INSTRUCTION MANUAL

FOR

WJ-8626A-4/FSK DEMODULATOR OPTION

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6/85

WARNING

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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CHAPTER I

GENERAL INFORMATION

1.1 INTRODUCTION

The WJ-8626A-4 Frequency Shift Keying (FSK) Demodulator option is a single plug-in printed circuit board which mounts in the WJ-8626A-4 HF receiver. It demodulates two-tone FSK signals with frequency shifts from less than 30 Hz to 2000 Hz. The FSK Demodulator is manually operated via the WJ-8626A-4 HF Receiver front panel or remotely controlled through the WJ-9040 IOM108 I/O Module.

1.2 EQUIPMENT PURPOSE, CAPABILITIES AND FEATURES

The FSK Demodulator printed circuit board replaces the standard Voltage Regulator board (A9A1) in the WJ-8626A-4 HF Receiver. The microprocessor in the WJ-8626A-4 recognizes the presence of the FSK option board and immediately includes FSK as a selectable detection mode.

The FSK Demodulator board demodulates two-tone FSK signals by covering the 30 Hz to 2000 Hz shift range in eight discrete steps. The eight optimum settings are selected via the front panel SHIFT key, or by remote control through the WJ-9040 IOM108 I/O Module. Manual fine tuning of the FSK signal is enhanced by front panel graphics.

Switchable onboard active filtering optimizes the demodulator for maximum keying speeds of 30 to 600 baud. The digitally controlled filter has eight optimum settings which are selected via the front panel BAUD key, or by remote control (through the IOM108).

Output levels are compatible with EIA RS-232, MIL-STD-188C or TTL/CMOS 5-volt logic and are selected via on board plug-in jumper wires.

1.3 EQUIPMENT SPECIFICATIONS

See Table 1-1 for WJ-8626A-4 HF FSK Demodulator Option specifications.

Table 1-1. WJ-8626A-4 FSK Demodulator Option Specifications

Shift	Less than 30 Hz to greater than 2 kHz
Keying Speed	Less than 5 baud to greater than 600 baud
Output	Bipolar, EIA RS-232 or MIL STD 188C compatible; unipolar 0/4.5V TTL/CMOS compatible. Outputs selected by jumpers.
Sensitivity	Operates with WJ-8626A-4 antenna input of less than 0.1 μV with a 300 Hz bandwidth.

CHAPTER II

INSTALLATION

2.1 UNPACKING AND INSPECTION

The WJ-8626A-4/FSK Demodulator Option is normally shipped as an installed unit inside a WJ-8626A-4 HF Receiver, but can easily be installed on site in any existing WJ-8626A-4 receiver with no modifications required. Examine the shipping carton for damage prior to unpacking the receiver or FSK Demodulator Option. If the carton appears to be damaged, have the carrier's agent present before unpacking. If this is not possible, unpack the receiver or FSK Option and retain the packaging material and shipping container(s). This is to later show the carrier's agent when verifying damage to the equipment.

The FSK Demodulator Option is thoroughly inspected and factory adjusted for optimum performance prior to shipment. It is, therefore, ready for use upon receipt. If the FSK Demodulator Option is already installed on receipt and external damage to the receiver is visible after uncrating, remove the dust covers and inspect the FSK Option and other internal components for apparent damage. Then check any internal connectors and plug-in items that may have been loosened.

2.2 REPACKING

If a WJ-8626A-4/FSK Demodulator Option, or the Option and the receiver it comes installed in, must be prepared for reshipment, refer to the WJ-8626A-4 HF Receiver Operator's Manual for repacking instructions.

2.3 INSTALLATION PROCEDURES

Installing the FSK Demodulator Option in an existing receiver consists of replacing one plug-in module and two key faces on the receiver front panel. A Phillips head screwdriver and a small straight blade screwdriver are required. The installation procedure is as follows:

1. Disconnect the WJ-8626A-4 receiver from the EFR100 Equipment Frame and remove its top cover using a Phillips head screwdriver.

2. Locate and remove Type 794432 Voltage Regulator (A9A1).

3. Select the FSK output levels and polarity on the Type 794456 FSK Demodulator board.

   a. Select one of the following output levels:

      For -5.5 V to +5.5 V output, use jumper P3 to connect J2-2 and J2-3.

      For 0 V to +4.5 V output, use jumper P3 to connect J2-1 and J2-2.

b. Select one of the following output polarities:

For high frequency = high voltage output, use jumper P2 to connect J1-1 and J1-2. A loss of carrier forces a high state.

For high frequency = low voltage output, use jumper P2 to connect J1-2 and J1-3. A loss of carrier will force a low state.

4. Install Type 794456 FSK Demodulator board in the slot formerly occupied by the Voltage Regulator board (A9A1).

5. Replace key buttons using a small straight blade screwdriver or similar tool.

   a. Pry off the plastic IFBW key and replace it with the SHIFT IFBW key by pressing it firmly in place.

   b. Pry off the plastic GAIN key and replace it with the BAUD GAIN key by pressing it firmly in place.

6. Replace the WJ-8626A-4 receiver top cover and tighten the screws.

CHAPTER III

OVERALL THEORY OF OPERATION

3.1 GENERAL

Refer to Chapter III of the WJ-8626A-4 HF Receiver Operator's Manual for operation instructions and commands.

3.2 OPERATIONAL SETUP PROCEDURE FOR FSK

The following steps set up the WJ-8626A-4 receiver for FSK operation:

1. Set the receiver for FAST AGC and CW mode.

2. Set the BFO for zero offset.

3. Select an IF bandwidth proper for the signal.

   a. The bandwidth is wide enough to pass the mark and space tones without distortion.

   b. The bandwidth in Hertz must be at least equal to the sum of the shift in Hertz and two times the keying speed in baud.

      Example 1: 850 Hz shift +(50 baud x 2) = 950
      A 1 kHz bandwidth is a good choice in this case.

      Example 2: 170 Hz shift +(75 baud x 2) = 290
      A 300 Hz bandwidth is the best choice.

      Example 3: 1000 Hz shift +(100 baud x 2) = 1200
      In this case, a 2 kHz or 3 kHz bandwidth is the best choice.

      4 kHz is the widest bandwidth that will typically be required for this demodulator.

   c. If the signal drifts excessively in frequency, add to the bandwidth requirement the amount of the maximum expected drift in Hertz. For example: An 850 Hz shift signal drifts about 300 Hz while keying at 50 baud. 850 + (50x2) + 300 = 1300 so that a 2 kHz or 3 kHz filter is the correct choice.

4. "Zero Beat" the signal.

   a. Tune the desired signal with the RF frequency control in 10 Hz increments while monitoring the audio output.

b. When the FSK signal is tuned for zero beat, both the mark and space frequencies will produce approximately the same beat note (frequency). The audio will sound somewhat like a steady tone. If the signal is not tuned correctly, a high and low tone will be heard. Zero beating will produce the lowest overall pitch.

c. For narrow shift FSK signals, it may be necessary to rock the tuning knob back and forth slightly to determine the zero beat.

5. Press the DET key to select FSK mode.

NOTE

The white letters on the keys indicate an upper case function of the keypad. Use the ↑↓ key and observe the arrow in the lower right corner of the display to select the keypad mode. When the lower case keypad is selected (arrow pointing down), the normal IFBW and GAIN settings are displayed, and the tuning indicator displays the signal position within the receiver IF passband. When the upper case is selected (arrow pointing up) during FSK mode only, the BAUD and SHIFT settings are displayed, and the tuning indicator displays the averaged two-tone signal within the PLL (phase-locked loop) of the FSK demodulator. The ↑↓ key may be used at any time to display the desired parameters.

3.3 BAUD RATE SELECTION

To optimize the demodulator for use with various keying speeds, the baud filter can be set for one of eight maximum data rates. Selecting the correct baud setting will reduce the bit error rate and improve the demodulator performance with low signal levels.

The baud rate setting must equal or exceed the highest baud rate of interest. The optimum choice is the setting which just meets this criterion. For example, if the highest baud rate of interest is 175, the 200B setting is best. If the highest baud rate is 75 (100 wpm TTY), then the 75B setting is correct.

The BAUD key on the front panel of the WJ-8626A-4 selects the baud rate filter setting. During the upper case display, pressing the BAUD key changes the filter characteristics for the maximum keying speed. The display indicates the selection in the BFO offset area. As the BAUD key is pressed, the demodulator steps through all eight filter settings.

3.4 SHIFT SELECTION

To facilitate use with various mark/space deviations, the WJ-8626A-4 FSK Demodulator Option has eight selections for frequency shift. The various SHIFT settings actually change the bandwidth of the phase-locked loop in the demodulator. When optimized for a given f_2-f_1 shift, the desired signal is correctly tracked and demodulated while reducing adjacent channel interference, even if other signals are present in the receiver's IF passband.

The SHIFT setting must equal or exceed the frequency shift of the signal, with the best setting as close as possible to the actual signal. For example, if the signal of interest shifts 170 Hz, the 170 setting is appropriate. If the shift is 850 Hz, use 1000.

The upper case SHIFT key on the front panel of the WJ-8626A-4 changes the maximum shift. While in the upper key case and FSK detection mode, the display indicates the selected shift in the IFBW/GAIN area. As the SHIFT key is pressed, the demodulator steps through all eight settings.

3.5 MARK-SPACE INVERSION

During FSK mode, the BFO+/- key inverts the offset of the BFO, this inverting the polarity of the output of the FSK demodulator. When FSK mode is enabled, the display will indicate either +FSK or -FSK. The +FSK mode produces a normal (upright) audio spectrum with the same frequency relationship as the original RF signal. The -FSK mode inverts this relationship, and also the demodulated data.

The BFO+/- key alternates the two modes.

NOTE

Only the polarity of the bit stream is changed by the BFO+/- key. The idle state of the carrier detect circuitry is set by hardware jumper P2 on the PC assembly. Refer to **paragraph 2.3** for installation procedures.

3.6 REMOTE CONTROL

The WJ-8626A-4 FSK option can be remotely controlled via an IOM108 equipped with either IEEE-488 or RS-232/C interface option. Refer to the WJ-9040 IOM108 I/O and Interface Module Operator's Manual for complete instructions.

The list of additional commands which are valid for the WJ-8626A-4/FSK Demodulator Option are listed in **Table 3-1.** Remote queries regarding the general status of the receiver are allowed at any time. The remote queries listed in **Table 3-1** are allowed only when FSK detection mode is selected.

As with other commands which change the receiver status, the WJ-8626A-4 must first be placed in remote mode by pressing the R/LCL key on the front panel, or by sending the RMT command through the interface. Refer to the WJ-8626A-4 HF Receiver Operator's Manual for details.

Table 3-1. WJ-8626A/FSK Demodulator Option Commands

COMMAND	EXPLANATION	EXAMPLE
FSK	Selects FSK detection mode, upright output polarity	FSK
FSK+	Selects FSK detection mode, upright output polarity	FSK+
FSK-	Selects FSK detection mode, inverted output polarity	FSK-
BD n	Sets optimum baud rate; n is a number from 1 to 8	BD 4
BD?	Asks baud rate, returns number n and optimum keying speed in baud	BD? returns "4,150 BD"
SH n	Sets optimum shift; n is a number from 1 to 8	SH 6
SH?	Asks shift, returns number n and optimum f2-f1 shift in Hz	SH? returns "6,85 Hz"

CHAPTER IV

DETAILED THEORY AND MAINTENANCE

4.1 CIRCUIT DESCRIPTION

4.1.1 GENERAL

The FSK Demodulator Option Board (A9A1) receives an FSK input signal, centered at 5 kHz, from the FM/CW/SSB Demodulator (A4A9). The demodulated bipolar (RS-232/MIL-188C compatible) or unipolar (TTL logic compatible) output at pin 37 of the board is routed to rear panel jack J4-K. The tuning indicator voltage at pin 39 of the board is routed to the Front Panel Interface (A9A6) and is graphically displayed during FSK mode (when the upper case keys are activated).

4.1.2 DETAILED CIRCUIT DESCRIPTION

Refer to **Figure 4-1**, the FSK Demodulator Simplified Block Diagram and **Figure 6-1**, the FSK Demodulator Schematic for the text that follows.

The FSK demodulator receives an input signal from the CW/SSB demodulator. If a CW carrier is tuned, this signal is a 5 kHz tone. When FSK modulation is properly tuned, the input to the demodulator becomes two tones: 5 kHz plus 1/2 the shift, and 5 kHz minus 1/2 the shift. Other signals present within the selected IFBW of the receiver also appear as demodulated tones.

The signal is fed into U5. This FSK demodulator IC has several sections. The first section is a phase-locked loop (PLL) with a center frequency of 5 kHz determined by R11, R12 and C17. The PLL attempts to follow all tones within its loop bandwidth. The error voltage produced by the phase detector is present at output of U5 at pin 11. This error voltage is routed through one of the gain resistors (R13 through R20) to the VCO control input at pin 12 of U5. The selected resistor, determined by the demodulator SHIFT setting, changes the loop bandwidth of the PLL, optimizing the system for a given f_2-f_1 shift.

The loop error voltage, which tracks the two tones, is fed to the high impedance buffer U8. After a low-pass section and gain reduction section, the signal is fed to the switched-capacitor low-pass filter U9. Using an internal Schmitt trigger, U9 performs a 4-pole, low-pass function at 1/50 the oscillator frequency. The oscillator frequency is set by C25 and one of the resistors (R32 through R39) selected by the demodulator BAUD setting. The -3dB point of the filter is set to 0.6 times the selected optimum baud rate. The 5 kHz carrier is removed and the square wave error voltage from the PLL is converted into a sine wave.

At this point, the signal is split two ways. For the main output path, the sine wave signal is fed back to the comparator input, pin 8 of U5. The internal reference of U5 is used with the sine wave to determine whether the input signal is above or below the carrier (e.g. a mark or space). Hysteresis is provided by R23, and R10 is a pull-up resistor for the open-collector output of U5. This main signal path is again split two ways. Through one resistor path, a simple divider network is formed for the INVERTED output. IC U7A and its associated resistors perform a level shift and inversion of the comparator output, used by the NORMAL or

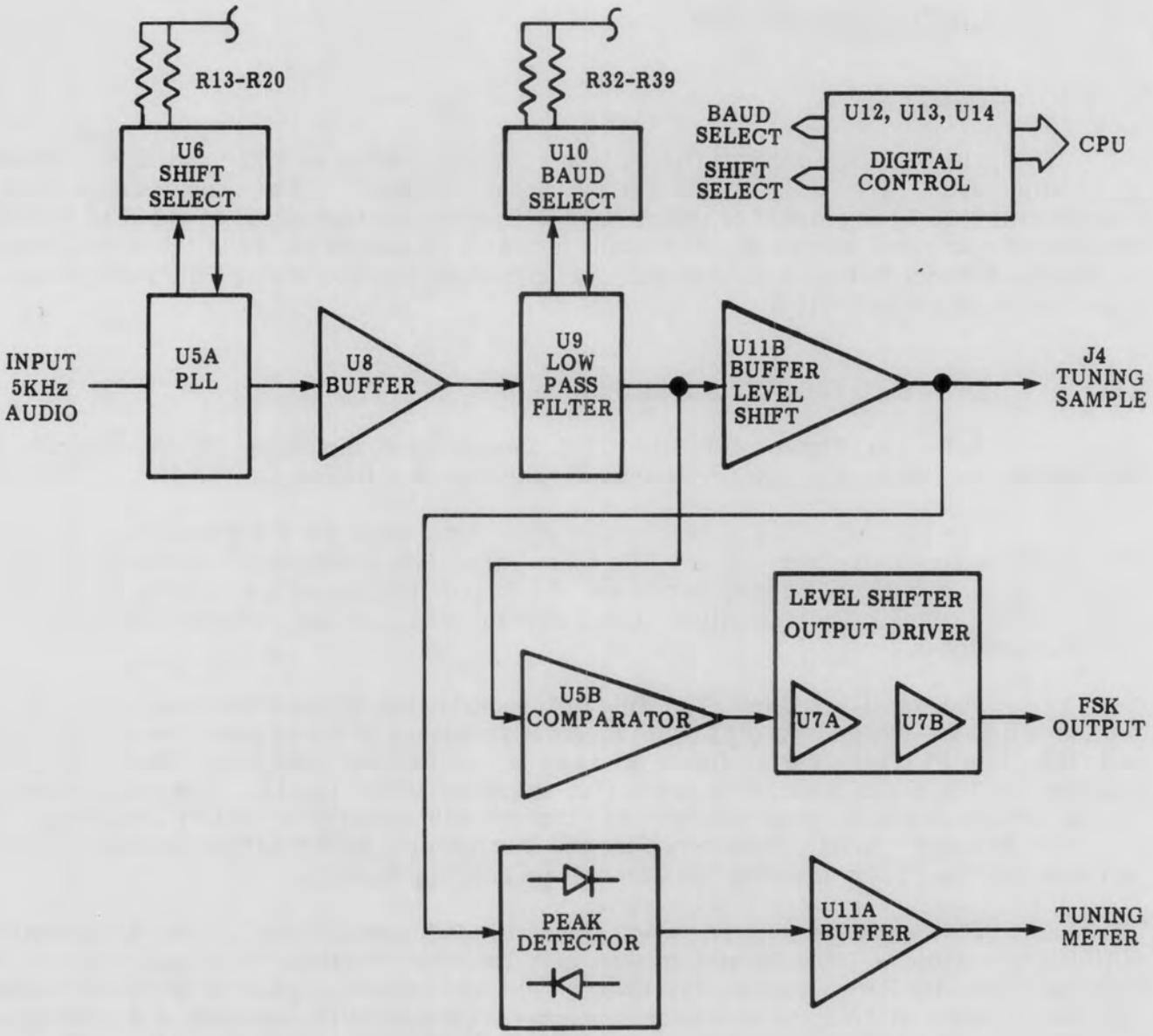

Figure 4-1. FSK Demodulator Option Simplified Block Diagram

upright output. IC U7B receives the selected NORM or INV signal from P2 and performs either a unity gain buffering for the TTL output, or a level shift to -5.5 V and +5.5 V if the bipolar output is selected by P3. The final FSK output at pin 37 is routed to the rear panel jack J4, pin K.

The other signal path at the output of U9 is for monitoring. IC U11 provides level shifting from the reference voltage (approximately 6 VDC) to 0 VDC. The U11 output at J4 is provided as a test point or as a user-connected monitor output. When viewed on an oscilloscope, this signal is useful for optimum shift and baud selection. The output of U11 also feeds the peak detectors which provide the tuning indicator output. The tuning indicator output from U11 is routed to Front Panel Interface (A9A6). If the front panel keypad is in the upper case FSK mode, the demodulator tuning voltage is displayed.

ICs U12, U13 and U14 receive signals from the WJ-8626A-4 controller section and select the desired SHIFT and BAUD settings.

During the WJ-8626A-4 initialization, the CPU sends an input command to I/O port 20H (only the 3 most significant bits are valid). This causes Q2 to conduct, forcing a 0 state to be read on AD5. The microprocessor is then informed that the FSK board is installed in this unit. The controller is thereafter permitted to send output signals to I/O port 00H (only 3 most significant bits are valid), causing the desired baud and shift data to be latched into U14.

4.2 MAINTENANCE

4.2.1 GENERAL

The WJ-8626A-4 HF Receiver and WJ-8626A-4 FSK Demodulator option have been designed to operate for extended periods of time with minimum routine maintenance. Inspection and performance tests should be conducted after component-level troubleshooting and at regular intervals consistent with the facility's normal scheduling. No routine adjustments are required. A general troubleshooting method is provided in the form of a FSK Demodulator board checkout procedure (see **paragraph 4.2.3**). Component-level troubleshooting is most effectively carried out if the technician is thoroughly familiar with the operating instructions and circuit descriptions in both this manual and the WJ-8626A-4 HF Receiver Instruction Manual.

4.2.2 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 and contacts, and chassis wiring for excessive wear, looseness, misalignment, corrosion or other deterioration.

4.2.3 FSK DEMODULATOR OPTION TROUBLESHOOTING

Troubleshooting the FSK Demodulator Option (A9A1) consists of a simple checkout procedure and fault isolation information. the procedure requires a signal generator and an oscilloscope (See **Table 4-1**). If the expected results are obtained by the checkout procedure, the FSK Demodulator board is assumed to be operating properly.

4.2.3.1 FSK Demodulator Option Checkout Procedure

Perform the following procedure in the given sequence.

1. Locate the FSK Demodulator Option (A9A1) in the receiver.
2. Select the NORMAL mode on A9A1 by placing the jumper plug between P2-1 and P2-2.
3. Select the -/+ mode by placing the jumper plug between P3-2 and P3-3.
4. Connect signal generator to RF IN (A2J1) of the receiver and set the controls as follows:

Frequency	15.0000 MHz
Modulation	OFF
Level	-97 dBm

5. Set the following receiver parameters:

FREQ	15.0000 MHz
DET	+FSK
IFBW	3 kHz or greater
GAIN	AGC
SHIFT	2000 Hz
BAUD	600

6. Connect the oscilloscope to verify a 5.0 kHz signal at A9P1, pin 17.
7. Tune the receiver to 15.00100 MHz and verify a +5.0 to +6.0 VDC at A9P1, pin 37.
8. Tune the receiver to 14.99900 MHz and verify a -5.0 to -6.0 VDC at A9P1, pin 37.

4.2.3.2 FSK Demodulator Fault Isolation

The FSK Demodulator Option Checkout Procedure assumes that all other major sections of the receiver are operating properly. For instance, the AM, FM, and CW detection modes should each provide the expected output signals at VIDEO OUT (A4J3) and at auxiliary connector J4 for known test input signals.

If the specified result is not obtained in Step 6 of the checkout procedure, the chassis wiring is probably at fault. While referring to the WJ-8626A-4 HF Receiver Instruction Manual, use the oscilloscope to follow the CW signal line from the FM/CW/SSB Demodulator (A4A9) to pin 17 of A9P1, looking for loose or corroded connectors, broken wires, or short circuits.

If Steps 7 and 8 result in no voltage or unusual levels, refer again to the WJ-8626A-4 Receiver Instruction Manual and check for wiring faults in the chassis. If Step 7 or 8 results in an output but does not change from + to - polarity, the FSK Demodulator is not operating properly. De-energize the receiver and remove the FSK Demodulator board from the receiver. Make note of the problem and prepare the board for shipment by packing it in a cushioned, fiberboard container marked for shipment. Conditions during storage and shipment should be limited as follows:

Maximum humidity: 95% (no condensation)

Temperature range: -30 to 85 C

Component-level troubleshooting should only be attempted by qualified maintenance technicians. The repair instructions in **paragraph 4.2.4**, as well as the location of components diagram, **Figure 4-2**, and the schematic diagram, **Figure 6-1**, are provided for their convenience.

Table 4-1. Test Equipment Required

Instrument Type	Required Characteristics	Recommended Instrument
Signal Generator	AM, FM, CW, RF Output, from -111 dBm to 0 dBm	HP 8640B
Oscilloscope	DC to 50 MHz	HP 1201B

4.2.4 REPAIR

4.2.4.1 General

As a result of the high density component packaging of the WJ-8626A-4/FSK Demodulator Option and associated WJ-8626A-4 HF Receiver, repair of a specific trouble is limited to component, circuit board, or assembly replacement. The available options are to either make the repair locally or to return the faulty component, or assembly to the factory for replacement. In some cases, only the complete circuit board 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.

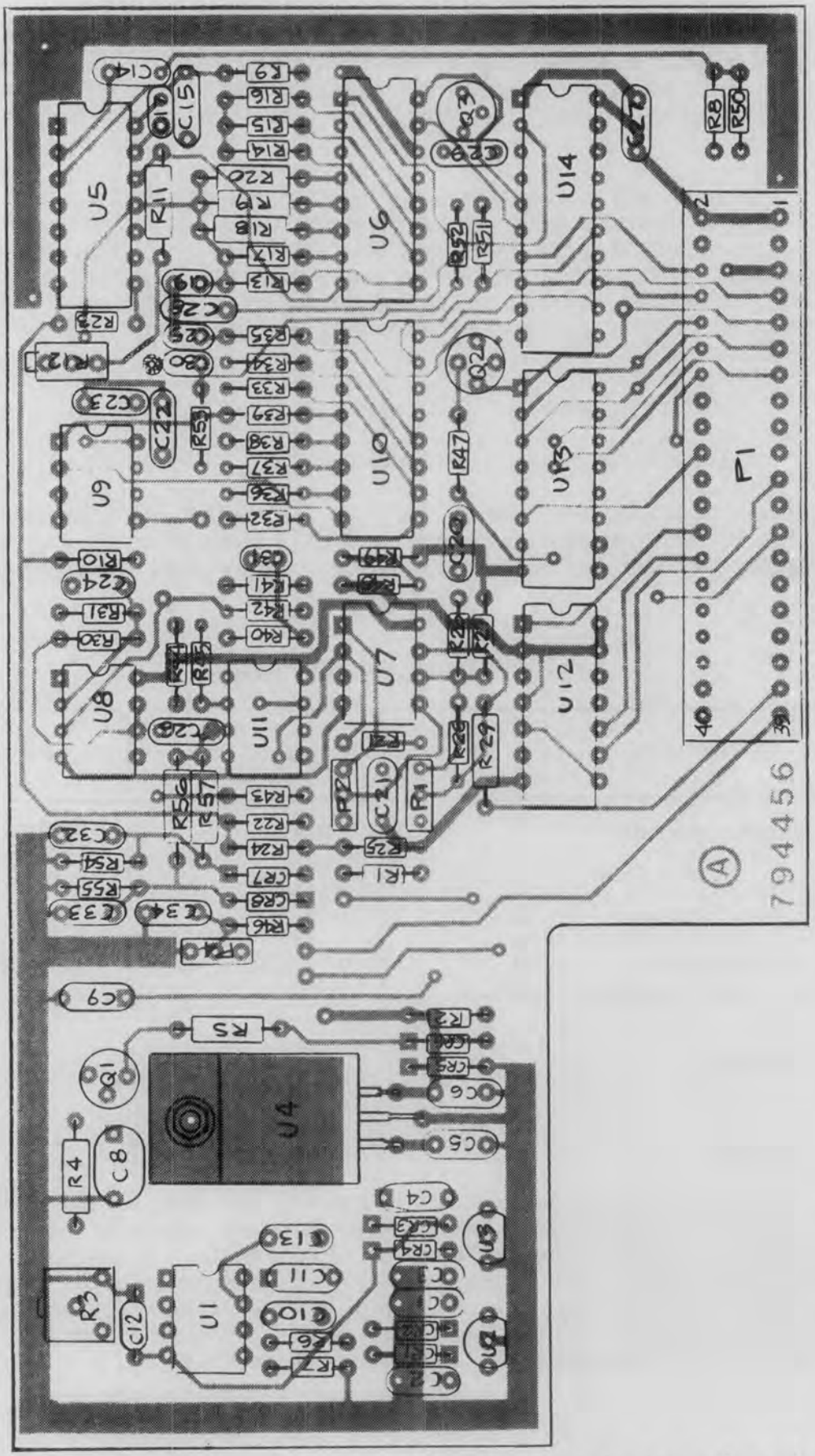

Figure 4-2. Type 794456-1 WJ-8626A-4/FSK Demodulator Option (A9A1), Location of Components

4.2.4.2 Component Removal

When removing components from a printed circuit bdoard 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. When using a wicking procedure, be sure to use non-corrosive soldering flux. If possible, use a heat sink to prevent component damage.

4.2.4.3 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. Take care that component leads to not catch on any track edges causing the tracks to be lifted from the board or damaged. Component installation should involve the same size soldering iron as in component removal, along with just enough heat and solder (60/40 rosin core) to achieve good solder joints. If possible, use a heat sink to prevent component damage.

4.2.4.4 Post-installation Procedures

After any components, assemblies or circuit boards have been installed in the demodulator or associated receiver, perform the appropriate alignment procedures and performance tests to verify proper operation and unit integrity.

4.2.5 FSK DEMODULATOR OPTION ALIGNMENT PROCEDURE

The following alignment procedure should not be performed on a routine basis. It should be performed strictly as part of a troubleshooting procedure (if required) or as a part of a post-repair procedure (if necessary), to bring repaired or replaced components on-line. The procedure should be performed by a skilled technician, familiar with the unit.

1. Energize the WJ-8626A-4 receiver, allowing a 30-minute warm-up period.

2. Verify that the 50 MHz reference signal is applied to J2.

3. Set the following receiver parameters:

FREQ	0.00000 MHz
DET	+FSK
IFBW	3 kHz or greater
GAIN	FST
SHIFT	2000 Hz
BAUD	600

4. With the front panel in the upper case mode, observe the tuning indicator, displaying the FSK demodulator tuning.

5. Adjust A9A1R12 until the tuning indicator is centered.

NOTE

An oscilloscope or DVM may be used at A9A1J4 to verify center tuning at 0 VDC.

6. Using the SHIFT key, select a shift setting of 1000 Hz.

7. For each shift setting using the SHIFT key, adjust A9A1R12 as necessary (as in Step 5), to maintain a center position on the tuning indicator. (The 30 Hz shift setting is the most sensitive.)

8. Verify tuning indicator performance by tuning the receiver in 10 Hz increments. The indicator should deflect to the right and return to center when tuned to 0 Hz.

CHAPTER V

REPLACEMENT PARTS LIST

5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules) and parts. An example of the unit numbering method follows:

Subassembly Designation A1	R1 Class and No. of Item
Identify from right to left as:	First (1) resistor (R) of first (1) subassembly (A)

Components which are an integral part of the main chassis have no subassembly designation.

5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Reference Designation Prefixes are provided on schematics in parentheses within the figure titles.

5.3 PARTS LIST

The parts list which follows contains all electrical parts used in the equipment. When ordering replacement parts from the Watkins-Johnson Company, specify the type and serial number of the equipment and the reference designation and description of each part ordered. The list of manufacturers provided in **paragraph 5.4** and the manufacturer's part number for components are included as a guide to the user of the equipment in the field. These parts may not necessarily agree with the parts installed in the equipment; however, the parts specified in this list will provide satisfactory operation of the equipment. Replacement parts may be obtained from any manufacturer as long as the physical and electrical parameters of the part selected agree with the original indicated part. In the case of components defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

NOTE

As improved semiconductors become available, it is the policy of Watkins-Johnson to incorporate them in proprietary products. For this reason some transistors, diodes, and integrated circuits installed in the equipment may not agree with those specified in the parts list and schematic diagrams of this manual. However, the semiconductors designated in the manual may be substituted in every case with satisfactory results.

5.4 LIST OF MANUFACTURERS

The List of Manufacturers that follows is listed numerically by the manufacturer's Federal Supply Code or "Code Ident" as it appears in the parts list.

Mfr. Code	Name and Address
01295	Texas Instruments, Inc. Semiconductor Group 13500 N. Central Expressway P.O. Box 225012 M/S 49 Dallas, TX 75265
09021	Airco Electronics Bradford, PA 16701
14632	Watkins-Johnson Company CEI Division 700 Quince Orchard Road Gaithersburg, MD 20878
18324	Signetics Corp. Military Products Division 4130 S. Market Court Sacramento, CA 95834
22526	DuPont E I DeNemours and Co., Inc. Photosystems and Electronic Products Dept. Berg Electronics Division Route 83 New Cumberland, PA 17070
27014	National Semiconductor Corp. 2900 Semiconductor Drive Santa Clara, CA 95051
32293	Intersil, Inc. Sub of General Electric Co. 10710 N. Tantau Avenue Cupertino, CA 95014
56289	Sprague Electric Co. 87 Marshall Street North Adams, MA 01247
59660	Tusonix, Inc. 2155 N. Forbes Boulevard Suite 107 Tuscon, AZ 85745
73138	Beckman Industrial Corp. Beckman Electronic Technologies Sub of Emerson Electric Co. 2500 Harbor Boulevard Fullerton, CA 92634
80131	Electronic Industry Association Washington, DC 20006
80294	Bourns Instruments, Inc. 135 Magnolia Avenue Riverside, CA 92506
81349	Military Specifications

5.5 **Type 794456-1 Voltage Regulator/FSK Demodulator PW Assembly**

REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
C1	Capacitor, Ceramic, Disc: .47 µF 20% 50V Z5U .300 SQ .200 Leads	6	34452-1	14632	
C2	Capacitor, Ceramic, Disc: .1 µF 20% 50V	9	34475-1	14632	
C3	Same as C1				
C4	Capacitor, Electrolytic, Tantalum: 1 µF 20% 35V	4	196D105X0035HE3	56289	
C5	Same as C1				
C6	Same as C2				
C7	Not Used				
C8	Capacitor, Electrolytic, Tantalum: 100 µF 20% 20V	1	196D107X0020TE4	56289	
C9	Same as C4				
C10	Capacitor, Ceramic, Disc: 1000pF 5% 100V	2	8121100COGO102J	59660	
C11	Same as C4				
C12	Same as C4				
C13	Capacitor, Ceramic, Disc: 2.2 µF 10% 50V	1	8141050651225M	59660	
C14	Same as C2				
C15	Capacitor, Electrolytic, Tantalum: 10 µF 10% 20V	1	196D106X0020JE3	56289	
C16	Not Used				
C17	Capacitor, Ceramic, Disc: 4700 pF 5% 100V NPO	3	8131100CDGO472J	59660	
C18	Not Used				
C19	Same as C10				
C20 Thru C23	Same as C2				
C24	Capacitor, Ceramic, Disc: .01 µF 20% 50V	3	34453-1	14632	
C25	Same as C17				
C26	Same as C24				
C27	Same as C2				
C28	Same as C24				
C29	Capacitor, Ceramic, Disc: .068 µF 10% 100V	1	CK06BX683K	81349	56289
C30	Same as C2				
C31	Same as C17				
C32	Same as C1				
C33	Same as C1				
C34	Same as C1				
CR1	Diode Rectifier 200PRV 1.0AMP Silicon	6	1N4003	80131	04713
CR2 Thru CR6	Same as CR1				
CR7	Diode Hi Cond HS SW 75PRV Silicon	2	1N4449	80131	
CR8	Same as CR7				
J1	Terminal Strip: 3 Pin .230 LG X .025 SQ .10 CTRS PC Mount	3	65500103	22526	

REF DESIG PREFIX A9A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
J2	Same as J1				
J3	Not Used				
J4	Same as J1				
P1	Connector, Plug: 40 Pin Double Row .10 CTRS PC Mt .310X .10	1	65000066	22526	
P2	Connector, Plug: 2 Socket Jumper Mates W/ .230 LG X .025 SQ Pin	2	65474001	22526	
P3	Same As P2				
Q1	Transistor Med Speed SW Sat and Ampl Npn Sil JEDEC To-18	2	2N2222A	80131	04713
Q2	Transistor RF-IF Ampl Npn Sil JEDEC To-104	1	2N3478	80131	34156
Q3	Same as Q1				
R1	Resistor, Fixed, Film: 10 KΩ 5% 0.125 W	2	CF1/8-10K/J	09021	
R2	Resistor, Fixed, Film: 18 KΩ 5% 0.125 W	4	CF1/8-18K/J	09021	
R3	Resistor, Terminal Film: 50 KΩ 10% .5 W	1	62PAR50K	73138	
R4	Resistor, Fixed, Film: 68Ω 5% .25 W	3	CF1/4-68Ω/J	09021	
R5	Same as R4				
R6	Same as R2				
R7	Same as R2				
R8	Resistor, Fixed, Film: 5.1 KΩ 5% 0.125 W	8	CF1/8-5.1K/J	09021	
R9	Resistor, Fixed, Film: 330 KΩ 5% 0.125 W	1	CF1/8-330K/J	09021	
R10	Resistor, Fixed, Film: 15 KΩ, 5%, 0.125 W	3	CF1/8-15K/J	09021	
R11	Resistor, Fixed, Film 40.2 KΩ 1% 0.10 W	1	RN55C4022F	81349	75042
R12	Resistor, Variable, Film: 5Ω 10% 0.25 W Side Adj	1	326X1502	80294	
R13	Resistor, Fixed, Film: 130 KΩ 5% 0.125 W	2	CF1/8-130K/J	09021	
R14	Resistor, Fixed, Film: 240 KΩ 5% 0.125 W	1	CF1/8-240K/J	09021	
R15	Resistor, Fixed, Film: 470 KΩ 5% 0.125 W	3	CF1/8-470K/J	09021	
R16	Resistor, Fixed, Film: 820 KΩ 5% 0.125	1	CF1/8-820K/J	09021	
R17	Resistor, Fixed, Film: 1.2 M 5% .125 W	4	CF1/8-1.2M/J	09021	
R18	Resistor, Fixed, Film: 2.7 M 5% .25 W	1	CF1/4-2.7M/J	09021	
R19	Resistor, Fixed, Film: 4.7 KΩ 5% .25 W	1	CF1/4-4.7K/J	09021	
R20	Resistor, Fixed, Film: 8.2 M 5% .25 W	3	CF1/4-8.2M/J	09021	
R21	Same as R8				
R22	Same as R8				
R23	Same as R15				
R24	Same as R8				
R25	Not Used				
R26	Same as R2				
R27	Same as R1				
R28	Resistor, Fixed, Film: 9.1 KΩ 5% 0.125 W	1	CF1/8-9.1K/J	09021	

REF DESIG PREFIX **A9A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
R29	Same as R24				
R30	Resistor, Fixed, Film: 43 KΩ, 5%, 0.125 W	1	CF1/8-43K/J	09021	
R31	Same as R2				
R32	Resistor, Fixed, Film: 150 KΩ 5% 0.125 W	2	CF1/8-150K/J	09021	
R33	Resistor, Fixed, Film: 100 KΩ, 5%, 0.125 W	3	CF1/8-100K/J		
R34	Resistor, Fixed, Film: 62 KΩ 5% 0.125 W	1	CF1/8-62K/J	09021	
R35	Resistor, Fixed, Film: 39 KΩ 5% 0.125 W	1	CF1/8-39K/J	09021	
R36	Resistor, Fixed, Film: 27 KΩ 5% 0.125 W	2	CF1/8-27K/J	09021	
R37	Resistor, Fixed, Film: 18 KΩ 5% 0.125 W	1	CF1/8-18K/J	09021	
R38	Resistor, Fixed, Film: 11 KΩ 5% 0.125 W	1	CF1/8-11K/J	09021	
R39	Same as R8				
R40	Same as R13				
R41	Same as R33				
R42	Same as R32				
R43	Same as R33				
R44	Same as R15				
R45	Same as R17				
R46	Resistor, Fixed, Film: 1.0 KΩ 5% 0.125 W	1	CF1/8-1.0K/J	09021	
R47	Same as R8				
R48	Same as R8				
R49	Same as R8				
R50	Same as R36				
R51	Same as R10				
R52	Same as R10				
R53	Resistor, Fixed, Film: 1.5 KΩ 5% 0.125 W	1	CF1/8-1.5K/J	09021	
R54	Same as R17				
R55	Same as R17				
R56	Same as R20				
R57	Same as R20				
U1	Integrated Circuit: Dual OP Amp Noise BI-Polar	3	TL062CP	01295	
U2	Voltage Regulator: 3-Term Pos 12V .1A Output To-92 Pkg.	1	LM78L12CZ	27014	
U3	Voltage Regulator: 3-Term Neg 12V .1A Output To-92 Pkg.	1	LM320LZ12	27014	
U4	Voltage Regulator: 3-Term Plus 5.0V 1.5 Amp To 220 Case	1	LM340T5.0	27014	
U5	Integrated Circuit: Monolythic Phase-Locked Loop 4.5V To 20V .01 Hz To 300 KHz	1	XR2211P	52063	
U6	Integrated Circuit: 8 Channel C Mos Analog Multiplexer 16 Pin Dip 0 Deg C To 70 Deg C	2	IH6108CPE	32293	
U7	Integrated Circuit: Dual Operational Amplifier	1	MC1458N	18324	
U8	Same as U1				

REF DESIG PREFIX **A9A1**

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURER'S PART NO.	MFR. CODE	RECM VENDOR
U9	Integrated Circuit Filter: SW Cap LP Filter 50 To 1 Clk To Cut Off Freq 4L Plstc Dip	1	MF4CN50	27014	
U10	Same as U6				
U11	Same as U1				
U12	Integrated Circuit: CMOS Quad 2-Input Nand Gate Indl Temp 14L Plstc Dip	1	MM74HC00N	27014	
U13	Integrated Circuit: Octal Decoder/Demultiplexer Inverted Output 16 Pin Dip	1	MM74HC137N	27014	
U14	Integrated Circuit: CMOS Range 2-6V -40 To +85 Deg C 20L Plstc Dip	1	MM74HC374N	27014	

CHAPTER VI

SCHEMATIC DIAGRAMS

NOTES:
UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS IN OHMS, ±5%, 1/8W.
b) CAPACITANCE IS IN µF.

Figure 6-1. Type 794456-1 WJ-8626A-4/FSK Demodulator Option (A9A1), Schematic Diagram 470996