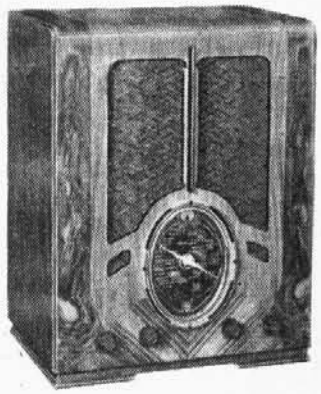
'TRADER' SERVICE SHEET

322

FERGUSON 602, 602C AND 602RG



AN AC/DC 3-band superhet chassis of the 6-valve (plus two rectifiers) type is fitted in the Ferguson 602 table model receiver, features being a cathode-ray tuning indicator, a barretter, a short-wave range of 16-50 m and provision for a gramophone pick-up.

The chassis of the 602C console and 602RG radio-gramophone are identical, but this *Service Sheet* was prepared on a 602.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1,** coupling condenser **C3,** coupling coil **L2** (SW) and coupling condenser **C4** (MW and LW) to single tuned circuits **L3, C33** (SW), **L4, C33** (MW) and **L5, C33** (LW) which precede heptode valve (**V1, National Union 6A7**), operating as frequency changer with electron coupling.

The choke **L1** across aerial circuit is claimed to prevent mains hum modulating a carrier and resistance **R1** damps the rejector circuit to prevent a resonance peak.

Oscillator grid coils **L6** (SW), **L7** (MW) and **L8** (LW) are tuned by **C34;** parallel trimming by **C36** (SW), **C37** (MW) and **C10, C38** (LW); series tracking by **C39** (SW), **C35** (MW) and **C40** (LW). Reaction by coils **L9** (SW) and **L10** (MW); on LW anode is coupled back to low potential end of **L8.**

Second valve (**V2, National Union 6D6**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned secondary transformer couplings **C6, C41, L11, L12, C42** and **C43, L14, L15, C44.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3, National Union 75**). Audio frequency component in rectified output is developed across load resistance **R12** and passed via AF coupling condenser **C17** and manual volume control **R11** to CG of triode section, which operates as AF amplifier. Fixed tone correction by **C19** in grid circuit and variable tone control by **R10, C16** across diode load. IF filtering by **R9, C14** and **C15.**

Second diode of **V3,** fed from **L15** via **C18,** provides DC potential which is developed across load resistance **R16** and fed back through decoupling circuit as CB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along **R13** in **V3** cathode lead.

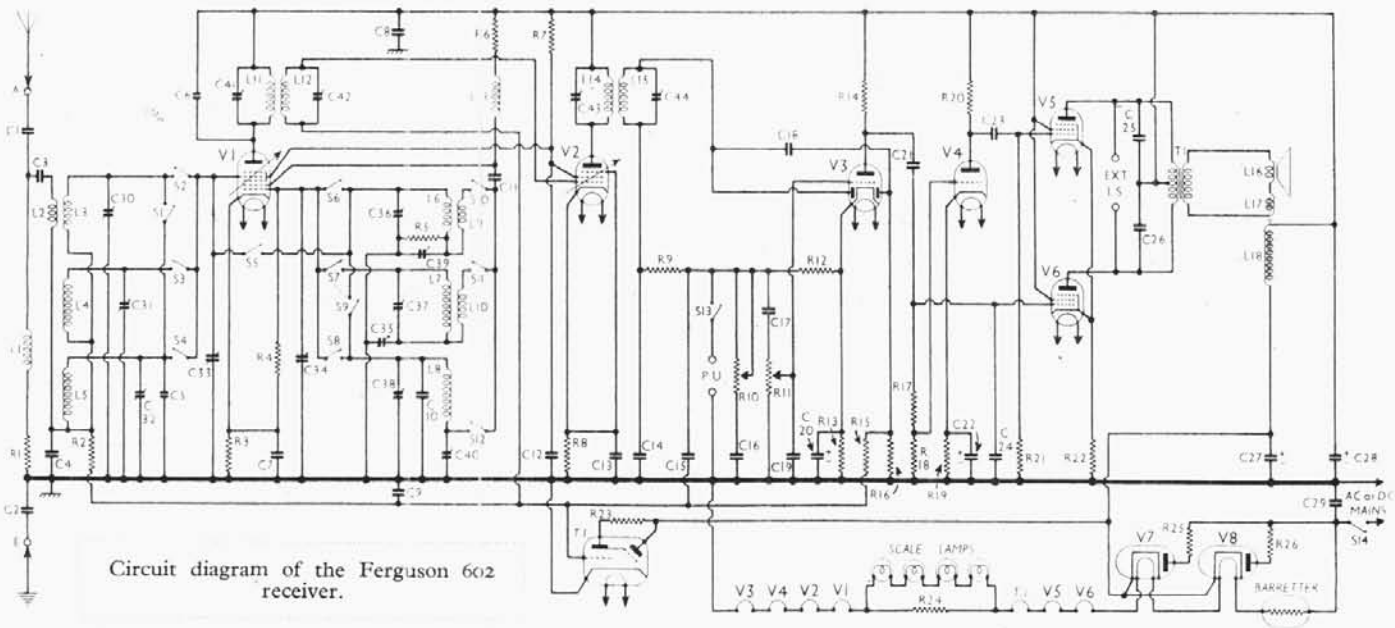
Operating potential for cathode ray tuning indicator (**T.I. National Union 6G5**) is obtained from AVC line.

Resistance-capacity coupling by **R14, C21** and **R17, R18** between **V3** triode and one section (**V6**) of push-pull output stage comprising two pentodes (**V5, V6, National Union 43's**). Second section (**V5**) is fed by phase-reversing valve (**V4, National Union 76**), which obtains its input voltage from junction of **R17, R18.**

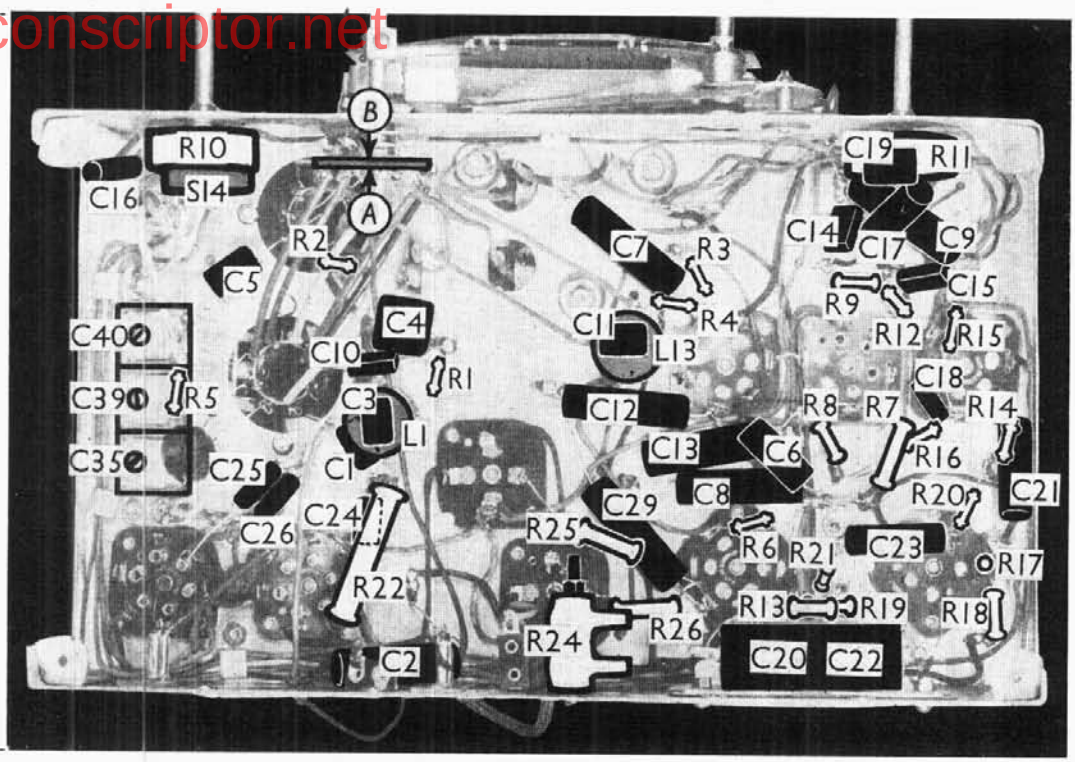
Fixed tone correction in output stage by condensers **C24, C25, C26.** Provision for connection of high impedance external speaker across primary of **T1.**

When the receiver is used with AC mains HT current is supplied by two half-wave rectifying valves (**V7, V8, National Union 12Z3's**) connected in parallel which, on DC supplies, behave as a low resistance. Smoothing is effected by speaker field **L18** and electrolytic condensers **C27, C28.** RF filtering in HT circuit by **C8** and in mains circuit by **C29.**

Valve heaters are connected in series together with scale lamps, with shunt resistance **R24,** and current regulating barretter (**Ferguson 130B** or **110B**), across mains input.



Circuit diagram of the Ferguson 602 receiver.



Under-chassis view. A single switch unit is used, but two diagrams, in the directions A and B, are given on page VIII. **R24** is the vitreous enamelled scale lamp shunt resistor. **C20** and **C22** are electrolytics in a single unit.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	AF rejector damping	2,500
R2	V1 hexode CG decoupling	500,000
R3	V1 fixed GB resistance	200
R4	V1 osc. CG resistance	25,000
R5	Oscillator SW circuit stabiliser	500,000
R6	V1 osc. anode HT feed	5,000
R7	V1, V2 SG HT feed	25,000
R8	V2 fixed GB resistance	300
R9	IF stopper	25,000
R10	Variable tone control	500,000
R11	Manual volume control	500,000
R12	V3 signal diode load	500,000
R13	V3 GB and AVC delay resistance	10,000
R14	V3 triode anode load	250,000
R15	AVC line decoupling	500,000
R16	V3 AVC diode load	500,000
R17	V4 CG resistances	500,000
R18		50,000
R19	V4 GB resistance	10,000
R20	V4 anode load	250,000
R21	V5 CG resistance	500,000
R22	V5, V6 GB resistance	300
R23	T.I. anode HT feed	250,000
R24	Scale lamps shunt	100
R25	V7 anode current limiter	100
R26	V8 anode current limiter	100

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·00025
C2	Earth isolating condenser	0·1
C3	Aerial coupling condenser	0·00025
C4	MW and LW aerial coupling	0·002
C5	Aerial LW fixed trimmer	0·00002
C6	1st IF trans. fixed trimmer	0·000025
C7	V1 cathode by-pass	0·1
C8	HT circuit RF by-pass	0·1
C9	AVC line decoupling	0·1
C10	Osc. circuit LW fixed trimmer	0·00011
C11	V1 osc. anode coupling	0·00025
C12	V1, V2 SG's decoupling	0·1
C13	V2 cathode by-pass	0·1
C14	IF by-pass condensers	0·00025
C15		0·00025
C16	Part of variable tone control	0·004
C17	AF coupling to V3 triode	0·01
C18	Coupling to V3 AVC diode	0·00025
C19	Fixed tone corrector	0·00025
C20*	V3 cathode by-pass	25·0
C21	V3 triode to V4 and V6 AF coupling	0·01

	CONDENSERS (*Continued*)	Values (μF)
C22*	V4 cathode by-pass	5·0
C23	V4 to V5 AF coupling	0·01
C24	Fixed tone correctors	0·001
C25		0·002
C26		0·002
C27*	HT smoothing	20·0
C28*		20·0
C29	Mains RF filter	0·1
C30‡	Aerial circuit SW trimmer	—
C31‡	Aerial circuit MW trimmer	—
C32‡	Aerial circuit LW trimmer	—
C33†	Aerial circuit tuning	—
C34†	Oscillator circuit tuning	—
C35‡	Osc. circuit MW tracker	—
C36‡	Osc. circuit SW trimmer	—
C37‡	Osc. circuit MW trimmer	—
C38‡	Osc. circuit LW trimmer	—
C39‡	Osc. circuit SW tracker	—
C40‡	Osc. circuit LW tracker	—
C41‡	1st IF trans. pri. tuning	—
C42‡	1st IF trans. sec. tuning	—
C43‡	2nd IF trans. pri. tuning	—
C44‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial AF modulation rejector	20·0
L2	Aerial SW coupling coil	Very low
L3	Aerial SW tuning coil	0·05
L4	Aerial MW tuning coil	3·0
L5	Aerial LW tuning coil	15·5
L6	Oscillator SW tuning coil	Very low
L7	Oscillator MW tuning coil	2·0
L8	Osc. LW tuning and reaction	5·0
L9	Oscillator SW reaction coil	0·15
L10	Oscillator MW reaction coil	0·7
L11	1st IF trans. Pri.	9·5
L12	1st IF trans. Sec.	13·0
L13	V1 osc. anode feed choke	20·0
L14	2nd IF trans. Pri.	13·0
L15	2nd IF trans. Sec.	9·5
L16	Speaker speech coil	2·0
L17	Hum neutralising coil.	0·1
L18	Speaker field coil	1,000·0
T1	Speaker input trans. Pri., total	650·0
	Speaker input trans. Sec.	0·3
S1-S12	Waveband switches	—
S13	Gram. pick-up switch.	—
S14	Mains switch, ganged R10	—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the knobs (pull off) and the felt washers from the four control spindles, and the four bolts (with spring washers and washers) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is adequate for normal purposes.

If it is desired to free the chassis entirely, unsolder the speaker leads, and *when replacing*, connect them as follows :—F and 2 joined, red ; 1, blue ; 3, blue ; F, red/white.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts from the four screws holding it to the sub-baffle and *when replacing*, see that the transformer is on the right.

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A7	150	2·1	58	2·7
	Oscillator			
	130	3·1		
V2 6D6	150	3·8	58	1·1
V3 75	53	0·7	—	—
V4 76	38	0·4	—	—
V5 43	140	30·0	150	7·0
V6 43	140	30·0	150	6·2
V7 12Z3†	—	—	—	—
V8 12Z3†	—	—	—	—
T.I. 6G5	37	0·9	—	—
	Target			
	245	0·3		

† Each cathode to chassis 245 V, DC.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on AC mains of 230 V. The receiver was tuned to the lowest wavelength on the medium band and the volume control was

Continued overleaf

FERGUSON 602—*Continued*

at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, **V1** should become unstable when its anode current is being measured and **V2** when its screen current is being measured, they can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

GENERAL NOTES

Switches.—**S1-S12** are the waveband switches and **S13** the pick-up switch, all ganged in a double-sided rotary unit beneath the chassis. The two sides are marked with the letters A and B in circles in our under-chassis view, and are shown in detail in the diagrams on this page. Note that in many cases tags opposite each other on either side of the paxolin support are common.

The table below gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

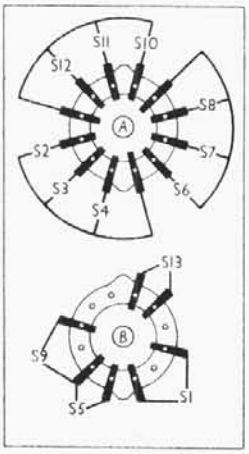
Switch	SW	MW	LW	Gram.
S1	—	C	—	—
S2	C	—	—	—
S3	—	C	—	—
S4	—	—	C	C
S5	—	—	—	C
S6	C	—	—	—
S7	—	C	—	—
S8	—	—	C	—
S9	—	C	—	—
S10	C	—	—	—
S11	—	C	—	—
S12	—	—	C	—
S13	—	—	—	C

S14 is the QMB mains switch, ganged with the tone control, **R10.**

Coils.—**L1** and **L13** are unscreened, and are mounted in two units beneath the chassis. **L2-L5**; **L6-L10**; **L11, L12** and **L14, L15** are in four screened units on the chassis deck, with their associated trimmers.

Scale Lamps.—These are two miniature bayonet cap types, rated at 4·5 V, 0·3 A. (National Union type 51).

External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (14,000 Ω) external speaker. The sockets are not isolated in this set.



Switch diagrams, as seen from the two directions in the under-chassis view.

Condensers C27, C28.—These are two 20μ F dry electrolytics in a single metal can on the chassis deck. The can is the common negative connection, and the two leads projecting beneath the chassis deck are the two positives. The yellow lead is the positive of **C27** and the red the positive of **C28.**

Condensers C20, C22.—These are two dry electrolytics in a single carton beneath the chassis, fixed to the rear member. The tag on the left (looking from the rear of the chassis) is the common negative, and the two on the right are the positives. The upper one is the positive of **C20** (25 μF) and the lower the positive of **C22** (5μF).

Trimmers and Trackers.—All the trimmers are housed inside the cans of the coil units with which they are associated. The three trackers, **C35, C39, C40,** are adjusted by means of screws above the chassis deck, on the right-hand side as seen in our plan chassis view.

A-E Leads.—These are short lengths of insulated wire, terminating in fahnstock clips. The aerial wire has a green covering, and the earth, black.

Chassis Divergencies.—**R7** is given as 50,000 Ω in the makers' diagram, but was 25,000 Ω in our chassis. **C6** is not shown in the makers' diagram. **C16,** given as 0·01 μF by the makers, was 0·004 μF in our chassis.

CIRCUIT ALIGNMENT

The scale pointer should be vertical when the gang is fully meshed, marks being provided for accurate setting.

IF Stages.—Connect signal generator to grid (top cap) of **V2** and earth lead, feed in a 465 KC/S signal and adjust **C43** and **C44** for maximum output. Transfer signal generator to grid (top cap) of **V1,** switch set to LW, see that gang is fully meshed, and adjust **C41** and **C42** for maximum output. Keep input low.

If necessary, re-adjust **C43** and **C44.**

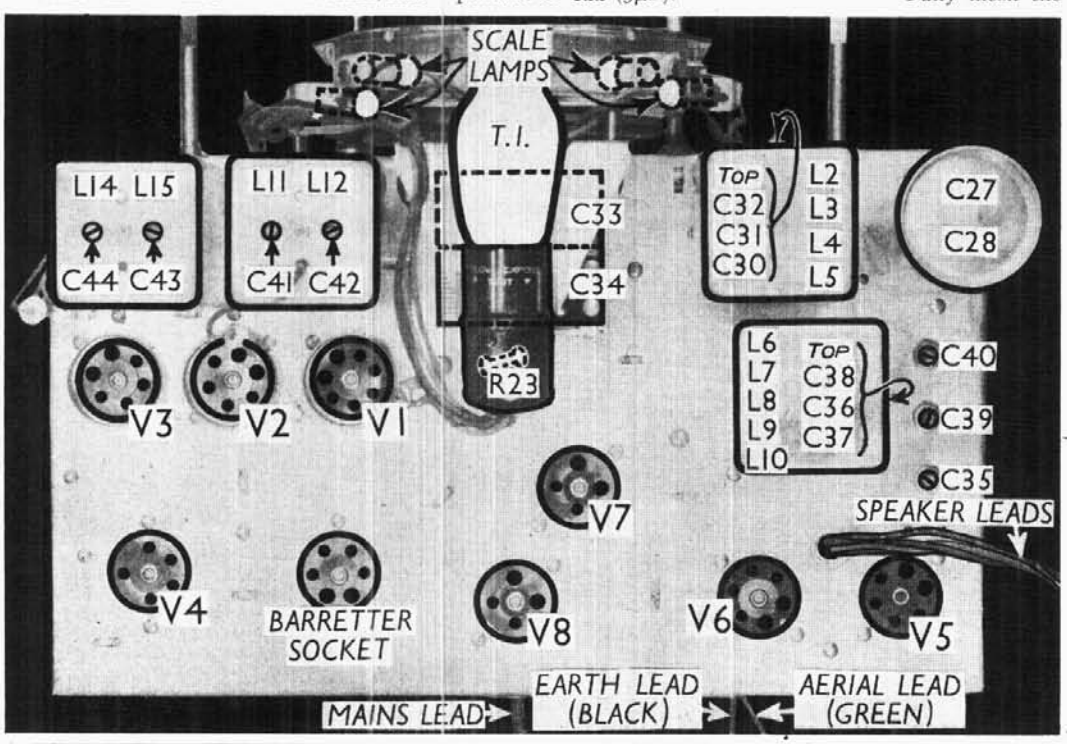
RF and Oscillator Stages.—First adjust trackers for maximum output at the top of each band, with the gang fully meshed. To do this, connect a high frequency buzzer via a 50 μμF condenser to the aerial lead of the set, and adjust **C39** on the SW band, **C35** on the MW band and **C40** on the LW band for maximum output.

Switch set to SW, connect signal generator to **A** and **E** leads and feed in a 21 m signal. Tune to 21 m on scale (about 235 m on MW calibrated scale). Adjust **C36** and **C30** for maximum output. Fully mesh the gang again and re-track **C39** as above. Return to 21 m and re-adjust **C36** and **C30.** Re-track **C39** again.

On the MW band, repeat above procedure, trimming **C37** and **C31** at 250 m and tracking **C35** at the top of the scale.

On LW, trim **C38** and **C32** at 1,200 m, and track **C40** at top of scale.

On the SW band, if **C36** peaks at two places, that with the least trimmer capacity is correct.



Plan view of the chassis. **R23** is inside the T.I. holder. Note the trimmers reached through holes in the sides of the **L2-L5** and **L6-L10** units.

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