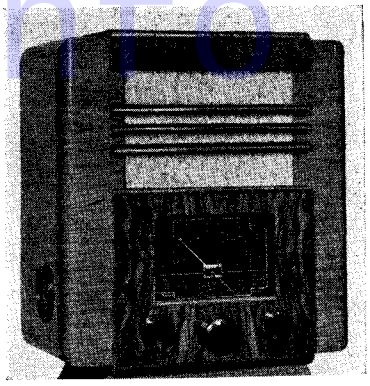
FERRANTI 513A.M. A.C.-D.C. 3-BAND



A four-valve, plus rectifier, circuit for reception on three wavebands is used in the Ferranti model 513 A.M.

CIRCUIT.—The aerial input to the signal grid of V1, the frequency changer, is by a series aerial isolating condenser to a set of tuned secondary transformer aerial coils. Traps for the medium and long wave bands are included and tuned by trimmer condensers.

A series grid resistance R5 is included to stabilise V1 and a signal-grid to oscillator-grid capacity is provided by four turns of twisted wire. An H.T. decoupling circuit is provided for supplying the screen and oscillator anode electrodes of V1.

An I.F. transformer, tuned to 450 kcs., effects the coupling between V1 and the signal grid of V2, an H.F. pentode operating as the I.F. amplifier. Both V1 and V2 are A.V.C. controlled.

A similar transformer provides the coupling between V2 and the demodulating diode of V3, a double diode triode. An L.F. coupling condenser C22 to the manual volume control R14 feeds the grid of the triode section of V3. The other diode of V3 provides the potentials operating the A.V.C. line to V1 and V2. A tone control circuit C24 and R15 is connected between the anode of V3 and chassis.

Resistance capacity coupling effects the connection between the triode of V3 and the output pentode V4. A resistance and condenser across the primary of the speaker transformer effect a fixed tone modification.

Mains equipment consists of a mains adjustment resistance, a half wave rectifier V5, electrolytic smoothing condensers, a

VALVE READINGS

No signal. Volume maximum. M.W. min. cap 200 volt A.C. mains.

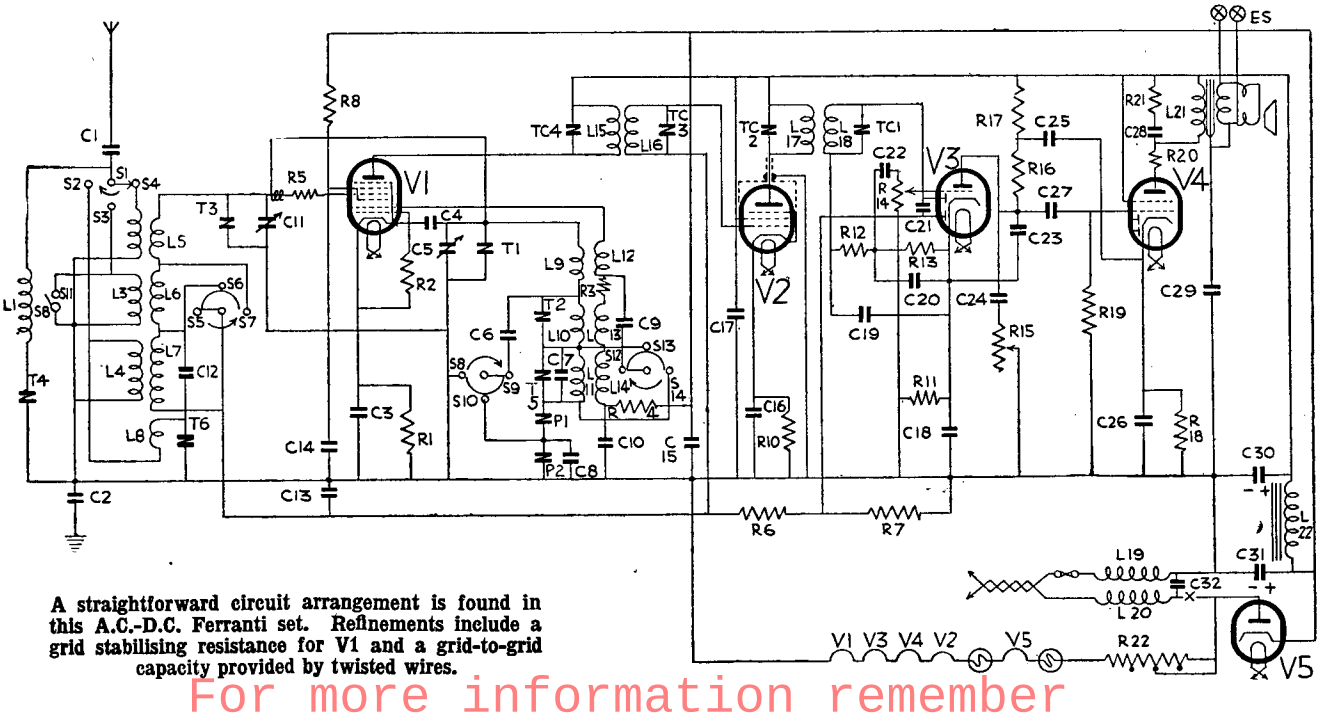
V.	Type.	Electrode.	Volts.	Ma.
1	FC 13C Mullard	Anode ..	148	1
		Screen ..	62	2.5
		Osc.anode	78	2.8
2	VP1321 Mazda	Anode ..	148	2.5
		Screen ..	148	.8
3	TDD.13C Mullard.	Anode ..	70	1.9
4	PenDD.4021 Mazda.	Anode ..	135	60
		Screen ..	148	11.5
5	U.4020 Mazda ..	Cathode	190	—.

WINDINGS (D.C. Resistances)

Winding.	Ohms.	Range.	Where measured.
L1 ..	21	—	Across tags.
L2 ..	.1	S.W.	C1 and chassis.
L3 ..	23	M.W.	C1 and chassis.
L4 ..	60	L.W.	C1 and chassis.
L5 ..	Very low	S.W.	Across tags.
L6 ..	3	M.W.	R5 and R6+C13.
L7 ..	26	L.W.	R5 and R6+C13.
L8 ..	4	L.W.	C1 and T6.
L9 ..	1	S.W.	C4 and C6.
L10 ..	5	M.W.	C6 and C7.
L11 ..	7.8	L.W.	Across C7.
L12 ..	.35	S.W.	Osc. anode V1 and C9.
L13+L14	4	—	R3 and R4.
L15 ..	8.9	—	Across leads.
L16 ..	8.9	—	Across leads.
L17 ..	8.9	—	Across leads.
L18 ..	8.9	—	Across leads.
L19 ..	3	—	Across leads.
L20 ..	3	—	Across leads.
L21 ..	3,500	—	Red and blue leads speaker panel.
L22 ..	500	—	Red and green leads speaker panel.

RESISTANCES

R.	Purpose.	Ohms.
1	V1 cathode bias	300
2	Osc. grid leak	50,000
3	Regeneration modifier ..	300
4	Osc. anode decoupling ..	20,000
5	V1 series grid	200
6	A.V.C. line decoupling ..	1 meg.
7	A.V.C. diode load	1 meg.
8	V1 screen decoupling	30,000
9	Osc. anode and V1 screen H.T. decoupling	10,000
10	V2 cathode bias	1,000
11	V3 cathode bias	1,000
12	H.F. stopper	100,000
13	Demodulating diode load ..	500,000
14	Volume control	1 meg.
15	Tone control	100,000
16	V3 anode load	20,000
17	V3 anode decoupling	20,000
18	V4 cathode bias	105
19	V4 grid leak	250,000
20	V4 anode stopper	50
21	Tone modifier	3,500
22	Mains adjustment	650



A straightforward circuit arrangement is found in this A.C.-D.C. Ferranti set. Refinements include a grid stabilising resistance for V1 and a grid-to-grid capacity provided by twisted wires.

smoothing choke (the speaker field) and a mains input suppression circuit.

Chassis Removal.—Remove the back, the three grub-screw fixed control knobs and the four chassis securing bolts from the base. Then remove the spring-fixed tone control knob from the side of the cabinet and the actual tone control resistance.

The chassis may then be partly withdrawn and, if it be placed with the control shafts nearest to the test bench, the underside of the chassis is conveniently accessible.

The speaker may be removed easily if desired and the chassis is then completely accessible.

Special Notes.—There are two dial lights in screw-in holders clamped to insulating brackets each side of the scale. These are rated at 6.2 volts .3 amp.

The mains adjustment resistance, located at the rear of the chassis deck, has three terminals to one of which a flying lead can be attached.

The mains suppressor components L19, L20 and C32 are mounted at the rear of the chassis and have leads brought to pins that make contact with the sockets of the mains lead connector.

It will be noticed that the connection between a mains pin and the choke L19 consists of a thin wire rated to blow under overload. This should be replaced, if burnt out, with one amp. fuse wire or a strand of No. 40 copper wire.

An insulating panel secured to the back of the chassis on which is inscribed "Aerial" and "Earth," should not be removed as it serves to prevent inexperienced operators from touching the chassis when inserting the two leads.

The heaters of the valves and also the pilot lights are wired in series. Should a dial light burn out the receiver will not operate until the lamp is replaced.

Speaker sockets are provided on the speaker transformer. The extra speaker should have a speech coil resistance of about 2 ohms.

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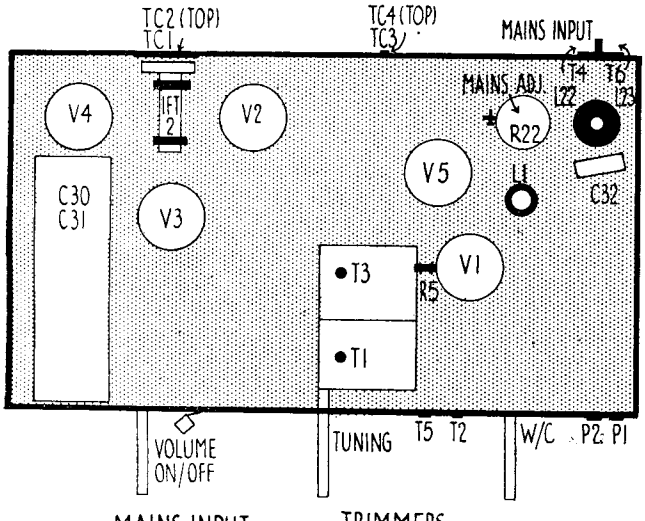
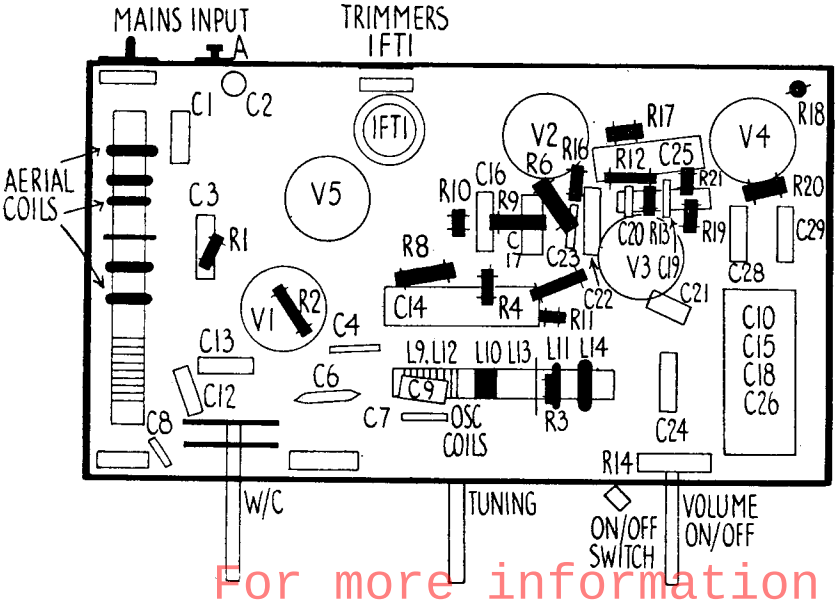
CONDENSERS

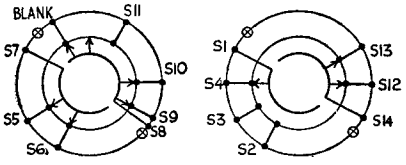
C.	Purpose.	Mfds.	C.	Purpose.	Mfds.
1	Series aerial	.002	18	V3 cathode bias shunt	6
2	Chassis isolating	.05	19	H.F. bypass	.00015
3	V1 cathode bias shunt	.05	20	H.F. bypass	.00015
4	Osc. grid	.00006	21	A.V.C. diode feed	.00005
6	S.W. osc. fixed padder	.004	22	L.F. coupling	.01
7	L.W. osc. fixed trimmer	.00006	23	V3 anode shunt	.0003
8	L.W. osc. fixed padder	.0002	24	Tone control	.05
9	S.W. reaction bypass	.001	25	V3 anode decoupling	2
10	Osc. anode decoupling	2	26	V4 cathode bias shunt	50
12	L.W. aerial fixed trimmer	.00005	27	L.F. coupling	.05
13	A.V.C. line decoupling	.05	28	Tone modifier	.05
14	V1 screen decoupling	2	29	Speaker isolating condenser	.002
15	Osc. anode and V1 screen H.T. decoupling	4	30	H. T. smoothing	24
16	V2 cathode bias shunt	.05	31	H.T. smoothing	8
17	I.F. H. T. line bypass	.1	32	Mains suppressor	.05



Left, the diagram identifying parts on top of the chassis. Remember, before handling the chassis, that under some conditions it is "live."



Below, the under chassis diagram and, right, the switch diagrams numbered according to the circuit. The bank nearer the front of the chassis is on the left.



Ferranti 513 A.M. on Test

MODEL 513 A.M. — Standard model for A.C.-D.C. mains operation, 200-260 volts, 40-100 cycles. Price 13½ gns.

DESCRIPTION.—Four valve, plus rectifier, three-band superhet table model receiver.

FEATURES. — Full-vision scale coloured for wavebands and calibrated in metres and station names. Controls for tuning, wave-selection, combined volume and master switch. Tone control at side of cabinet. Detachable mains lead. External speaker connections.

LOADING.—65 watts.

Sensitivity and Selectivity.

SHORT WAVES (16.6-51 metres).—Very good gain and selectivity. Easy handling, no noticeable drift. Well-maintained gain.

MEDIUM WAVES (200-550 metres).—Good gain with representative selectivity and a good background.

LONG WAVES (900-2,000 metres).—Very good gain and excellent selectivity. All main stations easily received and very little interference on Deutschlandsender.

Acoustic Output.

Clean, crisp tone with ample volume for an ordinary room without overloading. Quite vigorous tone control. Little coloration on speech and a general all-round pleasing balance.

McMichael 374 Transportable

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noise suppression circuit comes into operation.

The electrolytic smoothing condenser block (C25, C35 and C36) is mounted on the wood cross-bar, which also supports the mains transformer and rectifying valve, V6. The tone control resistance and condenser (C34 and R35) are mounted on the side of the cabinet. The visual tuning indicator is secured with its holder on the speaker baffle board; on its holder are located R28 and R45.

The mains adjustment, located on the mains transformer, consists of a threaded member adapted to make contact with one of three inscribed sockets.

The combined dial illumination and waveband indication lights, of which there are three, are mounted in screw-in holders on the rotating drum behind the wavelength scale. They have M.E.S. bases, and are rated at 6.2 volts .3 amp.

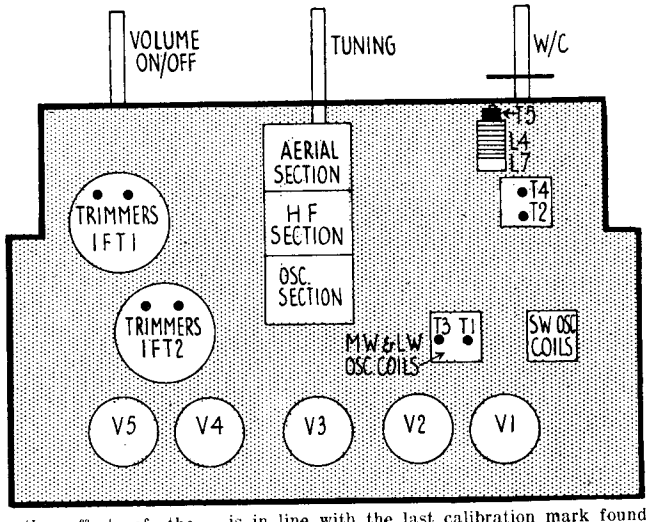
In our particular chassis R11 was found to have a value of 2,000 ohms and C22 was .01 mfd. R25, R42. C20 and C26 are contained in I.F.T.2. C2 is mounted on the frame aerial structure near T6. The short wave padding condenser is included in the oscillator coil can with R13.

Noise Suppression Circuit.—A noise suppression circuit controlled by a switch is included in this receiver enabling "quiet" reception to be obtained in "noisy" localities. V4 is given a positive potential of about 12 volts by a potentiometer between the H.T. positive line and chassis. This potential is only applied on the medium and long wave bands as on S.W. the cathode is returned to chassis *via* R26 and R34 connected in parallel.

The "cold" end of the secondary winding of the second I.F. transformer is connected to the demodulating diode load and also to the suppressor electrode of V3 *via* R27. The suppressor grid is used as a diode and saves the use of a separate valve. The noise suppression switch (N.S.) is open when in use and brings R5 into operation.

The demodulating diode of V4 has a quieting or quenching voltage applied to it when operating on the medium and long wavebands and, in effect, this potential is obtained from a potentiometer, R27 and R42. This voltage is approximately a third of the voltage applied to the cathode of V4—*i.e.*, about 4 volts.

When a signal is tuned in the diode (suppressor electrode) becomes of infinitely high impedance, the quenching voltage on the diode of V4 is removed and normal operation ensues. When the "noise suppression" comes into operation an extra bias is applied both to V1 and V3, and, therefore, a stronger signal will be needed to neutralise the effect of the quenching voltage, as both V1 and V2 are in a less sensitive condition.



The valves are accessibly arranged along the rear of the 374 chassis as the top "deck" diagram shows. Construction throughout is on particularly orderly lines.

Alignment Notes

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer and a service oscillator between the top grid cap of V2 and chassis. Switch receiver to M.W. band, turn gang to maximum capacity, volume to maximum and tone to "high."

Tune the service oscillator to 128.5 kc., and adjust the trimmers of I.F.T.2 and then I.F.T.1 for maximum response, reducing the input from the service oscillator as the circuits come into line to render the A.V.C. inoperative.

Signal Circuits.—Connect the leads from the service oscillator to a few turns of wire and bring these close to the cabinet, so that a signal is heard. As the volume increases, owing to adjustment of trimmers, move the coil further away, so that the receiver always operates below the A.V.C. level.

With gang at maximum, check that the leading edge of the medium wave tuning light is in line with the last calibration mark found 3-16 in. from the top (high wavelength) end of the medium wave scale.

Medium Waves.—Tune set and oscillator to 214 metres (1,400 kc.). On the set scale this is the short line opposite Radio Lyons. Adjust T1 and T2 for maximum response.

The medium wave padding is fixed, but if calibration is very much out at 500 metres (600 kc.), compensate with T1, and then retrim T2 on a 214 metres signal.

Long Waves.—Tune set and oscillator to 1,000 metres (300 kc.), and adjust T3 and T4 for maximum response. L.W. padding is fixed.

Short Waves.—Tune set and oscillator to 16.5 metres (18.2 mcs.) and adjust T5 and T6 for maximum response. T6 is the trimming condenser mounted on the frame aerial structure.

Replacement Condensers.

Exact replacement condensers are available for the McMichael 374 from A. H. Hunt, Ltd. These are: for the block containing C35, 36 and 25, unit 3666, 8s. 6d.; for C29, 2915, 1s. 9d.; and for C32, 2918, 1s. 9d

WINDINGS (D.C. Resistances)

Winding.	Ohms.	Range.	Where measured.	Winding.	Ohms.	Range.	Where Measured
L1 ..	25.4	L.W.	Top grid V1 and C2.	L12+R13	52	S.W.	C10 and chassis.
L2 ..	2.2	M.W.	Top grid V1 and C2.	L13 ..	13	L.W.	C14 and C 12.
L3 ..	Low	S.W.	Top grid V1 and C2.	L14 ..	3	M.W.	C14 and C13.
L4 ..	5.2	L.W.	Anode V1 and R6+C9.	L15 ..	Low	S.W.	Inaccessible.
				L16 ..	42	—	Across I.F. tags
L5 ..	4.5	M.W.	Anode V1 and R6+C9.	L17+R16	42	—	Across I.F. tags.
				L18 ..	42	—	Anode of V3 and R19.
L6 ..	.2	S.W.	Anode V1 and R6+C9.	L19 ..	—	—	Inaccessible.
				L20 ..	1,200	—	1st and 6th tags spkr. trans.
L7 ..	19.6	L.W.	Top grid V2 and R7+C6.	O.T. prim.	550	—	1st and 5th tags spkr. trans.
L8 ..	1.7	M.W.	Top grid V2 and R7+C6.	M.T. prim.	17	—	Across mains plug.
L9 ..	Low	S.W.	Top grid V2 and chassis.	Total H.T sec.	300	—	Across anode pins V6.
L10 ..	4.5	L.W.	R11 and chassis.				
L11 ..	2.2	M.W.	R12 and chassis.				

Alignment Notes for Ferranti Model 513A.M.

(Continued from page 5.)

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer, inserting a 2 mfd., 350 volt working, condenser in series with one of the leads. Switch receiver to M.W. band, turn gang to maximum, volume to maximum and tone to high position. Connect a service oscillator between the top grid of V1 cap (via a .01 condenser) and chassis.

Tune service oscillator to 450 kcs., and adjust TC1, TC2, TC3 and then TC4 for maximum response, reducing the input from the service oscillator as the circuits come into line in order to keep the signal below the point at which the A.V.C. operates.

Signal Circuits.—Connect the service oscillator to the A and E sockets *via* a dummy aerial only feeding sufficient input to obtain reliable peaks in the output meter and reducing the input as the circuits come into line.

Short Waves.—With the gang condenser at minimum capacity (vanes fully out) inject a weak signal of 16.6 metres (18 mcs.) and adjust T1 to obtain the signal. Rotation of T1 may produce more than two signals, but the output of the service oscillator should be adjusted until only two peaks are heard. The correct peak is the one obtained with T1 in the smaller capacity (anti-clockwise) position.

Medium Waves.—With vanes still fully out, inject a weak 200 metres (1,500 kcs.) signal, screw T2 right up and then unscrew until the second peak is heard.

Set service oscillator to 228 metres (1,316 kcs.), tune in on receiver and adjust T3.

Set service oscillator to 500 metres (600 kcs.), tune in on receiver and adjust P1 for maximum, simultaneously rocking the gang.

Repeat all operations until no further improvement results. Then turn gang to maximum capacity, tune service oscillator to 666.6 metres (450 kcs.), increase input from oscillator until the signal registers on the output meter and then adjust T4 for maximum or zero deflection.

Long Waves.—Set oscillator to 1,128 metres (266 kcs.), tune in on receiver and adjust T5 for maximum, simultaneously rocking the gang.

Set oscillator to 1,807 metres (166 kcs.), tune in on receiver and adjust P2 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement results. Then set oscillator to 261 metres (1,149 kcs.), tune in harmonic on receiver (about 1,200 metres), increase input from service oscillator until signal registers on the output meter, then adjust T6 for minimum or zero deflection.

Replacement Condensers.

Exact service replacement condensers for the 513 A.M. are available from **A. H. Hunt, Ltd.**

For the block containing Cs 30 and 31 there is unit 1992, price 8s. 6d.; for the block containing Cs 15 and 26, unit 4162, 6s. 6d., and for either C10, C14 or C25, unit 3542, 2s.