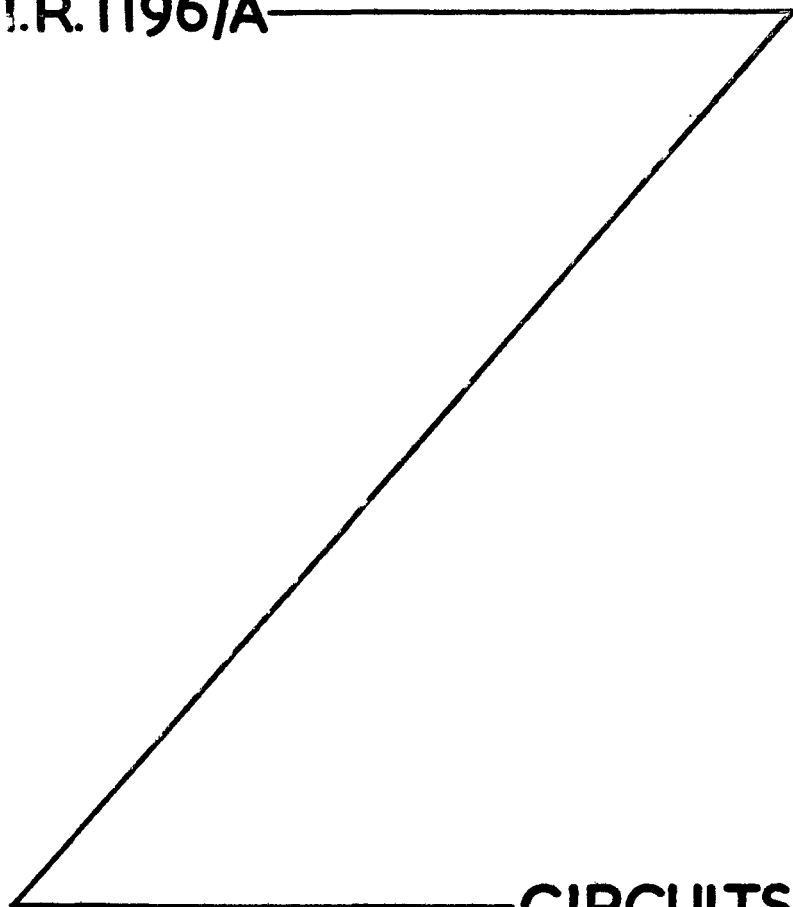


TRANSMITTER _____

RECEIVER _____

T.R. 1196/A _____



CIRCUITS

NOTES

TRANSMITTER-RECEIVER T.R.1196 and T.R.1196A

1. General Details

(i) *Purpose.* A light-weight self-contained crystal controlled R/T and M.C.W. transmitter-receiver for use in aircraft or on the ground. All crystals are incorporated and the set may be tuned to four spot frequencies; remote push button tuning is employed (controllers, electric, type 4, having buttons A, B, C, D and Off).

(ii) *Frequency range.* 4.3 to 6.7 Mc/s.

(iii) *Communication range.*

Air to ground 50 miles at 2,000 feet.

Air to ground 35 miles at 2,000 feet (channel D only)

Air to air 30 miles at 2,000 feet.

(iv) *Valves.*

(a) Transmitter—three; C.O., pentode V.R.91; P.A. tetrode V.T.501 modulator, pentode V.T.52.

(b) Receiver—six; R.F. amplifier, pentode V.R.53; frequency changer, octode V.R.57; I.F. amplifier, pentode V.R.53; A.F. amplifier, pentode V.R.56; A.G.C. amplifier, pentode V.R.56; det., A.G.C. and output, double-diode triode, V.R.55.

2. Power Supplies—Built-in Motor Generator

(i) Power unit, type 87, for T.R.1196—24 volts 2.5 amps. Supplied by the aircraft 24-volt supply.

Power unit, type 104, for T.R.1196A—12 volts 5 amps.

(ii) Output is the same in both cases.

(a) Transmitter. H.T., 250 volts 60 mA.

L.T., 6.3 volts 1.3 amps.

(b) Receiver. H.T., 275 volts 35 mA.

L.T., 6.3 volts 1.2 amps.

3. Aerial System

(i) *In the air.* Aircraft fixed aerial approximately 28 feet; capacity between 45 and 140 μF .

(ii) *On the ground.* Vertical single wire length = $\frac{240 \text{ feet}}{\text{freq. in Mc/s.}}$

A 125 μF condenser is connected in series with the aerial and a 500 μF condenser between aerial and earth terminals.

4. Circuit Details

(i) *Transmitter unit, type 22 (fig. I).* Crystal controlled oscillator driving anode-screen modulated class "C" neutralised P.A. stage. Both valves use leaky grid and condenser bias. The modulator valve is preceded by a sub-modulator consisting of the A.F. stages of the receiver unit. This stage can also be transformed into a tone oscillator (800 to 1,500 c.p.s.) by the energising of the M.C.W. relay. The four aerial tuning inductances are selected by the push button operated selector motor.

AE
C

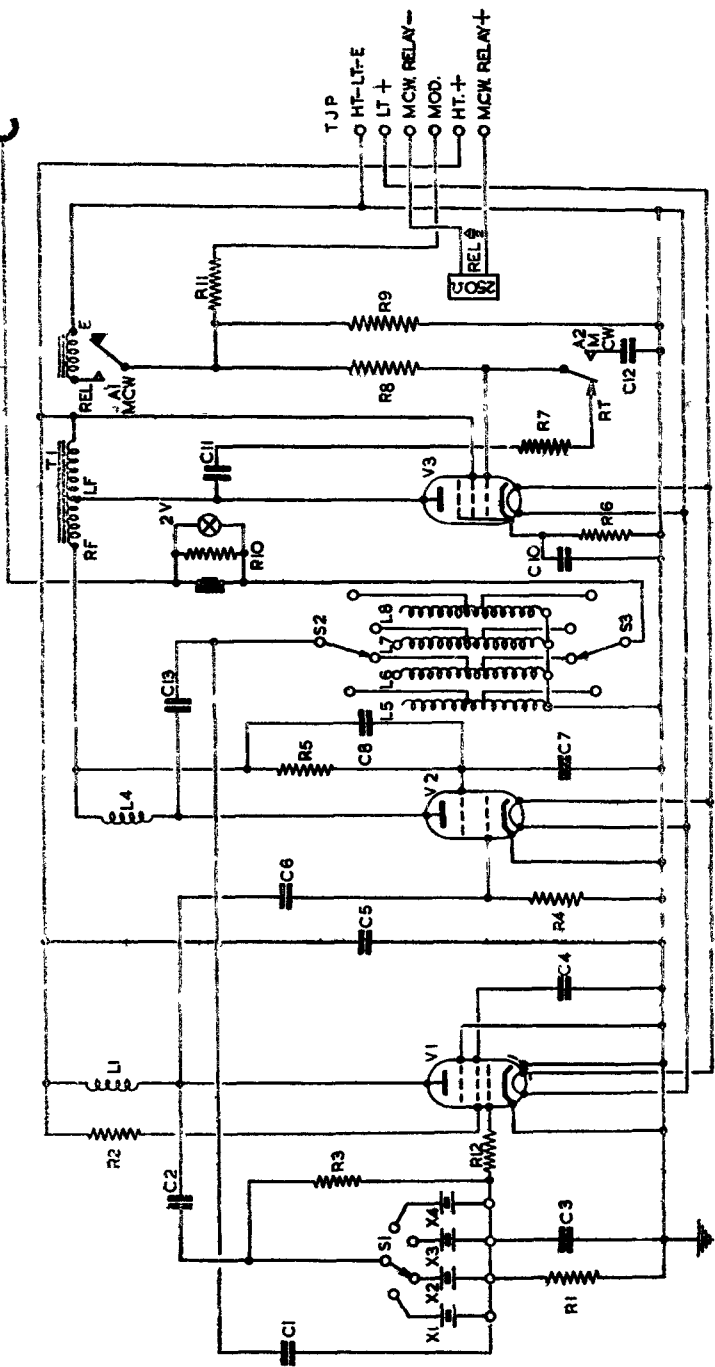


FIG. 1.—TRANSMITTER PORTION T.R. 1196

(ii) *Receiver unit, type 25 (fig. II)*. The transmitter aerial circuit is the aerial circuit of the receiver. The secondary of the R.F. transformer load is tuned by four variable condensers, selected, with the R.F. oscillator crystals, by the selector mechanism. The octode frequency changer includes the "Pierce" R.F. oscillator and has a 460 kc. I.F. transformer as its anode load. The frequency-changer output is coupled to the I.F. amplifier V.3, and A.G.C. amplifier V.4. The cathode circuits of V.2 and V.3 are used in conjunction with the "R.A." control (see below). V.3 is coupled to one of the diodes of D.D.T. (V.6) for detection, the load being the preset volume control. The A.F. voltages are coupled via the secondary of the microphone input transformer to the A.F. amplifier and the triode output portion of the D.D.T. (V.6). The tapped primary of the output transformer provides for high impedance telephones, the secondary winding provides for alternative outputs: the whole for 600-ohms working, and a tapping for 150-ohms 'phones. Amplified and delayed A.G.C. voltage is applied in full to the R.F. and frequency changer stages, half the A.G.C. voltage to the I.F. stage.

5. Control of T.R.1196

Uses controller, type 4, situated in the pilot's cockpit, and connected to the chassis assembly, type 7 (or type 8 for T.R.1196A). Pressing any button results in the energising of the B (starter) relay. The T/RA/R key switch controls the operation of the T/R relay, and the receiver attenuation switching.

- (i) *T/R relay in chassis assembly*. When operative, switches H.T.+ from the receiver R.F. and I.F. stages to the transmitter.
- (ii) *Receiver attenuation control*. On switching from "R" to "R.A." the receiver gain is attenuated; a preset variable resistance is brought in series with the cathode resistors of V.2 and V.3, reducing the gain of both stages, this reduces the background noise in the absence of a signal and makes for clearer I/C. In later versions the pre-set variable resistance is transferred to the receiver output circuit, and is connected in series with the output to A.1134 or A.1134A.

6. A.1134A

- (i) When it is necessary to feed more than three pairs of 'phones, the A.1134A is used. The crews' microphones are connected to the amplifier and to the microphone input transformer, T.4, of the receiver unit. T.4 has two main uses:—
 - (a) To match the microphone voltages to the receiver sub-modulator stages (V.5, V.6), for modulation of the transmitter.
 - (b) To provide receiver output at microphone level, for amplification through the A.1134A.
- (ii) If the A.1134A is u/s, or not in use, I/C is possible through the A.F. stage of the receiver, the telephones being placed across the output transformer of the receiver (normal/emergency switch of panel 192).

7. Tuning Instructions

- (i) *Transmitter*. The transmitter must be tuned first.
 - (a) Insert crystals, set counter mechanism to 0-0, select the required channel and switch to "Transmit".
 - (b) "Press to tune" button held while the channel P.A. inductance is adjusted until indicator lamp attains maximum brilliance.
 - (c) Test for modulation by speaking into the microphone and noting the variation in brilliance.

Note.—Since channel D has been modified by the inclusion of an 1,800-ohm resistance in the output circuit, normal tuning may not be possible on this channel. Any one of the following alternative methods may be used :—

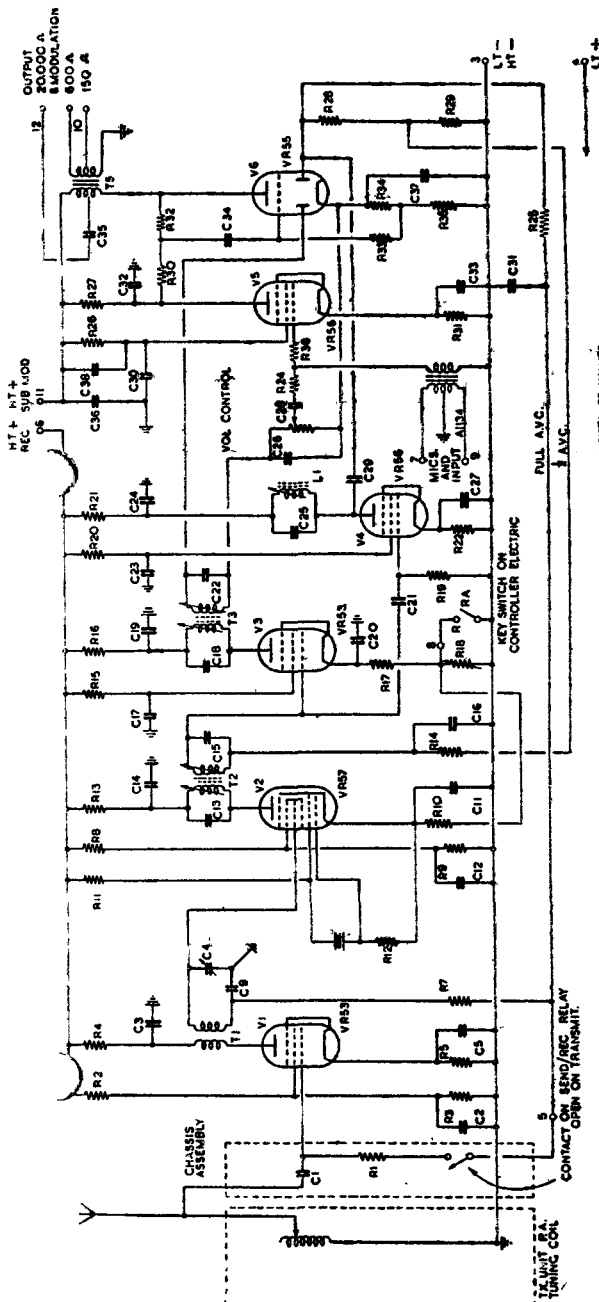
- (a) Remove shunt from across indicator lamp and tune as before.
- (b) Use an external aerial ammeter.
- (c) Remove transmitter screening can, hold down M.C.W. relay (or press key if connected) and tune for the lowest note in the telephones.
- (d) Substitute 150 mA tuning lamp for 300 mA lamp in normal use.

(ii) **Receiver.**

- (a) Insert crystals (\pm 460 kc/s from transmitter crystals), crystals should be + 460 kc/s in aircraft, and - 460 kc/s in receiver used on the ground. Switch on A.1134A, with panel 192 switch to "Normal". (If no I/C amplifier used, panel 192 switch should be at "Emergency").
- (b) Adjust receiver volume control (set at "Maximum"; controller switch at "R").
- (c) Adjust appropriate condensers for maximum background noise.
- (d) Ground test and get minimum setting of the volume control adequate output.
- (e) Set key to "R.A.", and under normal operating conditions adjust the R.A. control so that the background noise of the receiver is reduced, to allow efficient I/C and give adequate gain for "Listening out".

8. Servicing

- (i) Feed to the transmitter may be tested by a fall in the generator note on switching to transmit.
- (ii) Tests for H.T. :—
 - (a) Remove top cover of chassis assembly and place meter across T/R relay or watch the sparking of the relay when switching from "R" to "T".
 - (b) Remove transmitter cover, when the P.A. anode and screen voltage can be tested between the end of choke L.4 and chassis.
 - (c) With the receiver, test between the crystal socket of the channel in use and chassis, for indication of H.T. on the R.F. Osc., portion of V.2.
- (iii) Eliminate receiver trouble by testing the sub-modulator stages, i.e. V.5 and V.6 by microphone and phones of known reliability. If A.F. portion serviceable, fault must be in the R.F. or I.F. stages.



CONDENSER VALUES

- C1, C3, C9, C11, C28, C34, C5
- C2, C4, C8
- C12, C14, C18, C19, C20, C23, C24, C27, C30, C31, C33, C36, C38
- C13, C15, C16, C22
- C17, C19, C21, C26
- C25, C29
- C32, C35, C37
- C39

RESISTANCE VALUES

- 50PF.
- 0.1PF.
- VAR.
- 1/2F.
- 150PF.
- 100PF.
- 200PF.
- 500PF.
- 5/2F.
- 2/2F.

RESISTANCE VALUES

- R1, R7, R14, R25, R28, R29, R33
- R2, R8, R9, R16, R17, R30
- R3, R20, R18
- R4, R13, R15
- R5, R10
- R19, R24, R32, R36
- R21, R24, R35
- R17, R18, R21
- R11, R12
- R22, R25
- R26, R27

- V1 R. F. Amp.
- V2 Freq. Changer
- V3 I. F. Amp.
- V4 A. F. Amp.
- V5 A. G. C. Amp.
- V6 Det., A. G. C. and O. P.

FIG. 11.—RECEIVER PORTION T.R.1196

