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# Eddystone

**MODEL 990S**

# INSTALLATION NOTES OPERATING INSTRUCTIONS AND SERVICE DATA

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# AMENDMENT SHEET NO. 11

(Incorporating Sheets Nos 8, 9 and 10)

| | | |
|---|---|---|
| Page 3 | Change TR1 to read:- | AF139 (Siemens). |
| | Add note reading:- | Diode Type A80 (A.E.I. manufacture) may be fitted in lieu of DD006 normally used in D9 position. |
| Pages 5 | Change 4.5Mc/s to read:- | 4Mc/s. |
| 21 & 32 | Page 5 The RF Section | Line 5 of Para. 3. |
| | Page 21 | Last line at foot of page. |
| | Page 32 IF Bandwidth | Line 2. |
| Page 29 | Change C187, C193 & C195 to read:- | 0.64µF Tubular Electrolytic +100% -10% 64V |
| | Change C215 & C216 to read:- | 0.1µF Polycarbonate 20% 100V |
| Page 31 | Change R193 & R194 to read:- | 82Ω 10% ½-watt |
| Page 33 | Change Part No. for L77 to read:- | 7350P |
| Page 35 | Change Part No. for Monitor speaker to read:- | 7971P |
| Circuit | Amend circuit diagram in accordance with changes detailed above. | |

## HIGH-FREQ. RF UNIT

Current versions of the 990S receiver are fitted with a different type of High-freq. RF Unit (470-870 Mc/s). This is similar to the original unit but utilises transistor types as follows:-

| | | | |
|---|---|---|---|
| TR3 | RF Amplifier | AF279 | (germanium p.n.p.) |
| TR4 | Self-oscillating Mixer | BF181 | (silicon n.p.n.) |

The Spares List at the rear of the Handbook should be amended as follows:-

High-freq. RF Unit (Range 1 : 470-870 Mc/s) :: Part No. LP2953/D4384.

Issued by:- EDDYSTONE RADIO LIMITED, ALVECHURCH ROAD, BIRMINGHAM B31 3PP, ENGLAND
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# EDDYSTONE UHF RECEIVER

## MODEL 990S

The EDDYSTONE Model 990S is a fully transistorised single conversion superhet for AM and FM reception in the ultra-high frequency band 230-870 Mc/s. Power supply arrangements permit operation from any standard AC mains supply or from 12V DC and the receiver is suitable for use over the temperature range 0-50°C. A matching panoramic display unit is available when visual signal analysis is a requirement.

Advanced circuit techniques are employed throughout, performance is of a very high standard and the design will be found eminently suited to laboratory use especially in the UHF television field. Other applications include normal communications work, interference checking and noise measurement. Field use is facilitated by the ability to power the receiver from low voltage DC supplies.

Two separate RF heads with trough-line circuits are used to cover the complete tuning range which includes the whole of Bands IV and V. IF bandwidths of 1 Mc/s and 6 Mc/s can be selected for AM reception and 1 Mc/s only for FM. Provision is made for direct connection to the IF channel (36.5 Mc/s) so that external converters can be introduced to either extend the existing tuning range or to provide simultaneous reception on a pre-selected channel.

A low impedance IF output is provided for driving ancillary equipment including the IF Converter Type 939 which can be used to feed the Model EP17R Panoramic Display Unit so increasing still further the versatility of the receiver in the test instrument field. Separate video outputs are available from the AM and FM channels, circuit arrangements being such that both outputs can be used simultaneously if so desired.

On the audio side, a built-in monitor speaker is fitted for convenience in rack-mounted installations and outputs are available for external loudspeaker, telephones and remote lines. The latter output is restricted to permit direct connection to GPO lines and has a separate level control. Frequency response is good and the receiver can be used quite satisfactorily for high quality monitoring of television sound transmissions.

Other standard features include a built-in crystal calibrator providing modulated marker signals at 50 Mc/s intervals and a clearly scaled meter for carrier level measurement or tuning purposes. The panel controls include:- Tuning (flywheel-loaded gear-drive with a ratio of approximately 100:1), Range Switch, combined Selectivity/Mode Switch, independent RF, IF and AF Gains, combined Meter/Supply Switch, Manual/AGC Switch, AGC Time - Short/Long, Calibrator Switch, Calibration Re-set Adjuster, Monitor Speaker Switch. The telephone socket is on the panel and pre-set Line Level and Meter Zero controls at the rear.

The modern styling, convenient compact dimensions and rigid light-weight construction employing printed wiring techniques are in keeping with modern trends while the ease of conversion to rack-mounting allows great flexibility in installation. The layout has been arranged for ease of access and high grade materials are used throughout to ensure optimum reliability.

Sole Manufacturers:- EDDYSTONE RADIO LTD., ALVECHURCH ROAD, BIRMINGHAM 31, ENGLAND.

Issue 2. January 1967.

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### TRANSISTOR TYPE CHANGES

TR28 was OC81D and TR30 OC81 on all early versions of the 990S Receiver.

Texas 2S512 may be fitted in lieu of Fairchild C111 in TR13 position.

GM290A & GM378A may be fitted in lieu of GM290 and GM378.

### AMENDMENT RECORD

| Amend. No. | Incorporated by | Date |
|---|---|---|
| 1 | EDDYSTONE | ON ISSUE |
| 2 | EDDYSTONE | ON ISSUE |
| 3 | EDDYSTONE | ON ISSUE |
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Eddystone Radio Limited reserve the right to amend this publication. Amendment Sheets will be incorporated where necessary at date of issue.

# TECHNICAL DATA

## GENERAL

Frequency Coverage.

230-870 Mc/s in two switched ranges. Range 1 : 470-870 Mc/s. Range 2 : 230-510 Mc/s.

Intermediate Frequency.

36.5 Mc/s. Fixed bandwidth for FM reception, selectable bandwidths for AM.

Semiconductor Complement.

| Ref | Type | Manufacturer | Circuit Function |
|---|---|---|---|
| TR1 | AF186 | Mullard | RF Amplifier. } Low-freq. |
| TR2 | AF186 | Mullard | Self-oscillating Mixer. } RF Unit. |
| TR3 | AF186 | Mullard | RF Amplifier. } High-freq. |
| TR4 | AF186 | Mullard | Self-oscillating Mixer. } RF Unit. |
| TR5 | GM290 | Texas | IF Pre-amplifier. (IF Input) |
| TR6 | GM290 | Texas | IF Pre-amplifier. (Low-freq.) |
| TR7 | GM290 | Texas | IF Pre-amplifier. (High-freq.) |
| TR8 | GM378 | Texas | IF Amplifier. |
| TR9 | GM378 | Texas | IF Amplifier. |
| TR10 | GM378 | Texas | IF Amplifier. |
| TR11 | GM378 | Texas | IF Amplifier. |
| TR12 | GM378 | Texas | IF Amplifier. |
| TR13 | C111 | Fairchild | IF Amplifier. |
| TR14 | GM378 | Texas | *1st AM Video Amplifier. |
| TR15 | GM290 | Texas | 2nd AM Video Amplifier. |
| TR16 | GM290 | Texas | Emitter Follower 1. (FM Branch Isolator) |
| TR16A | GM290 | Texas | Emitter Follower 2. (IF Output) |
| TR17 | ACY21 | Mullard | RF AGC Amplifier. |
| TR18 | ACY21 | Mullard | IF AGC Amplifier. |
| TR19 | GM378 | Texas | FM Limiter Driver Stage. |
| TR20 | GM378 | Texas | 1st FM Limiter. |
| TR21 | GM378 | Texas | 2nd FM Limiter. |
| TR22 | GM378 | Texas | *1st FM Video Amplifier. |
| TR23 | GM378 | Texas | 2nd FM Video Amplifier. |
| TR24 | GET880 | Mullard | AF Amplifier. } 600Ω Channel. |
| TR25 | OC72 | Mullard | AF Output Amplifier. } 600Ω Channel. |
| TR26 | GET880 | Mullard | AF Amplifier. } |
| TR27 | AC127 | Mullard | AF Amplifier. } |
| TR28 | AC128 | Mullard | AF Driver. } 3Ω Channel. |
| TR29 | AC127 | Mullard | { Complementary } |
| TR30 | AC128 | Mullard | { AF Output. } |
| TR31 | GM290 | Texas | Calibration Osc. (50 Mc/s). |
| TR32 | GET880 | Mullard | Tone Osc./Modulator. |
| D1 | OA47 | Mullard | AM Detector. |
| D2 | OA47 | Mullard | RF AGC Rectifier. |
| D3 | OA47 | Mullard | IF AGC Rectifier. |
| D4/5 | 2xOA79 | Mullard | FM Discriminator. |
| D6 | OAZ228 | Mullard | 10V Supply Regulator. |
| D7 | OAZ230 | Mullard | 12V Supply Regulator. |
| D8 | M160T | G.E.C. | Supply Rectifier. |
| D9 | DD006 | Lucas | Reverse Polarity Protection. |

*These stages also serve as low-level AF Amplifiers.

Input and Output Impedances.

| | | |
|---|---|---|
| Aerial Input | . . | 75Ω unbalanced (BNC). |
| IF Input | . . | Low impedance (BNC). |
| IF Output | . . | Low impedance (BNC). |
| Video Outputs | . . | 1000Ω (BNC). |
| Audio Outputs | . . | Loudspeaker : 3Ω. |
| | | *Lines : 600Ω. |
| | | Headset : Low Z. |

*Line output can be balanced or unbalanced to suit installation requirements.

Power Supply.

Single-phase AC mains 100/130V and 200/260V (40-60 c/s) or 12V DC.

Consumption.

| | | |
|---|---|---|
| AC | . . | 12VA. (constant current drain). |
| DC | . . | 265mA quiescent. |
| | | 365mA at 500mW output. |

## TYPICAL PERFORMANCE FIGURES

This data should not be interpreted as a test specification.

Noise Factor.

| | | | | |
|---|---|---|---|---|
| Range 1 | . . | . . | . . | 10 - 16dB. |
| Range 2 | . . | . . | . . | 8 - 12dB. |

Spurious Responses.

All responses (including images) are at least 50dB down.

IF Bandwidth.(*)

Two separate IF filters are fitted which provide bandwidths of 6 Mc/s and 1 Mc/s.

Selectivity switching is performed by the MODE SWITCH which provides bandwidths of 6 Mc/s and 1 Mc/s for AM reception and 1 Mc/s only for FM.

Deviation Acceptance.

The discriminator will accept deviations of up to 250 kc/s.

Calibration Accuracy.

Within 1%. Crystal controlled markers are available at 50 Mc/s intervals on both ranges.

Frequency Stability.

Better than 1 part in $10^5$ per °C change in ambient temperature.

AGC Characteristic.

The audio output level does not change by more than 15dB for an increase in input level of 70dB above 10μV.

(*) Refer to Amendment on Page 32.

Audio Output.

The 3Ω loudspeaker output provides 500mW at 10% distortion.

Line output is restricted to a maximum of 10mW.

Audio Response.

Level within 6dB from 200 c/s to 10 kc/s.

IF Output.

An output of the order 50mV is available from the 36.5 Mc/s IF Amplifier. This is suitable for driving the EP17R Panoramic Display Unit via an IF Converter Type 939.

Video Output.(*)

Output from either the AM or FM video channels is of the order 2.5V p-p into a 1000Ω load.

Video Response. (AM)

Within 6dB from 20 c/s to 5 Mc/s. (Taken with external loading of 250pF).

Video Response. (FM)

Within 6dB from 20 c/s to 250 kc/s. (With external loading of 350pF).

IF Converter Type 939.

Output at 5.2 Mc/s is substantially the same as the input drive from the 990S receiver. The converter is crystal-controlled and has a fixed bandwidth of 1 megacycle.

# CIRCUIT DESCRIPTION

## The RF Section.

This portion of the receiver can be most conveniently considered in conjunction with the associated IF Pre-amplifiers since certain switching functions etc. are common to both.

The RF Section proper comprises two separate tuning units with separate aerial input sockets. One unit covers the band 470-870 Mc/s (Range 1) and is referred to as the "high-freq. unit." The other covers 230-510 Mc/s (Range 2) and is referred to as the "low-freq. unit."

Both RF units employ self-oscillating mixers (TR2 & TR4) and grounded-base RF Amplifiers (TR1 & TR3), using AF186 transistors in each stage. Capacity-tuned $\frac{1}{4}$-wave trough-line circuits are used with bandpass coupling between the RF and Mixer. The aerial input is tapped down the aerial circuit to provide correct matching and good image protection. Bandwidth is of the order 6 Mc/s on Range 1, and 4.5 - 5 Mc/s on Range 2. The oscillator tracks on the high side on both ranges.

Mechanical stability is of a high order due to the type of construction employed. This takes the form of a drawn 16-gauge steel box having steel partitions to form the trough-line circuits. A rigid steel cover plate together with a copper gasket and rubber pressure pad ensure that screening is complete, so maintaining stray oscillator leakage at a minimum. All connections to and from the units are made with feed-through capacitors, special "Filtercons" being used in certain positions.

IF output (36.5 Mc/s) is selected by L17 (high-freq. unit) and L7 (low-freq. unit). The outputs are fed separately via coaxial leads to the emitters of two grounded-base amplifiers TR6 & TR7. These stages employ GM290 transistors and serve the dual purpose of IF Pre-amplifier and Combiner for the two IF outputs. The combining action is achieved by working the collectors of both transistors into a common load (T1) which feeds the main IF channel.

TR5 (another GM290) also feeds into T1 and permits connection of external converters to the 36.5 Mc/s IF channel. Input to this stage is at low impedance to a BNC socket.

Range switching is effected by the double-pole toggle switch S1, one section of which (S1A) transfers the +10V supply line to the appropriate unit and simultaneously to the corresponding IF Pre-amplifier. Two indicator lamps conveniently located behind the scale plate are fed from the same switching to show clearly which range is in use at any given time. The +10V supply is permanently connected to TR5.

The other section of the RANGE SWITCH (S1B) connects the base of the appropriate RF Amplifier to the RF section of the MANUAL/AGC SWITCH S3B. The base potential of TR1 or TR3 is then controlled either by the setting of the MANUAL RF GAIN CONTROL, or, when using AGC, by the voltage across R73. AGC is <u>not</u> applied to the Mixer Stages or the IF Pre-amplifiers.

## Crystal Calibrator.

The crystal-controlled calibration oscillator (TR31 : GM290) and its associated Tone Oscillator/Modulator (TR32 : GET880) provide crystal check-points at 50 Mc/s intervals throughout the tuning range of the receiver. Injection to the high-freq unit is by stray pick-up only but in the case of the low-freq unit a small injection probe is fitted (adjacent to L2).

The Calibrator is brought into operation by means of S8 which completes the +10V supply to both TR31 and TR32. Correction for scale errors is carried out mechanically with an adjuster which provides limited lateral movement of the cursor independently of the TUNING CONTROL.

Main IF Channel.

Output from the IF Pre-amplifier transformer T1 is taken at low impedance to one section (S2A) of the combined SELECTIVITY/MODE SWITCH. S2 selects the required bandwidth by introducing one of two L-C filters. These have bandwidths of 6 Mc/s and 1 Mc/s and govern to a very large extent the overall selectivity of the receiver. Either bandwidth can be used for AM reception, but at FM bandwidth is limited to 1 Mc/s only. The three positions of S2 are marked 6 Mc/s - 1 Mc/s - FM, the first two being for AM reception.

S2B selects the output end of the appropriate filter and the switching is arranged such that the input and output of the 6 Mc/s filter are grounded when using the 1 Mc/s positions. Gain equalisation when switching from one filter to the other is effected by resistive loading in the form of R26 and R27 on the 6 Mc/s filter.

Output from the selected filter is passed to the first of six cascaded amplifiers operating at the intermediate frequency of 36.5 Mc/s. These stages (TR8-TR13) form the main IF strip of the receiver, the final stage feeding the AM Detector D1, the emitter follower TR16A (which provides a low-impedance pre-detector output at 36.5 Mc/s) and two separate AGC Rectifiers (D2 and D3). Drive for the FM Channel is derived from the penultimate stage TR12. It should be noted that the final transistor is an n-p-n type (C111) whereas all other stages employ p-n-p transistors type GM378.

Gain control is effected in the first and second stages (TR8 & TR9). The controlling voltage is actually applied only to the base of TR8 (via R28) but control is extended to TR9 by virtue of its base return being connected to the emitter of TR8. The second stage exercises greatest control of the overall gain. R28 is returned either to the MANUAL IF GAIN CONTROL or to R79 when using AGC.

Interstage coupling in the main IF Amplifier takes the form of single-tuned transformers with low impedance secondaries. Adjustable cores are employed for tuning on the first three transformers (T2, T3 & T4), while T5, T6 and T7 are wound on ferrite cores and are broadly tuned to the intermediate frequency.

AM Detector and Video Amplifier.

The AM Detector (D1 : OA47) employs a series circuit having a bandwidth in excess of 5 Mc/s. Output is tapped down the diode load (R54/R55) to improve both the response and dynamic range of the following video stage. An IF filter network comprising L60, L61, R58, C111 and C113 is included in the circuit.

TR14 serves the dual purpose of audio amplifier and emitter follower to feed the main video amplifier. Audio output at the collector of TR14 is fed via a low pass filter to the 1 Mc/s and 6 Mc/s positions of the SELECTIVITY/MODE SWITCH section S2D. The DC component across the collector load (R60) is utilised for metering (see later).

The video response is maintained at the emitter of TR14 which is direct-coupled to the base of TR15 (GM290). Low frequency response in this stage is effectively boosted by applying considerable high frequency attenuation in the form of C114 and C118. C117 and C120 provide decoupling of the emitter circuit. Final tailoring of the response is achieved by L63 which is peaked in the vicinity of 6 Mc/s.

FM Channel and Video Amplifier.

Drive for the FM Channel is taken from a link winding on T6 to TR16 (GM378) which functions as an emitter follower to isolate the two signal channels.

Low impedance output is taken from TR16 to the first stage in the FM strip (TR19 : GM378). This operates as a Limiter Driver Stage and is followed by a pair of cascaded limiters (TR20/21) using GM378 transistors. Double-tuned transformers are used on the FM Channel (T8-T10) with stabilising feedback applied across each of the last two stages. Stopper resistors are included in the collector leads to prevent collector bottoming.

The Discriminator uses a pair of OA79 diodes (D4/5) in a conventional Foster-Seeley circuit, component values etc. being chosen to preserve the overall response up to 250 kc/s.

Output from the Discriminator is AC coupled via C170 to TR22 (GM378) which functions in the same manner as TR14 on the AM Channel, i.e. video drive is taken from the emitter and audio from the collector (to FM position of S2D). AC coupling is used to avoid upsetting the bias conditions at the base of TR22. This latter stage drives the base of TR23 (GM378) to provide video output as on the AM Channel. C175 prevents parasitic oscillation in the TR23 circuit.

The +10V supply line is removed from TR19, TR20 and TR21 when S2 is set in the AM positions but the action of S2 (C) can be overridden by a separate switch (S9) when simultaneous operation of both video outputs is required.

RF and IF Gain Control.

Separate manual gain controls and AGC circuits are provided for the RF and IF Stages. The desired mode of operation is selected by the MANUAL/AGC SWITCH S3 which routes the base returns of the RF and IF transistors to the appropriate part of the circuit.

In the case of manual operation, the bases are returned to two stepped controls (switches) which take the form of potential dividers across the 10V supply. Resistor values have been chosen so that the controls will serve as attenuators, each step corresponding to roughly 3dB in the case of the RF GAIN and 6dB on the IF GAIN.

When using AGC, the RF and IF GAINS are switched out of circuit and become totally inoperative. The AGC system comprises two separate AGC Rectifiers (D2 & D3) with associated DC Amplifiers TR17 and TR18 (2 x ACY21). The two diodes are fed from the final IF Amplifier (TR13) via C105 and C134, values being chosen so that drive to the IF AGC diode is greater than to the RF diode. This tends to give greater control of the IF Stages and helps preserve optimum signal/noise performance when using AGC.

Initial operating conditions in the two DC Amplifiers are set by RV5 and RV6 which are adjusted to give the same voltages across R73 and R79 in the absence of a signal that exist when the two manual controls are at maximum gain setting (posn. 9). On receipt of a signal, the current through R73 and R79 decreases so that the gain control lines move towards the +10V supply line so reducing the gain of the RF and IF transistors. The normal AGC time constant can be lengthened when required by closing S4 to introduce C101 on the IF AGC line.

Meter Circuit.

A sensitive microammeter is included in the circuit for relative carrier level measurement and also serves as a tuning indicator. The meter is switched to operate from either the main IF Channel or from the Discriminator as required by the mode of operation. Switching is performed by S7A/B.

The meter is a centre-zero instrument and when operating as a tuning indicator on FM is connected directly across the Discriminator load through an isolating resistor (R99) which prevents damping of the output.

On AM, the meter can operate from either the IF AGC line or the collector of TR14 depending on whether logarithmic or linear meter scaling is required. Separate meter zero controls (RV1 & RV2) are provided for these two positions so that the meter needle can be biased electrically to a normal left-hand zero against the standing potential across R79 or R60. These adjustments are made under no-signal conditions. The meter is scaled in arbitrary divisions 0-10.

## The Audio Section.

Audio output from the two audio amplifiers (TR14 and TR22) following the AM Detector and FM Discriminator is routed by S2C to separate gain controls which feed the two independent audio channels. These are the low-level and high-level channels respectively and both are usable simultaneously with the selected mode.

## Low-level Audio Channel.

TR24 (GET880) and TR25 (OC72) form a low-level audio amplifier for connection to 600Ω line circuits. The gain control on this channel is pre-set and is located at the rear of the set. The output transformer (T11) has a centre-tapped secondary which is electrostatically screened from the primary winding. Maximum output is limited to 10mW.

## High-level Audio Channel.

This portion of the receiver employs a total of five transistors (TR26-TR30). Outputs are provided for a low-level built-in monitor speaker, an external loudspeaker and low-impedance telephones. The monitor speaker can be switched off by means of S10 and the external speaker is cut automatically on insertion of the telephone plug into JK1.

The output stage on this channel employs a pair of complementary transistors (PNP-NPN) and provides a maximum output of 500mW at the external 3Ω terminals.

Unlike the other stages in the receiver, TR26-TR30 operate from a +12V supply line.

## Power Supply.

This part of the receiver is of conventional design and allows operation from any standard AC supply or from 12V DC.

In the case of AC working, a full-wave low-voltage bridge rectifier (D8 : M160T) is fed from the low voltage secondary winding (14V) on T13. Tappings are provided on the split primary windings to allow adjustment for the local mains voltage. Zener diode D7 (OAZ230) regulates the output from the rectifier at 12V to feed the high-level audio stages and the 10V zener diode D6 (OAZ228) which supplies <u>all</u> other stages in the receiver.

For DC working, the shorting plug (PL1) is removed from SKT7 to isolate the 12V zener diode and the AC transformer. Connection of the external 12V supply is then by PL2, the 10V line being regulated in the normal manner by the OAZ228.

A silicon diode (D9 : DD006) is wired directly across the 12V input and serves as a protection device in the event of the supply being connected with reversed polarity. In this event, D9 conducts in a forward direction and draws a current which exceeds the rating of FS1.

FS1 fuses the negative 12V supply line and is wired to be in circuit for both DC and AC working. On AC, an additional fuse (FS2) is included in the live line to the power transformer primary. Switching is by S11A and S11B which interrupt both the AC and DC circuits in the "off" position. S11 is ganged to the METER SWITCH S7.

## CIRCUIT CORRECTIONS

The following changes should be made on the circuit diagram at the rear.

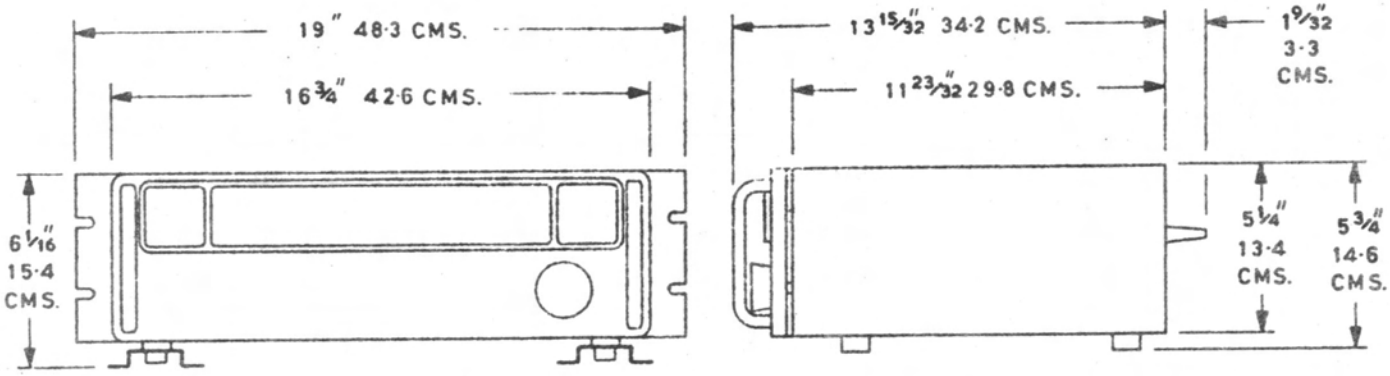
R71 & R77 to read VA1097
R123 to read 2.7K
R150 to read VA1066S
C180 to read 0.001μF
FC1-FC9 to read 0.0015μF
Delete R198

# MECHANICAL CONSTRUCTION

General.

The 990S receiver in its standard form is suitable for bench-mounting only. Receivers are available for rack-mounting and are designated Model 990S/RM. Dimensions and fixing are arranged to suit standard 19-inch Post Office racking. Conversion kits can be supplied to allow modification of standard receivers already in service. A shock-absorbent mounting is also available if required.

Dimensions.




Weight.

| | |
|---|---|
| Bench-mounting version . . . . . | 21¾ lb. (9.87 kg.). |
| Rack-mounting version . . . . . | 22¼ lb. (10.1 kg.). |

Internal Layout.

All parts of the circuit with the exception of the power supply and the two RF Units are carried on printed boards of which there are ten in all. The Power Supply is built on a small metal sub-chassis and is located at the rear of the set adjacent to the platform which carries the two RF Units at the right-hand side. The Units are protected by a lightweight cover which affords screening and also prevents dust ingress to the drive mechanism. The cover can be removed quite easily if access to the Units should prove necessary.

Five of the ten printed boards are visible immediately on removal of the receiver cabinet. These are:-

1. The IF Amplifier (TR8-21, excluding TR16 & TR16A).
2. The Low-level Audio Amplifier (TR24/25).
3. The High-level Audio Amplifier (TR26-30).
4. The FM Video Amplifier (TR22/23).
5. The 50 Mc/s Crystal Calibrator (TR31/32).

Three of the other boards are housed in the large screening box near the panel and adjacent to the cover over the RF Section. This box is referred to as the "Filter Box" and the three boards are as follows:-

6. IF Pre-amplifier (TR5-7).
7. 6 Mc/s Filter.
8. 1 Mc/s Filter.

The two remaining boards carry the circuitry associated with TR16 & TR16A and are located in small screening cans mounted on the IF Amplifier board.

9. Emitter Follower 1 : FM Isolator (TR16). 10. Emitter Follower 2 : IF O/P (TR16A).

Panel.

The front panel is a lightweight aluminium casting and contributes great mechanical strength to the receiver as a whole. Chromium-plated handles are fitted for convenience in handling the receiver and these also allow it to be placed "face-down" without damage to the panel controls when removing the cabinet.

Cabinet.

This is fabricated from light-gauge sheet steel and affords adequate protection for the receiver regardless of the manner in which it is mounted. Fixing points are provided in the form of hank bushes for attachment of rack-mounting brackets, rubber feet and shock-absorbent mountings.

Dial and Drive Assembly.

The tuning control drives a spring-loaded split-gear system having a reduction ratio of approximately 100:1. The drive is flywheel-loaded, substantially free from backlash and ensures a consistently high degree of re-setting accuracy when use is made of the logging scales provided. Tuning scales are over nine-inches long and are calibrated directly in frequency. A cursor adjuster allows correction for scale errors.

External Wiring.

All external connections (with the exception of the telephone output) are made to sockets and terminals at the rear of the set. The telephone output is brought out on the panel and accepts a standard Post Office jack plug.

# INSTALLATION

## GENERAL

Accessories.

All receivers are supplied complete with six standard BNC coaxial connectors, a 12V DC supply connector (ready-wired with shorting strap as per PL1 on circuit diagram) and a mains connector with six-feet of three-core PVC lead. Spare fuses (1A and 500mA) are retained in clips on the right-hand end plate.

The following accessories and associated equipment are available for use with the 990S receiver:-

1. Rack-mounting conversion kit. (Comprises two rack-mounting brackets : 7093P and four 2BA x $\frac{3}{8}$" fixing screws : 40A-246).
2. Set of four rubber mounting feet : 7132P. (For use when converting Model 990S/RM to bench-mounting).
3. Shock-absorbent mounting : LP2817. (Complete assembly for attachment to either version of the receiver).
4. Cabinet loudspeaker : Cat. No. 935.
5. Plinth loudspeaker unit : Cat. No. 906.
6. IF Converter Type 939 (939/1 for rack installation).
7. Panoramic Display Unit Model EP17R (EP17R/RM for rack installation).
8. Low-impedance telephones : Cat. No. ~~LP2922~~ LP3242

Orders and enquiries relating to accessories for the 990S receiver should be sent to the "Sales & Service Dept." at our usual address.

## Converting a standard 990S receiver to rack-mounting.

This is a simple operation taking only a few minutes to complete. A screwdriver is the only tool required.

1. Remove rubber mounting feet and store (with screws) for possible future use.
2. Attach rack-mounting brackets to leading edges of cabinet using the four screws supplied with the kit.

## Fitting shock-absorbent mountings to the 990S receiver.

1. Place the receiver upside down and remove the rubber mounting feet. Store for possible future use.
2. Take the large neoprene washers and place these over the fixing holes in the underside of the cabinet (stepped face uppermost).
3. Lower the channel-shaped mounting brackets onto the washers, keeping the fixing flange towards the outside of the receiver and at the same time making sure that the step on the washers locates with the holes in the brackets.
4. Place the smaller neoprene washers on the inside of the channel and pass the 2BA screws with brass washers through both neoprene washers.
5. Locate screws in hank-bushes in cabinet and tighten.
6. Fix channel mounting brackets to bench top with suitable screws. Take care to bond the brackets to the bench top if this is of metal construction.

## Panoramic Display Installation Type EPR29.

The 990S receiver can be supplied as a panoramic display installation which comprises the following items and is designated Model EPR29 (EPR29/RM rack mounting).

1. 990S receiver (or 990S/RM).
2. EP17R Panoramic Display Unit (or EP17R/RM).
3. 939 IF Converter (or 939/1). (36.5 Mc/s in, 5.2 Mc/s out)
4. Loudspeaker Unit (bench-mounted version only).
5. Pair of tie-bars for bench-mounted installation.
6. Associated cabling and connectors.

## Assembly of EPR29 Panoramic Display Installation.

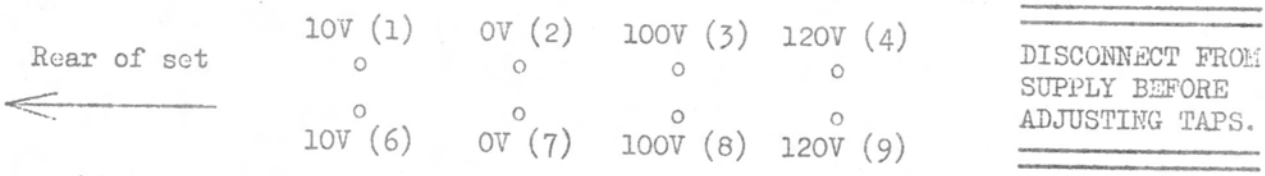
1. Invert receiver and remove the four rubber feet (if fitted). Attach loudspeaker unit to underside of receiver using the four screws provided. Do not use the screws which previously held the rubber feet.
2. Connect the loudspeaker lead to the 3Ω terminals at the rear of the receiver.
3. Place receiver in a face-down position and remove the four cabinet retaining screws. Fit the two tie-bars to the receiver, omitting at this stage the top retaining screw on the left-hand bar (adjacent to aerial input sockets). Fit spacing washer on the bottom left-hand screw. Set receiver down resting on its plinth speaker unit.
4. Remove the four cabinet retaining screws from the EP17R Display Unit and place it on top of the receiver. Re-fit three of the screws through the tie-bars (spacing washer on top left-hand screw). Omit screw in lower left-hand corner.
5. Slacken the two screws in the left-hand tie bar and slide the 939 IF Converter mounting bracket between the tie-bar and the rear of the main units so that the two holes in the bracket coincide with the two centre fixing holes in the bar. Fit the two screws omitted in operations (3) and (4) above. Tighten all screws securely.
6. Connect the receiver IF Output socket to the Input socket on the 939 Converter and the IF Output socket on the IF Converter to the Input socket on the Display Unit, using the leads provided. Plug the 939 IF Converter supply connector into the 12V supply socket on the receiver after removing the existing shorting plug.
7. Make all other external connections as for a normal receiver installation as described later in this Section.

Assembly of EPR29/RH Panoramic Display Installation.

1. Remove rubber feet from receiver and display unit (if fitted).
2. Mount receiver and display unit in rack with receiver in lower position.
3. Attach IF Converter Type 939/1 to rear of equipment. Refer to sheet supplied.
4. Make connections as per paras (6) and (7) for bench-mounted installation.

## MAINS VOLTAGE ADJUSTMENT

The voltage tappings on the primary side of the power transformer must be checked and changed if necessary before connecting the receiver to the supply. Tapping points are located below chassis at the rear of the set and are accessible after removing the cabinet. The transformer has two separate 130V primaries tapped as follows:-




DISCONNECT FROM SUPPLY BEFORE ADJUSTING TAPS.

For voltages in the range 200/260V, operate appropriate sections of secondaries in series; for voltages in the range 100/130V, operate equal sections of the primaries in parallel. Tappings (3) or (4) should be linked to (6) or (7) for series working.

The receiver leaves the factory with tappings set for 240V operation.

## EXTERNAL CONNECTIONS

Mains.

A suitable polarised connector and three-core mains lead are supplied with the set. The lead is colour-coded as follows:- RED : LIVE, BLACK : NEUTRAL, GREEN : EARTH. One end of the lead is left free so that the user can fit a plug of a type suitable for connection to the local supply.

When operating from AC mains, it is important to check that a shorting plug is in position at the 12V DC supply socket. Its purpose is to complete the 12V regulated positive line to the appropriate receiver circuits. The plug should be wired as PL1 on the circuit diagram at the rear of the Manual.

12V DC Operation.

If an extended period of operation from 12V DC is envisaged, the existing shorting plug (which is used in mains operation to complete the 12V supply line) can be re-wired as shown at PL2 on the circuit diagram. On the other hand, where 12V working is for emergency operation in the event of mains failure, an additional plug should be obtained to facilitate rapid changeover. The plug is a three-way polarised female connector Bulgin Type No. P430.

Ancillary Supply.

The 12V DC supply at SKT7 is available for connection to external units when the receiver is operating from AC mains supplies. Maximum current drain is 35mA.

Note that the negative lead from the external unit must be connected to the earth terminal and not to SKT7, otherwise FS1 and S11A will be short-circuited if an earth return exists between the receiver and the ancillary unit.

Aerial.

Input impedance on both ranges is 75Ω unbalanced with BNC connectors. For optimum performance, separate aerials should be used for each range, this effecting considerable simplification in the design of the aerials and also avoiding the need for changing over a single aerial when switching from one range to the other. This is especially important in the case of a rack-mounted installation where access to the rear of the rack may be difficult.

Aerials for use with the Model 990S are not supplied by Eddystone Radio Ltd.

IF Input.

BNC coaxial socket accepting low-impedance line from external converter giving 36.5 Mc/s IF output. Supply for the converter can be taken from the 12V DC connector at the rear, up to 35mA of current being available when required. Maximum current drain is limited to 25mA if simultaneous operation with the IF Converter Type 939 is required.

IF Output.

Low impedance 36.5 Mc/s output to BNC socket. Bandwidth can be either 6 Mc/s or 1 Mc/s and is selected by the combined SELECTIVITY/MODE SWITCH on the panel of the receiver. IF output is available at 1 Mc/s bandwidth with the switch at "FM."

This output can be used to drive the IF Converter Type 939 which converts the 36.5 Mc/s output to 5.2 Mc/s to suit the EP17R Panoramic Display Unit. Maximum bandwidth through the converter is 1 Mc/s and is not affected by the receiver selectivity switching.

Video Outputs.

Separate video outputs are available from the AM and FM intermediate frequency channels. Both outputs are suitable for termination in 1000Ω loads, connection being made to BNC sockets at the rear of the set. External lead lengths should be kept to a minimum to preserve the high frequency response. Small DC voltages are present at both outputs (of the order 3-6 volts).

Both video outputs can be used simultaneously when the SELECTIVITY/MODE SWITCH is set to "FM." Simultaneous operation is possible on "AM" only when the COMBINING SWITCH at the rear is set to "SIMULTANEOUS AM/FM."

External Loudspeaker.

Two terminals are provided for connection of an external loudspeaker. The output is marked "3Ω" and suitable speakers are available in the Eddystone range. Full details are available on request.

Line Output.

This output is marked "600Ω" and provides a maximum of 10mW for connection to remote lines. The centre-tap (CT) can be left floating or alternatively earthed to provide a balanced output. The secondary winding is electrostatically screened from the primary.

Telephones.

The telephone output is suitable for use with low-impedance type headsets. Circuit arrangements provide for muting of the external loudspeaker on insertion of the telephone plug. The internal speaker can be cut by means of a panel switch.

Earth Terminal.

Bond to frame of rack when receiver is installed as a rack-mounted equipment.

# OPERATION

## CONTROL FUNCTIONS

### Tuning.

This control is conveniently located at the right-hand side of the receiver and operates the tuning capacitors in both RF units through a precision gear drive having a ratio of the order 100:1.

Logging scales are provided on the skirt of the control knob and at the foot of the main tuning dial. Calibration on the latter runs from 0-5000 with index marks at 100-division intervals. Sub-division between the main scale markings is by use of the scale on the control knob which runs from 0-100. All markings are arbitrary.

### Range Switch.

Changeover from one range to the other is by means of a toggle switch which completes the 10V supply to the appropriate Tuner and Pre-amplifier and also illuminates the correct range indicator lamp on the tuning scale.

Separate aerial input sockets are provided for use on each of the two ranges and care must be taken when using a single aerial only, to change over the aerial connector at the rear of the set. The sockets are clearly marked with both the range number and the frequencies covered.

### Selectivity/Mode Switch.

This control has three positions and is marked "6 Mc/s - 1 Mc/s - FM", the first two positions being for AM reception only.

Functions performed by this switch are (1) selection of the appropriate IF bandwidth (2) application of the +10V supply to the FM stages when switched to FM and (3) routing of audio from the selected channel to the audio section of the receiver.

Simultaneous operation of the AM and FM video channels is immediately available with the switch at "FM", but in the "6 Mc/s" and "1 Mc/s" settings only when the VIDEO COMBINING SWITCH at the rear of the set is moved to "SIMULTANEOUS AM/FM."

### RF and IF Gains.

Both these controls take the form of attenuators, each having ten positions marked 0-9. On the RF control each step corresponds to roughly 3dB and on the IF control to 6dB. Both gain controls are inoperative with the MANUAL/AGC SWITCH set to the "AGC" position.

### AF Gain Control.

Controls the level of audio on the high-level output feeding the telephones and the internal and external loudspeakers. Adjustment of this control does not significantly affect the output at the 600Ω terminals.

### 600Ω Line Level.

Provides independent adjustment of the audio level at the 600Ω line output. The control is pre-set and is located at the back of the receiver. Interaction with the AF GAIN on the high-level channel is negligible.

### Manual/AGC Switch.

Provides for manual or automatic control of the gain in the RF and IF stages of the receiver. The manual gain controls are totally inoperative when the switch is at "AGC."

AGC Time Constant Switch.

Can be set for "LONG" or "SHORT" time constant. Affects IF AGC line only, RF AGC time constant is fixed.

Supply/Meter Switch.

This control combines supply switching (on both AC and DC operation) with switching of the built-in tuning meter. The four positions are marked "SUPPLY OFF" - "METER LOG" - "METER LIN" - "METER FM."

The supply is completed to the receiver by moving the switch to "METER LOG" and remains connected in the other two positions.

On "METER FM", the meter operates as a centre-zero tuning indicator, no manual zero adjustment being required. Correct tuning on FM signals is obtained when the meter needle lies on the red line at the centre of the meter scale. Off-tuning in either direction will cause the needle to swing away from centre, returning to centre when the carrier lies outside the IF passband. The needle will swing to left or right depending on the direction of off-tuning.

The "LOG" and "LIN" positions of the switch are intended mainly for use on AM but do of course function when the SELECTIVITY/MODE SWITCH is at "FM." The MANUAL/AGC SWITCH should be set to "MANUAL" when using the "LIN" position and to "AGC" for "LOG."

Separate meter zero controls are provided for "LOG" and "LIN" in which positions the meter operates with a conventional left-hand zero.

Monitor Speaker Switch.

Allows the built-in monitor speaker to be muted when not required. External speaker is cut on insertion of telephone plug.

Calibrator Switch.

Introduces the built-in crystal calibrator when checking the accuracy of the tuning scale. Modulated calibration markers are available at 50 Mc/s intervals on both ranges.

Calibration Re-set Adjuster.

This is a mechanical adjuster which allows limited lateral movement of the cursor independently of the TUNING CONTROL. Provides a means of compensating for errors when checking the frequency scales against the built-in crystal calibrator.

Video Combining Switch.

This control is located at the rear of the set and is for use when it is necessary to operate both video outputs at the same time when using the "6 Mc/s" and "1 Mc/s" settings of the SELECTIVITY/MODE SWITCH. The switch positions are marked "INDEPENDENT AM/FM" - "SIMULTANEOUS AM/FM", the "INDEPENDENT AM/FM" setting being the one for normal operation. Leaving the switch at "SIMULTANEOUS AM/FM" when using the receiver in the normal manner gives rise to a slight distortion of the overall IF response when the SELECTIVITY/MODE SWITCH is in the "6 Mc/s" position.

Meter Zero Controls.

These are located at the rear of the receiver and are marked (1) METER ZERO AM LIN and (2) METER ZERO AM LOG. Their function is to set the meter needle to coincide with the "0" mark on the arbitrary 0-10 scale. Adjustment should be made as follows:-

LOG : Adjust under no-signal conditions with MANUAL/AGC SWITCH at "AGC."

LIN : Adjust under no-signal conditions with MANUAL/AGC SWITCH at "MANUAL" and both RF and IF GAINS at maximum setting (9).

## TUNING INSTRUCTIONS

### Normal Operation.

1. Check that all external connections have been made correctly and that the AC or DC supply is available as appropriate.
2. Switch on the receiver by moving the SUPPLY/METER SWITCH to "METER LOG." An indication that the supply is completed to the receiver is given by illumination of one of the two range indicator lamps at the left-hand end of the scales. The meter needle will swing from centre-zero towards the left-hand zero.
3. Switch to "METER LIN" and note whether the meter needle is accurately zero'd in this and the "METER LOG" positions. If necessary, adjust the METER ZERO CONTROLS at the rear as described on page 15.
4. Select the required range, taking care to ensure that the aerial feeder is connected to the correct socket at the rear of the set.
5. Set SELECTIVITY/MODE SWITCH to "1 Mc/s" position and the RF/IF GAIN CONTROLS at maximum. Adjust the AF GAIN CONTROL for a convenient output.
6. Move the CALIBRATOR SWITCH to "ON" and tune in the calibration marker at the nearest check-point to the required frequency. (Check-points are available at 500, 550, 600, 650, 700, 750, 800 and 850 Mc/s on Range 1 and at 250, 300, 350, 400, 450 and 500 Mc/s on Range 2).
7. Adjust TUNING CONTROL for maximum deflection on the tuning meter and then switch off the Calibrator. (NOTE: For greatest accuracy, this check can be carried out at "FM" in which case the adjustment is made for centre-zero reading on the meter).
8. Without disturbing the setting of the TUNING CONTROL, adjust the CAL RE-SET CONTROL to position the cursor coincident with the correct calibration mark on the tuning scale.
9. Tune to required frequency.
10. Select "AM" or "FM" as required, using the "1 Mc/s" position for reception of an AM signal. The "6 Mc/s" setting is normally for use only when taking a wide-band video output on this channel.
11. Adjust all GAIN CONTROLS as necessary for desired output. Select AGC if required. (The AGC circuit is provided mainly for convenience during search tuning when it eliminates the need for continual adjustment of the manual controls and prevents overload occurring. In the case of spot frequency working there will be little need to use the AGC facility since path disturbances are likely to be of a minor nature or due to such causes as aircraft flutter etc. Use AGC "LONG" or "SHORT" as required. Note that the manual RF/IF GAIN CONTROL settings do not affect the performance when switched to "AGC").

### Operation with EP17R Panoramic Display Unit.

Reference should be made to the Manual supplied with the Display Unit for instructions on initial adjustment etc. (see page 9 onwards). On page 11, ignore all references to the 770R (Mk.II) VHF Receiver and read instead the notes on the EPR25 Installation since these are applicable also to the EPR29 (990S + EP17R).

It should be noted that when reading page 12 of the EP17R Manual, the lowest display frequency when using the 990S Receiver with the EP17R, occurs at the left-hand end of the trace. This is due to there being two frequency inversions, one in the receiver itself and the other in the IF Converter Unit which provides the 5.2 Mc/s output to drive the Display Unit.

Interpolation can be carried out as described for the 770R and 770U receivers, provided that external 1 Mc/s and 10 Mc/s harmonic generators are available.

# MAINTENANCE

## GENERAL

The 990S receiver is suitable for continuous use under arduous operating conditions and should require very little in the way of routine maintenance over quite long periods of operation. All components with the exception of the semiconductors are guaranteed by the Manufacturer for a period of one year from the date of purchase. The semiconductors are covered by a separate guarantee.

As with all Eddystone receivers, the 990S can be returned to the Manufacturer at any time should major servicing become necessary. The receiver can be sent direct or via one of the many Eddystone Agents, the latter course often being the most convenient since the Agent will usually have a suitable packing case in which to return it. If there is no local Eddystone Agent and it is necessary to send direct, prior arrangements should be made before despatch. It is most important that the receiver is well protected against damage during transit and the reader is referred to the Guarantee Card for further information on this point. Always quote the Serial No. of the set in all communications.

Spares for user-servicing can be supplied and helpful advice will be freely given when necessary. Any enquiries relating to service matters should be directed to the "Sales and Service Dept." at our usual address.

The following paragraphs are devoted to minor servicing and will be found useful if it becomes necessary to replace fuses, lamps etc. Periodic cleaning of the receiver should be carried out as a matter of course, care being taken to avoid displacing any components when cleaning the interior. Full instructions for carrying out re-alignment will be found later in this section.

### Lubrication.

The gear drive and other mechanical arrangements will not normally require attention since these are treated with a permanent lubricant during initial assembly. If however, additional lubrication should be thought necessary after the receiver has been in use for a prolonged period, this can be carried out with a light mineral oil suited to the temperature conditions under which the equipment is operated. Care should be taken to use only the smallest amount of oil necessary for free and easy movement.

### Replacing a faulty fuse.

Separate AC and DC fuses are provided for protection of the 990S receiver. Ratings are 1A : DC and 500mA : AC, the fuses being standard 1¼" x ¼" cartridge types. Circuit arrangements are such that either fuse could fail when operating from AC mains. On DC, only the 1A fuse is in circuit and this, in addition to its normal function, also protects the receiver in the event of the 12V supply being connected with reversed polarity. Fuseholders are located at the rear of the set and are immediately accessible without need for removal of the cabinet.

### Range Indicator Lamps.

These can be changed quite easily after removal of the cabinet. Bulbs are L.E.S. type rated at 6V 50mA (Part No. 6659P). Holders are retained in sponge rubber mounting and can be extracted by pulling gently away from the scale plate.

### Cleaning the scale window.

After a long period of use, especially in dusty locations it may prove necessary to clean the inside of the scale window. To do this, take off the window escutcheon by removingthe four retaining screws. The window, which is of perspex, can now be withdrawn and should be cleaned with a suitable polish containing anti-static additive.

Drive cord replacement.

In the unlikely event of the pointer drive cord breaking, replacement can easily be effected by following the instructions given below. A new cord can be obtained from Eddystone Radio Ltd. by quoting Part No. D3631. The cord supplied is of the exact length required and is complete with end termination.

NB: Left-hand and right-hand in the instructions which follow apply when the receiver is viewed from the rear.

1. Remove the faulty drive cord.
2. Set CAL RE-SET ADJUSTER to mid-travel position.
3. Rotate TUNING CONTROL to full extreme of anti-clockwise rotation.
4. Take the knotted end of the replacement cord and slide this into the slot on the left-hand drive pulley so that the knot is trapped against the inner wall.
5. Pass the free end of the cord under the sprung jockey pulley, up and over the left-hand guide pulley and then across the scale plate towards the right-hand guide pulley. Do not attach to cursor at this stage.
6. Hold the cord in tension and rotate the TUNING CONTROL to the full extreme of its clockwise rotation so that five complete turns of cord are wound onto the left-hand drive pulley.
7. Maintain tension to prevent cord slipping and then pass the free end over the right hand guide pulley, down and under the cursor shift pulley and then across towards the right-hand drive pulley.
8. Attach the cord to the right-hand drive pulley by sliding into slot so that the eyelet is trapped against the inner wall.
9. Lift the lower run of cord so that it lies over the two inner guide pulleys which prevent it fouling the controls below.
10. Check drive for free running by rotating TUNING CONTROL to full extreme of anti-clockwise rotation.
11. Leave control at this setting, slide cursor to "0" on logging scale and attach to cord by means of three hooks on the rear of the carrier.
12. Check cursor for free running and CAL RE-SET ADJUSTER for normal operation. Verify scale accuracy by checking against the built-in crystal calibrator.

## RE-ALIGNMENT

General.

Initial factory alignment of the receiver will hold good for a long period of time and re-alignment should only be attempted if there is a clear indication that such adjustment is in fact required. Adjustments should be made only by experienced technicians with a sound knowledge of the procedures involved and an adequate range of reliable test equipment must be available if the task is to be completed correctly.

Comprehensive instructions covering all phases of the alignment procedure are given here for the sake of completeness but in most cases it will only be found necessary to make minor adjustments to compensate for normal component ageing or replacement. The relevant instructions can be extracted as required.

All dust cores are self-locking (rubber string and silicone core-retaining compound) so that there is no need to use wax etc. after adjustment. Trimming capacitors in the two RF Units are also self-locking.

Re-alignment of the AM IF Channel.

Test Equipment ..... Standard Signal Generator covering 30-45 Mc/s with provision for amplitude modulation (30%, 400 c/s) and an output impedance of 50Ω.

Crystal Calibrator for checking accuracy of generator scale.

Power Output Meter matched to 3Ω impedance.

Miniature insulated screwdriver type trimming tool.

Connect generator output lead to base of TR8 via C75. Connection can be conveniently made at tags 1 and 2 on the IF Board. These are located adjacent to the filter box and are connected to a coaxial lead running from S2B inside the filter box. Tag 1 is earthed, tag 2 the base; there is no need to block the live generator lead.

The output meter is connected to the 3Ω terminals at the rear, the external speaker being disconnected. Aural monitoring of the output during alignment is by use of the built-in loudspeaker.

Set the receiver controls as follows:-

| | |
|---|---|
| SUPPLY/METER SWITCH | "METER LOG." |
| RF, IF & AF GAINS | "9" (Maximum). |
| SELECTIVITY/MODE SWITCH | "1 Mc/s." |
| MANUAL/AGC SWITCH | "MANUAL." |
| MONITOR SPEAKER SWITCH | "ON." |
| VIDEO COMBINING SWITCH | "INDEPENDENT AM/FM." |

Check generator scale against crystal calibrator and tune in turn to the following frequencies, adjusting the three tunable transformers for maximum output reading. Note that T5, T6 and T7 are wide-band pre-tuned transformers and require no alignment.

Adjust T2 at 36 Mc/s.
Adjust T3 at 41 Mc/s. } Single cores accessible from the top.
Adjust T4 at 32 Mc/s.

On completion of these adjustments, check that the sensitivity with the generator connected to tags 1 & 2 and tuned to 36.5 Mc/s (IF centre-frequency) is of the order 16μV for 200mW output (monitor speaker "on", external speaker disconnected). If the sensitivity appears low, isolate the live generator lead with a capacitor of the order 1500pF and introduce the signal at the base of each stage in turn. Expected sensitivities are as follows:- (Allow for variations due to transistor tolerances etc.)

Generator applied at base of TR9 :: 50μV for 200mW output.
Generator applied at base of TR10 :: 112μV for 200mW output.
Generator applied at base of TR11 :: 360μV for 200mW output.
Generator applied at base of TR12 :: 3.2mV for 200mW output.
Generator applied at base of TR13 :: 56mV for 200mW output.

If sensitivity is low from TR13, check audio sensitivity with 1000 c/s signal introduced across AF GAIN CONTROL. With control at maximum setting, 1.7mV should produce an output of 500mW in 3Ω.

Re-alignment of the FM IF Channel.

Test Equipment ..... As for re-alignment of the AM Channel.

Connect generator and output meter as for alignment of AM Channel. Locate D5 and short with temporary wire strap soldered on underside of printed board. This allows the standard AM generator to be used for alignment. Set top core of T10 flush with top of can. Control settings should be as for AM alignment but with the SELECTIVITY/MODE SWITCH set to "FM."

Check accuracy of generator scale and then tune to exactly 36.5 Mc/s. Peak the lower core in T10 and both top and bottom cores in T8 & T9 for maximum output reading. Note that all cores are set to their "outer" peak.

On completion of these adjustments, check that the sensitivity is of the order 1µV for 500mW output. Stage sensitivities can be measured if the overall IF sensitivity appears to be low. Expected sensitivities are as follows:-

Generator applied at base of TR19 :: *9mV for 500mW output.
Generator applied at base of TR20 :: *9mV for 500mW output.
Generator applied at base of TR21 :: 90mV for 500mW output.

*Readings are similar due to limiting action.

Switch to "METER FM", remove the short from D5 and adjust the top core of T10 to bring the needle on the built-in tuning meter to centre-scale coincident with the red indicating line.

Reduce RF and IF GAIN settings to minimum and note whether the meter needle deviates from the centre position. Any tendency for the needle to wander can be corrected by minor adjustment of the top core in T8. Repeat adjustments as necessary.

Re-alignment of the FM Channel can be carried out by using a sweep frequency generator and visual display. In this case it will be found most convenient to introduce the swept signal at the IF INPUT socket. Output for display of the discriminator characteristic can be taken from the top end of R100. The overall IF response can be displayed from the same point provided that D5 is shorted with a temporary wire strap soldered to the underside of the printed board.

Re-alignment of the IF Filters.

Any change in filter response is likely to be slight and not greater than say 1 or 2dB unless caused by an actual component failure. Re-alignment should not be attempted unless absolutely essential.

Adjustment of the 1 Mc/s filter is a straightforward procedure and can if necessary be carried out with a standard signal generator and output meter. All four cores are accessible from the underside of the filter box and should be set for maximum output with the input signal set to 36.5 Mc/s. Adjustment should be made with the signal introduced via the IF INPUT socket and the SELECTIVITY/MODE SWITCH set to "1 Mc/s." The response on completion should be 6dB down at 36 and 37 Mc/s.

The 6 Mc/s filter is adjusted with the SELECTIVITY/MODE SWITCH at "6 Mc/s" and can only be aligned correctly if a sweep generator and visual display unit are available. Access for alignment is through trimming apertures in the top of the filter box, the individual adjustments giving the following effects:-

| | |
|---|---|
| L27, 28, 30, 31, 32 . . . . . | control overall response. |
| L29 . . . . . | controls tilting. |
| L25, 33 . . . . . | control low frequency skirt. |
| L26, 34 . . . . . | control high frequency skirt. |

Overall response on completion of the adjustments should be of the order 6dB down at 33.5 Mc/s and 39.5 Mc/s. The trough should not exceed 2dB and is typically 1 to 1.5 dB on an average receiver.

IF sensitivity should now be checked with a modulated signal introduced at the IF INPUT socket. Typical figures for both IF bandwidths are as follows:-

IF bandwidth set to 1 Mc/s . . . . 15µV for 500mW output.
IF bandwidth set to 6 Mc/s . . . . 20µV for 500mW output.

RF Alignment.

Test Equipment ..... Sweep generator covering range 200-900 Mc/s with sweep width of the order 10 Mc/s. Output impedance closely matched to 75Ω unbalanced.

Visual Display Unit.

Frequency sub-standard providing marker signal for standardisation of the built-in crystal calibrator.

Trimming tool - insulated with metal tip.

The first step in RF alignment is a check on the overall scale accuracy. This can be conveniently carried out by using the built-in crystal calibrator after its accuracy has been verified against an external standard. The test can be performed at any check point on either range by introducing the marker signal at the appropriate aerial input socket. The receiver (with SELECTIVITY/MODE SWITCH at "FM") should be set to the check frequency by means of the TUNING CONTROL which should then be carefully adjusted for a centre-zero reading on the built-in tuning meter (METER SWITCH at "FM"). Next, switch off the external marker, switch on the internal calibrator and without touching the TUNING CONTROL, adjust L76 (accessible through cut-out in right-hand side plate) to obtain a centre-zero reading on the meter.

It is most important that final adjustment of L76 be performed most carefully to ensure positive firing of the crystal and stable operation of the calibrator circuit. A check should therefore be made by subjecting the calibrator to several switching cycles, noting that the meter reading is constant each time the switch is in the "CAL ON" position. Check on "AM" with METER SWITCH at METER LIN.

After satisfactory completion of this check, set the CAL RE-SET knob to mid-travel, select Range 1 and tune to 800 Mc/s. With the CALIBRATOR SWITCH at "ON", tune the 800 Mc/s marker signal for maximum deflection of the tuning meter. Note what error exists, re-tune to 800 Mc/s on tuning scale by use of TUNING CONTROL and then adjust C21 (accessible through trimming aperture in right-hand side plate) to bring in the marker signal at the correct dial setting.

This adjustment should ensure correct calibration throughout the range because the overall oscillator coverage has been set very carefully by fanning the vanes on the capacitor (C17D) during initial factory alignment of the receiver. Nevertheless, check the accuracy at each 50 Mc/s point to verify that any slight error which may exist lies well within the correction facilities afforded by the adjustable cursor.

Repeat for Range 2, using the 500 Mc/s marker and adjusting C5 if necessary to correct scale error. Ensure that the CAL RE-SET knob remains at mid-travel throughout.

The next step is to align the Mixer bandpass circuits and the IF output coils on both RF Units. The aerial circuits are <u>not</u> aligned at this time. Proceed as follows:-

Select appropriate range, set receiver for AM reception using 6 Mc/s bandwidth with AGC "OFF". Introduce sweep generator signal at correct aerial input socket and tune to centre-frequency of 800 Mc/s on Range 1, 500 Mc/s on Range 2, using 10 Mc/s sweep. Feed visual display from IF Output socket via suitable detector probe.

The actual response is affected more by adjustment of the appropriate IF output coil than by trimming the Mixer bandpass circuit. In most cases, adjustment of the latter will be found unnecessary; in fact, provided the response can be made symmetrical and of the correct bandwidth (6 Mc/s @ -3dB) by adjustment of the IF coil, trimming of the Mixer circuit should be avoided. Bandwidth on Range 2 will be slightly less than that on Range 1. Typical figures are 5 Mc/s at HF end and 4.5 Mc/s at LF end of range.

If adjustment of the bandpass circuit should prove necessary, trimming can be effected through apertures in the right-hand side plate, C19/20 being the trimmers for Range 1 and C3/4 for Range 2. It should be noted that, as with the local oscillator section of the tuning capacitor, the mixer sections likewise are fanned during initial factory alignment to ensure correct tracking and a substantially constant bandwidth at all frequencies in the range covered.

The final phase in the alignment procedure is to set the aerial circuit in each RF Unit for optimum image rejection. Adjustments should be made at 800 Mc/s on Range 1 and 500 Mc/s on Range 2 with the signal introduced at the appropriate aerial input socket on 873 Mc/s and 573 Mc/s respectively (fs + 2IF).

Tapping of the input circuit is so arranged that provided the signal source and associated cable are closely matched to 75Ω, the adjustment which provides maximum image protection is also that which gives best matching to the RF transistor. Gang fanning is carried out during initial alignment to ensure that performance is optimum over the whole coverage.

Trimming apertures are provided for adjustment of the appropriate trimmers (C18 : Range 1 and C2 : Range 2) which should be set for minimum response to the image signal.

Sensitivity and/or noise factor measurements can now be taken. Overall absolute sensitivity should be better than 5μV for 50mW output. Noise factor should lie in the range 10-16dB on Range 1, 8-12dB on Range 2.

Adjustment of the AGC Level Controls.

These two pre-set controls are located on the left-hand side plate and must be set as follows:-

1. Set RF & IF GAIN CONTROLS to maximum (9).
2. Set MANUAL/AGC SWITCH to "MANUAL."
3. Connect voltmeter -ve lead to earth.
4. Connect voltmeter +ve lead to one centre-tag of MANUAL/AGC SWITCH. Note reading.
5. Set MANUAL/AGC SWITCH to "AGC." Adjust RV5 and RV6 by small amount to determine which produces a change in the indicated voltage. Set this control to give a voltage equal to that determined in (4) above.
6. Transfer voltmeter +ve lead to other centre-tag of MANUAL/AGC SWITCH. Switch back to "MANUAL" and note reading on voltmeter.
7. Revert to "AGC" and adjust the other AGC Level Control (i.e. the one not previously adjusted) for a reading equal to that taken in (6) above.
8. Disconnect voltmeter.

Low-level Audio Sensitivity.

With 1000 c/s signal applied across LINE LEVEL CONTROL (set to maximum), an input of 1.75mV should produce an output of 1mW in 600Ω.

## APPENDIX "A"

## VOLTAGE ANALYSIS

The following "Table of Voltage Values" will prove useful in the event of the receiver developing a fault which makes it necessary to carry out voltage checks. All readings are typical and were taken with a meter having a sensitivity of 20,000Ω/V. A nominal tolerance of 10% will apply to readings taken with a meter of this sensitivity and the tolerance should be increased accordingly if a meter of lower sensitivity is employed. Readings are quoted on the basis of an applied AC mains supply of 240V under no-signal conditions with the controls set as follows:-

RANGE SWITCH . . Range 1 except as indicated.
TUNING . . 0 on logging scale (lowest tune frequency).
MODE SWITCH . . FM.
RF/IF GAINS . . Maximum (9).
AF GAIN . . Mid setting.
LINE LEVEL . . Mid setting.
MANUAL/AGC . . MANUAL except as indicated.
SUPPLY/METER . . FM.
CALIBRATOR . . ON.

| Ref | Emitter | Base | Collector | Note |
|---|---|---|---|---|
| TR1 | 7.35V | 7.1V | 0V | NOTE 1. |
| TR2 | 8.2V | 8.1V | 0V | NOTE 1. |
| TR3 | 7.5V | 7.25V | 0V | NOTE 2. |
| TR4 | 8.4V | 8.1V | 0V | NOTE 2. |
| TR5 | 9.25V | 8.9V | 0.2V | NOTE 3. |
| TR6 | 9.2V | 8.9V | 0V | NOTE 3. |
| TR7 | 9.2V | 8.9V | 0V | NOTE 3. |
| TR8 | 9.0V | 8.75V | 0.75V | |
| TR9 | 9.3V | 9.1V | 0.6V | |
| TR10 | 9.2V | 8.9V | 0V | |
| TR11 | 9.15V | 8.8V | 0V | |
| TR12 | 9.25V | 8.9V | 0V | |
| TR13 | 1.8V | 2.5V | 8.7V | |
| TR14 | 8.35V | 8.1V | 6.65V | |
| TR15 | 8.5V | 8.25V | 3.8V | |
| TR16 | 9.2V | 8.9V | 2.7V | NOTE 4. |
| TR16A | 9.2V | 8.9V | 2.7V | NOTE 4. |
| TR17 | 7.15V | 6.7V | 0.3V | |
| TR18 | 8.6V | 8.3V | 0.15V | |
| TR19 | 4.7V | 4.4V | 0.15V | |
| TR20 | 4.7V | 4.35V | 0.3V | |

| Ref | Emitter | Base | Collector | Note |
|---|---|---|---|---|
| TR21 | 4.6V | 4.5V | 0.2V | |
| TR22 | 7.75V | 7.4V | 5.5V | |
| TR23 | 8.0V | 7.75V | 5.6V | |
| TR24 | 9.25V | 9.0V | 4.2V | |
| TR25 | 9.25V | 9.1V | 1.0V | |
| TR26 | 10.7V | 10.3V | 5.0V | |
| TR27 | 6.3V | 6.25V | 12.4V | |
| TR28 | 12.6V | 12.3V | 6.1V | |
| TR29 | 6.4V | 5.9V | 12.4V | |
| TR30 | 5.5V | 5.7V | 0V | |
| TR31 | 9.5V | 8.6V | 0V | |
| TR32 | 9.5V | 9.3V | 0.05V | |

Notes.

NOTE 1. Not accessible for direct check without removing Low-freq. RF Unit.

NOTE 2. Not accessible for direct check without removing High-freq. RF Unit.

NOTE 3. Accessible after removal of rear cover from Filter Box. The RANGE SWITCH must be at Range 1 when checking TR7 and at Range 2 when checking TR6. The RANGE SWITCH does not affect the voltages on TR5.

NOTE 4. Accessible after removal of screening cans. It will be necessary to unsolder the flying lead to allow removal of the can on the TR16 circuit. Base voltage on both TR16 and TR16A can be measured on underside of printed board without need for removing cans.

Supply Voltages.

Voltages measured across the two zener diodes should lie within the following limits:-

D6 :: 9.4 - 10.6 volts.

D7 :: 11.4 - 12.6 volts.

## APPENDIX "B"

## LIST OF COMPONENT VALUES, TOLERANCES AND RATINGS

Location.

In the Tables which follow, each component is allocated a reference letter which gives an indication of its approximate location. Coding is as follows:-

| | | | | | |
|---|---|---|---|---|---|
| A | Low-freq. RF Unit. | F | IF Board.* | K | Panel Assembly. |
| B | High-freq. RF Unit. | G | Emitter Followers. | L | FM Video Board. |
| C | IF Pre-amplifier. | H | 600Ω Audio Board. | M | Power Unit. |
| D | 6 Mc/s Filter. | I | 3Ω Audio Board. | N | RF Platform. |
| E | 1 Mc/s Filter. | J | Crystal Calibrator. | O | Back Plate. |
| | | | | P | Side Plates. |

*Components housed in screening cans are marked F-

Capacitors.

| Ref | Value | Type | Tolerance | Wkg. V. | Loc |
|---|---|---|---|---|---|
| C1A-D | - | Line Tuning Capacitor | - | - | A |
| C2 | - | Ceramic Tube Trimmer | - | - | A |
| C3 | - | Ceramic Tube Trimmer | - | - | A |
| C4 | - | Ceramic Tube Trimmer | - | - | A |
| C5 | - | Ceramic Tube Trimmer | - | - | A |
| C6 | 0.001µF | Disc Ceramic | 20% | 500V | A |
| C7 | 0.001µF | Disc Ceramic | +50% -20% | 500V | A |
| C8 | 0.001µF | Disc Ceramic | +50% -20% | 500V | A |
| C9 | 0.001µF | Disc Ceramic | +50% -20% | 500V | A |
| C10 | - | Spiral wound capacitor | - | - | A |
| C11 | 15pF | Disc Ceramic | 10% | 500V | A |
| C12 | 5pF | Tubular Ceramic F/Thru | 10% | 300V | A |
| C13 | 40pF | Tubular Ceramic F/Thru | 20% | - | A |
| C14 | - | Reference not allocated | - | - | - |
| C15 | 10µF | Tubular Electrolytic | +50% -10% | 16V | A |
| C16 | - | Reference not allocated | - | - | - |
| C17A-D | - | Line Tuning Capacitor | - | - | B |
| C18 | - | Ceramic Tube Trimmer | - | - | B |
| C19 | - | Ceramic Tube Trimmer | - | - | B |
| C20 | - | Ceramic Tube Trimmer | - | - | B |
| C21 | - | Ceramic Tube Trimmer | - | - | B |
| C22 | 0.001µF | Tubular Ceramic F/Thru | - | - | B |
| C23 | 0.001µF | Tubular Ceramic F/Thru | - | - | B |
| C24 | 0.001µF | Tubular Ceramic F/Thru | - | - | B |
| C25 | 220pF | Disc Ceramic | - | - | B |
| C26 | 2pF | Tubular Ceramic | - | - | B |
| C27 | 0.001µF | Disc Ceramic | - | - | B |
| C28 | 220pF | Disc Ceramic | - | - | B |
| C29 | 220pF | Disc Ceramic | - | - | B |

| Ref | Value | Type | Tolerance | Wkg. V. | Loc |
|---|---|---|---|---|---|
| C30 | 0.3pF | Short length twin lead | - | - | B |
| C31 | - | Reference not allocated | - | - | - |
| C32 | 0.001µF | Tubular Ceramic F/Thru | - | - | B |
| C33 | 6.8pF | Disc Ceramic | - | - | B |
| C34 | 10pF | Tubular Ceramic F/Thru | - | - | B |
| C35 | 50pF | Tubular Ceramic F/Thru | - | - | B |
| C36 | 10µF | Tubular Electrolytic | +50% -10% | 16V | B |
| C37 | 27pF | Polystyrene | 10% | 125V | E |
| C38 | 27pF | Polystyrene | 10% | 125V | E |
| C39 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C40 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C41 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C42 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C43 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C44 | 0.001µF | Polystyrene | 5% | 125V | C |
| C45 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C46 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C47 | 0.001µF | Polystyrene | 5% | 125V | C |
| C48 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C49 | 0.001µF | Disc Ceramic | 20% | 500V | C |
| C50 | 0.001µF | Polystyrene | 5% | 125V | C |
| C51 | - | Reference not allocated | - | - | - |
| C52 | - | Reference not allocated | - | - | - |
| C53 | - | Reference not allocated | - | - | - |
| C54 | - | Reference not allocated | - | - | - |
| C55 | 12pF | Tubular Ceramic | 10% | 750V | D |
| C56 | 6pF | Tubular Ceramic | 10% | 750V | D |
| C57 | 25pF | Tubular Ceramic | 10% | 750V | D |
| C58 | 15pF | Tubular Ceramic | 10% | 750V | D |
| C59 | 15pF | Tubular Ceramic | 10% | 750V | D |
| C60 | 15pF | Tubular Ceramic | 10% | 750V | D |
| C61 | 90pF | Silvered Mica | 5% | 350V | D |
| C62 | 15pF | Tubular Ceramic | 10% | 750V | D |
| C63 | 25pF | Tubular Ceramic | 10% | 750V | D |
| C64 | 12pF | Tubular Ceramic | 10% | 750V | D |
| C65 | 6pF | Tubular Ceramic | 10% | 750V | D |
| C66 | 500pF | Silvered Mica | 2% | 350V | E |
| C67 | 27pF | Polystyrene | 10% | 125V | E |
| C68 | 8pF | Tubular Ceramic | 10% | 750V | E |
| C69 | 27pF | Polystyrene | 10% | 125V | E |
| C70 | 500pF | Silvered Mica | 2% | 350V | E |
| C71 | 140pF | Polystyrene | 5% | 125V | F- |
| C72 | 140pF | Polystyrene | 5% | 125V | F- |
| C73 | 180pF | Polystyrene | 5% | 125V | F- |
| C74 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C75 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C76 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C77 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C78 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C79 | 0.001µF | Disc Ceramic | 20% | 500V | F |

| Ref | Value | Type | Tolerance | Wkg. V. | Loc |
|---|---|---|---|---|---|
| C80 | 10µF | Tubular Electrolytic | +50% -10% | 16V | F |
| C81 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C82 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C83 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C84 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C85 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C86 | 0.1µF | Polyester | 20% | 250V | F |
| C87 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C88 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C89 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C90 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C91 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C92 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C93 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C94 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C95 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C96 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C97 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C98 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C99 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C100 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C101 | 100µF | Tubular Electrolytic | +100% -20% | 15V | F |
| C102 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C103 | 0.5pF | Tubular Ceramic | 0.25pF | 750V | F |
| C104 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C105 | 22pF | Tubular Ceramic | 10% | 100V | F |
| C106 | 100µF | Tubular Electrolytic | +100% -20% | 15V | F |
| C107 | - | Reference not allocated | - | - | - |
| C108 | - | Reference not allocated | - | - | - |
| C109 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C110 | 10pF | Tubular Ceramic | 10% | 100V | F |
| C111 | 15pF | Tubular Ceramic | 10% | 100V | F |
| C112 | 0.1µF | Polyester | 20% | 250V | F |
| C113 | 10pF | Tubular Ceramic | 10% | 100V | F |
| C114 | 790pF | Polystyrene | 5% | 125V | F |
| C115 | 0.002µF | Polystyrene | 2% | 125V | F |
| C116 | 22pF | Tubular Ceramic | 10% | 100V | F |
| C117 | 250µF | Tubular Electrolytic | +100% -20% | 12V | F |
| C118 | 0.002µF | Polystyrene | 2% | 125V | F |
| C119 | 0.01µF | Metallised Paper | 20% | 200V | F |
| C120 | 22pF | Tubular Ceramic | 10% | 100V | F |
| C121 | 500µF | Tubular Electrolytic | +100% -20% | 12V | F |
| C122 | 0.1µF | Polyester | 20% | 250V | F |
| C123 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C124A | 0.001µF | Disc Ceramic | 20% | 500V | G |
| C125A | 0.001µF | Disc Ceramic | 20% | 500V | G |
| C126 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C127 | 0.1µF | Polyester | 20% | 250V | F |
| C128 | 100pF | Polystyrene | 5% | 125V | F |
| C129 | 0.001µF | Disc Ceramic | 20% | 500V | F |

| Ref | Value | Type | Tolerance | Wkg. V. | Loc |
|---|---|---|---|---|---|
| C130 | 10µF | Tubular Electrolytic | +50% -10% | 16V | F |
| C131 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C132 | 10µF | Tubular Electrolytic | +50% -10% | 16V | F |
| C133 | 0.1µF | Polyester | 20% | 250V | F |
| C134 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C135 | 100pF | Polystyrene | 5% | 125V | F |
| C136 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C137 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C138 | 1pF | Tubular Ceramic | 0.25pF | 750V | F |
| C139 | 10µF | Tubular Electrolytic | +50% -10% | 16V | F |
| C140 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C141 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C142 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C143 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C144 | 27pF | Polystyrene | 10% | 125V | F- |
| C145 | 27pF | Polystyrene | 10% | 125V | F- |
| C146 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C147 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C148 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C149 | 3pF | Tubular Ceramic | 0.25pF | 750V | F |
| C150 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C151 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C152 | 27pF | Polystyrene | 10% | 125V | F- |
| C153 | 27pF | Polystyrene | 10% | 125V | F- |
| C154 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C155 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C156 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C157 | 1.5pF | Disc Ceramic | 0.5pF | 500V | F |
| C158 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C159 | 27pF | Polystyrene | 10% | 125V | F- |
| C160 | 1.5pF | Disc Ceramic | 0.5pF | 500V | F- |
| C161 | 27pF | Polystyrene | 10% | 125V | F- |
| C162 | 500pF | Metallised Paper | 20% | 600V | F |
| C163 | 500pF | Metallised Paper | 20% | 600V | F |
| C164 | 100µF | Tubular Electrolytic | +100% -20% | 15V | F |
| C165 | 0.001µF | Disc Ceramic | 20% | 500V | F |
| C166 | 100pF | Polystyrene | 5% | 125V | F |
| C167 | - | Reference not allocated | - | - | - |
| C168 | - | Reference not allocated | - | - | - |
| C169 | - | Reference not allocated | - | - | - |
| C170 | 10µF | Tubular Electrolytic | +50% -10% | 16V | L |
| C171 | 470pF | Polystyrene | 5% | 125V | L |
| C172 | 0.005µF | Metallised Paper | 20% | 250V | L |
| C173 | 0.002µF | Polystyrene | 2% | 125V | L |
| C174 | 0.002µF | Polystyrene | 2% | 125V | L |
| C175 | 60pF | Tubular Ceramic | 10% | 750V | L |
| C176 | 100µF | Tubular Electrolytic | +100% -20% | 15V | L |
| C177 | 100µF | Tubular Electrolytic | +100% -20% | 15V | L |
| C178 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C179 | - | Reference not allocated | - | - | - |

| Ref | Value | Type | Tolerance | Wkg. V. | Loc |
|---|---|---|---|---|---|
| C180 | 0.001µF | Tubular Ceramic | 10% | 750V | K |
| C181 | 0.001µF | Disc Ceramic | 20% | 500V | N |
| C182 | - | Reference not allocated | - | - | - |
| C183 | - | Reference not allocated | - | - | - |
| C184 | - | Reference not allocated | - | - | - |
| C185 | 10µF | Tubular Electrolytic | +50% -10% | 16V | K |
| C186 | 100µF | Tubular Electrolytic | +100% -20% | 15V | H |
| C187 | 0.5µF | Tubular Electrolytic | +50% -25% | 50V | H |
| C188 | 100µF | Tubular Electrolytic | +100% -20% | 15V | H |
| C189 | 10µF | Tubular Electrolytic | +50% -10% | 16V | H |
| C190 | 100µF | Tubular Electrolytic | +100% -20% | 15V | H |
| C191 | - | Reference not allocated | - | - | - |
| C192 | - | Reference not allocated | - | - | - |
| C193 | 0.5µF | Tubular Electrolytic | +50% -25% | 50V | I |
| C194 | 100µF | Tubular Electrolytic | +100% -20% | 15V | I |
| C195 | 0.5µF | Tubular Electrolytic | +50% -25% | 50V | I |
| C196 | 500µF | Tubular Electrolytic | +100% -20% | 12V | I |
| C197 | 200µF | Tubular Electrolytic | +100% -20% | 6V | I |
| C198 | 0.001µF | Tubular Ceramic | 10% | 750V | I |
| C199 | 0.01µF | Metallised Paper | 20% | 200V | I |
| C200 | 200µF | Tubular Electrolytic | +100% -20% | 6V | I |
| C201 | - | Reference not allocated | - | - | - |
| C202 | - | Reference not allocated | - | - | - |
| C203 | 10pF | Tubular Ceramic | 10% | 750V | F |
| C204 | 0.047µF | Plate Ceramic | +80% -20% | 30V | F |
| C205 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C206 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C207 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C208 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C209 | 0.001µF | Disc Ceramic | 20% | 500V | K |
| C210 | 25pF | Tubular Ceramic | 10% | 750V | J |
| C211 | 0.001µF | Disc Ceramic | 20% | 500V | J |
| C212 | 0.001µF | Disc Ceramic | 20% | 500V | J |
| C213 | 100pF | Polystyrene | 5% | 125V | J- |
| C214 | 27pF | Polystyrene | 10% | 125V | J- |
| C215 | 0.047µF | Polyester | 20% | 250V | J |
| C216 | 0.047µF | Polyester | 20% | 250V | J |
| C217 | 10µF | Tubular Electrolytic | +50% -10% | 16V | J |
| C218 | 500µF | Tubular Electrolytic | +100% -20% | 25V | N |
| C219 | - | Reference not allocated | - | - | - |
| C220 | 500µF | Tubular Electrolytic | +100% -20% | 25V | N |
| C221 | 0.001µF | Disc Ceramic | 20% | 500V | N |
| C222 | 6400µF | Tubular Electrolytic | +50% -10% | 16V | M |
| C223 | 6400µF | Tubular Electrolytic | +50% -10% | 16V | M |
| Add:- | | | | | |
| C201a | 6pF | Tubular Ceramic | 10% | 750V | G |

| Ref | Value | Tol | Rating | Loc |
|---|---|---|---|---|
| R1 | 1,000Ω | 5% | 1/8-watt | A |
| R2 | 470Ω | 5% | 1/8-watt | A |
| R3 | 680Ω | 5% | 1/8-watt | A |
| R4 | 2,200Ω | 5% | 1/8-watt | A |
| R5 | 6,800Ω | 5% | 1/8-watt | A |
| R6 | 68Ω | 5% | 1/8-watt | A |
| R7 | 3,300Ω | 5% | 1/8-watt | A |
| R8 | 1,000Ω | 5% | 1/8-watt | B |
| R9 | 470Ω | 5% | 1/8-watt | B |
| R10 | 1,000Ω | 5% | 1/8-watt | B |
| R11 | 2,200Ω | 5% | 1/8-watt | B |
| R12 | 8,200Ω | 5% | 1/8-watt | B |
| R13 | 47Ω | 5% | 1/8-watt | B |
| R14 | 2,200Ω | 5% | 1/8-watt | B |
| R15 | 2,200Ω | 5% | 1/8-watt | C |
| R16 | 15,000Ω | 5% | 1/8-watt | C |
| R17 | 390Ω | 5% | 1/8-watt | C |
| R18 | 2,200Ω | 5% | 1/8-watt | C |
| R19 | 15,000Ω | 5% | 1/8-watt | C |
| R20 | 390Ω | 5% | 1/8-watt | C |
| R21 | 2,200Ω | 5% | 1/8-watt | C |
| R22 | 15,000Ω | 5% | 1/8-watt | C |
| R23 | 390Ω | 5% | 1/8-watt | C |
| R24 | 47Ω | 5% | 1/8-watt | C |
| R25 | 68Ω | 5% | 1/8-watt | C |
| R26 | 150Ω | 5% | 1/8-watt | D |
| R27 | 100Ω | 5% | 1/8-watt | D |
| R28 | 470Ω | 5% | 1/8-watt | F |
| R29 | 68Ω | 5% | 1/8-watt | F |
| R30 | 680Ω | 5% | 1/8-watt | F |
| R31 | 390Ω | 5% | 1/8-watt | F |
| R32 | 150Ω | 5% | 1/8-watt | F- |
| R33 | 270Ω | 5% | 1/8-watt | F |
| R34 | 270Ω | 5% | 1/8-watt | F |
| R35 | 330Ω | 5% | 1/8-watt | F- |
| R36 | 390Ω | 5% | 1/8-watt | F |
| R37 | 2,200Ω | 5% | 1/8-watt | F |
| R38 | 15,000Ω | 5% | 1/8-watt | F |
| R39 | 100Ω | 5% | 1/8-watt | F |
| R40 | 390Ω | 5% | 1/8-watt | F |
| R41 | 330Ω | 5% | 1/8-watt | F- |
| R42 | 2,200Ω | 5% | 1/8-watt | F |
| R43 | 15,000Ω | 5% | 1/8-watt | F |
| R44 | 390Ω | 5% | 1/8-watt | F |
| R45 | 390Ω | 5% | 1/8-watt | F- |
| R46 | 2,200Ω | 5% | 1/8-watt | F |
| R47 | 15,000Ω | 5% | 1/8-watt | F |
| R48 | 390Ω | 5% | 1/8-watt | F |
| R49 | 1,000Ω | 5% | 1/8-watt | F- |

| Ref | Value | Tol | Rating | Loc |
|---|---|---|---|---|
| R50 | 5,600Ω | 5% | 1/8-watt | F |
| R51 | 2,200Ω | 5% | 1/8-watt | F |
| R52 | 100Ω | 5% | 1/8-watt | F |
| R53 | 100Ω | 5% | 1/8-watt | F |
| R54 | 2,200Ω | 5% | 1/8-watt | F |
| R55 | 680Ω | 5% | 1/8-watt | F |
| R56 | 2,700Ω | 5% | 1/8-watt | F |
| R57 | 10,000Ω | 5% | 1/8-watt | F |
| R58 | 2,200Ω | 5% | 1/8-watt | F |
| R59 | 680Ω | 5% | 1/8-watt | F |
| R60 | 2,200Ω | 5% | 1/8-watt | F |
| R61 | 390Ω | 5% | 1/8-watt | F |
| R62 | 47Ω | 5% | 1/8-watt | F |
| R63 | 2,700Ω | 5% | 1/8-watt | F |
| R64 | 1,000Ω | 5% | 1/8-watt | F |
| R65&A | 2,200Ω | 5% | 1/8-watt | G |
| R66&A | 15,000Ω | 5% | 1/8-watt | G |
| R67&A | 390Ω | 5% | 1/8-watt | G |
| R68&A | 1,000Ω | 5% | 1/8-watt | G |
| R69 | 22,000Ω | 5% | 1/8-watt | F |
| R70 | Not used | - | - | - |
| R71* | XXXØ65 | - | - | F |
| R72 | 22,000Ω | 5% | 1/8-watt | F |
| R73 | 1,500Ω | 5% | 1/8-watt | F |
| R74 | 150Ω | 5% | 1/8-watt | F |
| R75 | 4,700Ω | 5% | 1/8-watt | F |
| R76 | Not used | - | - | - |
| R77* | XXXØ65 | - | - | F |
| R78 | 22,000Ω | 5% | 1/8-watt | F |
| R79 | 1,500Ω | 5% | 1/8-watt | F |
| R80 | 150Ω | 5% | 1/8-watt | F |
| R81 | Not used | - | - | - |
| R82 | Not used | - | - | - |
| R83 | Not used | - | - | - |
| R84 | Not used | - | - | - |
| R85 | 2,700Ω | 5% | 1/8-watt | F |
| R86 | 1,000Ω | 5% | 1/8-watt | F |
| R87 | 6,800Ω | 5% | 1/8-watt | F |
| R88 | 100Ω | 5% | 1/8-watt | F- |
| R89 | 2,200Ω | 5% | 1/8-watt | F- |
| R90 | 2,700Ω | 5% | 1/8-watt | F |
| R91 | 6,800Ω | 5% | 1/8-watt | F |
| R92 | 470Ω | 5% | 1/8-watt | F |
| R93 | 100Ω | 5% | 1/8-watt | F- |
| R94 | 2,200Ω | 5% | 1/8-watt | F- |
| R95 | 2,700Ω | 5% | 1/8-watt | F |
| R96 | 6,800Ω | 5% | 1/8-watt | F |
| R97 | 680Ω | 5% | 1/8-watt | F |
| R98 | 100Ω | 5% | 1/8-watt | F- |
| R99 | 4,700Ω | 5% | 1/8-watt | L |

(*) See Page 32

| Ref | Value | Tol. | Rating | Loc |
|---|---|---|---|---|
| R100 | 22,000Ω | 5% | 1/8-watt | F |
| R101 | 22,000Ω | 5% | 1/8-watt | F |
| R102 | 470Ω | 5% | 1/8-watt | F |
| R103 | Not used | - | - | - |
| R104 | Not used | - | - | - |
| R105 | Not used | - | - | - |
| R106 | Not used | - | - | - |
| R107 | Not used | - | - | - |
| R108 | Not used | - | - | - |
| R109 | Not used | - | - | - |
| R110 | 3,300Ω | 5% | 1/8-watt | L |
| R111 | 2,700Ω | 5% | 1/8-watt | L |
| R112 | 10,000Ω | 5% | 1/8-watt | L |
| R113 | 680Ω | 5% | 1/8-watt | L |
| R114 | 2,200Ω | 5% | 1/8-watt | L |
| R115 | 330Ω | 5% | 1/8-watt | L |
| R116 | 39Ω | 5% | 1/8-watt | L |
| R117 | 1,500Ω | 5% | 1/8-watt | L |
| R118 | 100Ω | 5% | 1/8-watt | L |
| R119 | Not used | - | - | - |
| R120 | 4,700Ω | 5% | 1/8-watt | K |
| R121 | 1,000Ω | 5% | 1/8-watt | N |
| R122 | Not used | - | - | - |
| R123 | 2,700Ω | 5% | 1/8-watt | N |
| R124 | Not used | - | - | - |
| R125 | 3,300Ω | 5% | 1/8-watt | N |
| R126 | 10,000Ω | 5% | 1/8-watt | K |
| R127 | 10,000Ω | 5% | 1/8-watt | K |
| R128 | 4,700Ω | 5% | 1/8-watt | K |
| R129 | Not used | - | - | - |
| R130 | 10,000Ω | 5% | 1/8-watt | H |
| R131 | Not used | - | - | - |
| R132 | 1,000Ω | 5% | 1/8-watt | H |
| R133 | 82,000Ω | 5% | 1/8-watt | H |
| R134 | 1,000Ω | 5% | 1/8-watt | H |
| R135 | 5,600Ω | 5% | 1/8-watt | H |
| R136 | 2,700Ω | 5% | 1/8-watt | H |
| R137 | 0.1MΩ | 5% | 1/8-watt | H |
| R138 | 22,000Ω | 5% | 1/8-watt | H |
| R139 | 180Ω | 5% | 1/8-watt | H |
| R140 | Not used | - | - | - |
| R141 | Not used | - | - | - |
| R142 | 4,700Ω | 5% | 1/8-watt | I |
| R143 | 47,000Ω | 5% | 1/8-watt | I |
| R144 | 680Ω | 5% | 1/8-watt | I |
| R145 | 4,700Ω | 5% | 1/8-watt | I |
| R146 | 680Ω | 5% | 1/8-watt | I |
| R147 | 15,000Ω | 5% | 1/8-watt | I |
| R148 | 15,000Ω | 5% | 1/8-watt | I |
| R149 | 15,000Ω | 5% | 1/8-watt | I |

| Ref | Value | Tol. | Rating | Loc |
|---|---|---|---|---|
| R150* | XXXXXX | - | - | I |
| R151 | 10Ω | 5% | 1/8-watt | I |
| R152 | 560Ω | 5% | 1/8-watt | I |
| R153 | 390Ω | 5% | 1/8-watt | I |
| R154 | 47Ω | 5% | 1/8-watt | I |
| R155 | 1,000Ω | 5% | 1/8-watt | I |
| R156 | 3.3Ω w.w. | 5% | 3-watt | I |
| R157 | 3.3Ω w.w. | 5% | 3-watt | I |
| R158 | Not used | - | - | - |
| R159 | Not used | - | - | - |
| R160 | 6,200Ω | 5% | 1/8-watt | K |
| R161 | 1,500Ω | 5% | 1/8-watt | K |
| R162 | 330Ω | 5% | 1/8-watt | K |
| R163 | 220Ω | 5% | 1/8-watt | K |
| R164 | 150Ω | 5% | 1/8-watt | K |
| R165 | 47Ω | 5% | 1/8-watt | K |
| R166 | 47Ω | 5% | 1/8-watt | K |
| R167 | 22Ω | 5% | 1/8-watt | K |
| R168 | 22Ω | 5% | 1/8-watt | K |
| R169 | 22Ω | 5% | 1/8-watt | K |
| R170 | 220Ω | 5% | 1/8-watt | K |
| R171 | 4,700Ω | 5% | 1/8-watt | K |
| R172 | Not used | - | - | - |
| R173 | 180Ω | 5% | 1/8-watt | K |
| R174 | 100Ω | 5% | 1/8-watt | K |
| R175 | 68Ω | 5% | 1/8-watt | K |
| R176 | 47Ω | 5% | 1/8-watt | K |
| R177 | 22Ω | 5% | 1/8-watt | K |
| R178 | 22Ω | 5% | 1/8-watt | K |
| R179 | 22Ω | 5% | 1/8-watt | K |
| R180 | 22Ω | 5% | 1/8-watt | K |
| R181 | 22Ω | 5% | 1/8-watt | K |
| R182 | 330Ω | 5% | 1/8-watt | K |
| R183 | Not used | - | - | - |
| R184 | Not used | - | - | - |
| R185 | 3,300Ω | 5% | 1/8-watt | J |
| R186 | 47,000Ω | 5% | 1/8-watt | J |
| R187 | 680Ω | 5% | 1/8-watt | J |
| R188 | 560Ω | 5% | 1/8-watt | J |
| R189 | 15,000Ω | 5% | 1/8-watt | J |
| R190 | 220Ω | 5% | 1/8-watt | J |
| R191 | 150Ω | 5% | 1/8-watt | J |
| R192 | Not used | - | - | - |
| R193 | 150Ω | 5% | 1/2-watt | K |
| R194 | 150Ω | 5% | 1/2-watt | K |
| R195 | 8Ω w.w. | 5% | 3-watt | M |
| R196 | 3.3Ω w.w. | 5% | 3-watt | M |
| R197 | 100Ω | 5% | 1/8-watt | N |
| XXXXX | XXXXX R198 deleted. | XX | XXXXXX | XX |

(*) See Page 32

Potentiometers.

| Ref | Value | Type | Loc |
|---|---|---|---|
| RV1 | 1,000Ω | Pre-set carbon. | O |
| RV2 | 1,000Ω | Pre-set carbon. | O |
| RV3 | 5,600Ω | Pre-set carbon. | O |
| RV4 | 5,000Ω | Carbon. | K |
| RV5 | 47,000Ω | Pre-set carbon. | P |
| RV6 | 47,000Ω | Pre-set carbon. | P |

Thermistors.

| Ref | Type | Loc |
|---|---|---|
| R71 | Mullard VA1065 | F |
| R77 | Mullard VA1065 | F |
| R150 | Mullard VA1011 | I |
| | VA1065 superseded by new type VA1097 | |
| | VA1011 superseded by new type VA1066S | |

Filtercons.

| Ref | Value(*) | Wkg. V. | Type | Loc |
|---|---|---|---|---|
| FC1 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | A |
| FC2 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | A |
| FC3 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | A |
| FC4 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | A |
| FC5 | 0.001μF + 0.001μF | 200V | Erie Type 1201-052 | C |
| FC6 | 0.001μF + 0.001μF | 200V | Erie Type 1201-052 | C |
| FC7 | 0.001μF + 0.001μF | 200V | Erie Type 1201-052 | C |
| FC8 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | A |
| FC9 | 0.001μF + 0.001μF | 200V | Erie Type 1203-050 | B |

(*) All values should read 0.0015μF

EXTRACTS FROM AMENDMENTS NOS. 4 & 7 APPLICABLE TO TECHNICAL DATA ON PAGE 4.

IF Bandwidth

After second paragraph, add note reading:-

Overall bandwidth is identical to IF bandwidth on Range 1, but becomes slightly narrower on Range 2. Typical figures are 5 Mc/s at HF end of range and 4.5 Mc/s at LF end.

Video Output

Add after existing paragraph:-

(This figure indicates the maximum output of which the video stages are capable. Outputs to be expected under actual signal conditions are of the order 0.5V p-p on FM and 1V p-p on AM.)

## APPENDIX "C"

## SPARES

The following list details all major spares for the Model 990S UHF Receiver. Spares should be ordered by quoting the Circuit Ref. (where applicable), the written description given in the list and the Part No. in the right-hand column. The Serial No. of the receiver should be stated in all communications.

All orders and enquiries should be addressed to:-

EDDYSTONE RADIO LTD., SALES AND SERVICE DEPT., ALVECHURCH RD., BIRMINGHAM, 31.

In cases of extreme urgency, ring PRIory 2231/4, cable EDDYSTONE BIRMINGHAM or use Telex 33708.

| Ref | Description | Part No. |
|---|---|---|
| | INDUCTORS | |
| L1-L18 | Available to special order only | - |
| L19 | Reference not allocated | - |
| L20-22 | Filter choke | D2854 |
| L23/24 | Reference not allocated | - |
| L25-34 | Available to special order only (part of 6 Mc/s filter) | - |
| L35/36 | Available to special order only (part of 1 Mc/s filter) | - |
| L37-44 | References not allocated | - |
| L45-56 | Filter choke | D2854 |
| L57/58 | Filter choke (vertical mounting) | D2854/1 |
| L59 | Filter choke | D2854 |
| L60 | 5.6µH choke | D3557 |
| L61 | 10µH choke | D3558 |
| L62 | Filter choke | D2854 |
| L63 | 36µH choke | D3559 |
| L64 | Filter choke | D2854 |
| L65 | 5.6µH choke | D3557 |
| L66 | Filter choke (vertical mounting) | D2854/1 |
| L67 | 5.6µH choke | D3557 |
| L68-75 | Filter choke | D2854 |
| L76 | Crystal Calibrator coil | D3572 |
| L77 | Tone Oscillator choke | 6763P |
| | TRANSFORMERS | |
| T1 | IF Pre-amplifier Output Transformer | D3570 |
| T2 | 36.5 Mc/s IF Transformer (tuned) | D3571 |
| T3 | 36.5 Mc/s IF Transformer (tuned) | D3618 |
| T4 | 36.5 Mc/s IF Transformer (tuned) | D3618/1 |
| T5 | 36.5 Mc/s IF Transformer (untuned) | D3553 |
| T6 | 36.5 Mc/s IF Transformer (untuned) | D3552 |
| T7 | AM Detector Transformer (untuned) | D3551 |
| T8 | 1st FM Limiter Transformer | D3556 |
| T9 | 2nd FM Limiter Transformer | D3556 |
| T10 | FM Discriminator Transformer | D3554 |
| T11 | Line Output Transformer (600Ω) | 7020P |
| T12 | Loudspeaker Transformer (3Ω) | 7021P |
| T13 | Power Transformer | 7022P |
| T14/15 | Available to special order only (part of 1 Mc/s filter) | - |

| Ref | Description | Part No. |
|---|---|---|
| | **RF UNITS** | |
| - | High-freq. RF Unit complete (Range 1 : 470-870 Mc/s) | LP2953 |
| - | Low-freq. RF Unit complete (Range 2 : 230-510 Mc/s) | LP2952 |
| | **FILTER UNITS** | |
| - | 1 Mc/s bandpass filter complete (aligned) | LP2949 |
| - | 6 Mc/s bandpass filter complete (aligned) | LP2948 |
| | **CRYSTALS** | |
| XL1 | 50 Mc/s ± 0.005%. Series-mode Style "J", wire-ended | 7107P |
| | **SWITCHES** | |
| S1 | Range Switch (DPDT Toggle type) | 4772PC |
| S2 | Selectivity/Mode Switch (less wafers in Filter Box, shaft extension and coupler) . . | D3639 |
| - | Shaft extension for S2 | 7019P |
| - | Coupler 7382P | ~~5334P~~ |
| - | Wafers S2A/S2B (in Filter Box) | D3647 |
| S3 | Manual/AGC Switch (DPDT Toggle type) | 4772PC |
| S4 | AGC Time Constant Switch (SPST Toggle type) | 4771PB |
| S5* | Manual IF Gain Control *supplied complete with | D3637 |
| S6* | Manual RF Gain Control associated resistors. | D3638 |
| S7 | Meter Switch (supplied as complete assembly with DPST Supply Switch S11) . . | 7011P |
| S8 | Calibrator Switch (SPST Toggle type) | 4771PB |
| S9 | Video Combining Switch (SPST Toggle type) | 4771PB |
| S10 | Monitor Speaker Switch (SPST Toggle type) | 4771PB |
| | **POTENTIOMETERS** | |
| RV1 | 1,000Ω pre-set carbon | 6076P |
| RV2 | 1,000Ω pre-set carbon | 6076P |
| RV3 | 5,600Ω pre-set carbon | 6366P |
| RV4 | 5,000Ω carbon | 6860P |
| RV5 | 47,000Ω pre-set carbon | 6488P |
| RV6 | 47,000Ω pre-set carbon | 6488P |
| | **PLUGS AND SOCKETS** | |
| - | Standard BNC Coaxial Plug (as used for aerial input etc.) | 6084P |
| PL1 | Shorting Plug for AC operation (3-way female) | D3640 |
| PL2 | 12V DC Input Connector (3-way female with 6' twin lead) | D3641 |
| - | Standard Telephone Plug (to mate with JK1) | 6567P |
| SKT1/2 | Standard BNC Coaxial Socket (as used for aerial inputs) | 7016P |
| SKT3/6 | Special BNC Coaxial Socket (as used for IF Output etc.) | 7225P |
| SKT7 | 12V DC Input Socket (3-way shrouded male) | 7130P |
| SKT8 | AC Mains Input Socket (polarised with earth contact) | D2310/1 |
| - | AC Mains Connector complete with 6' of 3-core cable | D2311/1 |
| JK1 | Telephone Socket | 6660P |

| Ref | Description | | Part No. |
|---|---|---|---|
| | KNOBS | | |
| | Tuning (less skirt) | | D3613/1 |
| | Skirt for Tuning knob graduated 0-100 | D3708 | [illegible] |
| | Meter/Mode (complete with skirt with index line only) | | D3614 |
| | RF, IF and AF Gains (complete with skirt marked 0-9) | | D3614/1 |
| | DRIVE MECHANISM & ASSOCIATED ITEMS | | |
| | Main drive unit complete with dual output gears, flywheel and sprung jockey pulley) . . | | LP2941 |
| | Guide pulley - large | | 6125P |
| | Guide pulley - small | | 7040P |
| | Cal Re-set Assembly | | D3644 |
| | Cursor Assembly (cursor, carrier and steady) | | D3643 |
| | Drive cord | | D3631 |
| | Scale plate (calibrated) | | 7004P |
| | Coupler - for High-freq. RF Unit [illegible] | 7327P | [illegible] |
| | Coupler - for Low-freq. RF Unit (front) | | D3563 |
| | Coupler - for Low-freq. RF Unit (rear) | D2469/1 | [illegible] |
| | MISCELLANEOUS | | |
| | Chromium-plated panel handles | | 6553P |
| | Tuning meter | | 7006P |
| | Finger plate | | 6953P |
| | Escutcheon | | 6990P |
| | Monitor speaker | | 6101P |
| | Monitor speaker grille | | 6976P |
| | Range indicator lamps (6V 50mA LES) | | 6659P |
| | LES holder | | 6600P |
| | Fuse - 1A x $1\frac{1}{4}$" x $\frac{1}{4}$" cartridge | | 6124P |
| | Fuse - $\frac{1}{2}$A x $1\frac{1}{4}$" x $\frac{1}{4}$" cartridge | | 6244P |
| | Fuseholder | | 6103P |
| | Terminals (as used for 600Ω o/p etc.) | | 6102P |
| | Perspex window | | 6977P |
| | Cover fixing screws | | 5446P |

## APPENDIX "D"

## IF CONVERTER TYPE 939

The IF Converter Type 939 is an ancillary unit for use with the 990S.UHF Receiver when IF output is required at 5.2 Mc/s to drive the associated Panoramic Display Unit Type EP17R. A variant of the standard 939 Unit is available for rack-mounting (939/1).

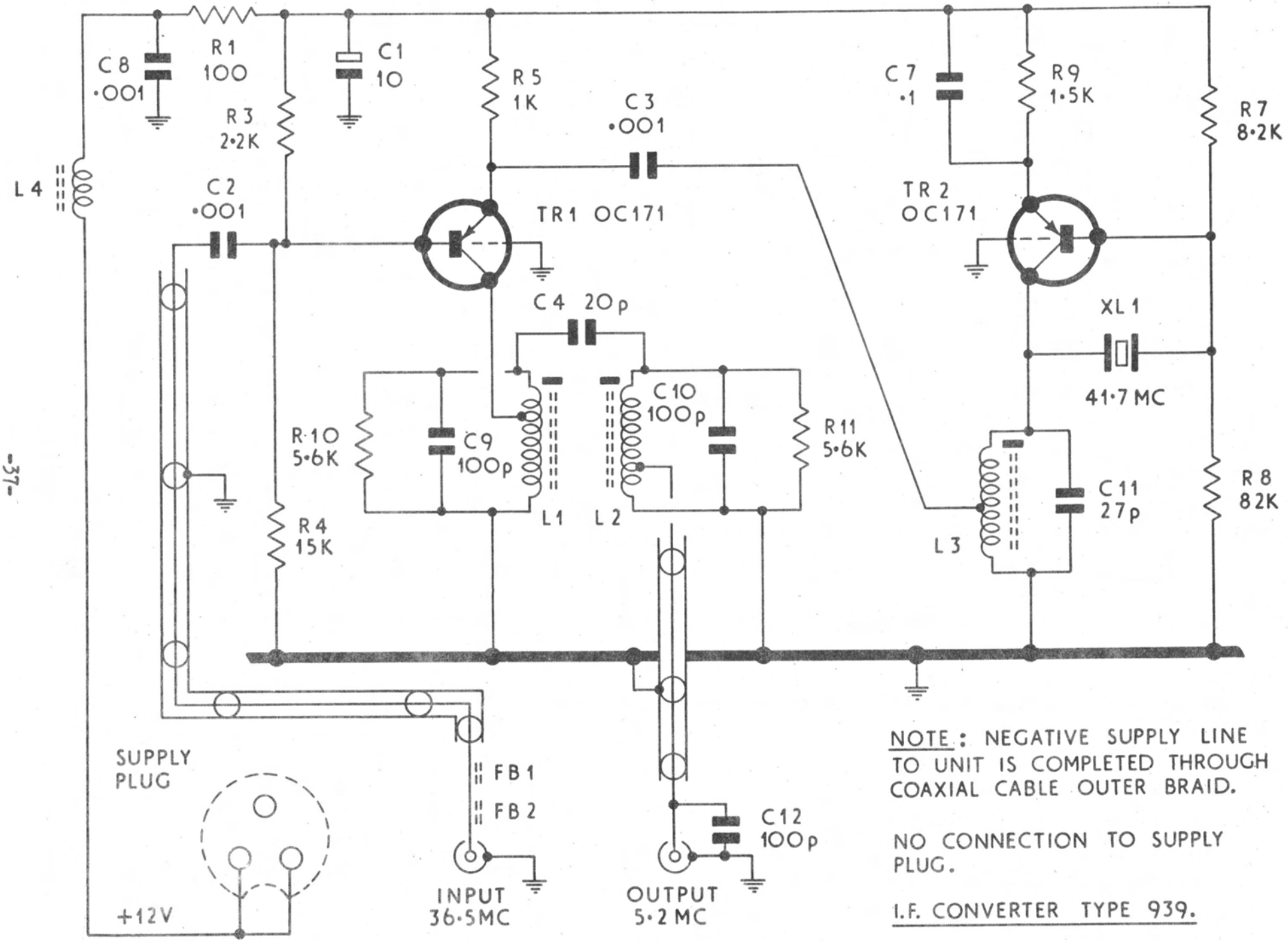
The unit employs two transistors (Mullard OC171) as Mixer (TR1) and Oscillator (TR2). The oscillator is crystal controlled at 41.7 Mc/s and the unit operates as a "no-loss/no-gain" device with a bandwidth of 1 Mc/s. BNC coaxial sockets are fitted for input (36.5 Mc/s) and output (5.2 Mc/s) connections.

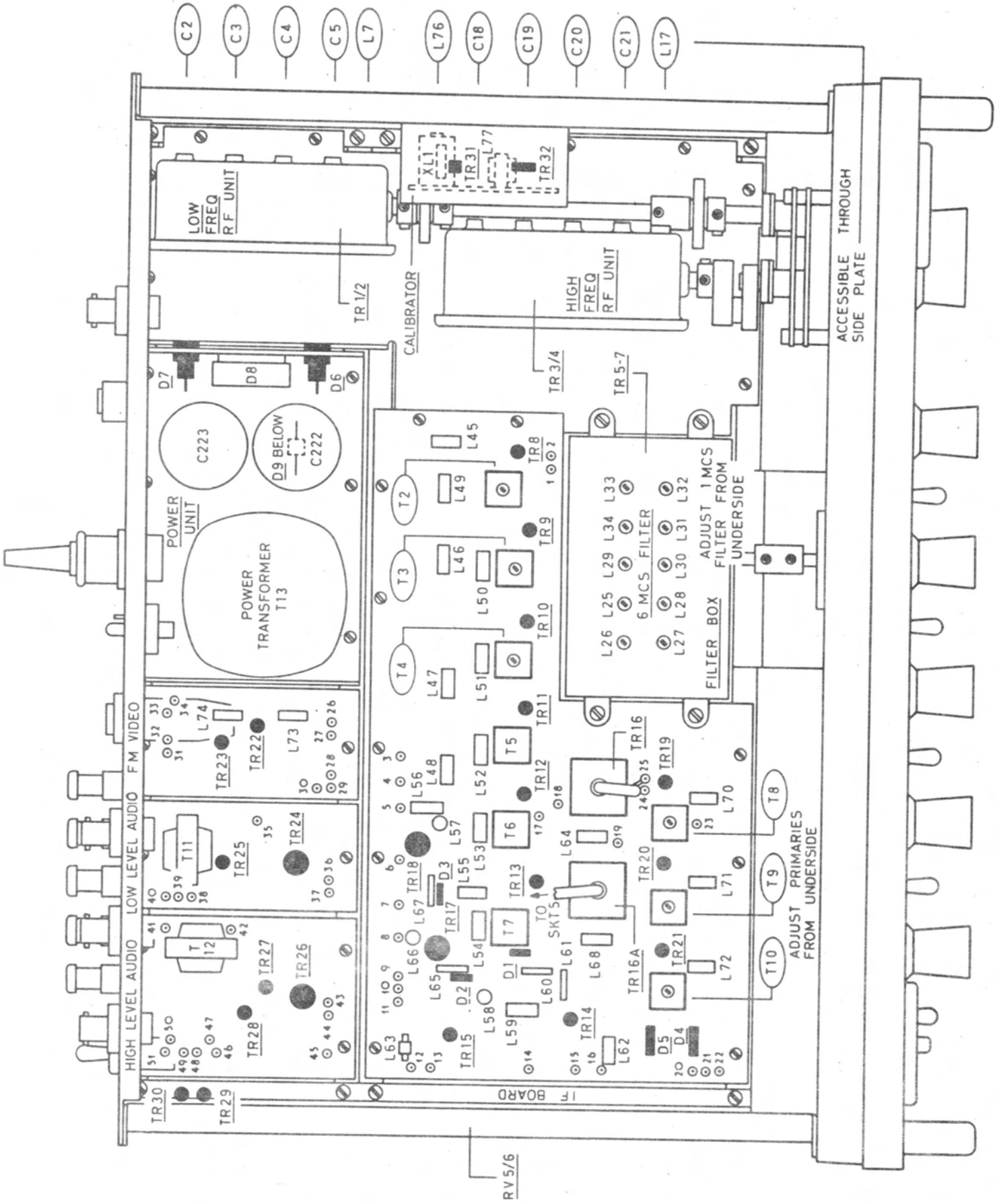
A flying lead terminates in a polarised connector to mate with the 12V DC socket at the rear of the 990S receiver. The connector carries the +ve supply lead only and has a shorting strap to complete the receiver supply as on the normal shorting plug fitted for AC working. The -ve return is via the coaxial leads to avoid shorting out the switch S11A and the fuse FS1 in the main receiver which would occur if the -ve line was taken to the 12V DC connector.

A circuit diagram of the converter is given on the following page. Other converters can be produced to special order for applications where IF drive is required at other specified frequencies.

Component Values for IF Converter Type 939.

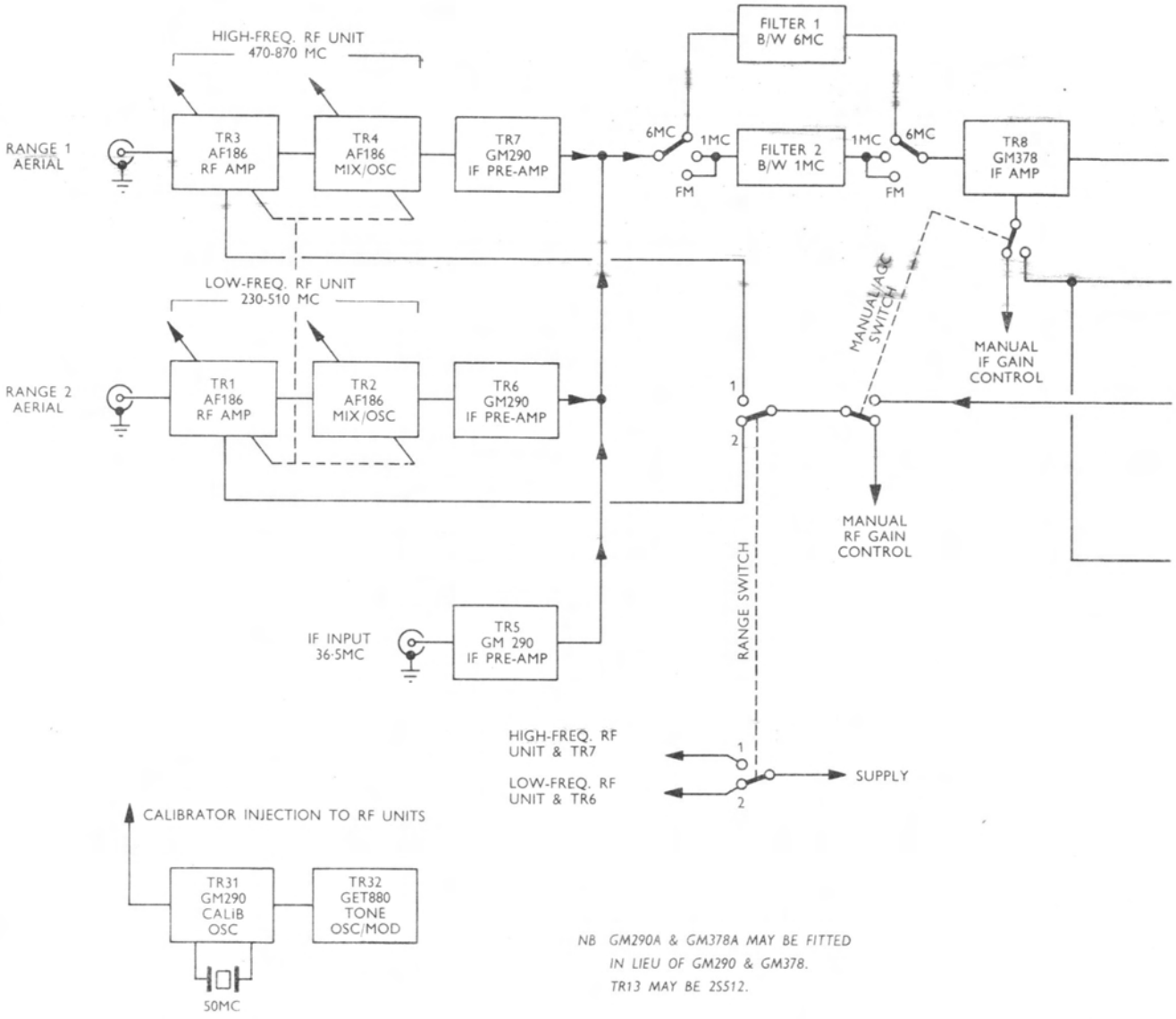
| Ref | Value | Type | Tolerance | Rating |
|---|---|---|---|---|
| C1 | 10µF | Tubular Electrolytic | +50% -10% | 16V |
| C2 | 0.001µF | Tubular Ceramic | 20% | 750V |
| C3 | 0.001µF | Tubular Ceramic | 20% | 750V |
| C4 | 20pF | Tubular Ceramic | 10% | 750V |
| C5 | - | Reference not allocated | - | - |
| C6 | - | Reference not allocated | - | - |
| C7 | 0.1µF | Polyester | 20% | 250V |
| C8 | 0.001µF | Tubular Ceramic | 20% | 750V |
| C9 | 100pF | Polystyrene | 5% | 125V |
| C10 | 100pF | Polystyrene | 5% | 125V |
| C11 | 27pF | Polystyrene | 10% | 125V |
| C12 | 100pF | Tubular Ceramic | 10% | 750V |
| R1 | 100Ω | Carbon | 10% | ½-watt |
| R2 | - | Reference not allocated | - | - |
| R3 | 2,200Ω | Carbon | 10% | ½-watt |
| R4 | 15,000Ω | Carbon | 10% | ½-watt |
| R5 | 1,000Ω | Carbon | 10% | ½-watt |
| R6 | - | Reference not allocated | - | - |
| R7 | 8,200Ω | Carbon | 10% | ½-watt |
| R8 | 82,000Ω | Carbon | 10% | ½-watt |
| R9 | 1,500Ω | Carbon | 10% | ½-watt |
| R10 | 5,600Ω | Carbon | 5% | ⅛-watt |
| R11 | 5,600Ω | Carbon | 5% | ⅛-watt |


C8
·001
R1
100
C1
10
R5
1K
C3
·001
C7
·1
R9
1·5K
R7
8·2K
L4
R3
2·2K
C2
·001
TR1 OC171
TR2
OC171
C4 20p
XL1
41·7 MC
C10
100p
R10
5·6K
C9
100p
R11
5·6K
L1
L2
L3
C11
27p
R8
82K
R4
15K
SUPPLY
PLUG
+12V
FB1
FB2
INPUT
36·5MC
OUTPUT
5·2 MC
C12
100p
NOTE: NEGATIVE SUPPLY LINE TO UNIT IS COMPLETED THROUGH COAXIAL CABLE OUTER BRAID.
NO CONNECTION TO SUPPLY PLUG.
I.F. CONVERTER TYPE 939.

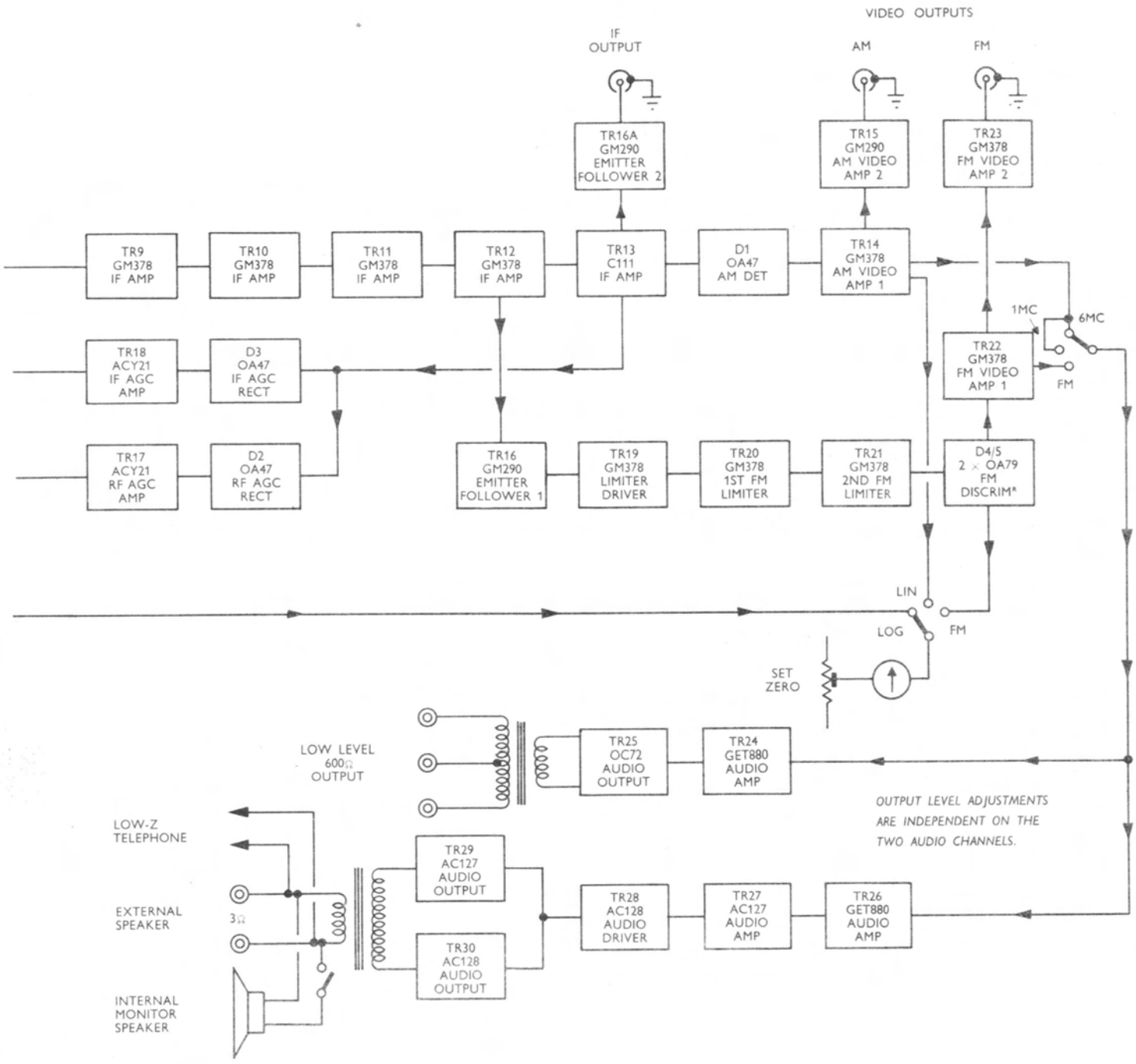


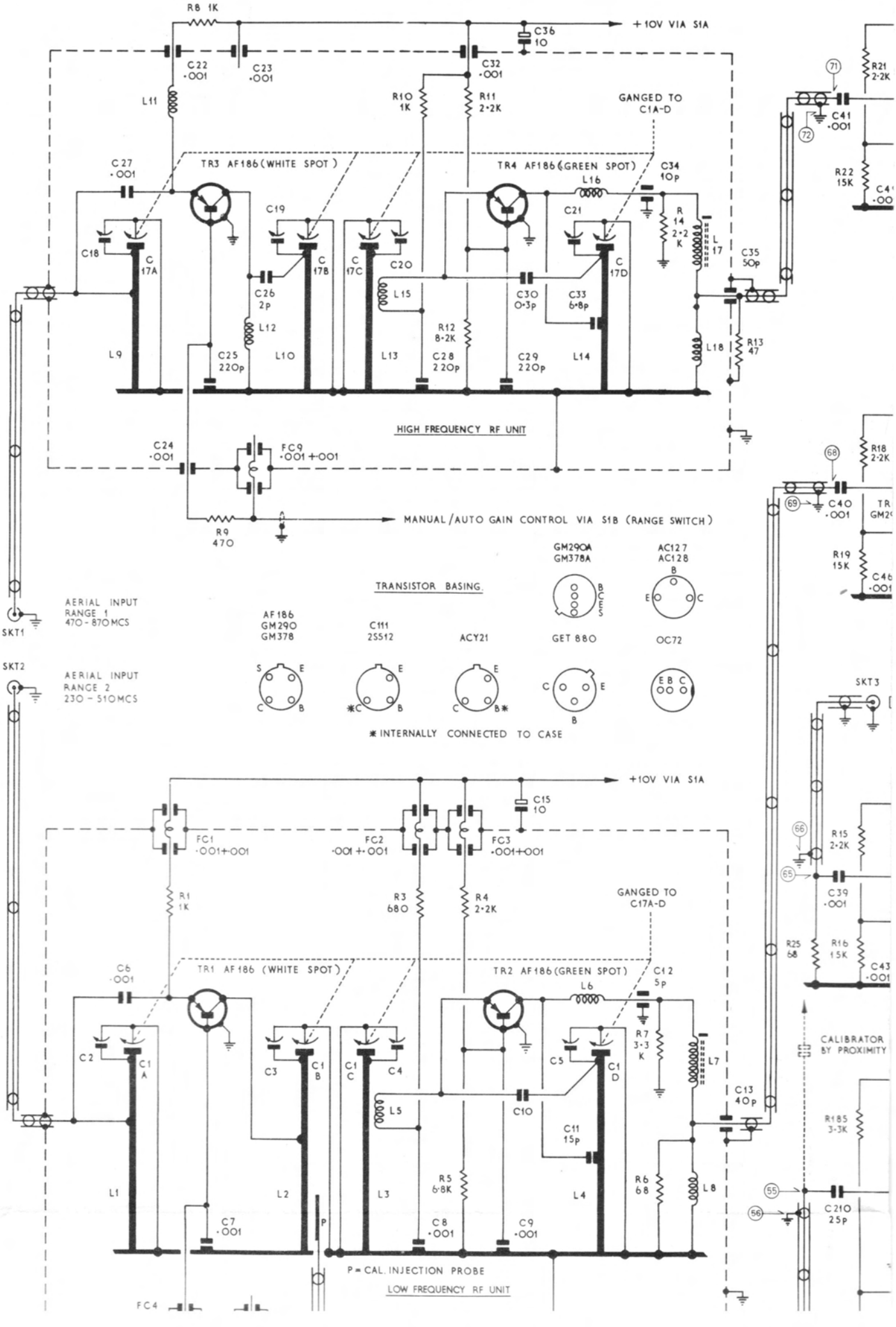

Plan View of Model 990S UHF Receiver.

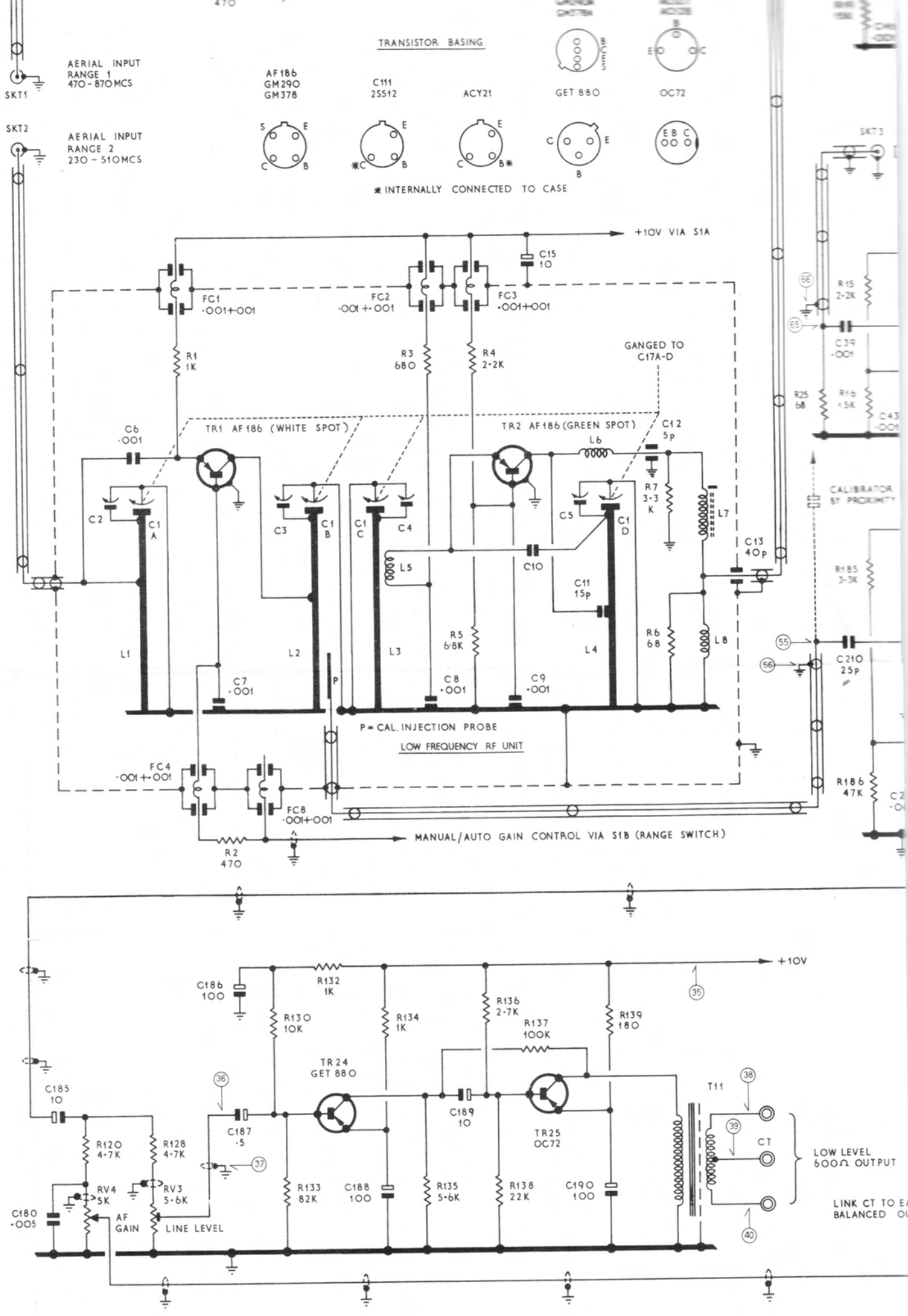
# BLOCK SCHEMATIC DIAGRAM—UHF RECEIVER MODEL 990S

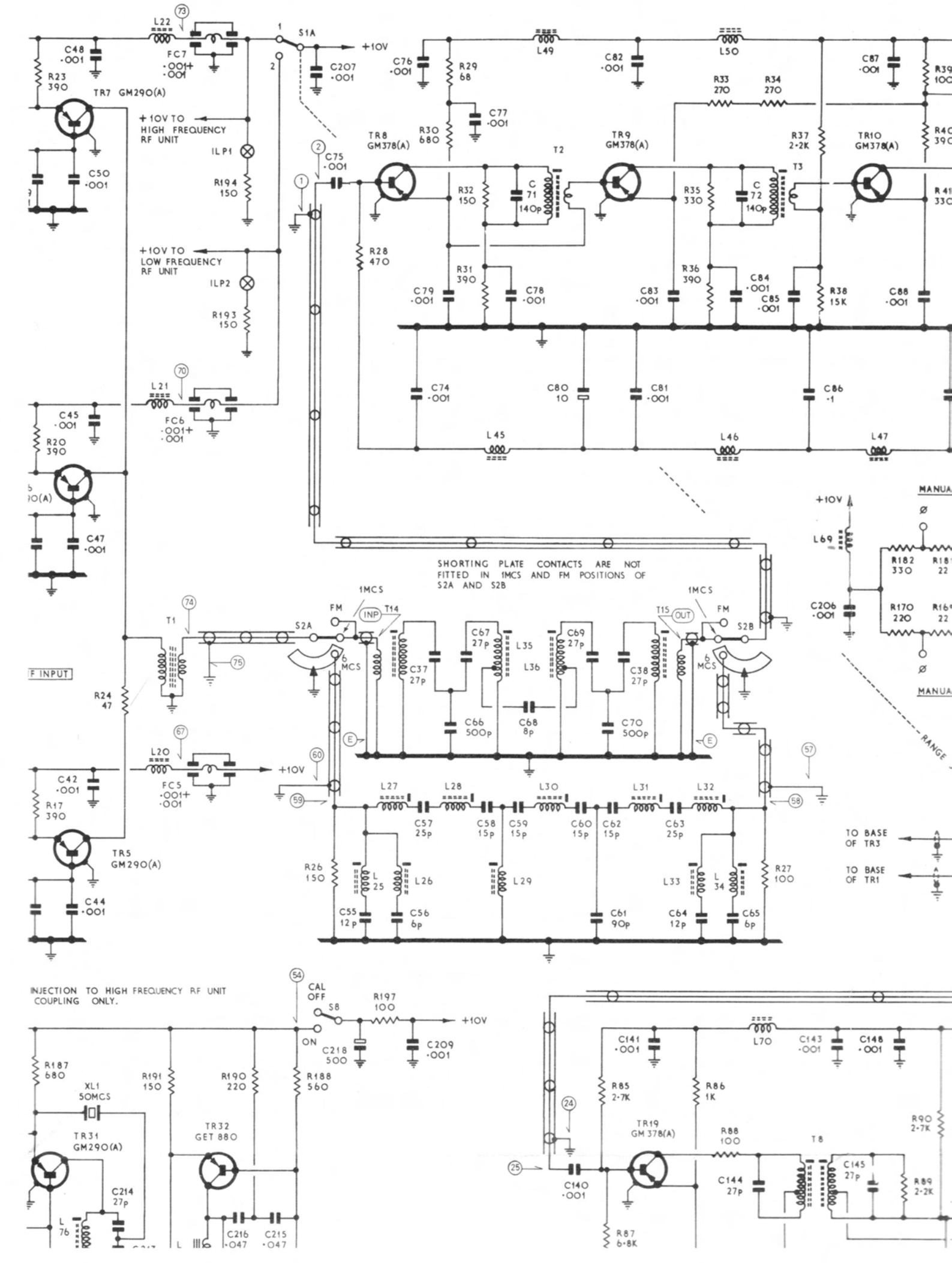


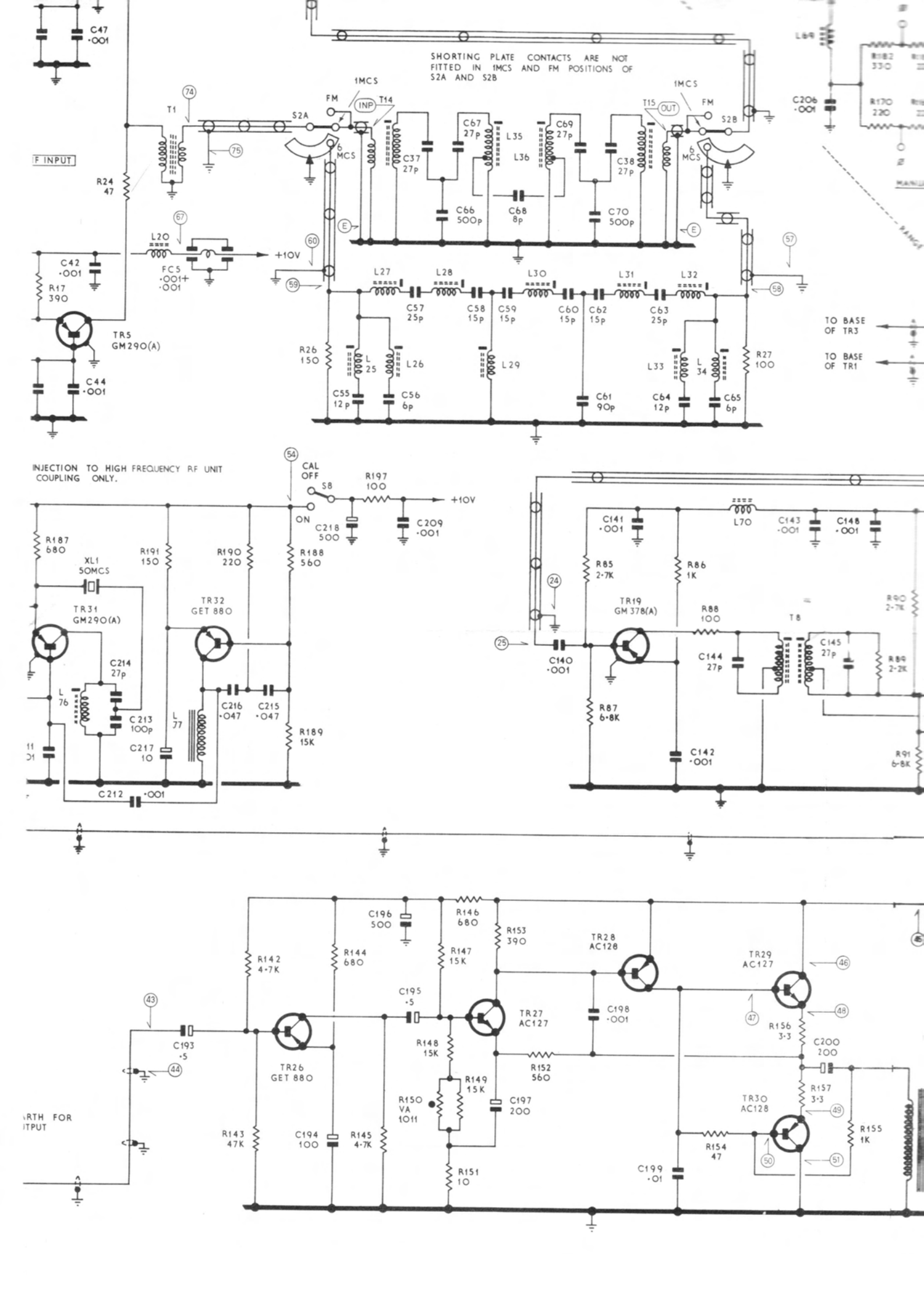

*NB GM290A & GM378A MAY BE FITTED IN LIEU OF GM290 & GM378. TR13 MAY BE 2S512.*

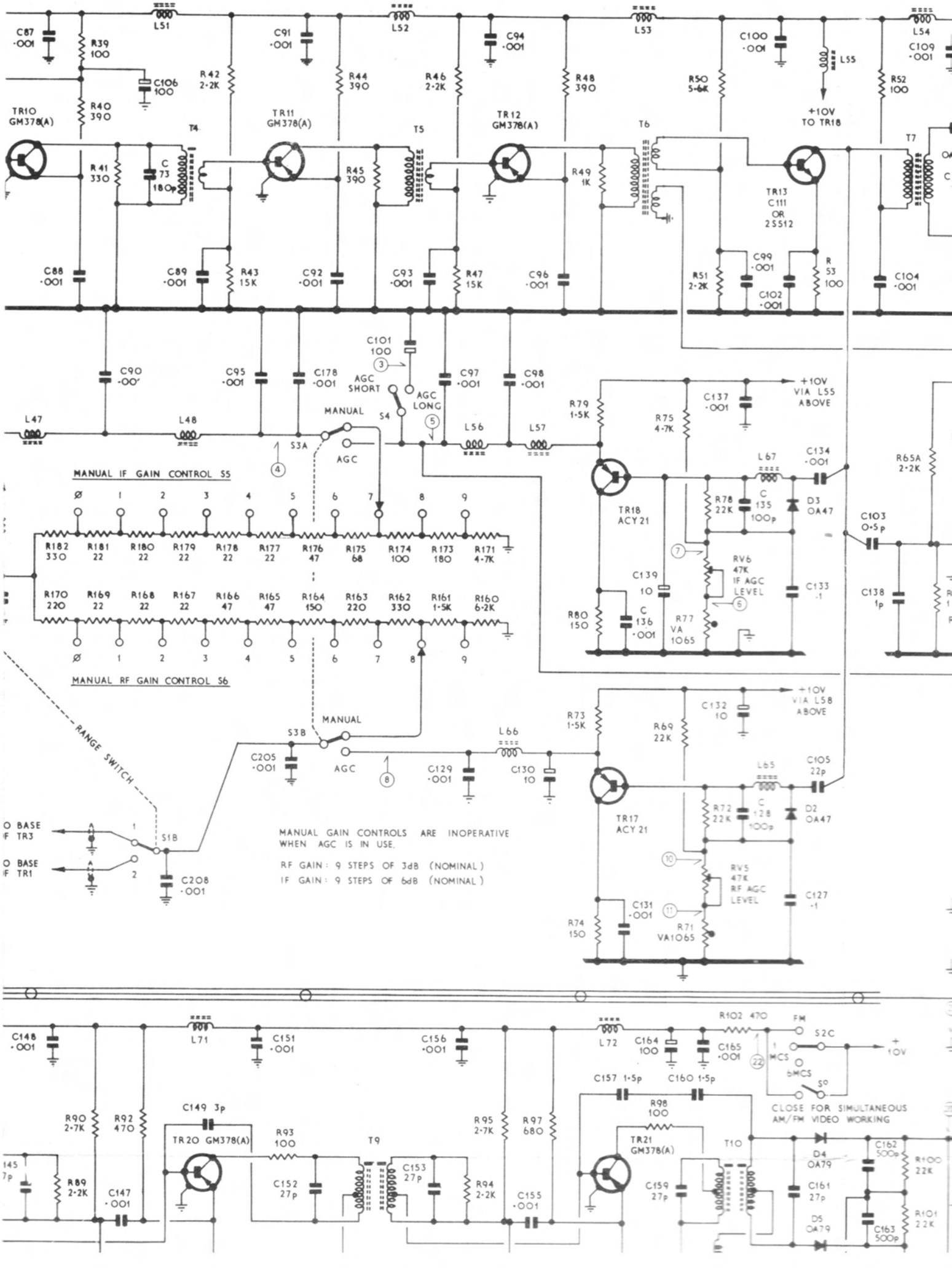

VIDEO OUTPUTS
IF OUTPUT
AM
FM
TR16A GM290 EMITTER FOLLOWER 2
TR15 GM290 AM VIDEO AMP 2
TR23 GM378 FM VIDEO AMP 2
TR9 GM378 IF AMP
TR10 GM378 IF AMP
TR11 GM378 IF AMP
TR12 GM378 IF AMP
TR13 C111 IF AMP
D1 OA47 AM DET
TR14 GM378 AM VIDEO AMP 1
1MC
6MC
TR18 ACY21 IF AGC AMP
D3 OA47 IF AGC RECT
TR22 GM378 FM VIDEO AMP 1
FM
TR17 ACY21 RF AGC AMP
D2 OA47 RF AGC RECT
TR16 GM290 EMITTER FOLLOWER 1
TR19 GM378 LIMITER DRIVER
TR20 GM378 1ST FM LIMITER
TR21 GM378 2ND FM LIMITER
D4/5 2 × OA79 FM DISCRIM*
LIN
LOG
FM
SET ZERO
LOW LEVEL 600Ω OUTPUT
TR25 OC72 AUDIO OUTPUT
TR24 GET880 AUDIO AMP
OUTPUT LEVEL ADJUSTMENTS ARE INDEPENDENT ON THE TWO AUDIO CHANNELS.
LOW-Z TELEPHONE
EXTERNAL SPEAKER
3Ω
INTERNAL MONITOR SPEAKER
TR29 AC127 AUDIO OUTPUT
TR30 AC128 AUDIO OUTPUT
TR28 AC128 AUDIO DRIVER
TR27 AC127 AUDIO AMP
TR26 GET880 AUDIO AMP

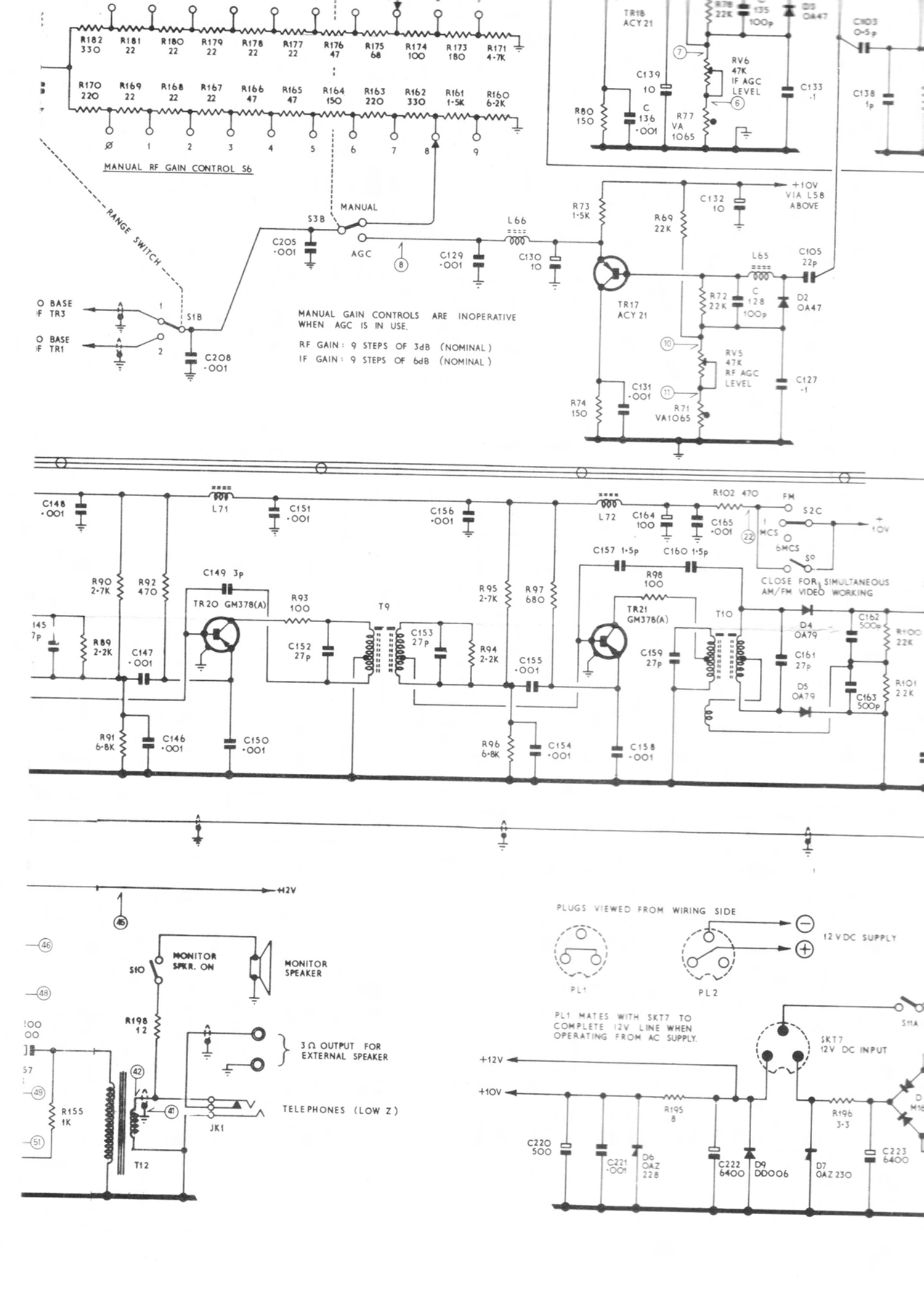

R8 1K
+10V VIA S1A
C36 10
C22 ·001
C23 ·001
C32 ·001
L11
R10 1K
R11 2·2K
GANGED TO C1A-D
C27 ·001
TR3 AF186 (WHITE SPOT)
TR4 AF186 (GREEN SPOT)
C34 10p
L16
C19
C21
C18
C 17A
C 17B
C 17C
C 17D
C20
R 14 2·2 K
L 17
C35 50p
C26 2p
L12
L15
C30 0·3p
C33 6·8p
R12 8·2K
L9
C25 220p
L10
L13
C28 220p
C29 220p
L14
L18
R13 47
HIGH FREQUENCY RF UNIT
C24 ·001
FC9 ·001+·001
R9 470
MANUAL/AUTO GAIN CONTROL VIA S1B (RANGE SWITCH)
SKT1
AERIAL INPUT RANGE 1 470 - 870MCS
SKT2
AERIAL INPUT RANGE 2 230 - 510MCS
TRANSISTOR BASING.
GM290A GM378A
AC127 AC128
AF186 GM290 GM378
C111 2S512
ACY21
GET 880
OC72
* INTERNALLY CONNECTED TO CASE
+10V VIA S1A
C15 10
FC1 ·001+·001
FC2 ·001+·001
FC3 ·001+·001
R1 1K
R3 680
R4 2·2K
GANGED TO C17A-D
C6 ·001
TR1 AF186 (WHITE SPOT)
TR2 AF186 (GREEN SPOT)
C12 5p
L6
C2
C1 A
C3
C1 B
C1 C
C4
C5
C1 D
R7 3·3 K
L7
C13 40p
L5
C10
C11 15p
R5 6·8K
L1
L2
L3
L4
R6 68
L8
C7 ·001
P
C8 ·001
C9 ·001
P = CAL. INJECTION PROBE
LOW FREQUENCY RF UNIT
FC4
R21 2·2K
C41 ·001
R22 15K
R18 2·2K
C40 ·001
R19 15K
SKT3
R15 2·2K
C39 ·001
R25 68
R16 15K
CALIBRATOR BY PROXIMITY
R185 3·3K
C210 25p

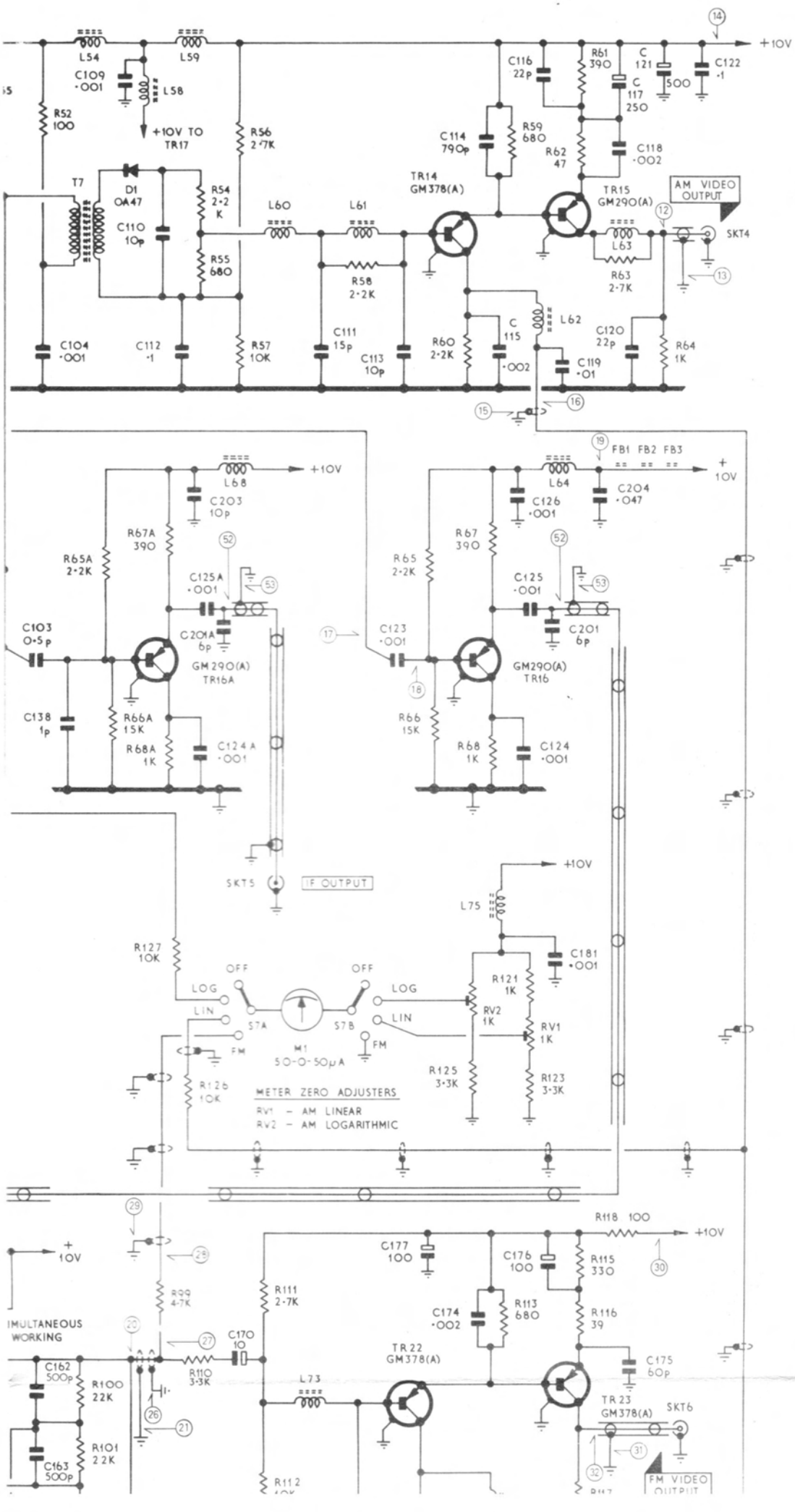

SKT1
AERIAL INPUT
RANGE 1
470 - 870MCS
SKT2
AERIAL INPUT
RANGE 2
230 - 510MCS
TRANSISTOR BASING
AF186
GM290
GM378
C111
2S512
ACY21
GET 880
OC72
* INTERNALLY CONNECTED TO CASE
+10V VIA S1A
FC1 ·001+001
FC2 ·001+·001
FC3 ·001+001
C15 10
R1 1K
R3 680
R4 2·2K
GANGED TO C17A-D
TR1 AF186 (WHITE SPOT)
TR2 AF186 (GREEN SPOT)
C6 ·001
C12 5p
L6
R7 3·3 K
L7
C2
C1 A
C3
C1 B
C1 C
C4
C5
C1 D
C13 40p
C10
L5
C11 15p
L1
L2
L3
L4
R5 6·8K
R6 68
L8
C7 ·001
P
C8 ·001
C9 ·001
P = CAL. INJECTION PROBE
LOW FREQUENCY RF UNIT
FC4 ·001+·001
FC8 ·001+001
R2 470
MANUAL/AUTO GAIN CONTROL VIA S1B (RANGE SWITCH)
SKT3
R45 2·2K
C39 ·001
R25 68
R46 1·5K
C43 ·001
CALIBRATOR BY PROXIMITY
R185 3·3K
C210 25p
R186 47K
+10V
C186 100
R132 1K
R130 10K
R134 1K
R136 2·7K
R137 100K
R139 180
TR24 GET 880
TR25 OC72
T11
C185 10
C187 ·5
C189 10
R120 4·7K
R128 4·7K
RV4 5K
RV3 5·6K
AF GAIN
LINE LEVEL
R133 82K
C188 100
R135 5·6K
R138 22K
C190 100
C180 ·005
CT
LOW LEVEL 600Ω OUTPUT
LINK CT TO E
BALANCED O

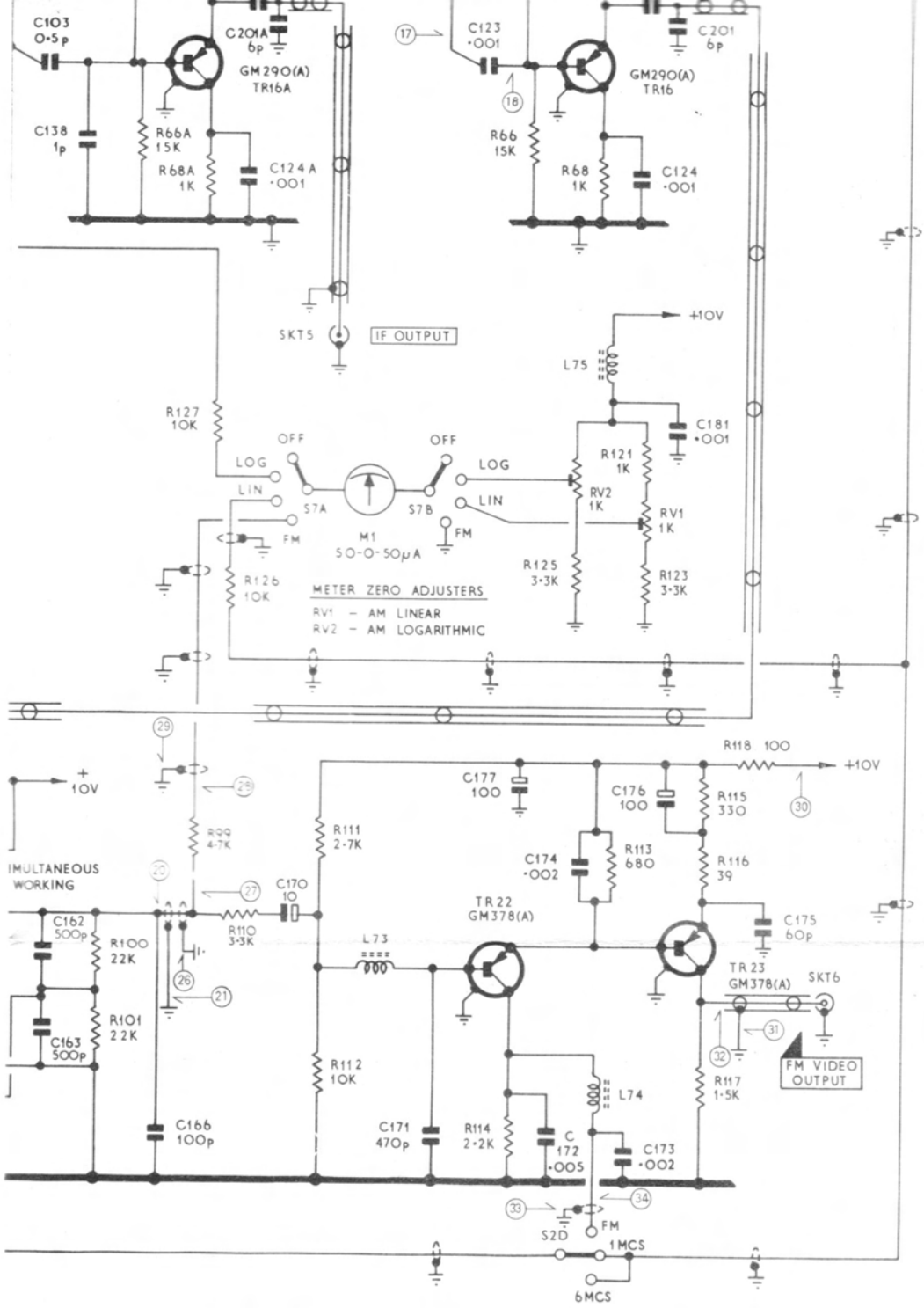

L22
S1A
+10V
C48 ·001
FC7 ·001+ ·001
C207 ·001
R23 390
TR7 GM290(A)
+10V TO HIGH FREQUENCY RF UNIT
ILP1
R194 150
C50 ·001
+10V TO LOW FREQUENCY RF UNIT
ILP2
R193 150
L21
FC6 ·001+ ·001
C45 ·001
R20 390
C47 ·001
C76 ·001
R29 68
L49
C82 ·001
L50
C87 ·001
R33 270
R34 270
C77 ·001
R30 680
TR8 GM378(A)
T2
TR9 GM378(A)
R37 2·2K
T3
TR10 GM378(A)
C75 ·001
R32 150
C 71 140p
C 72 140p
R35 330
R28 470
R31 390
R36 390
C84 ·001
C85 ·001
R38 15K
C88 ·001
C79 ·001
C78 ·001
C83 ·001
C74 ·001
C80 10
C81 ·001
C86 ·1
L45
L46
L47
SHORTING PLATE CONTACTS ARE NOT FITTED IN 1MCS AND FM POSITIONS OF S2A AND S2B
1MCS
FM
INP
T14
T15
OUT
S2A
S2B
6 MCS
T1
F INPUT
R24 47
C67 27p
C69 27p
L35
L36
C37 27p
C38 27p
C66 500p
C68 8p
C70 500p
L20
FC5 ·001+ ·001
C42 ·001
R17 390
TR5 GM290(A)
C44 ·001
L27
L28
L30
L31
L32
C57 25p
C58 15p
C59 15p
C60 15p
C62 15p
C63 25p
R26 150
L 25
L26
L29
L33
L 34
R27 100
C55 12p
C56 6p
C61 90p
C64 12p
C65 6p
+10V
L69
R182 330
C206 ·001
R170 220
MANUA
RANGE
TO BASE OF TR3
TO BASE OF TR1
INJECTION TO HIGH FREQUENCY RF UNIT COUPLING ONLY.
CAL OFF
S8
R197 100
ON
C218 500
C209 ·001
R187 680
XL1 50MCS
R191 150
R190 220
R188 560
TR31 GM290(A)
TR32 GET 880
C214 27p
L 76
C216 ·047
C215 ·047
C141 ·001
L70
C143 ·001
C148 ·001
R85 2·7K
R86 1K
TR19 GM 378(A)
R88 100
T8
R90 2·7K
C140 ·001
C144 27p
C145 27p
R89 2·2K
R87 6·8K


SHORTING PLATE CONTACTS ARE NOT FITTED IN 1MCS AND FM POSITIONS OF S2A AND S2B
F INPUT
T1
S2A
S2B
1MCS
FM
INP
T14
T15
OUT
6 MCS
C67 27p
C69 27p
C37 27p
C38 27p
L35
L36
C66 500p
C68 8p
C70 500p
R24 47
C42 ·001
R17 390
TR5 GM290(A)
C44 ·001
L20
FC5 ·001+ ·001
+10V
L27
L28
L30
L31
L32
C57 25p
C58 15p
C59 15p
C60 15p
C62 15p
C63 25p
R26 150
L 25
L26
L29
L33
L 34
R27 100
C55 12p
C56 6p
C61 90p
C64 12p
C65 6p
TO BASE OF TR3
TO BASE OF TR1
C47 ·001
C206 ·001
INJECTION TO HIGH FREQUENCY RF UNIT COUPLING ONLY.
CAL OFF
S8
ON
R197 100
C218 500
C209 ·001
R187 680
XL1 50MCS
R191 150
R190 220
R188 560
TR31 GM290(A)
TR32 GET 880
C214 27p
L 76
C213 100p
C216 ·047
C215 ·047
L 77
C217 10
R189 15K
C212 ·001
C141 ·001
L70
C143 ·001
C148 ·001
R85 2·7K
R86 1K
TR19 GM 378(A)
R88 100
T8
C145 27p
R89 2·2K
C144 27p
C140 ·001
R87 6·8K
C142 ·001
R91 6·8K
C196 500
R146 680
R153 390
R142 4·7K
R144 680
R147 15K
TR28 AC128
TR29 AC127
C195 ·5
TR27 AC127
C198 ·001
R156 3·3
C200 200
C193 ·5
R148 15K
R152 560
TR26 GET 880
R149 15K
R150 VA 1011
C197 200
R157 3·3
TR30 AC128
R155 1K
R143 47K
C194 100
R145 4·7K
R154 47
R151 10
C199 ·01
RTH FOR ITPUT


C87 ·001
R39 100
L51
C91 ·001
L52
C94 ·001
L53
C100 ·001
L55
L54
C109 ·001
R52 100
+10V TO TR18
C106 100
R40 390
R42 2·2K
R44 390
R46 2·2K
R48 390
R50 5·6K
TR10 GM378(A)
TR11 GM378(A)
TR12 GM378(A)
T4
T5
T6
T7
R41 330
C 73 180p
R45 390
R49 1K
TR13 C111 OR 2S512
C88 ·001
C89 ·001
R43 15K
C92 ·001
C93 ·001
R47 15K
C96 ·001
R51 2·2K
C99 ·001
R 53 100
C102 ·001
C104 ·001
C101 100
C90 ·001
C95 ·001
C178 ·001
AGC SHORT
AGC LONG
C97 ·001
C98 ·001
+10V VIA L55 ABOVE
R79 1·5K
R75 4·7K
C137 ·001
L47
L48
MANUAL
S4
S3A
AGC
L56
L57
L67
C134 ·001
R65A 2·2K
MANUAL IF GAIN CONTROL S5
Ø 1 2 3 4 5 6 7 8 9
R182 330
R181 22
R180 22
R179 22
R178 22
R177 22
R176 47
R175 68
R174 100
R173 180
R171 4·7K
R170 220
R169 22
R168 22
R167 22
R166 47
R165 47
R164 150
R163 220
R162 330
R161 1·5K
R160 6·2K
TR18 ACY 21
R78 22K
C 135 100p
D3 OA47
C103 0·5p
C138 1p
RV6 47K IF AGC LEVEL
C139 10
C133 ·1
R80 150
C 136 ·001
R77 VA 1065
MANUAL RF GAIN CONTROL S6
RANGE SWITCH
+10V VIA L58 ABOVE
R73 1·5K
R69 22K
C132 10
MANUAL
S3B
L66
C205 ·001
AGC
C129 ·001
C130 10
L65
C105 22p
TR17 ACY 21
R72 22K
C 128 100p
D2 OA47
O BASE IF TR3
O BASE IF TR1
S1B
C208 ·001
MANUAL GAIN CONTROLS ARE INOPERATIVE WHEN AGC IS IN USE.
RF GAIN: 9 STEPS OF 3dB (NOMINAL)
IF GAIN: 9 STEPS OF 6dB (NOMINAL)
RV5 47K RF AGC LEVEL
C127 ·1
C131 ·001
R74 150
R71 VA1065
C148 ·001
L71
C151 ·001
C156 ·001
L72
C164 100
C165 ·001
R102 470
FM
S2C
+10V
MCS
bMCS
S0
CLOSE FOR SIMULTANEOUS AM/FM VIDEO WORKING
C157 1·5p
C160 1·5p
R98 100
C149 3p
R90 2·7K
R92 470
R93 100
TR20 GM378(A)
T9
R95 2·7K
R97 680
TR21 GM378(A)
T10
R89 2·2K
C147 ·001
C152 27p
C153 27p
R94 2·2K
C155 ·001
C159 27p
D4 OA79
C161 27p
D5 OA79
C162 500p
C163 500p
R100 22K
R101 2·2K


R182 330
R181 22
R180 22
R179 22
R178 22
R177 22
R176 47
R175 68
R174 100
R173 180
R171 4·7K
R170 220
R169 22
R168 22
R167 22
R166 47
R165 47
R164 150
R163 220
R162 330
R161 1·5K
R160 6·2K
Ø 1 2 3 4 5 6 7 8 9
MANUAL RF GAIN CONTROL S6
RANGE SWITCH
S3B
MANUAL
AGC
C205 ·001
C129 ·001
L66
C130 10
R73 1·5K
R69 22K
C132 10
+10V VIA L58 ABOVE
L65
C105 22p
TR17 ACY 21
R72 22K
C 128 100p
D2 OA47
RV5 47K RF AGC LEVEL
R71 VA1065
C131 ·001
R74 150
C127 ·1
S1B
C208 ·001
MANUAL GAIN CONTROLS ARE INOPERATIVE WHEN AGC IS IN USE.
RF GAIN: 9 STEPS OF 3dB (NOMINAL)
IF GAIN: 9 STEPS OF 6dB (NOMINAL)
TR18 ACY 21
C139 10
R80 150
C 136 ·001
R77 VA 1065
RV6 47K IF AGC LEVEL
C133 ·1
C138 1p
C148 ·001
L71
C151 ·001
C156 ·001
L72
C164 100
C165 ·001
R102 470
FM
S2C
1 MCS
6 MCS
S0
CLOSE FOR SIMULTANEOUS AM/FM VIDEO WORKING
C157 1·5p
C160 1·5p
R98 100
TR21 GM378(A)
T10
D4 OA79
D5 OA79
C162 500p
C163 500p
R100 22K
R101 22K
C159 27p
C161 27p
R90 2·7K
R92 470
C149 3p
TR20 GM378(A)
R93 100
T9
C153 27p
R94 2·2K
C152 27p
C155 ·001
R95 2·7K
R97 680
R89 2·2K
C147 ·001
R91 6·8K
C146 ·001
C150 ·001
R96 6·8K
C154 ·001
C158 ·001
+12V
S10
MONITOR SPKR. ON
MONITOR SPEAKER
R198 12
3Ω OUTPUT FOR EXTERNAL SPEAKER
TELEPHONES (LOW Z)
JK1
T12
R155 1K
PLUGS VIEWED FROM WIRING SIDE
PL1
PL2
12 V DC SUPPLY
PL1 MATES WITH SKT7 TO COMPLETE 12V LINE WHEN OPERATING FROM AC SUPPLY.
SKT7 12V DC INPUT
S11A
+12V
+10V
R195 8
R196 3·3
C220 500
C221 ·001
D6 OAZ 228
C222 6400
D9 DDOO6
D7 OAZ 230
C223 6400


+10V
L54
L59
C109 ·001
L58
+10V TO TR17
R52 100
R56 2·7K
T7
D1 OA47
R54 2·2 K
C110 10p
R55 680
L60
L61
R58 2·2K
TR14 GM378(A)
C114 790p
R59 680
C116 22p
R61 390
C 121
C 117 250
500
C122 ·1
R62 47
C118 ·002
TR15 GM290(A)
AM VIDEO OUTPUT
L63
R63 2·7K
SKT4
C104 ·001
C112 ·1
R57 10K
C111 15p
C113 10p
R60 2·2K
C 115 ·002
L62
C119 ·01
C120 22p
R64 1K
FB1 FB2 FB3
L68
C203 10p
R67A 390
R65A 2·2K
C125A ·001
C201A 6p
C103 0·5p
GM290(A) TR16A
C138 1p
R66A 15K
R68A 1K
C124A ·001
L64
C204 ·047
C126 ·001
R67 390
R65 2·2K
C125 ·001
C201 6p
C123 ·001
GM290(A) TR16
R66 15K
R68 1K
C124 ·001
SKT5
IF OUTPUT
L75
C181 ·001
R127 10K
OFF
LOG
LIN
S7A
S7B
FM
M1 50-0-50μA
R121 1K
RV2 1K
RV1 1K
R125 3·3K
R123 3·3K
R126 10K
METER ZERO ADJUSTERS
RV1 – AM LINEAR
RV2 – AM LOGARITHMIC
R118 100
C177 100
C176 100
R115 330
C174 ·002
R113 680
R116 39
R111 2·7K
R99 4·7K
C170 10
TR22 GM378(A)
C175 60p
TR23 GM378(A)
SKT6
R110 3·3K
L73
C162 500p
R100 22K
C163 500p
R101 22K
R112
FM VIDEO OUTPUT
SIMULTANEOUS WORKING




BOARD TERMINATIONS ARE SHOWN THUS:- (22)
NUMBERS RUN FROM 1-74.
(NOS. 9, 23 AND 61-64 ARE NOT USED)

12 VDC SUPPLY