P & T special (ex Ldg. A)

SCHEMATIC DIAGRAM AND COMPONENT DATA COVERING

6-VALVE MEDIUM-WAVE RECEIVERS.

TYPE 641-M.W.B-1 SERIAL NOS.610-621,
677-700 AND 701-724

C. & B. REF. 1760-A

F. & T. O/NOS. H.1286, REFERENCE 150/6314, H.1439
REFERENCE 150/6365 AND H.1505 REFERENCE 150/6384.

BULLETIN NO.78.

COLLIER & BEALE LIMITED,
66, GHUZNEE STREET,
WELLINGTON, C.2.

11th. May, 1942.

P+T model
641 MWB

Ref. P. & T. H.1286 - 150/6314
H.1439 - 150/6365
H.1505 - 150/6384
C. & B. 1760-A

May 1942

BULLETIN NO.78

TECHNICAL DESCRIPTION AND ADJUSTMENT PROCEDURE COVERING

RECEIVER TYPE 641-M.W.B.

FREQUENCY RANGE 290-900-KC/S.

Receiver Type 641-M.W.B. is of the superheterodyne type and employs a total of six all-metal valves in the following arrangement:-

1	- type	6K7	- signal frequency amplifier
1	- "	6K8	- mixer oscillator
1	- "	6K7	- I.F. amplifier (270-Kc/s)
1	- "	6R7	- diode detector & 1st A.F. amplifier
1	- "	6C5	- audio amplifier
1	- "	6C5	- C.W. oscillator

Mechanical Arrangement.

The receiver is of the doubly-shielded type, all major components making up the tuner section being assembled on an aluminium sub-chassis which is insulated from the main chassis or cabinet. This sub-chassis is fitted with enclosing screens both top and bottom, the top screen or cover being held in place with two sheet metal screws and the bottom cover by pressure of the base mounting plate. A sheet of insulating material is interposed between these latter items and should always be replaced in the event of the base plate being removed for any purpose. The base mounting plate, which is held to the main chassis by a number of No.6/32 ~~T.C.I.~~ screws, is equipped with four resilient suspensions and table-mounting wood slats. The sub-chassis is held in place in the main frame via four rubber bushings, thus providing the required insulation and some resilience as well.

Receiver controls are all fitted to the front panel of the main chassis; their descriptions and functions are as follows :-

Tuning Control.

This is of the string drive type and connects to a 3" diameter steel pulley on the variable condenser shaft.

R.F. Gain Control.

This takes the form of a carbon potentiometer in series with cathode bias resistor R.F. stage tube 6K7, screen current also being bled through this control to provide the requisite operating variable grid bias.

I.F. Gain Control.

This takes the form of a carbon potentiometer and operates in exactly the same manner as described above but on the I.F. stage tube type 6K7.

Battery Switches.

"L.T." controls all valve heaters and pilot lamp; "H.T." controls the main H.T. feed.

C.W. Oscillator.

Controls the H.T. feed to heterodyning oscillator tube type 6C5.

Circuit Description.

The circuits embodied in this receiver are entirely conventional other than the use of special radio frequency filters in the battery leads.

Aerial input is taken via a short length of screened cable to inductively coupled aerial coil (No.741) and thence to grid of R.F. stage valve (6K7). Coupling to the diode section of the mixer tube (6K8) is via a double wound coil (No.841-A), the primary inductance being such that it is resonant at approximately 300-Kc/s. H.F. transfer is provided by a ceramic capacitor of 15-mmfd. between the R.F. stage plate and mixer grid. The triode section of the mixer valve (6K8) is wired to a tickler feed-back type oscillator coil (No.151) which is fed from the main H.T. through a decoupling resistor of 12,000-ohms. (R-6).

Cathode bias is used on both stages, a variable resistor being also included in the case of the R.F. stage and through which a small current is bled from the screen supply, thus serving as the R.F. gain control. The tuning element in each case is a section of a 450-mmfd. variable condenser (Plessey No.2866). A padder condenser of 1,000-mmfd. maximum capacity (C-6) is inserted between the grid return of the tuned winding of the oscillator coils and ground.

The mixer output is coupled to the I.F. stage amplifier tube (6K7) through conventional double tuned I.F. transformer (C. & B. No.11) tuned to 270-Kc/s. Cathode bias plus variable resistor is used to control the gain of this stage. An identical transformer is used to couple the I.F. amplifier to the diode rectifier section of the demodulator tube (6R7), the rectified carrier being developed in diode load resistor (R-8). The audio component appearing in the diode load circuit is passed to the grid of the triode section of this valve through coupling condenser (C-10) of .01-mfd. capacity, the amplified output being developed in plate load resistor (R-12). Fixed cathode bias is used and obtained from resistor (R-4). The output of this stage is coupled to the final A.F. stage valve (6C5) by condenser C-11 of .01-mfd. capacity, fixed cathode bias being used and obtained from resistor (R-3). The output of this stage is taken to the external circuit (two jacks in series) through iron cored transformer (No.324). By-pass condensers are included in the outputs of the two amplifying stages and designated C-16 and C-17 and also across the output jacks designated C-14 and C-15 respectively. These are for the sole purpose of reducing the radio frequency output appearing across the external section to a very low minimum.

The heterodyning oscillator employs a type 6C5 triode valve in a conventional Hartley circuit, the R.F. output being developed in plate load resistor (R-11) and coupled to the diodes of the modulating valve through 5-mmfd. condenser (C-18).

Battery connections are taken via four suitably marked terminals at the rear of the cabinet, "H.T." requiring a supply of 150 to 180-volts of approximately 25-m.a. and "L.T." requiring a supply of 6-volts A.C. or D.C. of 1.8-amperes.

Operation.

Operation of the receiver is quite straightforward and conventional, receiver gain adjustments being undertaken with either or both the controls fitted, it being noted that the highest weak signal sensitivity will be realised with the maximum possible R.F. gain in use. For the reception of C.W. telegraph signals the heterodyning oscillator should be brought into service by depressing the panel switch provided for this purpose.

Service Adjustments.

Service adjustments could almost wholly be confined to valve replacements but, in the event of alignment being considered faulty, the following notes and procedure are offered.

Intermediate Frequency Amplifier Alignment.

The intermediate frequency used in Model 641-M.W.B. is 270-Kc/s and both transformers should be adjusted for maximum output and under no circumstances should a "staggered" adjustment be used as the gain of the whole receiver will be materially affected. Adjustment of the I.F. amplifier should be undertaken by first aligning the diode transformer alone, this being accomplished by clipping the signal generator lead on to the grid of the intermediate frequency amplifier tube (6K7) and adjusting for maximum output. The generator unit should then be transferred to the grid of the mixer tube (6K8) and the first transformer treated in a similar manner, reducing the signal output of the generator as the stage is resonated to avoid overloading.

Signal Frequency Circuit Alignment.

Adjustment of the signal frequency circuit, although not difficult, should be undertaken with a fair amount of care, particularly in the setting of the oscillator trimmer condenser and in no case, unless the performance of the receiver is in question, regardless of minor errors in dial reading, should any attempt be made to disturb the factory adjustments. The order of adjustment is as follows :-

(1) Fully mesh the variable condenser and ascertain that the last scale marking coincides with the index on the dial aperature window. If this is found to be appreciably in error the grub screws on the condenser extension shaft should be loosened and the dial plate brought to its correct position.

(2) With an accurate signal generator set at some convenient high frequency, say 900 or 850-Kc/s., and with the gang condenser set at the correct position as indicated by the dial scale, the oscillator trimmer should be adjusted for maximum output. With this adjustment made, both the mixer and R.F. trimmers may then be adjusted, reducing the signal generator output as the stages are resonated to prevent overloading. Neither of these two latter adjustments is critical nor difficult to perform, and very rarely - unless the receiver has been tampered with - will any major variation be required to be made.

(3) The most satisfactory way of adjusting the padding condenser is to use a highly damped signal source, rather than the signal generator, to avoid the necessity of constantly "rocking" the tuning mechanism to ensure the optimum adjustment that provides maximum output. A suitable highly damped source is generally available in the variety of electrical disturbances that constitute the usual background of a radio receiver when connected to an antenna. The receiver, therefore, should preferably be tuned to a frequency of approximately 300-Kc/s., making sure that no station carrier wave is present, and the padding condenser adjusted for maximum noise output. After satisfactory adjustment of the padding condenser, it is wise to again recheck the high frequency oscillator trimmer condenser, this latter adjustment only being necessitated if a considerable movement of the padding condenser has taken place.

As a further aid in servicing the receiver, a tabulation of the voltage readings for the various stages, together with a component schedule which is to be used in conjunction with the schematic diagram attached, is appended.

Collier & Boale Limited,
66 Ghuznee Street,
WELLINGTON, C.2

11th. May, 1942.

COMPONENT SCHEDULE COVERING

RECEIVER UNIT - TYPE 641-M.W.B.

FREQUENCY RANGE 290-900-KC/S.

Ref.No.	Type or Value	Make	Description or Function.
TRANSFORMER:			
T-1	15,000-10,000-ohms	C. & B.324-A	Audio output transformer
RESISTORS:			
R-1	600-ohms	Contralab 310	Cathode bias, R.F. stage
2	200 "	" "	" " , mixer
3	2,000 "	" "	" " , 2nd A.F. stage
4	2,000 "	" "	" " , 1st " "
5	50,000 "	" "	Grid leak oscillator
6	12,000 "	" 316	Feed resistor "
7	10,000 "	" "	Screen feed resistor
8	500,000 "	" 310	Diode load "
9	1-meg.	" "	Grid leak, A.F. stage
10	50,000-ohms	" "	" " , C.W. oscillator
11	100,000- "	" "	Feed resistor, C.W.
12	50,000 "	" 310	Plate feed resistor, A.F. stage
13	1-meg.	" "	Grid leak, A.F. stage
14	600-ohms	" "	Cathode bias, I.F. stage
15	40, 000 "	" 314	Screen bleeder & R.F. bias
16	40, 000 "	" "	" " " I.F. "
17	25,000/20,000 "	" Fot.	R.F. gain control
18	25,000/20,000 "	" "	I.F. " "
REACTORS:			
R-1	5-10 henries	C. & B. 326	H.T. decoupling reactor

Ref.No.	Type or Value	Make	Description or Function
CONDENSERS:			
C-1	.1-mfd.400-v	Solar Tubular	Cathode by-pass, R.F. stage
2	.1 " "	" "	Screen " " " "
3	.1 " "	" "	Cathode " " Mixer "
4	.1 " "	" "	Signal oscillator, feed by-pass
5	.00005-mfd.	" Mica	" " , grid condenser
6	600-1,000-mmfd.	" T.C.C.	Padding condenser
7	.1-mfd. 400-v	" Tubular	Screen by-pass, mixer stage
8	.1 " "	" "	Cathode " , I.F. "
9	.00005-mfd.	" Mica	Diode load by-pass
10	.01-mfd. 600-v	" Tubular	Audio coupling condenser
11	.01 " "	" "	" " "
12	25-mfd.	Hunt Tub.Elec.	Cathode by-pass, A.F. stage
13	25 "	" " "	" " , 2nd A.F. stage
14	.01 "	Solar Tubular	Phone R.F. by-pass condenser
15	.01 "	" "	" " " "
16	.002-mfd.	" Mica	Plate R.F. by-pass "
17	.001 "	" "	" " " "
18	5-mmfd.	T.C.C. Ceramic	Beat frequency coupling condenser
19	.5-mfd. 2-.25-par.	Solar Tub.600-v	H.T. R.F. by-pass condenser
20	1 " 2-.5-par	T.C.C. 350-v	L.T. R.F. " "
21	.0001-mfd.	Solar Mica	Beat osc., R.F. by-pass condenser
22	.0001 "	Solar Mica	Grid condenser, C.W. oscillator
23	.5-mfd. 350-v	T.C.C. Tubular	H.T. R.F. by-pass
24	.5 " "	" "	H.T. " "
25	8 "	Tubular Elect.	H.T. Filter condenser
26	.25 " 400-v	Solar Tubular	Fil. R.F. by-pass

Ref.No.	Type or Value	Make	Description or Function
CONDENSERS (Cont'd)			
C-27	.25-mfd. 400-v	Solar Tubular	Screen R.F. by-pass
28	5-pfd.	T.C.C. Ceramic	H.F. coupling

RECEIVER TYPE 641-M.W.B.

VOLTAGE READINGS.

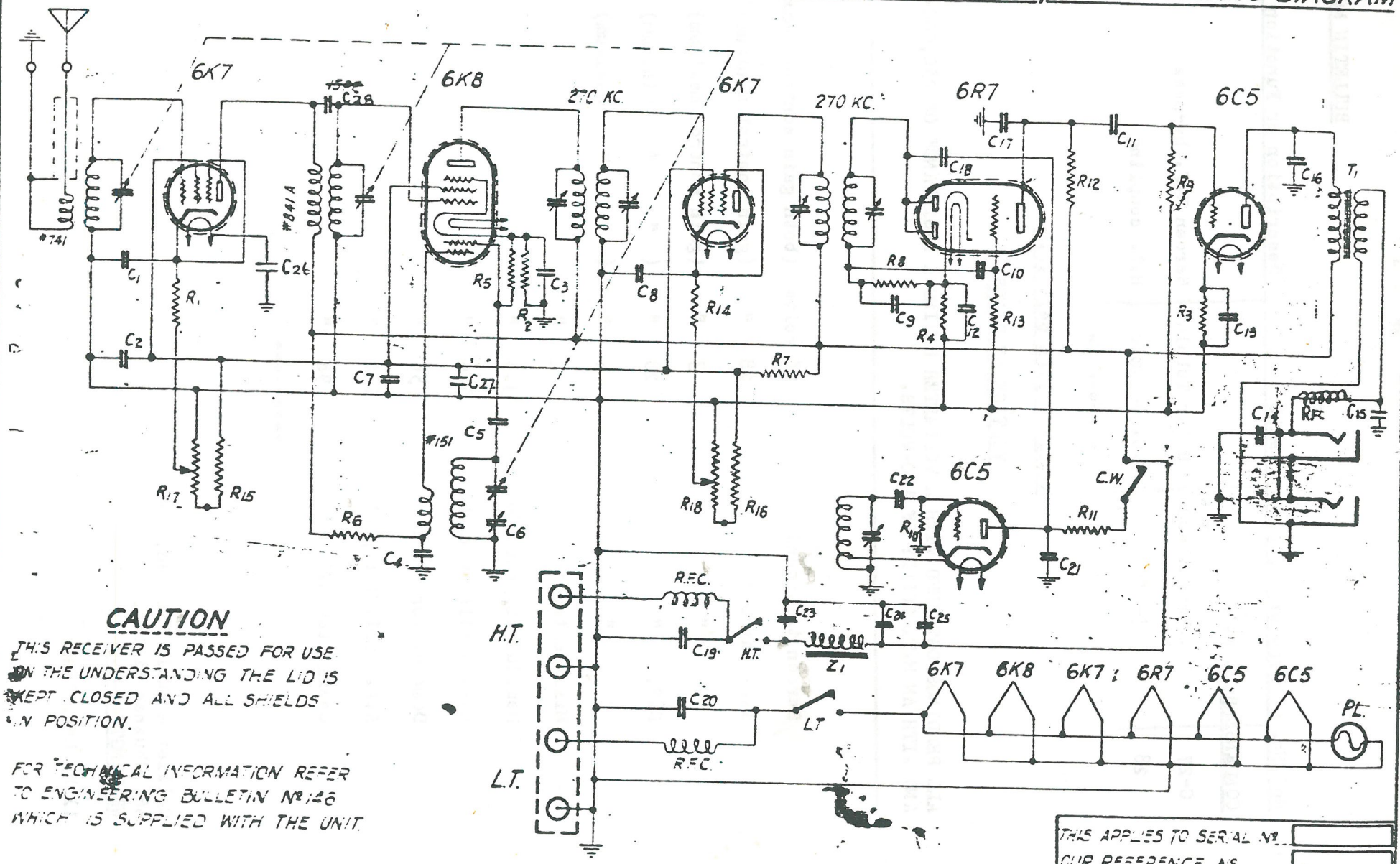
ALL READINGS OBTAINED WITH A VOLTMETER HAVING A RESISTANCE OF 250,000-OHMS AND WITH AN H.T. SUPPLY OF 180-VOLTS.

Screen to Ground	96 volts	(both gain controls maximum)
I.F. cathode	28 "	(gain control minimum)
" "	3 "	(gain control maximum)
R.F. "	28 "	(" " minimum)
" "	3 "	(" " maximum)
Mixer cathode	2 "	
Demodulator cathode	3.4 "	
A.F. amplifier cathode	5.4 "	
Demodulator plate	56 "	
A.F. amplifier plate	164 "	
Oscillator H.T.	96 "	

Collier & Beale Limited,
66, Ghuznee Street,
WELLINGTON, C.2

11th. May, 1942.

RECEIVER TYPE 641 MWB – FREQUENCY RANGE 290-900 KC/s – SCHEMATIC DIAGRAM



CAUTION

THIS RECEIVER IS PASSED FOR USE ON THE UNDERSTANDING THE LID IS KEPT CLOSED AND ALL SHIELDS IN POSITION.

FOR TECHNICAL INFORMATION REFER TO ENGINEERING BULLETIN Nº 126 WHICH IS SUPPLIED WITH THE UNIT.

THIS APPLIES TO SERIAL Nº	
OUR REFERENCE Nº	
DRAWING Nº	576.
COLLIER & BEALE LTD. WELLINGTON	
DATE	