

INSTRUCTION SUPPLEMENT

WJ-8718/COR

FOR



WATKINS-JOHNSON

INSTRUCTION SUPPLEMENT
WJ-8718/COR
FOR
CARRIER OPERATED RELAY

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This equipment employs dangerous voltages which may be fatal if contacted. Exercise extreme caution in working with this equipment with any of the protective covers removed.

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1.1 GENERAL

This section describes the WJ-8718/COR (Carrier Operated Relay) Option used with the WJ-8718 HF Receiver. The COR Option, illustrated schematically in Figure 1-7, consists of a Type 796042 COR Amplifier/Switch, (COR-A1) terminal board (COR-TB1), Type 796044 Manual Tuning Module (COR-A2), and associated interface cable assemblies. Refer to the circuit description of the Type 78112 AGC (A4A6) in the WJ-8718 HF Receiver Instruction Manual for further information regarding the AGC input to the COR Option.

1.2 FUNCTIONAL DESCRIPTION

COR SENSITIVITY adjust (Resistor COR-A2 A2R1) provides a variable bias for the turn-on threshold of amplifier U1A which, in turn, controls the operation of the rest of the COR circuitry. As a result, this allows variations in the AGC input (from summing amplifier U2B on the Type 78112 AGC Amplifier) which actually causes the turn-on and operation of the COR circuitry. A Darlington amplifier and associated circuitry prevent immediate circuit shut-down during possible short-term, negative-going AGC input fluctuations.

1.3 CIRCUIT DESCRIPTION

1.3.1 TYPE 796042 COR AMPLIFIER/SWITCH COR-A1

Amplifier U1A (Figure 1-8) is a bistable level sensor with positive feedback through resistors R4 and R5 to the noninverting input (pin 3). The AGC input to U1A (via pin 2) is the AGC signal from summing amplifier U2B on Type 78112 AGC Amplifier. The COR Sensitivity Input Control to U1A is a bias voltage established by resistor COR-A2A2R1. With no RF input to the receiver and, subsequently, no AGC signal, U1A is reversed biased by resistor COR-A2A2R1 and does not conduct. This prevents transistors Q1 and Q2, which control COR relay K1, from conducting.

A Darlington amplifier, consisting of transistors Q1 and Q2, controls relay K1. This amplifier configuration aids the delayed relay dropout feature of the COR option in the following manner. Since a Darlington amplifier requires a much smaller base current to cause conduction than a single switching transistor, hold-in capacitor C4 is small. With relay K1 connected between +15 volts and the collectors of Q1 and Q2, when Q1 and Q2 conduct, the relay coil is returned to ground and the relay transfers.

With the output of U1A (pin 1) negative, diode CR1 is reverse-biased and Q1 and Q2 are cut-off. With the Darlington pair off, the collector voltages and the positive end of C4 charge toward +15 volts through the relay coil. The negative end of C4 is returned to ground through diode CR2 and resistor R7. The voltage across C4 is now approximately 14 volts.

When the AGC input overcomes the bias voltage on U1A, U1A output goes positive, forward biasing diode CR-1 and causing Q1 and Q2 to conduct. Relay K1 energizes placing the positive end of C4 at ground. The negative end of C4 now appears to be more negative. This negative voltage reverse biases diode CR2 and C4 discharges rapidly through CR3.

When the AGC input falls below the bias voltage on U1A, U1A changes state causing Q1 and Q2 to try to turn off. The collector voltages start to increase and C4 begins to charge. The charging current through C4 flows through CR2 to the base of Q1. This forward biases Q1 and Q2, holding them in conduction and preventing relay K1 from dropping out at the first sign of an AGC input decrease. However, when the AGC input remains below the bias voltage on U1A, the charging current decreases as capacitor C4 becomes more fully charged, the bias voltage on Q1 and Q2 decreases to the point where Q1 and Q2 cease to conduct, and relay K1 drops out.

1.3.2 TYPE 796044 MANUAL TUNING MODULE COR-A2

The COR Sensitivity Input Control is a variable voltage (0 to +5V) established by resistor R1 (Figure 1-7). As described in paragraph 1.3.1, this voltage is the bias voltage for amplifier U1A which must be overcome by the AGC input to cause conduction through the COR circuitry. Indicator DS1 provides a visual indication of the conduction point, or time, of the circuit. When relay K1 transfers because of circuit conduction, the ground potential on its coil enables current flow through indicator DS1.

1.4 MAINTENANCE

1.4.1 **GENERAL** - The WJ-8718 HF Receiver and WJ-8718/COR Option have been designed to operate for extended periods of time with minimum routine maintenance. Inspection and performance tests should be conducted at regular intervals consistent with the facility's normal scheduling and after troubleshooting. No routine adjustments are required. Troubleshooting and performance tests can be most effectively carried out if the technician is thoroughly familiar with the operating instructions and circuit descriptions in both the manual for the WJ-8718 HF Receiver and this supplement.

1.4.2 **INSPECTION FOR DAMAGE OR WEAR** - Many existing or potential troubles can be detected by visual inspection. For this reason, a complete visual inspection should be performed on a regular basis and whenever the unit is inoperative. Any component showing signs of deterioration and its associated circuitry should be checked to verify proper operation. Any apparent damage due to overheating may be the result of other less apparent troubles in a circuit. As a result, the cause of overheating should be determined and corrected prior to replacing any damaged components. Inspect mechanical parts such as pin connectors, contacts, printed wiring board guides, contacts, and chassis wiring for excessive wear, looseness, misalignment, corrosion, or other deterioration.

1.4.3 **COMPONENT LOCATION** - Every component can be located using the component location diagrams found in this supplement (for the WJ-8718/COR Option) and the manual (for the WJ-8718 HF Receiver). The component location diagrams are listed according to their reference designation prefix and can be found using the List of Illustrations in the front of this supplement. For example, COR-A2 A2R1 (a 10 k ohm resistor) can be found by turning to the component location drawing for COR-A2.

1.4.4 **REPAIR**

1.4.4.1 **General** - As a result of the high density component packaging of the WJ-8718/COR Option and associated WJ-8718 HF Receiver, repair of a specific trouble or fault is limited to component, circuit board, or assembly replacement. The options available are either to make the repair locally or to return the faulty component, circuit board, or assembly

to the factory for replacement or repair. Many of the modules and components can be removed for testing and replacement while in other cases, only complete circuit boards can be removed. Since component and assembly replacement are obvious upon inspection and the level of maintenance and repair capability vary, the following procedures are presented in general terms.

1.4.4.2 Component Removal - When removing components from a printed circuit board for inspection, testing, or replacement, be careful not to damage the tracks. Use a soldering iron with a power rating of 40 watts, or less, in conjunction with either a solder sipper or wicking procedure. If using a wicking procedure, be sure to use non-corrosive soldering flux. If possible, use a heat sink to prevent component damage.

1.4.4.3 Component Installation - When installing components on a printed circuit board after inspection, testing or as a replacement part, be sure lead connection holes are clear and free of excess solder prior to installing the components. Also be sure that component leads do not catch on any track edges and cause tracks to be lifted from the board or cause any track damage. The soldering technique used should involve the same size soldering iron as in component removal, along with only enough heat and solder (60/40 rosin core) required to achieve good solder joints. If possible, use a heat sink to prevent component damage.

1.4.4.4 Post Installation/Repair Procedures - After installation or repair of the COR Option, perform the performance test procedures in paragraph 1.4.5 to verify proper COR operation.

1.4.5 COR OPTION PERFORMANCE TEST - Perform the following performance test to verify proper operation of the COR Option installed in its associated WJ-8718 HF Receiver.

1.4.5.1 Test Equipment Required - The test equipment required for COR Option performance testing is the same as that listed in Table 4-1 of the WJ-8718 HF Receiver instruction manual. Not all the equipment listed is required for the performance test.

1.4.5.2 Test Setup

1. Connect the equipment as shown in Figure 1-1.

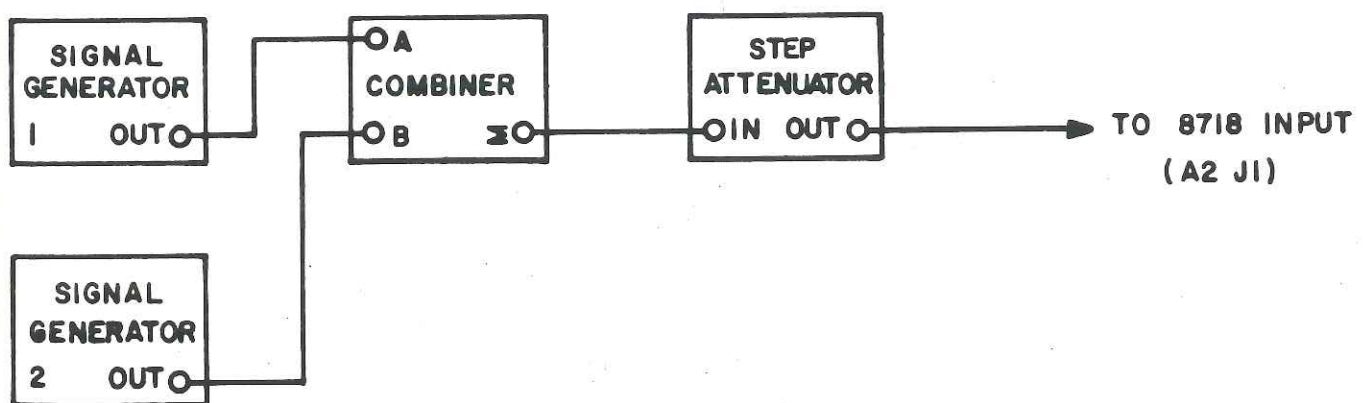


Figure 1-1. COR Option Test Setup

- Set the WJ-8718 controls and switches to the following positions:

Front Panel:

METER	SIGNAL STRENGTH
DETECTION MODE	AM
GAIN MODE	FAST AGC
IF BANDWIDTH, kHz	6
TUNING STEPS	10 Hz
TUNING FREQUENCY	15.00500 MHz
PHONE LEVEL	MID RANGE
RF GAIN	Maximum CW
BFO kHz	+0.0
POWER	ON

Rear Panel:

Clock (S2)	INT
FLISI	120V
LINE AUDIO LEVEL	MID RANGE

- Set generator 1 output frequency to 15.0050 MHz. Lock generator to this frequency.
- Set generator 1 output level to -91.5 dBm, modulated 30% at 400 Hz.
- Set generator 2 output level to -145 dBm.
- Set step attenuator to 3 dB insertion loss.
- Set variable auto transformer output to 110.0 ± 1.0 V rms as indicated by the digital multimeter.
- Set PHONE LEVEL control for 4.24 V rms as indicated by AC VTVM 1.
- Set LINE AUDIO control for 34.7 V rms as indicated by the distortion analyzer (VOLTMETER FUNCTION).

1.4.5.3

Performance Test -

- Set generator 1 output level to minimum.
- Turn COR SENSITIVITY control clockwise until relay turns off, as indicated by front panel LED.
- Increase generator 1 output level until the relay turns on, as indicated by front panel LED. Read and record receiver input level. Receiver input level does not exceed -101 dBm.

4. Turn COR SENSITIVITY control fully clockwise.
5. Increase generator 1 output level until the relay turns on, as indicated by front panel LED. Read and record receiver input level. Receiver input level should be at least -41 dBm.
6. Check relay continuity on receiver rear panel with the relay in on and off states as listed below.

	<u>Terminal</u>	<u>Terminal</u>	<u>State</u>
Relay ON	C	NC	Open
	C	NO	Short
Relay OFF	C	NC	Short
	C	NO	Open

1.5 REPLACEMENT PARTS LIST AND SCHEMATIC DIAGRAMS

The following list of manufacturers, parts lists, and schematic diagrams are a supplement for the WJ-8718 Instruction Manual and are to be used in conjunction with Sections V and VI of that manual.

<u>Mfr. Code</u>	<u>Name and Address</u>	<u>Mfr. Code</u>	<u>Name and Address</u>
75382	Kulka Electric Corporation 633-643 South Fulton Avenue Mt. Vernon, NY 10550	78277	Sigma Instruments, Inc. 170 Pearl Street South Braintree, MA 02185

WJ-8718/COR OPTION
WJ-8718 HF RECEIVER

SUPPLEMENT

L.6 TYPE WJ-8718/COR CARRIER OPERATED RELAY (WJ-8718 HF RECEIVER OPTION)

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
COR-A1	COR Amplifier, Switch	1	796042	14632	
COR-A2	Manual Tuning Module	1	796044	14632	
COR-P1	Connector, Plug: Faston	2	42236-1	00779	
COR-P2	Same as COR-P1				
COR-P3	Housing, MOD IV	4	87499-5	00779	
COR-P4	Same as COR-P3				
COR-P5	Same as COR-P3				
COR-P6	Same as COR-P3				
COR-TB1	Terminal, Board	1	411-1904-3-CFG	75382	
COR-W1	Cable Assembly	1	380053-1	14632	

WJ-8718/COR OPTION
WJ-8718 HF RECEIVER

SUPPLEMENT

1.6.1 TYPE 796042 COR AMPLIFIER

REF DESIG PREFIX COR-A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
C1	Capacitor, Ceramic, Disc: 0.1 μ F, 20%, 100 V	1	8131M100-651-104M	72982	
C2	Capacitor, Electrolytic, Tantalum: 27 μ F, 10%, 35 V	2	196D276X903TE4	56289	
C3	Same as C2				
C4*	Capacitor, Electrolytic, Tantalum: 2.2 μ F, 10%, 35 V	1	CS13BF225K	81349	56289
CR1	Diode	3	1N462A	80131	93332
CR2	Same as CR1				
CR3	Same as CR1				
K1	Relay, SPDT	1	60REIS-12DC	78277	
Q1	Transistor	2	2N2222A	80131	04713
Q2	Same as Q1				
R1	Resistor, Fixed, Composition: 100 k Ω , 5%, 1/4 W	3	RCR07G104JS	81349	01121
R2	Resistor, Fixed, Composition: 51 k Ω , 5%, 1/4 W	1	RCR07G513JS	81349	01121
R3	Same as R1				
R4	Resistor, Fixed, Composition: 1 M Ω , 5%, 1/4 W	1	RCR07G105JS	81349	01121
R5	Resistor, Fixed, Composition: 2.2 k Ω , 5%, 1/4 W	1	RCR07G222JS	81349	01121
R6	Same as R1				
R7	Resistor, Fixed, Composition: 33 k Ω , 5%, 1/4 W	1	RCR07G333JS	81349	01121
R8	Resistor, Fixed, Composition: 180 Ω , 5%, 1/4 W	1	RCR07G181JS	81349	01121
U1	Integrated Circuit	1	MC1458V	18324	

* Nominal value, final value factory selected.

WJ-8718/COR OPTION
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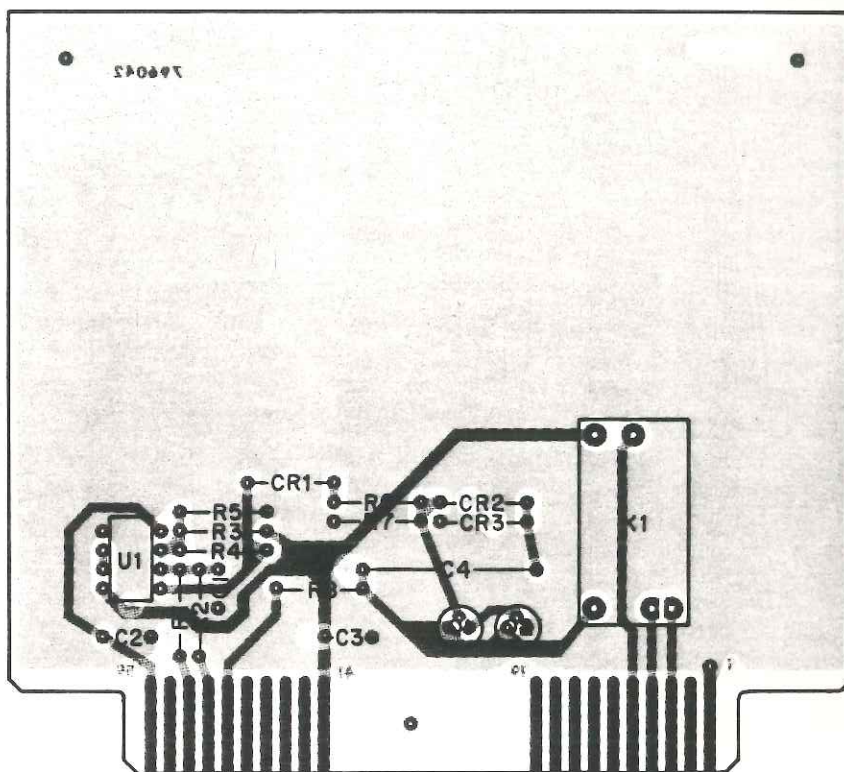


Figure 1-2. Type 796042 COR Amplifier (COR-A1), Location of Components

WJ-8718/COR OPTION
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1.6.2 TYPE 796044 MANUAL TUNING MODULE

REF DESIG PREFIX COR-A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
A1	Tuning Resolution	1	791589-2	14632	
A2	Component Board	1	280077	14632	
R1	Resistor, Variable, Composition: 10 k Ω , 10%, 1 W	1	70A3N056L103U	01121	
U1	Encoder, Assembly	1	34836-1	14632	

WJ-8718/COR OPTION
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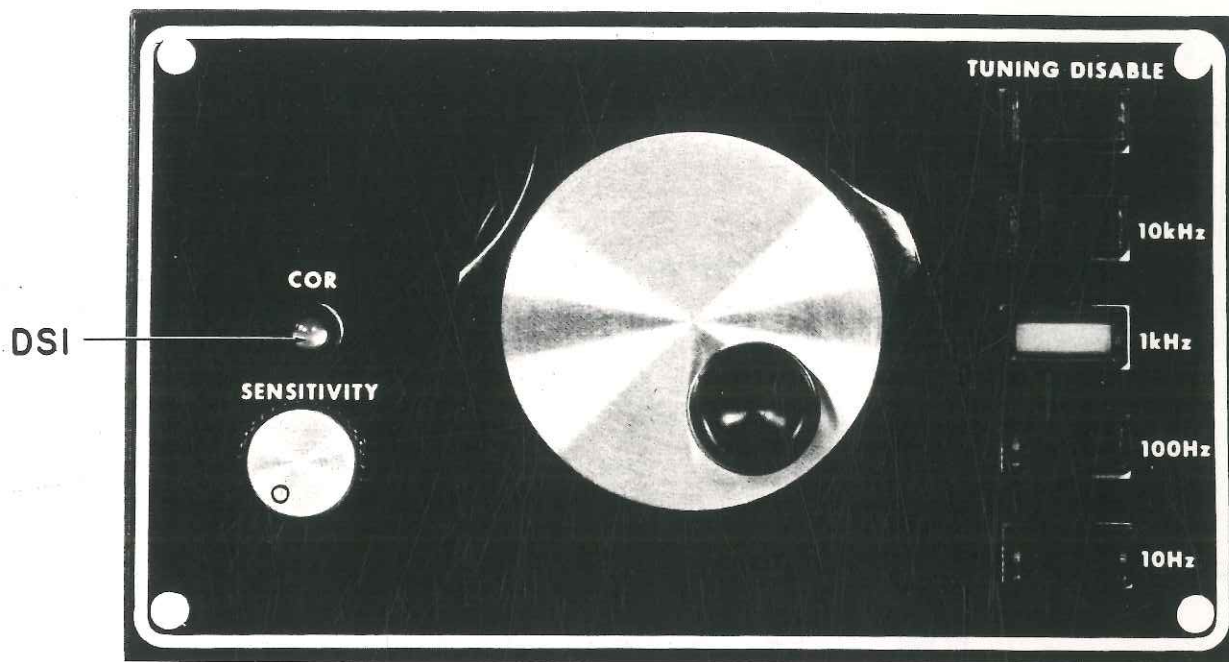


Figure 1-3. Type 796044 Manual Tuning Module (COR-A2),
Location of Components, Front View

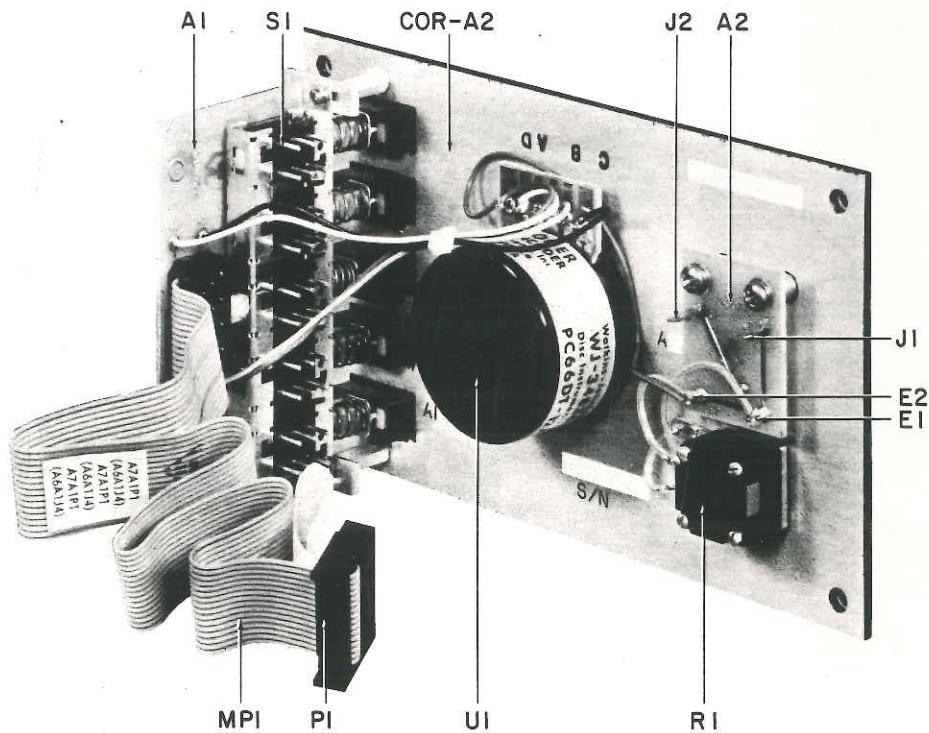


Figure 1-4. Type 796044 Manual Tuning Module (COR-A2),
Location of Components, Rear View

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SUPPLEMENT

1.6.2.1 Type 791589-2 Tuning Resolution

REF DESIG PREFIX COR-A2A1

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
MP1	Cable, Assembly	1	380037-4	14632	
P1	Connector, Plug	1	88011-2	00779	
S1	Switch, Pushbutton	1	18488	14632	

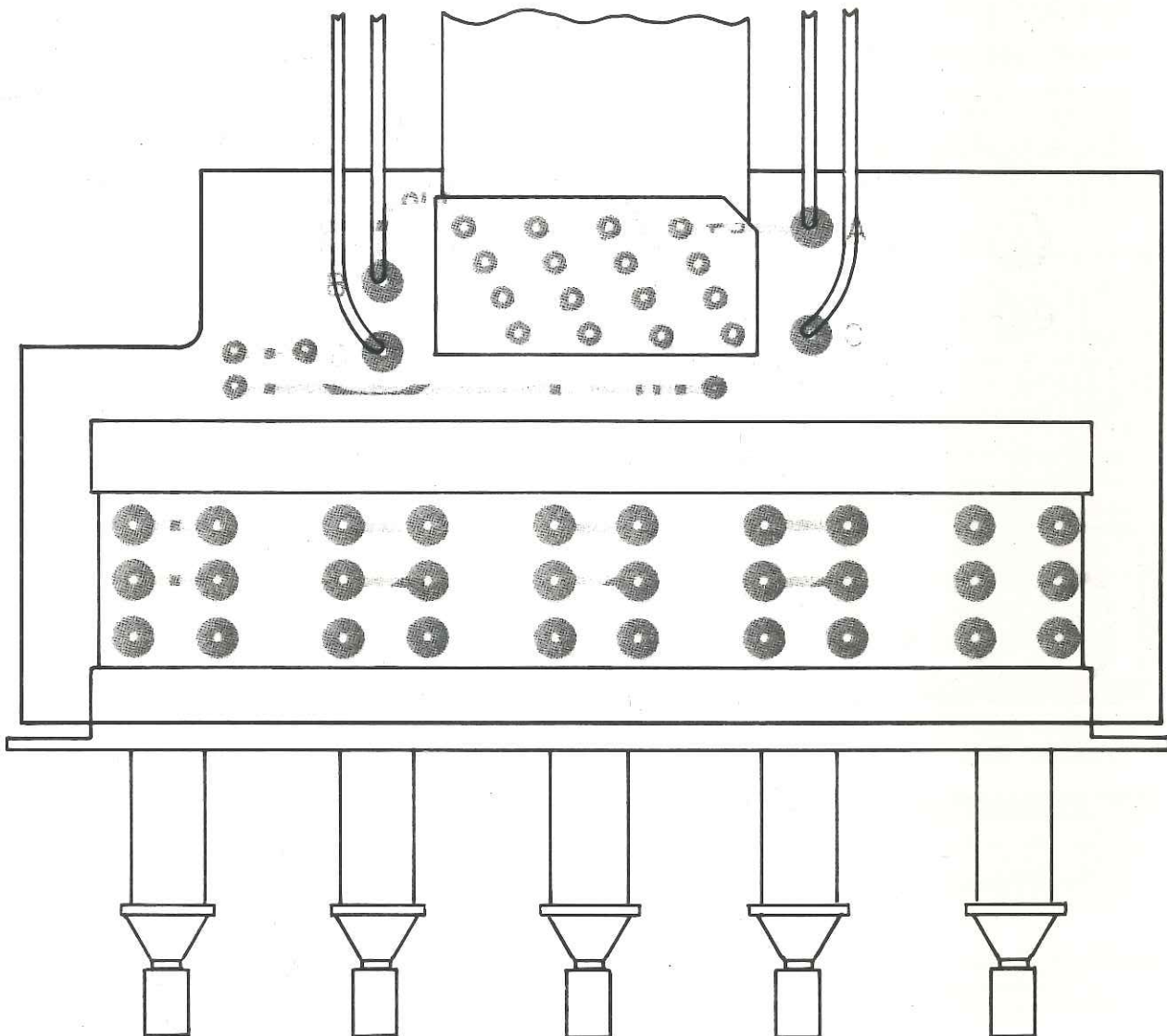


Figure 1-5. Type 791589-2 Tuning Resolution (COR-A2A1),
Location of Components

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SUPPLEMENT

1.6.2.2 Type 280077 Component Board Wiring Assembly

REF DESIG PREFIX COR-A2A2

REF DESIG	DESCRIPTION	QTY. PER ASSY.	MANUFACTURER'S PART NO.	MFR. CODE	RECM. VENDOR
DS1	Diode, LED	1	5082-4555	28480	
E1	Terminal	2	140-1941-02-01	71279	
E2	Same as E1				
J1	Connector, Receptacle: Faston	2	62073-1	00779	
J2	Same as J1				

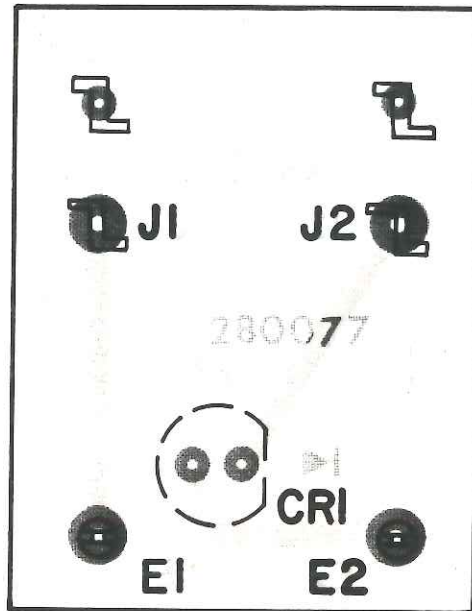
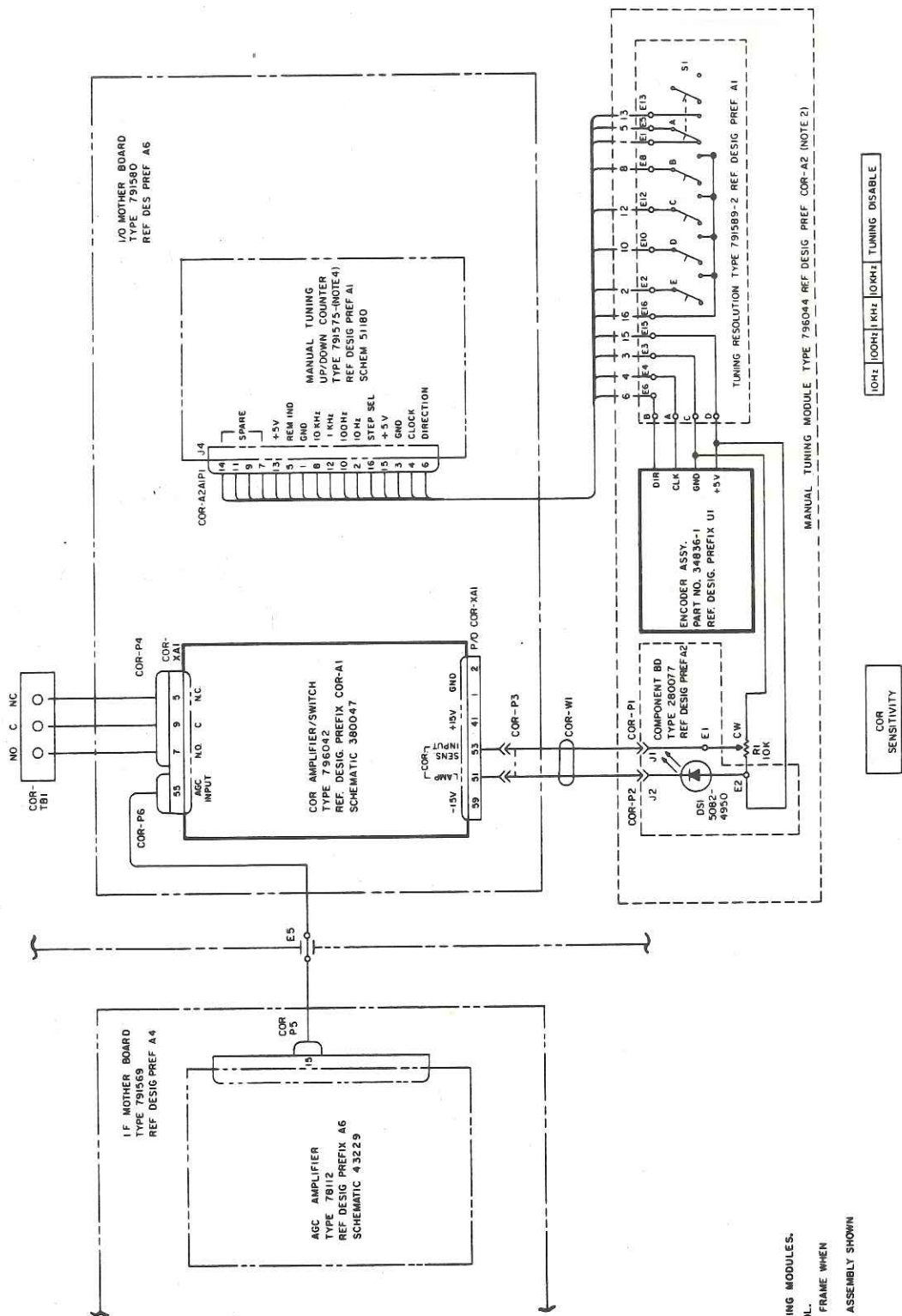


Figure 1-6. Type 280077 Component Board Wiring Assembly (COR-A2A2),
Location of Components

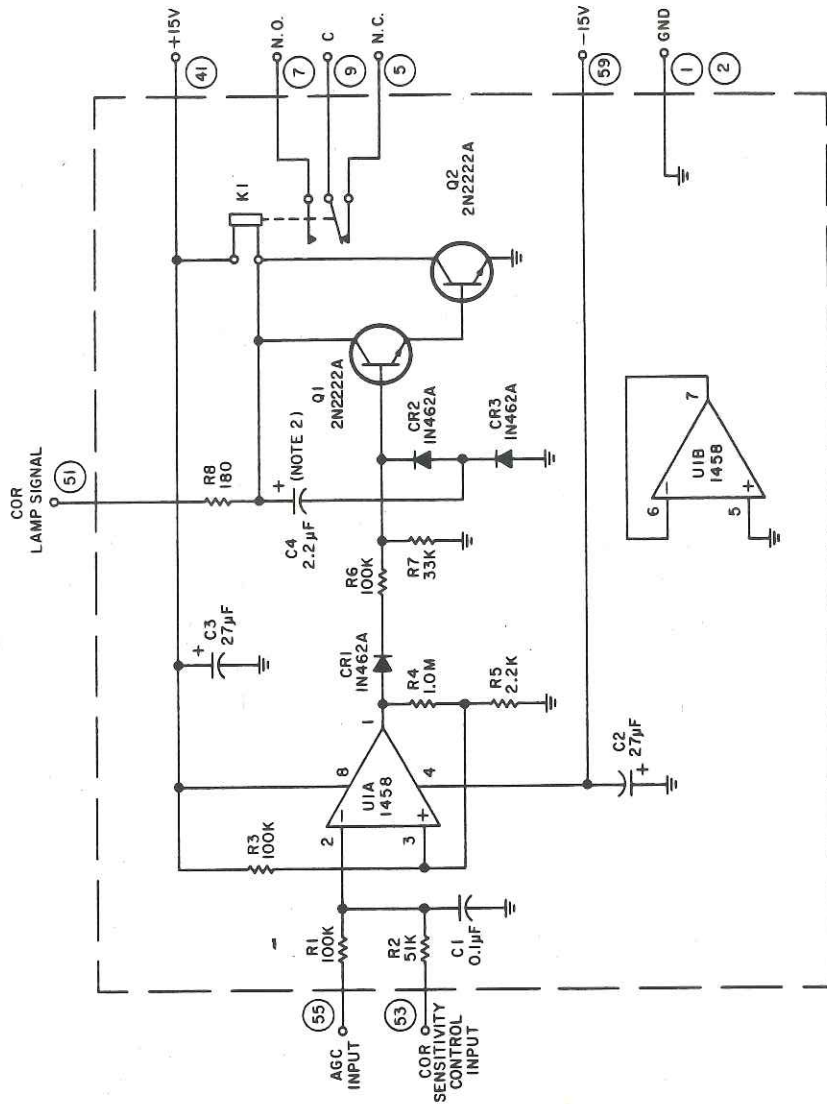
WJ-8718/COR



- NOTES
1. PHANTOM LINES INDICATE PRE-EXISTING MODULES.
 2. DENOTES FRONT PANEL CONTROL.
 3. COR-A2 REPLACES A7 MODULE OF MAIN FRAME WHEN 8718/COR IS IMPLEMENTED.
 4. MANUAL TUNING UP/DOWN COUNTER PC ASSEMBLY SHOWN FOR HOOK-UP OF COR-A2A1P1.

Figure 1-7. COR Option to WJ-8718 HF Receiver Schematic Diagram

WJ-8718/COR



- NOTES:
1. UNLESS OTHERWISE SPECIFIED:
 a. RESISTANCE IS IN OHMS, $\pm 5\%$, 1/4W.
 b. CAPACITANCE IS IN μF .
 2. VALUE SELECTED FOR SPECIFIED COR RELEASE TIME. NOMINAL VALUE 2.2 μF .

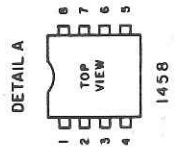


Figure 1-8. Type 790M2 COR Amplifier/Switch Schematic Diagram I-15

Courtesy of <http://BlackRadios.terryo.org>