

Amalgamated  **Wireless**
(Australasia) Ltd

INSTRUCTION BOOK NO. 6726R

INSTRUCTIONS FOR OPERATING AND MAINTAINING

A.W.A. MODULATED OSCILLATOR

TYPE J6726

47 York Street, Sydney

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DRAWINGS.

Drawing Nos.

Schematic Diagram,
Modulated Oscillator Type J6726

6726D1

1.

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INSTRUCTIONS FOR ORDERING REPLACEMENT PARTS.

When ordering spare or replacement parts, the type number (and, if shown, the serial number) marked on the component should be quoted. If it does not bear its own type number, or if it is a piece part, the circuit reference number and the type and serial numbers of the unit in which it is mounted should be quoted. The circuit reference number and the type number should be checked against the corresponding ones on the diagram; it should be noted that the main units may comprise a number of sections so that only the section type number should be quoted.

SECTION A.

SCHEDULE OF EQUIPMENT.

- Item 1. One A.W.A. Modulated Oscillator Type J6726.
- Item 2. Valves required for the operation of Item 1 as follows:
2 Radiotrons Type 1Q5GT.
- Item 3. One shielded Output Cable.
- Item 4. One EverReady Battery Type PR8 (1.5V).
- Item 5. One EverReady Battery Type PR45 (45V).
- Item 6. Instruction Book No. 6726R.

NOTE: This list is a guide to the items which comprise a normal equipment, but may be varied to suit the requirements of each installation.

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SECTION B.

DESCRIPTION OF INSTRUMENT.

1. PURPOSE.

This instrument has been designed for use in servicing all types of radio receivers. It provides modulated or unmodulated signals of any frequency between 140 kilocycles (2,140 metres) and 30 megacycles (10 metres).

It enables the following tests to be carried out:

- (a) Alignment of i-f and r-f circuits at any desired frequency.
- (b) Adjustment of receivers provided with wavelength or kilocycle scales to correct dial calibration.
- (c) Examination of ganged t-r-f circuits for errors in tracking.
- (d) Measurement of overall sensitivity of all types of receivers at any frequency.
- (e) Determination of stage gain in i-f or r-f amplifiers.
- (f) Measurement of selectivity of i-f or r-f amplifiers (bandwidth in kilocycles for input signals one hundred or one thousand times larger than the signal on tune required to give some chosen value of audio output).
- (g) Determination of image ratio (ratio of microvolts input at the image or second spot frequency to that at wanted signal frequency for same audio output).
- (h) Checking the A.V.C. performance of receivers.
- (i) Estimation of noise level at higher sensitivities by comparison of audio outputs from modulated and unmodulated inputs of equal strength.
- (j) Testing of valves for performance under working conditions by insertion of several in succession in the same socket of a receiver and noting the change in audio output.

This comprehensive series of tests covers more than is usually required in receiver servicing, and may be carried out rapidly and with ample service accuracy.

2. CIRCUITS.

The unit comprises a variable radio-frequency oscillator using a type 1Q5GT beam-power battery valve and a fixed audio-frequency oscillating using a similar valve. The a-f oscillator may be switched so as to modulate the r-f output at a fixed depth or may be switched out of circuit.

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SECTION B. (Contd.)

3. CONTROLS.

(a) Control Switch.

This has three positions, "off", "carrier on" and "modulation on".

(b) Band Switch.

This is a six-position switch which selects the correct r-f oscillator coils for each band.

(c) Frequency Dial.

This has six bands calibrated directly in kilocycles or metres. A slow-motion knob provides a 56-1 vernier drive or direct drive as required.

(d) Output Control.

This consists of a piston type variable capacity attenuator, and allows the r-f output to be adjusted to any desired value.

4. CONSTRUCTION.

The unit is contained in a standard pressed steel equipment case measuring 8" x 8" x 12.1/2", and weighs 23 lbs. The size over all projections is 9.1/2" x 9.1/4" x 12.3/4". A carrying handle and four rubber feet are provided.

All components are mounted behind the front panel, and are separated from the batteries by a screen which divides the case into two compartments. The batteries are carried on the back cover of the case, and are easily accessible. Battery test jacks are provided under a small removable plate at the end of the case.

In order to reduce r-f leakage from the unit both front and back covers are fixed to the case by closely-spaced self-tapping screws, and a copper foil screen is provided behind the front panel.

5. OUTPUT CABLE.

The shielded output cable which is supplied has the correct characteristics to suit the piston attenuator, and to behave as a dummy aerial at all frequencies.

6. PERFORMANCE.

(a) Frequency.

The frequency coverage on each range is as follows:-

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 SECTION B. (Contd.)

Band A:	140 to 350 Kc.
Band B:	340 to 850 Kc.
Band C:	840 to 2,100 Kc.
Band D:	145 to 58 M (2.07 to 5.17 Mc)
Band E:	60 to 24 M (5.0 to 12.5 Mc)
Band F:	25 to 9.8 M (12.0 to 30.6 Mc)

The calibration accuracy is better than 2%.

At high outputs the attenuator has some effect on the frequency. This is shown in the following table:-

Output.	Frequency Shift.		
	High Frequency (short wavelength) end of bands.	Middle of Bands	Low Frequency (Long wavelength) end of Bands.
100 mV	0.03%	0.1%	0.2%
300 mV	0.05%	0.15%	0.3%

(b) Output.

The attenuator is calibrated to read the r-f voltage at the end of the shielded output cable. It is direct-reading on Bands A, B, C and D but on Bands E and F it is necessary to use a multiplying factor as follows:-

Band	Multiplying Factor for Output
E	0.7
F	0.4

The attenuator scale is marked as follows:

and 1, 3, 10, 30, 100, 300 μ V (microvolts).
 and 1, 3, 10, 30, 100, 300 mV (millivolts).

(In addition, there is an end mark which is used for setting the knob. See Section E, Service Information).

Therefore: The approximate maximum output on each band is

A:	300 mV	D:	300 mV
B:	300 mV	E:	210 mV
C:	300 mV	F:	120 mV

It is important that the shielded output cable supplied with the instrument should always be used, otherwise the above figures

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SECTION B. (Contd.)

will not hold.

Leakage signal through the attenuator cannot be detected, but at wavelengths less than approximately 15 metres leakage from the case of the instrument becomes noticeable, although it is never greater than 10 μ V. This leakage signal enters the receiver mainly through the central conductor of the output lead, being picked up from the outer shield. It may be reduced to a negligible amount by using a short additional earth lead between the modulated oscillator and the receiver. This lead will have very little effect on the output voltage calibration.

(c) Modulation.

The modulation frequency is 400 cycles $\pm 5\%$ and the modulation depth approximately 30%.

NOTE:

The A.W.A. Modulated Oscillator Type J6726 may also be supplied with a three piece Telescopic aerial which enables the instrument to be used as a low power exciter unit.

The instrument is essentially unaltered in its use as covered by this Book.

The modification to the unit takes the form of an attachment to the R.F. output terminal to which a 3 piece telescopic aerial Type 10190 is fitted.

The aerial screws into a socket and is supported by an ebonite supporting tube attached to the case.

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SECTION C.

INSERTION OF VALVES AND BATTERIES.

To insert the two type 1Q5GT valves in the instrument, it is necessary to remove the screws around the edge of the front cover and withdraw the unit from its case. The valves may then be inserted in their sockets and the unit replaced.

To insert batteries, the back cover should be removed and the battery clamp unscrewed. The PR8 1.5 volt battery should be placed at the left-hand end of the cover (looking from the front) and the PR45 (45 volt) battery at the right. The battery clamp may then be replaced and the leads connected as follows:-

Maroon	+45V	("+B")
Black	-45V) ("Earth")
Red	+1.5V	
Yellow	-1.5V	("-A")

See Figure 1, Circuit Diagram.

Finally, the back cover should be replaced.

It is important that all screws on both front and back covers should be screwed up tightly in order to prevent r-f leakage.

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SECTION D.

OPERATION.

- (a) Place the modulated oscillator to the left of the receiver under test, and as far away from it as the output cord will allow.
- (b) Connect the output cable to the terminals of the modulated oscillator, the braided lead with coloured tracer (inner conductor) to the insulated terminal, and the plain braided lead (outer conductor) to the earth terminal.
- (c) Connect the other end of the cable to the receiver under test. The plain lead is to be connected to the earth terminal and the lead with coloured tracer to the aerial terminal or grid cap of a valve as required. When connected to a grid cap, it is necessary to connect a resistor from grid cap to earth (or across the modulated oscillator terminals) to complete the bias circuit, (250,000 Ω or larger is suitable).
- (d) Connect an output meter or cathode ray oscillograph across the plate circuit of the receiver output valve.
- (e) Turn the modulated oscillator control switch to "Mod. On" and select the desired test frequency by means of the band switch and frequency dial.
- (f) Tune the receiver to this frequency and adjust the modulated oscillator output to give a convenient deflection on the output meter or oscillograph.

Any of the tests listed in Section B, sub-section 1 may now be carried out.

CAUTION:

In order to avoid run-down batteries, be sure that the control switch is at "Off" when the modulated oscillator is not in use.

If at any time it is suspected that the modulated oscillator is not functioning correctly, the battery voltages should be checked by inserting the test prods of a voltmeter in the test jacks at the end of the case.

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SECTION E.

SERVICE INFORMATION.

1. ATTENUATOR ADJUSTMENT.

If the attenuator control becomes loose or sticky it may be adjusted as follows:-

With the unit removed from its case, take off the attenuator knob, unscrew the two terminals and unscrew or unsolder the connecting wire. The attenuator may then be dismantled for cleaning, or it may merely be necessary to adjust the pinion to cause it to mesh correctly with the rack. This is done by loosening the grub-screw in the die-casting and rotating the eccentric brass bush slightly until a smooth action is obtained with a minimum of backlash. A small amount of pure petroleum jelly may be used as a lubricant.

When replacing the attenuator in the unit, it is necessary to line it up with the graduations on the front panel. This is done as follows:

Loosen the two screws holding the clamp-plate to the back of the die-casting. Move the stop-plate aside so that it does not restrict the motion of the piston, which will now be stopped only when the moving plate carried by it comes into contact with the fixed plate in the end of the cylinder. With the piston in this position, move the attenuator about slightly so that the mark on the knob coincides with the short end-mark of the scale, and so that the knob is concentric with the scale. Tighten down the terminals to hold the attenuator in position. Now reset the stop-plate so that the knob stops at the 300 mV mark on the scale, and tighten down the clamp-plate.

NOTE: If the stop plate is not reset, it will be found that over-modulation or stopping of oscillation will occur at short wavelengths when the attenuator plates touch.

2. BATTERY AND VALVE ELECTRODE VOLTAGES.

H.T. ("B") to chassis ("earth"): +45V.

L.T. ("-A") to chassis ("earth"): -1.5V

V1 plate to chassis: +30 to +43V (depending on frequency).

V2 plate to chassis: +45V

3. R-f OSCILLATOR GRID CURRENTS.

Measure by inserting a microammeter between the normally-earthed end of R1 and the chassis ("earth").

<u>Band.</u>	<u>Approximate Grid Current Range.</u>
A	200-350 μ A
B	140-310 μ A
C	200-350 μ A
D	180-300 μ A
E	90-200 μ A
F	40-100 μ A

4. FREQUENCY CALIBRATION.

If it is suspected that the frequency calibration has become incorrect, lining-up may be carried out. The auxiliary apparatus required comprises an all-wave receiver (550 Kc/s.-30 Mc/s.) and an A.W.A. Piezo Electric Calibrator Type R6795. This instrument provides signals at harmonics of 100 Kc/s. correct to 0.03% and at harmonics of 1,000 Kc/s. correct to 0.1%.

The frequency adjustments provided on the Modulated Oscillator are as follows:-

- (a) A piston type trimmer condenser which ensures the correct capacity at all settings of the main condenser. This trimmer is mounted on the coil panel at the left-hand end of the unit.
- (b) Magnetite cores in the coils of Bands A to E and an adjustable end turn on the coil of band F. These ensure the correct inductance for each coil. Each coil has its circuit reference number and band reference letter stamped beside it on the coil panel.

On Band A, the r-f oscillator is series-fed, but on the other ranges the Band A coil acts as a shunt-fed choke, hence it is necessary to adjust Band A first. The lining-up procedure is as follows:-

Commencing with Band A, adjust the piston trimmer and the magnetite slug by trial and error until 150 Kc/s. and 300 Kc/s. coincide with these marks on the frequency dial. The receiver should be tuned to 600 Kc/s., so that the sixth harmonic of the 100 Kc/s. output of the Piezo-Electric Calibrator may be used. Then check the 250 Kc/s. mark on the frequency dial with the receiver tuned to 1,000 Kc/s. and using the 1,000 Kc/s. output of the Calibrator.

The other bands should then be adjusted in order. It should not be necessary to alter the piston trimmer, but if alteration is required, a check back must be made to bands previously lined up.

The lining up should be carried out at the following points:

Band	Lining-Up Points	Receiver tuned to	P.E. Calibrator Output
A.	150 Kc/s. 300 Kc/s. 250 Kc/s.	600 Kc/s. 600 Kc/s. 1,000 Kc/s.	100 Kc/s. 100 Kc/s. 1,000 Kc/s.
B.	400 Kc/s. 800 Kc/s. 500 Kc/s.	800 Kc/s. 800 Kc/s. 1,000 Kc/s.	100 Kc/s. 100 Kc/s. 1,000 Kc/s.

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 SECTION E. (Contd.)

Band	Lining-up Points	Receiver tuned to	P.E. Calibrator Output
C.	1,000 Kc/s. 2,000 Kc/s. 1,500 Kc/s.	2,000 Kc/s. 2,000 Kc/s. 3,000 Kc/s.	1,000 Kc/s. 1,000 Kc/s. 1,000 Kc/s.
D.	120M 60M 75M	60M (5 Mc/s.) 60M (5 Mc/s.) 75M (4 Mc/s.)	1,000 Kc/s. 1,000 Kc/s. 1,000 Kc/s.
E.	50M 25M 30M	25M (12 Mc/s.) 25M (12 Mc/s.) 30M (10 Mc/s.)	1,000 Kc/s. 1,000 Kc/s. 1,000 Kc/s.
F.	20M 10M 15M	10M (30 Mc/s.) 10M (30 Mc/s.) 15M (20 Mc/s.)	1,000 Kc/s. 1,000 Kc/s. 1,000 Kc/s.

5. MODULATION FREQUENCY.

This may be adjusted to 400 cycles by adjustment of the modulation transformer (T1) air gap. The auxiliary apparatus required comprises an audio oscillator and a cathode ray oscillograph.

6. MODULATION DEPTH.

The a-f voltage from V2 plate to earth should be approximately 11 volts. A blocking condenser should be used in series with the voltmeter in making this measurement.

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SECTION F.SCHEDULE OF COMPONENTS.Condensers.

C1,2	2 gang Variable, Production type.
C3	Mica, Type S6771/T (100 μF).
C4	Mica, Type S6771/T (100 μF).
C5	Moulded, Type S7080 (0.05 μF , 350V).
C6	Moulded, Type S7080 (0.25 μF , 350V).
C7	Piston Trimmer, Type 3658/0.
C9	Ceramic (12 μF).
C10	Moulded, Type S7080 (0.005 μF , 700V).

Resistors.

R1	50,000 Ω 1/2 watt.
R2	1 M Ω 1/2 watt.
R3	0.1 M Ω 1/4 watt.
R4	2,000 Ω 1/4 watt.
R5	0.1 M Ω 1/4 watt.

Inductances.

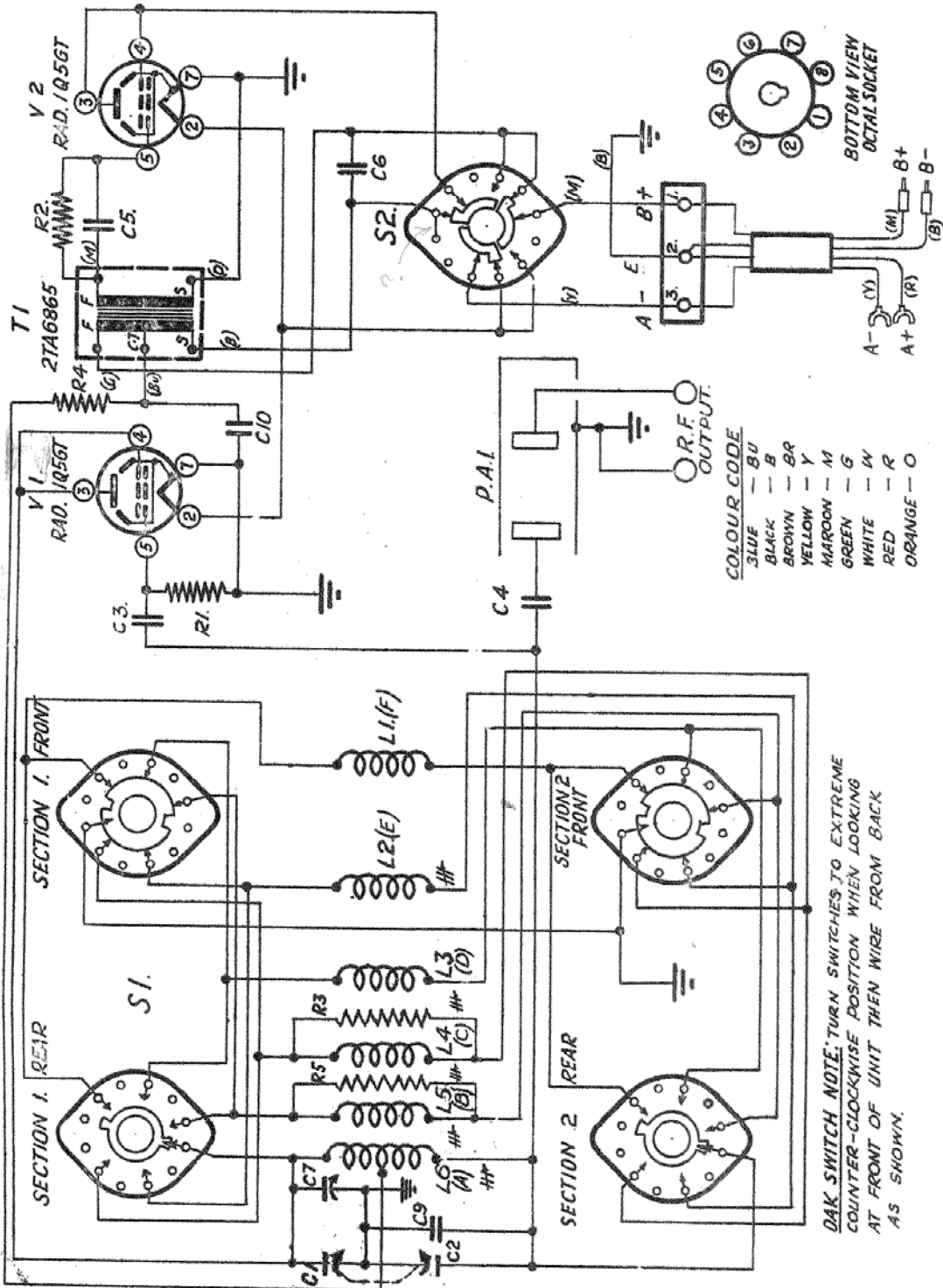
L1	(Band F), Drawing 6726A4/20, (resistance very low)
L2	(Band E), Drawing 6726A4/21 (resistance very low)
L3	(Band D), Drawing 6726A4/22 (resistance approx. 0.5 Ω)
L4	(Band C), Drawing 6726A4/23 (resistance 4 Ω)
L5	(Band B), Drawing 6726A4/24 (resistance 12 Ω)
L6	(Band A), Drawing 6726A4/25 (resistance 16 Ω)

Miscellaneous.

PA1	Piston Attenuator, Type 1R4744.
T1	Modulation Transformer, Pt. 10655 Q.P. (resistances as follows: M-0 30 Ω , B-B1 50 Ω , B-G 100 Ω)
S1	Oak "H" Type Switch, Drawing No. 6726E2.
S2	Oak "H" Type Switch, Drawing No. 6726E1.
V1	Radiotron Type 1Q5-GT.
V2	Radiotron Type 1Q5-GT.

6726DI

APPROVED	DATE
<i>[Signature]</i>	25-11-40
C8 DELETED CHANGES	
TEC. D. I.W. C.D. A.M.D.	
APP.	31. 12-40



AMALGAMATED WIRELESS (AUSTRALASIA) LTD. — SYDNEY

**SCHEMATIC DIAGRAM
MODULATED OSCILLATOR**

REF.	
ARGT.	<i>[Signature]</i>
DRN.	<i>[Signature]</i>
TRCD.	<i>[Signature]</i>
CKD.	<i>[Signature]</i>
APP.	<i>[Signature]</i>

1st SHEET REF.	1
TYPE J6726	
DWG. 6726DI	