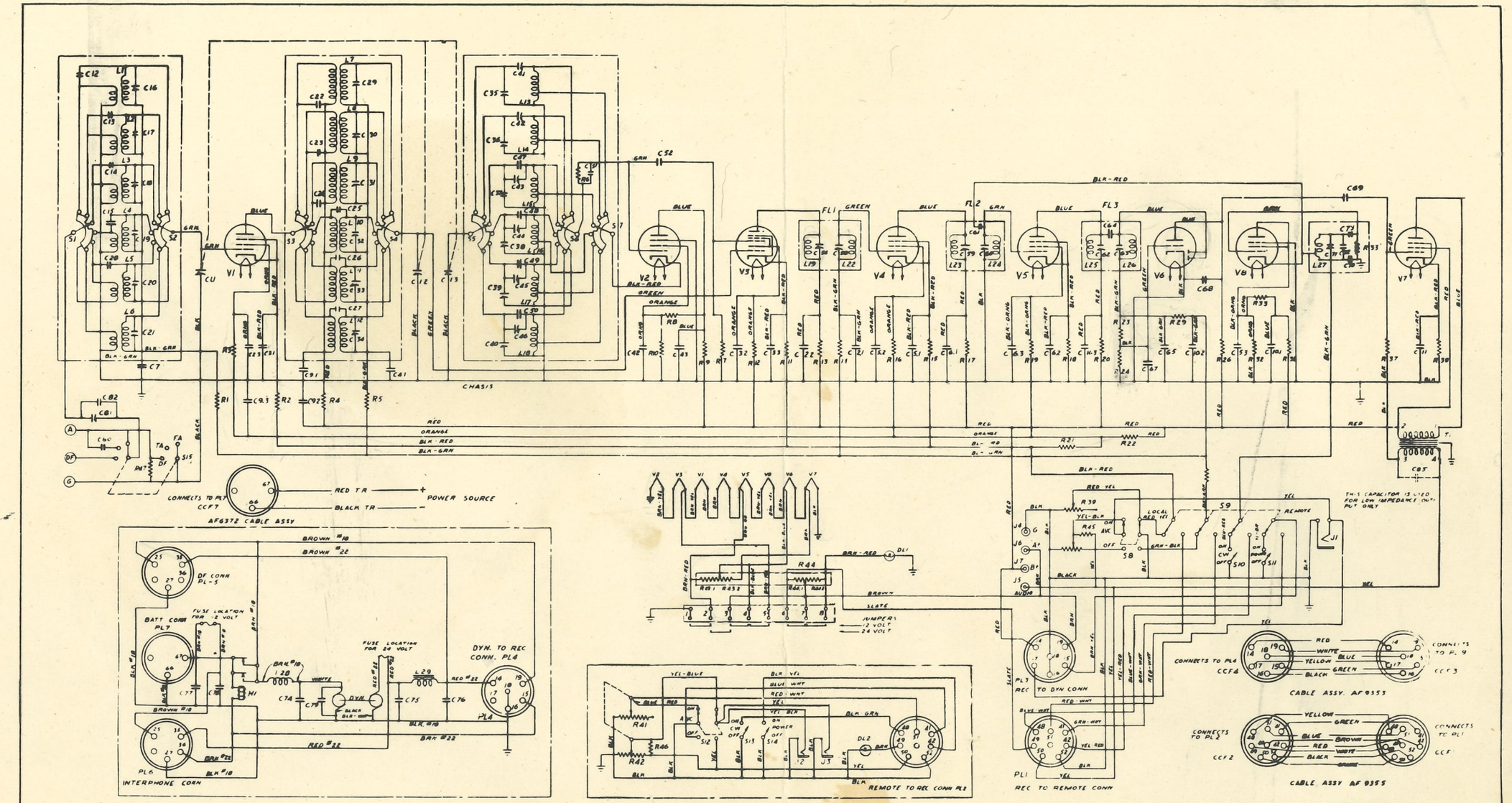

FIG. 15 - TYPE RA-1B RECEIVER UNIT SCHEMATIC DIAGRAM

COMMUNICATIONS

RECEIVER RA-1B

Compiled by the Staff of 'Elpreg', from the Official Handbook

The Bendix Type RA-1B Receiver is a communication receiver designed for use in aircraft. It may be employed for the reception of continuous wave telegraph or radio telephone signals within frequency ranges of 0.15 to 1.5 megacycles (2000 to 200 metres), and 1.8 to 15.0 megacycles (166 to 20 metres). Three bands are used to give full coverage in each frequency range.

Aural direction finding and loop antenna reception may be obtained over a frequency range from 0.2 to 1.5 megacycles by using the receivers in conjunction with the Bendix Direction Finding Equipment.

The receiver is designed to be operated locally, using the controls mounted on its front panel, or from any remote point within the airplane through the use of Bendix Type MR-1B Remote Control Unit which includes duplicate operating controls.

The receiver may be operated from either a 12- or 24-volt storage battery supply, jumper connections being provided at a terminal board in the receiver chassis to permit arranging the circuit for 12- or 24-volt operation.

1-3-1 Frequency Bands

The frequency ranges covered by the receiver are divided into six operating bands, the end limits of which are as follows:

Band 1	.15	to	.315 mc.
Band 2	.315	to	.680 mc.
Band 3	.680	to	1.5 mc.
Band 4	1.8	to	3.7 mc.
Band 5	3.7	to	7.5 mc.
Band 6	7.5	to	15.0 mc.

Extension of each tuning range beyond the nominal band limit provides an overlap of approximately 2%.

1-3-2 Sensitivity

The CW sensitivity of the receiver is 2 microvolts for a 50-milliwatt output when the volume control is adjusted to give a noise output of 5 milliwatts with no carrier input.

The MCW sensitivity of the receiver is 4 microvolts on Bands 4, 5, or 6 and is 5 microvolts or better on Bands 1, 2, or 3 for the standard output of 50 milliwatts into a 300-ohm load, with a signal to noise ratio of at least 4 to 1, and an input signal 30% modulated at 400 CPS.

1-3-3 Selectivity

The Selectivity of the receiver is indicated by the ratio of the input voltage off resonance to the input voltage at resonance, at given band width; and is observed by varying the input voltage to maintain a constant output level for frequencies off resonance. The selectrivity of the Type RA-1B Receiver at representative frequencies follows:

Input Voltage	Total Band Width For Reference Frequencies		
	150 kc	700 kc	3000 kc
10 times	7 kc	15 kc	18 kc
100 times	13 kc	24 kc	28 kc
1000 times	20 kc	32 kc	40 kc

1-3-4 Image Rejection

The discrimination against image frequencies over the various ranges of the receiver is given in the following table:

Band	Frequency	Minimum Ratio
1	.315 mc	200,000
2	.580 mc	90,000
3	1.50 mc	35,000
4	3.70 mc	7,000
5	7.50 mc	2,000
6	15.00 mc	1,000

BENDIX RX TYPE RA-1B

CAPACITORS

C1-1)	348 mf.
1-2) 3 Gang	241 mf.
1-3)	241 mf.
2-1)	
2-2) 3 x .1 mf. 400v.	
2-3)	
3-1)	
3-2) 3 x .1 mf. 400v.	
3-3)	
4-1)	
4-2) As C3	
4-3)	
5-1)	
5-2) As C2	
5-3)	
6-1)	
6-2) As C2	
6-3)	
7	.1 mf. 400v.
9-1)	
9-2) As C3	
9-3)	
10-1)	
10-2) As C3	
10-3)	
11	1.0 mf. 100v.
12	10 mmf. 500v.
13	As C12
14	5 mmf. 500v.
15	As C12
16	50 mmf. Trimmer Silver Plated
17	As C16
18	As C16
19	75 mmf. Trimmer Silver Plated
20	As C19
21	100 mmf. Trimmer Silver Plated
22	500 mmf. 500 v.
23	70 mmf. 500v.
24	15 mmf. 500v.
25	As C12
26	As C14
27	As C14
28	As C12
29	25 mmf. Trimmer Silver Plated
30	As C29
31	As C29
32	As C16
33	As C16
34	As C16
35	As C19
36	As C16
37	As C16
38	As C29
C39	As C29
C40	As C29
41	As C19
42	As C21
43	As C19
44	As C19
45	As C21
46	As C21
47	110 mmf. 500v.
48	300 mmf. 500v.
49	580 mmf. 500v.
50	1110 mmf. 500v.
51	100 mmf. 500v.
52	25 mmf. 500v.
54)	
58)	110-150 mmf. Dual Variable (Trimmer)
59)	
60)	As C54
61	1.5 mmf.
62)	
63)	As C54
64	As C61
65	150 mmf. 500v.
67	As 65
68	230 mmf. 500v.
69	.01 mf. 500v.
70	As C69
71	As C19
72	500 mmf.
73	100 mmf.
80	As C65
81	100 mmf. Var. Brass Plates
82	As C65
83	As C69

RESISTORS

R1	50 K o ½ w Ceramic
2	500 o ½ w "
3	5 K o ½ w "
4	1 K o ½ w "
5	As R1
6	As R1
7	As R1
8	25 K o ½ w "
9	As R3
10	As R1
11	As R4
12	As R8
13	As R4
14	As R1
15	As R2
16	As R3
17	As R4
18	As R2
19	As R3
20	As R4
21	20 K o ½ w Ceramic
23	700 K o ½ w "
24	300 K o " "
26	As R1
29	1 Meg. ½ w. Ceramic
30	As R1
32	100 K o ½ w. Ceramic
33	500 K " "
34	As R33
35	As R32
37	As R29

Note: As the frequency specified in each band is that at which the image rejection is poorest, considerably better minimum ratios will be assured for all other frequencies.

1-3-5 Resonance Stability

The resonance stability of the Type RA-1B Receiver is such that the signal variation through the 1.8 to 15.0 megacycle range will not exceed ¼ of 1% of the signal frequency in kilocycles, and it will not exceed ½ of 1% of the signal frequency in kilocycles through the .15 to 1.5 megacycle range. These ratings will be obtained under the following conditions:

A. Any 20°C temperature variations between the limits of -20° and plus 50°C.
B. Humidity variation between zero and 100%.
C. Battery voltage variation of 15%.
D. Normal vibration as encountered in aircraft.
E. Manipulation of the sensitivity control from maximum to minimum.

1-3-6 Overall Fidelity

The overall fidelity characteristic of the Type RA-1B Receiver as measured from the antenna to the output terminals varies, on the different bands, due to the selectivity requirements in the range of 150 to 500 kilocycles.

On Band 1, .150 to.315 megacycles the output varies plus or minus 6 DB over the range of 200 to 1500 cycles per second, 2000 cycles per second is attenuated approximately 15 DB below the level at 1000 cycles per second.

On Bands 2 and 3, .315 to 1.500 megacycles the output varies plus or minus 8 DB over the range of 200 to 2000 cycles per second.

On Bands 4, 5, and 6, 1.800 to 15.00 megacycles the output varies plus or minus 6 DB over the range of 200 to 3000 cycles per second.

1-3-7 Power Output

The output circuit of the Type RA-1B Receiver is designed for a 300-ohm load and will deliver over 500 milliwatts output at not over ten per cent distortion when properly loaded. The maximum possible output is 1.5 watts.

1-6 Power Requirements

For 12-volt operation the receiver filament current is 1.5 amperes and the type MP-5B power supply requires approximately 3 amperes. Receiver filament current of 0.8 amperes and approximately 1.5 amperes current for the type MP-5A24 power supply will be required for 24-volt operation. The total plate current for the receiver is approximately 70 milliamperes at 225-volts.

The I.F. frequency is 1630 kcs.

2-2-1 Panel and Controls

The front panel of the receiver bears all the controls required for its operation. Viewing it from the front, one may note, in the upper left hand corner, three binding posts for connecting the antenna to Post A, Direction Finder (if used) to Post DF, and Post G to ground. Immediately to the right of these is the rotary antenna switch S15 which permits changing the receiver input for use with a direction finder DF, trailing antenna TA or fixed antenna FA, depending upon which type of antenna is connected to the binding posts. The antenna compensating condenser C81, is located at the right of the antenna switch. By turning the spring dust cover to one side, the condensers can be adjusted with a screw driver. Below the antenna switch is a projecting gear case, having an external knob marked TUNING. It contains a bevel-gear arrangement that permits the mechanical linkage of a remote control unit to the receiver. The TUNING control drives a precision, spring-loaded, worm gear which in turn drives the gang tuning condensers (C1.1, C1.2 and C1.3). The BAND SELECTOR located to the right of the tuning control has a similarly arranged mechanism, this has the external knob marked BAND SELECTOR. Along the bottom of the front panel, in succession from left to right, are the telephone jack J1, marked PHONES, the automatic volume control switch S8, marked A.V.C. OFF-ON, the CW switch S10, marked C.W. OFF-ON, the power switch S11 marked POWER OFF-ON, that operates the starting relay H1, a six-contact plug receptacle PL3 that receives the power cable from the dynamotor-filter unit and an eight-contact plug receptacle PL1 which connects to the remote control unit. Below and to the right of the band selector gear case are four pin jack terminals used for testing, G is the common terminal, B connects to the plate voltage bus, A connects to the heater voltage bus and AUDIO connects to the secondary high side of the output transformer. In the upper right corner is the VOLUME control (R30-R40).

R38	750 o ½ w. Ceramic
39	10 K o) Dual Pot.
40	2 K o)
43-1	126 o
43-2	63 o
44-1	120 o
44-2	120 o
45	As R2
47	As R33

VALVES

V1	6K7G
2	6K7G
3	6L7G
4	6K7G
5	6K7G
6	6R7G
7	6K6G
8	6K7G

PLUGS

PL1	8 pin
PL3	6 pin
CCF1	8 pin
CCF3	6 pin

SWITCHES

S1	6 position - 1 pole
2	As A1
3	"
4	"
5	"
6	"
7	"
8	DPOT 7/8" Shank
9	4P. DT.
10	S.P.D.T. 7/8" Shank.
11	As S10
15	Two pole 3 position.
Transformer	260 ohms O/P

EX TYPE RA-LL

ADDITIONAL ITEMS

CAPACITORS

C83	.001 mf. 500v.

RESISTORS

R39	10 K o POT.
40	25 K o POT.
45	4 K o ½ w. Ceramic

TRANSFORMERS 3500 o O/P

EX TYPE RA-1J

ADDITIONAL ITEMS

CAPACITORS

C15	5 mmf. 500v.
48	420 mmf. 500v.
49	810 mmf. 500v.
49	810 mmf. 500v.
50	1420 mmf. 500v.

Capacitors C25, 26, 27, & 25 are not used.

RESISTORS

R2	300 o ½ w Ceramic
8	20 K o ½ w "
9	1 K o ½ w "
11	500 o ¼ w. "

VALVES

V2	6J7G

CONTROL UNIT TYPE MR-1B

RESISTORS

R41)	As R39 and R40
42)	
46	As R45

SWITCHES

S12	As S8
S13	As S10
S14	As S10

CONTROL UNIT TYPE MR-11

ADDITIONAL ITEMS

R41)	As R39, R40 in RA-11
42)	

TYPE MR-1J As for MR-1B

TYPE MP-5B POWER SUPPLY

CAPACITORS

C74)	
75)	3 x .8 mf. 500v.
76)	
77	As C69
78	As C69
79	As C69

DYNAMOTORS 14v, 3A 1/P, 230v. .1A O/P

FUSE 10 A; 25v.

RELAY 2 polo 8-16v. DC, Norm.Open

CHOKE L29 - 6 Henries, 80 M/A
DC Res. - 150 o.

TYPE MP-5A24 POWER SUPPLY

DYNAMOTOR 28v. 1.55 A 1/P;
230v., .1A O/P

FUSE 1/8 A - 500v.

RELAY 16-30v., Norm Open.

COMMUNICATIONS

RECEIVER RA-1B

Compiled by the Staff of 'Elprep'
from the Official Handbook