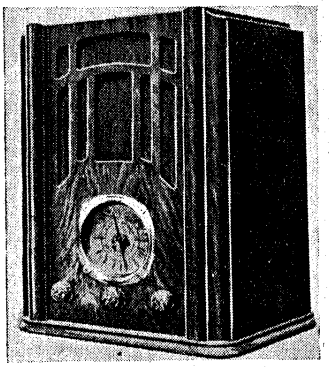
"TRADER" SERVICE SHEET

673

REVISED ISSUE OF SERVICE SHEET No. 187

FERGUSON 366

3-BAND AC/DC SUPERHET



THE Ferguson 366 is a 4-valve (plus rectifier) 3-band superhet designed to operate from AC or DC mains of 200-250 V, 40-100 c/s. The SW range is 16.5-50 m.

Release date and original price: August, 1936; £10 10s.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1**, coupling condenser **C2** and coil **L2** (SW and LW), choke **L1** and bottom coupling condenser **C3** to single-tuned input circuits **L3, C24** (SW), **L3, L4, C24** (MW), **L3, L4, L5, C24** (LW).

First valve **(V1, National Union 6A7)** is a heptode operating as electron coupled frequency changer. Oscillator grid coils **L6, L7, L8** are tuned by **C25**; parallel trimming by **C26** (SW), **C27** (MW), **C28** (LW); series tracking by **C29** (SW), **C30** (MW), **C31** (LW); oscillator anode reaction coils **L9, L10.**

Single variable-mu RF pentode intermediate frequency amplifier **(V2, National Union 6D6)** operates with tuned transformer couplings **C32, L11, L12, C33,** and **C34, L14, L15.**

Intermediate frequency 456 kc/s.

Diode second detector is part of double diode triode valve **(V3, National Union 75).** Audio-frequency component in rectified output developed across load resistor **R7** is passed via **C11** and manual volume control **R8** to CG of triode section. Provision for connection of gramophone pick-up across **R8.**

Resistance-capacity coupling by **R10, C15** and **R11** between **V3** triode and pentode output valve **(V4, National Union 43).** Fixed tone correction in anode circuit by **C16.**

When the receiver is used with AC mains, HT current is supplied by half-wave rectifying valve **(V5, National Union 12Z3)** which, with DC mains, behaves as a low resistance. Smoothing by speaker field coil **L18** and electrolytic condensers **C18, C19.**

Valve heaters are connected in series together with barretter **(National Union 185/R8)** and additional ballast resistors **R14, R15** across mains input circuit. Scale lamps are fed from tapping on barretter resistance.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 220 V, using the 220 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input, the aerial and earth leads being connected together.

Voltages were measured on the 1,200 V scale of an Avometer, chassis being negative.

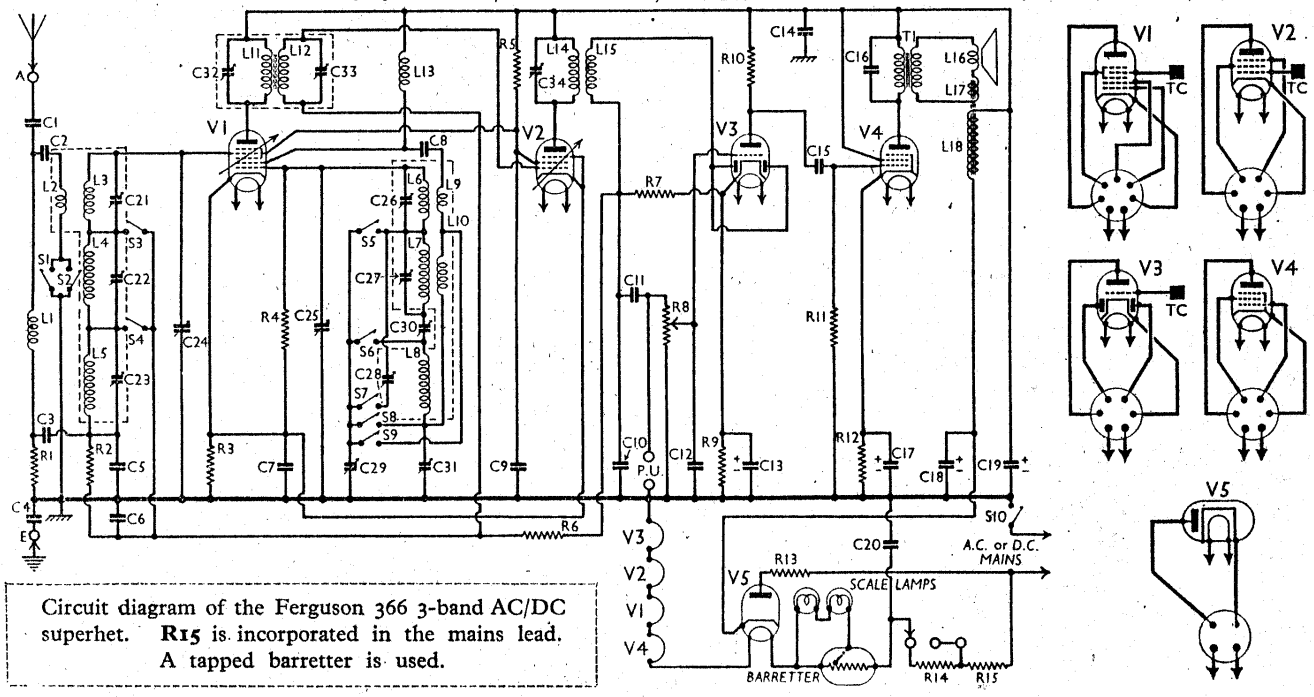
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A7	160	1·4	60	2·6
	Oscillator			
	160	3·6		
V2 6D6 ...	160	3·5	60	1·0
V3 75 ...	40	0·2	—	—
V4 43 ...	150	31·0	160	6·1
V5 12Z3† ...	—	—	—	—

† Cathode to chassis, 245 V D.C.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial series condenser ...	0·00025
C2	Aerial coupling	0.00005
C3	Part aerial coupling ...	0·002
C4	Earth blocking condenser	0·1
C5	Part aerial decoupling ...	0·002
C6	AVC line decoupling ...	0·1
C7	V1, V2 cathode by-pass...	0·1
C8	V1 osc. anode coupling ...	0·00025
C9	V1, V2 SG's by-pass ...	0·1
C10	IF by-pass	0·00025
C11	AF coupling to V3 triode	0·01
C12	IF by-pass	0·00025
C13*	V3 cathode by-pass ...	10·0
C14	HT circuit RF by-pass ...	0·1
C15	V3 to V4 AF coupling ...	0·01
C16	Fixed tone corrector ...	0·01
C17*	V4 cathode by-pass ...	5·0
C18*	HT smoothing condensers	12·0
C19*		12·0
C20	Mains RF by-pass ...	0·05
C21‡	Aerial SW trimmer ...	—
C22‡	Aerial MW trimmer ...	—
C23‡	Aerial LW trimmer ...	—
C24†	Aerial circuit tuning ...	—
C25†	Oscillator circuit tuning...	—
C26‡	Osc. circ. SW. trimmer ...	—
C27‡	Osc. circ. MW trimmer ...	—
C28‡	Osc. circ. LW trimmer ...	—
C29‡	Osc. circ. SW tracker ...	—
C30‡	Osc. circ. MW tracker ...	—
C31‡	Osc. circ. LW tracker ...	—
C32‡	1st IF trans. pri. tuning...	—
C33‡	1st IF trans. sec. tuning...	—
C34‡	2nd IF trans. pri. tuning...	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Ferguson 366 3-band AC/DC superhet. **R15** is incorporated in the mains lead. A tapped barretter is used.

	RESISTORS	Values (ohms)
R1	Aerial circuit series ...	10,000
R2	V1 tet. C.G. decoupling ...	500,000
R3	V1, V2 fixed GB resistor	200
R4	V1 osc. CG resistor ...	25,000
R5	V1, V2 SG's HT feed ...	25,000
R6	AVC line decoupling ...	500,000
R7	V3 diode load	500,000
R8	Manual volume control ...	500,000
R9	V3 GB resistance ...	10,000
R10	V3 triode anode load ...	500,000
R11	V4 CG resistor	500,000
R12	V4 GB resistor	600
R13	Surge limiter resistor ...	100
R14	Part heater circ. ballast...	100
R15	Main heater circ. ballast...	350*

* In mains lead.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial circuit choke ...	21·0
L2	Aerial coupling coil ...	0·7
L3, L4, L5	Aerial circuit tuning coils ...	Very low, 4·0, 23·0
L6, L7, L8	Oscillator circuit tuning coils	Very low, 3·1, 4·7
L9, L10	Oscillator reaction coils ...	0·6, 3·5
L11	1st IF trans. Pri. ...	5·7
L12	1st IF trans. Sec. ...	5·7
L13	V1 osc. anode choke ...	21·0
L14	2nd IF trans. Pri. ...	20·0
L15	2nd IF trans. Sec. ...	15·0
L16	Speaker speech coil ...	1·7
L17	Hum neutralising coil ...	0·1
L18	Speaker field coil	1,800·0
T1	Speaker input trans. Pri.	290·0
	Speaker input trans. Sec.	0·25
S1-S9	Waveband switches ...	—
S10	Mains switch, ganged R8...	—

DISMANTLING THE SET

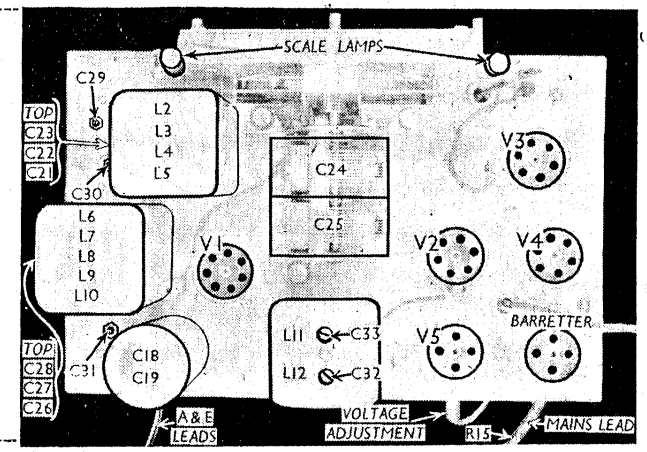
Removing Chassis.—Remove the three control knobs (recessed grub screws), and the four bolts (with flat washers and spring washers) holding chassis to bottom of cabinet.

The chassis may now be withdrawn, and if the speaker leads are unsoldered it may be removed entirely.

When replacing, the speaker leads should be connected as follows, numbering the tags on the speaker from top to bottom: 1, red/white; 2, blue; 3 and 4 (joined together), red.

Removing Speaker.—This is held to the sub-baffle by four nuts and bolts. The transformer should be on the right.

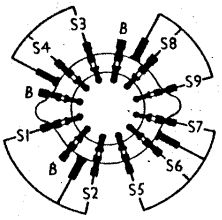
Plan view of the chassis. The sequence of the trimmers in the **L2–L5** and **L6-L10** coil units is indicated, reading from top to bottom. The oscillator tracker adjustments are reached through holes in the chassis deck.



GENERAL NOTES

Switches.—**S1-S9** are the waveband switches, in a single rotary unit beneath the chassis. A diagram of the unit, as seen from the rear of the underside of the chassis, appears below. **S1, S3, S5** and **S9** close on SW (fully anti-clockwise position of control); **S4, S6** and **S8** close on MW; and **S2, S7** close on LW. Otherwise they are open.

Diagram of the waveband switch unit, as seen from the rear of the underside of the chassis.



S10 is the QMB mains switch, ganged with the volume control **R8.**

Coils.—**L1** is beneath the chassis, while **L2-L5** and **L6-L10** are in two screened units on the chassis deck. Each of these contains three trimmers, which are at the sides of the units, and are numbered from top to bottom in our plan chassis view.

The first IF transformer, **L11, L12,** is in another screened unit on the chassis deck, with its associated trimmers, while beneath the chassis is the second IF transformer, **L14, L15,** which is unscreened and supports the primary trimmer **C34.** The secondary has no trimmer.

Scale Lamps.—These are two National Union MES types, rated at 6·8 V. They are connected in series, from the low voltage side of the barretter to its tapping.

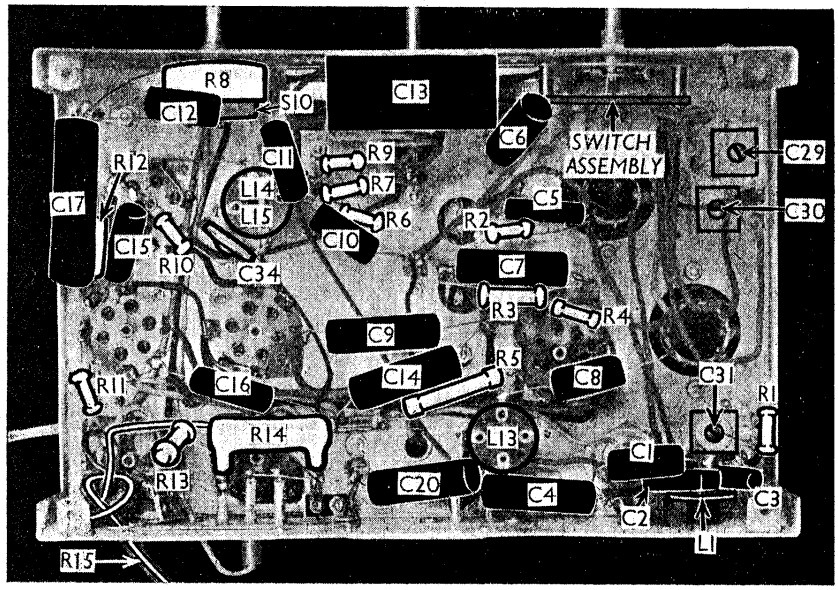
Barretter.—This is actually an American 185 R8 ballast resistor, full information on which is given in *Service Sheet* 597. Our sample measured 145Ω + 45 Ω cold, and its base connections will be found in the *Service Sheet* referred to above.

R15.—This is a 350 Ω line cord resistor, incorporated in the mains lead. This, together with the barretter and **R14,** forms the heater circuit ballast.

Voltage Adjustment.—This is carried out by a plug and sockets, putting **R14** in or out of circuit. Although three sockets marked 200, 220 and 250 V were provided in our chassis, those for 200 and 220 V were joined together.

Condensers C18, C19.—These are two 12 μF dry electrolytics in a single tubular metal container on the chassis deck. The case is negative, the yellow lead is the positive of **C18** and the red the positive of **C19.**

Condenser C13.—This consists of two 5 μF dry electrolytics in parallel in our chassis. The black lead is negative, and the red and yellow leads joined together from the positive.



Under-chassis view. **R15** is a line cord resistor. A detailed diagram of the switch assembly appears in col. 2 above.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V2** and earth lead, feed in a 456 kc/s (657.9 m) signal and adjust **C34** for maximum output. Transfer signal generator to control grid (top cap) of **V1,** switch set to LW, see that gang is fully meshed, and adjust **C33** and **C32** for maximum output. Readjust **C34** if necessary. Keep input low.

RF and Oscillator Stages.—With the gang at maximum, the scale pointer should be vertical. First adjust trackers for maximum output at the top of each band, with the gang fully meshed. To do this, connect a high-frequency buzzer via a 50 μμF condenser to the aerial lead of the set, and adjust **C29** on the SW band, **C30** on the MW band and **C31** on the LW band for maximum output.

SW.—Switch set to SW, connect signal generator to **A** and **E** leads, feed in a 14.29 Mc/s signal, and set pointer to 21 m on scale. Adjust **C26,** selecting the peak involving the lesser trimmer capacity, and **C21** for maximum output. Fully mesh the gang again and retrack **C29** as above. Return to 21 m., and readjust **C26** and **C21.** Retrack **C29** again.

MW.—On MW repeat above procedure, trimming **C27** and **C22** at 250 m (1,200 kc/s) and tracking **C30** at the top of the scale.

LW.—On LW trim **C28** and **C23** at 1,200 m (250 kc/s), and track **C31** at top of scale.

Note that the three bands are interdependent, and any re-alignment of one band will affect the others.

Printed in Great Britain by The Cornwall Press Ltd., Paris Garden, London, S.E.1