NUMBER 130 'TRADER' SERVICE SHEETS

FERRANTI 1936-37 NOVA AND MAGNA

SIMILAR chassis are fitted in the Ferranti Nova and Magna 3-valve (plus rectifier) A.C. all-wave superhets which were released in June of this year. The only differences between the two receivers are that the Nova has a moulded cabinet, while the Magna has a wood cabinet and a visual tuning indicator.

Our "Service Sheet" was prepared on a Nova model.

CIRCUIT DESCRIPTION

Aerial input on M.W. and L.W. via switch **S1**, coupling coils **L1, L2**, and coupling condenser **C1** to mixed-coupled band-pass filter. Primary **L3, L4** tuned by **C26**; secondary **L7, L8** tuned by **C30**; coupling by coil **L6** and condenser **C2**. Image rejection by coil **L5**. On short-wave range aerial input is via switch **S2** and coupling coil **L9** to single tuned circuit comprising **L10** and **C30**.

First valve (**V1, Ferranti metallised VHT4**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L11, L12** (M.W. and L.W.) and **L15** (S.W.) are tuned by **C31**; anode reaction coils **L13, L14** (M.W. and L.W.) and **L16** (S.W.); tracking by condensers **C33** (M.W.) and **C34** (L.W.).

Second valve, a variable-mu H.F. pentode (**V2, Ferranti metallised VPT4**) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L17, L18** and **L19, L20**.

Intermediate frequency 125 KC/S.

Diode second detector forms part of double diode output pentode (**V3, Ferranti PT4D**). Audio-frequency component in rectified output is developed across load resistance **R13** and passed via coupling condenser **C17** and manual volume control **R14** to C.G. of pentode section. Fixed tone correction by condenser **C21**; variable tone control by filter **R21, C22.** Provision for connection of low-impedance external speaker across secondary of internal speaker transformer **T1.**

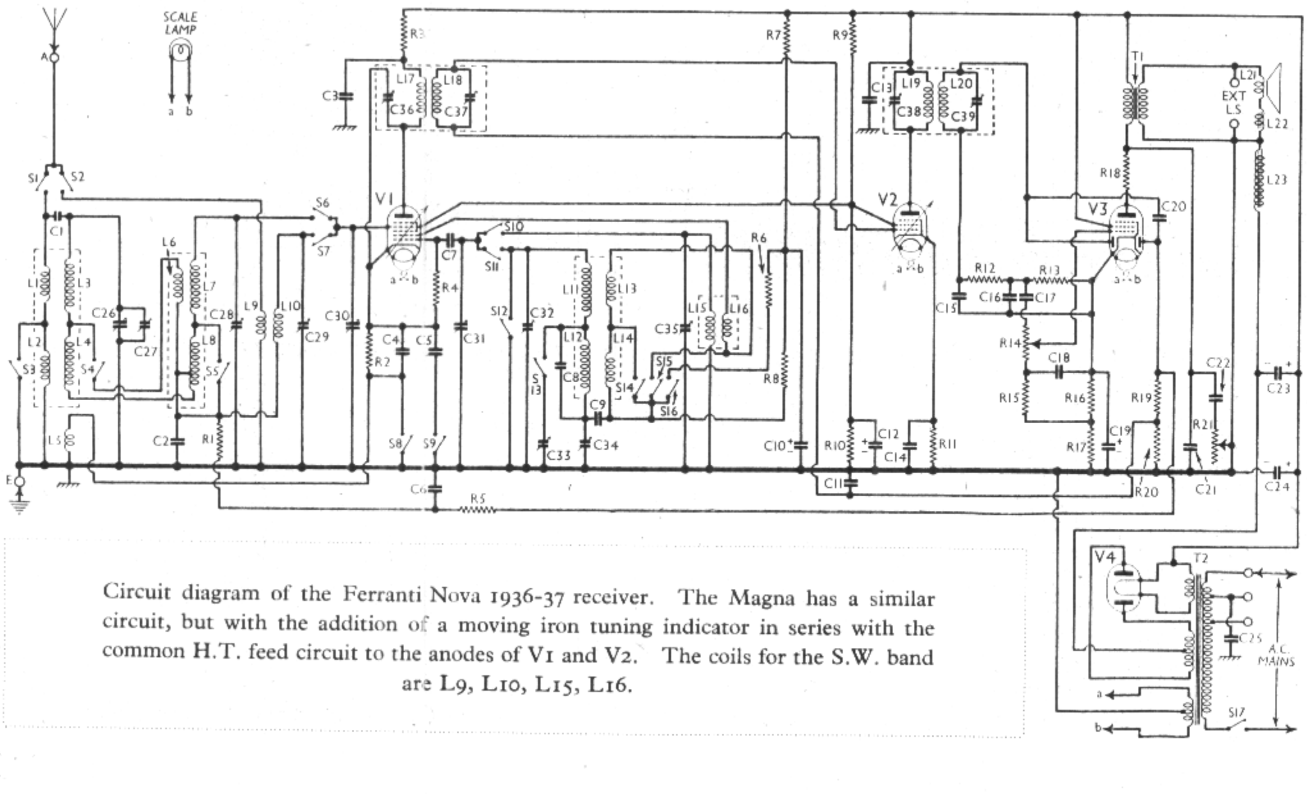
Second diode of **V3,** fed from **V2** anode via **C20,** provides D.C. potential which is developed across load resistances **R19, R20** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along cathode resistances **R16, R17.**

H.T. current is supplied by full-wave rectifying valve (**V4, Ferranti R4**). Smoothing by speaker field coil **L23** in H.T. negative line and dry electrolytic condensers **C23, C24.** Mains H.F. by-passing by condenser **C25.**

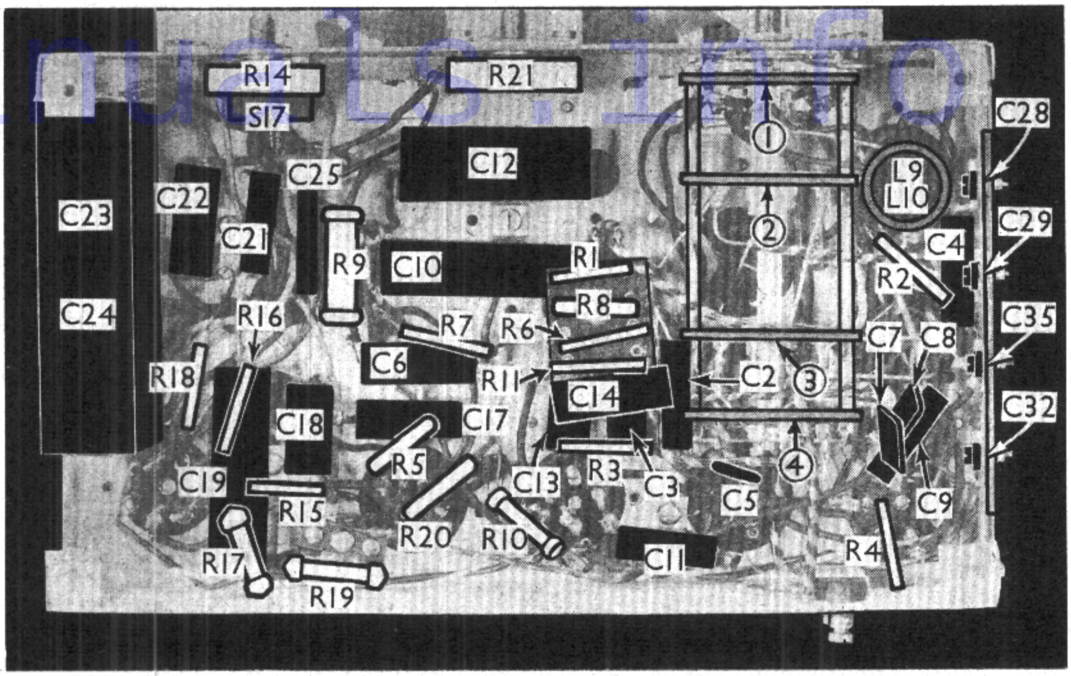
COMPONENTS AND VALUES

Condensers		Values (μF)
C1	Aerial coupling	0·000016
C2	Band-pass coupling	0·05
C3	V1 tetrode anode decoupling ..	0·1
C4	V1 cathode by-pass	0·05
C5	V1 cathode by-pass (S.W.) ..	0·0005
C6	V1 A.V.C. line decoupling ..	0·05
C7	V1 osc. C.G. condenser ..	0·00005
C8	Oscillator L.W. trimmer ..	0·000018
C9	V1 osc. anode coupling ..	0·01
C10*	V1 osc. anode decoupling ..	2·0
C11	V2 C.G. decoupling	0·05
C12*	V1 and V2 S.G.'s by-pass ..	4·0
C13	V2 anode decoupling	0·1
C14	V2 cathode by-pass	0·1
C15	I.F. by-pass	0·00015
C16	I.F. by-pass	0·00015
C17	L.F. coupling to vol. control ..	0·02
C18	V3 C.G. decoupling	0·25
C19*	V3 cathode by-pass	4·0
C20	V3 A.V.C. diode coupling ..	0·00015
C21	Fixed tone corrector	0·002
C22	Part of T.C. filter	0·05
C23*	H.T. smoothing ..	8·0
C24*	H.T. smoothing ..	8·0
C25	Mains H.F. by-pass	0·002
C26†	Band-pass primary tuning ..	—
C27‡	Band-pass primary trimmer ..	—
C28‡	Band-pass secondary trimmer	—
C29‡	Aerial circuit trimmer (S.W.) ..	—
C30†	Band-pass secondary tuning ..	—
C31†	Oscillator tuning	—
C32‡	Oscillator trimmer (M.W. and L.W.)	—
C33‡	Oscillator M.W. tracker ..	0·0039
C34‡	Oscillator L.W. tracker ..	0·0007
C35‡	Oscillator trimmer (S.W.) ..	—
C36‡	1st I.F. trans. pri. tuning ..	—
C37‡	1st I.F. trans. sec. tuning ..	—
C38‡	2nd I.F. trans. pri. tuning ..	—
C39‡	2nd I.F. trans. sec. tuning ..	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Ferranti Nova 1936-37 receiver. The Magna has a similar circuit, but with the addition of a moving iron tuning indicator in series with the common H.T. feed circuit to the anodes of V1 and V2. The coils for the S.W. band are L9, L10, L15, L16.



Under-chassis view. The four rotary switch units are indicated by numbers in circles, the arrows showing the direction in which they were viewed for the production of the diagrams overleaf. L9 and L10 are the S.W. coils preceding V1, the S.W. oscillator coils being in the main oscillator unit on the chassis deck.

	Resistances	Values (ohms)
R1	V1 tetrode C.G. decoupling ..	250,000
R2	V1 cathode resistance.. ..	300
R3	V1 tetrode anode decoupling	1,000
R4	V1 osc. C.G. resistance ..	100,000
R5	V1 A.V.C. line decoupling ..	1,000,000
R6	V1 oscillator anode decoupling resistances.	1,000
R7		30,000
R8		150,000
R9	V1 and V2 S.G.'s H.T. potential divider.	25,000
R10		50,000
R11	V2 cathode resistance.. ..	450
R12	I.F. stopper	100,000
R13	V3 signal diode load	500,000
R14	Manual volume control ..	1,000,000
R15	V3 C.G. decoupling	100,000
R16	V3 G.B. and A.V.C. delay voltage resistances.	140
R17		600
R18	V3 anode circuit stabiliser ..	140
R19	V3 A.V.C. diode load ..	4,000,000
R20		1,000,000
R21	Variable tone control	50,000

	Other Components	Approx. Values (ohms)
L1	Aerial coupling coils (M.W. and L.W.)	18·0
L2		70·0
L3	Band-pass primary coils	4·5
L4		45·0
L5	Image rejector coil	0·25
L6	Band-pass coupling coil ..	0·2
L7	Band-pass secondary coils	4·5
L8		40·0
L9	Aerial coupling coil (S.W.) ..	1·3
L10	Aerial tuning coil (S.W.) ..	0·05
L11	Oscillator tuning coils (M.W. and L.W.).. ..	8·5
L12		23·0
L13	Oscillator reaction coils (M.W. and L.W.).. ..	7·2
L14		8·0
L15	Oscillator tuning coil (S.W.)..	0·05
L16	Oscillator reaction coil (S.W.)	0·8
L17	1st I.F. trans. Pri.	80·0
L18	1st I.F. trans. Sec.	80·0
L19	2nd I.F. trans. Pri.	80·0
L20	2nd I.F. trans. Sec.	80·0
L21	Speaker speech coil	3·8
L22	Hum neutralising coil.. ..	0·25
L23	Speaker field coil	1,600·0
T1	Speaker input trans. Pri. ..	200·0
	Speaker input trans. Sec. ..	0·5
T2	Mains trans. Pri. total ..	32·0
	Mains trans. Heater sec. ..	0·05
	Mains trans. Rect. fil. sec. ..	0·1
	Mains trans. H.T. sec. total	380·0
S1-S16	Waveband switches, ganged ..	—
S17	Mains switch, ganged R14 ..	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the back (six screws) and the five control knobs (pull off). Now remove the four bolts (with washers) holding the chassis to the bottom of the cabinet and disconnect the speaker leads from the sockets on the panel on the top of the mains transformer.

The chassis can now be withdrawn from the cabinet but if it is desired to put it into operating order, it will be necessary to extend the speaker leads.

When replacing, connect the speaker leads as follow, numbering the sockets from back to front, when viewing the chassis from the rear:—1, black; 2, red; 3, green; 4, blue.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts from the four bolts holding it to the sub-baffle. *When replacing*, see that the transformer is at the top.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, using the 230 V tapping on the mains transformer. The volume control was at maximum and the receiver was tuned to the lowest wavelength on the medium band but there was no signal input.

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

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 VHT4*	300	0·9	90	5·4
V2 VPT4	310	4·1	90	2·1
V3 PT4D	290	35·0	310	6·8
V4 R4	365†	—	—	—

* Osc. anode (G2) 78 V, 1·1 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S16** are the waveband switches in four ganged rotary units beneath the chassis. For the sake of clarity the contacts have been separated into single-pole units which are clearly shown in the separate switch diagrams. These give the contact positions as seen looking at the underside of the chassis from the rear. The table below gives the switch positions for the various settings of the control knob, O indicating open, and C closed.

Switch	S.W.	M.W.	L.W.
S1	O	C	C
S2	C	O	O
S3	O	C	O
S4	O	C	O
S5	O	C	O
S6	O	C	C
S7	C	O	O
S8	C	O	O
S9	C	O	O
S10	C	O	O
S11	O	C	C
S12	C	O	O
S13	O	C	O
S14	C	C	O
S15	C	O	O
S16	C	O	O

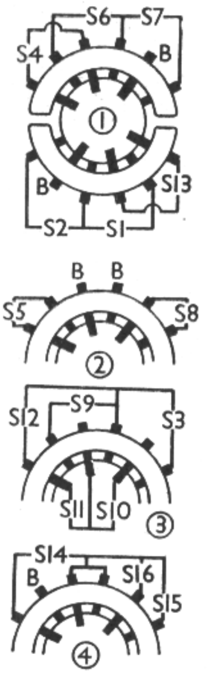
Coils.—All tuning coils, with the exception of those for aerial coupling and tuning on the S.W. range, are in five screened units mounted on the chassis deck. **L9** and **L10**, the S.W. coils referred to, are wound on a tubular former mounted underneath the chassis immediately below the M.W. and L.W. aerial coil unit (band-pass primary). The oscillator unit contains S.W., M.W., and L.W. coils, and also the trackers **C33** (M.W.) and **C34** (L.W.), which comprise fixed and pre-set condensers in parallel. The first I.F. transformer unit **L17, L18** contains its trimmers **C36, C37,** while the second unit **L19, L20,** apart from trimmers **C38, C39,** contains

(*Continued overleaf*)

FERRANTI NOVA AND MAGNA *(Continued)*

resistances **R12, R13** and fixed condensers **C15, C16** and **C20.**

Condensers.—**C27** is the M.W. and L.W. aerial circuit (band-pass primary) pre-set trimmer, which is built into the front section of the ganged tuning condenser unit. Four other trimmers, **C28, C29, C32** and **C35** are mounted in a row at one side of the chassis.



Diagrams of the four switch units, numbered in accordance with the under-chassis view on the preceding page, and viewed from the underside of the chassis in the direction of the arrows shown in the under-chassis view. The letters B indicate blank tags.

C23 and **C24** are 8 μF 500 V dry electrolytics in a single unit with a common positive (red) lead. The black lead to chassis is the negative of **C24** and the other black lead the negative of **C23.**

C10 and **C12** are respectively 2 and 4 μF 350 V dry electrolytics, while **C19** is a 4 μF 50 V type.

Scale Lamp.—An Ever Ready 6.2 V 0.3 A M.E.S. type carried on an easily detachable bracket above the scale-plate.

Magnascopic Scale.—This comprises a large transparent dial and a system of mirrors and lenses which normally should give no trouble. If the scale numbers do not appear centrally in the scale opening the holder of the top mirror should be bent slightly, either backwards (to raise numbers) or forwards (to lower numbers).

Magna Receiver.—This is exactly similar to the Nova except for the cabinet, and the addition of a moving-iron meter visual tuning indicator. The D.C. resistance of the meter winding is 1,200 O, and it is connected in the common H.T. feed circuit to the anodes of **V1** and **V2.**

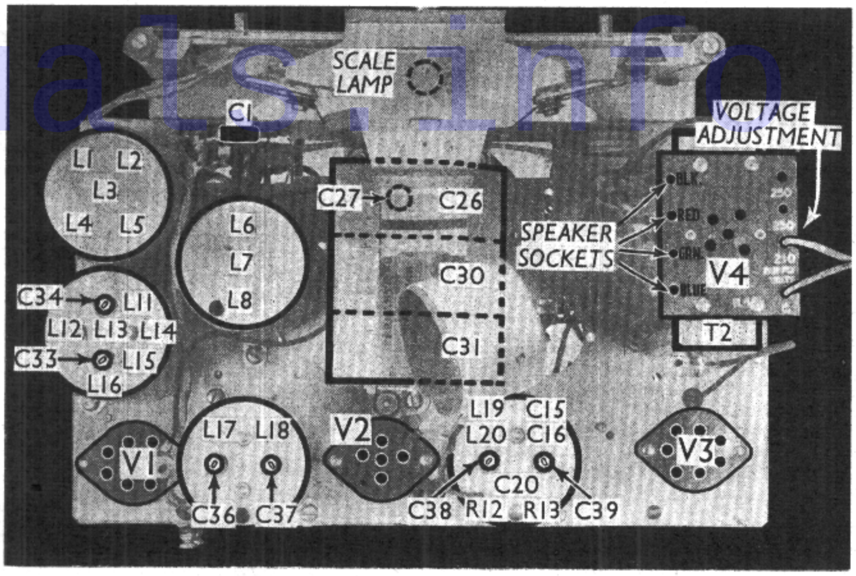
CIRCUIT ALIGNMENT

I.F. Transformers.—Adjust signal generator to 125 KC/S and feed output between **V1** control grid (top cap) and chassis. Adjust trimmers **C39, C38, C37** and **C36,** in that order, to obtain maximum reading on output meter.

Signal Frequency and Oscillator Circuits.—Set tuning pointer to 200 m. with the condenser vanes fully out of mesh (anti-clockwise). Set wavechange switch to M.W. and tuning condenser to 228 m. and feed in a 228 m. signal between **V1** top cap and chassis. Screw oscillator trimmer **C32** to maximum (anti-clockwise) and then slowly clockwise until the second maximum peak output is obtained.

Now apply the 228 m. signal to aerial circuit via an artificial aerial or 0.0002 μF condenser and adjust band-pass trimmers **C27, C28** for maximum output. Adjust tuning condenser and signal generator to 500 m. and adjust M.W. tracker **C33** for maximum output while rocking the gang. Switch to L.W. and adjust tracker **C34** for maximum output at 1,807 m.

Switch to S.W., set tuning condenser to 19.7 m. (marked by black line at top of scale), and apply 19.7 m. signal to aerial. Screw oscillator trimmer **C35** to maximum (anti-clockwise) and then slowly clockwise until second maximum peak output is obtained. To verify adjustment, turn tuning condenser slightly to right and the image output should be obtained. Go back to correct peak and adjust aerial trimmer **C29** for maximum output.



Plan view of the chassis. The speaker sockets are colour-coded. Note that the second I.F. transformer unit contains a number of components in addition to the usual trimmers.

HINTS AND PROBLEMS

(Continued from p. IV)

Loss of Valve Emission

The set in question was an A.C. superhet and the customer complained of severe distortion, which had been present for a considerable time.

The output pentode was suspected, as the H.T. voltage was exceptionally high, and little or hardly any current was being passed by this valve.

A new one was plugged in, and the result was no signals at all. At first, the new valve was suspected, but anode current was normal and H.T. voltage had dropped to normal. On replacing the old valve, however, the set worked and stations were received.

The whole reason was at last seen to be that owing to excessive H.T. voltage caused by the faulty output valve, the oscillator valve had partially lost its emission and would not oscillate at its normal working voltage, which was applied when the new output valve was fitted. On fitting new oscillator and new output valves, the set worked normally.—F.H.

A Useful Tester

Here is a tip that may be useful to many of your readers. I have employed it in service work for over two years.

The " ingredients " are a pair of headphones, a 500 V 0·01 μF fixed condenser, and any ordinary on-off switch.

The condenser is fastened by insulating tape on the headband near one earpiece, and is wired in series with the phones. The switch is fastened to the earpiece by any convenient method, depending on the type of switch and phones, and is wired across the condenser.

When the switch is " on," the phones work normally, while when it is " off " the condenser is in circuit and the phones may be tapped across any convenient points when testing, *e.g.*, anode and chassis, without fear of causing damage.

Of course, a larger condenser will work even better as regards tone, although for this kind of testing good tone is not normally needed. It is inadvisable to use a smaller value of condenser.—P. B.