HACKER DEMOCRAT Model RP34

General Description: Compact portable receiver with 9 transistors and 1 diode. Aerial, 8 in. ferrite rod. Speaker: elliptical, 15 Ω. Batteries, 2 × PP9 Ever Ready. Battery current, 18 mA approximately (quiescent). Output, 1.5 W.

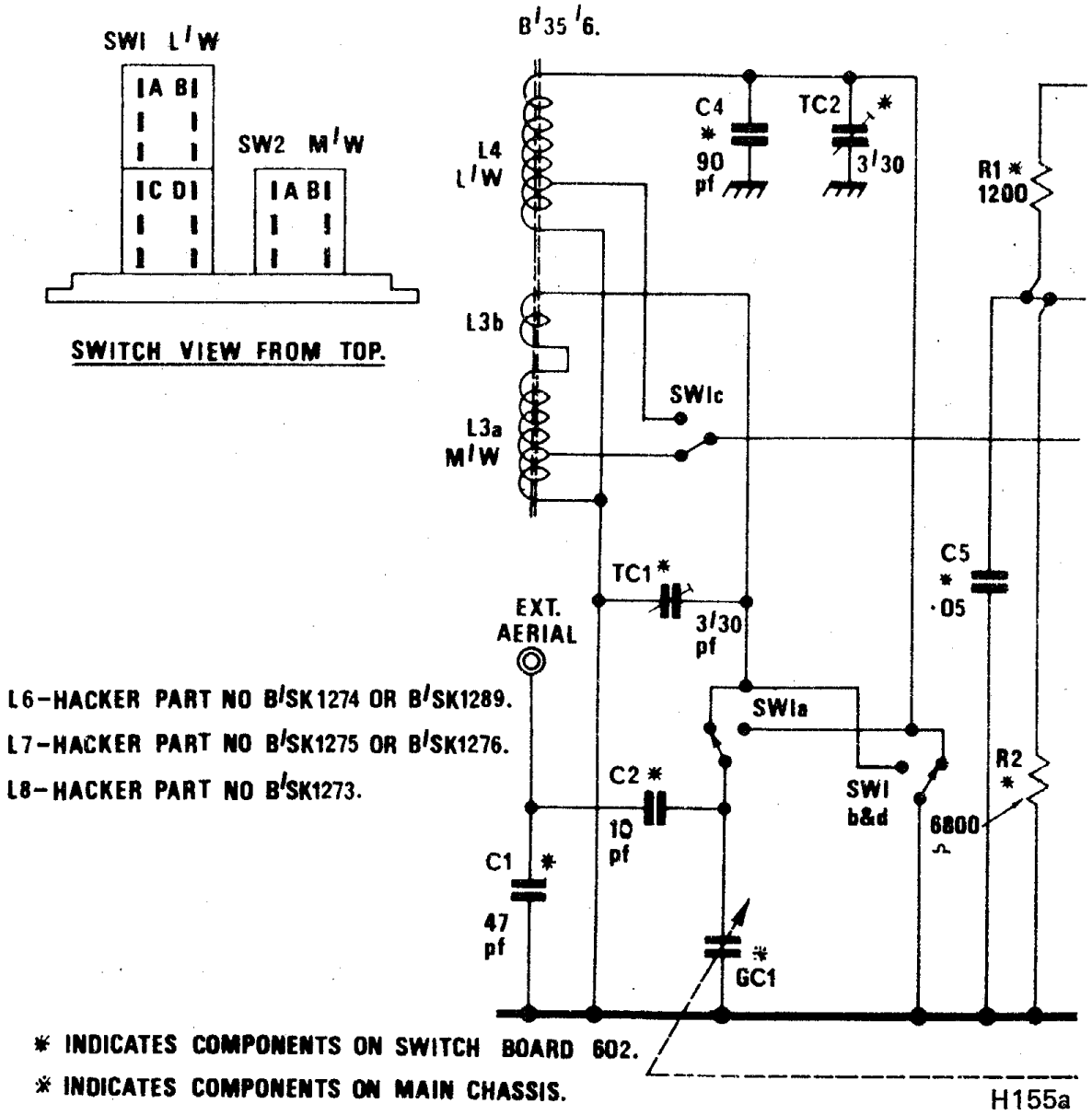
Wavebands: M.W.: 191–535 metres. L.W.: 1120–1980 metres.

Circuit Description (Tuner): The car aerial which is coupled via C1 is switched by SW1A on to the top of L36 for M.W. and L4 for L.W. L3 and L4 are the aerial coils and are resonated at each end of a long length of ferrite rod, producing a highly selective and sensitive internal aerial.

GC1 is the variable tuning element for L3 and L4 and TC1 and TC2 are the M.W. and L.W. aerial trimming condensers respectively. The signals are fed to the base of T2 via the low impedance taps on L3 or L4 via C7.

T2 is a mixer and operates by local oscillations produced by T1 fed to the emitter via the low impedance winding in L5 (osc. coil).

The oscillator is tuned on M.W. by C9, GC2 and TC3, C9 being the padding condenser, TC3 the trimming condenser and GC2 the variable tuning element.



(H155a) Circuit Diagram of Tuner—Model RP34 (Part)

These same conditions with the exception of TC3, tune oscillator on L.W. with addition of C10 and TC4, TC4 being the trimming condenser (L.W. only).

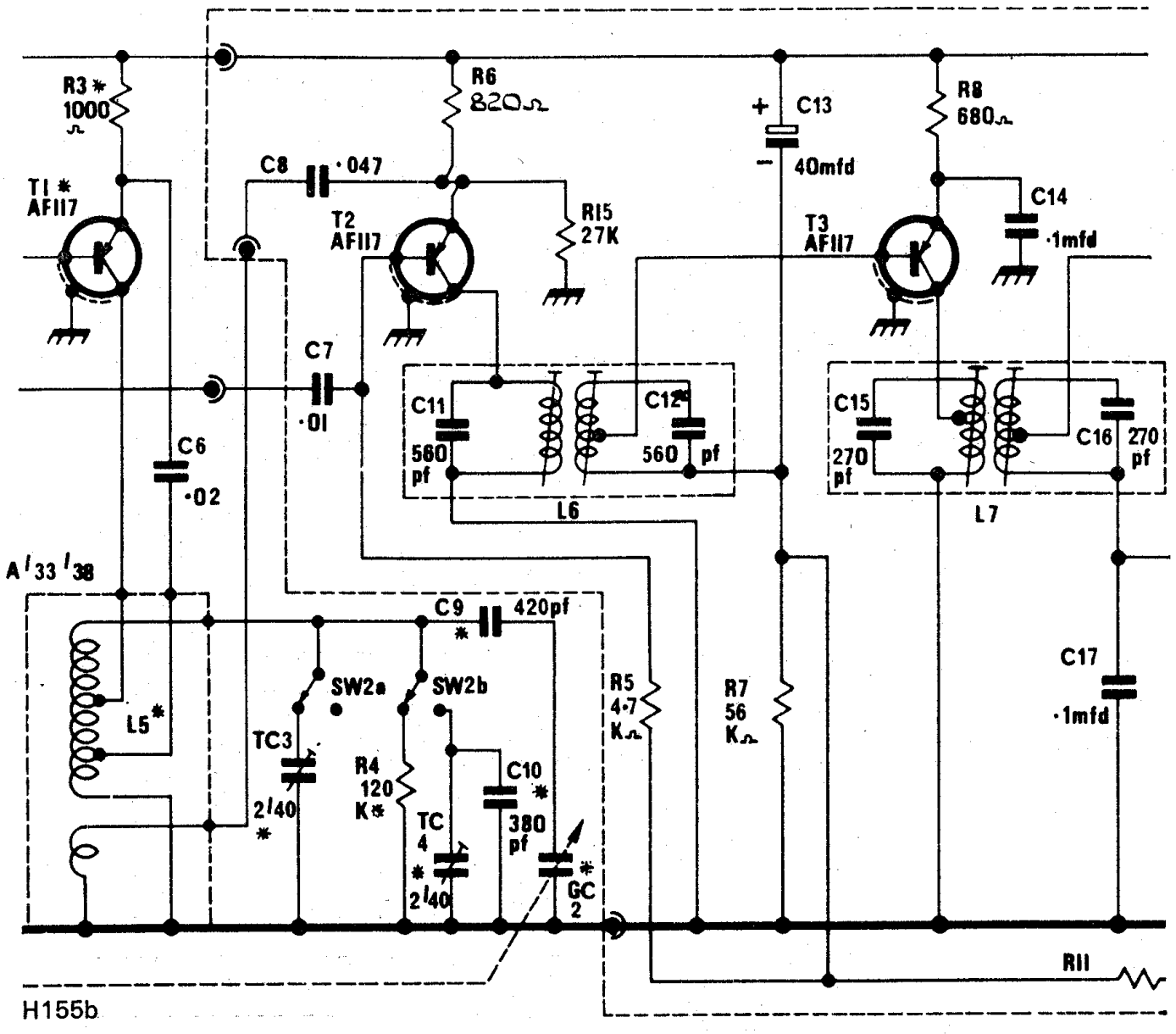
From T2 the signals are fed via L6 to the base of T3 which is a grounded emitter I.F. amplifier. The base bias varies according to the A.G.C. conditions but is held constant in the low signal (no A.G.C.) conditions by the network R7, R11, R13 and VR1. A.G.C. is also applied via R5 to the base of T2

From T3 the signals are fed via L7 to the base of T4 which is also a grounded emitter I.F. amplifier. The base bias is derived from the network R9 and R10. Collector current is stabilised by R12.

From T4 the signals are fed to the detector diode CR1 from which the audio signal and the A.G.C. voltage is taken via R13 and R11 respectively.

VR1 is the volume control and the resulting A.F. developed across it is fed to the amplifier via the interconnecting plug PL1.

Circuit Description (Amplifier): The circuit employs 5 transistors D.C. coupled with a high A.C./D.C. feedback loop. The amplifier is operated in Class B single ended push-pull output. Phase inversion is achieved by virtue of the complimentary pair. Overall feedback both A.C. and D.C. is applied to T1



(H155b) Circuit Diagram of Tuner—Model RP34 (Part)

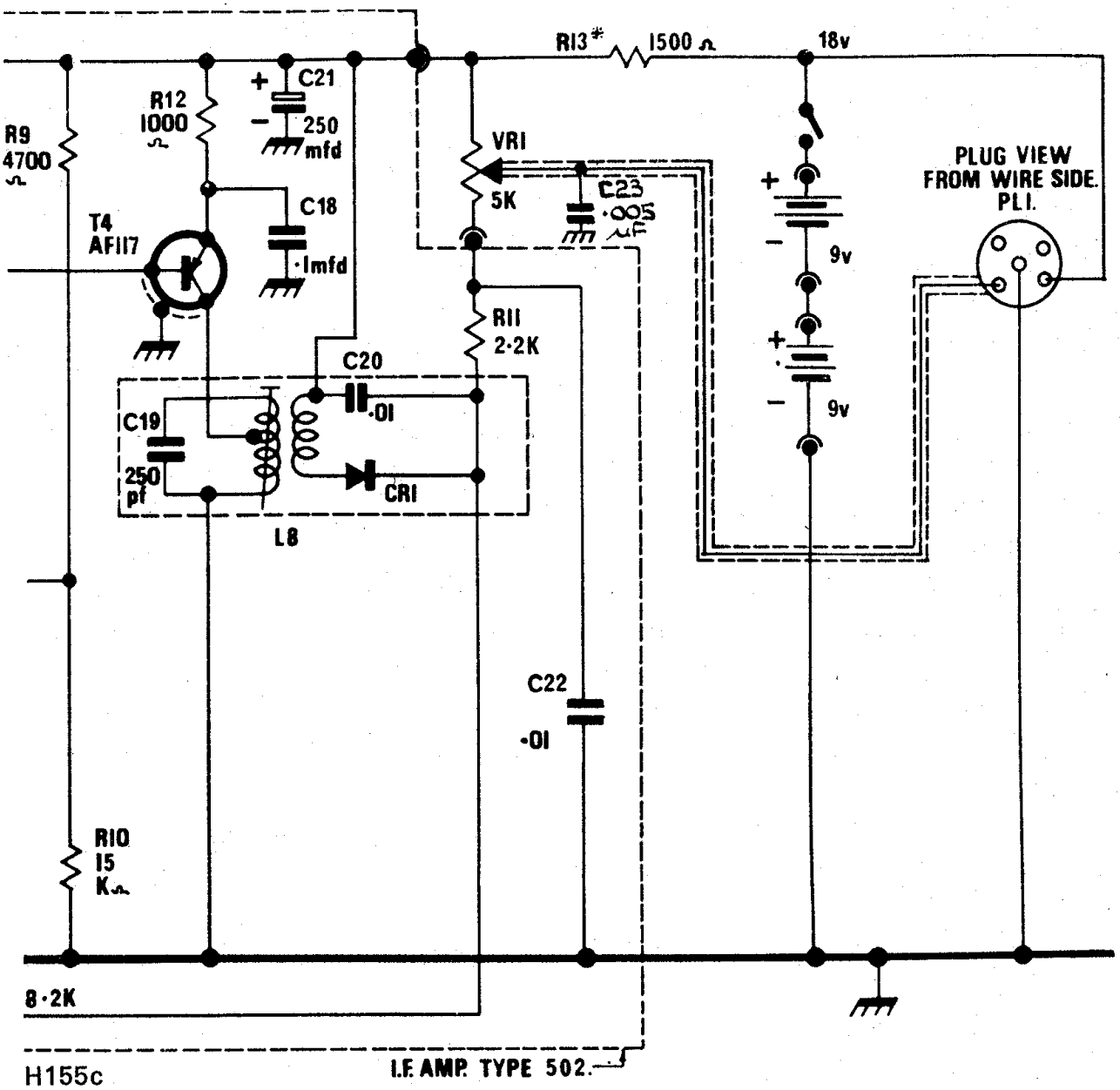
via potential divider network C5, R5, R6, C6 and R4, C4. A small amount of L.F. frequency compensation is achieved by the feedback network C5, R5 across R6.

Dismantling: Back of receiver is easily removed by laying face down on a soft surface and pushing top edge of back with the thumbs thereby releasing the spring catches. The back may then be lifted clear. Remove batteries. The amplifier is removed by first unplugging the five-pin power plug and the L.S. plugs, then loosening the 4BA nuts securing amplifier to battery box cover.

To remove tuner, gently prise off caps covering the handle pivots and remove the two 4BA countersunk screws concealed beneath. The tuner may then be gently eased forward until the black and green car aerial leads can be unplugged from the appropriate slot.

Removal of loudspeaker is self explanatory but in replacing, note that the nuts should be tightened alternately and care taken to avoid overtightening.

Static Voltages (R.F./I.F. Panel): Receiver switched to M.W. Measured with Avo 8, with respect to H.T.+ (18V) rail at positive terminal of C21 (250μF).



(H155c) Circuit Diagram of Tuner—Model RP34 (Continued)

		E	B	C
T1	AF117	−1·1V	−1·25V	−8·0V
T2	AF117	−0·9V	−1·9V	−8·0V
T3	AF117	−0·9V	−1·05V	−8·0V
T4	AF117	−1·5V	−1·7V	−8·0V

Oscillator Drive: Receiver switched to M.W. Measured with valve voltmeter between T1 emitter and chassis. M.W. 80–100mV. Receiver switched to L.W. 60–80mV.

Alignment and Sensitivity Checks: *Test gear required:* (1) A.M. signal generator covering 470kHz, 600kHz, 100kHz, 1500kHz, 174kHz, 260kHz. (2) Valve voltmeter. (3) Wobbulator covering 470kHz. (4) Oscilloscope. (5) Shielded radiating loop.

The latter item consists of a length of copper or brass tube of a diameter suitable to clear 3 strands of 20swg P.V.C. wire or similar. The tube is bent into a circle of approximately 10 in. diameter and the two ends pass through a copper or brass box approximately 2·5 in. square, the latter having one open side. The tube is insulated at one end from the box by a suitable rubber grommet and the other end soldered to the box.

The lead from the signal generator should be screened and the braid soldered to the same point to which the tube is soldered. Three turns of 20swg P.V.C. wire or similar is then fed through the tube and one end also soldered to the box. The other end must go via a 405Ω 1 per cent resistor to the inner of the screened lead from the generator. The loop should be placed at 90° to the ferrite rod aerial in the receiver with approximately 24 in. between centres for all R.F. alignments.

I.F. Alignment: Connect oscilloscope across volume control and inject wobbulator and marker signals (470kHz) across L3 (M.W. aerial coil). Switch receiver to M.W. and close gang. Adjust the instruments to give a reasonable display on the oscilloscope, making sure that the input is kept as low as possible in order to avoid overloading and the effect of A.G.C. action. Adjust the cores of L6, L7 and L8 to obtain an even response curve with ±3kHz approx. 4dB down at either side of the centre frequency of 470kHz.

R.F. Alignment:

1. Check pointer datum. The centre of the pointer must coincide with the edge of the right-hand end of the frequency scale when the tuning gang is just brought up to the fully enmeshed position from open. It is important that the adjustment is checked before alignment of the R.F. circuit is commenced.

2. Fix L3a in the centre of the ferrite rod so that the start of the coil is 4 in. from the end of the rod.

3. Switch the receiver to M.W. and set pointer to 600kHz (500 metres). Inject a signal from A.M. generator via loop at 600kHz and adjust core of oscillator (L5) to give the maximum signal as indicated by oscilloscope or output meter connected to output. (Be careful to avoid overloading by using excessive input signal.)

4. Inject via the loop, a signal of 1500kHz and tune the receiver to the 1500kHz (200 metre) mark on the scale. Adjust TC3 for maximum. Repeat 3 and 4 until calibration is accurate.

5. Inject via the loop a 600kHz signal and with the receiver tuned to the 600kHz (500 metre) mark on the scale, adjust the position of the M.W. coil L3b on the ferrite rod to give maximum output.

6. Retune receiver and generator to 1500kHz (200 metres) and adjust TC1 for maximum output. Repeat 5 and 6 until no further improvement can be obtained.

7. Switch the receiver to L.W. Tune to B.B.C. 2 on 200kHz (1500 metres) and adjust TC4 for maximum output.

8. Inject, via the loop, a signal of 174kHz (1718 metres) and tune the receiver to this frequency. Adjust the position of the L.W. coil (L4) on the ferrite rod for maximum output.

9. Inject, via the loop, a signal of 260kHz (1154 metres) and tune the receiver to this frequency. Adjust TC2 for maximum output. Repeat 8 and 9 until no further improvement can be obtained.

10. Fix the coils carefully in position on the ferrite rod with adhesive tape.

I.F. Sensitivity: Measured with receiver switched to M.W. and gang closed. With signal generator (10Ω source) adjusted to 460kHz (30 per cent modulation at 400Hz) connected across L1 (M.W. aerial coil) and valve voltmeter connected across VR1, adjust generator output to give 25mV on valve voltmeter. The generator output to give the reading should not exceed 30μV.

R.F. Sensitivity: For the same valve voltmeter reading (25mV) a signal at R.F. (30 per cent modulation at 400Hz). Injected into the car aerial socket via 400Ω dummy aerial should require not more than the following input levels: M.W.: 600kHz (23μV), 1MHz (9μv) and 1500kHz (4·5μV). L.W.: 174kHz (32μV) and 260kHz (10μV).

Amplifier Tests: Test gear required: (1) C.R.O. (2) A.F. generator (600Ω). (3) Output meter (15Ω). (4) D.C. voltmeter (0–10V). (5) D.C. milliammeter (0–10mA).

Static Voltages (Amplifier): Measured with Avo 8.

	TR1	TR2	TR3	TR4	TR5
Vce	8·5V	0·28V	9·2V	9·2V	8·8V
Vcb	7·6V	0·25V	9·0V	9·1V	8·55V
Vbe	0·625V	—	0·125V	0·13V	0·13V

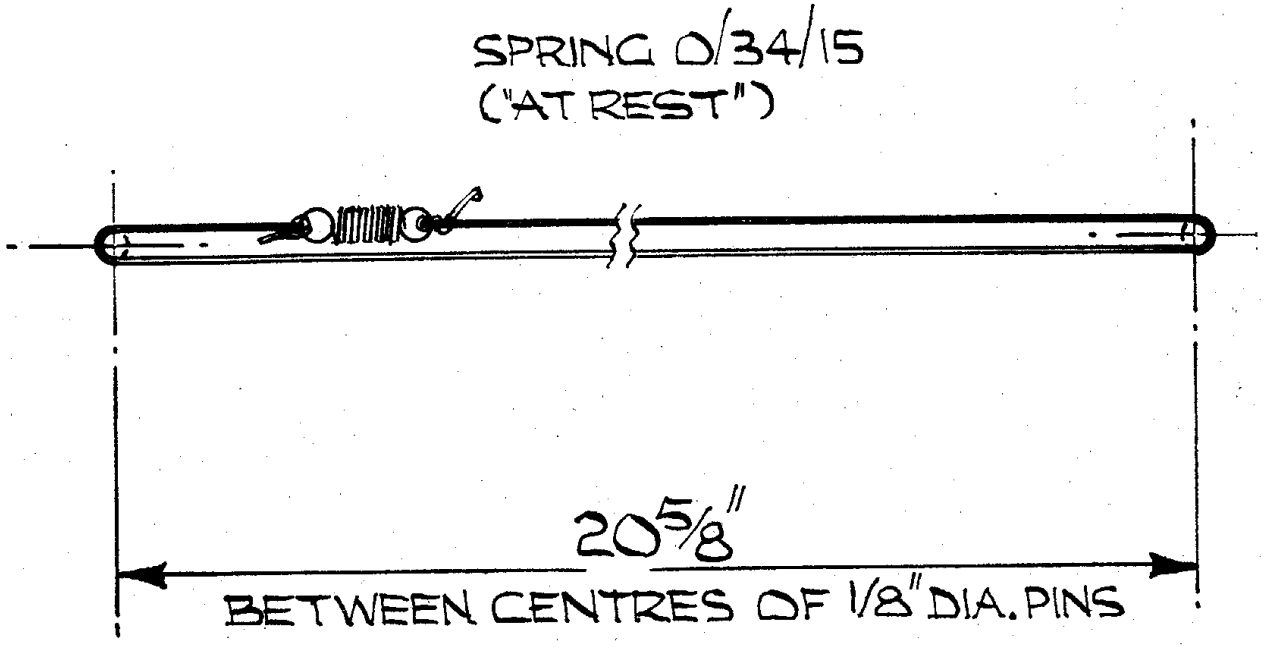
Note that total current consumed by amplifier is 13mA approx.

Static Current Adjustment (Amplifier): Short circuit the input to the amplifier by a link between pin 4 and 5 of SK1. Cut the test link and insert a 0–10mA meter and adjust RV2 for a reading of 3mA. Connect a 0–10V meter between the mid-point voltage test point (junction of R11 and R12) and adjust RV1 to give a reading of 8·85V. Remove supply. Remove meters and replace link.

Note: The battery voltage must be 18V.

Sensitivity (Amplifier): Connect oscilloscope and output meter (15Ω non-inductive load) to the output terminals of the amplifier. Inject a signal of 1000Hz into the amplifier input (pins 4 and 5) sufficient to produce an output of 1·25W without serious distortion as indicated on the oscilloscope. The input necessary to give this output should be approximately 70mV.

Frequency Response (Amplifier): With conditions the same as for the sensitivity test, reduce the audio signal generator output to give an amplifier outputof 100mW (1000Hz). Changes in input frequency should produce the following results: 1kHz (0dB = 100mW), 100Hz (plus 4dB) and 20kHz (minus 6·5dB).

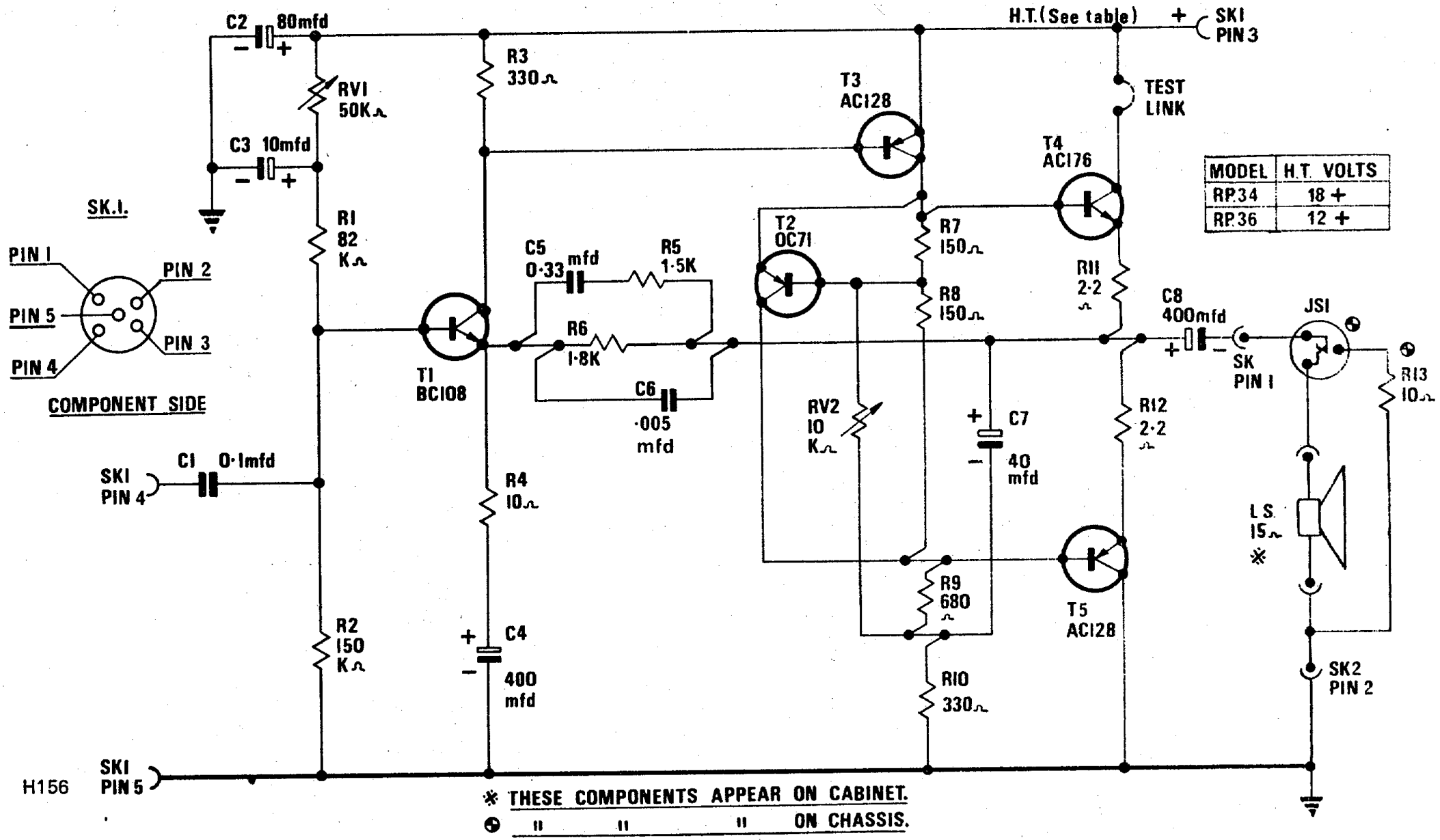


(H159) Drive Cord—Model RP34

Drive Cord Replacement: The control knobs must first be removed by gently pulling them off the volume and tuning control shafts. Remove the four Phillips screws and the scale may then be simply lifted off, and the old cord removed.

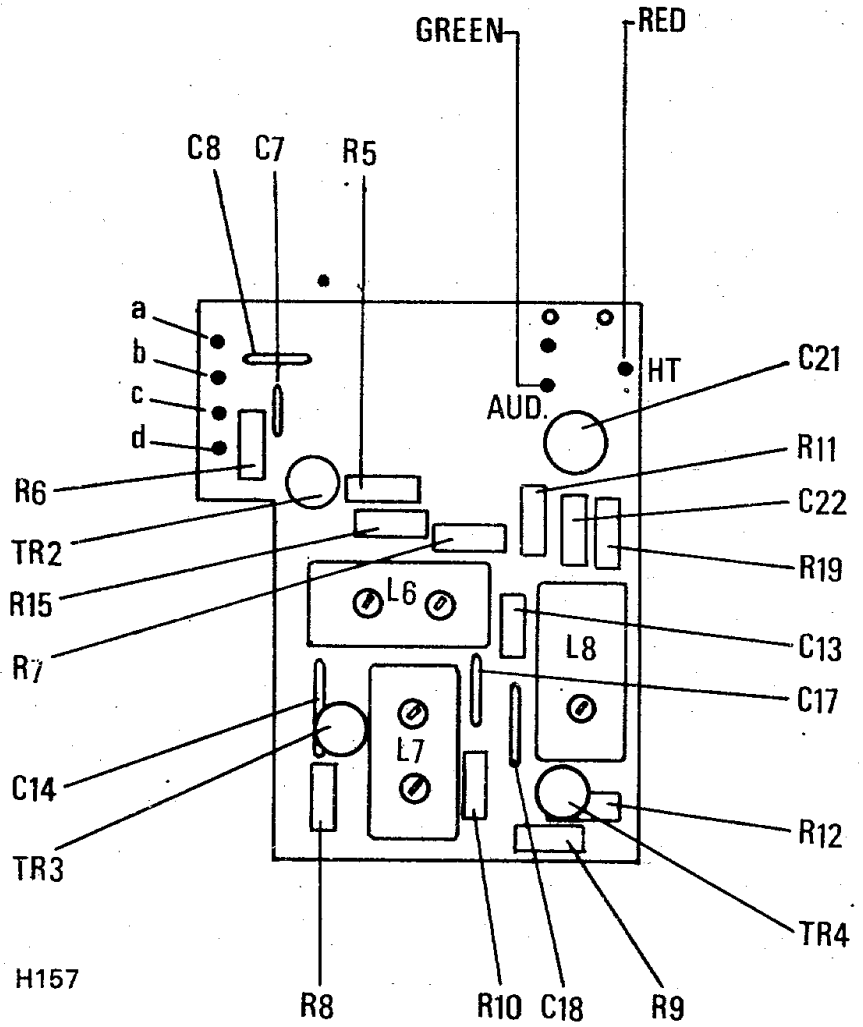
If a ready-made cord is not available one may be made by cutting a length of nylon cord to approx 46 in. Each end of this cord must be knotted to the spring to form continuous loop, which when loosely pulled, measures $20\frac{7}{8}$ in. Hold the receiver with the front panel facing and the tuning condenser fully closed on the right-hand side.

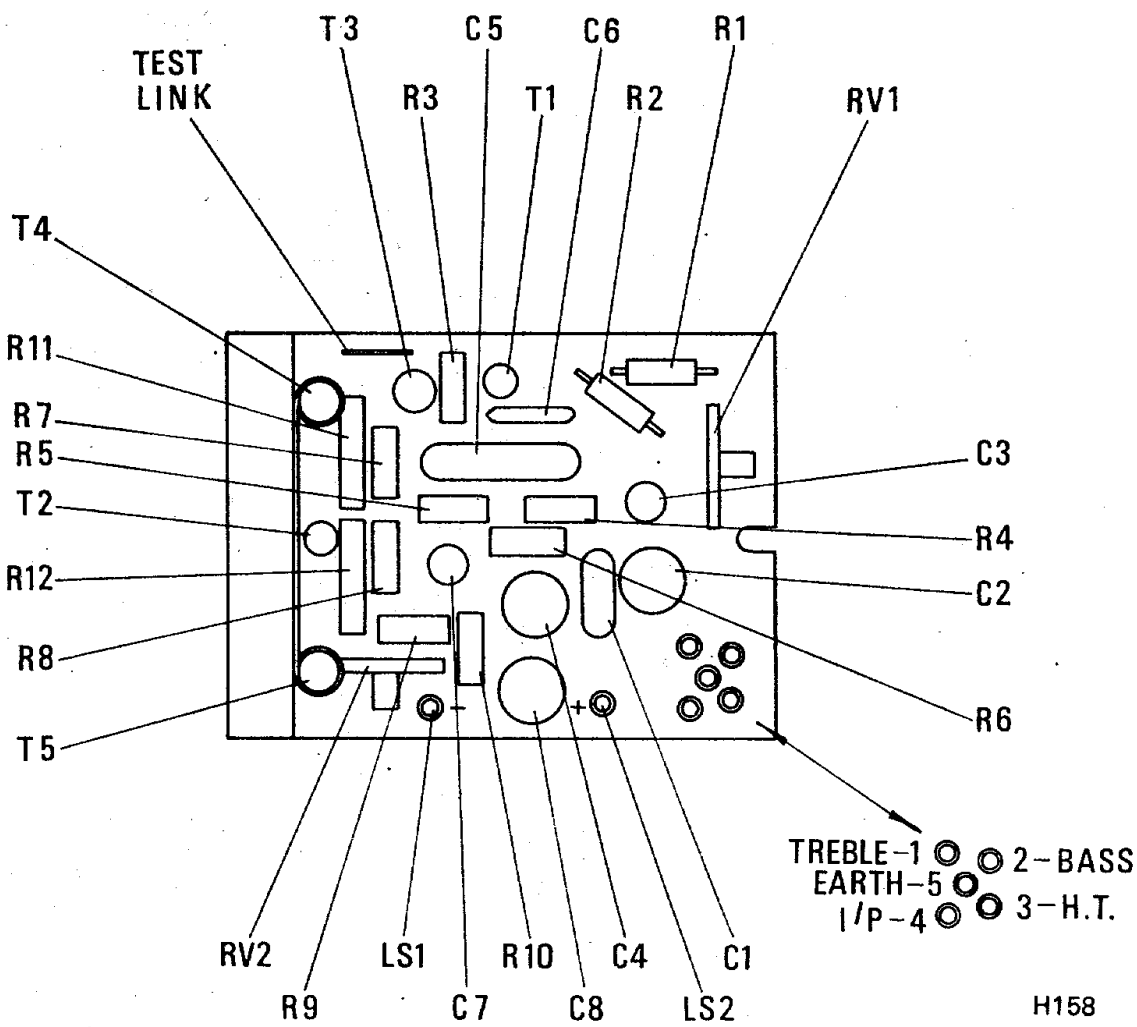
Take the cord and place it round the top left-hand rear pulley with the spring just to the right. Feed the cord down and around the bottom left-hand pulley, place $4\frac{1}{2}$ anticlockwise turns round the rear section of the drive spindle starting from the back, pass this through slot in the centre. One turn round front section up and round top right-hand rear pulley along to left-hand front pulley and finish round top right front pulley. Replace pointers so that with the gang fully closed they line up with the right-hand end (low frequency) of the tuning dial.



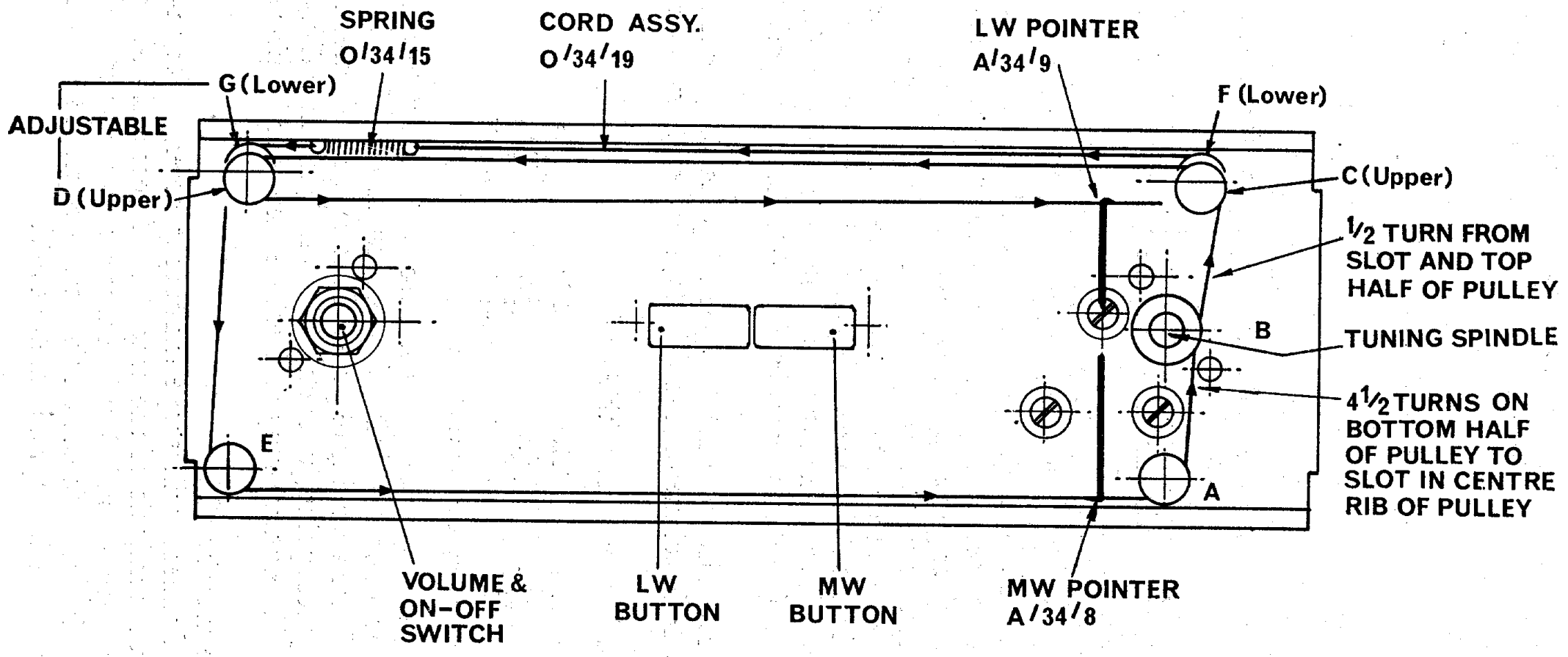
MODEL	H.T. VOLTS
RP34	18 +
RP36	12 +

(H156) Circuit Diagram of Amplifier—Model RP34





Left: (H157) COMPONENT LOCATIONS—I.F. AMPLIFIER. *Right:* (H158) COMPONENT LOCATIONS—L.F. AMPLIFIER—MODEL RP34



H160

ASSEMBLY DRAWN WITH TUNING CONDENSER ROTOR VANES IN MESH (L.F. END)
NOTE POSITION OF SPRING WHICH MUST BE AS CLOSE AS POSSIBLE TO PULLEYS G & D.

(H160) DRIVE CORD ASSEMBLY—MODEL RP34