

TECHNICAL DESCRIPTION OF MODEL 5PP PUSH/PULL DUAL WAVE MANTEL
RADIO RECEIVER.

1. DESCRIPTION:

- 1.01 The receiver about to be described is a most important one in that a new arrangement of valves has been used in a somewhat unconventional manner.

As pointed out in previous technical descriptions the dealer or salesman must be thoroughly conversant with the product he is presenting for sale. The following description will enable the dealer to compile sales literature and sales talk and will also be of great interest to the Serviceman because this receiver uses circuits which are new.

- 1.02 The receiver to be described in detail is a 5 valve Push-Pull dual wave giving standard 5 valve set sensitivity and in addition having the advantage of a push-pull output stage to give tone which has not previously been incorporated in a receiver of this class.

2. IMPORTANT SALES POINTS:

- 2.01 The Important sales and technical points which are to be stressed are as follows:
- (a) Push Pull output stage which gives tone normally only obtained in radio receivers having 8 or more valves.
 - (b) Full 5 valve receiver sensitivity.
 - (c) Short wave performance of standard high quality 5 valve sensitivity.
 - (d) Provision for attachment of gramophone pickup and Extension Speaker.
 - (e) High power output produced by the Push-pull output stage enables this receiver to drive its own and the extension speaker at full volume.
 - (f) Cabinet styling of a new type, that is the dial below the loud speaker. The Loud Speaker grill is in the new anodised aluminium.
 - (g) Full sized edge lit etched glass dial in toning and colours.

3. VALVES:

- 3.01 The valves used throughout this receiver are English types with the standard loctal base. All valves except the rectifier are of dual purpose type, that is, incorporating 2 separate valves in the same envelope.
- 3.02 The valve arrangement is as follows:
- 1 ECH 21 Hexode Mixer - - Triode Oscillator
 - 1 ECH 21 Pentode Intermediate Frequency Amplifier
Triode 1st Audio Amplifier
 - 2 EBL 21 Pentode Push-Pull Output - Diode Demodulator
 - 1 EZ 35 Rectifier.

4. CIRCUIT DESCRIPTION:

- 4.01 The aerial coil has a high impedance primary on broadcast. On short wave the aerial coil has been designed to give optimum performance on the average domestic aerial. The result of the design features in both the broadcast and short wave aerial coils is that a high degree of pick up is obtained from the average short aeriels which are used in actual practice. The selection of either the short wave or broadcast secondary is made by a section of the wave band switch. This switch connects the appropriate secondary to the control grid of the Hexode Mixer. The Triode section of the 1st ECH 21 is used in a conventional

grid tuned oscillator circuit and here again the appropriate coil secondary is selected by a section of the wave band switch. The Oscillator coils and the aerial coils have, on broadcast, variable iron cores. Both the short wave and broadcast coils are of heavy mechanical construction so that calibration and alignment will be stable through years of service. The oscillator coils have been carefully designed to give substantially constant oscillator grid current through the ranges.

The Anode Mixer is coupled to the control grid of the intermediate frequency amplifier by means of a permeability tuned intermediate frequency transformer. The construction of the transformer is such that it is stable mechanically and its electrical constants are such that high gain is obtained. Low tolerance silver mica capacitors are used as capacitive elements. The intermediate frequency amplifier is the Pentode section of the 2nd ECH 21 valve. The Anode of this section of the valve is transformer coupled to the diode demodulator and the description of the 2nd intermediate frequency transformer is identical to the description of the first. The Diode Demodulator is in the same envelope and part of one of the EEL 21 output valves. The Audio AC Voltage developed across the load resistor associated with the aforementioned circuit is applied via a volume control to the control grid of the first audio amplifier. The first audio amplifier is the triode section of the ECH 21 valve used as the intermediate frequency amplifier. The Anode of this section is resistance capacity coupled to the control grid of one of the EEL 21 output valves. The control grid of the other EEL 21 output valve is decoupled and grounded to form a conventional grounded grid push-pull output stage. The Anodes of the output valves are transformer coupled by means of a centre tapped primary transformer to the voice coil of the Loud Speaker.

So far no mention has been made of the AVC circuits. The AVC voltage, which is applied to the control grids of the Mixer, and intermediate frequency amplifier, is obtained from the rectified RF voltage produced by the 2nd diode in one of the EEL 21 valves. The tone control is a variable resistor and condenser combination operating on the control grid of the 1st audio amplifier. This is necessary because there is approximately 6DB inverse feedback over the audio section of this receiver and consequently the tone control circuit must be outside the feedback circuits. As mentioned above there is 6 DB inverse feedback over the audio section and therefore, the tone is improved even over standard push-pull tone.

Included on the wave band switch is a 3rd position for bringing the gramophone connection into operation. When the switch is in the gramophone position the gramophone terminals are connected to the top end of the volume control and therefore, the volume control operates on gramophones. In this 3rd position a high grid bias is applied to the control grids of the mixer and intermediate frequency amplifier thus muting the radio.

The rectifier is of the conventional full wave type and uses choke condenser filtering of conservative design so that the hum level is virtually zero.

On the rear of the receiver is a slide type switch for local or distance reception.

5. CONTROLS:

- 5.01 The following controls are used with this receiver:
- (a) Located on the righthand side of the dial is the tuning control.
 - (b) Located on the lefthand side of the dial is the AC on-off switch and tone control.

- (c) Located under the dial on the righthand side is the waveband switch.
- (d) Located under the dial on the lefthand side is the volume control.
- (e) On the back of the chassis is the slide type local distance switch.

6. DIAL MECHANISM:

- 6.01 The dial which is of the etched edge-lit glass type in 4 colours measures 9" long by 3" high and has marked on it the frequency in KC for the broadcast band and MC for the short wave band. In addition to this the broadcast band is marked with New Zealand stations while the shortwave has the international short wave bands clearly indicated.
- 6.02 The tuning knob has associated with it a high efficiency spinner unit which gives a smooth and suitable action for tuning. This smooth action enables shortwave stations to be tuned quite easily.
- 6.03 The functions of the various controls at the front of the set are marked by inscriptions in the appropriate places on the dial glass.
- 6.04 The general mechanical construction of the dial is such that an indefinite life can be expected of the bearings pulleys and cords. The pointer travel is $6\frac{3}{8}$ " and therefore stations are widely separated on the dial.

7. FREQUENCY:

- 7.01 The frequency range of this receiver is as follows:

Broadcast band	1500 - 550 KC
Short wave	6 - 20 MC

8. CABINET:

- 8.01 A considerable amount of time has been spent by stylists and radio engineers to ensure that there will be wide public acceptance of the radically new design features incorporated in this cabinet. In the first instance the fact of having the dial and controls towards the bottom of the cabinet makes the receiver very easy to tune, secondly, the speaker being located above the dial brings it in the average mantel set location nearer to ear level. The proportions of the cabinet are such that they must appeal to all prospective buyers and the workmanship and finish is the best obtainable.
- 8.02 Some features of the cabinet are set out below:
 - (a) Grill of gold anodised aluminium.
 - (b) Controls placed in a logical manner.
 - (c) Completely new styling.
 - (d) Veneers finished to a glass-like finish.
- 8.03 Dimensions of the cabinet described above are 18" long 14" high and 8" from front to back.

9. SPEAKER:

- 9.01 The speaker is of the permanent magnet type and is 8" in diameter and has a heavy magnet in order to give high flux density in the gap. This speaker is fitted with a transformer is insulated from the frame of the speaker and connected to high tension positive. This is to eliminate any possibility of electrolysis corroding the primary winding.

10. TROPIC-PROOFING:

10.01 N.Z. has, in the main, a sub-tropical climate and also can have areas of extremely high humidity and high temperature. Special precautions have therefore been taken to render all components impervious to the effects of high humidity and high temperature conditions. All RF, IF and transformer coils are dehydrated and then vacuum impregnated with world recognised waxes. All metal work and all hardware such as screws etc., are given a heavy coat of cadmium plating to preclude the possibility of their being damaged or corroded by moisture. In addition the bright cadmium plating gives the set a neat and clean appearance.

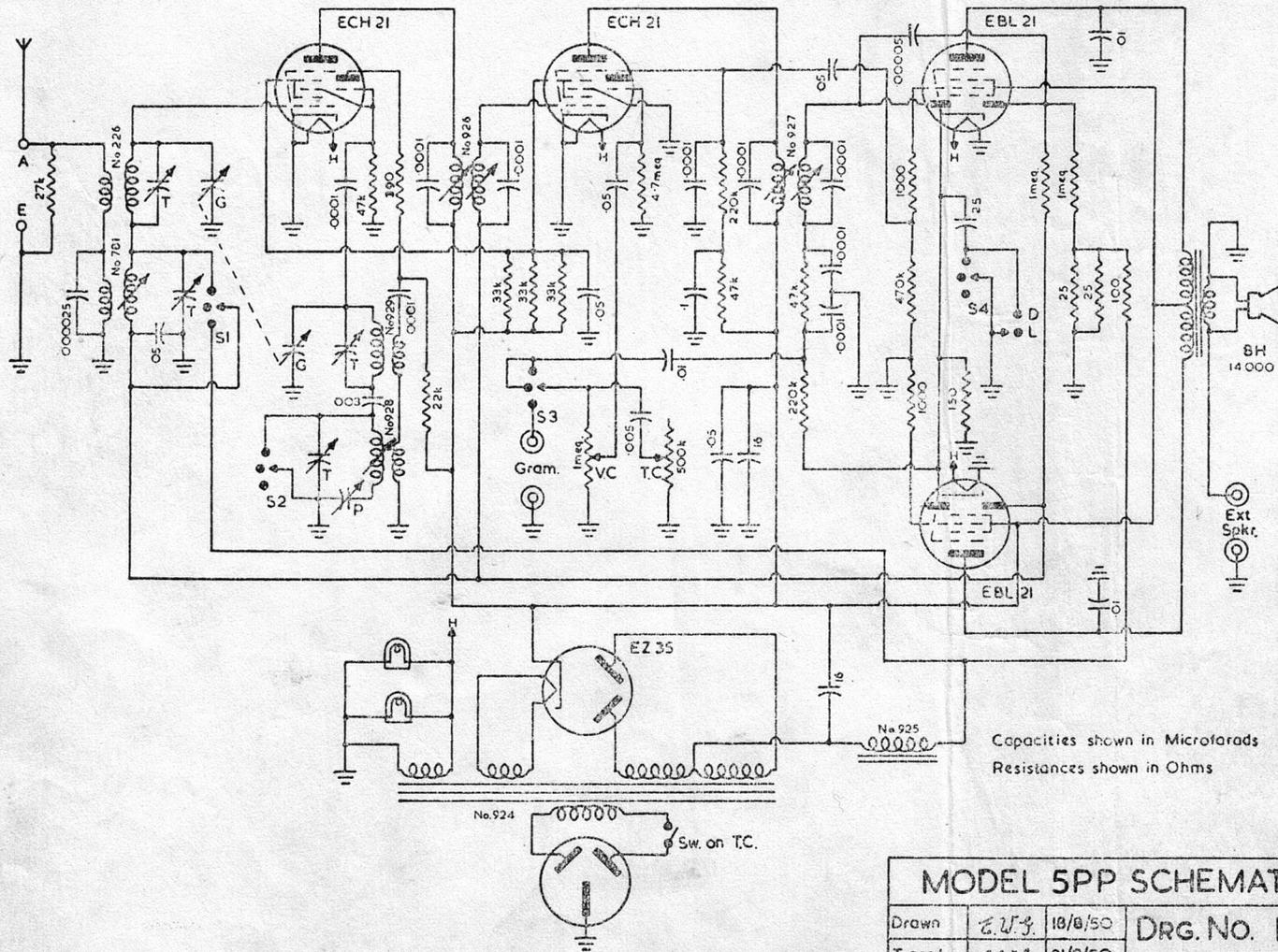
Summarising, standard military tropic proofing procedures are used throughout during the construction of the set.

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MODEL 5PP SCHEMATIC

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