

9R90C
UHF RECEIVER
Assembly No.12.0283

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9R90C UHF RECEIVER

1 SPECIFICATIONS

POWER REQUIREMENTS 1W AF	13.6 VDC at 280 mA. typ.
POWER REQUIREMENTS STD. BY	13.6 VDC at 130 mA. typ. (80 mA. speaker off).
FREQUENCY	406 to 512 MHz.
SENSITIVITY	0.30 μ V for 12 dB SINAD.
SELECTIVITY EIA SINAD	75 dB at +/-25 kHz.
FREQUENCY STABILITY	+/-0.0005%, -30 to +60 deg. C.
INTERMODULATION EIA SINAD	65 dB.
SPURIOUS RESPONSE	85 dB, (75 dB 470 to 512 MHz.)
AUDIO OUTPUT	1 watt (8 ohms) at less than 5% THD.
AUDIO RESPONSE (LOW-LEVEL OUTPUT)	+1, -2 dB from 6 dB/octave. de-emphasis, 300 to 3000 Hz.
HUM AND NOISE	-50 dB from 3.0 kHz. deviation at 1000 Hz.
SIZE L x W x H	260mm x 60mm x 108mm

2 DESCRIPTION

The 9R90C. receiver is a single-conversion frequency-modulation receiver contained in a plug-in module. Power, control and audio connections are made through a rear-mounted 15-pin connector. A front-panel 14-pin metering receptacle is provided for test and alignment using a model M90 Test Set.

3 FUNCTIONAL CONNECTIONS (by pin number)

1 +13.6 V	+13.6 volt supply input.
2 +13.6 V	+13.6 volt supply input.
3 SW +8.0V	+8.0V switched by the Line/Local channel selector switch; this output is used to enable line channel selection.
4 SPEAKER	Speaker AF out.
5 COS	Receiver squelch output.

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8 RX MUTING	Muting input. With +8.0V applied to this pin, the receiver will be muted.
11 RX AF	Low-level receiver audio output. This output is used by external facilities.
12 OSC 1	Channel 1 oscillator control.
13 OSC 2	Channel 2 oscillator control.
14 GND	Common ground.
15 GND	Common ground.

4 CIRCUIT DESCRIPTION

4.1 CONVERTER

The RF amplifier, Q1, amplifies the input signal to overcome the loss of the five helical resonators L1,2,4-6 and the noise level of the mixer, Q2. The mixer is a base-injected bipolar transistor mixer which heterodynes the signal down to the 10.7 MHz. IF.

Q6 (Q7) is the oscillator for channel 1 (2). The crystals Y1 and Y2 are third-overtone at a frequency of (channel-10.7 MHz.)/9. The channel switch S1 is installed in two-channel models. This switch has three positions and is located on the front-panel. In the center position, external channel selection is enabled through pin 3 of P1.

4.2 IF AMPLIFIER

Filter FL1-2 provides the prime selectivity of the receiver. IF Amplifier-1 (Q3) sets the IF noise figure and has filter FL3-5 to restrict the noise bandwidth applied to later stages. IF Amplifier-3 (U1) further amplifies the 10.7 MHz. signal for application to the Limiter, U2.

FM demodulation is carried out with CR4,5 with CH6 and C45 removing 10.7 MHz. components from the demodulator output. The IF amplifier stages are contained in a shielded compartment to ensure stability and reduce unwanted pick-up of extraneous signals.

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4.3 AUDIO AMPLIFIER

The AF amplifier, U4, amplifies the low level demodulator output for processing. R48 and C87 form a de-emphasis network. The output of U4 is coupled through C94 to the volume control R83. After passing through the volume control, the signal is amplified by the final audio amplifier U6.

The speaker switch allows the reduction of stand-by current drain by disabling the audio power stages when speaker operation is not required.

The Output Buffer, U5, is a separate circuit which provides a high quality low level RX AF output at pin 11 of P1. This output is used by external accessories.

4.4 SQUELCH

The output of Noise Amplifier-1 (Q10) is fed to a high-pass filter C78,79,80 and CH10,11 which removes the voice-band components of the demodulator output. U3 amplifies the remaining noise for detector CR11. The SQ-KEY control, R66, sets the collector voltage and the gain of Q10, and thus the unmuting SINAD.

Q11 is the detector switch that activates the muting in U4 (pin 4) and squelch gate Q15. The output of inverter-buffer Q14 is connected to pin 5 of P1 where it is available for external circuits that utilize a carrier operated switch or COS. CR8, CR14 and U8 will mute the receiver and disable the channel oscillator when +8.0V is applied to pin 8 of P1, RX MUTING. This connection is used for simplex operation.

4.5 POWER SUPPLY

U7 generates the +8.0 volt supply which powers all circuits except the final audio amplifier. This amplifier is powered directly from the 13.6V input.

5 ADJUSTMENTS

5.1 EQUIPMENT

The following test equipment and tools are recommended for performing the various adjustments

RF signal generator -127 dBm to -27 dBm

AF distortion analyser 1000 Hz. 8 ohm term.

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Power supply	11 to 16 VDC at 0.5 A.
IF marker generator	10.7 MHz. crystal control
Test set	WR M90 Test Set
Tuning tools	Insulated
Screwdrivers	Slot, Phillips and Robertson head.

5.2 ALIGNMENT

Set the power supply voltage to 13.6 volts. Connect the power supply and RF signal generator to the receiver module at P1 and J1 respectively. Connect the speaker output, pin 4 of P1, to the AF distortion analyser. Plug the Test Set into the front-panel connector and follow the instructions in Table 1, Receiver Alignment.

Table 1:- Receiver Alignment

Test Point	Test Set Range uA	Typical Reading uA	Align	Set to
1	50	16	L15	Note 1
2	100	55	L16	max.
3	50	15 Note 2	C1,2,6,7,8, 70,13 L8-10	max. Note 3
4	50	0	L11,12	Note 4

Note 1 Tune to a peak then decrease to 80% of the peak by increasing the inductance of L15. The final reading at the test point should be about 16 uA.

Note 2 15 uA reading is for 10 uV at J1 after alignment (approximate).

Note 3 After tuning C1,2,6,7,8, the crystal Y1 (Y2) must be set on frequency before the IF (L8-10) is aligned.

Set the RF generator exactly on frequency and to a level that does not saturate the IF.

Couple the IF marker to the IF for a beat note.

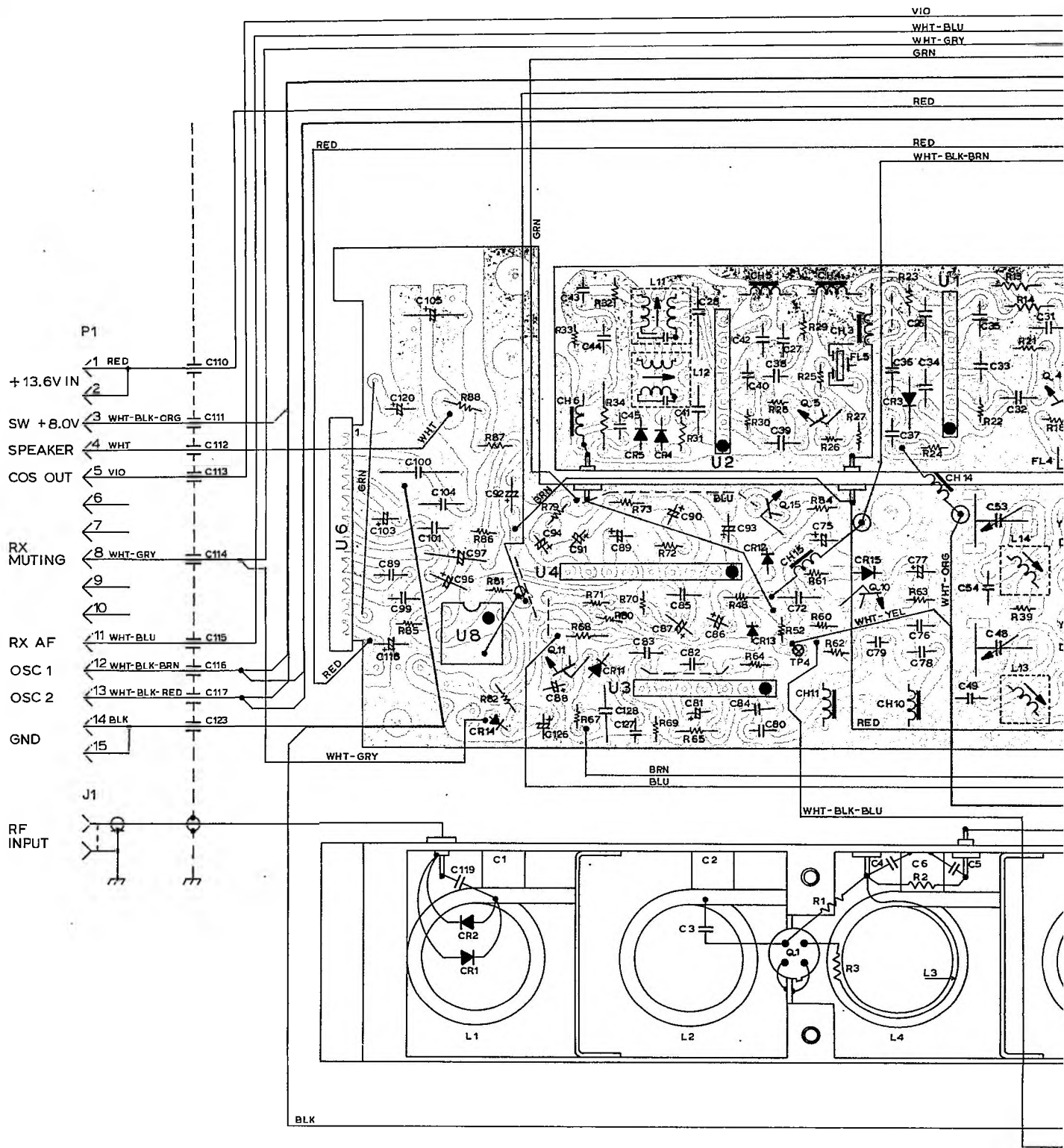
9R90C UHF RECEIVER

Set C48 (C53) controls for zero beat. L13,14 provide coarse adjustment. Note that later tuning of L15 pulls frequency slightly.

Note 4 Set the volume for 1 Vrms at the speaker for a 1 mV(RF), 3.0 kHz deviation, 1 kHz tone signal at J1 that is exactly on the channel frequency.

Tune L11 for a peak at the speaker output.

Tune L12 for a reading of 0 uA at test point 4.

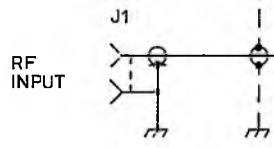


VIO
 WHT-BLU
 WHT-GRY
 GRN

RED

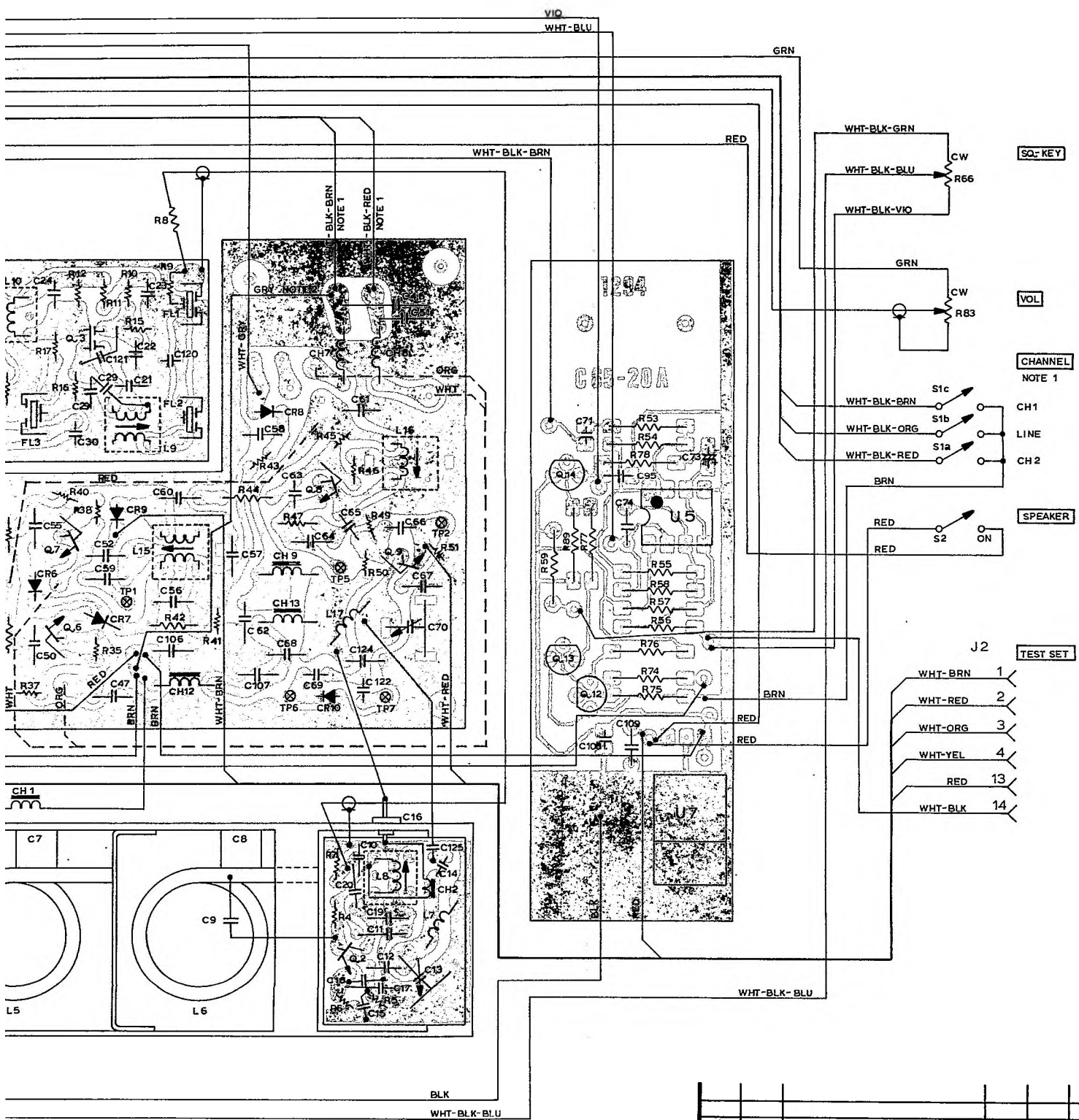
RED
 WHT-BLK-BRN

- P1
- 1 RED C110
 - 2
 - 3 WHT-BLK-ORG C111
 - 4 WHT C112
 - 5 VIO C113
 - 6
 - 7
 - 8 WHT-GRY C114
 - 9
 - 10
 - 11 WHT-BLU C115
 - 12 WHT-BLK-BRN C116
 - 13 WHT-BLK-RED C117
 - 14 BLK C123
 - 15
- RX MUTING
- RX AF
- OSC 1
- OSC 2
- GND



BLK

NOTE 1:
 NOTE 2:
 NOTE 3:



SECTION FOR TWO-CHANNEL RECEIVER
 SECTION FOR SINGLE-CHANNEL RECEIVER
 SECTION FOR SIMPLEX STATION

SO: KEY

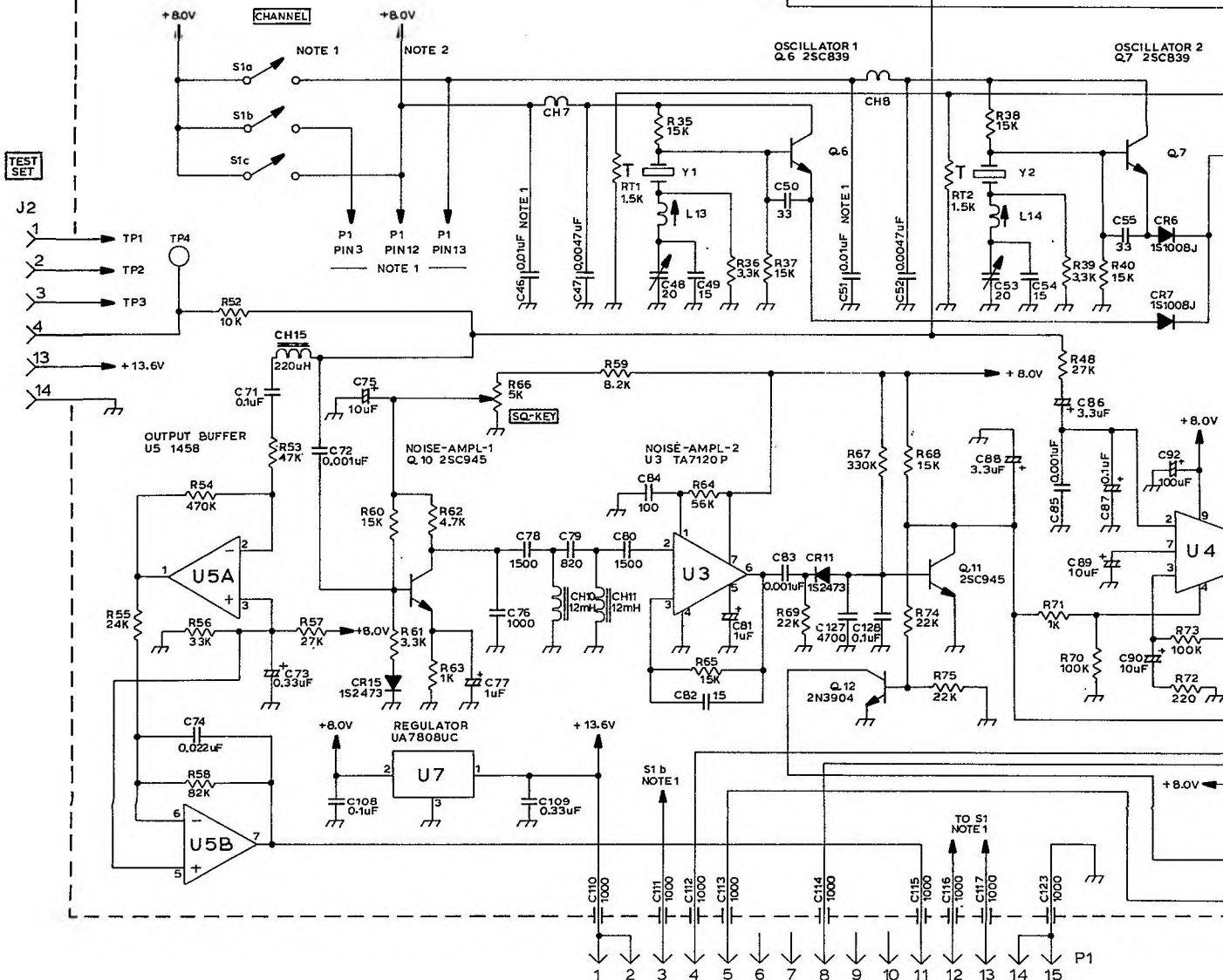
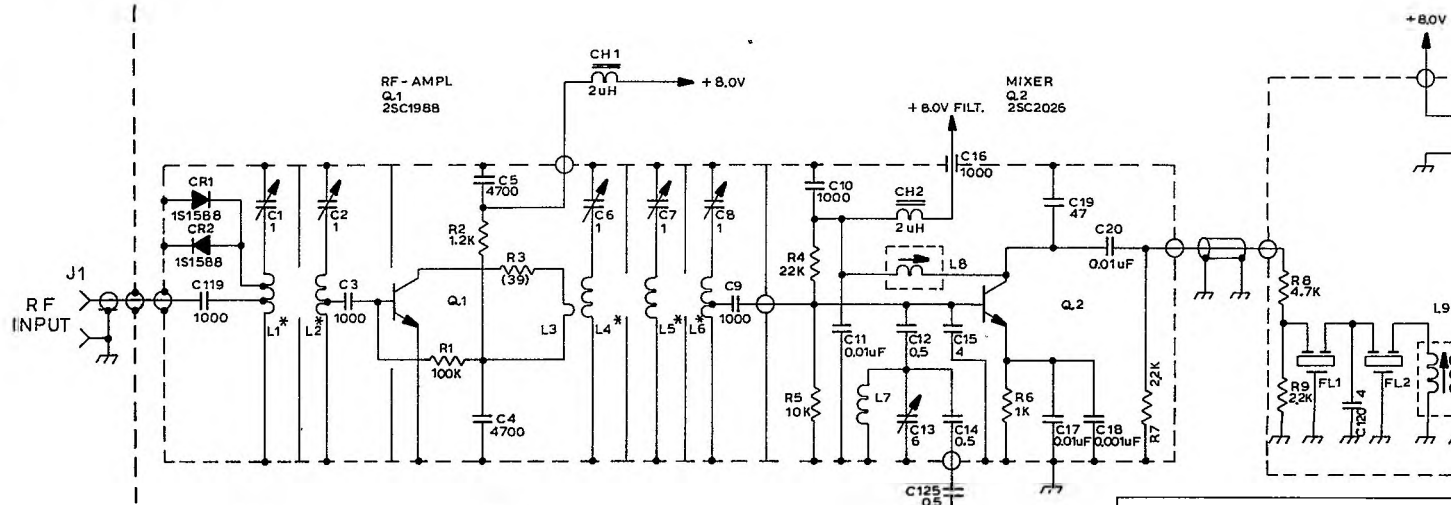
VOL

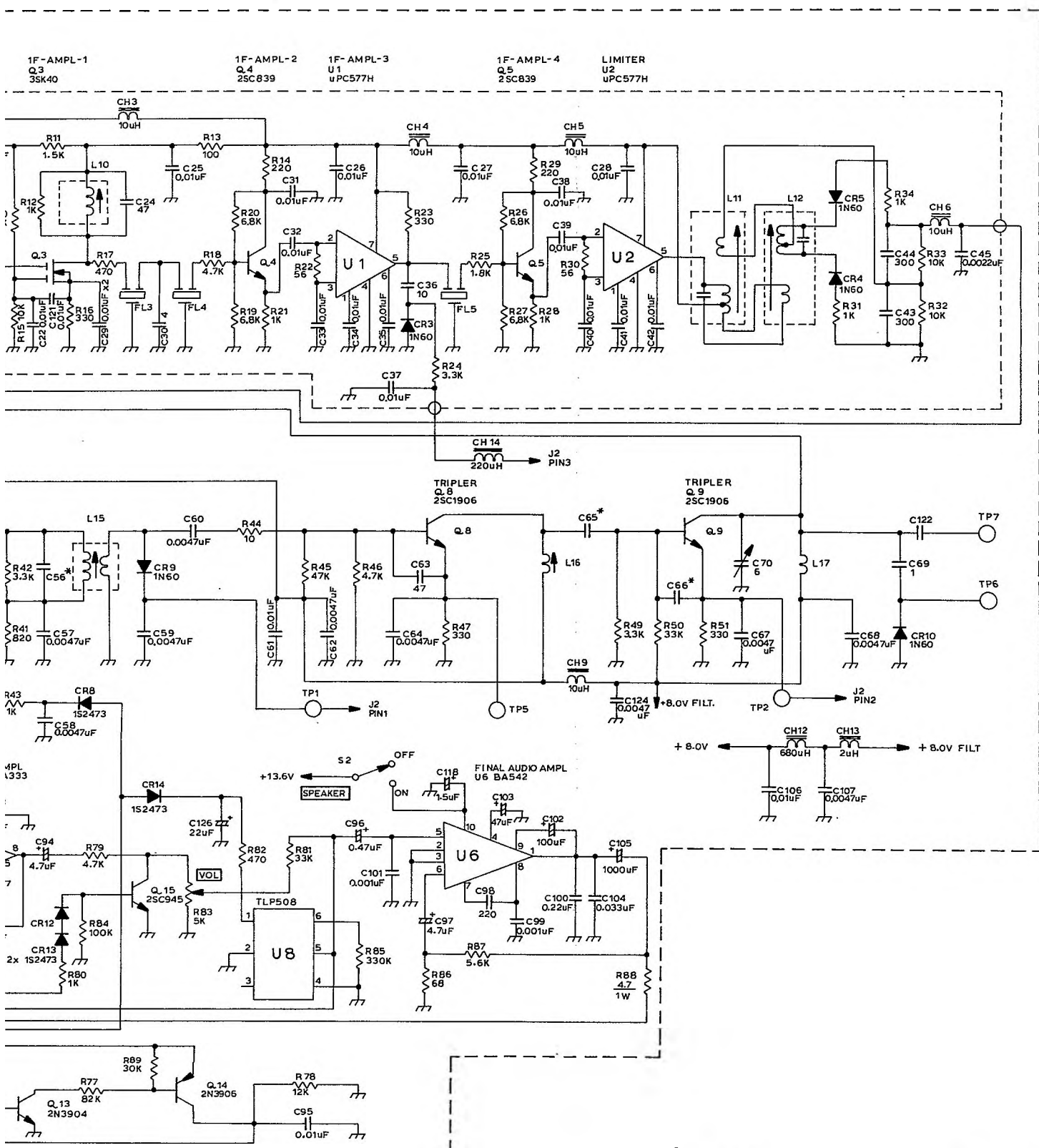
CHANNEL
NOTE 1

SPEAKER

TEST SET

REV	DATE	DESCRIPTION	DRN	CHKD	APPVD
UR communications ltd. vancouver, b.c., canada.					
TITLE: 9R90C RECEIVER WIRING AND ASSEMBLY DIAGRAM					
DRAWN <i>Robbela</i>	DATE JUL.17, 1981.	DRAWING NUMBER			
CHECKED <i>fc</i>	SCALE	65-146			
APPROVED <i>o</i>					





SUFFIX	FREQUENCY	C56	C65	C66	L1	L2	L4	L5	L6
A	406~430 MHz	33p	22p	15p	L1B	L2B	L4B	L5B	L6B
B	450~470 MHz	33p	(10p)	(15p)	L1B	L2B	L4B	L5B	L6B
C	470~512 MHz	27p	(6p)	(18p)	L1C	L2C	L4C	L5C	L6C

* SEE THE TABLE CAPACITANCE IS IN pF UNLESS OTHERWISE SPECIFIED

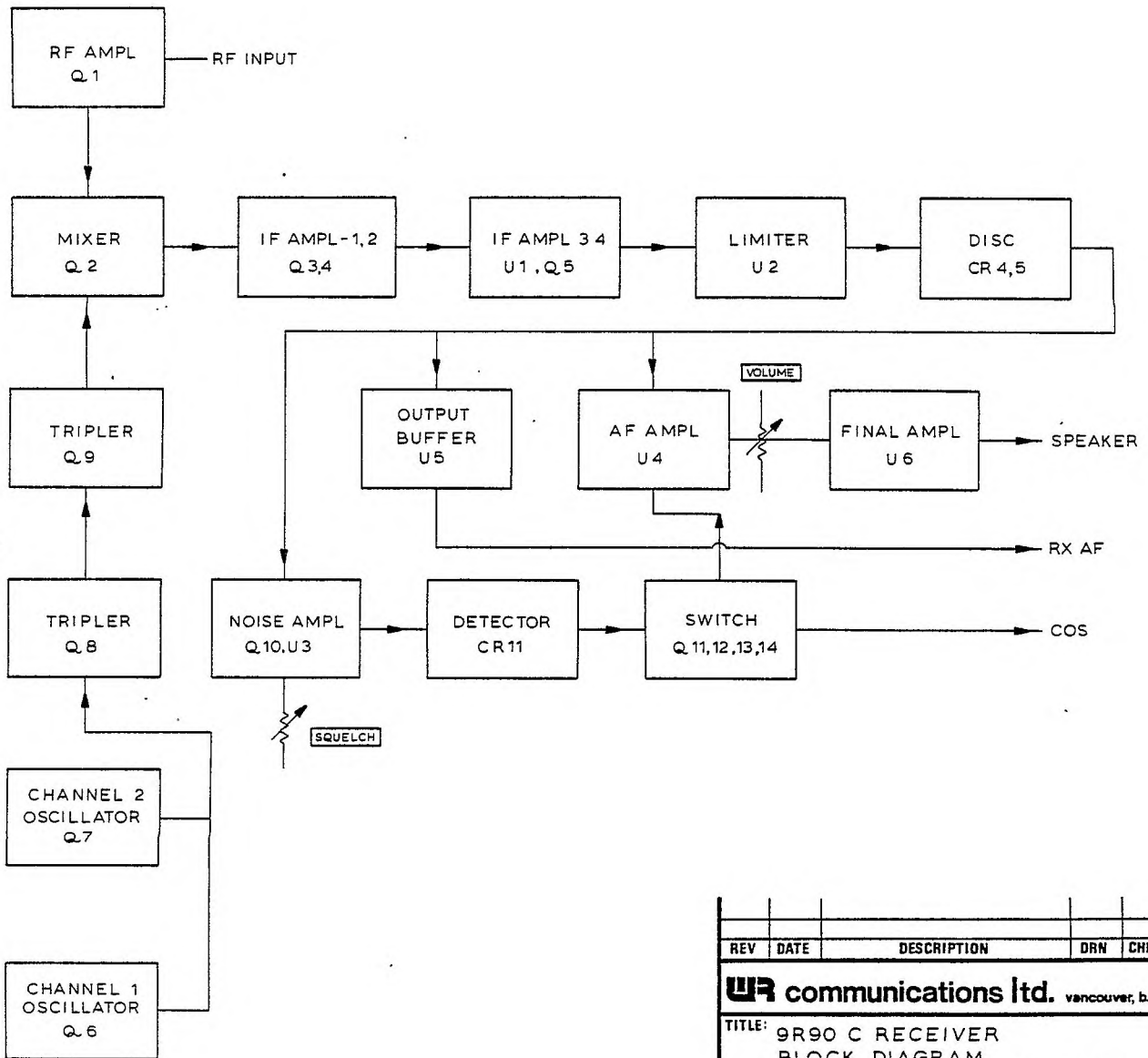
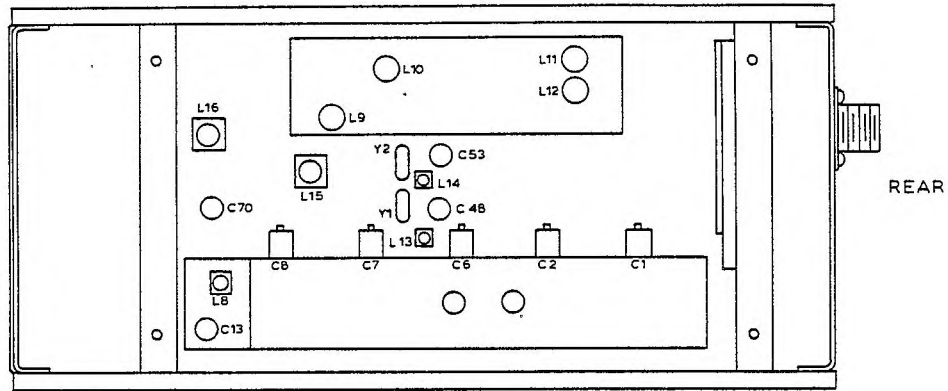
NOTE 1: CONNECTION FOR TWO-CHANNEL RECEIVER
 NOTE 2: CONNECTION FOR SINGLE-CHANNEL RECEIVER
 NOTE 3: USED FOR SIMPLEX STATION

A	ADD. CH 14,15; C127,128		
REV	DATE	DESCRIPTION	DRN CHKD APPVD

UP communications Ltd. vancouver, b.c., canada.

TITLE: 9R90C RECEIVER SCHEMATIC DIAGRAM

DRAWN <i>Shula</i>	DATE MAY, 25, 1981.	DRAWING NUMBER
CHECKED <i>fl</i>	SCALE	65-145
APPROVED		



REV	DATE	DESCRIPTION	DRN	CHKD	APPVD
UR communications ltd. vancouver, b.c., canada.					
TITLE: 9R90 C RECEIVER BLOCK DIAGRAM ALIGNMENT LOCATION DIAGRAM					
DRAWN	<i>[Signature]</i>	DATE	JUN.30, 1981.	DRAWING NUMBER	
CHECKED	<i>[Signature]</i>	SCALE		65-147	
APPROVED	<i>[Signature]</i>				

C1	1 pF ceramic adj			29.0250		
C2	1 pF ceramic adj			29.0250		
C3	1000 pF ceramic			24.3171		
C4	4700 pF ceramic			24.2104		
C5	4700 pF ceramic			24.2104		
C6	1 pF ceramic adj			29.0250		
C7	1 pF ceramic adj			29.0250		
C8	1 pF ceramic adj			29.0250		
C9	1000 pF ceramic			24.3171		
C10	1000 pF ceramic			24.3171		
C11	0.01 uF ceramic			24.2152		
C12	0.5 pF ceramic NPO			24.0200		
C13	6 pF ceramic adj			29.0251		
C14	0.5 pF ceramic NPO			24.0200		
C15	4 pF ceramic NPO			24.0204		
C16	1000 pF feedthrough			28.0001		
C17	0.01 uF ceramic			24.2152		
C18	0.001 uF ceramic			24.3171		
C19	47 pF ceramic N220			24.1002		
C20	0.01 uF ceramic			24.2152		
C21	47 pF ceramic N150			24.0803		
C22	0.01 uF polyester			24.3311		
C23	0.01 uF polyester			24.3311		
C24	47 pF ceramic N140			24.0803		
C25	0.01 uF polyester			24.3311		
C26	0.01 uF polyester			24.3311		
C27	0.01 uF polyester			24.3311		
C28	0.01 uF polyester			24.3311		
C29	0.01 uF polyester			24.3311		
C30	4 pF ceramic N150			24.0695		
C31	0.01 uF polyester			24.3311		
C32	0.01 uF polyester			24.3311		
C33	0.01 uF polyester			24.3311		
C34	0.01 uF polyester			24.3311		

Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
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WR communications ltd.
vancouver, b.c., canada.

PARTS LIST

DATE : May 14, 1981 MODEL : 9R90C
APPROVED : *jc* ASSY. NO 12.0283K

REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.	SHEET 1 OF 11
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C35	0.01 uF polyester			24.3311		
C36	10 pF ceramic N150			24.0701		
C37	0.01 uF polyester			24.3311		
C38	0.01 uF polyester			24.3311		
C39	0.01 uF polyester			24.3311		
C40	0.01 uF polyester			24.3311		
C41	0.01 uF polyester			24.3311		
C42	0.01 uF polyester			24.3311		
C43	300 pF polystyrene			25.0005		
C44	300 pF polystyrene			25.0005		
C45	0.0022 uF polyester			24.3302		
C46	0.01 uF ceramic			24.2152		
C47	0.0047 uF ceramic			24.2104		
C48	20 pF ceramic variable N800			29.0113		
C49	15 pF ceramic NPO			24.0254		
C50	33 pF ceramic N150			24.0801		
C51	0.01 uF ceramic			24.2152		
C52	0.0047 uF ceramic			24.2104		
C53	20 pF ceramic variable N800			29.0113		
C54	15 pF ceramic NPO			24.0254		
C55	33 pF ceramic N150			24.0801		
C56A	33 pF ceramic N150			24.0801		
C56B	33 pF ceramic N150			24.0801		
C56C	27 pF ceramic N150			24.0751		
C57	0.0047 uF ceramic			24.2104		
C58	0.0047 uF ceramic			24.2104		
C59	0.0047 uF ceramic			24.2104		
C60	0.0047 uF ceramic			24.2104		
C61	0.01 uF ceramic			24.2152		
C62	0.0047 uF ceramic			24.2104		
C63	47 pF ceramic N150			24.0803		
C64	0.0047 uF ceramic			24.2102		
C65A	22 pF ceramic NPO			24.0256		
C65B	10 pF ceramic NPO			24.0209		
Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
			WR communications ltd. vancouver, b.c., canada.			
			PARTS LIST			
			DATE : May 14, 1981	MODEL : 9R90C		
			APPROVED : <i>jc</i>	ASSY. NO 12.0283K		
REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.	SHEET 2 OF 11

C65C	6pF ceramic NPO			24.0206		
C66A	15 pF ceramic NPO			24.0254		
C66B	15 pF ceramic NPO			24.0254		
C66C	18 pF ceramic NPO			24.0255		
C67	0.0047 uF ceramic			24.2104		
C68	0.0047 uF ceramic			24.2104		
C69	1 pF ceramic NPO			24.0201		
C70	6 pF ceramic adj N33			29.0252		
C71	0.1 uF ceramic	Kemet	C320C104M5R5CA	24.4045		
C72	0.001 uF polyester			24.3301		
C73	0.33 uF tant. 35 v	Kemet	T368A334M035AS	26.1029		
C74	0.022 uF ceramic	Kemet	T330C223M1R5CA	24.4050		
C75	10uF elect. 16 v			27.0011		
C76	1000 pF ceramic			24.3171		
C77	1uF tant. 25 v			26.0038		
C78	0.0015 uF polyester			24.3323		
C79	820 pF polystyrene			25.0007		
C80	0.0015uF polyester			24.3323		
C81	1 uF tant. 25 v			26.0038		
C82	15 pF ceramic NPO			24.0254		
C83	0.001uF polyester			24.3301		
C84	100 pF ceramic N470			24.1253		
C85	0.001 uF ceramic			24.3171		
C86	3.3 uF tant. 10 v			26.0017		
C87	0.1 uF tant. 35 v			26.0045		
C88	3.3 uF tant. 10 v			26.0017		
C89	10 uF elect. 16 v			27.0011		
C90	10 uF elect. 16 v			27.0011		
C91	10 uF elect. 16 v			27.0011		
C92	100 uF elect. 10 v			27.0004		
C93	47 uF elect. 10 v			27.0007		
C94	4.7 uF tant. 25 v			26.0042		
C95	0.01 ceramic	Kemet	C320C103M1R5CA	24.4044		
C96	0.47 uF tant. 35 v			26.0049		

Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
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PARTS LIST

DATE: May 14, 1981	MODEL: 9R90C
APPROVED: <i>jc</i>	ASSY. NO. 12.0283K

REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.	SHEET 3 OF 11
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C97	4.7 uF elect. 25 v			27.0023		
C98	220 pF ceramic N150			24.0900		
C99	0.001 uF ceramic			24.3171		
C100	0.22 uF polyester			24.3322		
C101	0.001uF polyester			24.3301		
C102	100 uF elect. 16 v			27.0014		
C103	47 uF elect. 16 v			27.0013		
C104	0.033 uF polvester			24.3313		
C105	1000 uF elect. 25 v			27.0029		
C106	0.01 uF ceramic			24.2152		
C107	0.0047 uF ceramic			24.2104		
C108	0.1 uF ceramic	Kemet	C320C104M5R5CA	24.4045		
C109	0.33 uF ceramic	Kemet	C330C334M5U1CA	24.4051		
C110	1000 pF feed through			28.0001		
C111	1000 pF "			"		
C112	1000 pF "			"		
C113	1000 pF "			"		
C114	1000 pF "			"		
C115	1000 pF "			"		
C116	1000 pF "			"		
C117	1000 pF "			"		
C118	1.5 uF tant. 35 v	Kemet	T362B155M035AS	26.1002		
C119	1000 pF ceramic			24.3171		
C120	4 pF ceramic N150			24.0695		
C121	0.01 uF polyester			24.3311		
C122	1 pF ceramic NPO			24.0201		
C123	1000 pF feed through			28.0001		
C124	0.0047 uF ceramic			24.2104		
C125	0.5 pF ceramic NPO			24.0202		
C126	22 uF elect. 10 v			27.0008		
C127	4700 pF ceramic			24.3320		
C128	0.1 uF polyester			24.2104		

Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
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WR communications Ltd.
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PARTS LIST

DATE : May 14, 1981

MODEL : 9R90C

APPROVED : *jc*

ASSY. NO. 12.0283K

REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.
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SHEET 4 OF 11

CH1	2 uH molded			31.0432		
CH2	2 uH molded			31.0432		
CH3	10 uH "			31.0435		
CH4	10 uH "			31.0435		
CH5	10 uH "			31.0435		
CH6	10 uH "			31.0435		
CH7	air core			31.0473		
CH8	air core			31.0473		
CH9	10 uH molded			31.0435		
CH10	12 mH molded P.C.			31.2007		
CH11	12 mH molded P.C.			31.2007		
CH12	680 uH molded			31.0485		
CH13	2 uH molded			31.0432		
CH14	220 uH	Del.	1025-76	31.1009		
CH15	220 uH	Del.	1025-76	31.1009		
CR1	Si		1S1588	37.1733		
CR2	Si		1S1588	37.1733		
CR3	Ge		1N60	37.0100		
CR4	Ge		1N60	37.0100		
CR5	Ge		1N60	37.0100		
CR6	Si		1S1008J	37.1650		
CR7	Si		1S1008J	37.1650		
CR8	Si		1S2473	37.1900		
CR9	Ge		1N60	37.0100		
CR10	Ge		1N60	37.0100		
CR11	Si		1S2473	37.1900		
CR12	Si		1S2473	37.1900		
CR13	Si		1S2473	37.1900		
CR14	Si		1S2473	37.1900		
CR15	Si		1S2473	37.1900		

Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
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vancouver, b.c., canada.
PARTS LIST

DATE: May 14., 1981 MODEL: 9R90C
APPROVED: *PC* ASSY. NO. 12.0283K

REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.	SHEET	OF	11
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FL1	Crystal filter			38.0065		
FL2	" "			38.0065		
FL3	" "			"		
FL4	" "			"		
FL5	" "			38.0062		
J1	Coaxial UHF, panel	Amph	S0-239	33.1502		
J2	14-pin, panel	Amph	57-20140	33.1560		
L1A	helical res. s.p.			31.0733		
L1B	"			31.0733		
L1C	"			31.0734		
L2A	"			31.0735		
L2B	"			31.0735		
L2C	"			31.0736		
L3	Part of R3			31.0739		
L4A	helical res. s.p.			31.0737		
L4B	"			31.0737		
L4C	"			31.0738		
L5A	"			31.0740		
L5B	"			31.0740		
L5C	"			31.0741		
L6A	"			31.0742		
L6B	"			31.0742		
L6C	"			31.0743		
L7	Coil, air			31.0744		
L8	10.7 MHz coil, adj			31.0745		
L9	"			31.0081		
L10	"			31.0081		
L11	10.7 MHz disc. pri.			31.0110		
L12	10.7 MHz disc. sec.			31.0111		
L13	coil, adj			31.0748		
L14	coil, adj			31.0748		


Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
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UR communications ltd.
vancouver, b.c., canada.
PARTS LIST

DATE: May 14, 1983 MODEL: 9R90C

APPROVED: *lc* ASSY. NO. 12.0283

REV	APP	DATE	ITEM	CHANGE TO	WR PART NO.	SHEET 6 OF 11
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L15	coil, adj			31.0187		
L16	coil, adj			31.0746		
L17	coil, air			31.0747		
P1	15-pin, chassis	Amph	133-015-21	33.1100		
Q1	NPN HF		2SC1988	64.1550		
Q2	NPN HF		2SC2026	64.1600		
Q3	N-chan MOSFET		3SK40	64.3201		
Q4	NPN		2SC839	64.0906		
Q5	NPN		2SC839	64.0906		
Q6	NPN		2SC839	64.0906		
Q7	NPN		2SC839	64.0906		
Q8	NPN HF		2SC1906	64.1500		
Q9	NPN HF		2SC1906	64.1500		
Q10	NPN LN		2SC945 (L)	64.0960		
Q11	NPN		2SC945	64.0960		
Q12	NPN		2N3904	64.0120		
Q13	NPN		2N3904	64.0120		
Q14	PNP		2N3906	64.0122		
Q15	NPN LN		2SC945 (L)	64.0960		
R1	100K 1/4W 5% tol.	Rohm	R25J	55.2104		
R2	1.2K 1/4W 5% tol.	Rohm	R25J	55.2122		
R3	39 1/4W 5% tol.	IRC	GBT 1/4	55.5390		
R4	22K 1/4W 5% tol.	Rohm	R25J	55.2223		
R5	10K "	"	"	55.2103		
R6	1K "	"	"	55.2102		
R7	2.2K "	"	"	55.2222		
Ref	Description	Mfr	Mfr Part No	WR Part No	Qty	Item
			 communications ltd. vancouver, b.c., canada. PARTS LIST			
			DATE: May 14, 1987	MODEL: 9R90C		
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R8	4.7K	1/8W	5% tol. comp.			55.1472		
R9	2.2K		"			55.1222		
R10	10K	1/2W	5% tol.	Rohm	R25J	55.2103		
R11	1.5K		"	"	"	55.2152		
R12	1K		"	"	"	55.2102		
R13	100		"	"	"	55.2101		
R14	220		"	"	"	55.2221		
R15	10K		"	"	"	55.2103		
R16	330	1/2W	5% tol.	Rohm	R25J	55.2331		
R17	470		"	"	"	55.2471		
R18	4.7K		"	"	"	55.2472		
R19	6.8K		"	"	"	55.2682		
R20	6.8		"	"	"	55.2682		
R21	1K		"	"	"	55.2102		
R22	56		"	"	"	55.2560		
R23	330		"	"	"	55.2331		
R24	3.3K	1/2W	10% tol. comp.			55.5332		
R25	1.8K	1/2W	5% tol.	Rohm	R25J	55.2182		
R26	6.8K		"	"	"	55.2682		
R27	6.8K		"	"	"	55.2682		
R28	1K		"	"	"	55.2102		
R29	220		"	"	"	55.2221		
R30	56		"	"	"	55.2560		
R31	1K		"	"	"	55.2102		
R32	10K		"	"	"	55.2103		
R33	10K		"	"	"	55.2103		
R34	1K		"	"	"	55.2102		
R35	15K		"	"	"	55.2153		
R36	3.3K		"	"	"	55.2332		
R37	15K		"	"	"	55.2153		
R38	15K		"	"	"	55.2153		
R39	3.3K		"	"	"	55.2332		
R40	15K		"	"	"	55.2153		
R41	820		"	"	"	55.2821		
Ref	Description			Mfr	Mfr Part No	WR Part No	Qty	Item

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R42	3.3K	½W	5% tol.	Rohm	R25J	55.2332		
R43	1K	"	"	"	"	55.2102		
R44	10	"	"	"	"	55.2100		
R45	47K	"	"	"	"	55.2473		
R46	4.7K	"	"	"	"	55.2472		
R47	330	"	"	"	"	55.2331		
R48	27K	"	"	"	"	55.2273		
R49	3.3K	"	"	"	"	55.2332		
R50	33K	"	"	"	"	55.2333		
R51	330	"	"	"	"	55.2331		
R52	10K	"	"	"	"	55.2103		
R53	47K	"	"	"	"	55.2473		
R54	470K	"	"	"	"	55.2474		
R55	24K	"	"	"	"	55.2243		
R56	33K	"	"	"	"	55.2333		
R57	27K	"	"	"	"	55.2273		
R58	82K	"	"	"	"	55.2823		
R59	8.2K	"	"	"	"	55.2822		
R60	15K	"	"	"	"	55.2153		
R61	3.3K	"	"	"	"	55.2332		
R62	4.7K	"	"	"	"	55.2472		
R63	1K	"	"	"	"	55.2102		
R64	56K	"	"	"	"	55.2563		
R65	15K	"	"	"	"	55.2153		
R66	5K	panel control		Clar	388L 5K	54.5700		
R67	330K	½W	5% tol.	Rohm	R25J	55.2334		
R68	15K	"	"	"	"	55.2153		
R69	22K	"	"	"	"	55.2223		
R70	100K	"	"	"	"	55.2104		
R71	1K	"	"	"	"	55.2102		
R72	220	"	"	"	"	55.2221		
R73	100K	"	"	"	"	55.2104		
R74	22K	"	"	"	"	55.2223		
R75	22K	"	"	"	"	55.2223		
Ref	Description			Mfr	Mfr Part No	WR Part No	Qty	Item

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APPROVED: *yc*

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R76	33K	1/2W	5% tol.	Rohm	R25T	55.2333		
R77	82K	"	"	"	"	55.2823		
R78	12K	"	"	"	"	55.2123		
R79	4.7K	"	"	"	"	55.2472		
R80	1K	"	"	"	"	55.2102		
R81	33K	"	"	"	"	55.2333		
R82	470	"	"	"	"	55.2471		
R83	5K	panel control		Clar.	388L-5K	54.5700		
R84	100K	1/2W	5% tol.	Rohm	R25J	55.2104		
R85	330K	"	"	"	"	55.2334		
R86	68	"	"	"	"	55.2680		
R87	5.6K	"	"	"	"	55.2562		
R88	4.7	1W	10% tol.	Phil.	CR25	55.4479		
R89	30K	1/2W	5% tol.	Rohm	R25J	55.2303		
RT1	1.5K	posistor		Mur.	PTH60T-152	69.0004		
RT2	1.5K	posistor		Mur.	PTH60T-152	69.0004		
S1	Toggle, panel ON-ON-ON			JBT	JMT-232	61.0802		
S2	Toggle, panel SPDT			JBT	JMT-123	61.0800		
TP1-7	Test point terminal					33.0600	6	
U1	I.F. Amp.				uPC577H	41.2922		
U2	I.F. Amp.				uPC577H	41.2922		
U3	Amp.				TA7120P	41.2510		
U4	Amp.				BA333	41.0030		
Ref	Description			Mfr	Mfr Part No	WR Part No	Qty	Item

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