

EDDYSTONE RADIO

1560

INSTALLATION NOTES
OPERATING INSTRUCTIONS
AND
SERVICE DATA

Eddystone User Group



INTRODUCTIONGeneral Description (Applicable to Serial Number 004 only)

The Eddystone Model 1560 is a compact high performance radio-telephone, consisting of transmitter 1560T and receiver 1560R mounted in a single bench mounting cabinet.

Transmission is possible on A3A, A3H or A3J with 31 channels over the frequency range 1.6MHz - 4.2MHz, and there is a built in alarm generator for use on the distress frequency 2182kHz. The receiver covers 30 channels over the range 1.6MHz - 4.2 MHz in addition to 2182kHz, and also provides continuous coverage from 180kHz to 1600kHz for reception of AM or SSB transmissions. Frequency generation for transmitter and receiver channels is by frequency synthesizer, with the channel information stored in a PROM.

The transmitter provides in excess of 200watts P.E.P., and has a self contained aerial tuning unit for matching into a wide variety of antennas.

The receiver has a built in loudspeaker providing 2watts output, and provision is made for a further 2watts output, into an external loudspeaker.

RECEIVER GENERAL SPECIFICATION

Frequency Coverage

2182kHz

30 channels in range 1.6MHz - 4.25MHz

180kHz - 535kHz

535kHz - 1600kHz

Scale Resolution

Digital display with resolution to 100Hz

Intermediate Frequencies

1.4MHz and 100kHz for 1.6MHz - 4.2 MHz

100kHz single conversion for 180kHz - 1600kHz

Aerial Impedance

10 Ω in series with 250pf

Reception Modes

A3, A3H

A3A, A3J (Upper Sideband)

Muting

Internal reed relay controlled from associated transmitter interrupts aerial feeder and earths input circuit during transmission. The 100kHz IF amplifier is de-sensitised simultaneously.

Environmental

The receiver conforms to the climatic and shock/vibration requirements of MPT1217, MPT1204 and CEPT recommendations.

Operating temperature - 15°C to +55°C

Humidity 95% R.H. at +40°C

Power Supply

24volts D.C. at approximately 20VA.

TYPICAL PERFORMANCE

(Not to be interpreted as a Test Specification)

Sensitivity

Input level to give 20dBs + N/N ratio from 10 Ω +250pf input:-

+16dB μ V for SSB

+30dB μ V for AM

IF Selectivity

| Position | -6dB | -40dB | -60dB |
|---------------------|--------|-------|---|
| AM (1.6MHz-4.35MHz) | 5.4kHz | | 20kHz |
| AM (180kHz-1600kHz) | 5.4kHz | 20kHz | |
| SSB | 2.4kHz | | 3.9kHz Asymmetrical response to MPT1217 & CEPT draft recommendations. |

Image Rejection

1.6MHz - 4.25MHz 60dB

IF Rejection

1.6MHz - 4.25MHz 60dB

Frequency Stability

1.6MHz - 4.25MHz within 50Hz at all times over -15 $^{\circ}$ C to +55 $^{\circ}$ C, one minute after turn-on.

Cross Modulation

With a wanted signal of level 60dB μ V producing standard output, unwanted output will be at least 30dB below this level with an interfering signal modulated 30% of level 90dB μ V at 20kHz off-tune.

Intermodulation

The level of third-order intermodulation products given by two signals of level 80dB μ V lying at (carrier +1kHz) and (carrier +1.6kHz) will be at least 30dB below the level of either signal.

With a wanted signal of 30dB μ V producing standard output, two unwanted signals adjusted to produce a third-order intermodulation product at the wanted frequency

must each be of a level greater than 80dB μ V to produce standard output when neither signal is closer than 30kHz to the wanted frequency.

Blocking

With a wanted signal of level 60dB μ V, output will be affected by less than 3dB with an interfering carrier 20kHz off-tune of level 100dB μ V.

AGC Characteristic

Output is maintained within 6dB for 90dB increase in signal from the threshold reference level.

Audio Output

2watts maximum to internal speaker

Additional 2watts to external speaker (8 Ω impedance)

10mW maximum to handset

Overall Response

Within 6dB over the range 350Hz to 2700Hz.

Radiation

Less than 400pW (typically 20pW).

Control Functions

- | | | |
|----------------------|---|--|
| AF Gain | - | Adjusts the level of the audio output to the internal and external loudspeakers. |
| Phone Level (Preset) | - | Adjusts the audio level to the handset. |
| IF Gain | - | Controls the gain of the 100kHz IF amplifier provided AGC is not used. |
| Channel Selector | - | Determines which channel is selected between 1.6MHz and 4.25MHz, selects variable tuning between 180kHz and 1600kHz. |
| Tune | - | When channel selector is set to tune, this control tunes from 180kHz to 535kHz or 535kHz to 1600kHz dependent on range switch. |
| Range | - | Selects frequency 180kHz - 535kHz or 535kHz -1600kHz when channel selector is set to tune. |
| Clarifier | - | Allows fine tune control of approximately \pm 180Hz for channels 1.6MHz -4.25MHz. |

- Mode - Selects either AM or SSB.
- Supply On/Off - When pressed, power is applied to the receiver.
- AGC On/Off - When pressed, the gain of the 100kHz IF amplifier is controlled by the AGC line.
- Loudspeaker On/Off - Enables the internal loudspeaker when pressed.

NOTE: The illumination of the display and supply LED is altered by the associated control on the transmitter.

TRANSMITTER SPECIFICATION

Meets requirements of MPT1217, MPT1204, MPT1212 and MPT1215 below 4.2MHz.

Frequency Coverage

2182kHz

30 channels in range 1.6MHz -4.2MHz arranged in fifteen pairs such that the frequency separation of each pair is less than 15kHz below 2.6MHz, and less than 30kHz above 2.6MHz. Greater spacing is possible but with some reduction in output.

Scale Resolution

Digital display with 100Hz resolution.

Power Output

In excess of 200watts P.E.P. into an aerial load of 10Ω in series with 250pf. It is possible to reduce the output power to 60watts or 10watts if required.

Aerial Load

A wide range of impedances can be catered for using the internal aerial tuning unit.

Operation Modes

A3H, A3A, A3J

Radio-Telephone alarm complies with MPT1212.

Two tone signal for tuning purposes

Simplex or Duplex operation

Environmental

The transmitter conforms to the climatic and shock/vibration requirements of MPT1217, MPT1204 and CEPT recommendations.

Operating temperature -15°C to $+55^{\circ}\text{C}$

Humidity 95% at $+40^{\circ}\text{C}$

Power Supply

24volts D.C. at approximately 450VA

Standby power consumption approximately 25VA

Control Functions

- Channel Selector** - Determines which channel is selected between 1.6MHz and 4.2MHz in association with the channel pair selection switch. 2182kHz is fully anti-clockwise.
- Channel Pair** - Selects one of two frequencies determined by the channel selector switch. Inoperative on 2182kHz.
- Simplex/Duplex** - Applies power to the transmitter, and selects either simplex or duplex operation.
- Illumination** - Controls the illumination of:-
Transmitter display
Receiver display
Receiver supply LED
Transmitter supply and mode LED's
Transmitter aerial current meter

NOTE: Alarm LED's are always at maximum intensity.
- Mode** - Push button bank of three switches to select either A3A, A3H or A3J, with LED's to indicate which mode has been selected.

A3H is automatically selected on 2182kHz

A3J is automatically selected above 4MHz

Otherwise A3J is automatically selected initially on every channel but can then be over-ridden.
- Tune** - Push button generating two tone test signal for tuning purposes.
- Antenna Tune** - Used to tune for maximum output on the aerial current meter. On 2182kHz, antenna tune is preset and this control is inoperative.
- Power Reduction** - Allows output powers of approximately 200watts, 60watts or 10watts when set respectively to high, medium and low.

On 2182kHz, maximum power is selected irrespective of the power level switch.
- Radio-Telephone Alarm** - Push button bank of three switches for:-

Test with green LED indication

Send with red LED indication

Cancel Alarm

To transmit the alarm, both test and send buttons must be pressed simultaneously.

RADIO-TELEPHONE INSTALLATION

The equipment is provided for bench mounting, and under normal conditions no additional anti-vibration mountings are required. The Radio-Telephone can be secured to the bench using six 6mm bolts (not supplied).

Power Supply

The equipment operates from 24V D.C. supply. Connecting the supply to the equipment causes neither supply lead to be connected to earth. Reversing polarity of the supply will not damage the equipment, nor will it cause any of the fuses to blow.

A 2A fuse is fitted in each supply lead to the receiver and is situated to the rear of the receiver. Access is by removing four 4mm screws retaining the receiver back plate.

In the transmitter fuses are fitted:-

25A on power amplifier PCB, accessible from the top.

3A in the driver stage, accessible from the top after removing the centre cover.

2A on the rear panel.

In the cabinet there is a 25A fuse in the negative supply lead, situated on the rear panel of the cabinet.

Aerial Connection

Aerial connection is made to the 6mm stud on top of the cabinet.

Earth Connection

Earth connection is made to the block situated at the rear of the bottom of the cabinet. The maximum width of the earth connection is 150mm, secured by three 6mm screws.

External Connections

With the exception of aerial and earth connections, all external connections are made to the blocks on the inside of the cabinet rear panel. These connectors are accessible either by removing the cabinet rear panel if there is sufficient room, or by removing the transmitter and receiver from the cabinet, thus allowing access through the front of the cabinet. The connection blocks are also used for inter-wiring between transmitter and receiver, with all relevant connections shown.

Installation Adjustments

No internal adjustments are necessary to the receiver. The transmitter must be matched into the antenna by adjustment of the sliding contacts situated inside the aerial tuning unit.

OPERATING PROCEDURE FOR RECEIVER

- 1) Depress supply push button.
- 2) Rotate illumination control on transmitter clockwise to set the required receiver display brightness. The supply LED and display should be illuminated.
- 3) Select frequency required with reference to channel frequencies printed on the chart.
- 4) Select AM or SSB depending on type of transmission to be received.
- 5) Set AGC on/off as required.
- 6) Set Loudspeaker on/off as required. If transmitter is set to duplex, the receiver loudspeaker is disabled. Audio level to the handset is preset by the phone level on the receiver front panel and should not normally need adjustment.
- 7) If AGC off, set IF gain maximum initially, and then adjust to suit signal level.
- 8) If SSB transmission, adjust clarifier for optimum clarity of reception.
- 9) If reception of signal required between 180kHz and 1600kHz proceed as follows:-

Turn channel select to tune.

Select either 180kHz - 535kHz or 535kHz -1600kHz by range selector.

Tune to required frequency as indicated on the display using the Tune control.

OPERATING PROCEDURE FOR TRANSMITTER

- 1) Turn supply switch to either simplex or duplex as required. Supply LED, one of the mode LED's, the meter and the display should be illuminated, with the intensity dependent on the illumination control.
- 2) Select required frequency by rotating channel switch and A/B selector. 2182kHz is fully anti-clockwise on the channel control, and is not affected by the A/B selector.
- 3) Select required mode by momentarily depressing the indicated mode push button. On 2182kHz A3H is automatically selected, and operation is restricted to A3J only on frequencies above 4MHz.
- 4) Select power level required. The levels are set to approximately 200watts on high, 60watts on medium, and 10watts on low. On 2182kHz, high power is automatically selected irrespective of the power switch setting.
- 5) Hold the tune push button depressed, and rotate antenna tune control for maximum aeral current indicated on the meter. On 2182kHz, antenna tune is preset, and this control does not affect the output level.
- 6) Depress the push-to-talk switch on the handset to transmit.

OPERATING PROCEDURE FOR RADIO-TELEPHONE ALARM

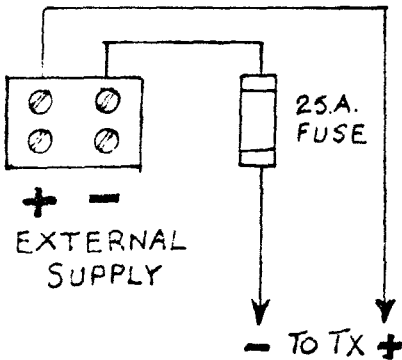
- 1) Set the transmitter and receiver for 2182kHz operation as detailed above.
- 2) The alarm may be tested by momentarily depressing the TEST ALARM push button. The test alarm LED should be illuminated (green), and the two tone alarm can be monitored through the phone handset via the receiver. Test alarm may be cancelled at any time by depressing the CANCEL ALARM push button.
- 3) To send alarm, depress simultaneously TEST ALARM and SEND ALARM push buttons. The radio-telephone alarm signal will then be transmitted for 33seconds as indicated by the ALARM SEND LED (red), unless stopped by the CANCEL ALARM push button.

CABINET REAR PANEL CONNECTIONS

| |
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| 1 |
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| 23 |
| 24 |

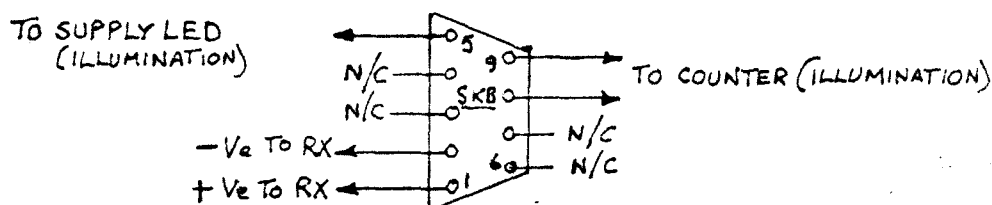
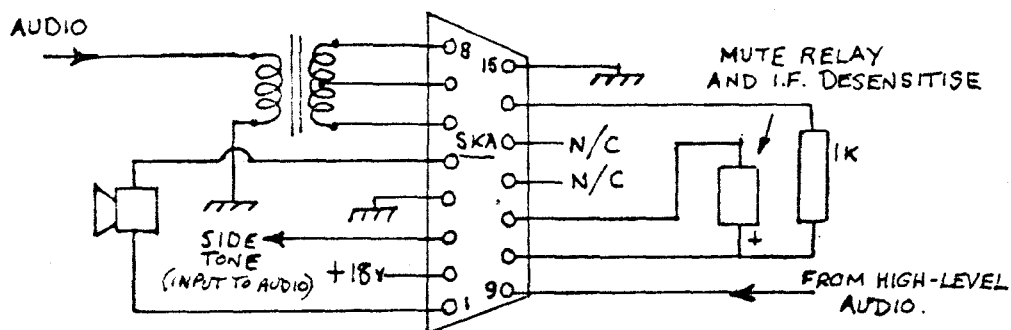
| |
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| 25 |
| 26 |
| 27 |
| 28 |
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| 30 |
| 31 |
| 32 |
| 33 |
| 34 |
| 35 |
| 36 |



EXTERNAL CONNECTIONS

- EXTERNAL LOUDSPEAKER — REAR PANEL CONNECTOR BLOCK 1 & 5
(SEE AUDIO SWITCHING TABLE)
- EXTERNAL TRANSMIT PUSH-TO-TALK — REAR PANEL CONNECTOR BLOCK 18.
- EXTERNAL MICROPHONE INPUT — REAR PANEL CONNECTOR BLOCK 19
AND 20 (SCREEN)
- REJECTOR UNIT — REAR PANEL CONNECTOR BLOCK 25 TO 35
(SEE CONNECTOR DIAGRAM)

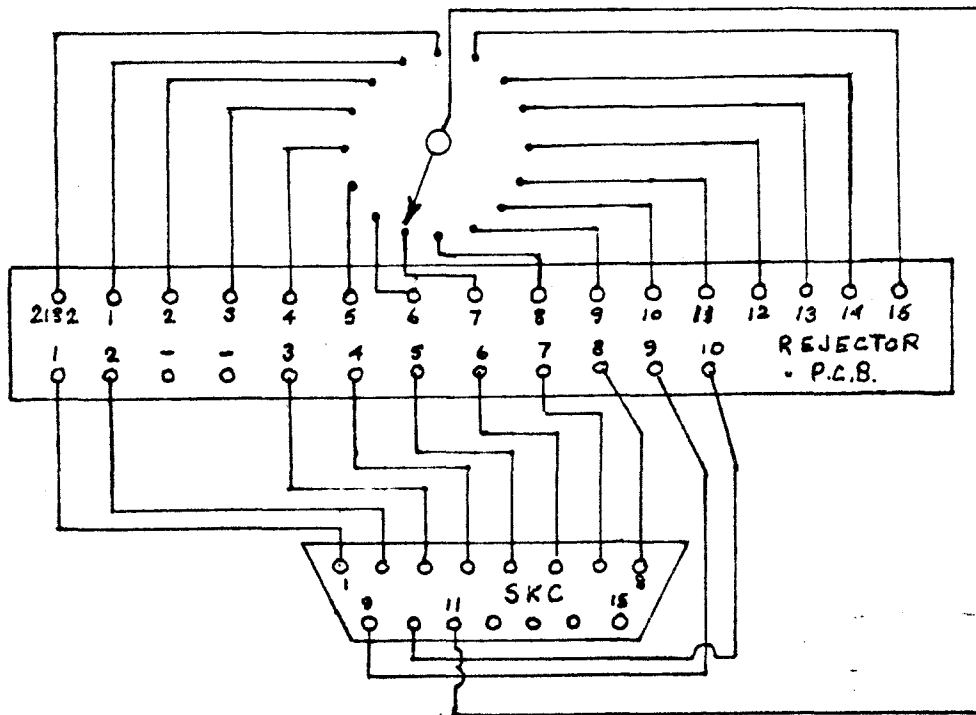
RECEIVER EXTERNAL CONNECTIONS



TH416

| PIN NO | SKA | CONNECT TO :- |
|--------|------------------------------|------------------------------------|
| 1 | AUDIO RETURN | REAR PANEL CONNECTOR BLOCK, PIN 1 |
| 2 | +18V SUPPLY FOR MUTING RELAY | LINK TO SKA, PIN 10 |
| 3 | SIDETONE INPUT | REAR PANEL CONNECTOR BLOCK, PIN 3 |
| 4 | SCREEN FOR SIDETONE INPUT | REAR PANEL CONNECTOR BLOCK, PIN 4 |
| 5 | INTERNAL L.S. | REAR PANEL CONNECTOR BLOCK, PIN 5 |
| 6 | AF TO HANDSET | REAR PANEL CONNECTOR BLOCK, PIN 6 |
| 7 | C.T. AF TO HANDSET | N/C |
| 8 | AF TO HANDSET (E) | REAR PANEL CONNECTOR BLOCK, PIN 8 |
| 9 | AUDIO OUTPUT (HIGH LEVEL) | REAR PANEL CONNECTOR BLOCK, PIN 9 |
| 10 | MUTE RELAY (+Ve LINE) | LINK TO SKA, PIN 2 |
| 11 | MUTE RELAY (-Ve LINE) | REAR PANEL CONNECTOR BLOCK, PIN 11 |
| 12 | N/C | N/C |
| 13 | N/C | N/C |
| 14 | MUTE RELAY (+24V LINE) | N/C |
| 15 | EARTH RETURN FOR AUDIO | REAR PANEL CONNECTOR BLOCK, PIN 12 |
| SKB | | CONNECT TO :- |
| 1 | +Ve SUPPLY | REAR PANEL CONNECTOR BLOCK, PIN 13 |
| 2 | -Ve SUPPLY | REAR PANEL CONNECTOR BLOCK, PIN 14 |
| 3 | N/C | N/C |
| 4 | N/C | N/C |
| 5 | ILLUMINATION FOR SUPPLY LED | REAR PANEL CONNECTOR BLOCK, PIN 15 |
| 6 | N/C | N/C |
| 7 | N/C | N/C |
| 8 | ILLUMINATION FOR DISPLAY | REAR PANEL CONNECTOR BLOCK, PIN 16 |
| 9 | ILLUMINATION FOR DISPLAY | REAR PANEL CONNECTOR BLOCK, PIN 17 |

TRANSMITTER EXTERNAL CONNECTIONS

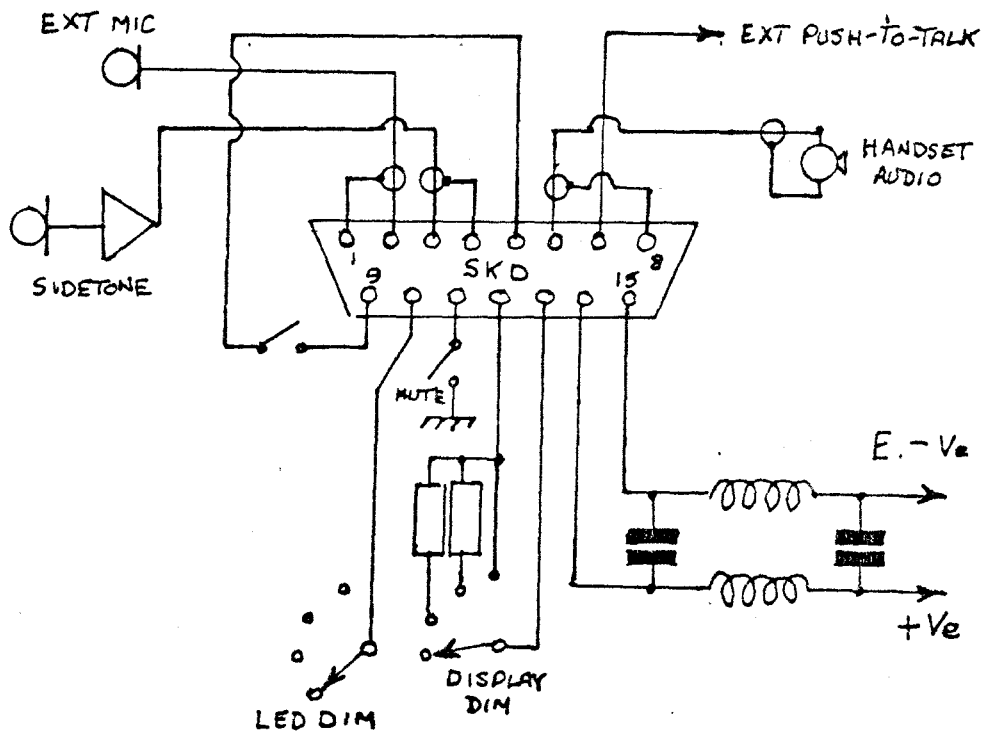


SKC

| PIN | CONNECTION TO | |
|-----|--------------------------------|--------------------------------|
| 1 | TO REJECTOR UNIT. POSITION 1. | REAR PANEL CONNECTOR BLOCK. 25 |
| 2 | TO REJECTOR UNIT. POSITION 2. | REAR PANEL CONNECTOR BLOCK. 26 |
| 3 | TO REJECTOR UNIT. POSITION 3. | REAR PANEL CONNECTOR BLOCK. 27 |
| 4 | TO REJECTOR UNIT. POSITION 4. | REAR PANEL CONNECTOR BLOCK. 28 |
| 5 | TO REJECTOR UNIT. POSITION 5. | REAR PANEL CONNECTOR BLOCK. 29 |
| 6 | TO REJECTOR UNIT. POSITION 6. | REAR PANEL CONNECTOR BLOCK. 30 |
| 7 | TO REJECTOR UNIT. POSITION 7. | REAR PANEL CONNECTOR BLOCK. 31 |
| 8 | TO REJECTOR UNIT. POSITION 8. | REAR PANEL CONNECTOR BLOCK. 32 |
| 9 | TO REJECTOR UNIT. POSITION 9. | REAR PANEL CONNECTOR BLOCK. 33 |
| 10 | TO REJECTOR UNIT. POSITION 10. | REAR PANEL CONNECTOR BLOCK. 34 |
| 11 | EARTH RETURN FOR REJECTOR UNIT | REAR PANEL CONNECTOR BLOCK. 35 |
| 12 | N/C | N/C |
| 13 | N/C | N/C |
| 14 | N/C | N/C |
| 15 | N/C | N/C |

SKD

| PIN | | CONNECTION TO |
|-----|-------------------------------|--------------------------------|
| 1 | EXTERNAL MIC. (EARTH) | REAR PANEL CONNECTION BLOCK 19 |
| 2 | EXTERNAL MIC | REAR PANEL CONNECTION BLOCK 20 |
| 3 | SIDETONE OUTPUT | REAR PANEL CONNECTION BLOCK 3 |
| 4 | SIDETONE (EARTH) | REAR PANEL CONNECTION BLOCK 4 |
| 5 | AUDIO RETURN (HIGH LEVEL) | REAR PANEL CONNECTION BLOCK 5 |
| 6 | AUDIO TO HANDSET | REAR PANEL CONNECTION BLOCK 6 |
| 7 | PUSH-TO TALK | REAR PANEL CONNECTION BLOCK 18 |
| 8 | AUDIO TO HANDSET (EARTH) | REAR PANEL CONNECTION BLOCK 8 |
| 9 | AUDIO IN (HIGH LEVEL) | REAR PANEL CONNECTION BLOCK 9 |
| 10 | RECEIVER LED ILLUMINATION | REAR PANEL CONNECTION BLOCK 15 |
| 11 | RECEIVER. RF. MUTE | REAR PANEL CONNECTION BLOCK 11 |
| 12 | RECEIVER DISPLAY ILLUMINATION | REAR PANEL CONNECTION BLOCK 16 |
| 13 | RECEIVER DISPLAY ILLUMINATION | REAR PANEL CONNECTION BLOCK 17 |
| 14 | POSITIVE SUPPLY (RECEIVER) | REAR PANEL CONNECTION BLOCK 13 |
| 15 | NEGATIVE SUPPLY (RECEIVER) | REAR PANEL CONNECTION BLOCK 14 |



RECEIVER SWITCHING

Receiver RF Mute switching

Relay connections inside receiver are arranged to cater for a wide range of combinations.

When 1560R receiver is used with 1560T transmitter, connect Pin 2 to Pin 10 inside 15way plug to receiver. Muting is then performed by the receiver negative mute line (Pin 11 of 15way connector, connector 11 on cabinet rear panel).

Audio Switching

Normally the radio-telephone is wired such that the internal loudspeaker, (and external if fitted) is on for simplex operation during receiver and muted on transmit. On duplex the loudspeaker is switched off at all times.

On simplex the loudspeaker may be turned off by the switch provided on the receiver front panel.

Other combinations are possible by changing the links:-

| | | |
|--|---|-------------------------------------|
| Both speakers on, (simplex receive), off |) | |
| (simplex transmit.) |) | |
| Both speakers off, (duplex). |) | EXT. LS to Pins 1 & 5 of rear panel |
| LS on/off switch disables both speakers |) | connector block. |
| | | |
| Both speakers on, (simplex receive), off |) | |
| (simplex transmit.) |) | |
| Both speakers off, (duplex). |) | LINK Pins 1 & 12 of rear panel |
| LS on/off switch inoperative |) | connector block. Connect EXT LS |
| | | to Pins 1 & 5. |
| | | |
| Both speakers, on (simplex receive), off |) | |
| (simplex transmit.) |) | |
| Both speakers off, (duplex). |) | Connect EXT LS to Pins 5 & 12 |
| LS on/off switch disables internal |) | |
| speaker only |) | |

AERIAL TUNER SETTING UP PROCEDURE

Remove screws from transmitter front panel securing transmitter to cabinet. Remove inspection cover on top of cabinet. Withdraw transmitter to its full extent on the runners, and remove the aerial tuner cover from the transmitter (This section is situated on the right hand side viewed from front panel). Attach a suitable cable from the aerial output of the tuner unit, through the inspection cover of the cabinet and to the aerial. Switch clips on the channel selector are numbered from the front panel end.

Ensure that clip 3 is fitted on all channels, clip 4 on 2182kHz and clip 31 on all channels except 2182kHz.

Referring to the circuit diagram, the input capacitors of the tuner are situated on clips 5, 7, 9, 11, 13 and 15, while the output capacitors are on clips 28, 29, 30 and 32.

When setting 2182kHz, the coil inductance is adjusted using clips 23, 24, 25, 26, 27 and 33, all other channels are adjusted using clips 1, 2, 6, 8, 10, 12, 14, 16, 17, 18, 19, 20, 21 and 22.

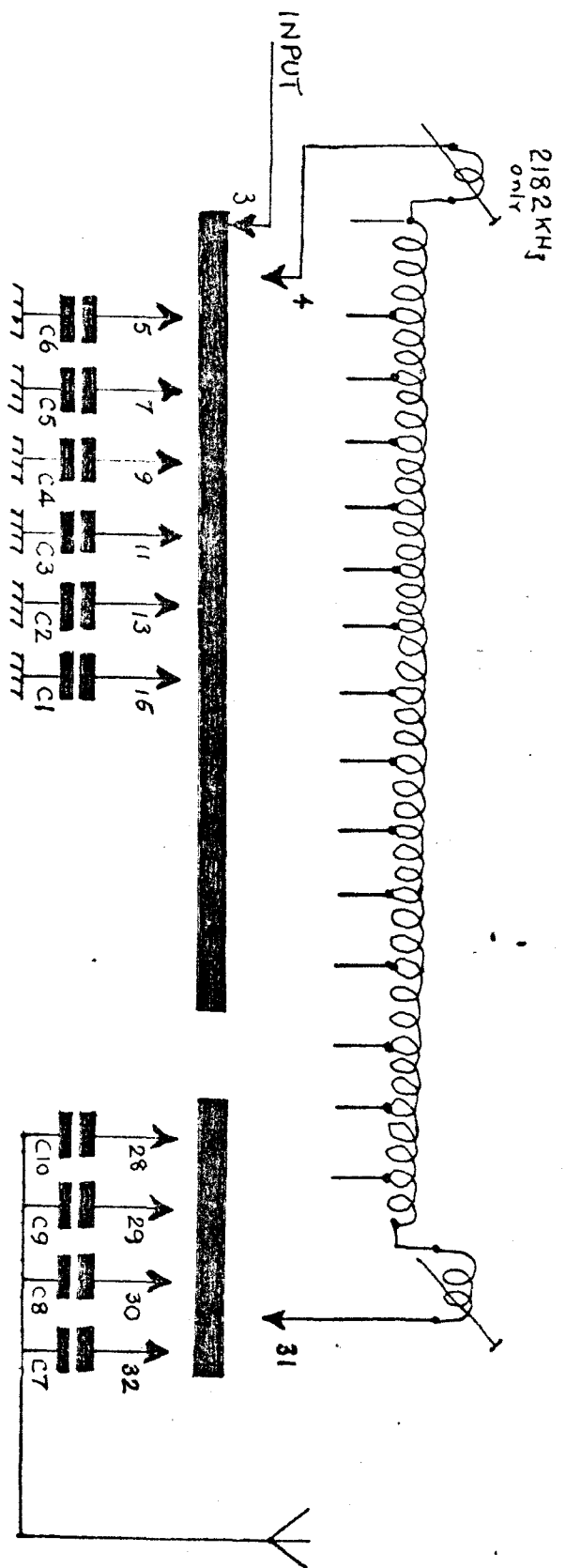
Switch to a channel other than 2182kHz, and fit one clip for the input capacitor, one clip for the inductance and one clip for the output capacitor. Select low power setting, set transmitter to simplex and press the 'TUNE' button, adjust the 'TUNE' control for maximum output on the meter. If there is no output or no distinctive peak, the aerial is not resonating and adjustment of the inductance or output capacitor tap is necessary.

When a peak is obtained, change the setting of the push-button switch situated behind the display PCB. This causes the meter to read reverse power, and the input capacitor should be adjusted for minimum reading on the meter in conjunction with the tuning control. As the correct tapping points are approached it will be necessary to switch to medium and high power to obtain more accurate indications on the meter.

There will be more than one combination of inductance and output capacitor value to resonate the aerial, with the correct setting giving maximum output current on the meter.

The procedure for tuning on 2182kHz is identical except that the front panel tuning control is inoperative, with tuning accomplished by the preset control adjustable through the front panel (using an insulated trimming tool) to the right of the tuning control. Also note that high power is always selected on 2182kHz, irrespective of the power level switch.

When the transmitter is replaced in the cabinet this preset control will need re-adjustment for maximum output.



- C1 - 2000p
- C2 - 1000p
- C3 - 500p
- C4 - 250p
- C5 - 100p
- C6 - 50p
- C7 - 1000p
- C8 - 500p
- C9 - 250p
- C10 - 140p

TAPPED COIL CONNECTED TO CLIPS 1, 2, 6, 8, 10, 12, 14, 16, 17, 18, 19, 20, 21, 22.
 FOR USE ON ALL CHANNELS EXCEPT 2182KH.

TAPPED COIL CONNECTED TO CLIPS 23, 24, 25, 26, 27, 33.
 FOR USE ON 2182KH ONLY.