

ADJUSTMENTS FOR AUTOMATIC TUNING.

Any eight stations in the Medium Wave band may be selected for Automatic tuning. The stations are identified by means of the call-sign tabs supplied for insertion in the recesses on the keys. A sheet of tabs, on which are printed the call-signs of all Australian stations accompanies the set. Call-signs of the eight stations selected should be neatly cut from the sheet.

The stations should be adjusted in order of their frequency in kilocycles. This order is used in the following example:—

(1) ZSM 1270 K.C.	(5) ZUE 950 K.C.
(2) ZCH 1190 K.C.	(6) ZGB 870 K.C.
(3) ZUW 1110 K.C.	(7) 2BL 740 K.C.
(4) ZKY 1020 K.C.	(8) ZFC 610 K.C.

Turn the receiver ON and allow it to operate for at least five minutes before making adjustments.

Proceed to set up for Automatic tuning as follows:—

- (1) Press the key labelled "Manual", and set the Fidelity Control in any but the extreme clockwise position.
- (2) Manually tune station No. 1. Be sure to tune accurately by watching the Tuning Indicator. Tune till the darkened sector of the Indicator's screen is at the narrowest possible width.
- (3) Look in the back of the receiver and two semi-circular slots in which are eight adjusting pins, as shown, numbered 1 to 8 in Fig. 2, will be seen. These correspond to the keys on the keyboard, numbered 1 to 8, from left to right.
- (4) Hold the "Manual" key down and press key No. 1 on the keyboard. Both keys will stay down. Then move adjusting pin No. 1 along the semi-circular slot, either clockwise or anti-clockwise, until the pilot globe situated above the adjusting pin goes out. It will be noticed that when the adjusting pin is moved to the right past this position the globe will light brightly and to the left dimly.

This is normal and care should be taken in making this adjustment to see that the globe does go completely out.

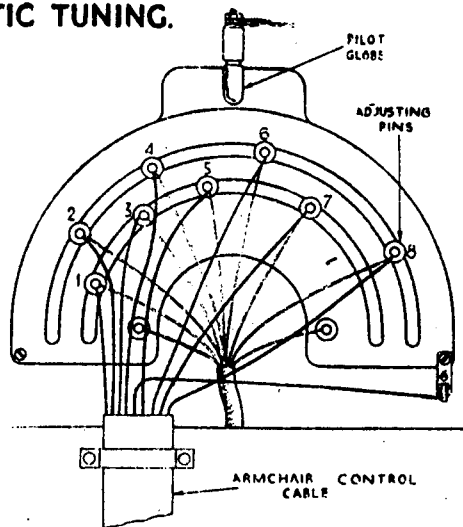


Fig. 2.—Automatic adjusting pins and Armchair Control connections.

- (5) Press another key and key No. 1 and the "Manual" key will then be released.
- (6) Press key No. 1 again. The pilot globe will stay out and the station will be heard. If reproduction is not normal, repeat the above procedure, as the adjustments were probably not carried out with great enough accuracy.

Proceed similarly for the other seven keys, and then any one of the eight stations may then be obtained by simply pressing the key on which is the call-sign of the desired station.

To change a station at any time, simply follow the same procedure and remember to replace the call-sign tab in the key with the new one.

AUTOMATIC TUNING MECHANISM.

ADJUSTMENT OF FLYWHEEL FRICTION.

In normal operation, the motor drives the tuning condenser and selector disc until the insulation line just passes the particular station-setting contact: The motor then reverses and moves the disc slowly in the opposite direction until the insulation line is under the contact, and the mechanism stops.

In some cases, particularly with high line-voltage, the disc may make two or three reversals before stopping.

The flywheel friction adjustment spring washer should be set to give the least number of reversals with the chassis in normal operating position.

ADJUSTMENT OF SELECTOR DISC.

The brass selector disc is fastened to the rear shaft of the tuning condenser by means of two set-screws. When the condenser is at maximum (plates fully meshed) the insulation line should be horizontal, with the operating-end at the right (viewed from rear). The operating-end has red insulating material and the brass is bevelled at this end.

The selector disc should be set so that the contact-tip plungers in the station-setting contacts project not more than 1/16-in. from the body of the contacts.

ARMCHAIR CONTROL UNIT.

WARNING:

Before installing the Armchair Control Unit, be sure that the

locking mechanism has been removed from the unit. This can be tested by pressing a push button. If the button returns to its normal position when pressure is released, the unit is ready for installation. If the button stays down, remove the unit from its case, then remove the locking mechanism by drilling-out four rivets by which it is held.

When an Armchair Control Unit is connected to the receiver, as shown in Fig. 2, it duplicates the action of the eight station selector keys on the receiver's keyboard. That is, after pressing the "Manual" key on the receiver, eight broadcast stations may be tuned automatically at any distance up to the length of the connecting cable from the instrument (25 feet).

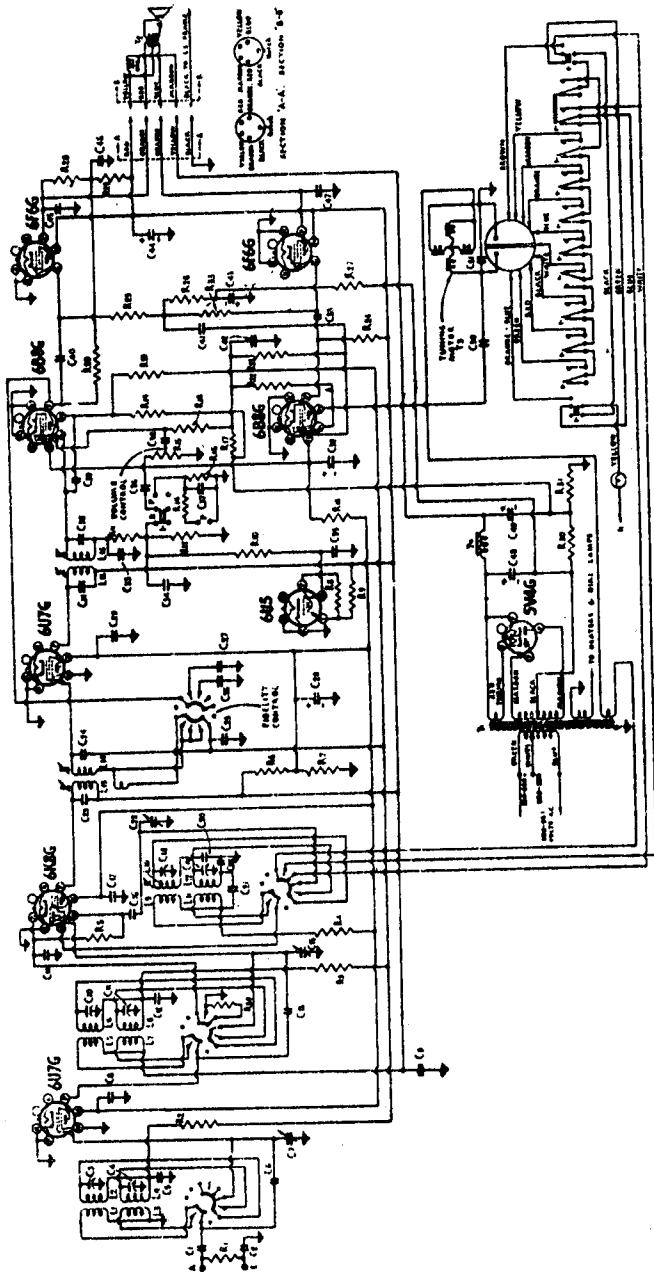
The unit is supplied fitted with a 9 wire flat cable. Take the central wire and solder it to a lug attached to the lower right-hand corner of the selector mechanism frame. The remaining eight wires are then soldered to the eight adjusting pins. The first, or right-hand wire, looking towards the unit, to No. 1 pin, the second to No. 2 pin and so on. The call-signs of the eight selected stations, which must correspond to those for which the receiver is set; should be removed from the sheet supplied and fitted beneath the windows of the unit.

Before operating the receiver from the unit, the "Manual" key on the receiver's keyboard must first be pressed. Then, press the push-button on the Unit for the desired station and hold the button down until the station is tuned. Care must be taken not to hold two push-buttons down at one time, as both windings of the motor may be engaged simultaneously, causing the motor to be inoperative and overheated.

FISK RADIOLA 280

8 Valve, Two Band, Automatic Tuning, A.C. Operated superheterodyne

TUNING RANGES: "Standard Medium Wave" (A) 1600-550 K.C. "Short Wave" (B) 16-50M.
 R.F. ALIGNMENT SETTINGS: "A" Band - 600 K.C. (Osc.), 1500 K.C. (Osc., R.F. Aer.).
 "B" Band - 18 metres (Osc., R.F., Aer.). INTERMEDIATE FREQ.: 460 K.C. POWER CONSUMPTION:-
 (Tuning Motor Inoperative) - 105 watts. VALVE COMPLEMENT - 6U7G R.F. Amplifier. 6X8G -
 Freq. Convert. 6U7G I.F. Amp. 6B8G 2nd det., A.V.C., & A.F. Amp. 6B8G Phase Inverter and
 Muting. 6F6G Output. 6F6G Output. 5V4G Rectifier. 6U5 Visual Tuning Indicator.
 UNDISTORTED POWER OUTPUT - 8 watts. LOUDSPEAKER - 12 inch Electrodynamic (Dustproof)
 Field Coil Resistance - 600 ohms.



Code No	RESISTORS
R1	100,000 ohms, 1/3 watt
R2	100,000 ohms, 1/3 watt
R3	100,000 ohms, 1/3 watt
R4	600 ohms, 1/3 watt
R5	50,000 ohms, 1/3 watt
R6	7,000 ohms, 5 watts
R7	11,000 ohms, 3 watts
R8	1 megohm, 1 watt
R9	20,000 ohms, 1 watt
R10	1.75 megohms, 1/3 watt
R11	60,000 ohms, 1/3 watt
R12	300,000 ohms, 1/3 watt
R13	250,000 ohms, 1 watt
R14	20,000 ohms, 1/3 watt
R15	1 meg. Vol. Cont.
R16	50,000 ohms, 1/3 watt
R17	500,000 ohms, 1/3 watt
R18	1.75 megohms, 1/3 watt
R19	1.75 megohms, 1/3 watt
R20	250,000 ohms, 1 watt
R21	1.75 megohms, 1/3 watt
R22	100,000 ohms, 1/3 watt
R23	1 megohm, 1/3 watt
R24	250,000 ohms, 1/3 watt
R25	390,000 ohms, 1/3 watt
R26	100,000 ohms, 1/3 watt
R27	50,000 ohms, 1/3 watt
R28	100,000 ohms, 1 watt
R29	20,000 ohms, 1 watt
R30	100 ohms, 3 watts
R31	26 ohms, 3 watts
R32	200 ohms, 1/3 watt
R33	390,000 ohms, 1/3 watt

Code No	CONDENSERS
C1	500 mmfd. Mica
C2	500 mmfd. Mica
C3	2-20 mmfd. Air Trim
C4	2-10 mmfd. Air Trim
C5	0.5 mfd. Paper
C6	4 mmfd. Mica
C7	Tuning Condenser
C8	.1 mfd. Paper
C9	5 mfd. Paper
C10	2-20 mmfd. Air Trim
C11	2-10 mmfd. Air Trim
C12	0.5 mfd. Paper
C13	4 mmfd. Mica
C14	1 mfd. Paper
C15	Tuning Condenser
C16	70 mmfd. Mica (N)
C17	.1 mfd. Paper
C18	11-29 mmfd. Air Trim
C19	2-10 mmfd. Air Trim
C20	420 mmfd. Mica (Pd)
C21	0.5 mfd. Paper
C22	Tuning Condenser
C23	80 mmfd. Mica (R)
C24	80 mmfd. Mica (R)
C25	0.5 mfd. Paper
C26	0.015 mfd. Paper
C27	0.025 mfd. Paper
C28	8 mfd. 450 V. Elect.
C29	.1 mfd. Paper
C30	50 mmfd. Mica (D)
C31	80 mmfd. Mica (P)
C32	80 mmfd. Mica (R)
C33	110 mmfd. Mica (L)
C34	110 mmfd. Mica (L)
C35	.05 mfd. Paper
C36	.05 mfd. Paper
C37	.0025 mfd. Paper
C38	.05 mfd. Paper
C39	8 mfd. 450 V. Elect.
C40	.01 mfd. Paper
C41	.5 mfd. Paper
C42	.5 mfd. Paper
C43	25 mfd. 25 V. Elect.
C44	8 mfd. 500 V. Elect.
C45	.0025 mfd. Paper
C46	.0025 mfd. Paper
C47	.0025 mfd. Paper
C48	16 mfd. 500 V. Elect.
C49	16 mfd. 500 V. Elect.
C50	.25 mfd. Paper
C51	60 mfd. Electrolytic
C52	3,200 mmfd. Mica (Padder)
C53	.01 mfd. Paper

FISK RADIOLA 280 (Contd.)

Valve	Bias Volts	Screen Grid to Chassis Volts	Plate to Chassis Volts	Plate Current M.A.	Heater Volts	Valve	Bias Volts	Screen Grid to Chassis Volts	Plate to Chassis Volts	Plate Current M.A.	Heater Volts
6U7G R.F. Amplifier	-3.4°	100	250	8.0	6.3	6F6G Pentode	-16.5°	250	240	35	6.3
6K8G Detector, M.W.	-5.0°	100	250	1.5	6.3	6F6G Pentode	-16.5°	250	240	35	6.3
S.W.	-3.4°	100	250	2.0	---	5V4G Rectifier	680/340 V.	130 M.A.	total drain	---	5.0
Oscillator, M.W.	---	---	100	2.8	---	* Not measured with ordinary voltmeter.					
S.W.	---	---	100	2.8	---	Measured with controls at maximum clockwise. Supply voltage 240 volts A.C. No signal.					
6U7G I.F. Amplifier	-3.4°	100	250	8.0	6.3	Tuning Motor Voltage (no load), 27 Volts A.C.					
6B8G Det. and 1st Audio	-3.4°	35°	125°	0.5	6.3	Tuning Motor Voltage (on load), 24 Volts A.C.					
6B8G Phase Inverter	-3.4°	35°	125°	0.5	6.3						

FISK RADIOLA 281

13 Valve, Three Band, Automatic Tuning, A.C. Operated Superheterodyne

TUNING RANGES: - "Standard Medium Wave" (A) 1600-550 K.C. "Short Wave" (B) 35-105M. "Short Wave" (C) 13-39M. **R.F. ALIGNMENT SETTINGS:** - "A" Band - 600 K.C. (Osc.), 1500K.C. (Osc., R.F., Aer.). "B" Band - 38 metres (Osc., R.F., Aer.). "C" Band - 14 metres (Osc., R.F., Aer.). **INTERMEDIATE FREQUENCY** - 460 K.C. **POWER CONSUMPTION** (Tuning Motor Inoperative) - 135 watts.

VALVE COMPLEMENT - 1. 6U7G R.F. Amp. 2. 6K8G Mixer. 3. 6J7G Oscillator. 4. 6J7G Osc. Control. 5. 6U7G 1st I.F. Amp. 6. 6U7G 2nd I.F. Amp. 7. 6H6G 2nd det., A.V.C., & A.F.C. 8. 6R7G 1st Audio Amp. 9. 6J7G 2nd Audio Amp. 10. 6J7G Phase Inverter. 11. 6V6G Output. 12. 6V6G Output. 13. 5V4G Rectifier. 6U5 Visual Tuning Indicator.

UNDISTORTED POWER OUTPUT - 13 watts. **LOUDSPEAKER** - 12 inch electro-dynamic (dustproof) Field Coil Resistance - 600 ohms.

CIRCUIT ARRANGEMENT.

The I.F. amplifier channel is of the variable selectivity type, in which variation of selectivity is obtained by switching in overcoupling windings (L19 and L22). These windings are in close proximity to their respective primary windings and are arranged to be switched in series with their respective secondary windings to give the desired increases in coupling and to produce the required changes in selectivity.

Each overcoupling winding is centre tapped so that two degrees of overcoupling are available on each of the two I.F. transformers, and combinations of these are used to obtain the desired effect. The switching of these windings is performed primarily by the fidelity switch, but the action of this switch, in regard to selectivity, is modified by the switch operating on the main tuning control knob.

The function of the switch on the main tuning control knob is to remove the overcoupling from the first I.F. transformer when pushed in, so that tuning can be satisfactorily performed, even though the fidelity switch be in a position which would normally give wide band width and consequent difficulty in tuning.

The function of the automatic frequency control circuit is to automatically change the frequency of the heterodyne oscillator, so that the correct intermediate frequency is formed for the I.F. amplifier. The circuit consists essentially of an I.F. discriminator, which furnishes a control voltage of the correct polarity to an oscillator frequency control valve for generated intermediate frequency carriers slightly above and below 460 K/cs, the frequency to which the I.F. amplifier is tuned.

The action of the discriminator circuit depends on the fact, that a 90 degree phase difference exists between the primary and secondary potentials of a double tuned, loosely coupled transformer, when the resonant frequency is applied; and that this phase difference varies as the applied frequency varies. That is, the maximum resultant response voltage across the primary and secondary windings, connected in series, will occur at a frequency, to one side of that to which the individual windings are resonated. Whether the frequency at which this maximum response occurs, is at a higher or lower frequency than that to which the individual circuits are tuned, depends on whether the windings are connected in series aiding or opposing.

The discriminator, or fourth I.F. transformer, consists of a primary winding L25, which is part of the third I.F. transformer secondary tuned circuit (tuned to 460 K/cs), and the centre tapped secondary L26. L27 may be considered as two secondary coils, the upper L26 series opposing, and the lower L27 series aiding the primary L25.

The core in L26, L27 is inserted to inductively balance the two halves.

The function of the coil L28, in parallel with L26, L27 is to tune L26, L27, L28 and C50 to 460 K/cs. It is arranged that the maximum rectified voltage will appear across R25, when the intermediate signal frequency is above 460 K/cs, and across R26 and R28 in series, when

below 460 K/cs. The resistors R25, R26 and R28 are connected in series, between ground and a point leading to the oscillator control valve grid.

D.C. voltages across R25 are always in opposition to those across R26 and R28. Consequently, the oscillator control valve grid bias voltage is always a differential amount, depending upon the I.F. signal strength, and its frequency deviation from the nominal value of 460 K/cs. The polarity of this differential bias, with respect to ground, depends upon whether the intermediate frequency signal is above or below 460 K/cs, but is always in the direction which will bring the generated intermediate frequency nearer to 460 K/cs.

The visual tuning indicator 6U5 has its cathode connected to ground, through resistor R46, across which the minimum bias for the R.F. amplifier, first detector and I.F. amplifier valves is developed. The grid of the 6U5 is connected through R22 to the A.V.C. line, which is fed with A.V.C. voltage through R27, from the rectified voltage appearing across R26. When there is no signal present, the junction voltages of R25, R26 and R28, tend towards ground potential, the grid of the 6U5 draws current and holds the potential of the A.V.C. line at a value of -3.5 volts, which is the sum of the voltage drop across R46, and the grid to cathode contact voltage of the 6U5.

The fidelity switch, besides varying the selectivity of the I.F. channel, and controlling the operation of the A.F.C., also operates on the automatic station selection circuit and the audio frequency amplifying circuit.

In the motor circuit, the fidelity switch is arranged to open-circuit the 24-volt supply in the first two positions, as these two positions are intended for distant reception, and automatic station selection is, therefore, not required. This, however, does not affect the operation of the scanning buttons, which will still operate if the manual tuning button is pressed, or if the wave change switch is turned to either of the short wave bands.

In the audio frequency circuit, the fidelity switch operates in positions 1 and 3 to connect the condenser C64 to ground from the plate of the 6R7G, thus reducing the high frequency response in these positions.

A special two-section filter is used in the plate circuit of the 6R7G first audio amplifier, and this filter, consisting of L29, C60, C61, L30, C62 and C63, is of the low pass type with cut-off frequency commencing at a frequency of 7 K/cs and having maximum suppression at 10 K/cs. This operates to materially reduce 10 K/cs heterodyne whistles and all frequencies above 10 K/cs, which are generally associated with background noise.

Inverse feedback is used with this audio amplifier circuit, and it is essential that correct phase relationship be maintained, so that in the event of the output transformer being removed, it is essential that it be replaced with identical connections.

CAUTION.

The iron core screw L26, L27, on the bottom of the fourth I.F. transformer, has been accurately adjusted for an exact electrical balance of coil L26, L27, to the centre tap during manufacture and should not be disturbed. However, if for any reason the adjustment has been moved from its original position, it will be necessary to mechanically adjust this screw, until the end of the stud protrudes exactly 1/16 in. (two threads exposed) above the brass bushing, prior to any alignment operations.