

WJ-861X RECEIVER
APPENDIX K
WJ-861X HIGH & LOW FREQUENCY
EXTENSION OPTIONS

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WARNING

This equipment utilizes voltages which are potentially dangerous and may be fatal if contacted. Exercise extreme caution when working with the equipment with any protective cover removed.

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APPENDIX K

WJ-861X 2-500 MHz HIGH FREQUENCY EXTENSION (HFE) OPTIONS

WJ-861X .5-500 MHz LOW FREQUENCY EXTENSION (LFE) OPTIONS

K.1 GENERAL DESCRIPTION

The 2-500 MHz HF Frequency Extension (HFE) option enables the receiver to be tuned from 2 MHz to 500 MHz. The .5-500 MHz LF Frequency Extension (LFE) option enables the receiver to be tuned from 500 kHz to 500 MHz. Tuning capability of from .5 MHz to 1100 MHz is acquired utilizing the FE option. Modifications to the Preselector subassembly enable it to tune down to .5 MHz or 2 MHz. Software modifications have also been made to the 1st LO Synthesizer and to the microprocessor. Performance deviation over the lower range varies from the present specifications as follows:

- | | | | |
|----|---------------------------|-------|--|
| a. | Noise Figure | | 25 dB, 0.5 to 2 MHz
16 dB, 2 to 5 MHz
12 dB, 5-20 MHz
(11 dB is present maximum for
20-1100 MHz, 9.5 dB typical) |
| b. | 3rd Order Intercept Point | | -8 dBm, 0.5 to 2 MHz
0 dBm, 2-20 MHz
(+3 dBm present specification for
20-500 MHz, +5 dBm typical) |
| c. | 2nd Order Intercept Point | | 10 dBm, 0.5 to 2 MHz
+15 dBm, 2-20 MHz
(+50 dBm present specification for
20-1100 MHz) |

K.2 INSTALLATION

The HFE and LFE options are factory installable options. Installation consists of modifying the microprocessor software and replacing the EPROM in the 1st LO Synthesizer. This modification is available only for receivers with software versions 2.1 or greater. The Preselector subassembly occupies slot XA3A4 on the RF/IF Motherboard and connects to the receiver circuitry via the board terminals and two interconnecting cables. When the HF or LF Preselector is properly installed, switch S1 on the Synthesizer Interface subassembly (A5A2) must also be re-configured permitting the receiver software to recognize the presence of the Frequency Extender options. This is accomplished by placing switch position #5 of A5A2S1 in the closed position.

The following cable connections are required for the installation of the HF or LF Options:

1. Connect P9 of cable A3W4 to J1 of the HF or LF options.
2. Connect P7 of cable A3W3 to J2 of the HF or LF options.

NOTE

The receiver front panel is capable of displaying 0 MHz. However, severe performance deviation should be expected.

K.3 CIRCUIT DESCRIPTION**K.3.1 FUNCTIONAL DESCRIPTION**

The Type 794095-2 Preselector (HFE) option divides the 2 to 120 MHz frequency range into four bands of 2 to 30 MHz, 30 to 47 MHz, 47 to 75 MHz and 75 to 120 MHz. The Type 794095-3 Preselector (LFE) Option divides the .5 to 120 MHz frequency range into four bands of .5 to 30 MHz, 30 to 47 MHz, 47 to 75 MHz and 75 to 120 MHz. Switching between frequency bands is controlled by the VHF HI/LO and VHF select signals (FPLA3 through FPLA6) supplied by the Digital Control Section. The tuning range of the 1st LO Synthesizer is 552 to 1051 MHz.

K.3.2 DETAILED CIRCUIT DESCRIPTION

The reference designation for this option is A3A4. Refer to **Figure K-2** for the Type 794095 VHF Low-Band Preselector schematic diagram.

The Type 794095-2 VHF Low-Band Preselector provides RF preselection for the frequency range of from 2 to 120 MHz. This frequency range is divided into four bands of 2 to 30 MHz (band #1), 30 to 47 MHz (band #2), 47 to 75 MHz (band #3) and 75 to 120 MHz (band #4). The Type 794095-3 VHF Low-Band Preselector provides RF preselection for the frequency range of from .5 to 120 MHz. This frequency range is divided into four bands of .5 to 30 MHz (band #1), 30 to 47 MHz (band #2), 47 to 75 MHz (band #3) and 75 to 120 MHz (band #4). The preselector for the HF and LF options and the existing preselector are identical with the exception of frequency range already described.

K.4 ALIGNMENT PROCEDURE**K.4.1 PERFORMANCE TESTS**

The performance tests for the Type 794095-2 and Type 794095-3 VHF Low-Band Preselector (HFE and LFE) options are identical to the Type 794095-1 VHF Low-Band Preselector found in **Section IV** except for the differences described below:

1. Tune the receiver to 2.2 MHz.
2. Differences in **Table 4-6** are shown here in **Table K-1**.

Table K-1. RF Preselector Passband Corrections

Center Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Upper Frequency 2 (MHz)	Lower Frequency x2 (MHz)
14.0	2.0 (HFE) 0.5 (LFE)	30	15	4.0 (HFE) 1.0 (LFE)

K.4.2 ALIGNMENT PROCEDURES

Control words on the Type 794110-1 Synthesizer Interface (A5A2) are changed as described below:

1. Select the 1 MHz Tuning Rate pushbutton on the front panel and set the receiver to the frequencies listed in **Table K-2**. Only 1 MHz and above tuning steps are being tested at this time. (The digits below 1 MHz will not affect the results.) Utilizing the oscilloscope, observe the logic levels at the XA2 connector pins listed in the table.
2. The results observed in step 1 should yield BCD words equivalent to the 1st LO frequency. The decimal equivalent of the BCD words will be equal to the tuned frequency +552. As seen in the table, the most significant digit is omitted when the decimal equivalent is above 1000.

Table K-2. 1st LO Synthesizer Control Words

Tuned Frequency	100 MHz Control				10 MHz Control				10 MHz Control				Decimal Equivalent
	A18	A26	A16	A24	A10	A6	A22	A28	A14	A8	A12	A4	
.5 MHz	0	1	0	1	0	1	0	1	0	0	1	0	552 (LFE)
2.X MHz	0	1	0	1	0	1	0	1	0	1	0	0	554 (HFE)
20.X MHz	0	1	0	1	0	1	1	1	0	0	1	0	572
25.X MHz	0	1	0	1	0	1	1	1	0	1	1	1	577
35.X MHz	0	1	0	1	1	0	0	0	0	1	1	1	587
50.X MHz	0	1	1	0	0	0	0	0	0	0	1	0	602
250.X MHz	1	0	0	0	0	0	0	0	0	0	1	0	802
456.X MHz	0	0	0	0	0	0	0	0	1	0	0	0	008

3. Tune the receiver to the frequencies listed in **Table K-3** and observe the logic levels present at XA2 connector pins listed in the table. These logic levels form a digital code which selects UHF or VHF operation, activates the appropriate RF preselector and selects the correct UHF LO frequency. Frequencies above 500 MHz require the 500-1100 MHz Frequency Extender to be installed on the RF/IF Motherboard.

4. Select AGC OFF and rotate the RF/IF gain control to its full CCW position.
5. Connect the DVM to pin B5 of XA2 and adjust the RF/IF Gain between its maximum CCW to maximum CW position. Observe that the DVM reading continuously decreases from 5.0 to 0 Vdc $\pm 10\%$.
6. Connect the DVM to pin B7 of XA2 and set the COR LEVEL Display to 00, using the front panel COR pushbuttons.
7. Step the COR LEVEL up to 40 while observing DVM. The voltage should increase from 0 ± 1 to 5.0 ± 4 Vdc in steps of approximately .125 Vdc.

Table K-3. RF Preselector and UHF VCO Control

	UHF2 A34	UHF1 A36	UHF/VHF A32	UHF3 A3	VHF2 A7	VHF1 A5	Comments
25.0000	0	0	0	0	0	0	.5-30 MHz preselector (LFE)
25.0000	0	0	0	0	0	0	2-30 MHz preselector (HFE)
35.0000	0	0	0	0	0	1	30-47 MHz preselector
60.0000	0	0	0	0	1	0	47-75 MHz preselector
100.0000	0	0	0	0	1	1	75-120 MHz preselector
150.0000	0	0	0	1	0	0	120-187 MHz preselector
250.0000	0	0	0	1	0	1	187-292 MHz preselector
350.0000	0	0	0	1	1	0	292-382 MHz preselector
450.0000	0	0	0	1	1	1	382-500 MHz preselector
550.0000	0	0	1	1	1	0	500-700 MHz preselector UHF VCO = 848 MHz
650.0000	0	1	1	1	1	0	500-700 MHz preselector UHF VCO = 944 MHz
800.0000	1	0	1	1	1	0	700-900 MHz preselector UHF VCO = 1144 MHz
1000.0000	1	1	1	1	1	0	900-1100 MHz preselector UHF VCO = 1344 MHz

K.5

PARTS LIST

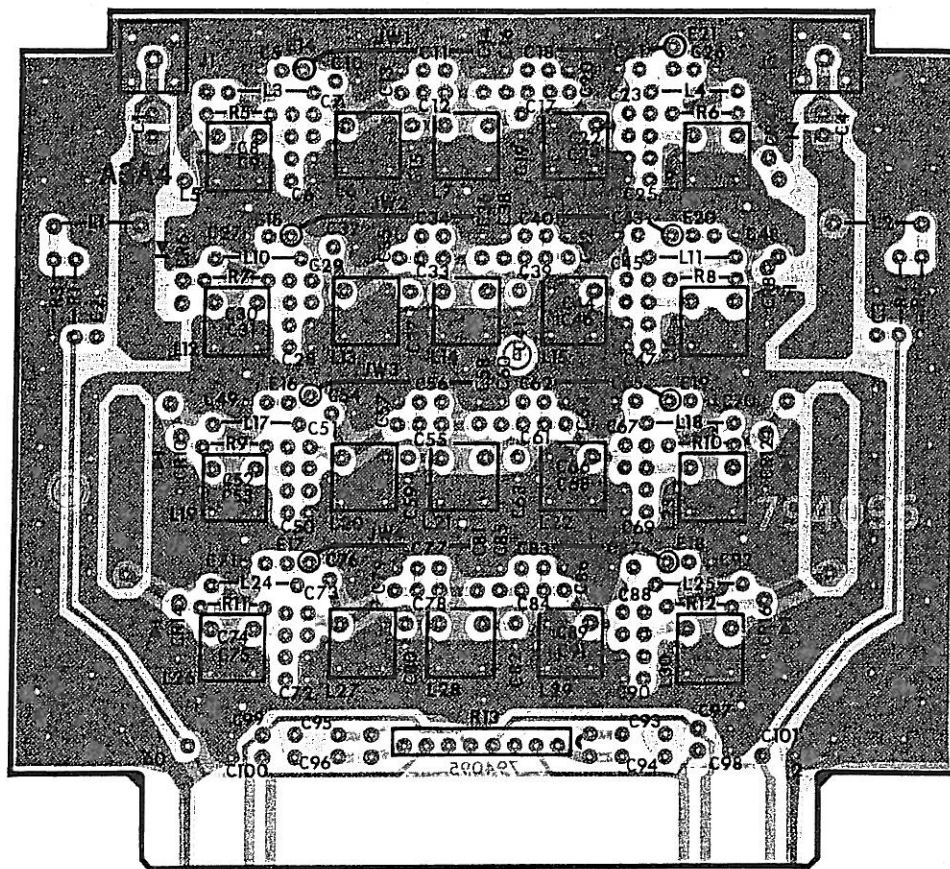


Figure K-1. Type 794095-2, 2-500 MHz Frequency Extension (Option K - HF), Location of Components

K.5.1 TYPE 794095-2 VHF LOW-BAND PRESELECTOR

REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
C1	Capacitor, Ceramic, Disc: .022 μ F, 10%, 100 V	2	8121-100-X7R0-223K	59660	
C2	Capacitor, Ceramic, Disc: 0.1 μ F, 20%, 50 V	6	34475-1	14632	
C3	Same as C2				
C4	Same as C1				
C5	Capacitor, Ceramic, Disc: 0.01 μ F, 10%, 100 V	8	8121-100-W5R0-103K	72982	
C6	Not Used				
C7	Capacitor, Ceramic, Disc: 82 pF, 2%, 100 V	2	200-100-NPO-820G	51642	
C8	Capacitor, Ceramic, Disc: 1100 pF, 2%, 100 V	2	150-100-NPO-112G	51642	
C9	Not Used				
C10	Capacitor, Ceramic, Monolithic: 100 pF, 2%, 100 V	2	200-100-NPO-101G	51642	
C11	Not Used				
C12	Capacitor, Ceramic, Monolithic: 1000 pF, 2%, 100 V	1	150-100-NPO-102G	51642	
C13	Capacitor, Ceramic, Disc: 39 pF, 2%, 100 V	2	150-100-NPO-390G	51642	
C14					
Thru	Not Used				
C17					
C18	Capacitor, Ceramic, Monolithic: 2200 pF, 2%, 100 V	1	200-100-NPO-222G	51642	
C19	Not Used				
C20	Same as C13				
C21	Same as C10				
C22	Same as C7				
C23	Same as C8				
C24	Not Used				
C25	Not Used				
C26	Same as C5				
C27	Same as C5				
C28	Capacitor, Ceramic, Monolithic: 3.3 pF, \pm 1 pF, 100 V	14	8101-100-COJO-339B	59660	
C29	Same as C28				
C30	Capacitor, Ceramic, Monolithic: 15 pF, 5%, 100 V	6	100-100-NPO-150G	51642	
C31	Same as C30				
C32	Same as C28				
C33	Capacitor, Ceramic, Monolithic: 4.7 pF, .1 pF, 100 V	4	100-100-NPO-479B	51642	
C34	Capacitor, Ceramic, Disc: 18 pF, 5%, 100 V	4	8111-100-COGO-180J	59660	
C35	Capacitor, Ceramic, Monolithic: 22 pF, 5%, 100 V	2	100-100-NPO-220J	51642	
C36	Same as C33				
C37	Same as C34				
C38	Same as C34				
C39	Same as C33				
C40	Same as C34				
C41	Same as C33				

REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C42	Same as C35				
C43	Same as C28				
C44	Same as C28				
C45	Same as C30				
C46	Same as C30				
C47	Same as C28				
C48	Same as C5				
C49	Same as C5				
C50	Not Used				
C51	Capacitor, Ceramic, Disc: 1.5 pF, ± 0.1 pF, 100 V	2	8101-100-COKO-159B	59660	
C52	Capacitor, Ceramic, Monolithic: 10 pF, ± 0.5 pF, 100V	4	100-100-NPO-100J	51642	
C53	Same as C52				
C54	Same as C28				
C55	Capacitor, Ceramic, Disc: 2.2 pF, ± 1 pF, 100 V	6	8101-100-COJO-229C	59660	
C56	Capacitor, Ceramic, Monolithic: 12 pF, 5%, 100 V	4	100-100-NPO-120J	51642	
C57	Same as C30				
C58	Not Used				
C59	Same as C56				
C60	Same as C56				
C61	Same as C55				
C62	Same as C56				
C63	Not Used				
C64	Same as C30				
C65	Same as C28				
C66	Same as C51				
C67	Same as C52				
C68	Same as C52				
C69	Not Used				
C70	Same as C5				
C71	Same as C5				
C72	Same as C55				
C73	Same as C28				
C74	Capacitor, Ceramic, Disc: 3.9 pF, ± 0.25 pF, 100 V	4	8101-100-COJO-399C	59660	
C75	Same as C74				
C76	Same as C28				
C77	Same as C28				
C78	Capacitor, Ceramic, Monolithic: 5.6 pF, .25 pF, 100 V	4	8101-100-COHO-569D	59660	
C79	Capacitor, Ceramic, Disc: 6.8 pF, .25 pF, 100 V	2	8101-100-COHO-689D	59660	
C80	Same as C55				
C81	Same as C78				

REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C82	Same as C78				
C83	Same as C28				
C84	Same as C78				
C85	Same as C55				
C86	Same as C79				
C87	Same as C28				
C88	Same as C28				
C89	Same as C74				
C90	Same as C74				
C91	Same as C55				
C92	Same as C5				
C93					
Thru C96	Same as C2				
C97	Capacitor, Ceramic, Disc: 1000 pF, 500 V	5	5925U102P	91984	
C98					
Thru C101	Same as C97				
CR1	Diode	16	5082-3188	28480	
CR2					
Thru CR16	Same as CR1				
J1	Connector, Receptacle	2	1009-7511-000	19505	
J2	Same as J1				
L1	Coil, Fixed: 47 μ H, 10%	10	1025-60	99800	
L2					
Thru L4	Same as L1				
L5	Coil, Variable: .33 μ H	2	6740-7	04213	
L6	Coil, Variable: 2.8 μ H	2	7067	04213	
L7	Coil, Variable: .58 μ H	1	7066	04213	
L8	Same as L6				
L9	Same as L5				
L10	Same as L1				
L11	Same as L1				
L12	Coil, Variable: 22 mH	2	6740-9	04213	
L13	Coil, Variable: 15 mH	2	6740-8	04213	
L14	Coil, Variable: 6.8 mH	1	6740-12	04213	
L15	Same as L13				
L16	Same as L12				
L17	Same as L1				
L18	Same as L1				
L19	Coil, Variable: .323 μ H	2	6807	04213	

REF DESIG PREFIX A3A4

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
L20	Coil, Variable: .232 μ H	2	6808	04213	
L21	Coil, Variable: 0.522 μ H	1	6809	04213	
L22	Same as L20				
L23	Same as L19				
L24	Same as L1				
L25	Same as L1				
L26	Coil, Variable: 0.202 μ H	2	6810	04213	
L27	Coil, Variable	2	7221	04213	
L28	Coil, Variable: 0.326 μ H	1	7220	04213	
L29	Same as L27				
L30	Same as L26				
R1	Resistor, Fixed, Film: 2.2 k Ω , 5%, 1/8 W	4	CF1/8-2.2K/J	09021	
R2 Thru R4	Same as R1				
R5	Resistor, Fixed, Film: 1 k Ω , 5%, 1/8 W	8	CF1/8-1.0K/J	09021	
R6 Thru R12	Same as R5				
R13	Resistor Network: 100 Ω , 2%, .3 W	1	4308R-102-101	80294	

