TECHNICAL INSTRUCTION NO.50, AMENDMENT NO.1.

1. This is an amendment to Technical Instruction No. 50 relating to the AR7 Receivers.

2. OPERATION:

2.1. CODAN:

Further information has come to hand on Codan combining equipment to be used in conjunction with these receivers. It has been found possible to use low impedance cables for connecting Receiver I.F. to Codan input, cable type PT29M. being suitable. This necessitates a change in the method of feed. Drawing HR-413-W shows a .01 mf condenser, (fitted inside the IFT3 container) in series with the tuning capacity across the primary of IFT3. The junction of these 2 condensers is taken from the can by way of the spare terminal, and a short length of PT29M. coaxial cable connects to a socket mounted on the movable plate which carries the aerial RF connector. This connector is type REC 125/IR, available from Repetition Engineering or from Stores. The 50 pf. formerly marked C71 is to be removed. This completes the modification for Codan operation. The principal advantage is that cables of any length may be used with the Codan whereas the former high impedance feed made cable lengths critical.

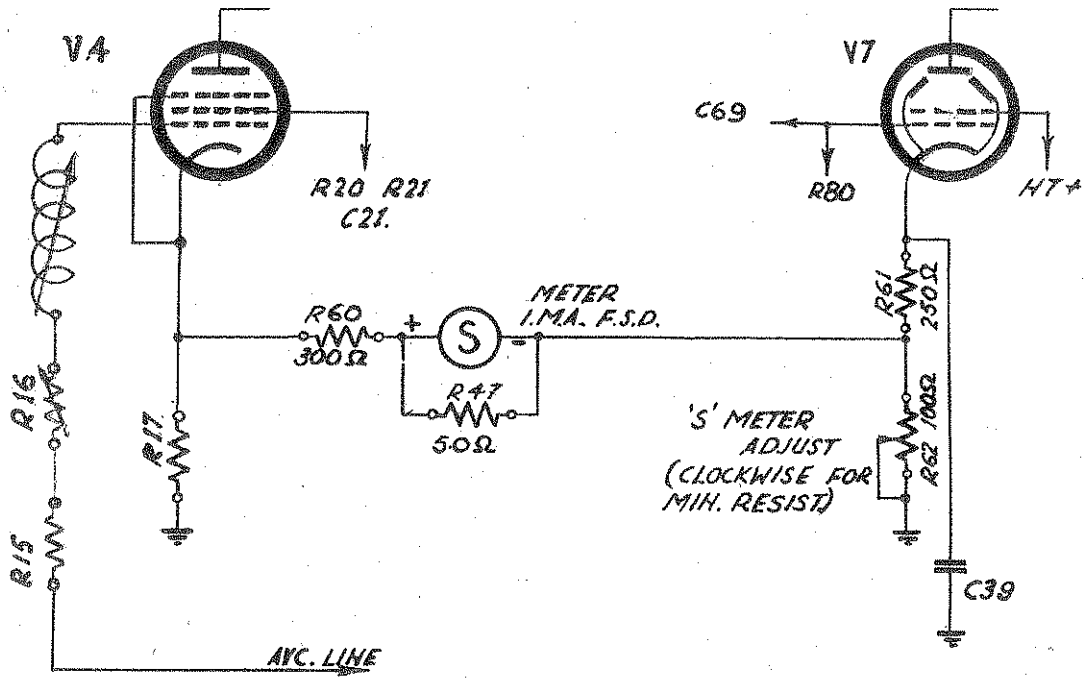
2.2. R.F. GAIN CONTROL:

In certain cases AR7 receivers have given trouble through overloading. It may be cured by connecting the cathode of V1 to the R.F.G. line V4 being removed as shown, and used for the S meter connection. Resistor R18 should then be reduced to 20 K using a combination having a power rating above 3 watts, such as three 60 K 2 watt in parallel. These changes will give better control of larger signals and all AR7 receivers should be modified as soon as possible. Relevant sheets of Drawing HR-303 have been modified accordingly.

(S.G. WILLIAMSON)
for Director-General of Civil Aviation.

DISTRIBUTION -

Regional Distribution.



NOTES

1 THIS DRAWING IS TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

2. COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.

ASSOCIATED DRAWINGS.

SEE D.C.A. DRAWING N° HR413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
2	W.A.	Y.M.C.	6.2.51	REDRAWN
3	[illegible]	C.P	14.2.51	VARIOUS AMMENDMENTS

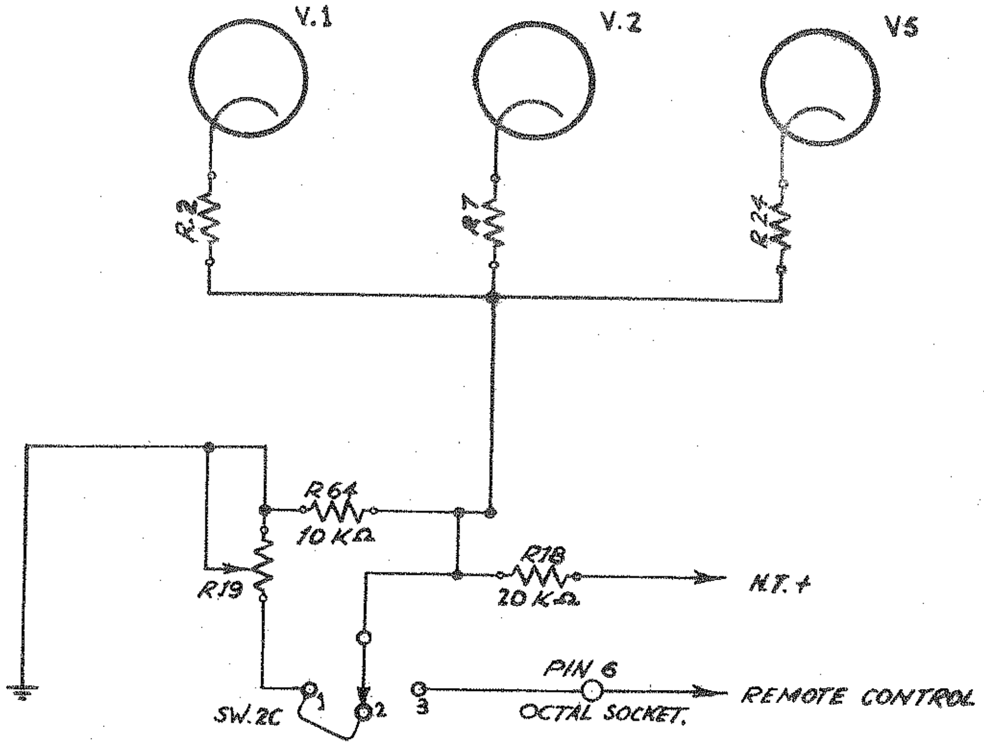
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF CIVIL AVIATION

DIVISION OF AIRWAYS

RECEIVER TYPE ART.
MODIFICATION
'S' METER
SCHEMATIC

DRAWN A.M.C.	EXAM'D. R.R.	DRAWING NO.
TRACED	APP'D. R.R.	HR-303-Z
CHECKED N.W.W.	DATE	SHEET 4 OF 10 SHEETS



SWITCH FUNCTIONS		
SWITCH Nº	POSITION	DESIGNATION.
SW 2	1	NORMAL
	2	REMOTE CHECK
	3	" OPERATE.

NOTES

THESE DRAWING ARE TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.

ASSOCIATED DRAWINGS

SEE D.C.A. DRAWING Nº HR413 FOR COMPLETE SCHEMATIC OF AR7 MODIFIED FOR REMOTE CONTROL.

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
1				
2	W.W.	C.R	14·2·51	V1 WAS V3 - V2 WAS V4 - R2 WAS R7 - R7 WAS R17. VALUES [illegible] ADD

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF CIVIL AVIATION

DIVISION OF AIRWAYS

RECEIVER TYPE AR7.
MODIFICATION
FOR REMOTE CONTROL OF
R.F. GAIN ——— SCHEMATIC.

DRAWN W.W. 4-11-49	EXAM'D. C.P.	DRAWING No.
TRACED	APP'D. V.W.G.	HR-303 -Z
CHECKED N.W.W.	DATE 6.2.50	SHEET 8 OF 10 SHEETS

COMMONWEALTH OF AUSTRALIA.

Department of Civil
"Almora House",
522-536 Little Collin
MELBOURNE. C.1.

RADIO TECHNICAL INSTRUCTION NO. 50

NOTES ON MODIFICATION OF RECEIVER. TYPE AR7.

1. GENERAL. SEE AMENDMENT No 1

1.1. These notes should be read in conjunction with Drawings No. 303 (Sheets 1-10), HR.413, HM.723 (Sheets 1-3) issued February, 1950.

1.2. The following terms have, as used in these notes, the meanings given -

"Normal"	= Condition whereby receiver is operated manually from its own front panel.
"Local"	= At the receiver itself.
"Operator"	= Person handling controls at point distant from receiver.
"Technician"	= Person responsible for setting up and maintaining receiver at remote station.

1.3. Mechanical materials requirements are shown on Drawing HM.723. Electrical components are referred to in Section 4 of these notes. In Drawing HR.303, each new component is indicated by value as well as its number.

1.4. The modified AR7 as shown in full schematic drawing HR.413 provides for the following:-

(a) Crystal Locking of Local Oscillator.

(b) Remote Control of CW note by means of Reactance Tube.

(c) Remote Control of RF. Gain.

(d) Electronic Squelch in Audio Section, with provision for remote IN/OUT switching.

(e) New form of 'S' Meter circuit.

(f) Monitoring.

(g) L.T. On/Off Indicator.

(h) Possible future use with Codan.

Further details concerning these are given in the sections following.

It should be noted that, because of these modifications, A.V.C. is applied under all operating conditions.

1.5. In connection with (b), (c) and (d) above, switching is incorporated to facilitate the setting up of the receiver prior to making it available to the operator. Switches SW2 and

SW5 provide the remote receiving station with full control of receiver for setting up purposes, and this operation can be performed without reference to the operator or his controls. Reference to the switching chart of Appendix A will simplify the explanations of operation given in Section 2.2., 2.3. and 2.4.

1.6. Where it is desired to operate receiver remotely under conditions where receivers are not located in same building as control equipment, it is necessary to use a suitable control system using relays and uniselectors so as B.F.O. and R.F. Gain lines from receiver are not unduly extended. This is necessary because if the control lines (B.F.O. in particular) are subject to inductive interference from adjacent cables unwanted and intermittent changes in beat note will occur.

2. OPERATION.

2.1. Crystal Locking:

(a) The crystal required will be of frequency F-455 or F-455 Kc/s., where F is carrier frequency and crystal to be between 2 and 8 Mc/s. approximately. This gives a possible range of about 2 to 17 Mc/s.. When requisitioning state that crystal is for AR7 use, as it is necessary to know the particular circuit to obtain the required ±.005% accuracy.

(b) Theloss of conversion gain to be expected when working on 2nd harmonic with a normally active crystal will be 4 to 5 db. Losses of conversion gain not greater than 6 db. can be compensated for by an increase in local RF. gain Control setting without an adverse effect on signal/noise ratio.

(c) Receivers modified for crystal locking may still be used as normal tuneable receivers by replacing modified coil box containing crystal, with normal unmodified coil box.

2.2. B.F.O. Control:

(a) Control of the B.F.O. is achieved by means of a reactance tube circuit connected across the tuned circuit of the B.F.O. The effective shunt reactance thus added is dependent upon the grid-cathode potential of the reactance tube, and so the frequency of the B.F.O. may be varied by changing the voltage applied to a control line which feeds a voltage divider in grid circuit of the reactance tube. A certain negative voltage on the control line will result in B.F.O. operating at 455 Kc/s., giving zero beat on CW signal; an increase or decrease in voltage causes B.F.O. frequency to shift, with corresponding change in beat note.

(b) The schematic circuit of Drawing HR.303, Sheet 7, shows reactance tube and associated switching in conjunction with the original B.F.O. Provision is made for operation of receiver under normal conditions, i.e., full manual control. For "normal CW" (i.e. both SW2 and SW5 set at position 1) additional resistance (R63 and R83) is inserted in cathode of reactance tube to give

grid bias equivalent to that present when on zero beat with remote control. For all other conditions, including "normal RT" operation, this cathode resistance is shorted out. When "normal RT" is used, there is also no external voltage applied to reactance tube grid (the B.F.O. control line being opened at SW2B), so this tube draws large current and B.F.O. is rendered ineffective, its output being greatly reduced and frequency shift increased so that resultant beat note is beyond audibility. This statement applies also to remote RT operation, when however, the control line is opened by operator instead of at SW2B. When set up for remote operation the grid voltage divider circuit is connected via SW2B to external control line which, at far end, should be terminated in a potentiometer system capable of putting to line voltages of from -15 to -30 with respect to earth. This voltage swing should cause a note change of at least 6 Kc/s. above and below a zero beat occurring at 22 volts. A 10,000 ohm. potentiometer with a fixed 10,000 ohm. resistance each side is recommended for use with a negative 48V supply, rotor of potentiometer going to line, via a S.P.S.T. switch for CW/RT change-over. A rotary switch can perform the potentiometer function in the case of long line operation. The 48V power supply must be well filtered and not subject to varying loads.

(c) Alignment:

The BFO should be aligned prior to installation of receiver as a remote-controlled equipment. Assuming alignment of IF stages, etc., has been correctly done, proceed as follows:- Place SW2 in position 2 and SW5 in position 3. With a CW signal accurately tuned in by 'S' meter, -22V applied to pin 1 of octal outlet, and front panel "BFO Note" Control in central position, adjust slug of BFO coil for zero beat. Then to ensure satisfactory normal operation, set SW2 and SW5 to position 1 and rotate "Local CW potentiometer" (R63). A note variation of at least 3 Kc/s. each side of zero beat should be obtainable. Set for zero beat. If receiver is later used as "normal", R63 can, if necessary, be further adjusted to compensate for any slight changes in BFO or Reactance tube circuit values. The net result is to give correct CW operation under all conditions, i.e., signals tuned to maximum by 'S' meter continue to give zero beat with "BFO Note" control at central position whether receiver used normally or remotely controlled.

(d) Setting up for Remote Operation:

By means of Local-Remote switch (SW2) and Squelch/CW switch (SW5), the technician can take full control of the receiver for the purpose of tuning in required signals, setting levels, etc.. Only when SW2 is set to position 3 ("Rem. Operate") has the operator control over BFO, RF Gain and squelch. Prior to switching SW2 to this position, the technician can tune signal using local RF gain control, 'S' meter, and monitor jack with SW2 set to "Normal" and SW5 set to "Squelch Out." For RT signals, squelch can then be adjusted with SW5 changed to "Squelch In." For CW, the "Rem. Check" position on SW2 is provided to enable the application of a precise voltage equivalent to that on BFO control line when operator's control central for zero beat condition (nominally 22V). The line carrying this voltage is connected to pin 1 of octal outlet and when SW2 on "Rem. Check" the check voltage is applied to grid circuit of reactance tube. This enables technician

to make any slight adjustment with the front panel "BFO Note" control, so that when finally SW2 is put to "Rem. Operate" the operator has adequate control of CW note. It is stressed that, in order to pass to the operator full control of RF Gain, BFO and Squelch, SW2 must be at "Remote Operate", and SW5 at "Squelch In".

(e) Test Unit:

Using items listed below in the circuit described at end of Para. (b), a test unit may be constructed. This will facilitate tests of BFO and Reactance Tube; also the alignment referred to in Para (c).

45 V Battery (1)
10,000 ohm. WW Potentiometer (1)
10,000 ohm. Resistors (2)
S.P.S.T. Switch (1)
Battery positive is earthed.

(f) In the event of faulty operation being observed during alignment or test, the values of R51 and R52 should first be checked as these are critical. Also value of C64 should be within 10% of 50PF.

2.3. R.F. Gain Control:

(a) See Drawing HR.303, Sheet 8. Resistance R64 is connected between RF gain line and earth to prevent this line carrying high voltages in the event of connectionsbeing left open. One section (SW2C) of the Local/Remote switch connects the RF Gain line to the receiver RF gain potentiometer (R19) or to the external line for remote control. The latter may terminate at a 5000 or 10,000 ohm. potentiometer (or equivalent rotary switch in case of long line control). Thus the method of gain control is identical for both remote and normal operation. The technician has control of RF gain in positions 1 and 2 of SW2, and his setting of R19 has no effect on operator's control of gain once SW2 is set to position 3 ("Remote Operate").

(b) Testing:

A 10,000 ohm potentiometer connected between outlet pin 6 and earth may be used to check operation of RF Gain control when receiver set up for remote operation.

2.4. Squelch:

(a) This provides a method of suppressing noise output (within limits) when no wanted signals are being received. The squelch circuit is shown on Sheet 6 of Drawing HR.303. The additional 6 SN7GT (V10) and Resistor Strip are located under the chassis as shown in Drawing HM.723, Sheet 2.

(b) The rectified carrier appears across R33 and R34. This is applied to the grid of Triode 2 of V10 through an RC circuit. The cathode of Triode 2 is set by a potentiometer located in the former "Noise Limiter" position. This control is set so that an increase in the signal gives additional negative grid bias on Triode 2 sufficient to cut off the plate current. This plate current flows through R73, which appears

also in the grid circuit of Triode 1. Triode 1 is an audio amplifier connected between the 6G8G (V6) and the 6V6G (V7). In the normal "no-signal" condition, Triode 2 draws plate current and biases to cut off Triode 1. An incoming signal removes this bias and the signal is delivered to the output circuit.

The control should be set to the position which permits all wanted signals to open the squelch. This will usually maintain the receiver silent between signals, but if noise is bad it will break through at times. This squelch does not discriminate between signals and noise, but only between different levels, and therefore must be set to operate on the weakest required signal.

(c) For In/Out switching of squelch, the junction of R75 and R78 is taken, via R81, to S.W.S.A., and also to pin 7 of octal outlet, via SW2A. When this point is earthed, (either locally by setting SW5 at position 1 or 3, or remotely after SW2 set at position 3) Triode 2 cannot draw plate current to cause cut-off condition in Triode 1 and so no silencing occurs. R81 reduces rate of discharge of C68.

For Remote control of squelch In/Out, the operator's basic need is merely a S.P.S.T. Switch connected between control line (from receiver outlet pin 7) and earth.

(d) The wiring layout shown on Drawing HR.303, Sheet 2, should be followed, because variations are likely to cause unwanted feedback. Potentiometer R76 should be connected so that maximum rotation clockwise from the front gives minimum resistance in circuit. This setting gives low value of bias on Triode 2 and low voltage at plate of Triode 2. Thus Triode 1 tends to remain cut-off, and a very strong signal is necessary before these conditions are changed to make Triode 1 operative and receiver vocal. In use, the potentiometer should be kept as far as possible towards the anti-clockwise position.

(e) Testing:

The operation of squelch circuit may be tested as follows. Insert milliameter in plate circuit of Triode 1 of V10, and voltmeter between cathode of Triode 2, and earth. Under no-signal conditions, vary voltage reading by rotating "Squelch Adjust" potentiometer. From zero to approximately 5.5. volts, milliameter should indicate that Triode 1 is cut-off. Beyond this voltage, Triode 1 should become conductive.

(f) N.B. It must be emphasised that as squelch circuits do not discriminate between noise and signals, but only between different levels of signal and noise, extreme care must be exercised in the setting of the squelch sensitivity. Where any doubt exists as to the ability of all desired signals to open squelch completely, squelch should be switched off.

2.5. 'S' Meter:

The Schematic circuit of the new 'S' meter is given in Drawing HR,303, Sheet 4. It consists of a bridge circuit using voltages developed across R2 (varying according to bias on V1), and across R62 (on almost constant voltage once potentiometer set). The original AR7 meter is used. R62 is strictly a zero adjust control, not a sensitivity control. Greater sensitivity may be obtained, e.g., for receiver alignment purposes, by reducing value of R60, but care must be exercised in order to protect meter. The 'S' meter is intended mainly as a tuning indicator, but by careful setting of 'S' meter adjust potentiometer under no-signal conditions, a relative indication of signal strengths can be obtained. Since meter reading is proportional to RF gain control setting as well as to AVC voltage applied to V1, signal strength comparisons can only be made whilst RF gain control remains constant. It should be noted that, due to the receiver's AVC characteristic, the 'S' meter peak reading may not necessarily indicate that a carrier has been accurately tuned in when the signal level is high and RF gain control advanced. When such signals, usually strong locals, are being tuned, ensure that gain is reduced accordingly.

2.6. Output Circuit:

The modifications include two resistors (R65 and R66) across the 1750 ohm winding of T5, with centre tap to earth. This balances the winding and prevents transformer being left open-circuited. The monitor jack (J1) provides a monitoring facility about 40 db below output level depending upon type of headphones used. The 600 ohm winding of T5 is not used, and the tone control circuit of V7 is removed. Drawing HR.303, Sheet 3, refers.

2.7. ON/OFF Indicator:

This provides indication as to whether receiver power supply is on or off, and is especially useful for the technician in remote installations.

2.8. CODAN:

The two essential connections required between a receiver and its associated codan equipment are for AVC and IF signal. These are provided for as stated in Appendix B below, and should permit the AR7 to be used with type of codan which may be in service in the future.

T. A. Housley.

(T. A. HOUSLEY)
for Director-General of Civil Aviation.

APPENDIX A.

Switching Chart:

	SW5 in Position 1 ("Normal CW")	SW5 in Position 2 ("RT Squelch In")	SW5 in Position 3 ("RT Squelch Out")
SW2 in Position 1 ('Normal')	Squelch control line disconnected from outlet pin 7. Reactance Tube Grid line open. Local RF Gain Control in circuit. Normal CW operation, with R63 in circuit as additional BFO adjust. Squelch out, but not controllable remotely. RECEIVER AVAILABLE FOR CW OPERATION USING LOCAL CONTROLS.	Squelch control line disconnected from outlet pin 7. Reactance Tube Grid line open. Local RF Gain Control in circuit. Normal RT Operation; R63 out of circuit. Squelch in, but not controllable, remotely. RECEIVER AVAILABLE FOR RT OPERATION (WITH SQUELCH) USING LOCAL CONTROLS.	Squelch control line disconnected from outlet pin 7. Reactance Tube Grid line open. Local RF Gain Control in circuit. Normal RT Operation: R63 out of circuit. Squelch out, but not controllable remotely. RECEIVER AVAILABLE FOR RT OPERATION (WITHOUT SQUELCH) USING LOCAL CONTROLS
SW2 in Position 2 ('Rem. Check')	Squelch control disconnected from outlet pin 7. Reactance Tube Grid line to 'BFO Align' (outlet pin 1). Local RF Gain Control in circuit. BFO available for alignment when check voltage applied; R63 out of circuit. Squelch out, but not controllable remotely.	Squelch control line disconnected from outlet pin 7. Reactance Tube Grid line to 'BFO Align' (outlet pin 1) Local RF Gain control in circuit. BFO available for alignment when check voltage applied; R63 out of circuit. Squelch in, but not controllable remotely.	Squelch control line disconnected from outlet pin 7. Reactance Tube Grid line to 'BFO Align' (outlet pin 1) Local RF Gain Control in circuit. BFO available for alignment when check voltage applied; R63 out of circuit. Squelch out, but not controllable remotely. RECEIVER AVAILABLE FOR SETTING-UP BY TECHNICIAN WITHOUT REFERENCE TO OPERATOR.
SW2 in Position 3 ('Rem. Operate')	Squelch control line connected to outlet pin 7 . Reactance Tube Grid line to 'BFO Control' (outlet pin 3) Remote RF Gain Control line in circuit (outlet pin 6). B.F.O. available for remote control; R63 out of circuit. Squelch out, but not controllable remotely.	Squelch control connected to outlet pin 7. Reactance Tube Grid line to 'BFO Control' (outlet pin3). Remote RF Gain Control line in circuit (outlet pin 6). B.F.O. available for remote control; R63 out of circuit. Squelch in, and remote control of Squelch IN/OUT available. RECEIVER READY FOR REMOTELY CONTROLLED.OPERATION.	Squelch control line connected to outlet pin 7. Reactance Tube Grid line to 'BFO control' (outlet pin 3). Remote RF Gain Control line in circuit (outlet pin 6). B.F.O. available for remote control; R63 out of circuit. Squelch out, but not controllable remotely. RECEIVER READY FOR REMOTELY CONTROLLED OPERATION WITHOUT SQUELCH.

APPENDIX B.

MECHANICAL

1. Crystal Locking:-

(a) Modify Receiver as for Drawing HR.303, Sheet 1.

(b) Fit crystal mounting to coil units as required, in accordance with Drawing HM. 723, Sheet 1.

2. BFO Control:-

(a) Metal Shields of BFO section (one above and one below chassis) are discarded.

(b) BFO - AVC Switch and leads to it are removed.

(c) Triode 2 of V8 becomes Reactance Tube, and ceases to be in 'S' Meter circuit.

(d) Mount wired Resistor Strip grommet and insulated lug as per relevant sections of Drawing HM. 723, Sheet 2.

(e) Mount R63 and R83 above chassis (near Meter) as per Drawing HM. 743, Sheet 2.

(f) Resistor Strip and other wiring is shown in Drawing HR.303, Sheet 10, and schematic diagram of complete BFO and Reactance Tube in Drawing HR.303, Sheet 7.

(g) Wiring of SW2B, SW2D and SW5B is included in full diagram of Switch wiring (Drawing HR. 303, Sheet 9).

3. RF Gain Control:-

(a) Modify RF Gain Section of Receiver in accordance with Drawing HR.303, Sheet 8.

(b) Wiring of SW2C is included in full diagram of switch wiring (Drawing HR.303, Sheet 9.)

4. Squelch:-

(a) Noise Limiter and Tone Controls are removed.

(b) Mount wired Resistance Strip and Octal Socket as per relevant sections of Drawing HM.723, Sheet 2.

(c) Controls are positioned and wired as per Drawing HR.303, Sheet 9. New front panel designation plates for these controls are shown on Drawing HM.723, Sheet 3.

(d) Full wiring diagram is given in Drawing HR.303, Sheet 2, and Schematic circuit in Drawing HR.303, Sheet 6. The layout given in Sheet 2 should be strictly adhered to, otherwise instability may occur in the audio stages.

5. 'S' Meter:-

(a) Modify receiver as shown in Drawing HR.303, Sheet 4. System using Triode 2 of V8 is superseded (since this Triode needed for Reactance Control of BFO), and simple circuit requiring no separate valve is used.

(b) Original Meter remains in position.

(c) 'S' Meter Adjust Potentiometer is in original position but becomes a 100 instead of 5000.

6. Output Circuit:-

(a) Two small terminal strips (Detail 1) are mounted together as shown on Drawing H.M. 723, Sheet 2. These carry the resistors of the monitoring network.

(b) Original "Phones 1" Jack is used as monitoring Jack.

(c) 5 Pin Output Socket is replaced by an Octal socket which carries all control line connections as well as audio output.

(d) Drawing HR.303, Sheet 3, shows circuit changes and connections to Octal Socket (Note that 600 ohm output of T5 is not wired in).

7. ON/OFF Indicator:-

(a) A standard Lamp Jack with 12 V lamp and bezel cap is mounted in "Phones 2" Position by means of a small bracket. No additional drilling of front panel is necessary for this.

(b) Drawing HR.303, Sheet 5, refers.

8. CODAN:-

(a) When operation with CODAN is desired, a co-axial connector for IF feed is mounted on rear face of chassis as shown in Drawing HM.723, Sheet 2. The necessary coupling condenser (C71) is included in Drawing HR. 303, Sheet 2.

(b) The AVC connection is included in wiring diagram of Drawing HR303, Sheet 2. Pin 8 of Octal Outlet is used for the purpose.

9. Switching:

(a) The new local/Remote Switch (SW2) and Squelch/CW Switch (SW5) are located in former BFO/AVC Switch and Tone Control positions respectively.

(b) Designation Plates for new switches are shown in Drawing HM.723, Sheet 3.

(c) It is desirable that locating holes be drilled in chassis front to take locating lugs of the switches. This will prevent switch rotating as a whole or being strained when retaining nut is tightened.

APPENDIX C.

CHANGES TO SCHEDULE OF COMPONENTS.

This Appendix refers to Section 4.4 of D.C.A. Instruction Book on Receiver Type AR7.

.1 Components Deleted.

(a) Resistors.

R13	12.5K	Screen & Oscplate Supply V3.	Replaced by R58. R59.
R25	50K	BFO Plate	" by R48
R32	5K Pot	'S' Meter Adjust.	" " R62
R37	500K Pot	Noise Limiter Conrol	" " R69
R40	50K	Grid V7	Removed
R42	300	Cathode V7	Replaced by R61, R62.
R43	50K Pot	Tone Control	Removed
R44	500	Phones Output	Replaced by R65, R66, R67.
R45	2K		
	(b) Condensers.		
C38	.1MF	Tone Control.	Removed.

.2 COMPONENTS ADDED.

(a) Resistors.

R48	20K	½w	BFO Plate	Replaces R25
R49	250K	½w	Reactance Tube Plate	New
R50	100K	½w	" " Grid	"
R51	30K±5%	½w	" " Input	"
R52	10K±5%	½w	Divider	
R53	50K	½w	Reactance Tube Feedback	"
R54	10K	½w	" Cathode	"
R58	25K	½w	Screen Grid V3	Replace R13
R59	25K	½w	Osc. Plate V3	
R60	300	1w	'S' Meter Limiter	New
R61	250	1w	Cathode V7	Replace R42
R62	100	W.W.Pot	" "	
R63	50K	Carb.Pot	Reactance Tube Cathode.	New
R64	10K	1W	RF Gain Control Shunt	"
R65	40K	½w		"
R66	40K	½w	Phones Output Divider	"
R67	500K	½w		"
R69	250K	½w	Screen Bleed V6	Replaces R37
R70	50K	½w	Plate Decoupling V6	New
R71	50K	½w	Grid Squelch Amp. V10	"
R72	1Megohm	1w	Grid Squelch Control V10	"
R73	500K	½w	Plate " " V10	"
R74	3K	1w	Cathode" Amp. V10	"
R75	30K	½w	" " " "	"
R76	5K	W.W.Pot	Squelch Adjust	"
R77	50K	1w	Divider Cathode Squelch Control V10	"
R78	50K	1w	Divider Cathode Squelch Amp. V10	"
R79	20K	1w	Plate" " "	"

R80	500K	½w	Grid Leak V7	Was R41 which is now coupling Squelch Amp.
R81	100	1W	Damping for Squelch switching.	New
R82	10.5	5W	Heater Balancing VIO	"
R83	20K	½w	Reactance Tube Cathode.	"

(b) Condensers.

C61	.005 MF 400V Mica.	BFO/Reactance Tube Coupling	New
C62	500 PF 400V Mica	Reactance Tube feed back.	"
C63	8 MF Elect. 525V	Reactance Tube input fitter.	"
C64	50PF Ceramicon	Reactance Tube grid	"
C65	8 MF Elect.525v	Plate Decoupling V6	"
C66	100PF Ceramicon	Bypass Grid Squelch Amp. V10	"
C67	25MF Elect.40V	Bypass Cathode " Amp. V10	"
C68	8 MF Elect.525V	Bypass " "	"
C69	.01MF 400v Mica	Grid Coupling V7	Was C37 which is now coupling squelch amp.
C70	.05MF 600v Paper	Fitter Grid Sqelch Control VIO	New
C71	50PF Ceramicon	IF Coupling for Codan.	"

N.B. C26 remains in the same position but becomes cathode bypass for Reactance Tube.

(c) Valves.

VIO	6SN7GT	Squelch	New

(d) Switches

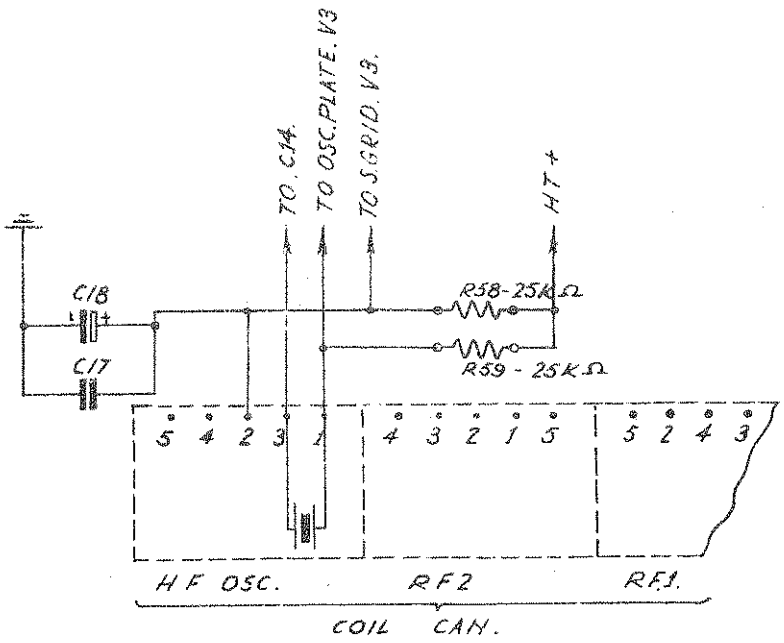
SW5	3 Section 3 position Midget Rotary.	Squelch/cw Switching.	New.

(f) Lamp.

Il	12v Jack Type	On/Off Indicator in J2	Now

.3. COMPONENTS CHANGED.

J2	Was Phone Jack	Now Lamp Jack with Bezel	For Il
P2	Was 5 Pin Socket.	Now Octal Socket.	Audio & Control Line outlet.
Sw2	Was Toggle Switch	Now 4 section 3 position Midget Rotary Switch.	Local/Remote Switching.



ASSOCIATED DRAWINGS.

SEE DCA DRAWING Nº HM 723 SHT 1 FOR MECHANICAL DETAILS.
" " " " HR 413 FOR COMPLETE SCHEMATIC OF AR7 RECEIVER, MODIFIED FOR REMOTE CONTROL

NOTE

THIS DRAWING TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

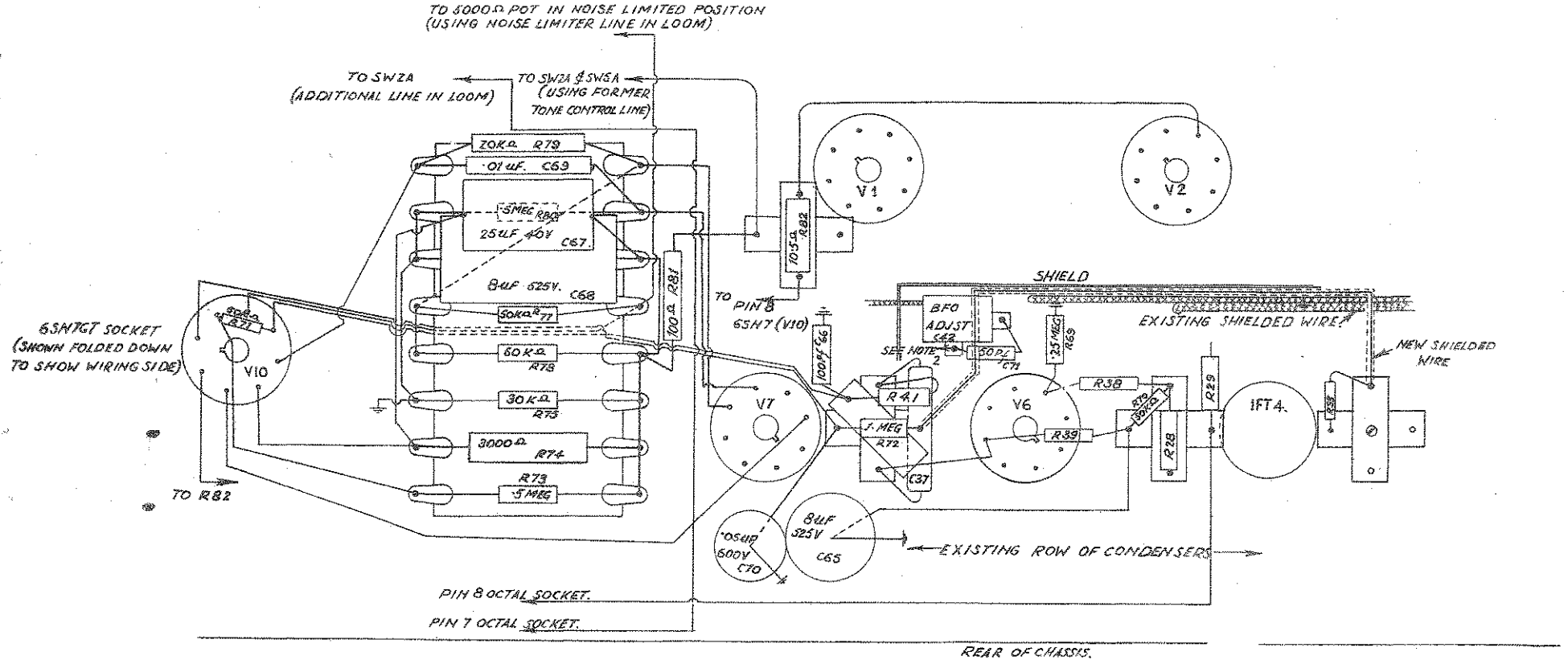
COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
3	A.M.C.	V.W.G.	6-2-50	REDRAWN. SHOWING CRYSTAL LOCKING ONLY.

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE AR7.
MODIFICATION
CRYSTAL LOCKING
SCHEMATIC

DRAWN A.M.C.	EXAM'D. R.R.	DRAWING NO.
TRACED	APP'D. E.W.A.	HR-303-Z
CHECKED N.W.W.	DATE 6-11-47.	SHEET 1 OF 10 SHEETS



NOTES:-

1. COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.
2. 16 SWG. T.C. WIRE WITH P.V.C SLEEVE GOES TO COAXIAL CONNECTOR ADJACENT TO AERIAL CONNECTOR WHEN RECEIVER IS AVAILABLE FOR USE WITH CODAN
3. THIS DRAWING IS TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.
4. AT V7. PIN 7 IS ASSUMED TO BE EARTH SIDE OF HEATER SUPPLY

ASSOCIATED DRAWINGS.

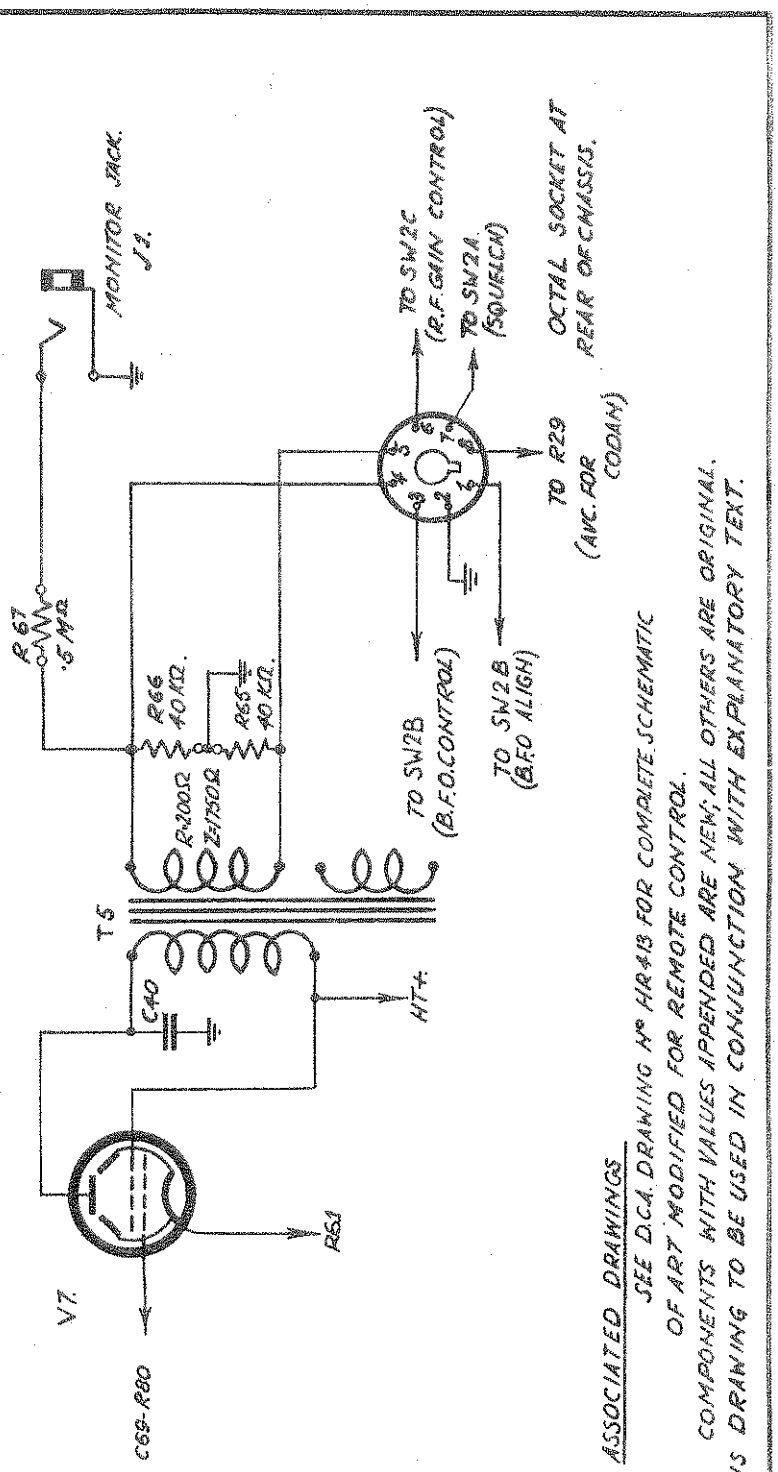
SEE D.C.A. DRAWING No HR303 SHT 6 FOR SCHEMATIC WIRING DIAG.
" " " " HR 303 " 9 " PANEL WIRING DIAG.
" " " " HMV23 SHTS. 1-103 FOR MECHANICAL DETAILS.

ISSUES				
No.	DRAWN	APP'D.	DATE	AMENDMENTS
1				
2	A.M.C.	R.R.	22-11-47	LOCATING DIMENSIONS ADDED.
3	W.M.	W.W.G.	6.1.48	REDRAWN. WAS LAY OUT OF COMPONENTS.

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE AR 7.
MODIFICATION
INTRODUCTION OF SQUELCH
WIRING DIAGRAM.

DRAWN A.M.C. 28-10-47	EXAM'D. R.R.	DRAWING No. HR-303-Y
TRACED	APP'D. E.W.A.	
CHECKED N.W.W.	DATE 6-11-47	SHEET 2 OF 12 SHTS

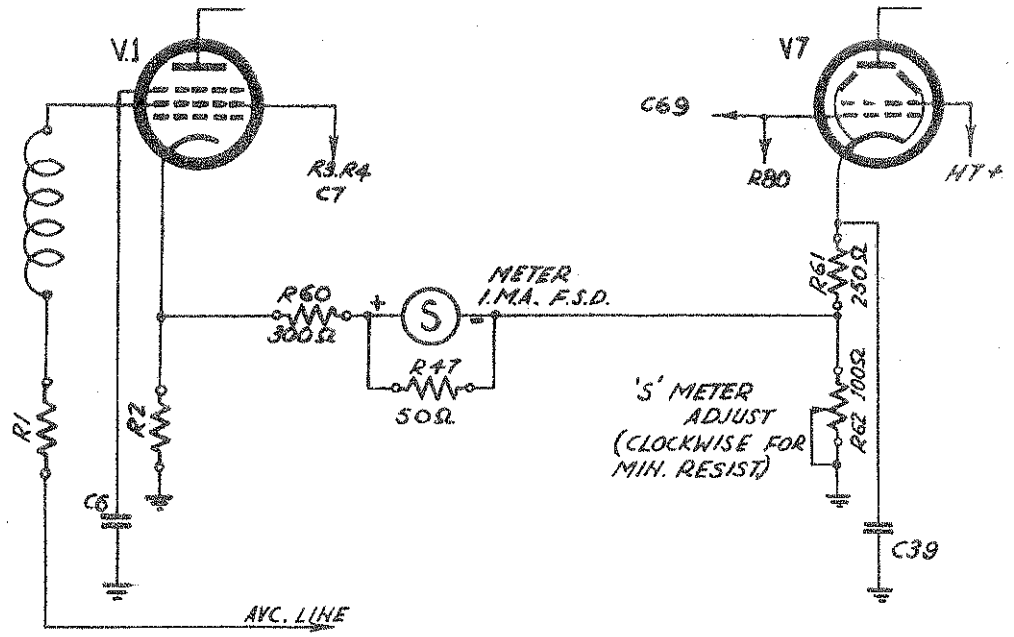


ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
2	W.M.	V.W.G.	6.2.50	REDRAWN

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE A R 7
MODIFICATION.
AUDIO OUTPUT
SCHEMATIC.

DRAWN A.M.C. 10/11/47	EXAM'D. R. R.	DRAWING NO.
TRACED	APP'D. E.W.A.	HR-303 -Z
CHECKED N.W.W.	DATE 21-11-47	SHEET 3 OF 10 SHEETS



NOTES

1 THIS DRAWING IS TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

2. COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.

ASSOCIATED DRAWINGS.

SEE D.C.A. DRAWING N°HR413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
2	W.A.	V.H.G.	6.2.50	REDRAWN

COMMONWEALTH OF AUSTRALIA

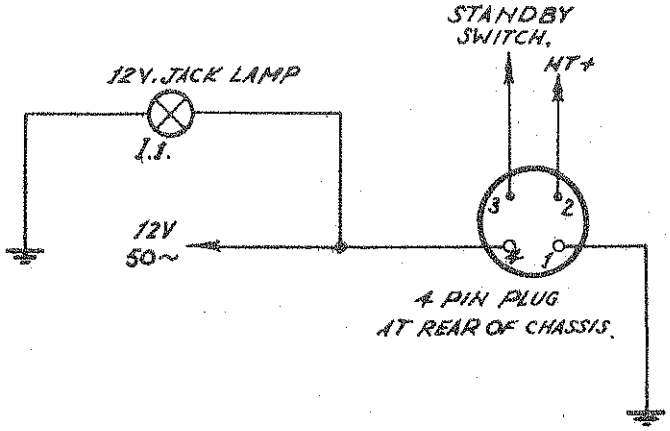
DEPARTMENT OF CIVIL AVIATION

DIVISION OF AIRWAYS

RECEIVER TYPE ART MODIFICATION 'S' METER SCHEMATIC

DRAWN A.M.C.	EXAM'D. R.R.	DRAWING NO.
TRACED	APP'D. R.R.	HR-303 -2
CHECKED N.W.W.	DATE	SHEET 4 OF 10 SHEETS

See Issue 3 14/1/51



NOTE.
THIS DRAWING TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

ASSOCIATED DRAWINGS.
SEE D.C.A. DRAWING N° HR 413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
2	wtl.	N.W.W.	6.2.50	REDRAWN.

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE ART MODIFICATION ON-OFF INDICATOR SCHEMATIC

DRAWN A.M.C.	EXAM'D. R.R.	DRAWING NO.
TRACED	APP'D. R.R.	HR-303 -Z
CHECKED N.W.W.	DATE	SHEET 5 OF 10 SHEETS

SWITCH FUNCTIONS		
SWITCH N°	POSITION	DESIGNATION
SW2	1	NORMAL
	2	REMOTE CHECK
	3	" OPERATE
SW 5	1	NORMAL C.W.
	2	R.T. SQUELCH IN -
	3	" OUT.

ASSOCIATED DRAWINGS.

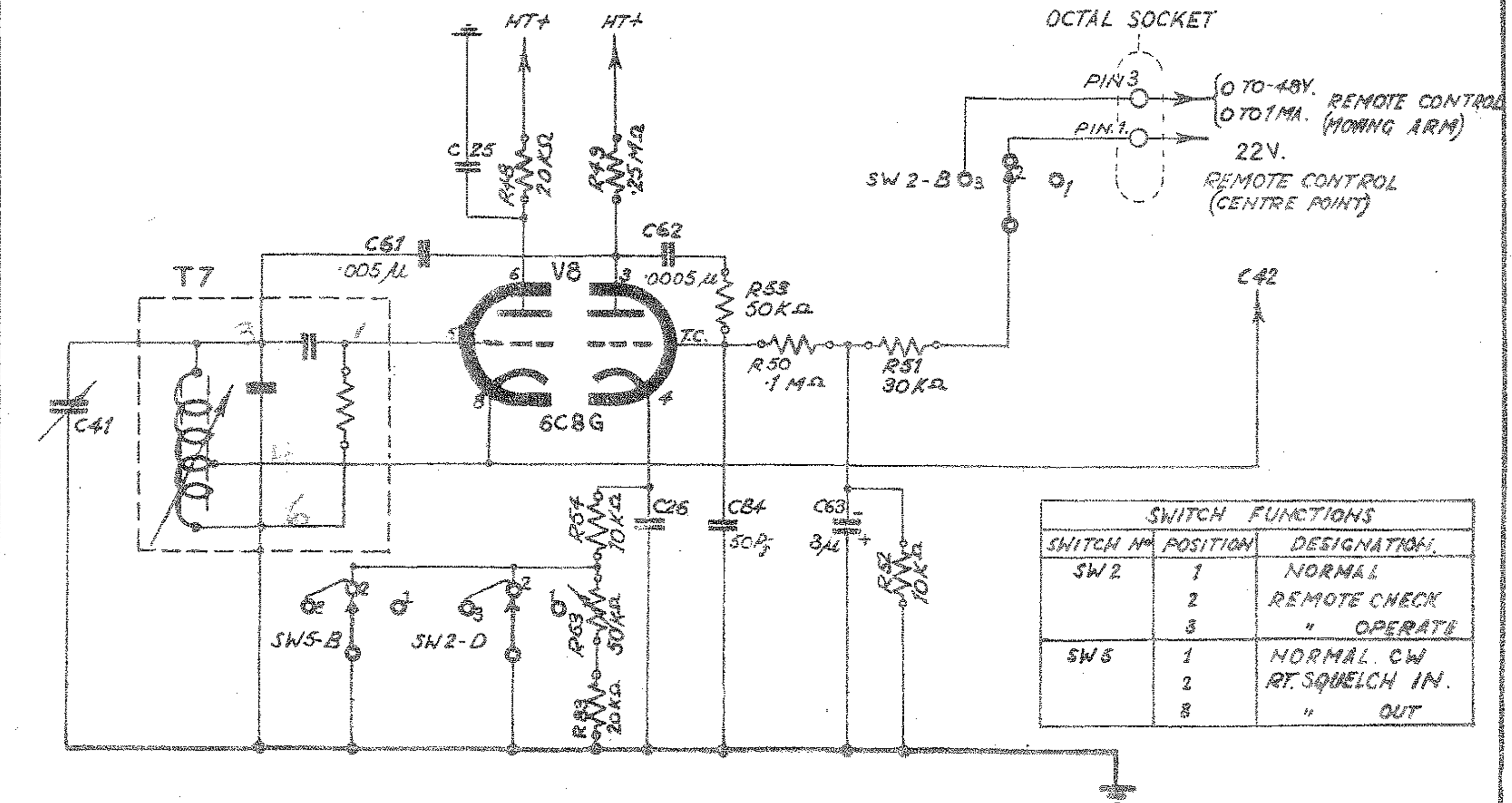
SEE D.C.A. DRAWING N° HR 413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL
" " " N° HR 303 SHT 2 & 3 FOR WIRING DIAGRAM.
" " " N° HM 723 "2 & 3 FOR MECHANICAL DETAILS.

ISSUES			
NO.	DRAWN	APP'D.	DATE
2	W.W.C.	W.W.C.	6.2.59
	REDRAWN	AMENDMENTS	

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE ART
MODIFICATION.
INTRODUCTION OF SQUELCH
SCHEMATIC.

DRAWN A.M.C.	EXAMD. R.R.	DRAWING No.
TRACED	APPD. R.R.	HR-303-Z
CHECKED N.W.W.	DATE	SHEET 6 OF 10 SHEETS



SWITCH FUNCTIONS

SWITCH No	POSITION	DESIGNATION.
SW 2	1	NORMAL
	2	REMOTE CHECK
	3	" OPERATE
SW 5	1	NORMAL CW
	2	RT. SQUELCH IN.
	3	" OUT

ASSOCIATED DRAWINGS.

SEE D.C.A. DRAWING No HR413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL.
" " " " HM 723 SHT 2 FOR MECHANICAL DETAILS

NOTES. COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.
THIS DRAWING IS TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

ISSUES

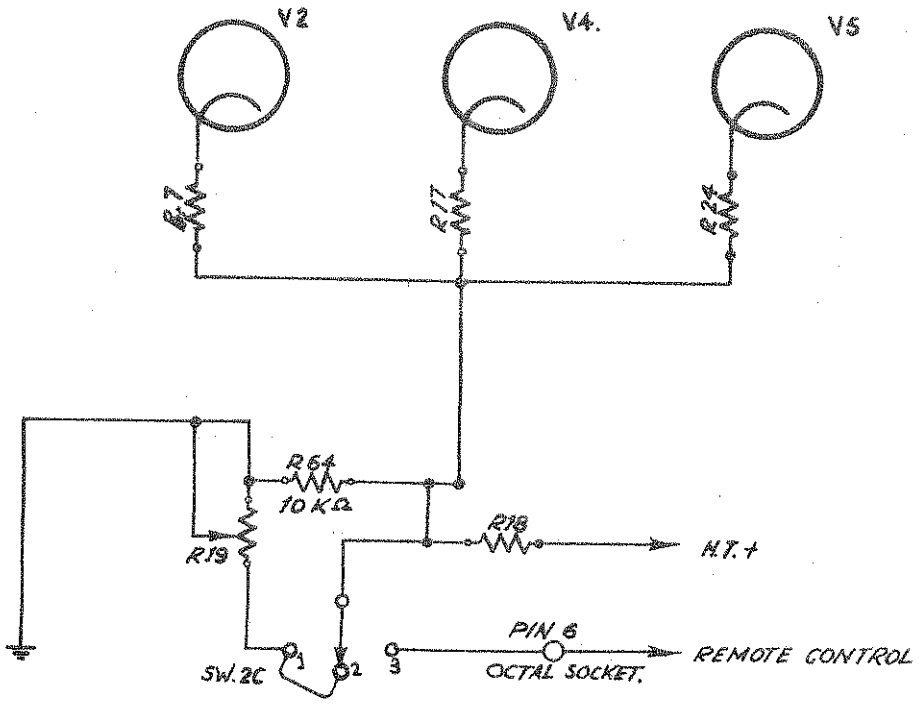
NO.	DRAWN	APP'D	DATE	AMENDMENTS
1				

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE ART
MODIFICATION
FOR REMOTE CONTROL OF
B.F.O. — SCHEMATIC

DRAWN AB.. 4-11-49.
TRACED
CHECKED W.W.W.
EXAM'D. CP
APP'D. V.W.G.
DATE 6.1.50

DRAWING NO. HR-303 Z
SHEET 7 OF 10 SHEETS



SWITCH FUNCTIONS		
SWITCH No	POSITION	DESIGNATION.
SW 2	1	NORMAL
	2	REMOTE CHECK
	3	" OPERATE.

NOTES

THESE DRAWING ARE TO BE USED IN CONJUNCTION WITH EXPLANATORY TEXT.

COMPONENTS WITH VALUES APPENDED ARE NEW; ALL OTHERS ARE ORIGINAL.

ASSOCIATED DRAWINGS

SEE D.C.A. DRAWING No HR413 FOR COMPLETE SCHEMATIC OF ART MODIFIED FOR REMOTE CONTROL.

ISSUES				
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
1		-		

COMMONWEALTH OF AUSTRALIA

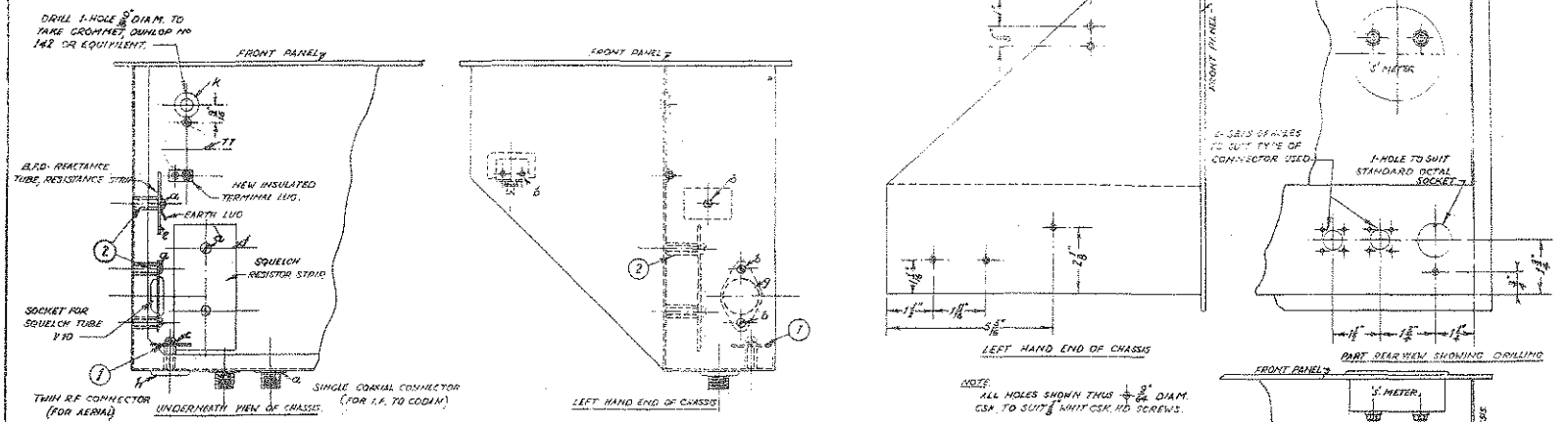
DEPARTMENT OF CIVIL AVIATION

DIVISION OF AIRWAYS

RECEIVER TYPE ART. MODIFICATION FOR REMOTE CONTROL OF R.F. GAIN ——— SCHEMATIC.

DRAWN J.J. 4-11-49	EXAM'D. C.-P.	DRAWING NO.
TRACED	APP'D. V.W.G.	HR-303 -Z
CHECKED N.W.W.	DATE 6.2.50	SHEET 8 OF 10 SHEETS

See Issue 2



ASSOCIATED DRAWINGS
SEE OCE DRAWING No MR303 SHTS. 6 AND 7 FOR SCHEMATIC WIRING.
" " " " " SHT 2 AND 16 " WIRING.

MATERIAL LIST

ITEM No	IDENT. No	DESCRIPTION	No OFF.
a	WSA/1504.RD	SCREWS BRASS, RND HD. 1/8" WHIT = 3/8" LONG	14
b	WSA/1504.CS.	" " CSK. " " "	8
c	WSA/3661	WASHERS, BRASS 1/8" I/D.	1
d	WSA/2051	NUTS, BRASS HEX 1/8" WHIT	2
e		RESISTOR STRIP 1/8" WIDE 1 1/2" LONG (WITH 6 SOLDER LUGS)	1
f		" " 2" " 4" " 16 " "	1
g		SOCKET, STANDARD OCTAL PLATE MOUNTED	1
h		" " " CHASSIS "	1
i		COAXIAL SOCKET SINGLE TYPE R.E.C. 125-1R OR EQUIV.	1
j		R.F. CONNECTOR " TWIN " " " -2R " "	1
k		GROMMET RUBBER 3/8" I/D DUNLOP M144 OR EQUIV.	1

ISSUES				
IN	DRAWN	APPD.	DATE	AMENDMENTS
1				

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

RECEIVER TYPE ART.

MECHANICAL MODIFICATION FOR B.F.O. AND SQUELCH

DRAWN	DESIGN'D	DRAWING No.
10-2-50	C.P.	HM-723-X
TRACED	APPD. K.W.G.	
VETTED H.W.W.	DATE 14.3.50	SHEET 2 OF 3 SHEETS

COMMONWEALTH OF AUSTRALIA

Department of Civil Aviation,
"Almora House"
522-536 Little Collins St.,
MELBOURNE. C.1.

July, 1950.

RADIO TECHNICAL INSTRUCTION NO. 52
(Supplement to RTI 50)

AR7 RECEIVERS.

INTRODUCTION

1.1 The modifications to the receiver type AR7 set out in Radio Technical Instruction No. 50 provide the necessary facilities required at all proposed permanent Aeradio Receiving Centres.

1.2 However owing to the fact that some considerable time will elapse before these Receiving Centres will be completed and ready for operation Radio Technical Instruction No. 52 is being issued in conjunction with Radio Technical instruction No. 50, so that all receivers remote controlled and otherwise may be immediately modified to incorporate the technical and operating advantages of the proposed final system.

1.3 In addition to the above the changeover to the permanent receiving system will be greatly facilitated if all receivers are already modified.

1.4 It should be noted that all modified receivers may be locally or remotely controlled as required, with the addition of Electronic Squelch which may be switched IN or OUT.

GENERAL

2.1 It will be seen that Radio Technical Instruction No. 50 provides for eight separate modifications. However although present requirements do not necessitate all these being carried out immediately, economy of manpower and material together with the technical details involved (see para. (d) section 2.4 Radio Technical Instruction No.50) indicate that six of these modifications should be effected forthwith.

2.2 In view of the foregoing the following modifications shall be carried out on all receivers type AR7 as soon as possible:-

(a) Remote control of C W note by means of a reactance tube.

(b) Remote control of R.F. Gain

(c) Electronic Squelch in the Audio Section with provision for remote IN/OUT switching.

(d) New form of "S" Meter.

(e) Monitoring

(f) L.T. ON/OFF Indicator.

2.3 It is anticipated that the time taken to carry out these modification on each receiver will be approximately 25 hours. A complete overhaul should be carried out on each receiver before being modified unless it is known that the receiver has been recently overhauled or is otherwise in good condition.

2.4 Modification Kits containing sufficient components to carry out all eight modifications are being asembled and will be distributed on the basis of one per receiver.

2.5 The modification for Crystal locking of the local oscillator may be carried out as required. Crystals should be requisitioned from Head Office, and the requisition annotated "For Receiver type AR7".

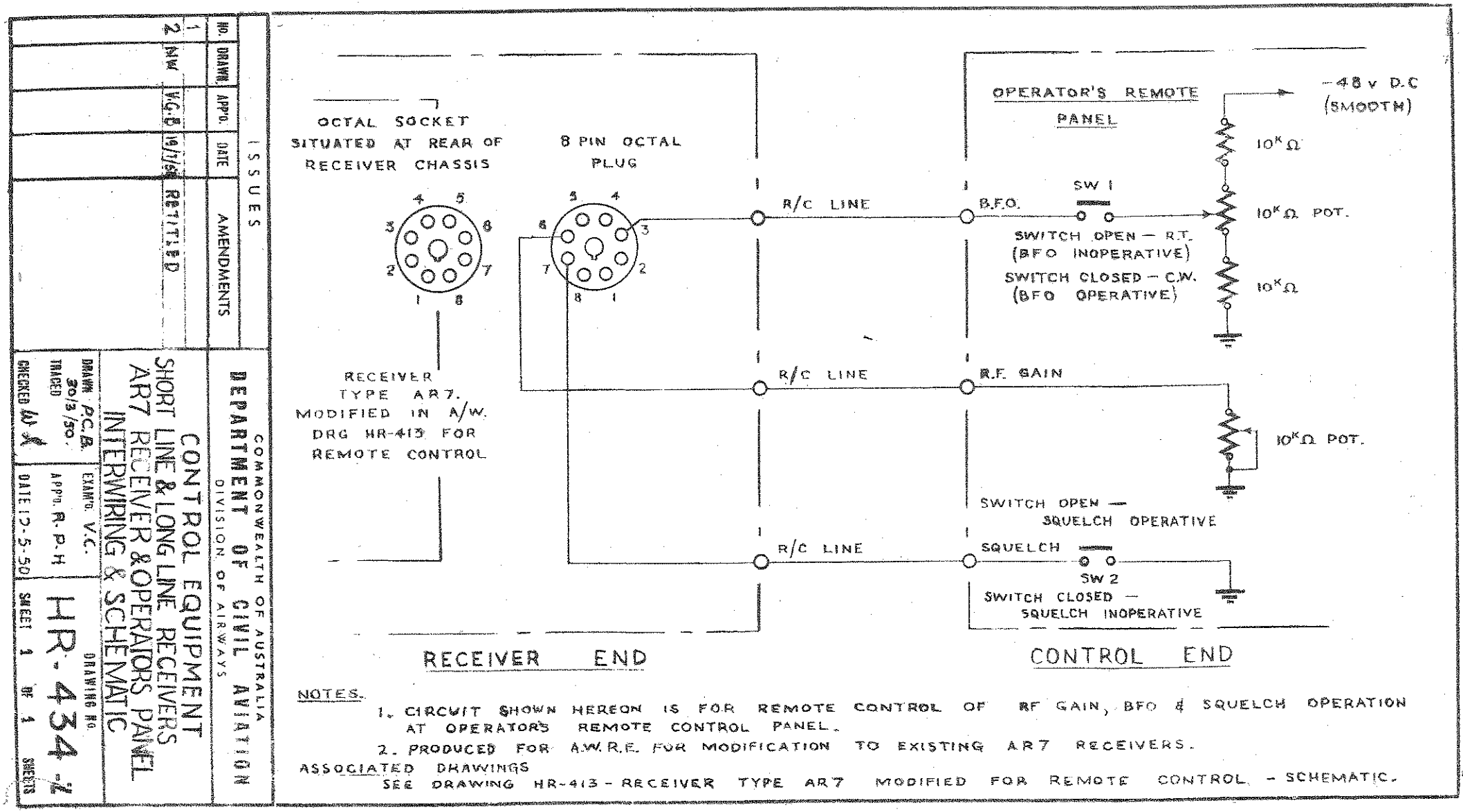
2.6 Attached herewith is a copy of drawing No. HR-434 showing the circuit diagram of the Receiver remote control panel at the control station. This constitutes a simple test unit for all remote operations (refer Para. 2.2 (e) and 2.3 (b) Radio Technical Instruction No. 50), and it is suggested that a test unit of this type be available at all workshops.

T A Housley

(T.A. Housley)
for Director-General of Civil Aviation.

DISTRIBUTION

Regional Director,	N.S.W. Region,	50 copies
Regional Director,	W.A. Region	50 copies
Regional Director,	Queensland Region	50 copies
Regional Director,	N.T. Region	50 copies
Regional Director,	Papua-New Guinea Region	25 copies
Regional Director,	Victorian-Tasmanian Region	50 copies
Regional Director,	South Australian Region	35 copies



NOTES.

1. CIRCUIT SHOWN HEREON IS FOR REMOTE CONTROL OF RF GAIN, BFO & SQUELCH OPERATION AT OPERATORS REMOTE CONTROL PANEL.
2. PRODUCED FOR A.W.R.E. FOR MODIFICATION TO EXISTING AR7 RECEIVERS.

ASSOCIATED DRAWINGS

SEE DRAWING HR-413 - RECEIVER TYPE AR7 MODIFIED FOR REMOTE CONTROL - SCHEMATIC.

ISSUES

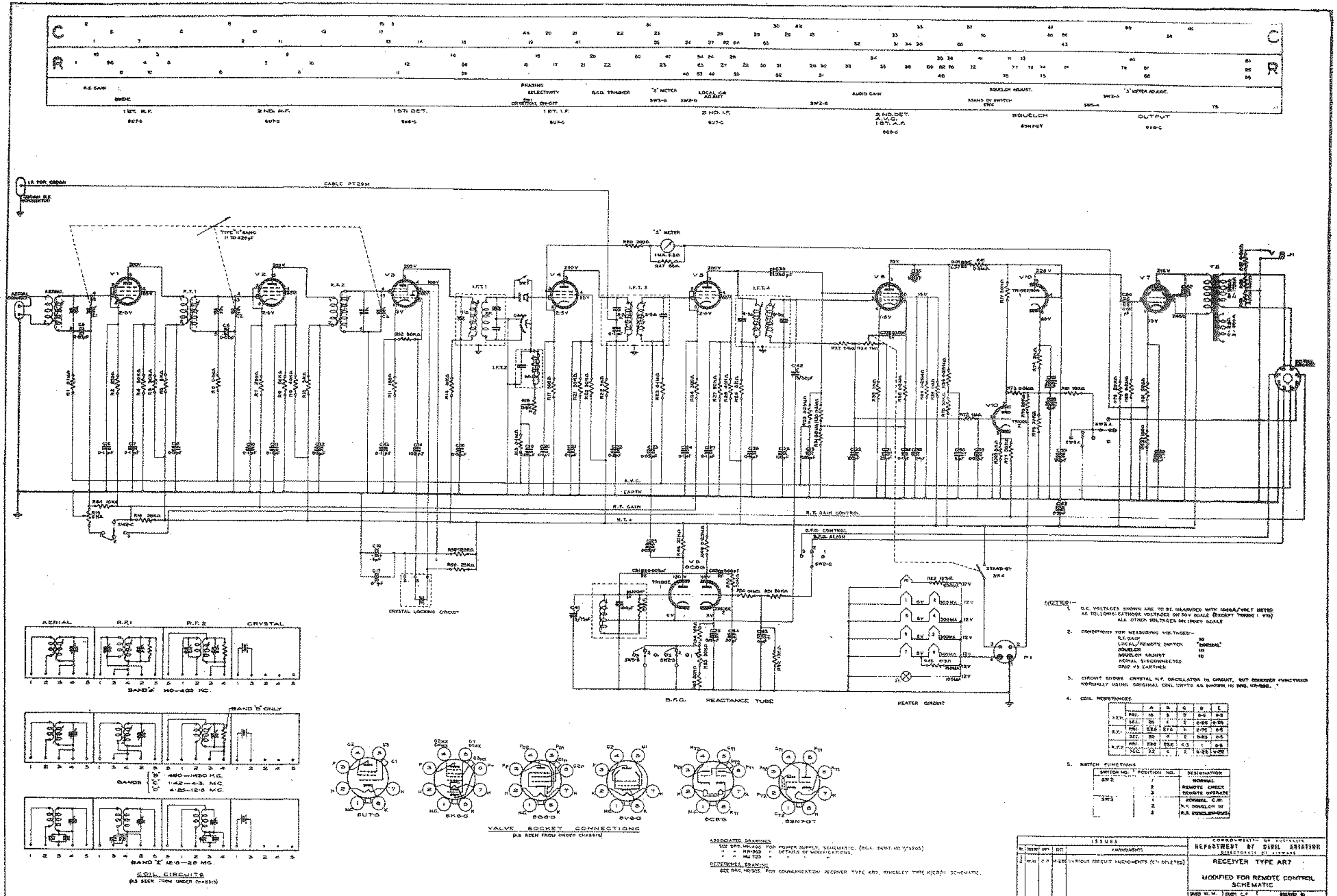
NO.	DRAWN	APP'D.	DATE	AMENDMENTS
1				
2	N.W.	V.G.B.	19/1/50	RETITLED

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIVISION OF AIRWAYS

CONTROL EQUIPMENT
SHORT LINE & LONG LINE RECEIVERS
AR7 RECEIVER & OPERATORS PANEL
INTERWIRING & SCHEMATIC

DRAWN P.C.B. 30/3/50. TRACED
CHECKED W.K.
EXAMD. V.C.
APP'D. R. P. H
DATE 12-5-50

DRAWING NO. HR-434-1
SHEET 1 OF 1 SHEETS



NOTES:–

1. D.C. VOLTAGES SHOWN ARE TO BE MEASURED WITH 1000Ω/VOLT METER AS FOLLOWS: CATHODE VOLTAGES ON 10V SCALE (EXCEPT TRIODE 1 V10) ALL OTHER VOLTAGES ON 1000V SCALE
2. CONDITIONS FOR MEASURING VOLTAGES:–
   - R.F. GAIN 10
   - LOCAL/REMOTE SWITCH "NORMAL"
   - SQUELCH 10
   - SQUELCH ADJUST 10
   - AERIAL DISCONNECTED
   - GRID V3 EARTHED
3. CIRCUIT SHOWS CRYSTAL H.F. OSCILLATOR IN CIRCUIT, BUT [illegible] FUNCTIONS NORMALLY USING ORIGINAL COIL UNITS AS SHOWN IN DWG. [illegible]
4. COIL RESISTANCES
5. SWITCH FUNCTIONS

SWITCH NO.	POSITION NO.	DESIGNATION
SW2	1	NORMAL
	2	REMOTE CHECK
	3	REMOTE OPERATE
SW3	1	NORMAL C.O.
	2	R.T. SQUELCH IN
	3	R.T. SQUELCH OUT

ASSOCIATED DRAWINGS

SEE DWG. HR-406 FOR POWER SUPPLY, SCHEMATIC. (D.C.A. IDENT. NO. Y/4205)
" " HR-303 " DETAILS OF MODIFICATIONS.
" " HR-325 " " " "

REFERENCE DRAWING

SEE DWG. HR-325 FOR COMMUNICATION RECEIVER TYPE AR7, KINGSLEY TYPE K/CR/11 SCHEMATIC.

ISSUES				
No.	DATE	DR.	CH.	AMENDMENTS
				VARIOUS CIRCUIT AMENDMENTS (C11 DELETED)

COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF CIVIL AVIATION
DIRECTORATE OF AIRWAYS

RECEIVER TYPE AR7

MODIFIED FOR REMOTE CONTROL
SCHEMATIC

HR-413

FOR REGIONAL DISTRIBUTION