

SERVICE MANUAL

FERRIS

MODEL 162 - 7 TRANSISTOR CAR RADIO



MANUAL TUNING

SPECIFICATIONS

TUNING RANGE: 520-1650 Kc/s

INTERMEDIATE FREQUENCY: 455 Kc/s

TRANSISTOR COMPLEMENT:

- | x 2N1637 RF Amplifier
- | x 2N1639 Converter
- | x 2N1638 1st IF Amplifier
- | x 2N1638 2nd IF Amplifier
- | x 2N406 Audio Amplifier
- | x 2N408 Audio Driver
- | x 2N301 Power Output

DIODE: 1 x 1N60A Detector & AGC

CONSUMPTION:

650 ma including dial lamp at 12 volts input.

LOUD SPEAKER:

Size & Type to suit Vehicle.
Voice Coil Impedance 15 ohms.

TUNING RATIO:

6 turns of knob to traverse dial.

POWER OUTPUT:

Undistorted 3 watts.
Maximum 5 watts.

DIMENSIONS:

7" x 5 $\frac{3}{4}$ " x 2"

WEIGHT:

3 lbs.

DESCRIPTION

The FERRIS MODEL 162 is a compact, rugged 7 Transistor Manually Tuned Car Radio, designed to mount either in dash or under dash in a motor vehicle. Simplicity of construction combined with uncomplicated circuitry assures satisfactory performance in all 12 volt vehicles. Polarity adjustment serves either positive or negative ground battery systems.

CONTROLS

TUNING KNOB operates permeability tuner by means of a smooth worm drive. Dial pointer is operated via cord and pulley system.

VOLUME KNOB is combined with push-pull "on/off" switch.

TONE KNOB is continuously variable and concentric with Volume Control.

EXTERNAL CONNECTIONS:

Aerial socket marked "A" is at rear right hand corner of set adjacent to aerial trimmer capacitor. Speaker and battery connections are at opposite rear corner of set.

POLARITY ADJUSTMENT:

To adjust polarity, remove top lid and follow instructions on indicator plate.

TO REMOVE TOP LID

1. Remove one self-tapping screw in rear flange in addition to fixing screws at each side.
2. Slacken lid screws at front of set.
3. Slide lid off towards rear of set.

DIAL SCALE:

The M162 is supplied with six dial scales (one for each state) including the one which is already fitted. TO CHANGE DIAL SCALE:-

1. Remove two screws which secure dial scale.
2. Remove dial scale.
3. Select required dial scale and snap off along score line. When breaking scales off, bend the material in the direction which results in the "V" score OPENING not closing. This procedure will give a clean break along the scale.
4. Fit new dial scale.

DIAL LAMP REPLACEMENT:

1. Remove knobs and escutcheon.
2. Remove two screws marked "A" - FIG. 1.
3. Remove diecast shroud.
4. Replace dial lamp.

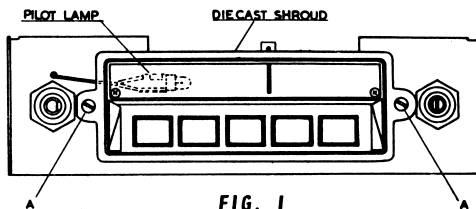


FIG. 1

REPLACEMENT OF DIAL CORD:

Re-string dial in accordance with diagram. When the tuning spindle is rotated 3 turns clockwise from its full anti-clockwise position, the tension spring and pointer are then in their mid position of traverse. The pointer is attached by wrapping the dial cord around the crank formation along its carriage section. Calibration is achieved by sliding the pointer along the cord as required.

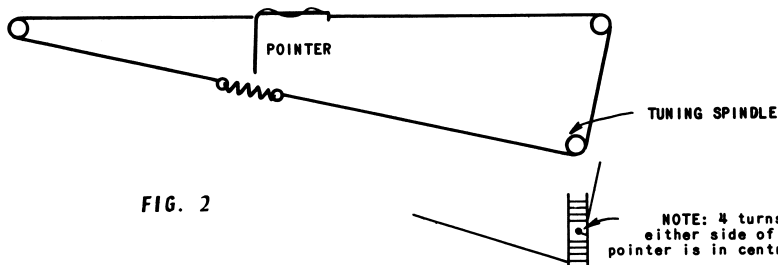


FIG. 2

NOTE: 4 turns of cord either side of hole when pointer is in centre of traverse.

PRINTED CIRCUIT BOARD:

For access to underside of printed board, remove the two screws marked "B" - FIG. 3.

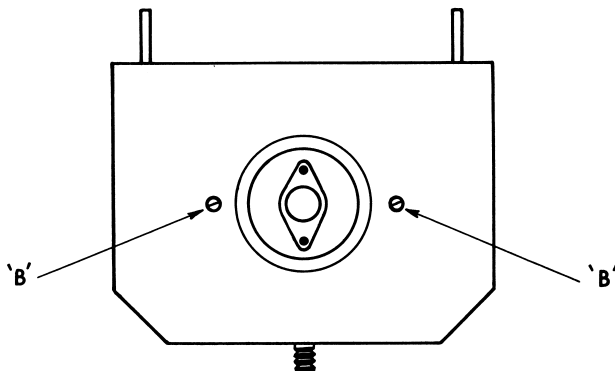


FIG. 3

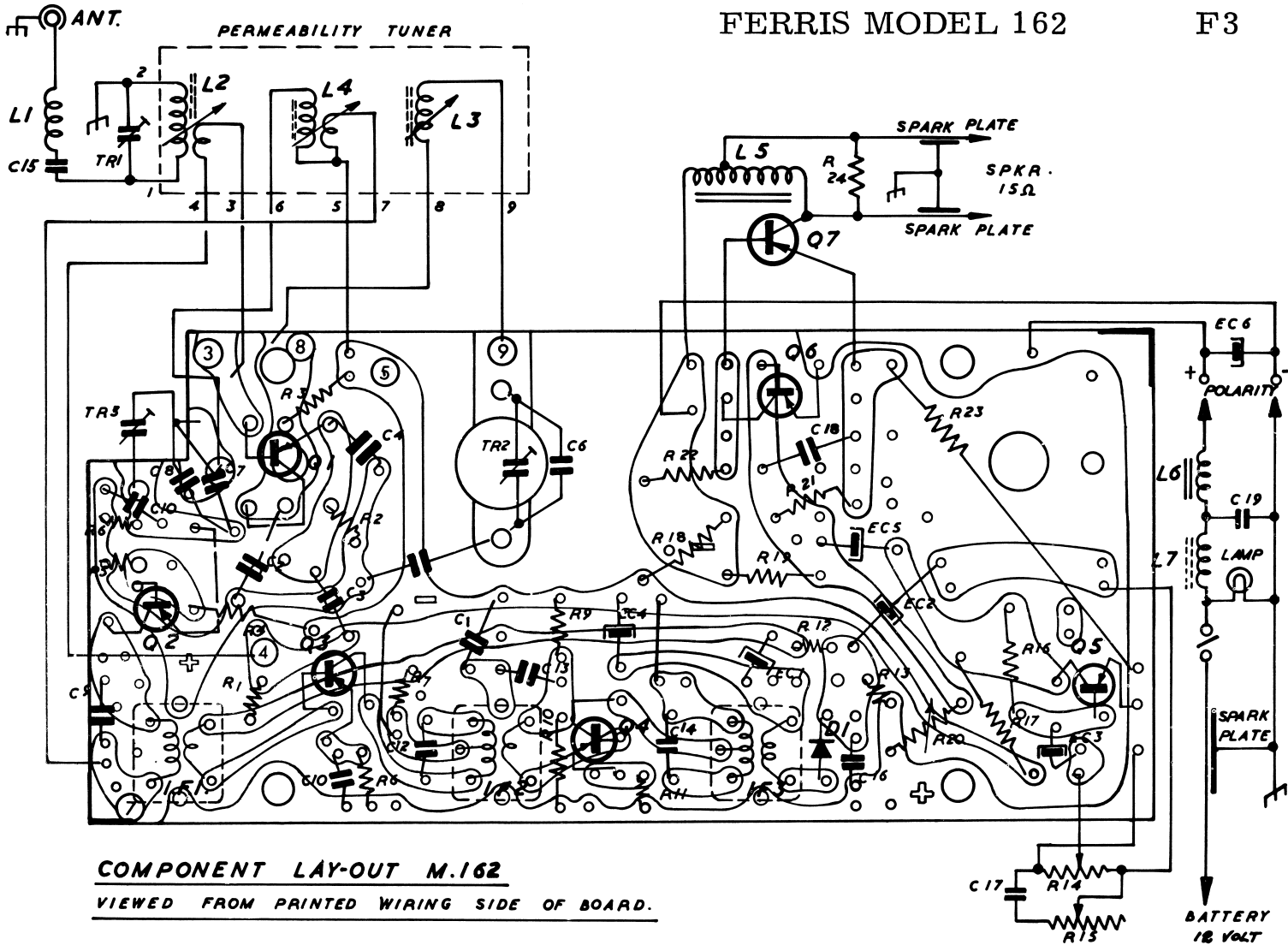
ALIGNMENT PROCEDURE:

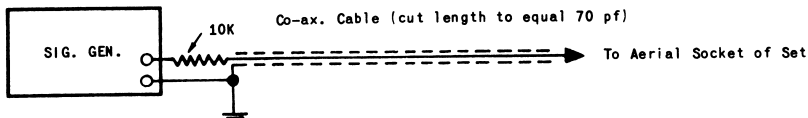
For all alignment operations, connect the earth side of the signal generator to the frame or case of receiver and keep the generator output as low as possible to avoid AVC action. Set volume control at maximum.

N.B. USE PROPER ALIGNMENT TOOL FOR MAKING ADJUSTMENTS. CORES ARE EASILY BROKEN BY IMPROPER HANDLING - MAKING REPLACEMENT OF ENTIRE COIL OR TRANSFORMER NECESSARY.

STEP	CONNECT SIG. GEN. TO:	TUNE SIG. GEN. TO:	TUNE RECEIVER TO:	ADJ. FOR MAX. OUTPUT
1	Emitter of 2N1639 via .1 uf capacitor	455 Kc/s	HF end of band	IF3
2				IF2
3				IF1
4 REPEAT ABOVE ADJUSTMENTS UNTIL NO FURTHER INCREASE CAN BE OBTAINED				
5	Aerial socket via dummy aerial (see diagram).	520 Kc/s	Tune receiver to max. LF end of band	Osc. trimmer TR3
MAX. HF LIMIT SHOULD NOW BE 1650 Kc/s APPROXIMATELY				
6	Aerial socket via dummy aerial (see diagram).	1500 Kc/s	1500 Kc/s	RF trimmer TR2 Ant. Trim. TR1
CHECK SENSITIVITY AT 1500, 1000 AND 600 Kc/s				

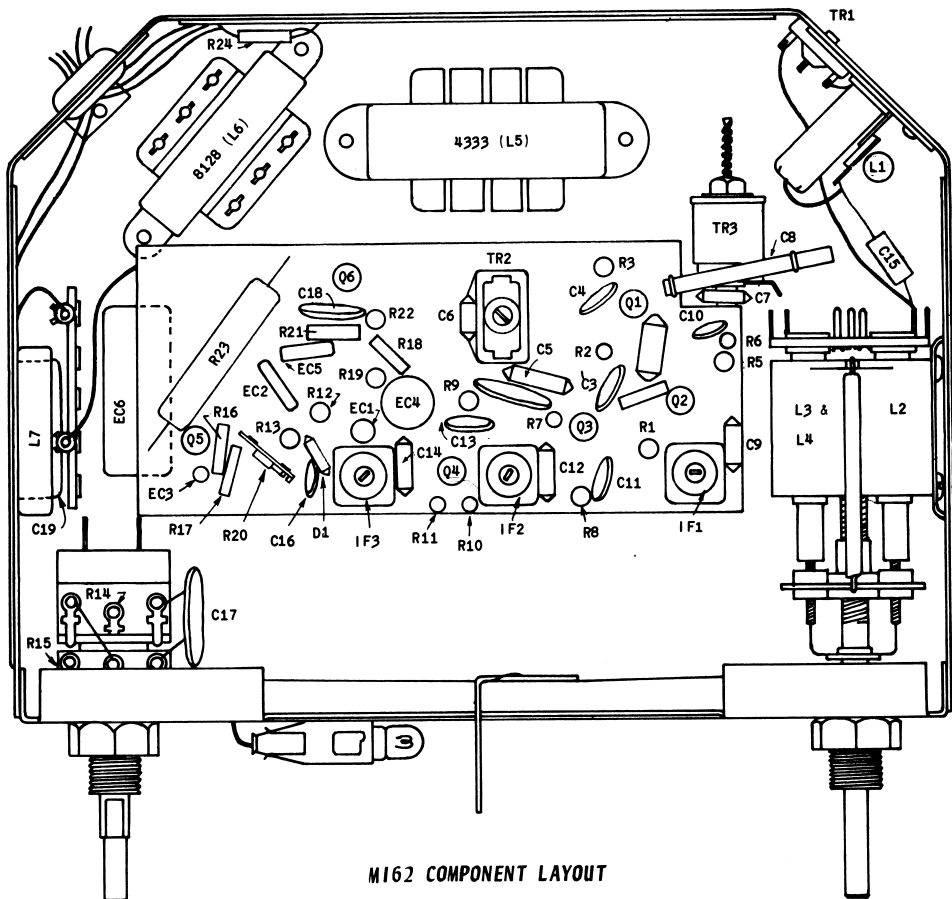
N.B. Cores of permeability tuner are accurately aligned and sealed at factory and should not require any adjustment. If however, a core is replaced due to breakage, it should be peaked at 1200 Kc/s. Seal with paint or lacquer.





SERVICE HINTS

- ★ Since a transistor needs only low voltage applied to its terminals for conduction, testing continuity of a circuit which includes a transistor can result in misleading indications, and possible damage to the transistor. To avoid this remove the transistor from the circuit board before making continuity tests.
- ★ Voltmeters used for test purposes must have a sensitivity of at least 20,000 ohms per volt. The use of low impedance meters will give misleading results as serious shunting effects will occur. When checking for a circuit fault causing excessive battery drain, an over all current measurement and supplementary voltage measurements should be made.
- ★ Signal tracing by signal injection from a signal generator is carried out on transistor radios in exactly the same manner as has been done for many years with conventional valve radios. The signal generator should be connected in series with a capacitor (.1 uf) to avoid shorting out bias voltages.
- ★ Transistors and printed circuit board can be damaged by excessive heat. Whenever soldering is necessary on the printed circuit board, use a soldering iron which is both HOT and CLEAN. Do not hold the soldering iron on a soldering point any longer than is absolutely necessary. This minimises the amount of heat which will be radiated from the point of soldering. When soldering or unsoldering a transistor, grasp the transistor lead with a pair of long-nose pliers to provide a heat sink. Excessive heat can damage a transistor.

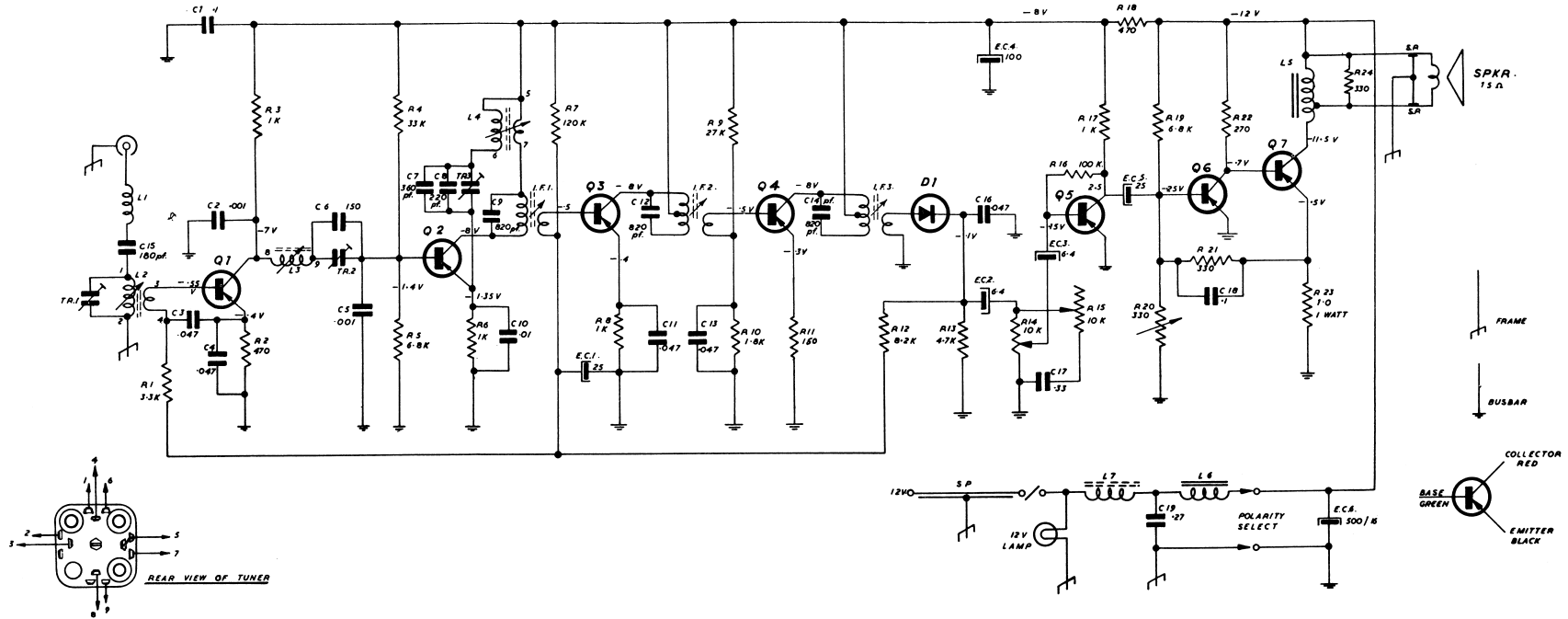


M162 COMPONENT LAYOUT

DC RESISTANCE OF WINDINGS:

DC RESISTANCE IN OHMS		DC RESISTANCE IN OHMS	
Aerial Filter Choke (L1)	2.5	O/P Choke (total) (L5)	2.2
Ant. Coil Primary } (L2)	7.0	IF1 Primary (total)	2.0
Ant. Coil Secondary	0.4	IF1 Secondary	0.3
RF Coil (L3)	7.0	IF2 Primary (total)	2.0
Oscillator Coil Primary } (L4)	1.5	IF2 Secondary	0.3
Oscillator Coil Secondary	2.5	IF3 Primary (total)	2.0
HF Choke (L7)	Less than 0.1 ohm	IF3 Secondary	1.0
LF Choke (L6)	0.3		

FERRIS 7 TRANSISTOR CAR RADIO - MODEL 162



- R1 - 3.3K 10% RESISTOR
- R2 - 470Ω 10% RESISTOR
- R3 - 1K 10% RESISTOR
- R4 - 33K 10% RESISTOR
- R5 - 6.8K 10% RESISTOR
- R6 - 1K 10% RESISTOR
- R7 - 120K 10% RESISTOR
- R8 - 1K 10% RESISTOR
- R9 - 27K 10% RESISTOR
- R10 - 1.8K 10% RESISTOR
- R11 - 150Ω 10% RESISTOR
- R12 - 8.2K 10% RESISTOR
- R13 - 4.7K 10% RESISTOR
- R14 - 10K POTENTIOMETER
- R15 - 10K POTENTIOMETER
- R16 - 100K 10% RESISTOR
- R17 - 1K 10% RESISTOR
- R18 - 470Ω 10% RESISTOR

- R19 - 6.8K 10% RESISTOR
 - R20 - 330Ω VARIABLE RESISTOR
 - R21 - 330Ω 10% RESISTOR
 - R22 - 270 10% RESISTOR
 - R23 - 1K 10% RESISTOR
 - R24 - 330Ω 10% RESISTOR
- C1 - 1μF 25V CAPACITOR
 - C2 - 100μF 100V STYROSEAL
 - C3 - 0.047μF 25V CAPACITOR
 - C4 - 0.047μF 25V CAPACITOR
 - C5 - 0.01μF 100V CAPACITOR
 - C6 - 150 PF 100V CAPACITOR
 - C7 - 360 PF 100V 5% CAP.
 - C8 - 220PF N150 CERAMIC
 - C9 - 820 PF 100V CAPACITOR

- C10 - 0.1μF 25V CAPACITOR
 - C11 - 0.047μF 25V CAPACITOR
 - C12 - 820PF 100V CAPACITOR
 - C13 - 0.047 25V CAPACITOR
 - C14 - 820PF 100V CAPACITOR
 - C15 - 180PF 100V CAPACITOR
 - C16 - 0.047μF 25V CAPACITOR
 - C17 - 33 μF 25V CAPACITOR
 - C18 - 1 μF 25V CAPACITOR
 - C19 - 27μF 125V POLYESTER
- L1 - AERIAL CHOKE - TYPE 6108
 - L2 - PERM. TUNER - ME3/EB45
 - L3 - " " " "
 - L4 - " " " "
 - L5 - OR. CHOKE - TYPE 4333
 - L6 - FILTER CHOKE - 8128
 - L7 - N.F. " " 828

- E.C1 - 25μF 6V. ELECTRO.
 - E.C2 - 6.4μF 6V. ELECTRO
 - E.C3 - 6.4μF 6V. ELECTRO
 - E.C4 - 100μF 10V. ELECTRO
 - E.C5 - 25μF 8V. ELECTRO
 - E.C6 - 500μF 16V. ELECTRO
- I.F.1 - 455KC TRANS. 9133
 - I.F.2 - " " " 9133
 - I.F.3 - " " " 9134
- TR1 - 3 PLATE TRIMMER R-120PF
 - TR2 - 2 " " 5-55 PF
 - TR3 - AIR TRIMMER 4-60PF

- Q1 - 2N1637 2N374
 - Q2 - 2N1639 2N374
 - Q3 - 2N1638 2N373
 - Q4 - 2N1638 2N373
 - Q5 - 2N406 AC125
 - Q6 - 2N408 2N2122
 - Q7 - 2N301 258337
- D1 - OA90 1N604
- S.P. = SPARK PLATE

BAND COVERAGE 320-1650 KC/S
IF FREQUENCY 455 KC/S
TOTAL BATTERY CURRENT - 650 MA.
INCLUDING DIAL LAMP.
COLLECTOR CURRENT OF 2ND STAGE 500 MA. (ADJ. R20)

NOTE - ALL VOLTAGES CHECKED WITH 40,000 ΩV. METER AT ZERO SIGNAL INPUT.

DO NOT OPERATE SET WITHOUT SPEAKER CONNECTED.