WJ-861X RECEIVER

APPENDIX O

WJ-861X VARIABLE BEAT-FREQUENCY-OSCILLATOR OPTION

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November 1990

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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WJ-861X VARIABLE BEAT-FREQUENCY-OSCILLATOR (VBFO) OPTION

O.1 GENERAL DESCRIPTION

The Variable Beat-Frequency-Oscillator (VBFO) option installs in place of the standard BFO subassembly, (A4A5) and provides an operator controllable BFO frequency, during CW operation. The frequency is varied by ±7.99 kHz about a 21.4 MHz center, in 10 Hz steps. In addition to the BFO output, 32.1 MHz and 10.7 MHz outputs are provided, for utilization with the Single-Sideband option, SSB, when incorporated.

When the receiver is set to CW operation, the VBFO subassembly is activated. Depressing the BFO TUN pushbutton permits the BFO frequency to be varied, utilizing the receiver tuning knob. At this time, the BFO offset frequency is displayed in place of the receiver frequency display. By depressing any of the tuning rate pushbuttons, the receiver frequency display and tuning knob are restored to their primary function, but the BFO frequency remains at the selected offset.

O.2 INSTALLATION

Installation of the VBFO option consist of inserting the Type 798029-1 Variable BFO Option into the A4A5 slot on the synthesizer motherboard. A wire-wrap connection must be made from pin 55 of the reference generator connector (A4XA1) to pin 52 of connector A4XA5, to supply a 25 kHz clock to the Variable BFO subassembly. The BFO TUN pushbutton, supplied with the VBFO option, replaces the blank button directly to the right of the memory select pushbuttons, on the receiver front panel.

O.3 CIRCUIT DESCRIPTION

The option designation for this subassembly is VBFO. Refer to **Figure O-3** for the Type 798029-1 Variable BFO option schematic diagram.

This option installs in the XA5 slot of the Synthesizer motherboard (A4) in place of the standard BFO subassembly. It provides a BFO frequency to the AM Demodulator when CW detection mode is selected. This output frequency is operator variable by 7.99 kHz above or below the 21.4 MHz center frequency. A fixed 32.1 MHz and a variable 10.7 MHz ±4 kHz is also available for utilization when the SSB option is in the receiver.

Two input frequencies originating in the Reference Generator (A4A1) are applied to the Type 798029-1 Variable BFO option. The 10.7 MHz reference frequency appearing at connector pin 53 is applied to oscillator subassembly, Part 390343-1, where it is tripled and output at connector pin 12 as a fixed 32.1 MHz signal. This signal is utilized to demodulate single sideband signals when the SSB option is installed in the receiver. The 25 kHz reference frequency appears at connector pin 52 and is divided by a factor of 25 to produce a 1 kHz reference utilized in producing the variable BFO output.

The variable beat frequency oscillator output is generated utilizing fractional frequency synthesis techniques. It utilizes a voltage controlled oscillator which is capable of producing an output frequency of 21.4 MHz ±7.99 kHz that is variable in 10 Hz steps. The output frequency is also divided by 2 providing a variable 10.7 MHz frequency to be utilized with the SSB option. Control over the output frequency is maintained via three BCD digits and a minus (pin 13) control line from the Digital Control Section. These BCD digits control the amount of frequency offset from the 21.4 MHz center frequency and the minus line determines whether the frequency is offset above or below the center frequency. A logic "1" on the minus control line causes the 21.4 MHz output to be offset below 21.4 MHz by the value of the BCD digits at the TH, H and T inputs of the subassembly. A logic "0" causes the offset to be above 21.4 MHz. CW and SSB control inputs (pin 49 and pin 51, respectively) activate the 21.4 MHz output when the CW detection mode is selected or the 10.7 MHz output when Single Sideband detection mode is selected.

O.4 ALIGNMENT PROCEDURE

Alignment of the Type 798029-1 Variable BFO consists of setting the gain and the frequency offset of the VBFO output circuits as follows:

1) Connect a DVM to terminal E20 of the Part 390343-1 Oscillators subassembly (A4A5A1) and set the meter to measure dc voltage.

2) Select CW mode of operation and activate the VBFO tuning function. Set the BFO offset to 0.00 kHz, utilizing the tuning knob.

3) Adjust capacitor C7 to obtain a reading of between +2 Vdc and +4 Vdc at testpoint E20.

4) While monitoring the voltage at E20, set the offset frequency to +7.99 kHz and then to -7.99 kHz. Observe the dc voltage at each tuning extreme. The DVM should indicate approximately +8 Vdc at the positive extreme and approximately -2 Vdc at the negative extreme.

5) Remove the DVM from E20 and connect an oscilloscope. Set the oscilloscope for ac coupling at an input sensitivity sufficient to view the ac ripple present at E20.

6) Tune VBFO between approximately 200 - 400 Hz.

7) Adjust R7 for minimum ripple as observed on oscilloscope.

8) Tune VBFO between approximately 200 - 400 Hz.

9) Adjust R3 for minimum ripple as observed on oscilloscope.

If the SSB option is installed, proceed as follows:

10) Select either Upper or Lower sideband operation.

11) Connect an RF millivoltmeter between connect pins 12 (signal) and ground. Adjust C18 and C20 for maximum indication on the millivoltmeter (typically -10 dBm).

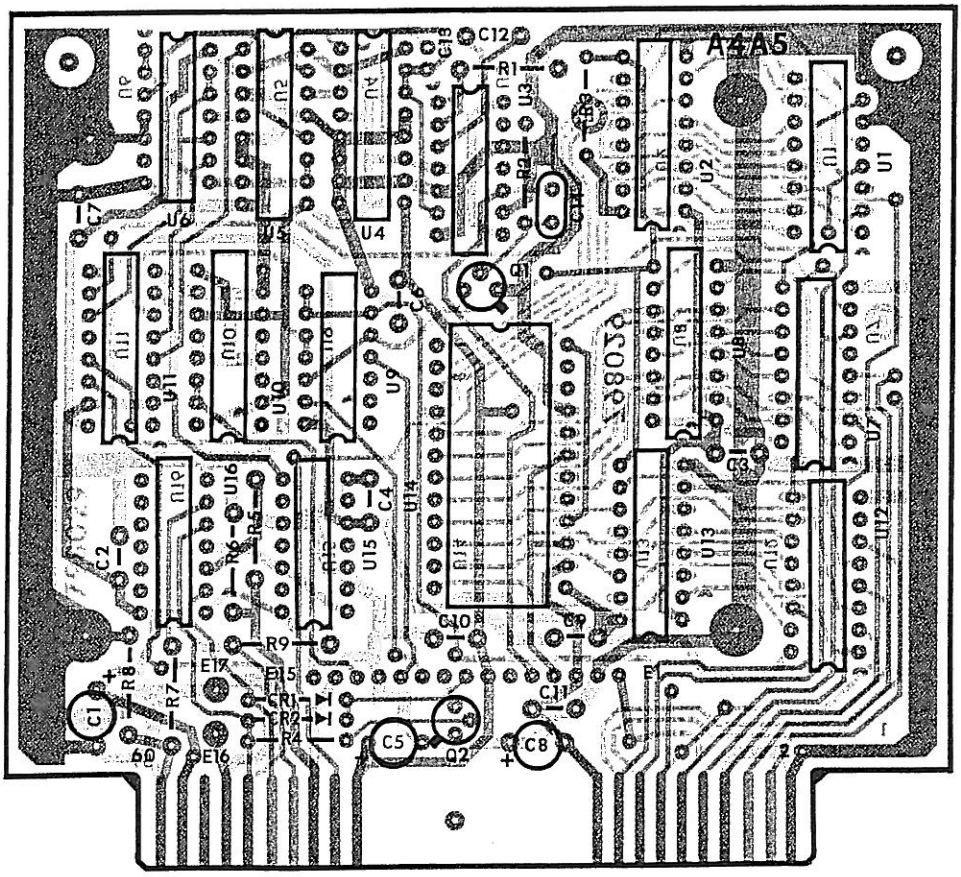

Figure O-1. Type 798029-1, Variable BFO (A4A5) (Option O - VBFO), Location of Components

O.4.1 TYPE 798029-1 VARIABLE BFO OPTION

REF DESIG PREFIX A4A5

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision E				
A1	Oscillators Assembly	1	390343-1	14632	
C1	Capacitor, Electrolytic, Tantalum: 22 µF, 20%, 10 V	1	196D226X0010JE3	56289	
C2	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	5	34475-1	14632	
C3	Same as C2				
C4	Same as C2				
C5	Capacitor, Electrolytic, Tantalum: 4.7 µF, 20%, 35 V	2	196D475X0035JE3	56289	
C6	Same as C2				
C7	Same as C2				
C8	Same as C5				
C9	Capacitor, Ceramic, Disc: .47 µF, 20%, 50 V	3	34452-1	14632	
C10	Same as C9				
C11	Same as C9				
C12	Capacitor, Mica, Dipped: 1000 pF, 5%, 100 V	1	DM15-102J	72136	
C13	Capacitor, Ceramic, Monolithic: 470 pF, 5%, 100 V	1	8121-100C0G0-471J	59660	
C14	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
CR1	Diode	2	1N4446	80131	
CR2	Same as CR1				
Q1	Transistor	2	2N2222A	80131	
Q2	Same as Q1				
R1	Resistor, Fixed, Film: 2 kΩ, 5%, 1/4 W	1	CF1/4-2K/J	09021	
R2	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R3	Resistor, Fixed, Film: 2.2 kΩ, 5%, 1/4 W	1	CF1/4-2.2K/J	09021	
R4	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	1	CF1/4-100K/J	09021	
R5	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	1	CF1/4-300 OHMS/J	09021	
R6	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R7	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R8	Resistor, Fixed, Film: 68Ω, 5%, 1/4 W	1	CF1/4-68 OHMS/J	09021	
R9	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
U1	Integrated Circuit	3	MC14560BCP	04713	
U2	Integrated Circuit	3	MC74C175N	27014	
U3	Integrated Circuit	1	CD4047BE	02735	
U4	Integrated Circuit	3	CD40102BE	02735	
U5	Same as U4				
U6	Integrated Circuit	1	MM74C00N	27014	
U7	Same as U1				
U8	Same as U2				
U9	Integrated Circuit	1	SN74LS02N	01295	
U10	Same as U4				
U11	Integrated Circuit	1	CD40109BE	02735	

REF DESIG PREFIX **A4A5**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U12	Same as U1				
U13	Same as U2				
U14	Integrated Circuit	1	ADDAC 80CCD-V	27014	
U15	Integrated Circuit	1	SN74LS90N	01295	
U16	Integrated Circuit	1	SN74LS00N	01295	

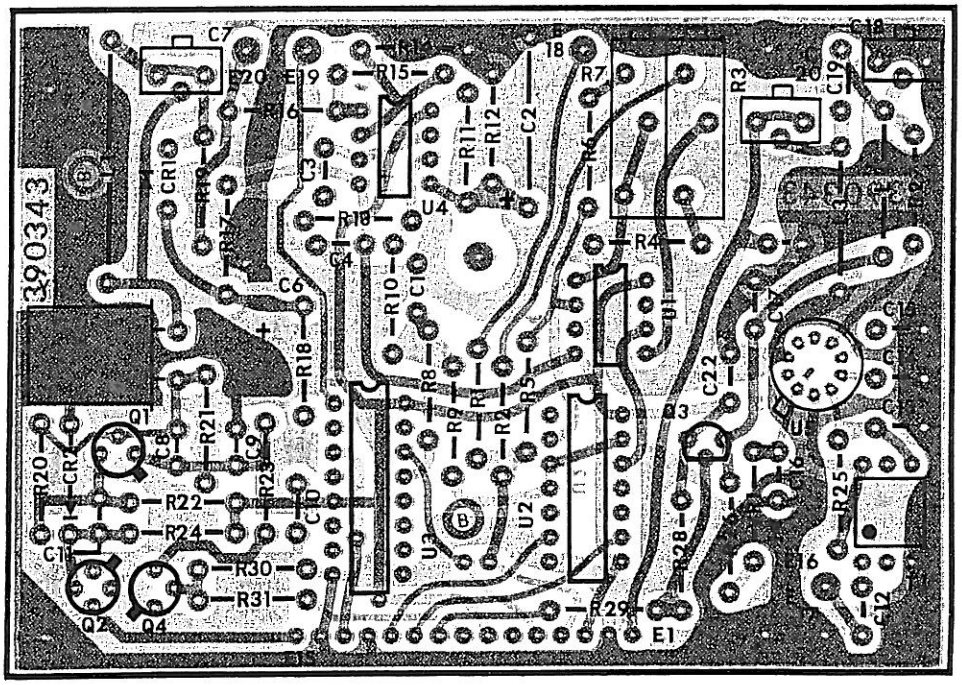

Figure O-2. Part 390343-1, Oscillators (A4A5A1), Location of Components

O.4.1.1 Part 390343-1 Oscillators Assembly

REF DESIG PREFIX A4A5A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
	Revision D				
C1	Capacitor, Ceramic, Disc: 0.47 µF, 20%, 50 V	2	34452-1	14632	
C2	Capacitor, Electrolytic, Tantalum: 15 µF, 10%, 20 V	1	CS13BE156K	81349	
C3	Same as C1				
C4	Capacitor, Ceramic, Disc: 0.1 µF, 20%, 50 V	3	34475-1	14632	
C5	Not Used				
C6	Capacitor, Ceramic, Chip: 1000 pF, 20%, 50 V	1	ATC700B102MP50X	29990	
C7	Capacitor, Variable, Ceramic: 2.5-9 pF, 100 V	1	518-002A2.5-9	59660	
C8	Capacitor, Mica, Dipped: 100 pF, 2%, 500 V	1	CM04FD101G03	99800	
C9	Capacitor, Mica, Dipped: 47 pF, 2%, 500 V	1	CM04ED470G03	81349	
C10	Same as C4				
C11	Capacitor, Ceramic, Disc: 1000 pF, 500 V	1	B-GP1000PFP	91418	
C12	Capacitor, Ceramic, Disc: 0.01 µF, 20%, 50 V	6	34453-1	14632	
C13 Thru C17	Same as C12				
C18	Capacitor, Variable, Ceramic: 7-40 pF, 25 V	2	518-002G7-40	59660	
C19	Capacitor, Ceramic, Tubular: 3.3 pF ±0.25 pF, 500 V	1	301-000COJ0-339C	59660	
C20	Same as C18				
C21	Not Used				
C22	Same as C4				
CR1	Diode, Varicap	1	KV3901	52673	
CR2	Diode	1	1N4446	80131	
L1	Coil, Fixed: 2.7 µH, 10%	1	210-11	99848	
L2	Coil, Fixed, Molded: 0.68 µH, 10%	2	1537-08	99800	
L3	Same as L2				
Q1	Transistor	2	2N222A	80131	
Q2	Transistor	1	2N3478	80131	
Q3	Transistor	1	2N3906	80131	
Q4	Same as Q1				
R1	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	4	CF1/4-10K/J	09021	
R2	Resistor, Fixed, Film: 8.2 kΩ, 5%, 1/4 W	2	CF1/4-8.2K/J	09021	
R3	Resistor, Variable, Film: 1 kΩ, 10%, 3/4 W	2	89PR1K	73138	
R4	Resistor, Fixed, Film: 10Ω, 5%, 1/4 W	1	CF1/4-10 OHMS/J	09021	
R5	Resistor, Fixed, Film: 12 kΩ, 5%, 1/4 W	1	CF1/4-12K/J	09021	
R6	Resistor, Fixed, Film: 270Ω, 5%, 1/4 W	1	CF1/4-270 OHMS/J	09021	
R7	Same as R3				
R8	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	3	CF1/4-1.8K/J	09021	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, Film: 22 kΩ, 5%, 1/4 W	2	CF1/4-22K/J	09021	
R12	Same as R11				
R13	Resistor, Fixed, Film: 56 kΩ, 5%, 1/4 W	1	CF1/4-56K/J	09021	

REF DESIG PREFIX **A4A5A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R14	Same as R1				
R15	Same as R1				
R16	Resistor, Fixed, Film: 33 kΩ, 5%, 1/4 W	1	CF1/4-33K/J	09021	
R17	Resistor, Fixed, Film: 10 kΩ, 5%, 1/8 W	1	CF1/8-10K/J	09021	
R18	Resistor, Fixed, Composition: 5.6 kΩ, 5%, 1/8 W	1	RCR05G562JS	81349	
R19	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF1/4-100K/J	09021	
R20	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	1	CF1/4-68K/J	09021	
R21	Same as R2				
R22	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W	1	CF1/4-200 OHMS/J	09021	
R23	Resistor, Fixed, Film: 1 kΩ, 5%, 1/4 W	1	CF1/4-1K/J	09021	
R24	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1	CF1/4-47K/J	09021	
R25	Resistor, Fixed, Film: 510Ω, 5%, 1/4 W	1	CF1/4-510 OHMS/J	09021	
R26	Resistor, Fixed, Film: 100Ω, 5%, 1/4 W	1	CF1/4-100 OHMS/J	09021	
R27	Resistor, Fixed, Film: 220Ω, 5%, 1/4 W	1	CF1/4-220 OHMS/J	09021	
R28	Same as R19				
R29	Resistor, Fixed, Film: 27 kΩ, 5%, 1/4 W	1	CF1/4-27K/J	09021	
R30	Same as R1				
R31	Resistor, Fixed, Film: 4.7 kΩ, 5%, 1/4 W	1	CF1/4-4.7K/J	09021	
T1	Transformer, RF	1	T4-1	15542	
U1	Integrated Circuit	2	MC1458N	18324	
U2	Integrated Circuit	1	DG300CJ	17856	
U3	Integrated Circuit	1	CD4046BE	02735	
U4	Same as U1				
U5	Integrated Circuit	1	CA3011	02735	
VR1	Diode, Zener: 3.3 V	1	1N746A	80131	
Y1	Crystal Quartz	1	91805-34	14632	