GOODMANS STEREOMAX

A.M. F.M. STEREO TUNER.

Introduction

The Stereomax is a fully integrated solid state Tuner, using silicon transistors.

Although designed and styled to match the Goodmans Maxamp 30 amplifier, it may be used with any type of Amplifier and if desired may be removed from its case for building into an existing cabinet. (Suitable brackets are available).

GENERAL SPECIFICATION

Mains Supply

The Stereomax tuner is fitted with a 6 ft. length of 2 core cable and moulded plug suitable for plugging in to the socket at the rear of the Maxamp 30 amplifier.

It is designed to be used on AC Mains only, 50-60 Hz and nominal supply voltages of 105, 120, 200, 220 and 240 volts. These may be selected by withdrawal and rotation of the mains selector, after removing the back. The voltage selected is indicated through an opening in the Cabinet back, and by the marker on the chassis, see fig. 1. The tuner leaves the factory adjusted to 240 volts.

Fuses

Mains fuse located on rear of chassis (see Fig.1). Type 150 mA anti-surge $\frac{3}{16} \times \frac{5}{8}$" long.

H.T. fuse located on Power Pack printed panel (see Fig.1) Type 100mA $\frac{3}{16} \times \frac{5}{8}$" long.

Scale and Pilot Light Bulbs

Two scale bulbs located at each end of the tuning scale. See Fig.2. Type-12V, 2.2 watts, M.E.S. Round 11mm.

Three Pilot bulbs located at the top of the tuning scale. See Fig.2. Type-12V, 0.75 watts, L.E.S., 4mm.

PERFORMANCE SPECIFICATION

A.M.

M.W. Sensitivity	20uV for 20dB S/N
Tuning Range	1650 – 545 kHz
Overall Selectivity	± 3 kc/s @ 3dB ± 4 kc/s @ 6dB at 1.5 MHz
Overall Distortion	Less than 1.5% @ 1 MHz @ 1mV input 30% Mod. 400 CPS.
I.F.	470 kHz
A.G.C.	8dB change in output for 60dB signal change above threshold
Overall Audio freq. response	20 CPS – 3.5 kHz @ + 0 – 3dB
Hum and Noise	50dB
2nd Channel	40dB @ 1 MHz
I.F. Rejection	50dB @ 1 MHz
Audio Output 30% Mod.	250mV R.M.S.

F.M.

Audio Output 100% Mod.	0.8V R.M.S.
Decoder. Residual 19kHz and harmonics	50dB below full output 100% Mod.
Stereo channel separation @ 1000 CPS	38dB
Sensitivity I.H.F.M.	2uV for 30dB quieting
Tuning Range	87.5 – 108 MHz
I.F.	10.7 MHz
I.F. Bandwidth	300 kHz @ 6dB
A.M. Rejection	50dB at full limiting A.M. @ 1 kHz 30% Mod.
Distortion. Stereo & Mono	Less than .6% 75 kHz deviation
Discriminator Bandwidth	600 kHz Peak to Peak
A.F.C. pull range	± 100 kHz
Signal noise ratio	65dB @ 100uV input
Overall freq. response without de-emphasis.	20 CPS – 50 kHz ± 1dB
Capture ratio. I.H.F.M.	3.5dB
Image Rejection @ 100MHz	Better than 40dB
I.F. Rejection	Better than 60dB
Overall freq. response on Stereo and Mono	20 Hz 0dB.15kHz – 3dB.

Controls

(a) Tuning

F.M. signals are tuned by the lower large tuning knob marked F.M., the scale reading being on the left hand side of the dial. A.M. signals are tuned by the large tuning knob marked A.M., the scale reading being marked on the right hand side of the dial.

The F.M. scale is calibrated in Mc/s (MHz) and the A.M. scale is calibrated in kc/s (kHz).

A logging scale is provided in the centre of the dial for accurately logging the desired station.

To enable a station to be tuned accurately a tuning meter is provided and the desired station should be tuned to give a maximum on this meter. This is operative on A.M. and F.M. Before tuning F.M. see instruction under A.F.C. below.

(b) Wave Change Switch

Situated under the dial scale, for F.M. reception this switch knob is turned to the extreme left position and in the extreme right position for A.M. reception. The centre position is for the reception of F.M. Mono. (See note on F.M. Stereo reception).

(c) Push Button Switch

The Push Button Switch consists of 4 buttons with the following functions:-

A.F.C. (Automatic Frequency Control) Functions on F.M. only. Initial tuning should always be executed without A.F.C.

When the desired transmission is heard depression of the A.F.C. button will bring the station precisely into tune. This accuracy will be maintained indefinitely without manual adjustment.

Muting

When depressed will reduce noise between stations on F.M. only. The noise level at which this occurs may be adjusted by the threshold control, see Fig. 1. It is important that this control is not turned too far in a clockwise direction (viewed from rear of tuner) otherwise reproduction of local stations will be impaired when the muting switch is depressed.

Local

This switch is depressed to prevent distortion due to overloading when listening to a very strong local station.

Tuning Meter

Calibrated 0–10 enables stations to be tuned in accurately. When tuned for maximum reading the signal is correctly tuned.

F.M. Stereo Reception

When F.M. Stereo signals are being received the centre pilot lamp will automatically light up. See fig.2. The wave change switch must be in the F.M. position with knob pointer to the extreme left.

A good aerial must always be used for the reception of F.M. Stereo, otherwise the reception will be spoilt by background noise.

A Stereo programme may be converted to mono be moving the switch to the centre position (F.M. Mono). This may be necessary if the stereo signal is too weak to give good results, which may be the case on distant stations.

Removal of Chassis from Cabinet

The tuner should be disconnected from the power supply and all leads removed from the rear. The tuner should be placed on a soft surface with the knobs downwards and the two rear fixing screws removed. See fig. 1.

After removing the back the cabinet may be lifted upwards from the chassis.

MECHANICAL DETAILS

The tuner chassis consists of a diecast front plate to which is attached at right angles a main chassis plate. This is the main fixing medium for the F.M. tuner unit, complete Power Pack chassis, A.M. tuner chassis, I.F. Panel and decoder panel.

All the controls and the tuning meter are mounted on a diecast front plate. It should not be necessary to remove this front plate from the metal chassis for servicing.

The diecast front plate is covered with a facia panel. This is detached by removing the two tuning control and switch knobs (fixed by grub screws) and bending back the ten tabs. The dial scale may then be removed.

To remove the various units from the main chassis proceed as follows:-

F.M. Tuner Unit

1. Pull off the drive drum complete with drive cord:
2. Unsolder both aerial feeders and I.F. output cable:
3. Remove the four 6BA tuner fixing screws:
4. The chassis may now be withdrawn from the main chassis plate.

Power Pack Chassis

1. Remove self tapping screws under F.M. flywheel:
2. Remove two small self tapping screws on rear flange:
3. The power pack chassis may now be removed.

A.M. Tuner Chassis

1. Remove Power Pack as above:
2. Pull off drive drum complete with cord drive:
3. Remove pointer knob:
4. Unscrew the self tapping screw under the front of the wave change switch
5. Unscrew the self tapping screw on aerial bracket (under cable form):
6. Remove long round fixing screw situated above and to the left of the A.M. tuning gang:
7. Unsolder F.M. tuner aerial feeders:
8. The A.M. tuner chassis may now be withdrawn.

I.F. Panel

Remove the panel by pulling it out of the retaining clips starting at the right hand side.

Decoder Panel

Pull out decoder cable plug from socket and release panel from retaining clips.

Dial Bulb Replacement

Remove lamp holders from clips and unscrew bulbs.

Wave Band Indicator and Pilot Bulb Replacement

1. Unclip I.F. Panel and pull out:
2. Remove the self tapping screw on paxolin strip:
3. The three bulb holders may now be withdrawn together.

CIRCUIT DESCRIPTION OF STEROMAX AM/FM TUNER

F.M. Tuner Unit

R.F. Amplifier

The aerial input is 300 ohms balanced across the outer ends of T1 primary or 75 ohms unbalanced across one end and the centre tap, which at VHF is earthed through C1. The secondary is tuned by C2 one section of the three gang capacitor. A capacitive tap C6, C7 is used to feed the signal to the base of the R.F. amplifier TR1 in order to give good selectivity in the aerial circuit. Base bias for TR1 is by R4, R3, X5 and R42. R3 prevents shunting of the signal by the AGC line, decoupling of this is done by C8, R5 and C10. The output of TR1 is tapped into the collector coil L1, which is tuned by the second section of the gang capacitor and capacitively tapped to the base of TR2, the Mixer.

Mixer

I.F. degeneration is prevented by the series trap L3 and C18, which resonates at approx. 10.7 MHz. Oscillator injection of approx. 90mV is provided by C22 from the oscillator tuned circuit. The output of the mixer at 10.7 MHz is selected by the bandpass transformer T2, which through a capacitive tap feeds via a coaxial cable to the I.F. stage. The collector resistor R9 prevents "bottoming", clipping oscillations in the mixer on very large signals.

Oscillator

The oscillator is tuned by C30, the third section of the gang capacitor, to a frequency 10.7 MHz below the signal frequency.

A.F.C.

Automatic frequency control is provided by the variable capacity diode X2 which alters its capacity as a function of DC voltage at the discriminator. This capacity in series with C29, C33 appears across L2, the oscillator tuned circuit and adjusts the frequency to maintain correct tuning. AFC line decoupling is by R16 and C33.

R14 and R15 reverse bias the diode to about 6 volts with respect to earth.

A.G.C.

A voltage fed back from the second IF stage reduces the current through TR1 from 2mA to nearly zero giving a gain reduction of approx. 40dB.

Local

When this switch is depressed X1 conducts, its low resistance in series with C4 appears across T1 secondary; this attenuates the input to TR1 by another 20dB. It should only be used in very strong signal areas if overloading is taking place.

Feedthrough capacitors C3, C11, C15, C21, C25, C26 and C32 are decoupling capacitors which filter all leads coming out of the silver plated tuner.

The supply to the tuner is switched by S2 which is connected in the FM and FM MONO positions.

A.M. Tuner Unit

Aerial

The circuit is arranged so that the FM aerial also functions on Medium wave. The screening of the cable is earthed through C21 which offers an impedance at Medium wave frequencies, the signals developed across this capacitor are fed via R17, which acts as an attenuator and VHF filter, to the primary of T3, which with C36 is tuned to a fixed frequency of 340 kHz. The signal is inductively coupled to the secondary winding which is tuned by the aerial section of the two gang capacitor. A small amount of top capacity coupling is provided by C37 to give uniform sensitivity over the band. The impedance tap is connected to the base of the mixer TR4, through C40 X3 in parallel with C41 and X4, both these diodes are normally conducting. An IF rejector C44 and L4 appears across the base input, tuned to 470 kHz. C43 is DC isolation.

Local

When the switch is depressed X3 and X4 become high resistance thus attenuating the input to the mixer. This feature in incorporated should overloading of the mixer occur in very strong signal areas. The amount of attenuation is controlled by R31.

Mixer

This stage is AGC controlled and normally runs with 2mA current with no input signal; this current is set by R22. Oscillator injection is by a link on T4 via C45 to the emitter. The 470 kHz output of the mixer is fed through R24, RF stopper, to the tapped collector winding of T6.

Oscillator

This is a conventional grounded base type tuned by the osc. section of the two gang capacitor C47. Temperature correction is provided by C39 which is in series with the trimmer C48.

Supply

DC supply to the tuner is switched on by S2 in the AM position only. Resistor R32 is switched in on FM to maintain correct current through TR6 when TR4 is switched off.

IF Amplifier

This consists of a two stage 470 kHz AM, and a three stage 10.7 MHz FM amplifier with one transistor TR7 common to both.

F.M.

The output of T2 is fed to TR6 base, the amplified output is passed through the tuned bandpass transformer T5 to the base of TR7. The Secondary winding as far as 10.7 MHz is concerned is connected back to the emitter of TR7 through C65. The output is developed across the primary of T7 and coupled by C66 to X5 (FM AGC diode) which conducts on the positive half cycle of the signal, thereby reducing its resistance, making the base of TR1 more negative which reduces the current and hence the gain of the RF stage. Audio decoupling is by C61 and IF filtering by RFC2, C60 and C62. The output is also rectified by the tuning meter rectifier X6; R4 completes the DC path. The current is limited by R45; RFC3 and C74 filter the IF component.

Limiter and Detector

The secondary of T7 bandpass transformer feeds the base of TR8 which in conjunction with TR9 forms an amplifier limiter stage. This circuit consists of two DC coupled common emitter stages. The DC feedback path from the emitter circuit of the limiter to the base of the amplifier maintains bias stability as well as constant collector current in both stages. This provides good limiting over a wide range of input signal levels. The collector feeds a conventional Foster-Seeley discriminator to give an audio signal, which is filtered by R67 and RFC4, to the decoder unit and the muting circuit. The DC output of the discriminator is fed back to the AFC diode by R71 which filters the IF component with C96. The AFC switch shorts the control voltage to ground when the button is out.

Muting

The two transistor (TR11, TR12) muting circuit, which is activated by a DC bias developed in the limiter, by passes the detector output to ground when the signal/noise ratio is low. The circuit is made operative by depressing the muting switch, the level of operation can be adjusted by R75 (noise level). The diode X7 rectifies the signal from the collector of TR8; with strong signals its anode goes sufficiently negative to cut off TR11 and TR12, this allows the audio signal to pass to the decoder. Small signals or noise voltages are insufficient to turn on X7, thus TR11 and TR12 conduct and shunt the audio signals to ground through C100. Components R55 R56 and C78 provide the correct time constant for noise muting. If the tuner is used without a decoder unit, de-emphasis is provided by R67 and C95. The audio output goes through C108, (which is fitted to a printed circuit plug) to S1 which in the FM position gives the same signal to both left and right channels.

AM Intermediate Frequency Amplifier

The 470 kHz signal is fed into the AGC controlled stage TR7 from T6 secondary through part of T5 secondary, this being low impedance. Bias for TR7 is provided by R41, R54, X8 and R40 which is adjusted to give correct current in TR7 of 2mA. C55 is decoupling. The output of TR7 is passed through low impedance T7 to the collector tap of T8, which is a bandpass transformer, the secondary tap going to the base of TR10. Fixed bias is by R50, R51. The output goes into a final bandpass transformer T10, which feeds the detector circuit.

Detector

Diode X12 demodulates the IF signal and produces audio which is passed through an audio filter comprising L5, C90, C93, C94, R70 and C97. This filter has a fairly sharp cut off above 4 kHz and maximum rejection at 9 kHz which reduces second channel interference.

The DC component is used to operate the tuning meter through R68 and S2, audio goes through C98 coupling capacitor to the switch S1, which gives an output on both left and right channels, in the AM position.

A.G.C.

The collector current of both TR4 and TR7 is dependent upon the base resistance to the negative line. As the signal is increased at TR10 collector the diode X8 conducts more heavily, thus reducing its forward resistance, causing the base potential on both transistors to go more negative; this reduces the collector current and hence the gain of both stages. Audio developed across the diode is by-passed by C76.

Power Supply

Mains input is switched by a double pole mains switch and an outlet socket is provided after the switch to supply ancillary equipment. The mains transformer T11 is protected by an anti-surge fuse (see operating instructions). One Secondary winding supplies 11.5V AC for scale lamps, etc., and another feeds a bi-phase rectifier, the output of which is smoothed by C104. The 19 volt supply which is fused with 100 mA fuse goes direct to the decoder unit and via the limiting and smoothing components R77, R80 and C106 to the collector of the regulator transistor TR13. The base of this transistor is held at 10 Volts negative by the Zener diode X22, which through TR13 stabilises the supply to all units, except the decoder, over a wide range of load and supply variations. R78, R81 and C107 further smooth the supply to X22. Capacitor C103 by-passes noise generated by X22. Decoupling of LF and RF components on the 9V line is done by C105 and C102.

STEREO DECODER – CIRCUIT DESCRIPTION

All connections to the decoder are made through an eight way plug and socket.

TR14, TR15, TR16, TR17 and TR18 are all p.n.p. transistors, TR19 and TR20 are n.p.n. types.

TR14

The multiplex signal from the FM discriminator is coupled by C110 and R83 to the base of TR14. TR14 is a "boot strapped" emitter follower, with an input impedance of approximately 350k ohms. This stage provides a high impedance load for the FM discriminator. The multiplex signal is developed across R87 and is coupled by the storecast filter (L6 and C112, if provided) and R88 to the base of TR15.

R83 and R88 are base "stoppers" and R90, R98 and R103 are collector "stoppers", included to stop parasitic oscillations resulting from the high gain and wide frequency response of the transistors.

TR15

This transistor obtains its base bias from the emitter of TR14. TR15 operates as a common emitter stage to 19 kHz, and as an emitter follower to audio and multiplex sidebands. The latter are developed across R91, and coupled, at a low impedance, by C118 to the tap on the secondary of T14. The voltage gain to this point is almost unity.

To maintain the voltage gain of the stage at 19 kHz the emitter of TR15 is partially by-passed via C118, the secondary of T14 and the switching diodes. T12a and T12b together form a bandpass transformer, critically coupled by C115, and tuned to 19 kHz. In this manner the 19 kHz pilot tone is selected by TR15 and the bandpass transformer from the other components of the signal.

TR16

TR16 is a 19 kHz amplifier and limiter. Under normal stereo operating conditions, this transistor receives DC bias through R93 and the tapped portion of T12b from the potential divider R94 and R95. R97 in the emitter provides DC stabilisation. The base bias resistors are decoupled by C116, the emitter resistor by C120. The 19 kHz from T12b is fed from the coil tap, via R93, to the base of TR16, which operates in grounded emitter configuration. TR16 amplifies the signal and the output is developed across the collector load T13 which is tuned to 19 kHz. The 19 kHz drive to this stage is sufficient to cause TR16 to limit the signal, so maintaining a constant 19 kHz output under all stereo input conditions.

Stereo/Mono Switch

When the wavechange switch is in the FM MONO position, the junction of R92 and C117 is connected to earth, so shorting out most of the base bias on TR16. R92 and C117 form a filter to confine the 19 kHz in this stage to the decoder panel. R96 maintains a small voltage across R97 and TR16 is reverse biased to cut off. The stage ceases to amplify the 19 kHz so stopping the stereo operation. In the stereo position the junction of R92 and C117 is left open so that TR16 functions normally.

TR17 & TR18

The 19 kHz output from the centre tapped secondary of T13 drive the frequency doubling diodes X16 and X17. These diodes give 38 kHz negative going pulses of approximately 4.5V peak across R102, which are fed into the base of TR17. The pulses are amplified by TR17 the output of which is developed at the primary of T14. This transformer is tuned to 38 kHz and convert the 38 kHz pulses into a sinewave.

The emitter resistors of TR17, R104 and R105, are partly decoupled by C128, to give sufficient gain without limiting in this stage. The emitter DC current of this transistor is passed through the base of TR18, which is the stereo/mono automatic switching transistor. When operating in mono mode, TR17 has no quiescent DC bias and so draws no emitter current, so TR18 is cut off. When TR17 is driven with 38 kHz the pulses of current it draws are smoothed by C126 and the resulting DC through the base of TR18 saturates this transistor. Current then flows from the main H.T. supply, via the stereo indicator lamp, and R106 on the collector-emitter junction of TR18 so lighting the lamp. C127 filters any 38 kHz which still comes from TR18.

Threshold Circuit

If the decoder is operating under mono conditions there is full negative H.T. on the collector of TR18 and the potential is applied across the threshold control R101. The potential at the wiper of this preset potentiometer is used to pass a current, via R100 through the diode X15, so forward biassing this diode. In this condition the diode presents low impedance to AC., and so forms a potential divider with R93 and C121, greatly attenuating any incoming signal before it reaches TR16. The threshold control is set so that when a continuous 19 kHz pilot tone is present at the input, the signal which passes through this attenuator commences to turn TR18 on. This reduces the current and hence the attenuation on the diode X15. This starts an avalanche action, the circuit suddenly commences stereo operation and works normally with TR18 on, and therefore, X15 is cut off. The circuit then continues to function normally until the 19 kHz input is removed or falls to a low level.

In this way the circuit is made to respond only to continuous pilot tone inputs, and the circuit exhibits hysteresis:- Stereo operation cannot work in an intermediate state but will be either on or off.

R108 serves to maintain the operation of TR18 and therefore the threshold circuit, in the event of the failure of the stereo lamp.

Detector Circuit

X18, X19 and X20, X21 are pairs of balanced detector diodes giving the restored right and left hand channel signals respectively. On stereo, 38 kHz from the balanced secondary of T14 makes each pair of diodes conduct alternately. These diodes are thus used as switches, applying the multiplex signal (which is fed into the centre tap of the balanced secondary of T14 - See TR15 circuit description) alternately to the right and left hand channels, thus resolving the multiplex signal.

The following description refers to the right hand channel, but the left hand channel is identical with this.

The combination of audio, sidebands and 38 kHz out of each diode X18 and X19 are partly filtered by C130, C131 and the 38 kHz component and 19 kHz harmonics are balancedout by R111. (The 38 kHz and 19 kHz harmonic outputs of the diodes are of opposite polarity, and therefore balance out, but audio components are of similar polarity and are not effected by R111).

When operating on mono, there is no 38 kHz drive to the diodes, but they receive some forward DC bias from R110 and R112 so allowing the audio signal to be fed continuously to both channels.

19 kc/s Filter and De-emphasis

In stereo or mono operation, the audio signal is passed from the slider of R111, through the 19 kHz rejector L7 and C143, to the de-emphasis filter R116 and C135.

Differential Amplifier

After de-emphasis, the signal is coupled by C137 to the differential amplifier TR19, which operates in conjunction with TR20. This transistor has the usual DC stabilisation, with R118 and R120 forming the base bias potential divider, R123 the emitter resistor and R124 the collector load. The emitter resistor is not decoupled so that when both channels receive the same signal the voltages gain is only 3dB, just sufficient to restore the overall voltage gain of the decoder to unity. When a stereo signal is being received the separation control R127 introduces a small amount of out-of-phase crosstalk between the channels, the level of which is adjusted by R127 to cancel the slight in-phase crosstalk which occurs in the decoding process. The audio output is taken from the collector of TR19, through C141 to S1, and in the FM positions is connected by S1 to the output sockets.

Decoder Power Supply

The full H.T. voltage is smoothed by the two R-C filters R130, C134 and R128, C140. Extra 19 kHz and 38 kHz decoupling is provided by R107 and C124 which supply power to TR16 and TR17.

STEREOMAX – AM/FM ALIGNMENT PROCEDURE

Instruments Required

Signal Sources

1. RF Signal Generator with FM modulation variable up to at least ± 75 kHz, to cover the range 10-110MHz (Marconi TF995A/2 or equivalent).

2. RF Signal Generator with 400 Hz AM 30% modulation to cover the range 400-1600 kHz. (Advance B4B5 or equivalent).

Output Indicators

1. Centre-zero meter. 100-0-100 ua with 15k series resistor.

2. Oscilloscope with sensitivity not less than 10 mV/cm.

3. Voltmeter to read up to 2.5 volts DC.

Tools

1. Insulated trimming tool (Screwdriver ended plastic knitting needle No.10).

2. Transistor coil trimming tool.

3. Small screwdriver.

General

1. Connect the earth side of the signal source and output indicator to an earth point as close as possible to the "live" connection unless otherwise specified.

2. Signal input should be kept as low as possible to avoid A.G.C. action on AM and limiting on FM unless otherwise stated (Set 'scope to max. sensitivity).

3. Care must be taken to ensure that the frequencies from the variable generators used are exactly as specified:

(a)	470	kHz	±	1 kHz
(b)	600	kHz	±	1 kHz
(c)	1500	kHz	±	2 kHz
(d)	10.7	MHz	±	.01 MHz
(e)	88	MHz	±	.05 MHz
(f)	108	MHz	±	.05 MHz

4. Generator dial should not be altered whilst IF alignment is being carried out.

5. All coils and transformers are pretuned and the coupling adjusted in simulators prior to fitting into the receiver. Therefore, only slight adjustments will be necessary.

AM. IF Alignment

1. Set wave change switch to AM position.

2. Set AM gang to maximum capacity (tuning knob fully clockwise).

3. Move pointer until it is in line with the calibration mark at the low frequency end of the scale.

4. Screw core of L4 (IF rejection) out of can approx. $\frac{1}{8}$" – $\frac{1}{4}$".

5. Connect the volt meter between 9 volt negative line and the emitter of TR7, adjust R40 for a reading of 0.6 volts.

6. Connect the volt meter between 9 volt negative line and TR4 emitter, adjust R22 for a reading of 0.5 volts. Repeat steps 5 & 6 since there is some inter-action between the two transistors.

7. Connect the oscilloscope to the output socket left channel. Connect the generator to the aerial and earth terminals and set to 470 kHz (lead from generator must be screened all the way to the terminals). Increase the generator output until an indication is obtained on the 'scope.

Adjust as follows:-

Reducing the input at each stage to prevent A.G.C. action:-

(a) T10 top core for maximum output
(b) T10 bottom core for maximum output
(c) T8 top core for maximum output
(d) T8 bottom core for maximum output
(e) T6 top core for maximum output.
(f) T6 bottom core for maximum output.

Repeat above adjustments for maximum output.

(g) Adjust L4 for minimum output.

AM. RF Alignment

1. Tune the receiver and generator dials to 600 kHz.

(a) Adjust the oscillator core of T4 until a signal is obtained.
(b) Adjust core of T3 for maximum output. This core should be in a position nearest to the printed panel.

2. Alter the receiver and generator dials to 1500 kHz.

   (a) Adjust trimmer C48 until the signal is obtained.
   (b) Adjust trimmer C34 for maximum output.

Repeat items 1 and 2 until calibration is correct and maximum sensitivity is obtained.

This completes the AM alignment

FM. IF Alignment

1. Set wave change switch to FM mono position.

2. All buttons out except ON/OFF.

3. Turn FM tuning knob fully clockwise.

4. Adjust FM pointer to calibration mark.

5. Leave oscilloscope connected as for AM.

6. Connect centre zero meter to junction of R71 and C100 (de-emphasis lead).

7. Connect generator across IF co-axial cable (from FM tuner to IF panel).

8. Set generator to 10.7 MHz modulated with 1000 Hz ± 10 kHz.deviation.

Adjust as follows, reducing the input to below limiting level as each stage is tuned so that the maximum tuning points can be found:-

   (a) T9 top core for zero output on the meter.
   (b) T9 bottom core for maximum output on scope.
   (c) T7 bottom core for maximum output on scope.
   (d) T7 top core for maximum output on scope.
   (e) T5 bottom core for maximum output on scope.
   (f) T5 top core for maximum output on scope.

Increase the deviation to ± 75 kHz and repeat (a) to (f) until maximum symmetrical output coincides with zero output on the meter.

9. Disconnect the generator.

FM. RF Alignment

1. Connect generator to FM aerial socket (75 ohms).

2. Tune generator to 88 MHz. Set mod. to approx. ± 25 kHz.

3. Turn receiver pointer to 88 MHz mark.

Note: With the following adjustments (4 – 8) core positions should be for correct max. tuning points as follows:-

   L2 – Farthest point from the chassis.
   L1 – Farthest point from the chassis.
   T1 – Proturding through the chassis hole.
   T2 – Bottom core nearest the chassis.
   T2 – Top core nearest the cover.

4. Adjust L2 until an audio output is obtained which coincides with zero on the meter.

5. Adjust T2 top core for maximum output.

6. Adjust T2 bottom core for maximum output.

7. Switch modulation to ± 75 kHz and repeat steps 5 & 6.

8. Keeping signal below limiting level adjust:-

   L1 for maximum output.
   T1 for maximum output.

9. Tune the receiver and generator dials to 108 MHz.

Note: The discriminator gives three maximum tuning points. The correct one is that which coincides with zero D.C. output on the centre zero meter.

Adjust

(a) C31 until an output is obtained which coincides with zero meter reading.
(b) C13 and C5 for maximum output.

Increase the RF signal input until a reading of about 2 is obtained on the receiver's tuning meter. Adjust the generator frequency slightly for zero reading at the discriminator, then adjust very carefully the cores of T5 and T2 for maximum reading on the tuning meter.

L1 and T1, C13 and C5 may also be adjusted this way at their respective frequencies.

When the alignment is finished it should be checked on a signal of approx. 50 uV. that the zero D.C. output coincides with maximum on the tuning meter, both of which should also coincide with maximum symmetrical output on the oscilloscope. Finally check that the voltages across R23 and R47 are 0.5V and 0.6V respectively.

STEREOMAX MULTIPLEX DECODER

Alignment Procedure

INSTRUMENTS REQUIRED

Signal Source

1. FM stereo multiplex coder, with 1 kHz modulation and variable 19 kHz pilot tone level.

Output Indicator

1. Oscilloscope, preferably with double beam and 1mV/cm range, and with high impedance probe.

Tools

1. Small insulated "screwdriver" trimming tool.

General Alignment Conditions

1. RF and IF sections of tuner to be aligned before decoder alignment is commenced.

2. Procedure given is that used when aligning the decoder in the complete tuner. The decoder may be aligned separately if run under simulated working conditions, the decoder being fed with multiplex signals straight from the coder and then the alignment procedure will be as given.

3. 100% modulation should be 75 kHz deviation, which corresponds to 0.8V r.m.s. of audio from the discriminator.

4. Set RF from coder into aerial input of tuner to give a tuning meter reading of 4 – 9. Tuner accurately tuned to coder signal, and A.F.C. on.

5. Oscilloscope to be connected to decoder chassis as close as possible to point of test.

6. Initially set threshold control R101 fully clockwise, 38 kHz balance controls R111 and R114 to mid position, separation control R127 fully anticlockwise.

Step.	*19 kHz Pilot*	*Audio*	*Oscilloscope Connected to:*	*Adjust*	*Adjust for:*
1	As Req'd.	None	Test point on T14 primary tap	T12a) T12b)* T14) T13	Maximum 38 kHz (Reduce 19 kHz input to avoid limiting).
2	9%	None	R.H.) Audio L.H.) Outputs	L7) 19 kc/s L8) filter	Minimum 19 kHz residual output.
3	9%	None	R.H.)Audio L.H.) Outputs	R111) 38 kHz R114) Balance	Minimum residual output (38 kHz & higher 19 kHz harmonics
4	9%	R.H. 1 kHz 90%	R.H.) Audio L.H.) Outputs	T13	Re-adjust for greatest stereo separation and output on correct channel.
5	9%	"	"	R127 Separation Control	Greatest stereo separation.
6	Repeat steps 4 and 5 for both R.H. and L.H. inputs, and adjust for optimum separation on both channels if necessary.				
7	Repeat steps 2 and 3				
8	None	None	–	T101 Threshold Control	Now turn this control fully anticlockwise.
9	7%	None	–	R101	Turn very slowly clockwise until stereo lamp just comes on.
10	Turn pilot off, and then slowly increase from a low level and check that Stereo lamp comes on at 7%. Re-adjust R101 if necessary				

* These transformers must not be re-adjusted after step 4 has been carried out, without repeating whole procedure. Therefore, they must initially be set accurately.

VOLTAGE AND CURRENT CHART FOR STEREOMAX AM/FM TUNER

Measured with AvoMeter Model 8 with respect to chassis. 10V range. No signal input.
HT line 9V. Values ± 10%.

Transistor	*Switch Position*	*Emitt. V*	*Base V*	*Collector V*	*Collector current mA*
TR1. RF Amp	FM	8.4	7.4	0	2
	AM	0.5	5.6	0	0
TR2 Mixer	FM	8.3	7.2	0.2	1
	AM	0.5	0.4	0	0
TR3 Osc. FM	FM	7.5	7	0	1.5
	AM	0.5	0.4	0	0
TR4 Mixer	FM	1.4	6.8	0	0
	AM	8.4	7.9	0.15	1.5
TR5 Osc. AM	FM	1.2	0.9	0	0
	AM	7.3	6.9	0.2	1.7
TR6 FM IF	AM/FM	7.9	7.0	0.2	1.8
TR7	AM/FM	8.4	7.6	0.2	1.8
TR8	AM/FM	7.5	6.8	4.6	4.8
TR9	AM/FM	5.5	4.7	1.1	8.5
TR10	AM/FM	7.8	7.2	0.5	5.0
TR11 Muting on and noise suppression control adj. to:-	AM/FM(1)	4.8	3.2	0	0.2
	Min. (2)	4.8	3.5	–	0.2
	Max. (3)	6.5	5.5	–	0.5
TR12	As for TR11				
	(1)	0	4.8	–	0
	(2)	5	4.8	–	0
	(3)	7	6.5	–	IE = 0.35
TR13	AM/FM	8.5-9.5	9.5-10.5	18	

GENERAL VOLTAGE AND CURRENT CHART

AC Input 240V 240V tap.		Switch position.
No signal input except for FM Stereo		
Current to IF panel	22 mA	AM/FM
Current to FM tuner	7 mA	FM
Current to AM panel	5 mA	AM
Current through HT fuse	50 mA	AM
Current through HT fuse	53 mA	FM Mono
Current through HT fuse	63 mA	FM (Mono and Muting)
Current through HT fuse	105 mA	FM Stereo
X22 current approx.	3 mA	AM/FM
Primary current	32 mA	AM/FM Mono
Primary current	38 mA	FM Stereo and lamp. On.
Stereo lamp current	40 mA	FM Stereo and lamp. On.
Max. supply power	9 watts.	
Voltage on IF panel	8.5-9.5	AM/FM/Stereo
Voltage on decoder panel	18V	FM Stereo
Voltage on decoder panel	21V	FM Mono

R22 adjusted for 0.5V across R23
R44 adjusted for 0.6V across R47

Voltage at junction of R78 and X15	9.5-10.5
Transformer magnetizing current	10 mA

VOLTAGE AND CURRENT CHART FOR STEREOMAX DECODER

Measured with AvoMeter Model 8 (100V range was used for measuring base voltage of TR14).

"Mono" voltages and currents measured with wavechange switch in FM Mono position.

For 19 kHz measurements with 30mV input, threshold control must be turned fully clockwise.

		D.C. VOLTAGE (Volts)		D.C. CURRENT (mA)		19 kHz VOLTAGE (Peak-to-Peak)	
COMPONENT	*Terminal*	*MONO*	*STEREO*	*MONO*	*STEREO*	*INPUT 30mV*	*INPUT 300mV*
C140		14	11	–	–	–	–
C134		15.9	12.6	–	–	–	–
–Ve Supply		22	18	16.5	18.5	–	–
TR14	e	5.5	4.2	–	–	30mV	300mV
	b	6.2	4.9	–	–	30mV	300mV
	c	14	11	0.85	0.64	0	0
TR15	e	4.8	3.5	–	–	–	–
	b	5.5	4.2	–	–	30mV	300mV
	c	14	11	10	7.8	1V	9V
T12b	Tap	0.4	3.4	–	–	100mV	900mV
TR16	e	1.3	2.2	–	–	–	–
	b	0.4	2.8	–	–	70mV	700mV
	c	14	10	0	1.3	11V	20V
T13	Secondary	0	0	–	–	5V	9V
TR17	e	0	2.4	–	–	–	–
	b	0	2.5	–	–	2.5V	4.5V
	c	14	10	0	2.3	4V	11V
TR18	e	0	–	–	–	–	–
	b	0.05	0.85	0	2.3	–	–
	c	22	0.15	0	45	–	–
X15		0.6	0.1	<4	0	70mV	700mV
T14	Secondary	7	5.5	–	–	1.25V	3.5V
Across R114, R111		–0.5	+0.8	–	–	–	–
TR19) TR20)	e	10.6	8.6	–	–	–	–
	b	9.4	7.6	–	–	–	–
	c	4.8	3.8	0.64	0.46	–	<3mV

COMPONENT PARTS LIST

10% unless otherwise stated.

Circuit Ref.	*Part Number*	*Ohms*	*Description*
			RESISTORS
R1			
R2	RE 5172	10K	Erie EM 1
R3	RE 5167	2K2	Erie EM 1
R4	RE 5169	82K	Erie EM 1
R5	RE 5166	1K	Erie EM 1
R6	RE 5170	330	Erie EM 1
R7	RE 5173	4K7	Erie EM 1
R8	RE 5171	22K	Erie EM 1
R9	RE 5174	220	Erie 15 5%
R10	RE 5166	1K	Erie EM 1
R11	RE 5167	2K2	Erie EM 1
R12	RE 5168	8K2	Erie EM 1
R13	RE 5166	1K	Erie EM 1
R14	RE 5175	470K	Erie 15 5%
R15	RE 5176	820K	Erie 15 5%
R16	RE 5175	470K	Erie 15 5%
R17	RAS4103	10K	Erie 9
R18	RAS1822	8K2	Erie 9AP
R19			
R20	RAS1822	8K2	Erie 9AP
R21	RAS1562	5K6	Erie 9AP
R22	VR 1087	220K	20% Lin. Min. Preset Morganite 62V
R23	RAS1391	390	Erie 9AP
R24	RAS1101	100	Erie 9AP
R25	RAS1102	1K	Erie 9AP
R26	RAS1101	100	Erie 9AP
R27	RAS1222	2K2	Erie 9AP
R28			
R29	RE 5182	2K2	Erie 15
R30	RAS1682	6K8	Erie 9AP
R31	RE 5163	680K	Erie EM2
R32	RHS7682	6K8	Erie 7AD
R33	RAS1331	330	Erie 9AP
R34	RAS1682	6K8	Erie 9AP
R35	RAS1223	22K	Erie 9AP
R36	RE 5151	1K8	Erie 15 5%
R37	RAS1681	680	Erie 9AP
R38	RE5150	100	Erie 15
R39			
R40	VR 4187	220K	20% Lin. Preset Pot Morganite 62H.
R41	RE 4963	5K6	Erie 9AP2
R42	RE 4911	10K	Erie 9AP2
R43	RAS1822	8K2	Erie 9AP
R44	RAS1272	2K7	Erie 9AP
R45	RE 5197	2K7	Erie EM 2
R46	RE 5151	1K8	Erie 15 5%
R47	RE 5149	330	Erie 9AP 2
R48	RE 5150	100	Erie 15
R49			
R50	RAS1223	22K	Erie 9AP
R51	RAS1682	6K8	Erie 9AP
R52	RE 5149	330	Erie 9AP2
R53	RAS1102	1K	Erie 9AP
R54	RAS1682	6K8	Erie 9AP
R55	RAS1474	470K	Erie 9AP
R56	RE 5153	68K	Erie EM1
R57	RE 5178	2K2	Erie 15 5%
R58	RAS1221	220	Erie 9AP
R59			
R60	RAS1271	270	Erie 9AP
R61	RE 5036	150	Erie 9AP2
R62	RE 5150	100	Erie 15
R63	RE 5150	100	Erie 15
R64	RE 5178	2K2	Erie 15 5%
R65	RE 5179	8K2	Erie 15 5%
R66	RE 5179	8K2	Erie 15 5%
R67	RE 5180	10K	Erie EM 1 2%
R68	RAS1822	8K2	Erie 9AP
R69			
R70	RAS1102	1K	Erie 9AP
R71	RAS1474	470K	Erie 9AP
R72	RAS1223	22K	Erie 9AP
R73	RAS1105	1M	Erie 9AP
R74	RE 5162	180	Erie EM 1
R75	VR 1088	200	20% Lin. Pot. A.B. Metals 38A
R76	RHS7471	470	Erie 7AD
R77	RHS1560	56	Erie 8AP
R78	RAS1152	1K5	Erie 9AP
R79			
R80	RHS1560	56	Erie 8AP
R81	RAS1152	1K5	Erie 9AP
R82			
R83	RAS1102	1K	Erie 9AP
R84	RE 5135	22K	Erie 9AP2
R85	RAG1563	56K	Erie 9AP 5%
R86	RAG1473	47K	Erie 9AP 5%
R87	RAS1682	6K8	Erie 9AP

Circuit Ref.	Part Number	Ohms	Description
			RESISTORS (contd.)
R88	RAS1471	470	Erie 9AP
R89			
R90	RAS1470	47	Erie 9AP
R91	RAS1471	470	Erie 9AP
R92	RE 5022	470	Erie 9APV
R93	RAS1102	1K	Erie 9AP
R94	RAS1183	18K	Erie 9AP
R95	RE 5121	6K8	Erie 9AP2
R96	RAS1103	10K	Erie 9AP
R97	RAS1102	1K	Erie 9AP
R98	RAS1101	100	Erie 9AP
R99			
R100	RHS7472	4K7	Erie 7AD
R101	VR 1078	22K	20% Lin. Preset Pot. Morganite 62H.
R102	RAS1103	10K	Erie 9AP
R103	RAS1101	100	Erie 9AP
R104	RAS1151	150	Erie 9AP
R105	RE 5103	470	Erie 9AP2
R106	RHS1181	180	Erie 8AP
R107	RAS1221	220	Erie 9AP
R108	RAS1392	3K9	Erie 9AP
R109			
R110	RAG1103	10K	Erie 9AP 5%
R111	VR 1084	4K7	20% Lin. Preset Morganite 62H.
R112	RAG1103	10K	Erie 9AP 5%
R113	RAG1103	10K	Erie 9AP 5%
R114	VR 1084	4K7	20% Lin. Preset Morganite 62H.
R115	RAG1103	10K	Erie 9AP 5%
R116	RE 5184	4K7	Erie E.M.1 2%
R117	RE 5184	4K7	Erie E.M.1 2%
R118	RE 5185	33K	Erie 9APV
R119			
R120	RAS1823	82K	Erie 9AP
R121	RAS1823	82K	Erie 9AP
R122	RE 5185	33K	Erie 9APV
R123	RE 5186	5K6	Erie 9APV
R124	RAS1822	8K2	Erie 9AP
R125	RAS1822	8K2	Erie 9AP
R126	RE 5186	5K6	Erie 9APV
R127	VR 4165	100K	20% Lin. Preset Morganite 62H.
R128	RAS1101	100	Erie 9AP
R129			
R130	RAS1391	390	Erie 9AP

Circuit Ref.	Part Number	Capacity	Description
			CAPACITORS
C1	CN 1843	120 pf	10% Erie Feed Thru CFT 2500/N 3300
C2	CV 1051	12.6 pf	Part of Polar Gang 3/CG8003/2
C3	CN 4807	1K pf	Erie Feed Thru 2500
C4	CN 4807	1K pf	Erie Feed Thru 2500
C5	CV 1127	15 pf	Trimmer Erie 3116C
C6	CN 1825	15 pf	5% Erie Tub. Cer. NPO/YD
C7	CN 1824	27 pf	5% Erie Tub. Cer. N330/YD
C8	CN 4807	1K pf	Erie Feed Thru 2500
C9	CN 1817	1K pf	10% Centrelab Disc. Cer. HiKap CRL size 2
C10	CN 4807	.001 mfd	Erie Feed Thru 2500
C11	CN 1836	1000+1000pf	-20% +80% Erie Feed Thru K170051/CFT3000
C12	CV 1051	12.6 pf	Part of Polar Gang 3/CG8003/2
C13	CV 1127	15 pf	Trimmer Erie 3116C
C14	CN 1826	10 pf	5% Erie Tub. Cer. NPO/YD
C15	CN 4807	1K pf	Erie Feed Thru 2500
C16	CN 1828	6.8 pf	±0.5 pf Erie Tub. Cer. P100/YD
C17	CN 1827	12 pf	5% Erie Tub. Cer. NPO/YD
C18	CN 1832	220 pf	10% Erie Disc. Cer. 831 K120051
C19	CN 1233	20 mfd	16V Mullard C426 AR/E20
C20	CN 1823	120 pf	5% Erie Tub . Cer. N750/BD
C21	CN 1836	1000+1000pf	-20% +80% Erie Feed Thru K170051/CFT3000
C22	CN 1831	0.5 pf ±0.1pf	±0.1pf Erie 831 Gimmicon.
C23	CN 1825	200 pf	2½% 30V Polystyrene. Lemco 7
C24	CN 1834	270 pf	2½% 30V Polystyrene. Lemco 7
C25	CN 1836	1000+1000pf	-20% +80% Erie Feed Thru K170051/CFT3000
C26	CN 1836	1000+1000pf	-20% +80% Erie Feed Thru K170051/CFT3000
C27	CN 1829	4.7 pf	±0.5 pf Erie Tub. Cer. P100/YD
C28	CN 1829	4.7 pf	±0.5 pf Erie Tub. Cer. P100/YD
C29	CN 1833	10 pf	±0.5 pf Erie Disc. Cer. 861/N220.
C30	CV 1051	14.5 pf	Part of Polar Gang 3/CG8003/2
C31	CV 1127	15 pf	Trimmer Erie 3116C
C32	CN 4807	1K pf	Erie Feed Thru 2500
C33	CN 1830	.047mfd	25V -25% +50% Erie Transcap CD801/T/25V
C34	CV 1129	25 pf	Trimmer S15-11/2 (Hex.nut) P024138 (W&R)
C35	CV 1050	326 -9 pf	Polar Gang 3/CG 7102/5 (W&R)
C36	CN 1630	100 pf	5% S.M. 200V Lemco 1106R Ins.
C37	CN 4619	3.3 pf	±½ pf S.M. Lemco 1106R
C38	CN 1750	0.1 mfd	12V Erie Disc. Cer. 811/T/12V
C39	CN 1845	75 pf	N4700 Erie Disc. Cer. 861/N4700
C40	CN 1822	.05 mfd	-20% +80% 16V Disc. Cer. Ultrakap DA-486-100E
C41	CN 1822	.05 mfd	-20% +80% 16V Disc. Cer. Ultrakap DA-486-100E
C42	CN 1750	.1 mfd	12V Erie Disc. Cer. 811/T/12V.
C43	CN 1750	.1 mfd	12V Erie Disc. Cer. 811/T/12V
C44	CN 1821	500 pf	2½% Polystyrene 30V Lemco 7E

Circuit Ref.	Part Number	Capacity	Description
			CAPACITORS (contd.)
C45 or	CN 1743	.1 mfd	10% 160V D.C. Mullard C296 AA/A100K
	CN 5168	.1 mfd	S.R.C. AX 160
C46	CN 4892	.022 mfd	10% 160V D.C. Mullard C296 AA/A22K
or	CN 4970	.022 mfd	S.R.C. AX 160
C47	CV 1050	326 –9 pf	Polar Gang 3/CG 7102/5 (W & R)
C48	CV 1129	25 pf	Trimmer S15-11/2 (Hex.nut) P024138 (W & R)
C49	CN 1750	0.1 mfd	12V Erie Disc. Cer. 811/T/12V
C50	CN 1750	0.1 mfd	12V Erie Disc. Cer. 811/T/12V
C51	CN 4603	120 pf	10% 200V S.M. Lemco 1106R ins.
C52	CN 1839	350 pf	2½% Polystyrene Lemco 7MM 30V
C53	CN 1834	270 pf	2½% Polystyrene Lemco 7MM 30V
C54	CN 1750	0.1 mfd	Erie Disc. Cer. Transcap 811/T/12V
C55	CN 1750	0.1 mfd	Erie Disc. Cer. Transcap 811/T/12V
C56	CN 1748	.01 mfd	Erie Disc. Cer. Transcap 831/T/12V
C57	CN 1839	350 pf	2½% Polystyrene Lemco 7MM 30V
C58	CN 1834	270 pf	2½% Polystyrene Lemco 7MM 30V
C59			
C60	CN 1748	.01 mfd	Erie Disc. Cer. Transcap 831/T/12V
C61	CN 1226	10 mfd	16V Mullard C426 AR/E10
C62	CN 1748	.01 mfd	Erie Disc. Cer. Transcap 831/T/12V
C63	CN 1750	0.1 mfd	Erie Disc. Cer. Transcap 811/T/12V
C64	CN 1818	6.8 pf	±.5pf Erie Disc. Ceramicon 831/NPO
C65	CN 1817	1K pf	10% Centralab Disc. Cer.DD-102 1D-120CRL)
C66	CN 1800	4.7 pf	±0.5pf Erie Disc. Ceramicon 831/NPO(size 2)
C67	CN 1839	350 pf	2½% Polystyrene Lemco 7MM 30V
C68	CN 1834	270 pf	2½% Polystyrene Lemco 7MM 30V
C69			
C70	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C71	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C72	CN 1834	270 pf	2½% Polystyrene Lemco 7MM 30V
C73	CN 1839	350 pf	2½% Polystyrene Lemco 7MM 30V
C74	CN 1751	.02 mfd	Erie Transcap Ceramicon
C75	CN 1820	.047 mfd	Erie Disc. Cer. Transcap 831/T/12V
C76	CN 1257	12.5 mfd	25V Mullard C426 AR/F 12.5
C77	CN 1816	.0047 mfd	10% Tub. Cer. Erie AD K750012
C78	CN 1815	0.1 mfd	Erie Disc. Cer. Transcap 811/T/30V
C79			
C80	CN 1750	0.1 mfd	Erie Disc. Cer. Transcap 811/T/12V
C81	CN 1819	100 pf	10% Erie Disc. Ceramicon 831/N3300
C82	CN 1837	330 pf	2½% Polystyrene Lemco 7MM 30V
C83	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C84	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C85	CN 1838	470 pf	2½% Polystyrene Lemco 7MM 30V
C86	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C87	CN 1834	270 pf	2½% Polystyrene Lemco 7MM 30V
C88	CN 1838	470 pf	2½% Polystyrene Lemco 7MM 30V
C89			
C90	CN 1844	.0015 mfd	10% Erie Tub. Cer. K2600 AD
C91	CN 1630	100 pf	5% S.M. 200V. Lemco 1106R ins.
C92	CN 1630	100 pf	5% S.M. 200V. Lemco 1106R ins.
C93	CN 4618	.001 mfd	2% 350V S.M. Multi plate Lemco 1510E
C94	CN 1844	.0015 mfd	10% Erie Tub. Cer. K2600 AD
C95	CN 4964	.0047 mfd	5% Mullard Polyester C296 AC/A4K7
C96	CN 1751	.02 mfd	12V Erie Transcap Ceramicon 831/T/12V
C97	CN 4964	4K7 pf	5% Mullard Polyester C296 AC/A4K7
C98	CN 1226	10 mfd	16V Mullard C426 AR/E10
C99			
C100	CN 4965	0.68 mfd	10% Mullard C281 AB/A680K
C101	CN 1748	.01 mfd	12V Erie Disc. Cer. Transcap 831/T/12V
C102	CN 1750	0.1 mfd	12V Erie Disc. Cer. Transcap 811/T/12V
C103	CN 1239	125 mfd	16V Mullard C426/AR/E125
C104	CN 1077	1000mfd	30V Daly RTT5 63/37 BS & Bakelite Mtg. Plate
C105	CN 1239	125 mfd	16V Mullard C426/AR/E125
C106	CN 1248	80 mfd	25V Mullard C426/AR/F80
C107	CN 1239	125 mfd	16V Mullard C426/AR/E125
C108	CN 4971	1 mfd	250V Mullard C291/AB/AIM
C109			
C110	CN 1243	.64 mfd	64V Mullard C426AS/HO.64
C111	CN 4140	1.6 mfd	25V Mullard C426AS/F1.6
C112			
C113	CN 1840	2K pf	±2½% Polystyrene 125V Lemco SF20/N
C114	CN 1840	2K pf	±2½% Polystyrene 125V Lemco SF20/N
C115	CN 1631	33 pf	±2½% S.M. 350V Lemco 1106R Insulated
C116	CN 1846	0.47 mfd	10V –20% +80% Centralab DA474 – 001E
C117	CN 1846	0.47 mfd	10V –20% +80% Centralab DA474 – 001E
C118	CN 1226	10 mfd	16V Mullard C426 AR/E10
C119	CN 5303	180 pf	N4700 10% Erie Disc. Cer. 831/N4700 (.018" leads)
C120	CN 1233	20 mfd	16V Mullard C426 AR/E20
C121	CN 1255	2.5 mfd	64V Mullard C246 ARH/H2.5
C122	CN 1840	2K pf	±2½% Polystyrene 125V Lemco SF 20/N
C123	CN 1257	12.5 mfd	25V Mullard C426 AR/F12.5
C124	CN 1248	80 mfd	25V Mullard C426 AR/F80
C125	CN 1841	1K pf	±2½% Polystyrene 125V Lemco SF15/N
C126	CN 1233	20 mfd	16V Mullard C426 AR/E20
C127	CN 1815	0.1 mfd	30V +50%-25% Erie Transcap Ceramicon 811/T/30V
C128	CN 1758	47K pf	+50% –25% Erie Transcap Ceramicon 831/T/3V
C129	CN 5303	180 pf	N4700 10% Erie Disc. Cer. 831/N4700 (.018" leads)
C130	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K

Circuit Ref.	*Part Number*	*Capacity*	*Description*
			CAPACITORS (contd.)
C131	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K
C132	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K
C133	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K
C134	CN 4161	160 mfd	25V Mullard C437 AR/F160
C135	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K
C136	CN 4972	.01 mfd	±5% 160V Mullard Polyester C296 AA/A10K
C137	CN 4140	1.6 mfd	25V Mullard C426 AS/F1.6
C138	CN 4140	1.6 mfd	25V Mullard C426 AS/F1.6
C139	CN 5303	180 pf	N4700 10% Erie Disc. Cer. 831 N4700 (.018" leads)
C140	CN 4162	1000 mfd	16V Mullard C437 AR/E1000
C141	CN 4151	25 mfd	6.4V Mullard C426 AR/C25
C142	CN 4151	25 mfd	6.4V Mullard C426 AR/C25
C143	CN 1842	4K pf	±5% Polystyrene 125V Lemco SF20/N
C144	CN 1842	4K pf	±5% Polystyrene 125V Lemco SF20/N

Circuit Ref.	*Type*	*Function*
	TRANSISTORS	
TR1	BF 166 Fairchild	FM RF Amp.
TR2	BF 160 Fairchild	FM Mixer
TR3	BF 160 "	FM Osc.
TR4	BF 160 "	AM Mixer
TR5	BF 160 "	AM Osc.
TR6	BF 160 "	FM IF
TR7	BF 160 "	AM & FM IF
TR8	BF 160 "	FM Limiter
TR9	BF 160 "	FM Limiter
TR10	BF 160 "	AM IF
TR11	BC118 "	Muting
TR12	BC118 "	Muting
TR13	V410 "	H.T. Stabiliser
TR14	BC153 "	Emitter follower
TR15	BC153 "	Amplifier
TR16	BC153 "	19 kHz Amp. Limiter
TR17	BC153 "	38 kHz Amp.
TR18	BC116 "	Stereo/Mono Switch
TR19	BC113 "	Differential Amp.
TR20	BC113 "	Differential Amp.

Circuit Ref.	*Type*	*Function*	*Part Number*
	DIODES		
X1	BA130 Fairchild	FM Local/Distance	GR 4032
X2	BA110 "	AFC	GR 4033
X3	BA130 "	AM Local/Distance	GR 4032
X4	BA130 "	AM Local/Distance	GR 4032
X5	BA130 "	FM AGC	GR 4032
X6	OA90 Mullard	FM Meter rectifier	GR 4019
X7	BA130 Fairchild	Muting rectifier	GR 4032
X8	BA130 "	AM AGC	GR 4032
X9			
X10	BA130 "	Discriminator	GR 4032
X11	BA130 "	Discriminator	GR 4032
X12	OA90 Mullard	AM Detector	GR 4019
X13	BA129 Fairchild	HT Rectifier	GR 4027
X14	BA129 "	HT Rectifier	GR 4027
X15	BA130 "	Threshold Switching	GR 4032
X16	OA90 Mullard	Frequency doubler	GR 4019
X17	OA90 "	Frequency doubler	GR 4019
X18	OA90 "	Detector	GR 4019
X19	OA90 "	Detector	GR 4019
X20	OA90 "	Detector	GR 4019
X21	OA90 "	Detector	GR 4019
X22	BZX15 Fairchild	Zenner diode	GR 4031

Circuit Ref.	*Description*	*Part Number*
	TRANSFORMERS, COILS AND CHOKES	
T1	Aerial Coil Assy	CL 1442
T2	Tuner Output Coil Assy	CL 1445
T3	Medium Wave Aerial Coil Assy.	CL 1440
T4	A.M. Oscillator Coil Assy.	CL 1431
T5	FM. IF. Coil Assy.	CL 1432
T6	AM. IF. Coil Assy.	CL 1433
T7	FM. IF. Coil Assy.	CL 1432
T8	AM. IF. Coil Assy.	CL 1434
T9	Discriminator Coil Assy.	CL 1435
T10	AM. IF. Coil Assy.	CL. 1436
T11	Mains Transformer	TR 1221
T12a	Band-pass Transformer	CL 1446
T12b	Band-pass Transformer	CL 1447
T13	Frequency Doubler Transformer	CL 1448
T14	Detector Transformer Decoder	CL 1449
L1	RF Coil	CL 1443
L2	Oscillator Coil Assy	CL 1444
L3	IF Rejector Coil Assy	CL 1441
L4	AM. IF Rejector Coil Assy	CL 1430
L5	Audio Filter Coil Assy.	CL 1439
L6	(Canadian only)	
L7	Filter Coil Assy.	CL 1450
L8	Filter Coil Assy.	CL 1451
R.F.C. 1,2 3,4 & 5.	RF Choke	CL 4135

SUNDRY COMPONENTS AND ASSEMBLIES

Bulbs				MES Round 11mm. 12/14V 2.2W	DL 1010
Bulbs				LES Lilliput 4mm. 12/14V .75W	DL 1011
Lampholder				MES Pressac 20/377	DL 4004
Lampholder				Lilliput Pressac 20/802	DL 1009
Drive Cord				Standard Nylon .02 90" length	CV 1324
Knob				Tuning FM or AM. Pedoka Art No. 12180 White V1/200 with Danish Silver Ground Finish	KN 1139
Knob				Switch Pointer Assy	KN 1136
Fuse				150mA Anti-Surge (Mains) Belling Lee $^{3}/_{16}" \times {}^{5}/_{8}"$	FU 4101
Fuseholder			"	" L575	FU 4009
Fuse	100mA	(H.T.)	"	L562	FU 1005
Fuseholder			"	" L1383	FU 1006
Mains Voltage Selector, Moulded.	Car Fastener				SP 1386
Mains Socket 2 way outlet	"	"			SK 1017
Phono Plug				Black (unassembled) Aerial Pressings RA 1826/C0	PL 1020
Phono Plug				Green " " RA 1826/C5	PL 1019
Edge Connector Assembly.				Pressac. Body moulding Series 70, 1 Bracket 10/1324, 5 Contacts 10/1322 1 Polarising Key 10/1330, 3 Contacts 10/1322 1 Bracket 10/1324	PL 1021
Aerial Input Panel Assy.					MS 1550
Decoder Plug Panel Assy.					PN 1385
Output Socket Panel Assy.					MS 1551
Tuning Meter				Type B106 200 microamp F.S.D. Pedoka	SP 1392
4 way Push Button Switch AB Metal Products					SW 1596
Switch Wafer Assembly					SW 1594
Printed Panel Assembly				PAM 1/2	PN 1381
" "				P1F1/3	PN 1380
" "				PP1/3 Power Pack	PN 1377
" "				PD2 Decoder	PN 1386
FM Tuner Chassis Assy.					TU 4108
Printed Panel				PAM 1/2	PN 1389
" "				P1F1/3	PN 1379
" "				PP1/3 Power Pack	PN 1378
" "				PD2 Decoder	PN 1389
" "				Decoder Plug	PN 1388

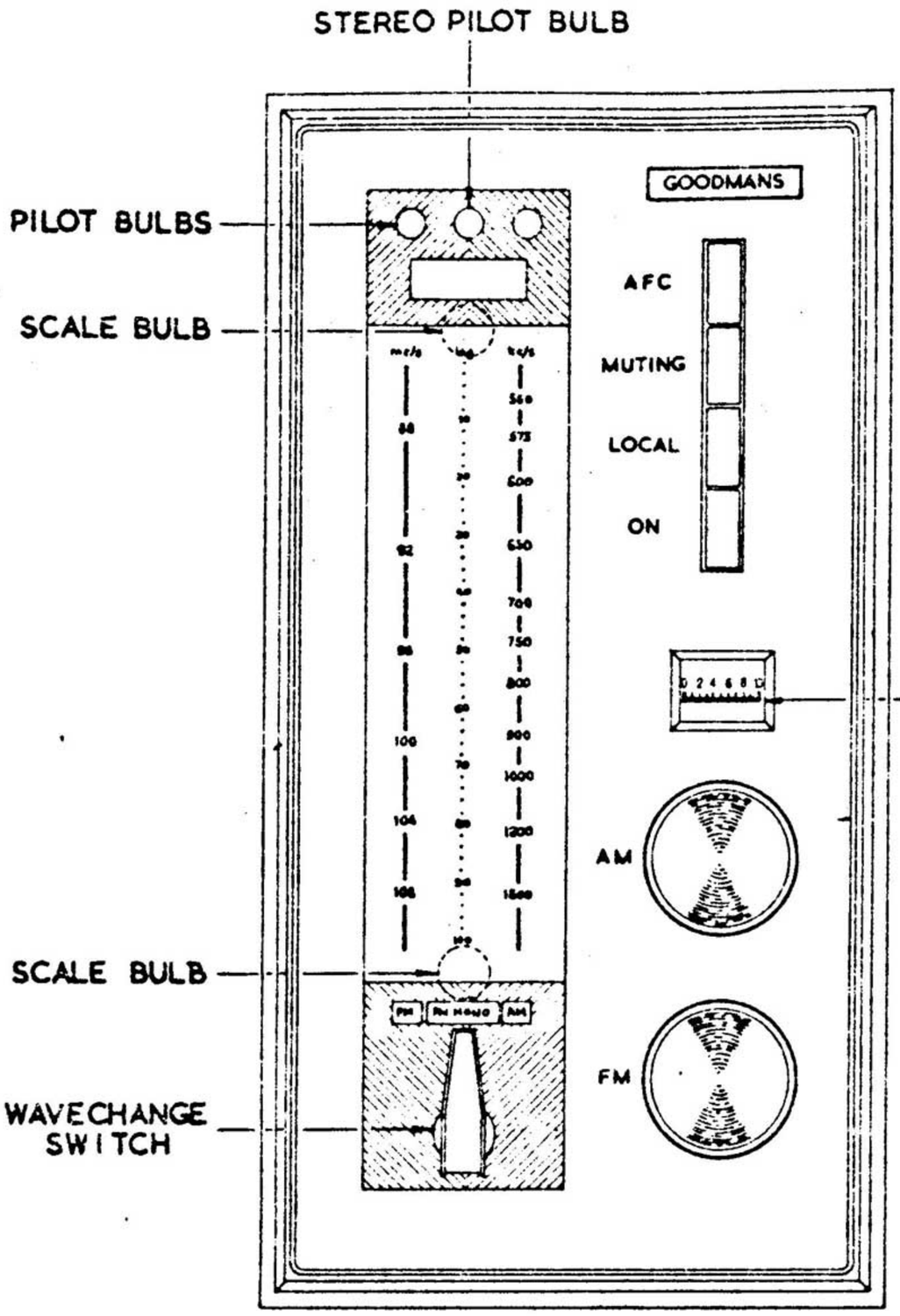


FIG. 2.
FRONT PANEL

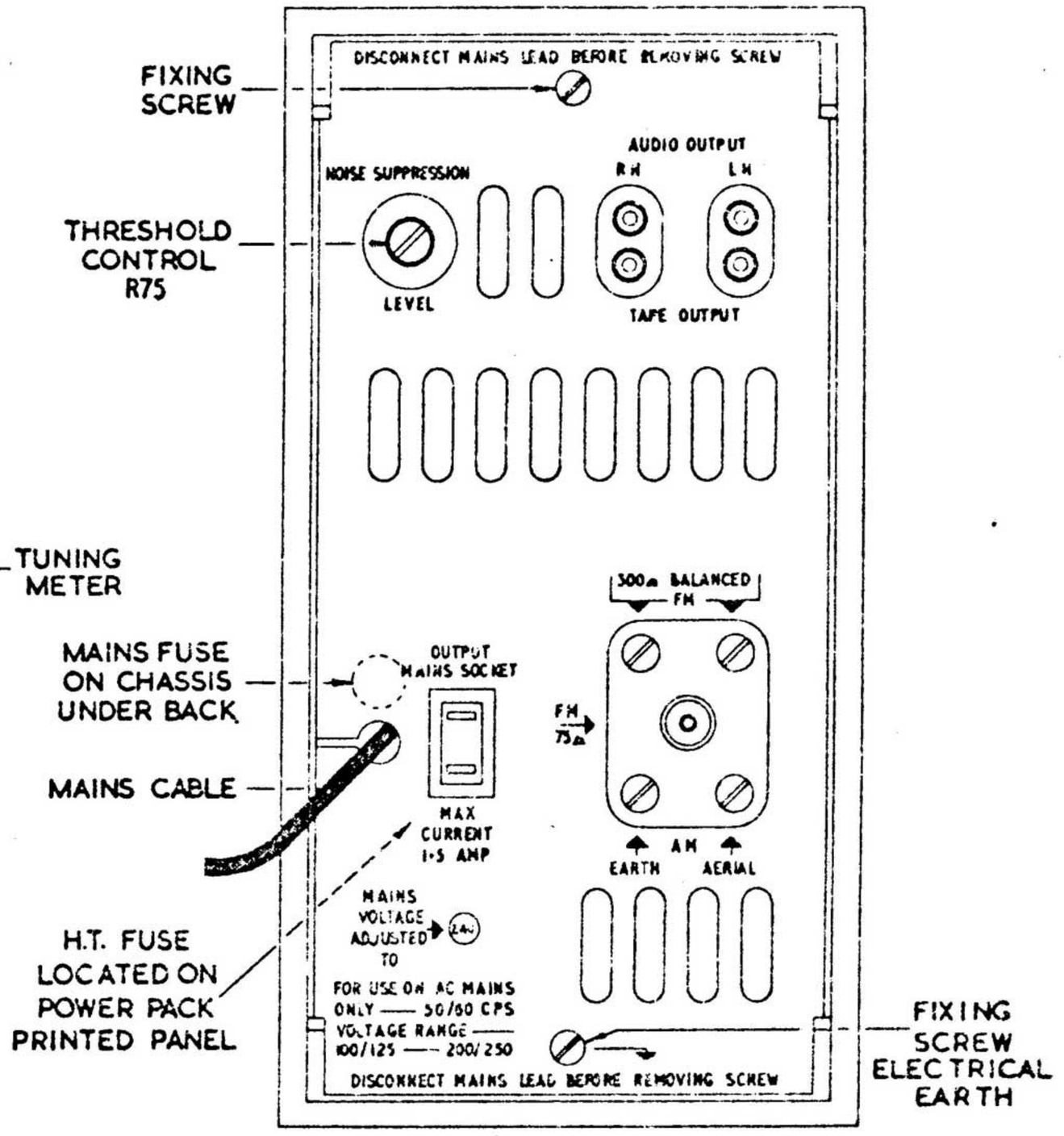
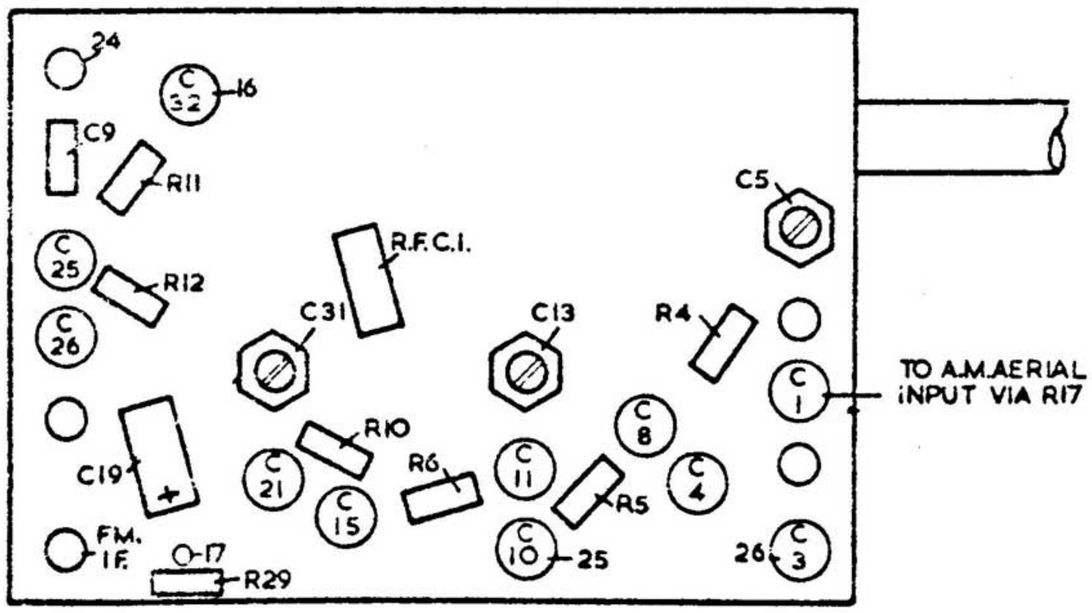
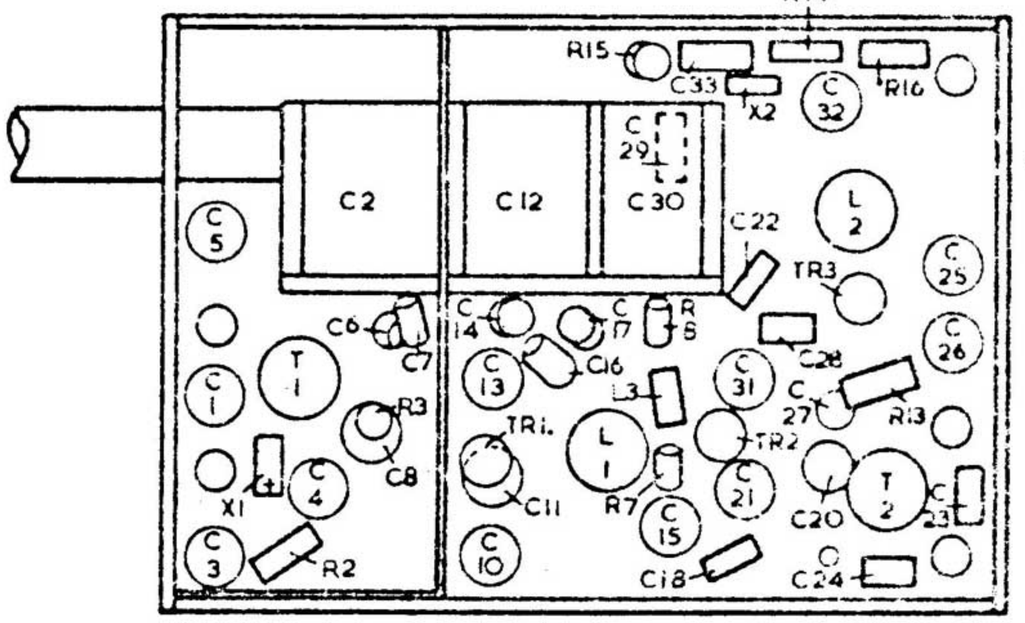


FIG. 1.
REAR PANEL

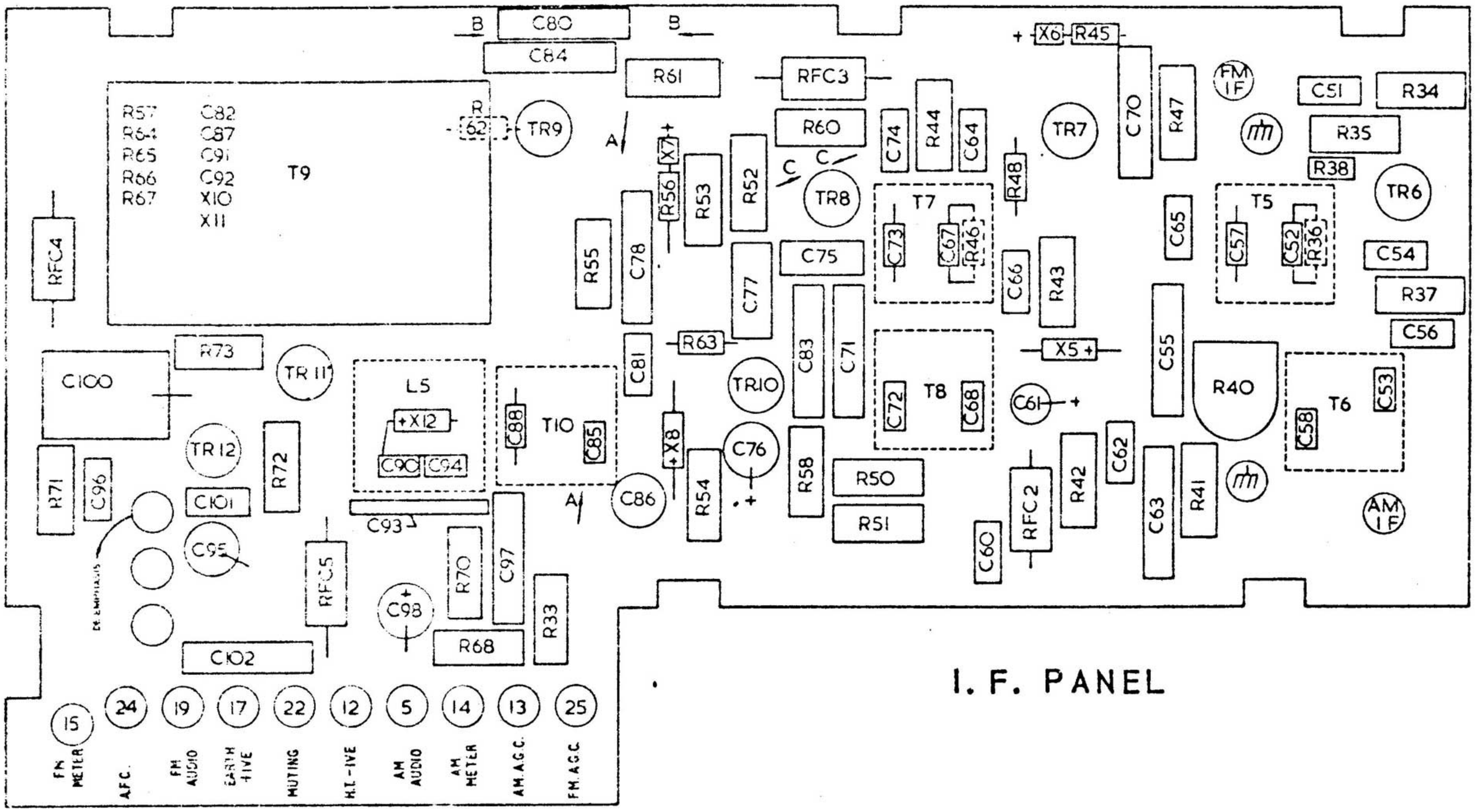


OUTSIDE VIEW

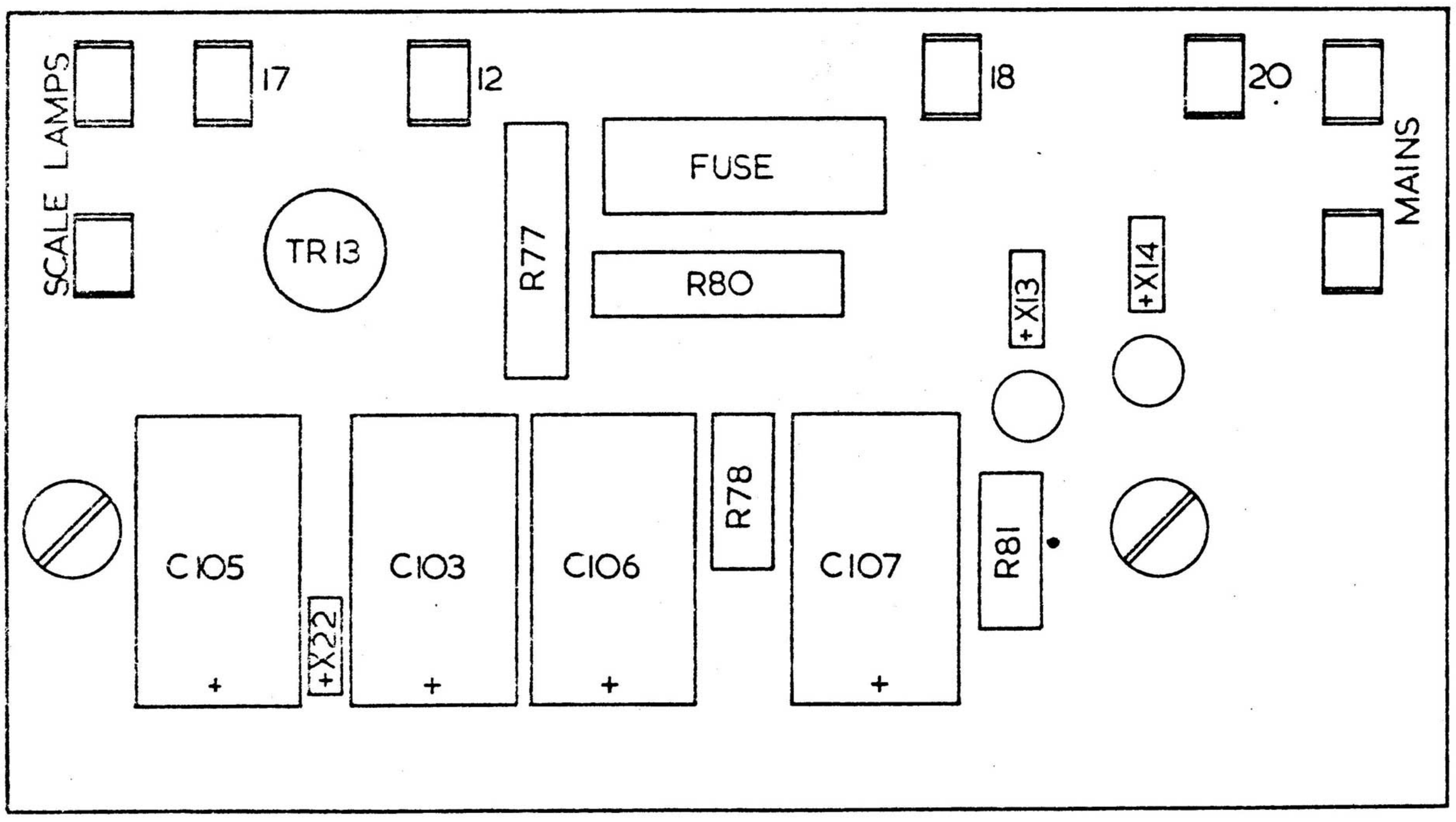


INSIDE VIEW

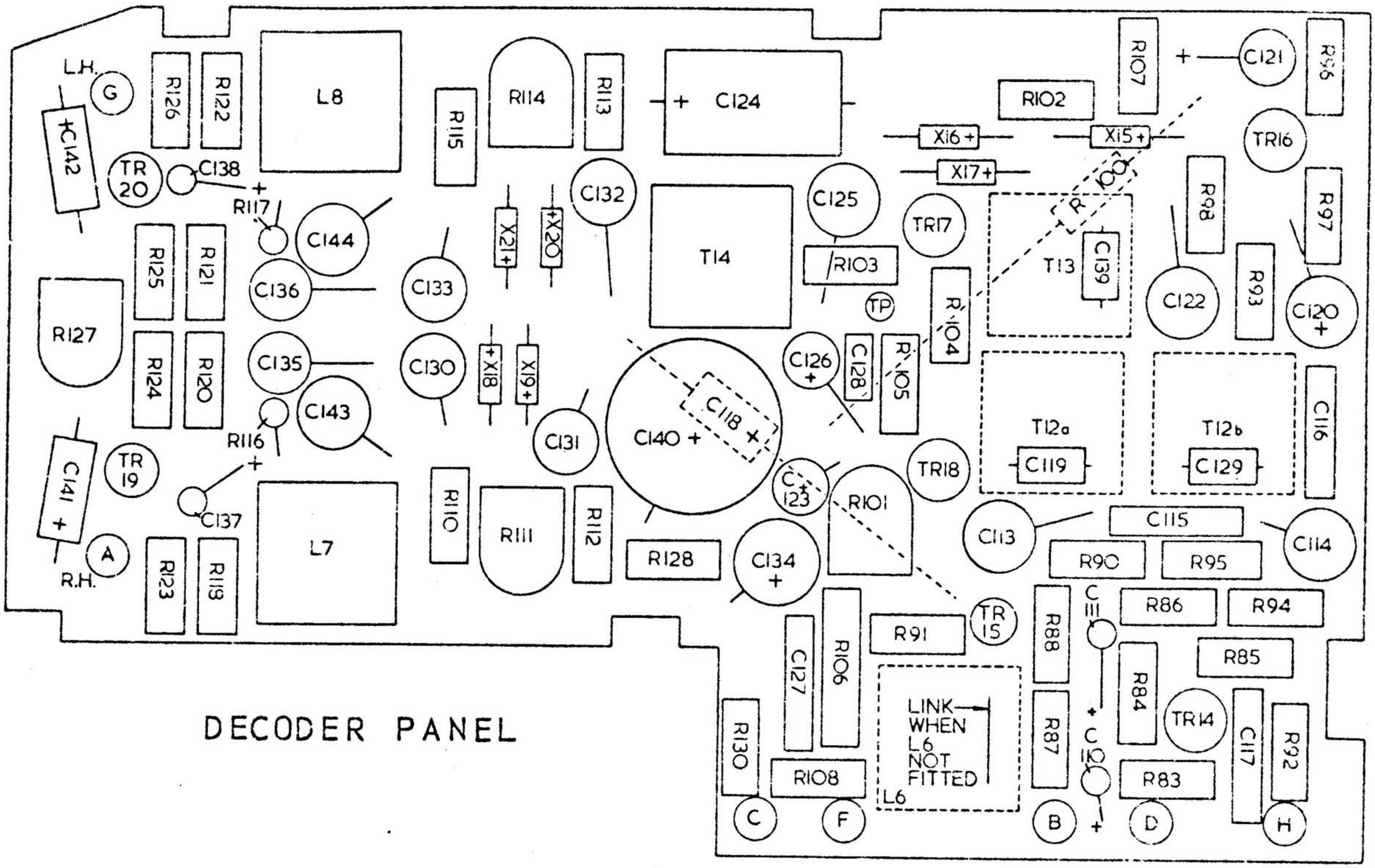
F.M. CHASSIS



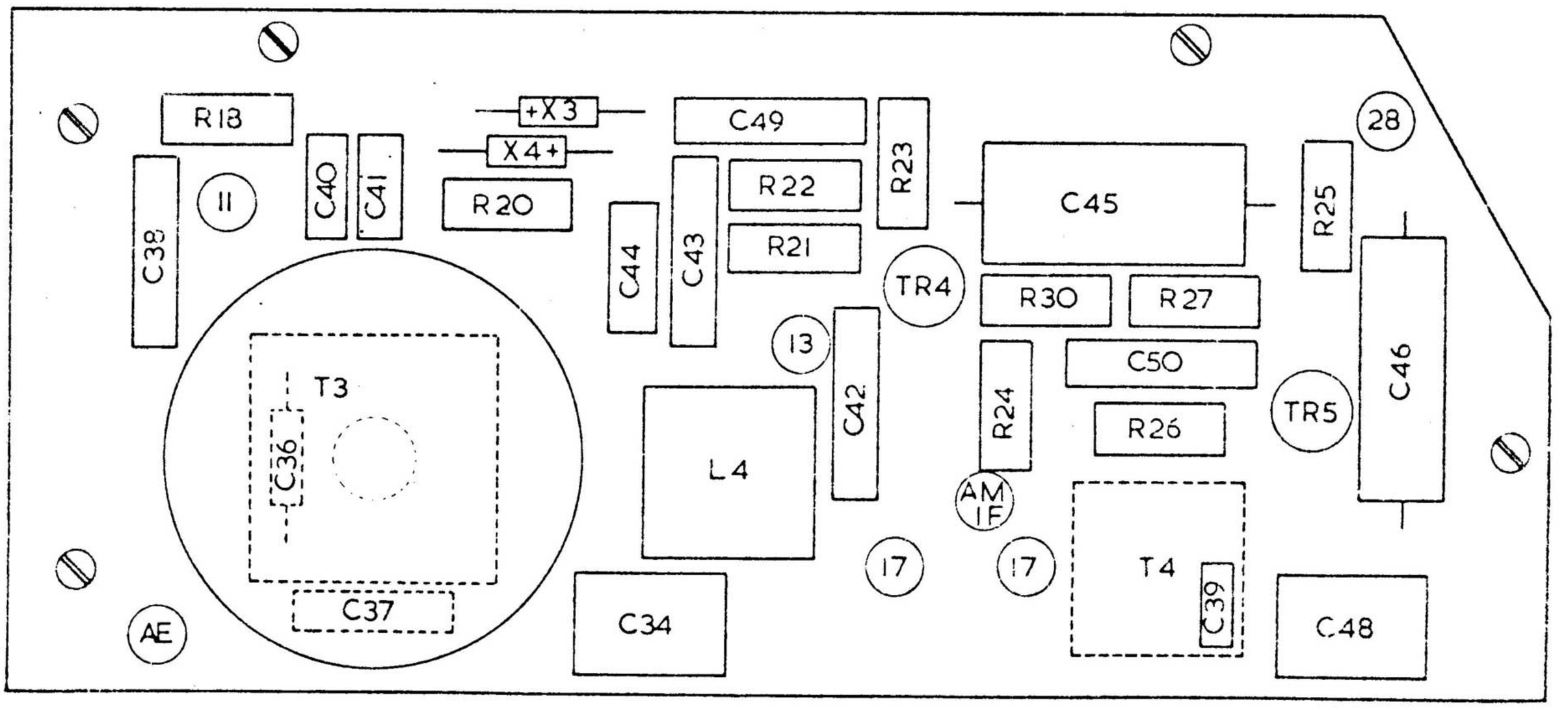
I. F. PANEL



POWER PACK PANEL



DECODER PANEL



A. M. PANEL

SHORT RIVET

BOSS ON PULLEY

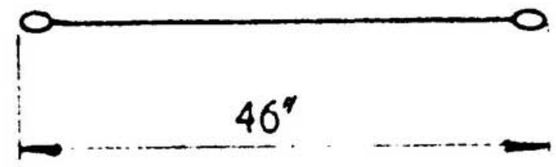
POINTER AT TOP GANG FULLY CLOSED.

FM. TUNER DRIVE DRUM

TURN FULLY CLOCKWISE TO CLOSE GANG

F.M. BOTTOM PULLEY

CORD LENGTH 46"
SUBJECT TO CORRECTION
BY PRODUCTION REQUIREMENTS



4 TURNS OF CORD

FM. FLYWHEEL DRIVE SHAFT.

ADJUSTABLE PULLEY BRACKET

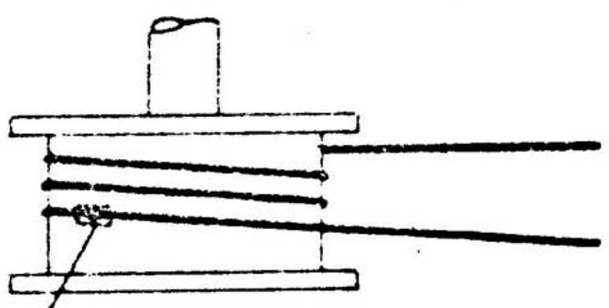
SHORT RIVET

LONG RIVET

LONG RIVET

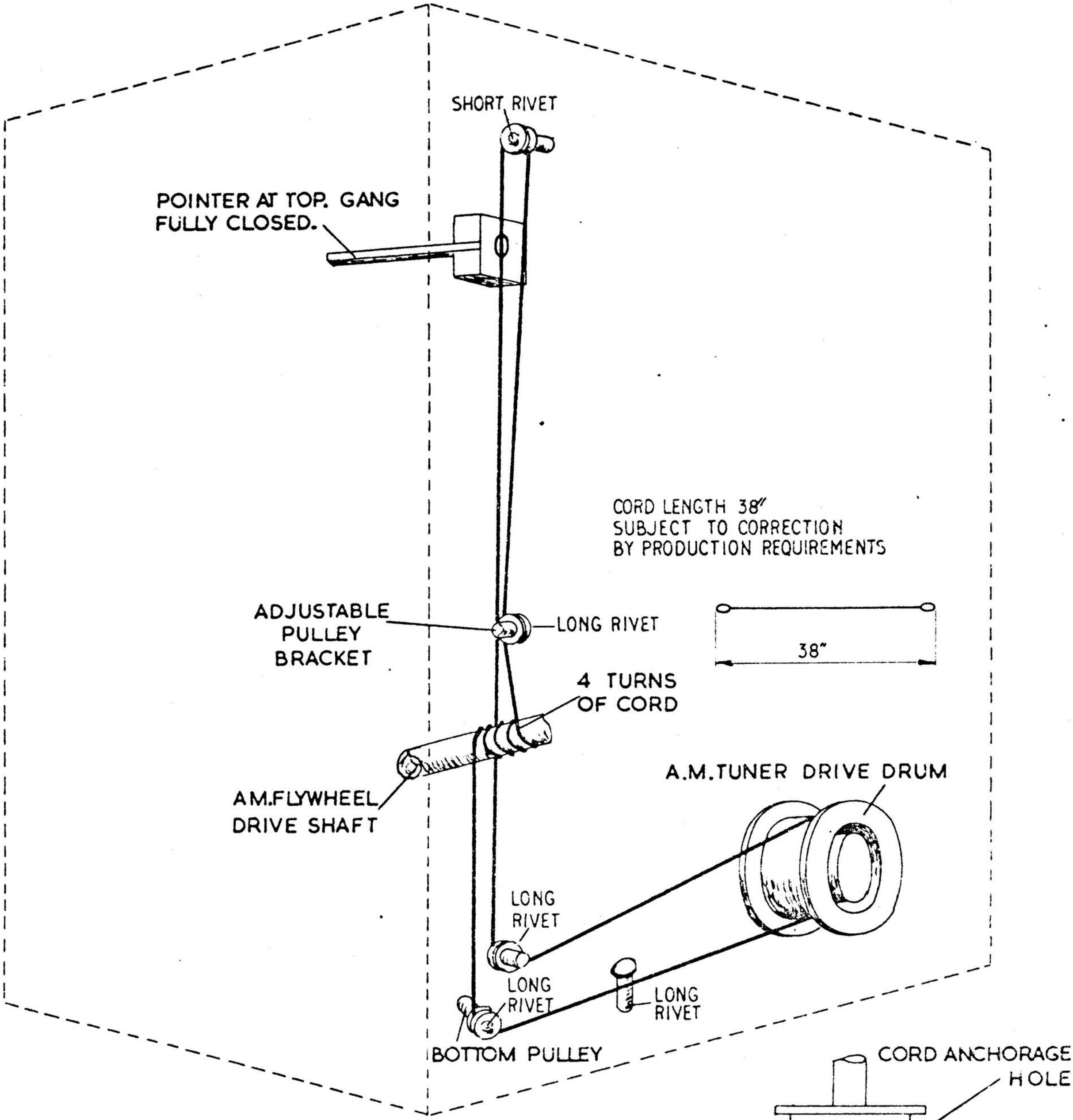
SHORT RIVET

BOTTOM PULLEY



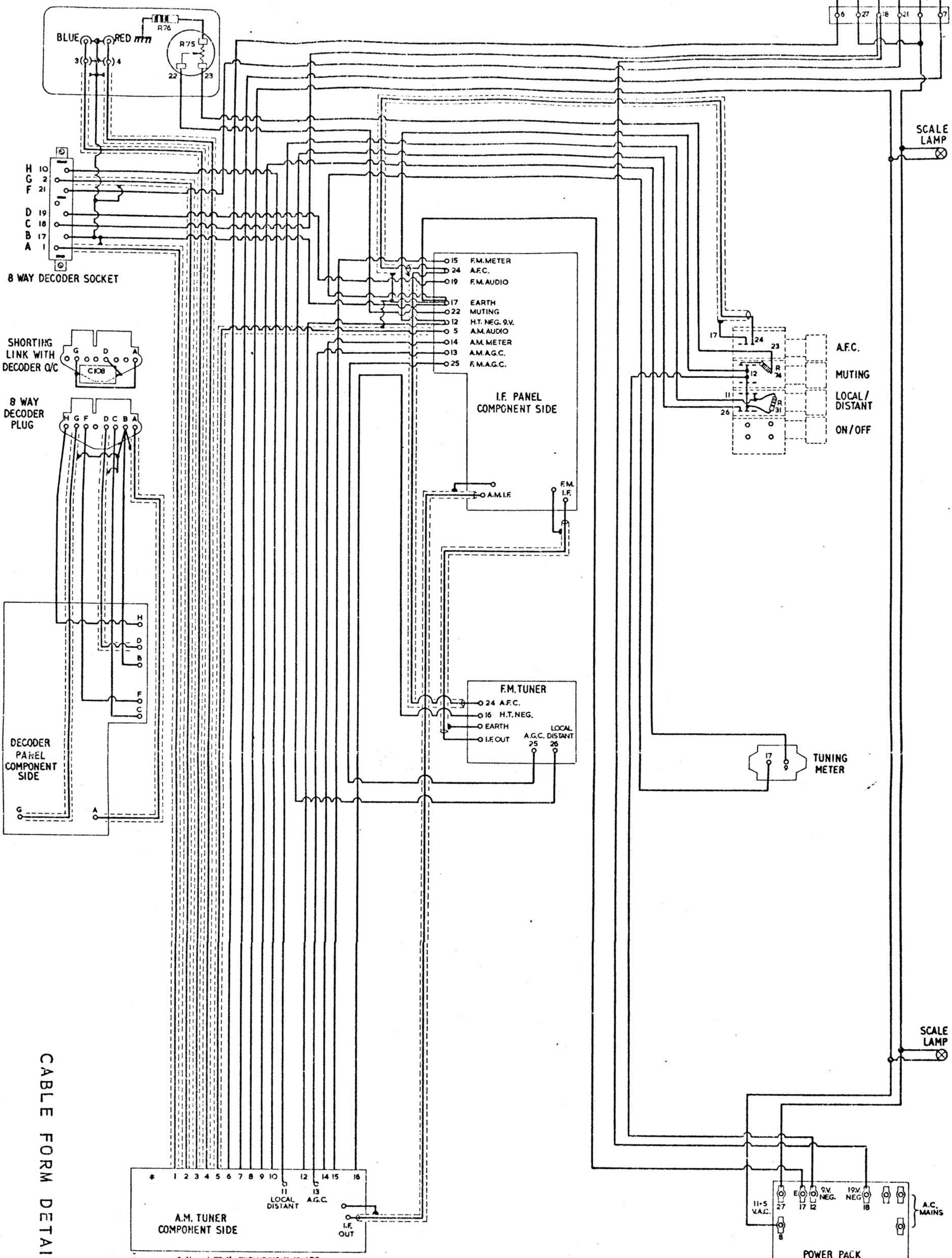
TOP VIEW OF DRIVE DRUM FULLY CLOSED

F.M. DRIVE CORD DETAILS



A.M. DRIVE CORD DETAILS

REAR VIEW OF OUTPUT PANEL



* Nos. 1 TO 16, EXCLUDING 11, 13 ARE LOCATED ON A.M. F.M. SWITCH UNDER AM TUNER PANEL.

CABLE FORM DETAILS

PIN No.	COLOUR	
1	SCREENED GREY	PIN 'A' DECODER SOCKET
2	SCREENED WHITE	PIN 'G' DECODER SOCKET
3	SCREENED CREAM	OUTPUT SOCKET. BLUE
4	SCREENED GREEN	OUTPUT SOCKET. RED
5	SCREENED BLACK	A.M. AUDIO
6	BLACK / BLUE	A.M. INDICATOR LAMP
7	GREEN / VIOLET	F.M. INDICATOR LAMP
8	BLUE / RED	SCALE LAMP SUPPLY. LIVE
9	VIOLET / ORANGE	TUNING METER
10	BLACK / WHITE	DECODER ON / OFF
11	GREY / WHITE	LOCAL / DISTANT SWITCH. A.M.
12	PINK / BLACK	H.T. NEG. 9.V. A.M.
13	BROWN / GREEN	A.M. A.G.C.
14	GREY / ORANGE	A.M. METER

PIN No.	COLOUR	
15	ORANGE / BLACK	F.M. METER
16	GREY / BROWN	H.T. NEG. F.M. TUNER
17	BROWN / BLACK	EARTH
18	BROWN / PINK	DECODER H.T. NEG. 19.V.
19	GREY / VIOLET	F.M. AUDIO. NOT IN CABLE FORM
21	BLACK	STEREO INDICATOR LAMP
22	YELLOW / RED	NOISE SUPPRESSION CONTROL
23	RED / VIOLET	NOISE SUPPRESSION CONTROL
24	SINGLE SCREENED *	A.F.C.
25	GREY / BLUE	F.M. A.G.C.
26	YELLOW / PINK	LOCAL / DISTANT SWITCH. F.M.
27	ORANGE / YELLOW	SCALE LAMP SUPPLY

* "LIGHTWEIGHT" 7/·004" ·076" DIA

STEREOMAX. AM. FM. TUNER.