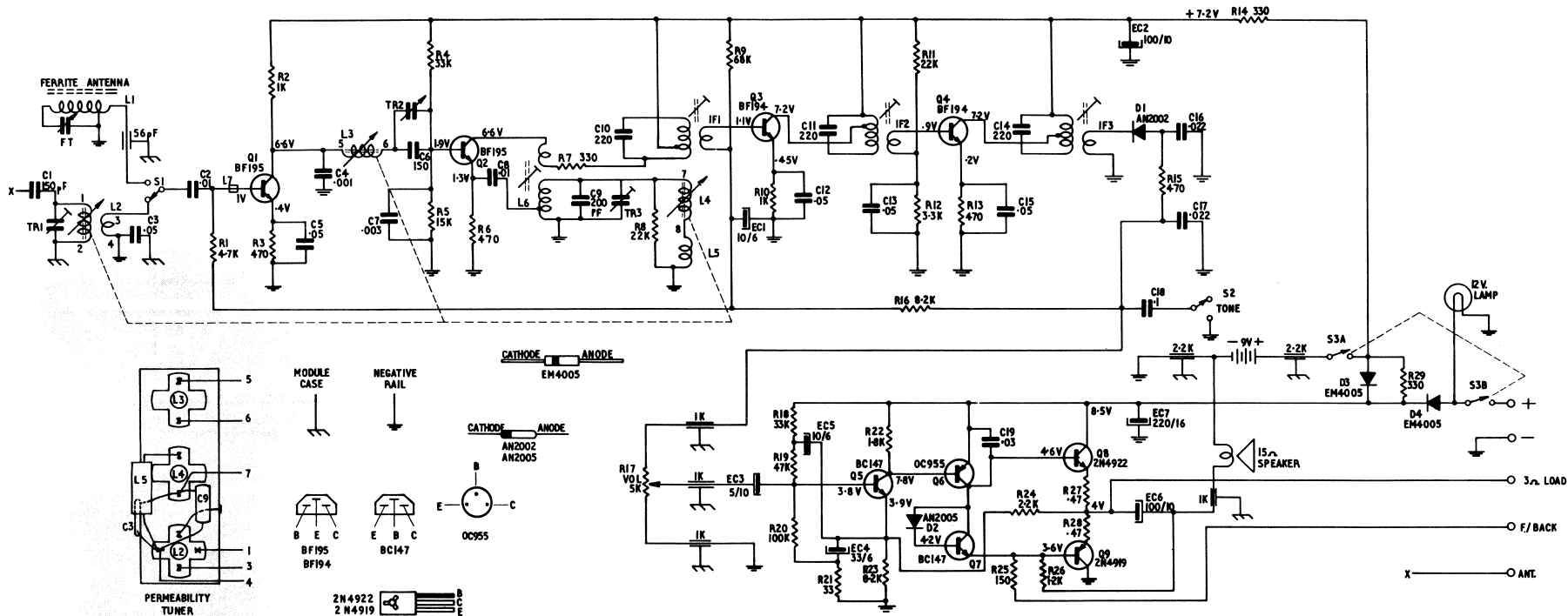


FERRIS 9 TRANSISTOR PORTABLE CAR RADIO MODEL 304



**RESISTORS**

R1	4.7K	10%	1/4 watt
R2	1K	"	"
R3	470	"	"
R4	33K	"	"
R5	15K	"	"
R6	470	"	"
R7	330	"	"
R8	22K	"	"
R9	68K	"	"
R10	1K	"	"
R11	22K	"	"
R12	3.3K	"	"
R13	470	"	"
R14	330	"	"
R15	470	"	"
R16	8.2K	"	"
R17	5K	potentiometer (R248)	"
R18	33K	10%	1/4 watt
R19	47K	"	"
R20	100K	"	"
R21	30	"	"
R22	1.0K	"	"
R23	0.2K	"	"
R24	2.2K	"	"
R25	300	"	"
R26	1.2K	"	"
R27	0.47	10%	1/4 watt w/wound
R28	0.47	"	"
R29	330	10%	1/4 watt

**CAPACITORS**

C1	100pf	63V	extended foil
C2	.01uf	80V	polyester
C3	.001uf	80V	ceramic
C4	.001uf	83V	extended foil
C5	.001uf	80V	polyester
C6	.001uf	83V	extended foil
C7	.001uf	83V	"
C8	.01uf	80V	"
C9	.01uf	80V	"
C10	220pf	63V	extended foil
C11	220pf	63V	"
C12	.001uf	80V	polyester
C13	.001uf	80V	"
C14	220pf	63V	extended foil
C15	.001uf	80V	polyester
C16	.001uf	80V	"
C17	.022uf	80V	"
C18	.022uf	80V	"
C19	.03uf	80V	ceramic
C20	.03uf	80V	polyester

**FEED THRU CAPACITORS**

1 x 90pf	type	CA0110
4 x 100pf	type	CA0110
2 x 220pf	type	CA0110

**ELECTROLYTICS**

EC1	100uf	6 volt
EC2	100uf	10 volt
EC3	50uf	10 volt
EC4	33uf	6 volt
EC5	100uf	6 volt
EC6	100uf	10 volt
EC7	220uf	16 volt

FT Film type capacitor  
type PVD -4/20HT

**INDUCTORS**

L1	Red aerial coil	type 7140
L2	"	"
L3	Permeability tuner	type TMM5 (L4)
L6	Padder choke	type 50H
L8	Padder coil	type 70M1
L7	Ferrite head choke	type 0100
IF1	486KHz transformer	type 0100
IF2	486KHz transformer	type 0100
IF3	486KHz transformer	type 0100

**TRANSISTORS**

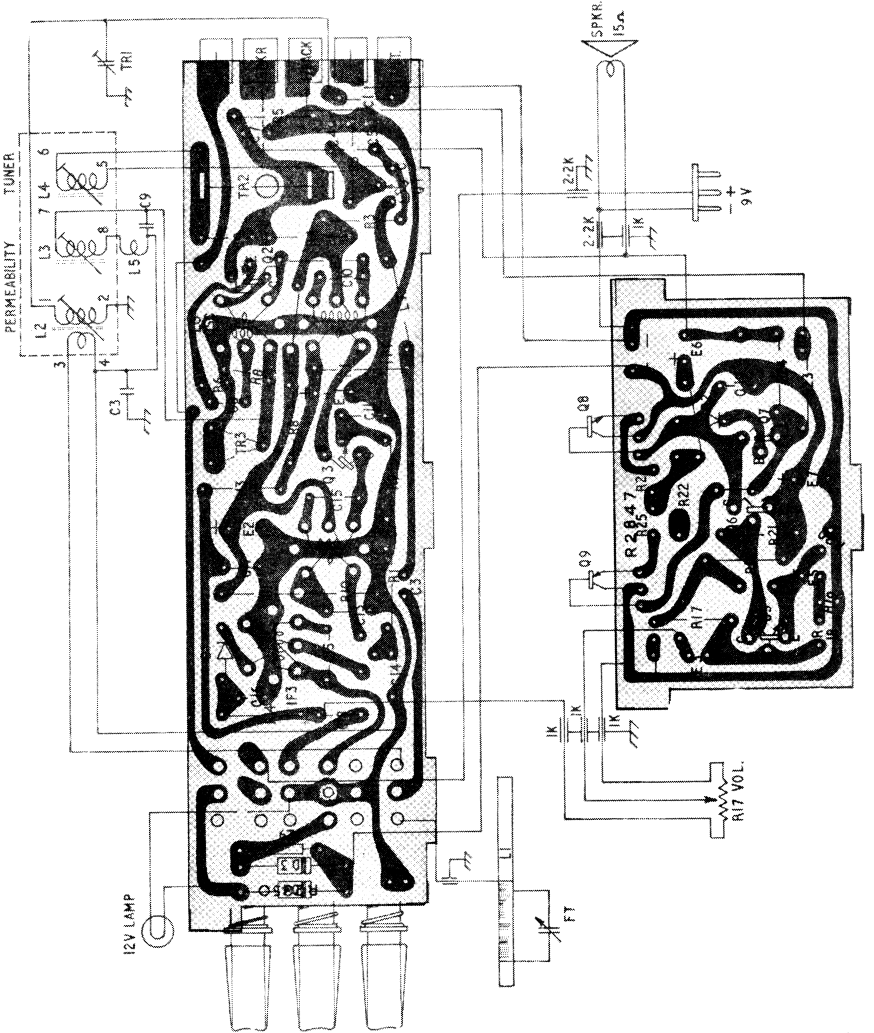
Q1	BF100
Q2	BF195
Q3	BF194
Q4	BF194
Q5	BC147
Q6	OC955
Q7	BC147
Q8	2N4922
Q9	2N4999

**DIODES**

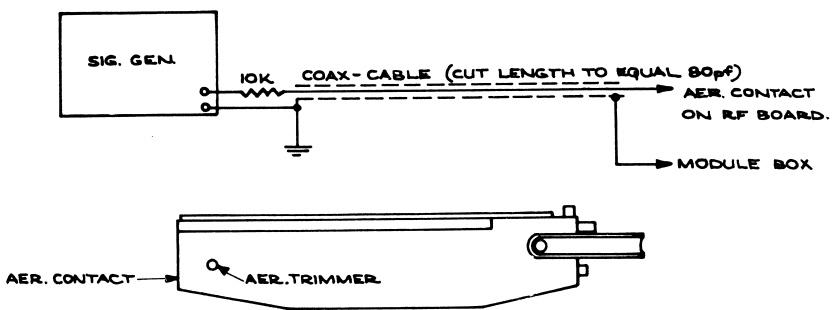
D1	AN2002
D2	AN2005
D3	EM4005
D4	EM4005

S1 1-16GSTA\*  
S2 push-button switch  
S3)

Battery type 2584  
Dial lamp 12V 2W blue  
IF Frequency: 486 KHz  
Band Coverage: 525-1620 KHz  
Zero signal battery current - 5 mA for 8V supply  
All resistance values in ohms  
All voltages measured with respect to negative rail  
All voltages checked with 20,000 O.P.V. meter at zero signal input



DUMMY AERIAL ARRANGEMENT

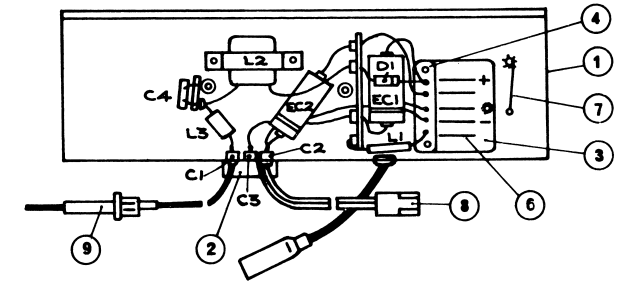


DC RESISTANCE OF WINDINGS

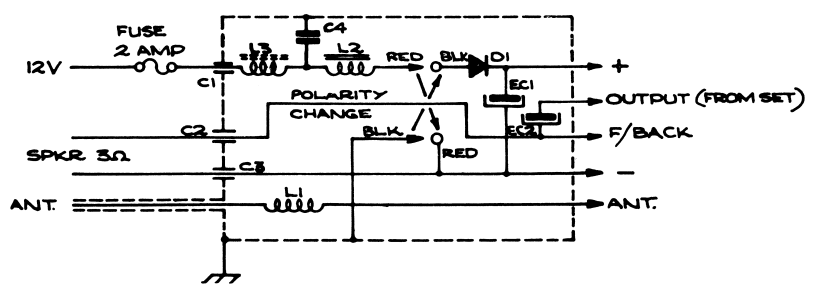
Winding	Resistance in Ohms	Winding	Resistance in Ohms
Ferrite rod aerial (total) L1	0.75	IF1 Primary (total)	4.0
Ant. coil primary L2	12.0	IF1 Secondary	0.4
" " secondary L2	0.5	IF2 Primary (total)	4.0
RF coil L3	12.0	IF2 Secondary	0.4
Oscillator coil L4	3.2	IF3 Primary (total)	4.0
Padder choke L5	1.0	IF3 Secondary	1.5
Padder coil primary L6	0.6		
" " secondary (total) L6	2.7		

MODEL 304 POWER CRADLE

Cradle Rear View (cover removed)



Circuit Diagram Model 304 Power Cradle



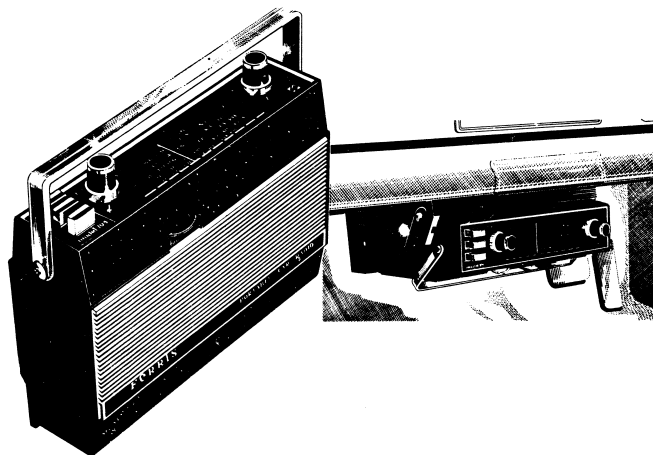
- C1 2200 pf feed thru type CAC110
- C2 470 pf feed thru type CAC110
- C3 2200 pf feed thru type CAC110
- C4 .22 of 50V lacquer film
- L1 Aerial choke type 6108
- L2 LF choke type 8134
- L3 HF choke type 828
- EC1 640 uf 16V electrolytic
- EC2 640 uf 16V electrolytic
- D1 Diode type EM4001

# SERVICE MANUAL

# FERRIS

## 9 TRANSISTOR MODEL 304

### PORTABLE CAR RADIO



#### SPECIFICATIONS

Tuning Range: 525-1620 KHz  
Intermediate frequency: 455 KHz

#### Transistor Complement

1 x BF195 RF amplifier  
1 x BF195 Converter  
1 x BF194 1st IF amplifier  
1 x BF194 2nd IF amplifier  
1 x BC147 Audio amplifier  
1 x OC325 Audio driver  
1 x BC147 Bias control  
1 x 2N4922 P-P output  
1 x 2N4949 complementary pair

#### Diodes

1 x AN2002 detector and A.V.C.  
2 x EM4005 battery blocking  
1 x AN2005 bias compensator

#### Battery

1 x Eveready Type 2364  
Current consumption (no signal) approx. 10 m.A.

#### Loudspeaker

5" x 3" perm. magnet  
Voice coil impedance 15 ohm

#### Power

Max. undistorted 450 m.W.  
Max. undistorted in cradle 3 watts with 14 volt external supply

#### Dimensions

8 1/2" x 5 5/8" x 2 5/16"  
216mm x 143mm x 58mm

#### Weight

2 lb. (.9 Kilo)

#### DESCRIPTION

The Ferris 9 Transistor Model 304 Portable Car Radio is designed to operate as a portable or home radio as well as a car radio. Shielding of the electronic components is achieved by the use of a zinc diecast module box with detachable lid. Module box, speaker, battery and ferrite rod aerial are contained in a two piece ABS moulded case.

A large station marked dial with 3 1/4" pointer traverse is edge-lit for excellent night viewing. A cord drive via a 3 stage permeability tuner motivates the dial pointer.

Battery, On/Off, Tone and Aerial selection is done by a push-button switch cluster adjacent to tuning knob. The ferrite rod antenna is resonated by a separate 'Fine Tune' control when the set is used as a portable.

#### PRINTED BOARD ASSEMBLIES

The receiver employs 2 printed board assemblies. The longer of the two is the R.F. board, embracing aerial, R.F. amplifier, converter, I.F. amplifiers and detector circuits. The small board carries the complete audio amplifier. Drive power for the speaker is provided by a complementary pair of transistors screwed to the diecast box for heat sink requirements.

Should a component fall or the set require circuit alignment, proceed as follows:

#### To Remove R.F. Board

- 1) Remove plastic back and lid of diecast module box as previously described.
- 2) Remove the 3 push-buttons (these pull off).
- 3) Remove battery.
- 4) Depress the 3 push-button stalks.
- 5) Lift R.F. board clear of module box for access to components and tuning adjustments.
- 6) When replacing R.F. board, ensure lugs enter slots in module box correctly and that wires are not pinched or caught by any components.

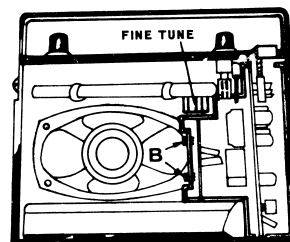


FIG. 4

#### REPLACEMENT OF FINE TUNE CONTROL

This component is a P.V.C. dielectric tuning capacitor, and is used to resonate the ferrite rod aerial when the set is operated as a portable. In the event of failure (see FIG. 4)–

- 1) Unsolder capacitor wiring.
- 2) Pull off volume and tuning knobs.
- 3) Remove dial cover and function plate.
- 4) Remove dial pointer and dial scale.
- 5) Set fine tune control either fully closed or fully open.
- 6) Insert a small screwdriver through the outer slots in the dial backplate and then through the clearance holes in the thumb wheel to slacken the 2 small mounting screws. (see FIG. 5).
- 7) Slide the capacitor up and out of the mounting bracket. Note the 2 small rotary trimmers on the back of the tuning capacitor. One is set for maximum 'C' and the other for minimum. This adjustment must be made prior to installing the new component, otherwise the ferrite rod aerial cannot be resonated over the entire broadcast band.

#### REPLACEMENT OF FERRITE ROD AERIAL

- 1) Unsolder rod aerial leads from fine tuning capacitor and 56 pF feed thru capacitor.
- 2) Remove rod aerial assembly complete with mounting pillars. The pillars are fitted to moulded pins which are integral with the plastic case.
- 3) After removing rod aerial assembly, slide pillars off rod.
- 4) Reverse procedure to install new rod aerial.
- 5) No rod aerial circuit alignment is required.

#### CIRCUIT ALIGNMENT PROCEDURE

For all alignment operations connect the aerial side of the signal generator to the diecast module box. Keep the generator output as low as possible to avoid A.V.C. action. Set volume control at maximum. Use correct alignment tool for making core and trimmer adjustments.

Remove lid from module box. Lift R.F. board clear of module box for access to cores and trimmers. Set the aerial switch to 'DOWN' position.

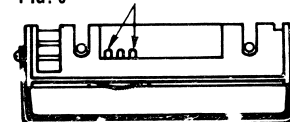
STEP	CONNECT SIG. GEN. TO	TUNE SIG. GEN. TO	TUNE RECEIVER TO	ADJ. FOR MAX. OUTPUT
1	Aer. Contact (FIG. 6)	455 KHz	Max. HF end of band	IF <sup>2</sup>
2	"	"	"	IF <sup>2</sup>
3	"	"	"	IF <sup>1</sup>
4	REPEAT ABOVE ADJUSTMENTS UNTIL NO FURTHER INCREASE OBTAINABLE			
5	Aer. contact via dummy	525 KHz	Max. LF end of band	Osc. coil L6
6	" " " "	1620 KHz	Max. HF end of band	Osc. Trim. TR 3
REPEAT STEPS 5 & 6 UNTIL BAND LIMITS ARE 525-1620 KHz				
7	Aer. contact via dummy	1500 KHz	1500 KHz	RF Trimmer TR 2
8	" " " "	"	"	Aer. Trimmer TR 1
9	CHECK SENSITIVITY AT 1500, 1000 & 600 KHz			

carefully install R.F. board and replace module lid.

#### To Remove Audio Board

- 1) Remove 2 screws marked 'B' (FIG. 4).
- 2) Lift audio board clear of module box.
- 3) When replacing audio board, carefully arrange lead dress and ensure mica washers are interposed between power transistors and face of module box before replacing screws and thrust washers.

FIG. 5 Access slots to fine tune control



TOP VIEW OF SET