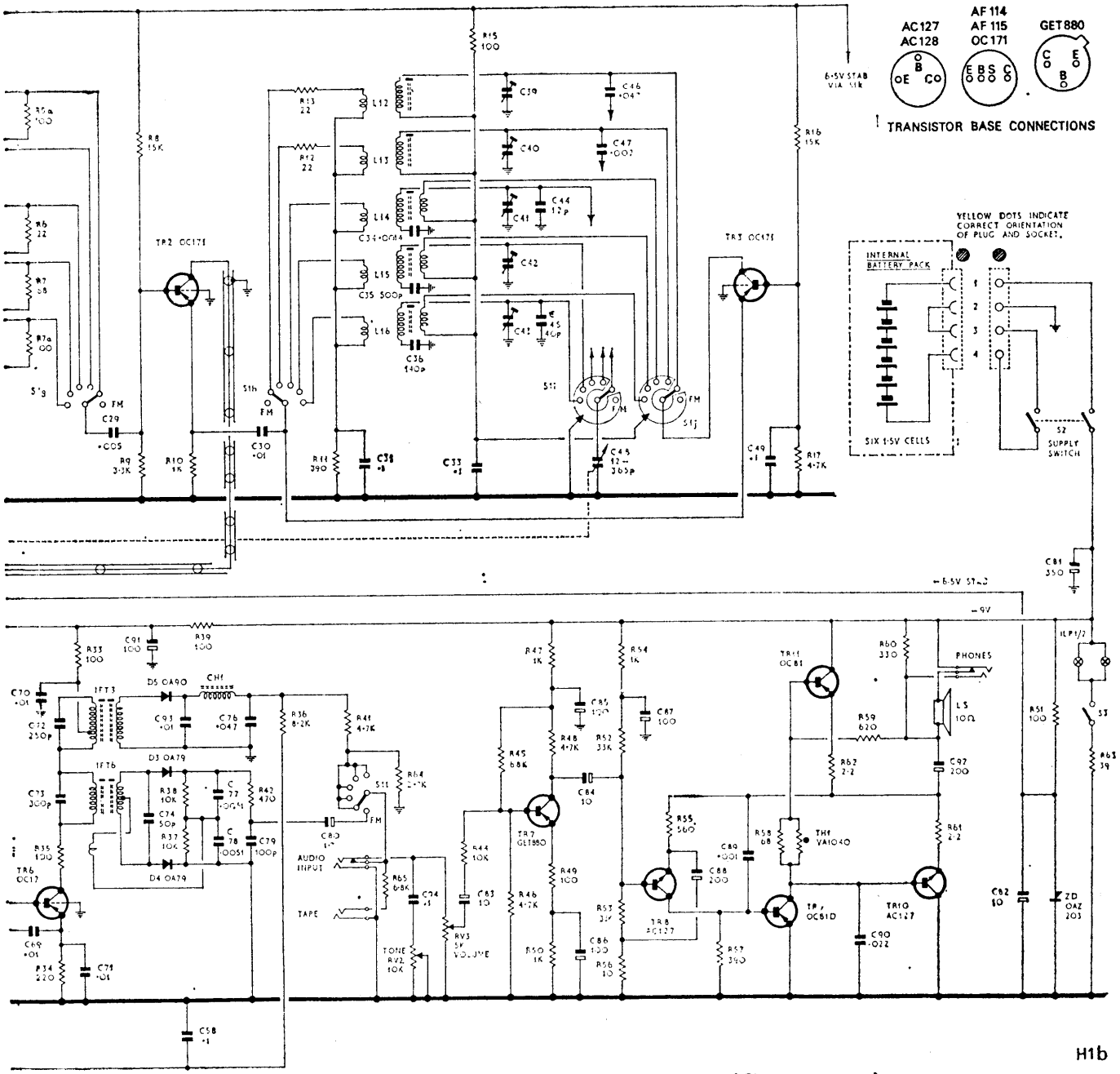


(H1a) Circuit Diagram—Model EB35 (Part)

Trimming tools: Miniature insulated screwdriver with $\frac{1}{16}$-in. blade (length 2 in. maximum), small metal-tipped insulated screwdriver and a Neosid HS1 hexagonal core adjuster.

When aligning either I.F. channel, the four screws which retain the two angle strips on which the I.F. board is mounted should be removed. The board can then be re-mounted at right-angles to its normal position using two screws only. All dust cores will then be accessible and there is no need to unsolder connections to the board.

465 kc/s. Stages: Stand the receiver on one end to allow connection of the generator output lead to the Range 5 mixer coil L11 (see underside view of receiver). The generator should be arranged to provide a 50-ohm source and the earth lead can be clipped to the screen adjacent to the coil. Disable the local oscillator by shorting out the forward section of the tuning gang (C48) and then plug the output meter into the telephone socket. The speaker is automatically disconnected on insertion of the plug and the meter if matched to 8 ohms will read the true output power. Switch on the



(H1b) Circuit Diagram—Model EB35 (Continued)

generator, allow it adequate time to stabilise against drift and then set the receiver controls as follows: Range Switch, Range 5; Volume, Maximum; Tuning, 350 kc/s.; Tone, Fully clockwise. Tune the generator to 465 kc/s. (with modulation 30 per cent. at 400 c/s.) and then set the attenuator to give a reading of approximately 50 mW. on the output meter. Peak the cores in IFT1, IFT2 and IFT3 for maximum output, setting all cores to the " outer " peak. Re-check each adjustment several times to ensure accurate alignment and then set the attenuator for an output reading of 50 mW. Input should be of the order 4 μV. If the I.F. sensitivity is lower than this figure, check the A.F. sensitivity by introducing an audio generator across RV3. At 1000 c/s. an input of 5 mV. should give an output of 50 mW. Disconnect the generator(s) and remove the shorting link from C48 on completion of the alignment.

10·7 Mc/s. Stages: *N.B.:* The 10·7 Mc/s. I.F. Transformer L21/L22 is not aligned with the other 10·7 Mc/s. circuits. It forms part of the F.M. tuner unit and is adjusted when aligning this unit later in the alignment procedure.

Switch on the generator, allow adequate time to stabilise against drift and set all receiver controls as for 465 kc/s. alignment except the range switch which should be at F.M. Short out the one discriminator diode D4 and connect the output meter to the telephone socket as before. Tune the generator to 10·7 Mc/s., adjust for 30 per cent. modulation at 400 c/s. and then connect its output lead to tag 16 at the right-hand end of the I.F. board. The adjacent tag 17 can be used as an earthing point.

Peak the cores in the 10·7 Mc/s. transformers IFT4, IFT5 and IFT6 on their " outer " peak for maximum reading on the output meter. Remove the short from D4 and adjust the secondary (top) core of IFT6 for minimum signal.

I.F. sensitivity using an A.M. signal and with D4 shorted should be of the order 30 μV. for 50 mW. output. RV1 can be adjusted if necessary to achieve this figure.

R.F. Alignment: (*Ranges 1–5*): The first step in this part of the procedure is a check on the overall calibration accuracy. Proceed as follows: Standardise the generator calibration against a reliable frequency standard and connect its output lead to the " A1 " socket and **" earth."** The shorting plug should be in position between " AE " and **" earth."** Select Range 1 and tune the generator and receiver to each megacycle point in turn noting the degree of error present. Errors should not exceed 1 per cent. (i.e. 180 kc/s. at 18 Mc/s., 90 kc/s. at 9 Mc/s., etc.). Repeat on Range 2 and then select Range 3. Checks should be made at 500 kc/s. intervals on this range followed by checks at 100 kc/s. intervals on Ranges 4 and 5.

Oscillator adjustments should not be touched unless errors of greater than 1 per cent. are detected. If realignment is found to be necessary, carry out normal tracking procedure using trimmers at the high frequency end of the band and cores at the low frequency end. Each adjustment must be

repeated several times to ensure accurate alignment. Alignment frequencies and adjustments are listed in the table which follows:

Range	*Frequency*	*Trimmer*	*Frequency*	*Core*
1	20·0 Mc/s.	C39	8·6 Mc/s.	L12
2	8·0 Mc/s.	C40	3·6 Mc/s.	L13
3	3·5 Mc/s.	C41	1·5 Mc/s.	L14
4	1400 kc/s.	C42	550 kc/s.	L15
5	330 kc/s.	C43	160 kc/s.	L16

Alignment of the R.F. (Aerial) and Mixer circuits can now be commenced. The generator is connected to " A 1 " and **" earth "** as before but must now be adjusted to match the receiver input impedance (75 ohms) for Ranges 1/3 and 400 ohms for Ranges 4/5. The output meter is connected as for I.F. alignment. Adjustments are made at the same frequencies used for oscillator alignment but using the adjustments listed in the following table. Care should be taken to ensure that the aerial circuits are set for best s/n ratio.

Range	*Trimmer*			*Core*		
	Frequency	*Aerial*	*Mixer*	*Frequency*	*Aerial*	*Mixer*
1	20·0 Mc/s.	C3	C21	8·6 Mc/s.	L2	L7
2	8·0 Mc/s.	C4	C22	3·6 Mc/s.	L3	L8
3	3·5 Mc/s.	C5	C23	1·5 Mc/s.	L4	L9
4	1400 kc/s.	C6	C24	550 kc/s.	L5	L10
5	330 kc/s.	C7	C25	160 kc/s.	L6	L11

On completion of these adjustments, select 550 kc/s. on Range 4, tune the generator to 465 kc/s. and increase its level until an indication is obtained on the output meter. Adjust the I.F. rejector coil L1 for *minimum* signal.

F.M. Alignment: Alignment of the F.M. tuner unit is most conveniently carried out by using an A.M. signal and with D4 shorted out as in alignment of the 10·7 Mc/s. stages. The generator is required only to establish the accuracy of the dial calibration, all other adjustments being made on noise to avoid the need for continual re-tuning of the generator to cope with pulling of the receiver oscillator which occurs when either the input or output circuits of the mixer transistor are re-tuned.

The calibration check should be carried out at 100 Mc/s. with the generator connected either to the F.M. coaxial socket or to " A2 " and **" earth "**. Oscillator trimmer C106 should be adjusted to nullify any error which may be present. Now switch off the generator and adjust C99, L21 and L22 for maximum noise output. Re-check C106 setting at 100 Mc/s. and then carry out a sensitivity check at this frequency. A figure of the order 10 μV. should be obtained for 50 mW. output. Finally, tune the generator to 10·7 Mc/s. and adjust the I.F. rejector L17 for minimum signal output. Disconnect the short across D4 before putting the set back into its case.

Drive Cord: In the instructions that follow, right-hand and left-hand are as viewed from rear of set.

1. Remove the existing cord and set the tuning gang to full mesh.

2. Tie a double knot in one end of the replacement cord and feed the cord through the hole provided in the left-hand drive pulley with the knot on the inside of the rim. The hole should lie at approximately " 4 o'clock ".

3. Wind approximately one and a half turns anti-clockwise round the drive pulley and then pass the cord under and over the left-hand guide pulley.

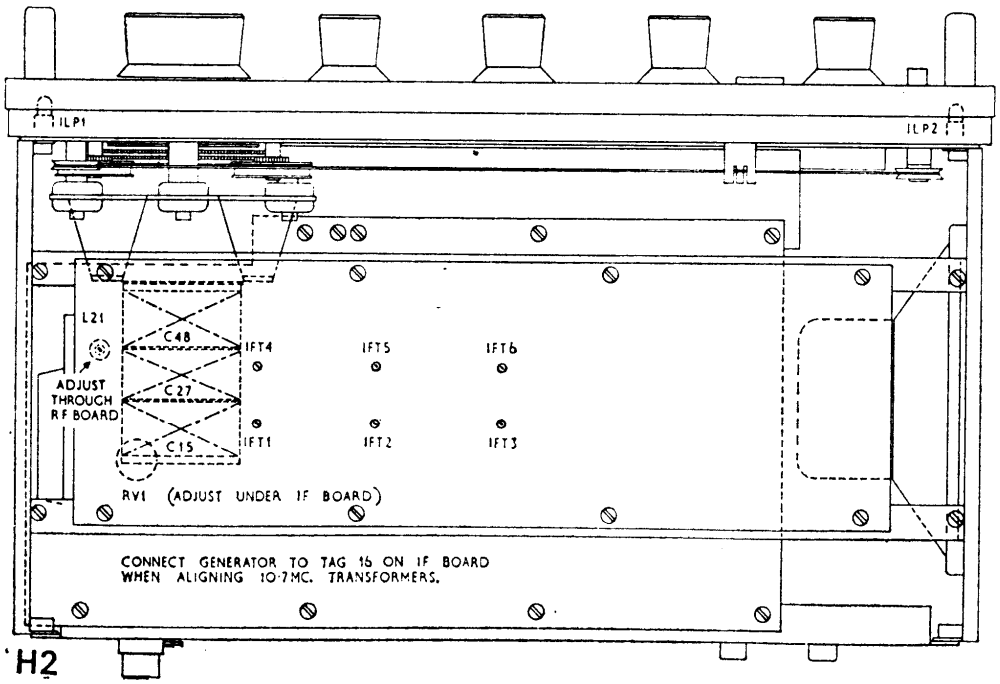
4. Pass the cord across the dial from left to right and then, while holding the free end of the cord in tension, rotate the tuning control to fully unmesh the tuning gang. This operation will wind just over three complete turns of cord on to the left-hand drive pulley and tension must now be maintained to prevent the cord from slipping out of the pulley groove.

5. Pass the cord clockwise round the jockey pulley (right-hand side of the receiver) and then back across to the right-hand drive pulley. Feed the cord into the pulley groove and then through the hole in the rim (hole lies at about " 10 o'clock "). Increase the tension on the cord until the outer rim of the jockey pulley takes up a position level with the nearest edge of the panel handle retaining screw. Mark the cord with a pencil at the point where the retaining knot must be tied.

6. Free the cord from the jockey pulley and while maintaining tension, draw the cord through the hole in the right-hand drive pulley until it tightens on the left-hand guide pulley.

7. Tie a double knot at the position marked in (5) above and then cut off the surplus cord. Feed the cord back through the hole and replace in position round the jockey pulley.

8. Set the tuning gang to full mesh and slide the pointer to " o " on the logging scale. Attach the pointer to the cord (when viewed from above the



(H2) PLAN VIEW—MODEL EB35

cord should pass under the two outer prongs at the rear of the pointer carrier) and then check the drive for free normal operation.

Aerials for Use on Ranges 1–5: The type of aerial used with the EB35 receiver will depend to a large extent on the permanency of the installation. Reasonable results may be obtained in a temporary installation with a relatively short length of wire located indoors. Some 15–20 ft. of insulated wire run round the picture rail will provide reception from all long and medium wave stations serving the area; many of the high-powered short-wave stations should also be audible at good strength. Such an aerial is of course relatively inefficient and it should be realised that signals are received only because of the high receiver sensitivity.

An outside aerial is strongly recommended for a permanent installation, permitting reception from a greater number of stations with a lower level of background noise. A suitable aerial could take the form of some 30–60 ft. of insulated wire strung between two insulators and located as high as conveniently possible. It should be kept well away from local obstructions (especially those of metallic construction). The down-lead can be taken from either end or from any point along the length of the horizontal top and should be run well clear of house guttering, etc., to avoid any loss in the available signal voltage. Soldered joints should be used where connections are needed.

Aerials of the types so far described are known broadly as " single-wire " or unbalanced aerials and are connected to socket " A1 ". The socket marked " AE " should be linked to the **" earth "** terminal using the special shorting plug supplied. Improved results may be obtained when the wire length is less than 15 feet if the " A2 " socket is used for the aerial connection. " A2 " should also be used for connecting short rod aerials when a longer aerial is not available as for example when using the receiver in a vehicle.

For serious short-wave reception a further improvement can be obtained if a balanced aerial is employed. One type which falls in this category and involves no difficult constructional problems is the dipole aerial. This takes the form of a letter " T " in appearance, the horizontal portion being the aerial proper and the vertical section the downlead or feeder. Any wire of adequate strength (either insulated or bare) can be used for the top while the feeder can be any good quality twisted flex suitable for outside use (e.g. plastic covered). Special feeder cables are manufactured for this specific application but these are more expensive and offer little in the way of advantage for a normal domestic installation. They can of course be employed if the user so wishes.

For general short-wave reception the overall length of the horizontal portion should be of the order 50–60 ft., the wire being broken at the centre with each lead connected separately to the feeder cable. An insulator is used at this point to facilitate connection and provide mechanical support for the feeder. The length of the feeder is of minor importance and little attention need be paid to its actual positioning. The aerial proper should be erected

as high as conveniently possible using insulators for supporting the two ends of the wire.

If attention is centred in one specific short-wave broadcast band, performance can be optimised at this frequency by cutting the aerial to a predetermined length. Overall lengths for the main broadcast bands are as follows: 49 m. : 76 ft., 31 m. : 48 ft., 25 m. : 39 ft., 19 m. : 30 ft., 16 m.: 26 ft., 13 m. : 21 ft. Overall lengths (in feet) for other bands can be calculated by dividing 468 by the frequency in megacycles.

When using a twisted flex feeder of the type described above one feeder wire is connected to the " A1 " socket and the other to the " AE " socket. The special shorting plug is removed and can be stored in the " A2 " socket to avoid loss. The same connections are employed when using a standard flat twin transmission line. Coaxial feeders are unbalanced and are connected as follows. Braid to **" earth "** terminal, inner wire to " A1 ", shorting plug in position between " AE " and **" earth "** terminal. On the lower frequencies the dipole can be operated as a single-wire aerial by strapping together both the feeder wires and connecting to the " A1 " socket. This will give greater signal pick-up and increase the versatility of the aerial.

In some cases it will be found that reception can be improved if an earth connection is made to the **" earth "** terminal. One benefit is a reduction of locally generated electrical interference especially when listening on the lower frequencies in the tuning range. The earth lead should be as short and direct as possible connected to a water pipe or an external earth rod.

Aerials for F.M. Reception: In the case of a permanent installation it will usually be found best to employ an outside aerial except when the receiver is situated very close to the transmitting station. A wide variety of commercial designs are available, but one should be selected of a type which is most suited to local conditions. Such an aerial will have a coaxial feeder which should be terminated with the plug supplied and connected to the " F.M." aerial socket.

For F.M. reception in regions of high signal strength an indoor aerial will usually suffice. The simplest type of indoor aerial takes the form of a short piece of insulated wire some 4–6 ft. in length connected to the " A2 " socket. Its position will have quite a marked effect on reception and some experimentation is called for if optimum results are to be achieved.

Greater signal pick-up and reduced background noise are features of the dipole aerial already referred to in connection with A.M. reception on the short-wave bands. A dipole suitable for receiving F.M. signals in the V.H.F. band is relatively small and can be conveniently made from a length of ordinary twisted flex. Unravel some 30 in. at one end and straighten the two wires to form a horizontal top with an overall length of approximately 60 in. Tape the flex to prevent further unravelling. The remainder of the lead will serve as the feeder; one wire being connected to the " A2 " socket and the other to the **" earth "** terminal.

As with the single-wire aerial, various positions should be tried for best

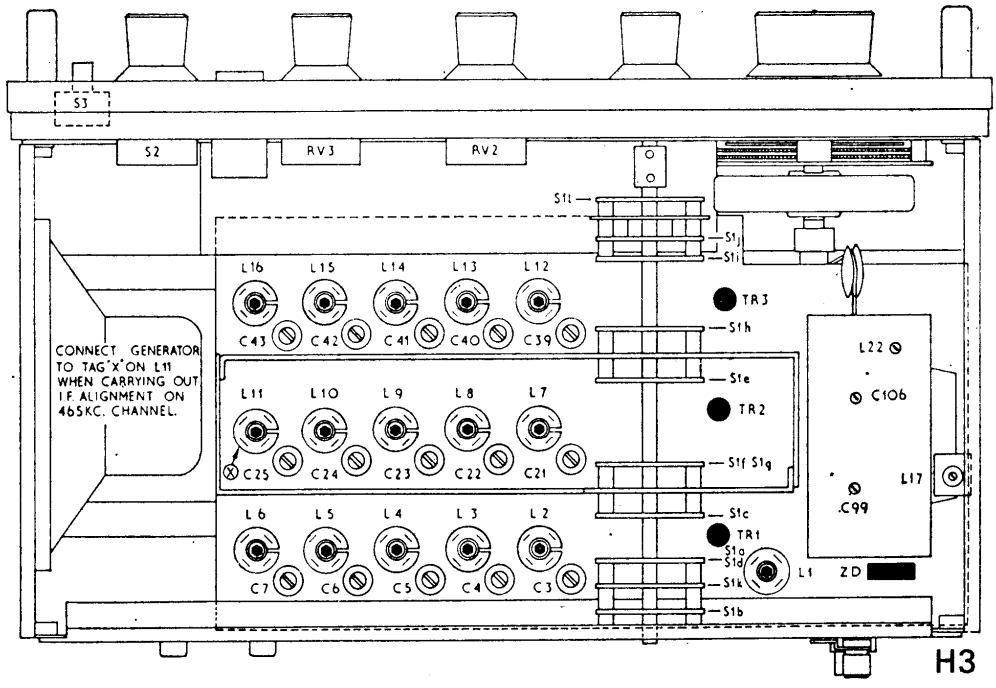
results and it may be found convenient to tape the aerial proper to a short length of bamboo cane to facilitate handling the wire which should be kept in a horizontal plane. Once the best position has been determined, the wire can be removed from the cane and tacked to a picture rail or otherwise retained in an unobtrusive location.

Use of the F.M. Attenuator: In some installations it may be found that too strong a signal is picked up by the aerial, especially when this is an outdoor type located only a few miles from the broadcast station. Excessive signal input to the receiver will be indicated by distorted output and a tendency for the station to remain in tune when the tuning is off-set from the correct tuning point. If this effect is noticed, it can be eliminated by removing the aerial plug from the set, plugging it instead into the attenuator and connecting this to the " F.M." aerial socket.

Batteries: To fit the batteries, first unscrew the two knurled screws which retain the battery box at the rear of the receiver. Carefully remove the box and free it from the receiver proper by disengaging the battery connector. Lay the box on a flat surface and take off the inner cover. Arrange the batteries in two groups of three and then slide them into the battery troughs.

Dial Bulbs: Faulty bulbs can be changed by levering the holders free from the rubber mounting grommets at the extreme ends of the dial. Replacements should be of the L.E.S. type with a rating of 6 volts at 50 mA.

Mains Operation: The receiver can be operated directly from all standard A.C. mains supplies by fitting a Power Unit Type 924 in place of the battery container. The P.U. gives an output of 9 volts and has the same physical size and fixing arrangements as the normal battery box.



(H3) Underside View—Model EB35

Removing the Cabinet

1. Remove the battery container by unscrewing the two knurled retaining screws and disengaging the battery connector.
2. Remove the four cabinet retaining screws located at the rear.
3. Free the cabinet from the panel by applying pressure with the fingers between the rear inner edge of the cabinet and the ends of the strip which supports the I.F. printed board near the top of the cabinet.
4. Slide the cabinet away from the panel.

Circuit Modifications:

1. Two reverse-connected diodes (DD006) have been added to the aerial input. The two diodes should be referred to as D6 and D7—they are connected directly across the A1 and AE sockets. See circuit diagram model EB36 in this volume.
2. C68 is 1 μF.
3. R27 is 1500 ohms.
4. Loudspeaker is 8 ohms.
5. IFT3 secondary winding is not tuned by dust core.
6. TR9 and TR11 are Mullard AC128.