WJ-861X RECEIVER

APPENDIX G

WJ-861X SINGLE SIDEBAND DEMODULATOR OPTION

WATKINS-JOHNSON COMPANY
700 QUINCE ORCHARD ROAD
GAITHERSBURG, MARYLAND 20878-1794

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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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TYPE 794188-1 SINGLE SIDEBAND DEMODULATOR (SSB) OPTION

G.1 GENERAL DESCRIPTION

The Type 794188-1 Single Sideband (SSB) Demodulator option installs in place of the SSB Bypass subassembly (A3A14) on the RF/IF Motherboard of the receiver. This subassembly utilizes the 32.1 and 10.7 MHz signals, provided by the receiver's SSB BFO subassembly, to demodulate Upper and Lower sideband signals. For optimum performance, it is suggested that #1 IF bandwidth slot contain an IF bandwidth of 10 kHz or less (6 kHz is preferred). Whenever the receiver is placed into the SSB detection mode, the receiver automatically switches to IF bandwidth #1 and the remaining bandwidth pushbuttons are deactivated.

Selection of the SSB mode of operation is accomplished by depressing the SSB pushbutton. This places the receiver into either the Upper or Lower sideband mode and activates IF bandwidth #1. Each additional depression of the SSB pushbutton causes the detection mode to be switched between USB and LSB. A letter "U" for upper Sideband or an "L" for lower Sideband illuminates on the digital display indicating which SSB mode is active. Selecting any other detection mode pushbutton deactivates SSB and activates the newly selected mode.

G.2 INSTALLATION

Installing the SSB option into the standard receiver is performed as follows:

1. Remove the receiver top cover.
2. Remove the Type 798074-1 SSB Bypass from the A3A14 slot on the RF/IF Motherboard and replace with the Type 794188-1 SSB Demodulator.
3. Remove the blank pushbutton from right DETECT MODE pushbutton bank on the receiver front panel and replace with the supplied SSB button.
4. Reconfigure switch A5A2S1 on the Synthesizer Interface to permit the receiver software to recognize the presence of the SSB Demodulator. This is accomplished by placing switch position #5 of A5A2S1 into the open position.

G.3 CIRCUIT DESCRIPTION

G.3.1 TYPE 794188-1 SSB DEMODULATOR (A3A14)

The reference designation for this subassembly is A3A14. Refer to **Figure G-2** for the Type 794188-1 SSB Demodulator schematic diagram.

The 21.4 MHz SSB signal enters this subassembly at connector pin 55 and is coupled, via C4, to U1. U1 splits the signal and applies it to the 21.4 MHz IF Output, via the 3 dB pad

formed by R3, R4 and R5 and also applies the signal to modulator U2. The signal is coupled to the signal input of U2 via the RC coupling network comprised of C7 and R9.

Modulator U2 mixes the 21.4 MHz input signal with a 32.1 MHz signal from the SSB BFO providing an output that consists of the SSB signal impressed on a 10.7 MHz carrier. Resistors R6 and R7 provide bias at the inputs of U2 and R11 controls gain. R8, R9 and R10 set the input impedance to 50 ohms. Coils L1 and L2 provide the collector loads for the output transistors contained in U2. The output signal taken from U2 pin 6 is developed across L2 and is applied to amplifier Q1, via the 10.7 MHz tuned circuit comprised of L3, C11 and C13. Transistor Q1 amplifies the 10.7 MHz signal and applies the amplified signal to the USB and LSB filters at its output. Resistors R14 and R15 provide bias for gate #1 of Q1 (pin 3) and R17 and R18 provide bias for gate #2 (pin 2). R16 is installed to suppress parasitics. The output of Q1 is developed across L5 and is coupled, via C16 and R21, to the USB/LSB selection circuitry.

Selection of the upper or lower sideband is controlled by the PIN diode switching network comprised of CR1 through CR4 and switch driver U3A. This network applies the signal through FL1, when upper sideband is selected, or through FL2 when lower sideband is selected. The control input, at connector pin 15, is provided by the Digital Control Section of the receiver. When Upper Sideband is selected, the control input is at logic "1," causing the output of U3A to switch to +15 V. This output places +15 V at the anodes of CR1 and CR3, causing them to be forward biased. CR2 and CR4 receive the +15 V output of U3A at their cathodes, causing them to be reverse biased. The signal then passes through the forward biased CR1 to the USB filter FL1. FL1 permits signals above 10.7 MHz to pass, causing only the Upper Sideband signal to appear at its output. The Upper Sideband signal is then coupled across C22 and through CR3 to the next stage. When Lower Sideband is selected, the control input (pin 15) is at logic "0," causing the output U3A to switch to -15 V. At this time, CR2 and CR4 are forward biased, causing the signal to be applied to FL2.

The output of FL1 or FL2 is then coupled across transformer T1 to U5. Integrated circuit U5 functions as the SSB Demodulator. This circuit mixes the modulated 10.7 MHz SSB signal with a fixed 10.7 MHz signal, provided by the SSB BFO, producing the video output. Resistors R31 and R32 provide bias at the inputs of U5 and R38 and R39 act as collector loads for the output transistors within U5. R33 provides a 50 ohm load for the 10.7 MHz signal provided by the SSB BFO. The gain of U5 is set by R36. The output of U5 is developed across R39 and is applied to the output amplifier (U3B) via the low pass filter comprised of R41, C35 and C36. This filter strips any residual 10.7 MHz component from the video signal. The video signal is amplified by U3B and is then applied, via R46, to output pin 11. The gain of U3B is set by the voltage divider formed by R43, R44 and R45.

The SSB Demodulator provides an SSB Detector output at connector pin 1 that is utilized by the receiver generating AGC voltages when in the SSB mode. This output is generated by amplifier U4 and the detector circuitry comprised of CR6, CR5 C28 and R30. A sample of the output of the SSB filters, FL1 or FL2, is coupled to U4, via C25. This signal is amplified and applied to the detector. The detector then rectifies the signal providing a DC level proportional to the strength of the received signal. The output at pin 1 varies from 0 when no signal is present, to -1.25 Vdc, when the signal level is at -10 dBm (with AGC on).

G.4 ALIGNMENT PROCEDURES

1. Connect the HP-8640B Signal Generator to the Antenna 1 input of the receiver and connect the HP-400EL AC Voltmeter and 93 ohm load to the switched Video Output (J4).

2. Set the receiver to 25.0000 MHz, AGC ON, and select the LSB detection mode.

3. Set the signal generator to produce a 24.9990 MHz CW signal, at an output level of -50 dBm.

4. Adjust C13, on the Type 794188-1 SSB Demodulator (A3A14), for the maximum output level, as indicated on the AC voltmeter.

5. Adjust R44, on the SSB Demodulator, to produce an output level of .235 V rms, as indicated on the AC voltmeter.

G.5 PARTS LIST

G.5.1 TYPE 794188-1 SSB DEMODULATOR

REF DESIG PREFIX **A3A14**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision C				
C1	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56289	
C2	Same as C1				
C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	24	34453-1	14632	
C4 Thru C9	Same as C3				
C10	Capacitor, Ceramic, Disc: 1000 pF, 5%, 100 V	5	8121-100COGO-102J	59660	
C11	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C12	Not Used				
C13	Capacitor, Variable, Ceramic: 2.5-11 pF, 350 V	1	538-006B2.5-11	59660	
C14	Same as C10				
C15	Same as C3				
C16	Same as C3				
C17	Same as C10				
C18 Thru C24	Same as C3				
C25	Same as C10				
C26	Same as C3				
C27	Same as C3				
C28	Same as C10				
C29 Thru C32	Same as C3				
C33	Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V	3	C023B101E502M	56289	
C34	Same as C3				
C35	Same as C33				
C36	Same as C33				
C37	Same as C3				
C38	Capacitor, Ceramic, Disc: .1 µF, 20%, 50 V	1	8131-050-651-105M	59660	
CR1	Diode	4	5082-3188	28480	
CR2 Thru CR4	Same as CR1				
CR5	Diode	2	5082-2800	28480	
CR6	Same as CR5				
FL1	Filter: Upper Sideband	1	92217	14632	
FL2	Filter: Lower Sideband	1	92218	14632	
L1	Coil, Fixed: 100 µH, 10%	2	1025-68	99800	
L2	Same as L1				
L3	Coil, Fixed: 15 µH, 10%	1	1025-48	99800	
L4	Coil, Fixed: 3.9 µH, 10%	1	1025-34	99800	
L5	Coil, Fixed: 27 µH, 10%	1	1025-54	99800	
Q1	Transistor	1	3N211	80131	

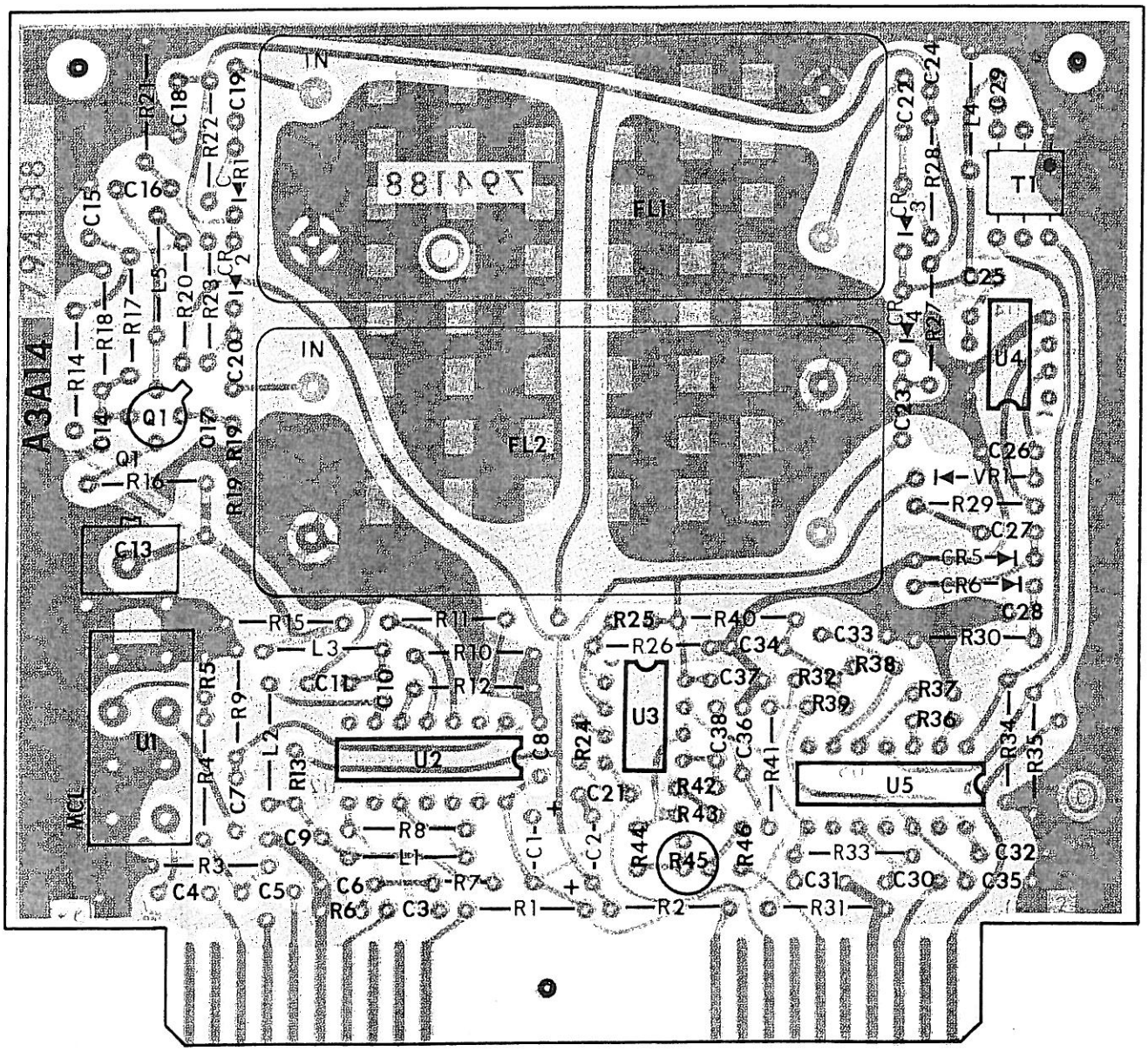

Figure G-1. Type 794188-1 SSB Demodulator (A3A14), Location of Components

REF DESIG PREFIX **A3A14**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R1	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	2	CF 1/4-10 OHMS/J	09021	
R2	Same as R1				
R3	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	2	CF 1/4-300 OHMS/J	09021	
R4	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1	CF 1/4-18 OHMS/J	09021	
R5	Same as R3				
R6	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	2	CF 1/4 -1.8K/J	09021	
R7	Same as R6				
R8	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W	4	RCR07G510JS	81349	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, Film: 620Ω, 5%, 1/4 W	1	CF 1/4-620 OHMS/J	09021	
R12	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	2	CF 1/4-12K/J	09021	
R13	Resistor, Fixed, Film: 22Ω, 5%, 1/4 W	3	CF 1/4-22 OHMS/J	09021	
R14	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF 1/4-68K/J	09021	
R15	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF 1/4-10K/J	09021	
R16	Resistor, Fixed, Film: 47Ω, 5%, 1/4 W	2	CF 1/4-47 OHMS/J	09021	
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF 1/4-100K/J	09021	
R18	Resistor, Fixed, Film: 56 kΩ, 5%, 1/4 W	1	CF 1/4-56K/J	09021	
R19	Resistor, Fixed, Film: 120Ω, 5%, 1/4 W	1	CF 1/4-120 OHMS/J	09021	
R20	Same as R13				
R21	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W	1	CF 1/4-200 OHMS/J	09021	
R22	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/4 W	5	RCR07G562JS	81349	
R23	Same as R22				
R24	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CF 1/4-120K/J	09021	
R25	Resistor, Fixed, Film: 270 kΩ, 5%, 1/4 W	1	CF 1/4-270K/J	09021	
R26	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF 1/4-47K/J	09021	
R27	Same as R22				
R28	Same as R22				
R29	Same as R16				
R30	Same as R17				
R31	Resistor, Fixed, Film: 1.1 kΩ, 5%, 1/4 W	1	CF 1/4-1.1K/J	09021	
R32	Reisitor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	1	CF 1/4-2.7K/J	09021	
R33	Same as R8				
R34	Resistor, Fixed, Film: 3.0 kΩ, 5%, 1/4 W	2	CF 1/4-3.0K/J	09021	
R35	Same as R34				
R36	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF 1/4-1.0K/J	09021	
R37	Same as R12				
R38	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	2	CF 1/4-3.3K/J	09021	
R39	Same as R38				
R40	Same as R13				
R41	Same as R36				

REF DESIG PREFIX A3A14

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R42	Resistor, Fixed, Film: 20 kΩ, 5%, 1/4 W	2	CF 1/4-20K/J	09021	
R43	Same as R22				
R44	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	1	CF 1/4-22K/J	09021	
R45	Resistor, Trimmer, Film: 20 kΩ, 10%, 1/2 W	1	62PR20K	73138	
R46	Resistor, Fixed, Film: 470Ω, 5%, 1/4 W	1	CF 1/4-470 OHMS/J	09021	
T1	Transformer	1	T9-1	15542	
U1	Power Divider	1	PSC2-1	15542	
U2	Integrated Circuit	2	MC1496P	04713	
U3	Integrated Circuit	1	MC1458N	18324	
U4	Integrated Circuit	1	SL1611C/DP	52648	
U5	Same as U2				
VR1	Diode Zener: 8.2 V	1	1N756A	80131	