

SERVICE ENGINEER

FERGUSON 378 A.C. ALL-WAVE SUPERHET

CIRCUIT.—The Ferguson model 378 is an eight-valve superheterodyne receiver for operation on A.C. mains, and covering four wave-bands—two short and the usual medium and long.

On medium and long wavelengths the aerial is connected through a series condenser and resistance to an inductively coupled coil and to V1, an H.F. pentode; on short waves the aerial is directly connected to the grid of V1 through C3.

Coupling between V1 and V2 is inductive on medium and long and capacitive via C7 on the short waves. V2 is the frequency changer.

The output of V2 is passed through an I.F. transformer tuned to 465 kc. to V3, an H.F. pentode, and then through a second I.F. transformer to V4, a double diode triode. The diodes are strapped and used for demodulation and A.V.C.

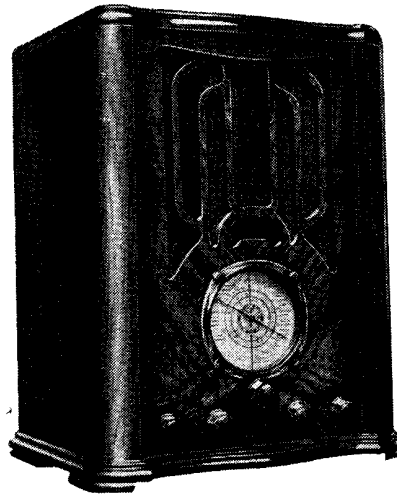
The L.F. output of V4 passes to the phase changer valve V5, a triode, by

means of a resistance and capacity stage, and then to the output pentodes, which are in resistance-coupled paraphase push-pull.

A sensitivity control is provided by VR1, which varies the bias applied to the cathode of V1. Volume is controlled by VR2 and tone by VR3.

Mains equipment consists of transformer, full-wave rectifier, electrolytic condensers and the speaker field.

Special Notes.—The dial lamps, of which there are four, are the usual



Eight valves, two of them in push-pull output, are used in the four wave-band American-type superhet produced by Ferguson. Below is the circuit diagram.

QUICK TESTS

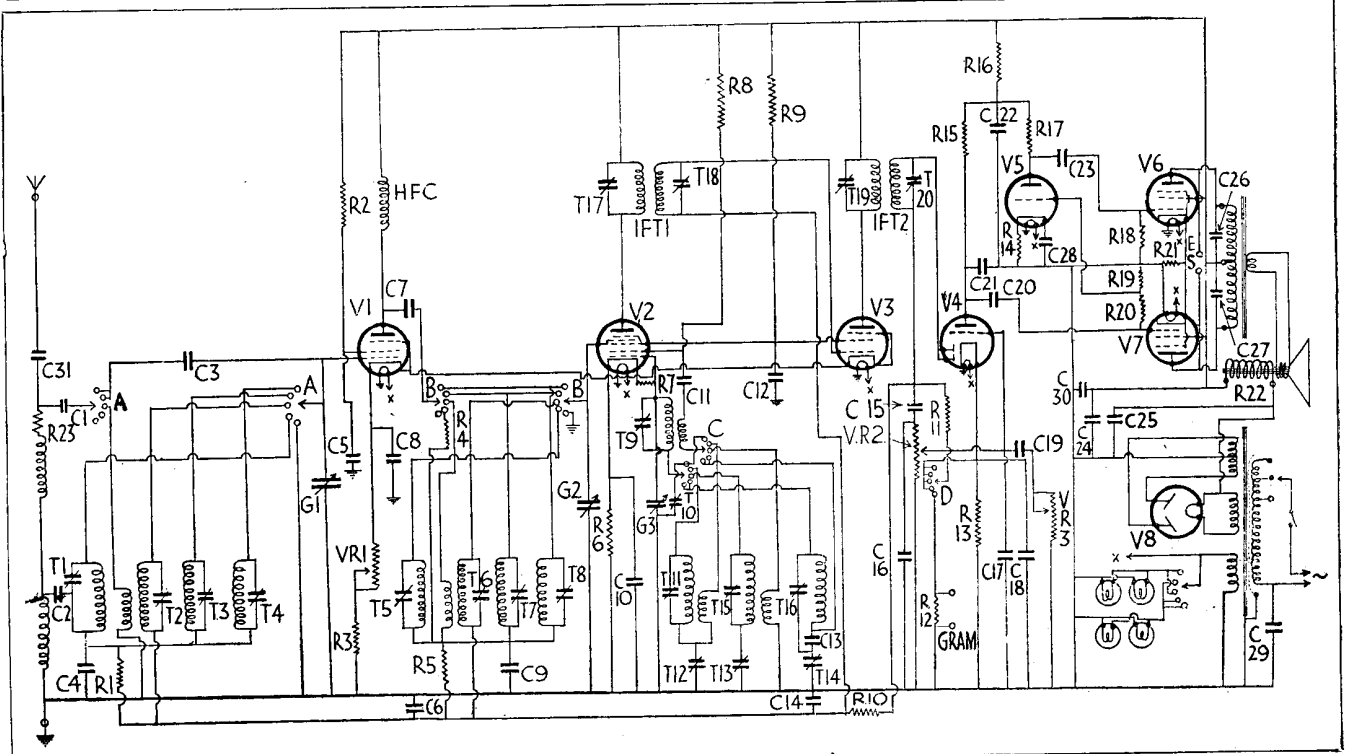
Quick tests are available on this receiver on the terminal strip on the back of the speaker. Volts measured between this and the chassis should be—

- 1 (top), 340v., unsmoothed, H.T.
- 2, 240v., smoothed, H.T.
- 3, 250 v., smoothed H.T.
- 4 (centre tap), 250v., smoothed H.T.
- 5 (bottom), 250v., smoothed H.T.

VALVE READINGS

No. signal. Volume and sensitivity maximum. 200-v. A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
1	6D6 (6)	anode ...	250	4.4
		screen ...	65	1.15
		...	250	1
2	6A7 (7)	anode ...	250	1.2
		screen ...	65	3.8
		osc. anode ...	140	4.4
3	6D6 (6)	anode ...	250	4.4
		screen ...	65	1.15
		...	250	1
4	75 (6) ...	anode ...	40	.4
		...	40	.4
		...	240	26.5
5	76 (5) ...	anode ...	40	.4
		...	250	5.6
		...	240	26.5
6	42 (6) ...	anode ...	240	26.5
		screen ...	250	5.6
		...	340	—
7	42 (6) ...	anode ...	240	26.5
		screen ...	250	5.6
		...	340	—
8	80 (4)	250	5.6
		...	340	—
		...	340	—



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6 volt .3 amp. type, and the holders are fixed to the dial assembly by clips. The chassis must be removed, however, before they can be taken out.

The external speaker is connected on the primary of the output transformer, and should have its own matching transformer.

Removing Chassis.—Remove the knobs from the front of the cabinet—they are secured by grub screws—and remove the speaker-connecting plug from its socket on the back of the chassis. Take out four bolts from underneath the cabinet. The chassis may then be removed.

ALIGNMENT NOTES

I.F. Circuits.—Connect a modulated oscillator tuned to 465 kc. to the grid of V3 and an output meter across the external speaker terminals. Roughly trim T19 and T20 for maximum on output meter.

Transfer the oscillator to the grid of V2 and adjust T17, T18, T19 and T20 for maximum until no further improvement is possible.

Padding (All Waves).—Connect a high-note buzzer to the aerial and close the gang condenser, i.e., maximum capacity. Starting with the first short-wave band, adjust the padding condensers for maximum response on each waveband. The padders are: SW1, T10; SW2, T12; medium, T13; and long, T14.

Long Waves.—With a high-frequency

FERGUSON 378 A.C

buzzer connected to the aerial terminals, tune the receiver to 1,200 metres and adjust T16, T8 and T4 for maximum on output meter. Close the gang condenser and readjust the padder T14 as before. Then return to 1,200 metres and readjust T16, T8 and T4.

Medium Waves.—Tune the receiver to

250 metres and adjust T15, T7 and T3 for maximum output.

Fully mesh the condenser plates and readjust T13. Then return to 250 metres and complete the adjustment of all these trimmers.

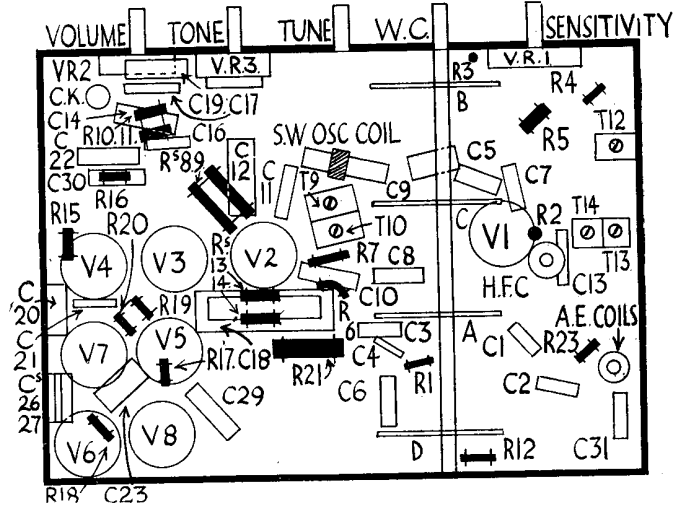
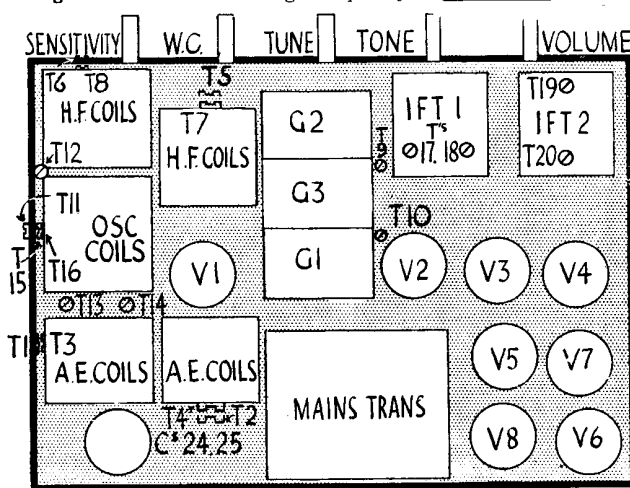
(Continued on page 13.)

RESISTANCES

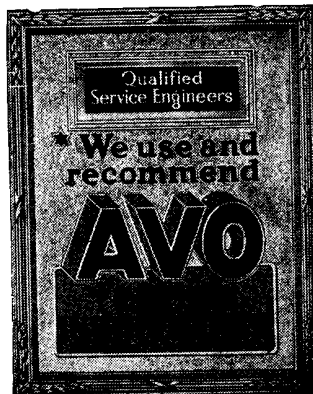
R.	Purpose.	Ohms.
1	V1 A.V.C. decoupling	500,000
2	V1 screen decoupling	100,000
3	V1 cathode bias	200
4	Long-wave anode shunt	50,000
5	V2 A.V.C. decoupling	500,000
6	V2 cathode bias	5,000
7	V2 osc. grid leak	50,000
8	V2 osc. anode feed	25,000
9	V2 and V3 screen decoupling	50,000
10	Main A.V.C. decoupling	250,000
11	Diode load	250,000
12	Pick-up shunt	25,000
13	V4 cathode bias	10,000
14	V5 cathode bias	10,000
15	V4 anode load	250,000
16	V4 and V5 anode decoupling	100,000
17	V5 anode load	250,000
18	V6 grid leak	500,000
19	V7 grid leak potr. (part)	50,000
20	V7 leak potr. (part)	500,000
21	V6 and V7 cathode bias	300
23	Series aerial	2,500
VR1	Sensitivity control	3,000
VR2	Volume control	500,000
VR3	Tone control	500,000

CONDENSERS

C.	Purpose.	Mfd.
1	Aerial feed	.00025
2	Aerial feed	.01
3	V1 grid (short waves)	.00005
4	V1 A.V.C. decoupling	.002
5	V1 screen decoupling	.1
6	V2 A.V.C. decoupling	.1
7	H.F. coupling	.00025
8	V1 cathode bias shunt	.1
9	V2 A.V.C. decoupling	.002
10	V2 cathode bias shunt	.1
11	V2 osc. anode feed	.00025
12	V2 and V3 screen decoupling	.1
13	Long wave padding	.00025
14	A.V.C. decoupling	.1
15	L.F. coupling	.00025
16	H.F. by-pass	.00025
17	H.F. by-pass	.00025
18	V4 cathode bias shunt	.25
19	Tone control	.01
20	L.F. coupling	.01
21	V4 anode shunt	.001
22	V4 and V5 anode decoupling	.1
23	L.F. coupling	.01
24	H.T. smoothing	8
25	H.T. smoothing	8
26	Pentode compensating	.002
27	Pentode compensating	.002
28	V5 cathode bias shunt	5
29	Mains suppressor	.01
30	V6 and V7 anode decoupling	.1
31	Series aerial	.01



Left, the top chassis layout of the 378 A.C.; right, the underneath design.



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Deferred Terms if desired.

MODELS 801, 804 Continued

output does not incorporate a feed condenser) and adjust T1, T2, T3 and T4 for maximum output.

SW Band.—Switch receiver to SW and adjust pointer to 15 megacycles. Inject a 15 megacycles signal into the aerial socket and adjust T5 and T6 for maximum output. Inject and tune in a 6 megacycles signal and adjust T7 while rocking gang to obtain maximum output. Retrim at 15 megacycles.

MW Band.—Inject and tune in a 1200 kc signal and adjust T8 and T9 for maximum output.

Inject and tune in a 580 kc signal and adjust T10 for maximum output while rocking gang.

Check over T8 and T9 adjustments.

LW Band.—Inject and tune in a 240kc signal and adjust T11, T12, for maximum output.

Inject and tune in a 145 kc signal and adjust T13 for maximum output while rocking gang.

Readjust T11 and T12 if necessary.

VALVE READINGS

V	Type	Electrode	Volts	Ma.
1	6A8G	Anode	240	5.2
		Osc. anode	138	3.1
		Screen	90	3.4
		Cathode	1.8	—
2	6U7G	Anode	240	7.2
		Screen	90	2.1
		Cathode	2.2	—
3	6Q7G	Anode	115	.4
		Grid	2.3	—
4	6V6G	Anode	220	35
		Screen	240	3.2
5	25Z6G	Cathode	12	—
		Cathode	340	—

Pilot lamps 6-8v, .3 amps MBC.

Above voltages apply when the smoothed HT measures 240v with a 1,000 opv meter, receiver switched to MW, gang fully meshed, A and E shorted and vol control at minimum.

Motor Field Winding

WHEN replacing the field coils on small electric motors after rewinding, be very careful to see that the turns are in the same direction as formerly and that the connections are the same. If not the motor will run slow and fail to turn a record when the pickup is in position. If in any doubt, change the connections to one field coil.

The coils can be tested for correct connections by passing a current from a dry cell or accumulator through them and testing for polarity of the magnet poles. In a two-pole machine the opposite poles should have different polarity and a small compass will indicate if this is the case.—F. D-L.

FERGUSON 802, 805

Six-valve, plus rectifier and CR tuning indicator, superhet, with push-pull output. Manual tuning with press-button wavechange and radio-gram. switches. For operation from AC or DC mains, 200-250 v. The 802 is a table model and the 805 a radiogram.

THESE models employ a similar chassis and circuit to those in the Models 801-804 reviewed elsewhere in this issue. The essential differences are, the addition of a cathode ray tuning indicator and a push-pull output.

From the accompanying circuit diagram it will be seen that the cathode ray tuning indicator is designated V5 and its control grid is fed from the grid circuit end of R5, which is the AVC line to V2.

To feed the push-pull output the LF output from the anode circuit of V3 is split into two channels. One feeds direct via C29 to one of the output pentodes, V7, while the other channel is taken via C20 to a potential divider R19, R20, which cuts down the signal fed to the grid of the phase reversal valve, V4, and thus

compensates for the extra amplification of this valve.

The output from V4 is resistance capacity coupled by R24 and C26 to the grid of the second pentode output valve, V6.

Anode instability suppressors, R28 R 29, are connected in the anode circuit of V6 and V7, and extra loudspeaker sockets for a high impedance speaker are provided across the primary of the output transformer L14, L15.

Ganging is same as with 801.

CONDENSERS

C	Mfd	C	Mfd
1	.0005	16	.0001
2	.0001	17	.1
3	.1	18	.01
4	20 mmfd.	19	.00025
5	.004	20	.01
6	.1	21	.25
7	.00025	22	.00025
8	.1	23	.25
9	.1	24	.5
10	.00025	25	.25
11	.1	26	.01
12	.00025	27	.16
13	.00025	28	.16
14	.02	29	.01
15	.02		

WINDINGS

L	Ohms	L	Ohms
1	20	10	9
2	17	11	11
3	3	12	9
4	.1	13	12
5	5	14	330
6	3	15	.5
7	1	16	2
8	.1	17	230
9	.5	Pickup*	2000

* Model 805 Radiogram.

VALVE READINGS

V	Type	Electrodes	Volts	Ma.
1	6A8G	Anode	245	4.7
		Osc anode	140	2.5
		Screen	93	3.8
		Cathode	2	—
2	6U7G	Anode	245	6.8
		Screen	93	1.8
		Cathode	2	—
3	6Q7G	Anode	118	.4
		Grid	2.2	—
4	6CS5	Anode	50	.8
		Anode	245	—
5	6G5	Anode	238	27
		Screen	245	1.5
7	6V6G	Cathode	15	—
		Cathode	340	—

Pilot lamps 6-8v, .3 amps MBC.
Voltages measured with a 1,000opv meter, A and E shorted, vol control at minimum, gang maximum capacity on MW.

RESISTANCES

R	Ohms	R	Ohms
1	10,000	20	35,000
2	3 meg	21	.25 meg
3	150	22	.25 meg
4	.5 meg	23	25
5	.5 meg	24	.25 meg
6	.5 meg	25	.5 meg
7	2,500	26	300
8	25,000	27	.5 meg
9	25,000	28	100
10	300	29	100
11	.5 meg	30	100
12	25,000	31	100
13	.5 meg	32	90
14	.25 meg	33	277
15	50,000	34	166
16	.5 meg	35	290
17	25,000	36	45
18	100,000	37	45
19	.5 meg		

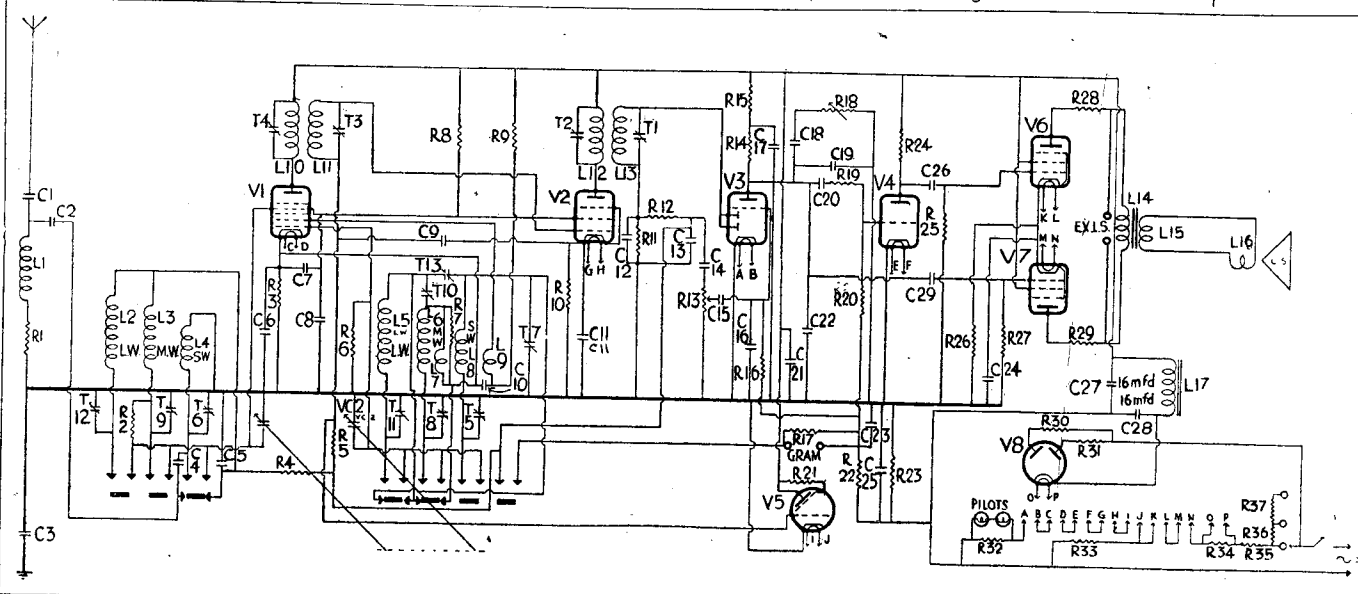
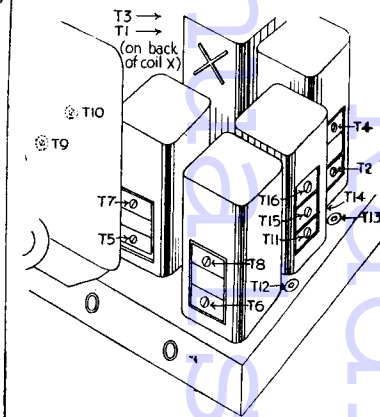
FERGUSON 378

IN the January issue we published service sheets for the Ferguson 378 AC and 378 AC-DC. It appears that the trimmer positions given are not those found in the majority of models.

A revised diagram is given below and the trimmer numbers correspond to those given in the circuit and text for the AC model on page vi of the January issue.

The same instructions apply to AC-DC models and the details given previously for that set should be ignored.

The IF of both AC and AC-DC models is 465 kcs.



In the 802 table model and 805 radiogram there are eight valves against the five of the 801. Push-pull output is provided with a phase reversing input stage. The third additional valve is a CR type tuning indicator.