

PAM TRANSISTOR PORTABLE Model 710

General Description : Two-waveband, portable superheterodyne receiver using eight transistors and operating from 6-volt battery supply. Ferrite-rod aerial. Receiver uses printed-circuit technique.

Power Supply : Four 1.5-volt cells. Suitable types are: Ever Ready U2, Drydex T20, Vidor V0002, G.E.C. BA6103, Petrix 601. Consumption, 9 mA. with no signal. Since the output stages are operated in push-pull Class B conditions, the battery current will increase greatly with increasing output, and should be about 35 mA. at 50 mW. output.

Wavebands : M.W.-L.W.

Transistor Types and Functions :

Code	Function	Type	Alternative Type	Collector, volts	Collector, mA.	Base, volts	Emitter, volts
V1	Oscillator	V6/R3	V6/R6	-4.1	0.70	-1.35	-1.6
V2	Mixer	V6/R3M	V6/R6M	-5.7	0.35	—	—
V3	1st I.F.	V6/R3	V6/R6	-6.0	0.22	-1.45	-1.35
V4	2nd I.F.	V6/R2	V6/R3	-6.0	0.50	-1.45	-1.3
V5	Detector	V6/R2	V6/R3	-5.2	0.16	-1.55	-1.4
V6	A.F. amplifier	V10/30A	V10/50A	-5.4	6.0	-0.6	-0.4
V7	Output	V10/30A	V10/15A or	-6.0	0.6	-0.2	-0.1
V8	Output	V10/30A	V10/50A	-6.0	0.6	-0.2	-0.1

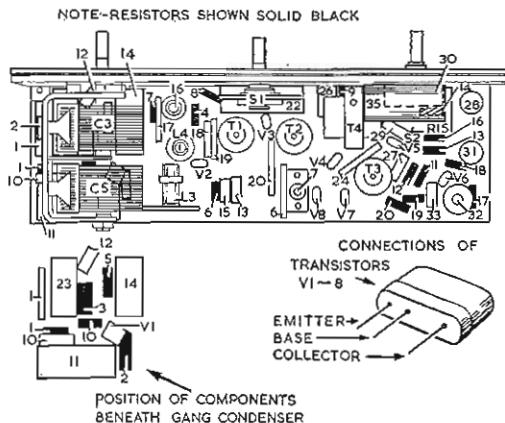
Measurements taken on M.W. band with no signal input, gang fully meshed, and using Avo Model 8 testmeter (20,000 ohms/volt).

Base and emitter current values are not given, since the introduction of a meter into either of these circuits would alter the base-emitter bias and thus affect the measurement. In general, the base-to-emitter D.C. potential should not exceed 250 mV.

Servicing Notes : The receiver should operate satisfactorily down to a battery voltage of 4 volts, and in checking a faulty receiver this should be measured first. A transistor fault is unlikely and other components should be carefully investigated before suspecting a transistor fault. It is most important to note that a transistor may be permanently damaged if the base is connected to the negative side of the battery, or if continuity tests are attempted with the transistor in circuit. If a transistor is to be removed or replaced in the circuit a heat trap, such as a pair of pliers, should be provided between the soldering-iron and the transistor during soldering.

Generally, fault finding can be carried out on this receiver in the usual way. A test signal should be connected into the circuit via a 0.1- μ F. capacitor to ensure that the transistor D.C. conditions are not altered.

It should be noted that the transistor emitter corresponds roughly to a valve cathode, a transistor base to a valve grid and a transistor collector to a valve anode. The base-input impedance is low (roughly 200-1000 ohms),



and the collector output impedance relatively high (4000-20,000 ohms). The class B output stages are operated in a common collector circuit which is similar to cathode-loaded valve stage and provides a power gain but no voltage gain. The receiver does not have an output transformer but employs a high-impedance centre-tapped loudspeaker (impedance at 400 c/s., 55 ohms per section, 120 ohms total).

Receiver output should be measured by connecting an A.C.

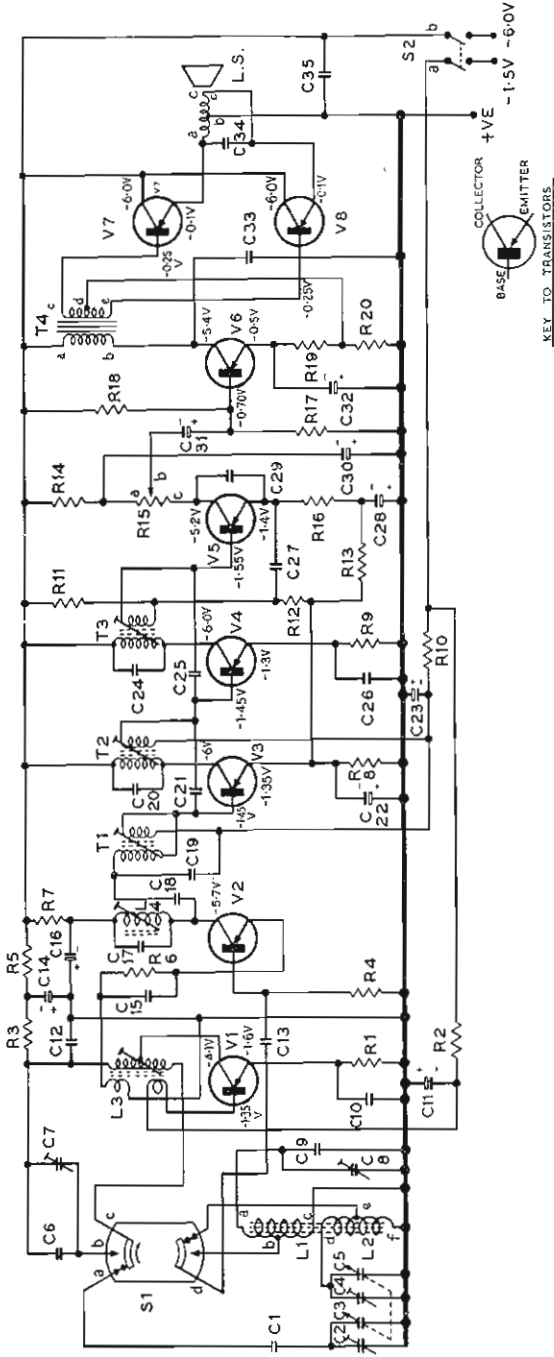
voltmeter (e.g., Avometer) on 10-volt A.C. range across the whole of the loudspeaker coil: 2.4 volts reading is then equivalent to 50 mW. output.

If it is necessary to replace either of the I.F. stages, the neutralising procedure, given below, should be followed.

Alignment Procedure : Note that operations (1) to (5) to be made on chassis; (6) to (9) to be made on complete receiver with back door and batteries in position; (6) and (8) should be carried out only if a replacement aerial is fitted. Operations (5) and (9) to be made using a 10-volt meter with a resistance of not less than 10,000 ohms connected between V₅ collector and chassis, optimum tuning being indicated by a *minimum* reading on the meter.

Apply Signal as Below	Set Controls to	Adjust in Order for Maximum Output
(1) 315 kc/s. between chassis and junction of S ₁ and C ₁₃	L.F. end of M.W.	Ferrite cores of T ₃ , T ₂ , T ₁
(2) As (1) but 600 kc/s.	M.W. 500 m.	Dust core of L ₄
(3) As (1) but 1500 kc/s.	M.W. 200 m.	Dust core of L ₃
(4) Repeat (2) and (3)	until calibration is correct	C ₂
(5) Connect L.W. aerial—L.W. Light Programme	L.W. 1500 m.	C ₇ (see note above)
(6) 600 kc/s. injected by allowing generator lead to lie near aerial rod	M.W. 500 m.	Adjust end turns of L ₂
(7) As (6) but 1500 kc/s.	M.W. 200 m.	C ₄
(8) Repeat (6) and (7) until tracking is correct.	Seal L ₂ with polystyrene dope	
(9) L.W. Light Programme	L.W.	C ₈ (see note above)

Neutralising Procedure : 2nd I.F. amplifier : (1) Connect valve voltmeter (approximate range 1-20 mV.) between V₄ base and chassis. (2) Connect signal generator via a 0.1-μF. capacitor between V₄ collector and chassis. (3) Connect V₂ emitter to chassis via a 0.1-μF. capacitor. (4) Set the signal generator to give an output of approximately 400 mV. at 315 kc/s. (5) Connect first a 33-pF. capacitor from V₅ base to V₄ base and note valve voltmeter



CIRCUIT DIAGRAM—PAM TRANSISTOR PORTABLE MODEL 710

Capacitors.

C1	790 pF. (±%)
C2	3-35 pF.
C3	523 pF.
C4	4-50 pF.
C5	523 pF.
C6	895 pF. (±%)
C7	3-50 pF.
C8	4-50 pF.
C9	270 pF.
C10	0.01
C11	50 (12 v.)
C12	0.04
C13	0.01
C14	50 (12 v.)
C15	0.01
C16	25 (12 v.)
C17	1200 pF. (±%)
C18	33 pF. (10%)
C19	1200 pF. (±%)
C20	2000 pF. (±%)
C21	Selected 100 to 220 pF.
C22	1
C23	50 (12 v.)
C24	2000 pF. (±%)
C25	Selected 33 to 68 pF.
C26	0.1
C27	0.01
C28	25 (12 v.)
C29	0.01
C30	50 (12 v.)
C31	5 (12 v.)
C32	50 (12 v.)
C33	0.002 (400 v.)
C34	0.5

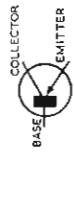
Resistors.

R1	2200 (10%)
R2	2700 (10%)
R3	100
R4	3k (Pot.)
R5	390k (5%)
R6	2700 (10%)
R7	50k (5%)
R8	33k (5%)
R9	33 (10%)
R10	1000
R11	33k (5%)
R12	2200 (10%)
R13	330 (10%)
R14	1000
R15	3k (Pot.)
R16	390k (5%)
R17	50k (5%)
R18	33k (5%)
R19	33 (10%)
R20	33 (10%)

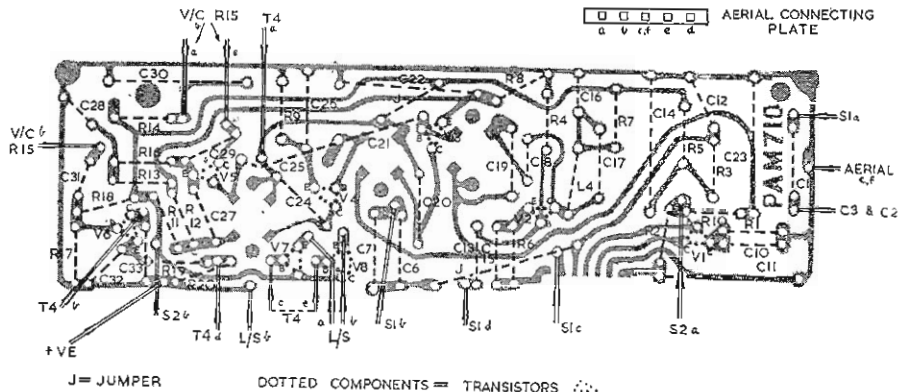
C35

I	2200 (10%)
I	2700 (10%)
I	100
I	3k (Pot.)
I	390k (5%)
I	2700 (10%)
I	50k (5%)
I	33k (5%)
I	33 (10%)
I	1000
I	33k (5%)
I	33 (10%)
I	33 (10%)

R10	1000
R11	33k (5%)
R12	2200 (10%)
R13	330 (10%)
R14	1000
R15	3k (Pot.)
R16	390k (5%)
R17	50k (5%)
R18	33k (5%)
R19	33 (10%)
R20	33 (10%)



KEY TO TRANSISTORS.



reading. Then try in turn 39-, 47-, 56- and 68-pF. capacitors and select that which gives the lowest reading on the valve voltmeter. The lower value capacitor should be used if two capacitors give similar readings. Note that the correct value is expected to lie between 33 and 68 pF.

1st I.F. amplifier: (1) Connect valve voltmeter between V₃ base and chassis. (2) Connect signal generator via a 0.1-μF. capacitor between V₃ collector and chassis. (3) Connect V₂ emitter to chassis via a 0.1-μF. capacitor. (4) Set signal generator to 315 kc/s. to give an output of approximately 400 mV. (5) Connect first a 100-pF. capacitor from V₄ base to V₃ base and note valve-voltmeter reading. Then try in turn 120-, 150-, 180- and 220-pF. capacitors and select that which gives the lowest reading on the valve voltmeter. Should two capacitors give similar readings, select the lower value. Note that the correct value is expected to lie between 100 and 220 pF.

Printed-circuit Notes: All components except the neutralising capacitors are located on top of the chassis. To avoid damaging printed circuits use a soldering-iron (60 watts maximum) with a small tip when replacing parts. Clean and tin replacement parts, and then melt the circuit solder before insertion into panel. To avoid running into adjoining circuits, use as little as possible. For quick replacement, resistors and capacitors may be replaced by clipping out defective component and soldering the new one to the connecting wire from the original part. Open or damaged sections of the printed circuit can be repaired by soldering a jumper of ordinary wire across the connection points. Where the need arises for testing on the printed-circuit side of the chassis plate, the insulating varnish covering must first be scraped away from the test points.

Replacement of Batteries: When replacing batteries ensure that each battery has the end with the brass terminal placed against the spring contact.

Circuit Modifications: R₂₁ (470 ohms) has been added between slider of volume control and C₃₁. On early receivers a 50-μF. electrolytic capacitor was used for C₂₂: if this requires replacement a 1-μF. paper capacitor is preferable.