WJ-861X RECEIVER

APPENDIX G

WJ-861X SINGLE SIDEBAND DEMODULATOR OPTION

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

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 G

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

Revision C		TITE TOTICE I BOB DEMODULATOR	REF DESIG PREFIX A3A			
C1	1,000,000	DESCRIPTION	PER	MANUFACTURER'S		RECM VENDO
C2 Same as C1 C2 C2 C2 C2 C2 C2 C2	Ì	Revision C				
C3	C1	Capacitor, Electrolytic, Tantalum: 2.2 µF, 20%, 35 V	2	196D225X0035JE3	56200	
Cd Thru	C2		1	1002220100000000	30289	
C4	C3	Capacitor, Ceramic, Disc: .01 µF, 20%, 50 V	24	34453-1	14639	
C3			1	September 2000	14002	İ
C10 Capacitor, Ceramic, Disc: 1000 pF, 5%, 100 V C11 Capacitor, Mica, Dipped: 47 pF, 2%, 500 V Not Used Capacitor, Variable, Ceramic: 2.5-11 pF, 350 V C14 Same as C10 C15 Same as C3 C16 Same as C3 C17 Same as C10 C18 C18 C19 Same as C3 C24 Same as C3 C25 Same as C10 C26 Same as C3 C27 Same as C10 C28 Same as C3 C29 Same as C3 C30 Same as C3 C31 Same as C3 C32 Same as C3 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V C34 Same as C3 C35 Same as C3 C36 Same as C3 C37 Same as C3 C38 Capacitor, Ceramic, Disc: 1 µF, 20%, 60 V Diode C19		Same as C3	1		1	İ
C11 Capacitor, Mica, Dipped: 47 pF, 2%, 500 V 1 CM04ED470G03 81349	20mg	Capacitor, Ceramic Disc. 1000 pF 5% 100 V		0101 10000 00		
C12						
C13	C12		1	CM04ED470G03	81349	
C14	C13	0 1 0 1 1 0 1 1 0 1 0 1 0 1 0 1 0 1 0 1	1.	F20 000D0 F 11		
C16	C14		1 '	538-006B2,5-11	59660	İ
C17	C15	Same as C3			Į.	
C18 Thru C24 C25 Same as C10 C26 C26 Same as C3 C27 Same as C3 C28 C28 Same as C10 C29 Thru C32 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V Same as C3 C35 Same as C3 C36 Same as C3 C37 Same as C3 C38 C38 C39 C39 C39 C49 C50 C71 Diode C71 Diode C72 C72 C73 C73 C74 Diode C75 C76 C77 C77 C78 Diode C78 C78 C78 C78 C78 C78 C78 C78 C78 C78	C16	Same as C3		ì		
Thru C24	C17	Same as C10	1			
C24	C18		1			
C25	National Assessment	Same as C3	1			
C26 Same as C3 C27 Same as C3 C28 Same as C10 C29 Thru C32 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V Same as C3 C35 Same as C3 C36 Same as C3 C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V Diode C81 Diode C81 Diode C82 C82 C82 C84 C85 Same as C81 C86 Same as C81 C87 Same as C81 C88 Same as C81 C88 Same as C81 C89 Same as C81 C80 Same as C81 C81 Diode C81 Diode C82 Same as C81 C84 Same as C85 C85 Same as C85 C86 Same as C85 C87 Same as C81 C88 Same as C85 C89 Same as C81 C80 Same as C81 C81 Diode C82 Same as C85 C83 Same as C85 C84 Same as C85 C85 Same as C85 C86 Same as C85 C87 Same as C85 C88 Same as C85 C89 Same as C85 C80 Same as C85 C81 Same as C85 C81 Same as C85 C81 Same as C85 C82 Same as C85 C83 Same as C85 C84 Same as C85 C85 Same as C85 C86 Same as C85 C87 Same as C85 C88 Same as C85 C89 Same as C85 C89 Same as C85 C80 Same as C85 C81 Same as C85 C81 Same as C85 C81 Same as C85 C82 Same as C85 C83 Same as C85 C84 Same as C85 C85 Same as C85 C86 Same as C86 C87 Same as C86 C88 Same as C86 C89 Same as C86 C89 Same as C86 C89 Same as C86 C80 Same as C86 C81 Same as C86 C81 Same as C86 C81 Same as C86 C81 Same as C86 C81 Same as C86 C82 Same as C86 C83 Same as C86 C84 Same as C86 C85 Same as C86 C86 Same as C86 C87 Same as C86 C88 Same as C86 C89 Same as C86 C89 Same as C86 C80 Same as C86 C				Ì		
C27 Same as C3 C28 Same as C10 C29 Thru Same as C3 C32 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V 3 C023B101E502M 56289 56289			1	1		
C28 Same as C10 C29 Thru Same as C3 C32 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V 3 C023B101E502M 56289 56289 56284 Same as C3 C35 Same as C3 C36 Same as C3 C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V 1 8131-050-651-105M 59660 CR1 Diode CR2 CR2 CR2 CR4 CR4 CR4 CR4 CR4 CR5 Diode 2 5082-2800 28480 CR6 Same as CR5 FL1 Filter: Upper Sideband 1 92217 14632 F1L2 Filter: Lower Sideband 1 92218 14632 1 Coil, Fixed: 100 μH, 10% 2 Same as L1 C3 Coil, Fixed: 15 μH, 10% 1 1025-48 99800 C3 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V 1 8131-050-651-105M 59660 28480 2	*************	Company of the Compan				
C29 Thru C32 C33 Capacitor, Ceramic, Disc: 5000 pF, 20%, 100 V 3 C34 Same as C3 C35 Same as C3 C35 Same as C3 C36 C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V Diode CR1 Diode CR2 Thru CR4 CR5 Diode CR5 Diode CR6 Same as CR1 CR6 Same as CR5 FL1 Filter: Upper Sideband FL2 Filter: Lower Sideband L1 Coil, Fixed: 100 μH, 10% CR1 CR3 Coil, Fixed: 15 μH, 10% CR4 Coil, Fixed: 3.9 μH, 10% Coil, Fixed: 3.9 μH, 10% Coil, Fixed: 27 μH, 20% Coil, Fixed:		The state of the s				
Thru C32		Same as C10	ł		1 1	
C33	Thru	Same as C3		lk		
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 CR1 Diode CR2 CR2 CR2 CR4 CR5 Diode CR6 Same as CR1 CR6 Same as CR5 CL1 Filter: Upper Sideband CR1 Coil, Fixed: 100 μH, 10% CR2 CR3 CR3 CR4 CR5 CR5 CR6 CR6 CR6 CR6 CR7 CR7 CR7 CR8 CR8 CR8 CR8 CR8 CR8 CR8 CR8 CR8 CR8		Capacitor, Ceramic, Disc: 5000 nF 20% 100 V		COSSESSES		I
C35 Same as C33 C36 Same as C3 C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V CR1 Diode CR2 CR2 CR2 CR4 CR5 CR6 Same as CR1 CR6 Same as CR5 FL1 Filter: Upper Sideband FL2 Filter: Lower Sideband CR1 Coil, Fixed: 100 μH, 10% CR2 Same as L1 C3 Coil, Fixed: 15 μH, 10% C4 Coil, Fixed: 3.9 μH, 10% C5 Coil, Fixed: 27 μH, 10% C6 Coil, Fixed: 27 μH, 10% C7 Coil,	C34		J	CUZSBIUIESUZM	56289	1
C36 Same as C33 C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V	22					
C37 Same as C3 C38 Capacitor, Ceramic, Disc: .1 μF, 20%, 50 V Diode CR1 Diode CR2 Thru Same as CR1 CR4 CR5 Diode CR6 Same as CR5 FL1 Filter: Upper Sideband FL2 Filter: Lower Sideband CR1 Coil, Fixed: 100 μH, 10% CR2 Same as L1 C3 Coil, Fixed: 15 μH, 10% C4 Coil, Fixed: 27 μH, 10% C5 Coil, Fixed: 27 μH, 10% C6 Coil, Fixed: 27 μH, 10% C7 Coil, Fixed: 27 μH, 20% C7 Coil,						
C38						1
CR1 Diode						
CR2 Thru CR4 CR5 Diode CR6 Same as CR5 FL1 Filter: Upper Sideband FL2 Filter: Lower Sideband I 92217 I 4632 I 92218 I 4632 I 025-68 Same as L1 Goil, Fixed: 15 µH, 10% I 1025-48 I 99800 Coil, Fixed: 3.9 µH, 10% I 1025-34 I 1025-54 I 10	117160010			100-2002	59660	I
Thru Same as CR1 CR4 Diode 2 5082-2800 28480 CR6 Same as CR5 2 5082-2800 28480 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 1 1025-48 99800 L3 Coil, Fixed: 15 μH, 10% 1 1025-34 99800 L4 Coil, Fixed: 27 μH, 10% 1 1025-54 99800 L5 Coil, Fixed: 27 μH, 10% 1 1025-54 99800	1	Diode	4	5082-3188	28480	ĺ
Same as CR5 2 3082-2800 28480	hru	Same as CR1				-
CR6 Same as CR5 FL1 Filter: Upper Sideband FL2 Filter: Lower Sideband 1 92217 14632 1 92218 1 14632 1 92218 1 14632 2 1025-68 99800 2 Same as L1 Coil, Fixed: 15 μH, 10% 1 1025-48 1 99800 2 Coil, Fixed: 3.9 μH, 10% 1 1025-34 99800 2 Transister	R5	Diode	2	5082-2800	20400	1
FL2 Filter: Lower Sideband 1 92218 14632 100il, Fixed: 100 µH, 10% 2 1025-68 99800 1025-68 99800 1025-48 99800 1025-34 99800 102	R6	Same as CR5		1	40480	
FL2 Filter: Lower Sideband 1 92218 14632 99800 Same as L1 Coil, Fixed: 15 μH, 10% 1 1025-48 99800 Coil, Fixed: 3.9 μH, 10% 1 1025-34 99800 Transistor	L1	Filter: Upper Sideband	1	92217	14620	
Coil, Fixed: 100 μH, 10% Same as L1 Coil, Fixed: 15 μH, 10% Coil, Fixed: 3.9 μH, 10% Coil, Fixed: 3.9 μH, 10% Coil, Fixed: 27 μH, 10% Transistor	L2	Filter: Lower Sideband	1 1	1	443.0 40	
22 Same as L1 3 Coil, Fixed: 15 μH, 10% 4 Coil, Fixed: 3.9 μH, 10% 5 Coil, Fixed: 27 μH, 10% 1 1025-34 99800 1 1025-54 99800	1	Coil, Fixed: 100 µH, 10%	1 1			
4 Coil, Fixed: 3.9 μH, 10% 1 1025-34 99800 99800 1 1025-54 99800 1 1025-54 99800 1 1025-54 99800 1 1 1 1025-54 99800 1 1 1 1025-54 99800 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2				22000	
4 Coil, Fixed: 3.9 μH, 10% 1 1025-34 99800 5 Coil, Fixed: 27 μH, 10% 1 1025-54 99800 99800	1	Coil, Fixed: 15 µH, 10%	1	1025-48	99800	
5 Coil, Fixed: 27 μH, 10% 1 1025-54 99800		Coil, Fixed: 3.9 µH, 10%	1 1	00000000000 to	0/300-000-000-000	
Transistor	1	Coil, Fixed: 27 µH, 10%	1			
	1	Transistor	1		80131	

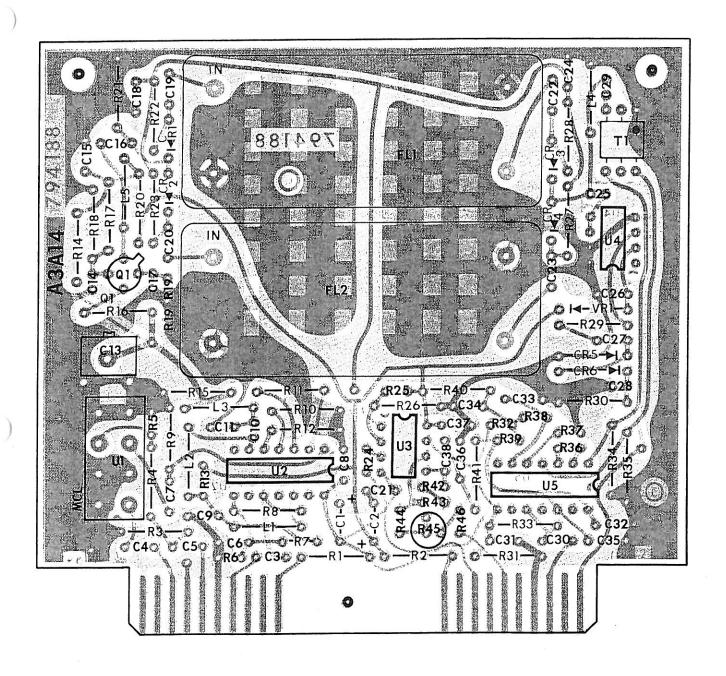


Figure G-1. Type 794188-1 SSB Demodulator (A3A14), Location of Components

REF DESIG PREFIX A3A14

				IG PREFI	X A3A1
REF DESIG	DESCRIPTION	QTY PER ASS	MANUFACTURER'S	MFR. CODE	RECM VENDO
R1 R2	Resistor, Fixed, Film: 10Ω , 5%, $1/4$ W Same as R1	2	CF 1/4-10 OHMS/J	09021	
R3	Resistor, Fixed, Film: 300Ω, 5%, 1/4 W	2	CF 1/4-300 OHMS/J		1
R4	Resistor, Fixed, Film: 18Ω, 5%, 1/4 W	1 1	CF 1/4-18 OHMS/J	09021	
R5	Same as R3	1 1	CF 1/4-16 OF MS/J	09021	
R6	Resistor, Fixed, Film: 1.8 kΩ, 5%, 1/4 W	2	CF 1/4 -1.8K/J	00001	
R7	Same as R6	1 -	01 1/4-1.0100	09021	
R8 R9	Resistor, Fixed, Composition: 51Ω, 5%, 1/4 W Same as R8	4	RCR07G510JS	81349	
R10	Same as R8		30	- 1	
R11	Resistor, Fixed, Film: 620Ω, 5%, 1/4 W				
R12	Resistor, Fixed, Film: $12 k\Omega$, 5% , $1/4$ W	1	CF 1/4-620 OHMS/J	09021	
R13	Resistor, Fixed, Film: 12 kM, 5%, 1/4 W	2	CF 1/4-12K/J	09021	
R14	Resistor, Fixed, Film: 68 kΩ, 5%, 1/4 W	3	CF 1/4-22 OHMS/J	09021	S.
R15	Resistor, Fixed, Film: 10 kΩ, 5%, 1/4 W	1	CF 1/4-68K/J	09021	
R16	Resistor, Fixed, Film: 47Ω , 5% , $1/4$ W	1	CF 1/4-10K/J	09021	
R17	Resistor, Fixed, Film: 100 kΩ, 5%, 1/4 W	2	CF 1/4-47 OHMS/J	09021	
R18	Resistor, Fixed, Film: $56 \text{ k}\Omega$, 5% , $1/4 \text{ W}$	2	CF 1/4-100K/J	09021	
R19	Resistor, Fixed, Film: 120Ω, 5%, 1/4 W	1	CF 1/4-56K/J	09021	
R20	Same as R13	1	CF 1/4-120 OHMS/J	09021	
R21	Resistor, Fixed, Film: 200Ω, 5%, 1/4 W		CD + 11 cos com as		
R22	Resistor, Fixed, Composition: 5.6 k Ω , 5%, 1/4 W	5	CF 1/4-200 OHMS/J	09021	
R23	Same as R22	°	RCR07G562JS	81349	
R24	Resistor, Fixed, Film: 120 kΩ, 5%, 1/4 W	1	CE 1/4 1907/1		
R25	Resistor, Fixed, Film: $270 \text{ k}\Omega$, 5% , $1/4 \text{ W}$	1	CF 1/4-120K/J CF 1/4-270K/J	09021	
R26	Resistor, Fixed, Film: 47 kΩ, 5%, 1/4 W	1 1	CF 1/4-47K/J	09021	
R27	Same as R22	1 1	OF 1/4-4/R/3	09021	
R28	Same as R22				
R29	Same as R16				1
R30	Same as R17		I		
231	Resistor, Fixed, Film: 1.1 kΩ, 5%, 1/4 W	1	CF 1/4-1.1K/J	22224	
R32	Reisitor, Fixed, Film: 2.7 kΩ, 5%, 1/4 W	1	CF 1/4-2.7K/J	09021	1
233	Same as R8	1 1	GF 1/4-2./ K/J	09021	1
R34	Resistor, Fixed, Film: $3.0 \text{ k}\Omega$, 5%, 1/4 W	2	CF 1/4-3.0K/J	00001	l
135	Same as R34	1 1	01 1/1 0.0100	09021	ı
236	Resistor, Fixed, Film: 1.0 kΩ, 5%, 1/4 W	2	CF 1/4-1.0K/J	00001	
	Same as R12	"		09021	
38	Resistor, Fixed, Film: 3.3 kΩ, 5%, 1/4 W	2	CF 1/4-3,3K/J	09021	
	Same as R38	1 - 1		09021	
40	Same as R13				
41	Same as R36			į	

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		ri e		
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	Т9-1	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	

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