

**APPENDIX L**

**860X/3GFE AND 860XA/3GFE FREQUENCY EXTENDER OPTIONS**

**P/N 181182-001, Revision F**

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**NOTE**

WJ-860X VHF/UHF Surveillance Receivers must be equipped with Software Release Version 0.30 or later, in order to use the 860X/3GFE Frequency Extender option. WJ-860XA VHF/UHF Surveillance Receivers must be equipped with Software Release Version 7.00 or later, in order to use the 860XA/3GFE Frequency Extender option.

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**LIST OF EFFECTIVE PAGES**

<u>Page Number</u>	<u>Description</u>	<u>Revision</u>
i	Cover	F
ii	Proprietary Statement	F
iii	List of Effective Pages	F
iv	Intentionally Blank	B
v	Revision Record	F
vi	Intentionally Blank	B
vii thru viii	Table of Contents	D
L-1 thru L-11	Appendix L	A
L-12	Appendix L	F
L-13 thru L-16	Appendix L	D
L-17/(L-18 blank)	Schematic	D

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**860X/3GFE AND 860XA/3GFE FREQUENCY EXTENDER OPTIONS****REVISION RECORD**

Revision	Description	Date
--	Initial issue.	12/96
A	Changed Table L-2 to show the proper "1st LO" and "Output Frequencies" associated with Bands 9 and 10.	7/97
B	Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers.	9/97
C	Not Applicable	N/A
D	Incorporated ECO # 041321.	5/01
E	Incorporated ECO # 041393.	8/01
F	Incorporated ECO # 043098.	3/03

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## APPENDIX L

### TYPE 860X/3GFE AND 860XA/3GFE FREQUENCY EXTENDER OPTIONS

#### L.1 INTRODUCTION

This appendix provides details on the 860X/3GFE and 860XA/3GFE 3 GHz Frequency Extender options for Miniceptor receivers. The 860X/3GFE option is intended for use with WJ-860X receivers (non “A” versions) while the 860XA/3GFE is intended for use with WJ-860XA receivers (“A” versions). Both Frequency Extender options are functionally identical. However, there are slight differences in their mechanical configuration. Due to the similarity between the two Frequency Extender options, most of the information in this appendix applies equally to both. The affect of their differences are limited to the Replacement Parts List section. For this reason, a replacement parts list is provided for both Frequency Extender options.

#### NOTE

WJ-860X Miniceptor Receivers must be equipped with Software Release Version 0.30 or later, in order to use the 860X/3GFE option. WJ-860XA Miniceptor Receivers must be equipped with Software Release Version 7.00 or later, in order to use the 860XA/3GFE option.

#### L.2 ELECTRICAL DESCRIPTION

The 3 GHz Frequency Extender Option (FE) extends the tuning range of Miniceptor receivers from 512 MHz to 3000 MHz. The extended tuning range is accomplished by block converting 14 bands of the RF spectrum to the tuning range of the Miniceptor. When the FE option is installed, the RF input at the front panel of the Miniceptor is routed directly to the FE. The FE then develops a down converted IF and returns it back to the receiver for further processing. The FE has a low loss bypass mode for the 20-512 MHz range.

**Table L-1** provides a list of specifications for the Frequency Extender option.

#### L.3 MECHANICAL DESCRIPTION

The 3 GHz Frequency Extender option attaches to the rear of the Miniceptor adding 2.85 inches to the overall length of the unit (see **paragraph L.4** for installation instructions). Cables are provided with the option for electrical connection of the FE to the Miniceptor.

The FE consists of internal cabling and two circuit boards: the Synthesizer Assembly and the RF Assembly which are enclosed in an aluminum chassis.

**Table L-1. Frequency Extender Specifications  
(when used with WJ-8607 or WJ-8607A Receivers)**

Input Frequency Range.....	512 to 3000 MHz
IF Output Frequency Range .....	190 to 510 MHz
Gain .....	+3 dB nominal
Noise Figure .....	15 dB maximum (512 to 3000 MHz)
3rd Order Input Intercept Point .....	0 dBm maximum
2nd Order Input Intercept Point.....	+35 dBm minimum
Image Rejection.....	80 dB minimum
IF Rejection .....	75 dB minimum
Conducted LO .....	-90 dBm maximum
Phase Noise at 20 kHz offset.....	-88 dBc/Hz (512 to 1410 MHz) -85 dBc/Hz (1410 to 3000 MHz)
VSWR .....	3.0:1 maximum
Power Requirements.....	+5.5 Vdc at 270 mA
(Supplied from Miniceptor)	+12 Vdc at 30 mA +7.5 Vdc at 85 mA -7.5 Vdc at 20 mA +30 Vdc at 5 mA
Dimensions .....	1.5" x 6.5" x 2.85"
Weight .....	1 lb. 8 oz.

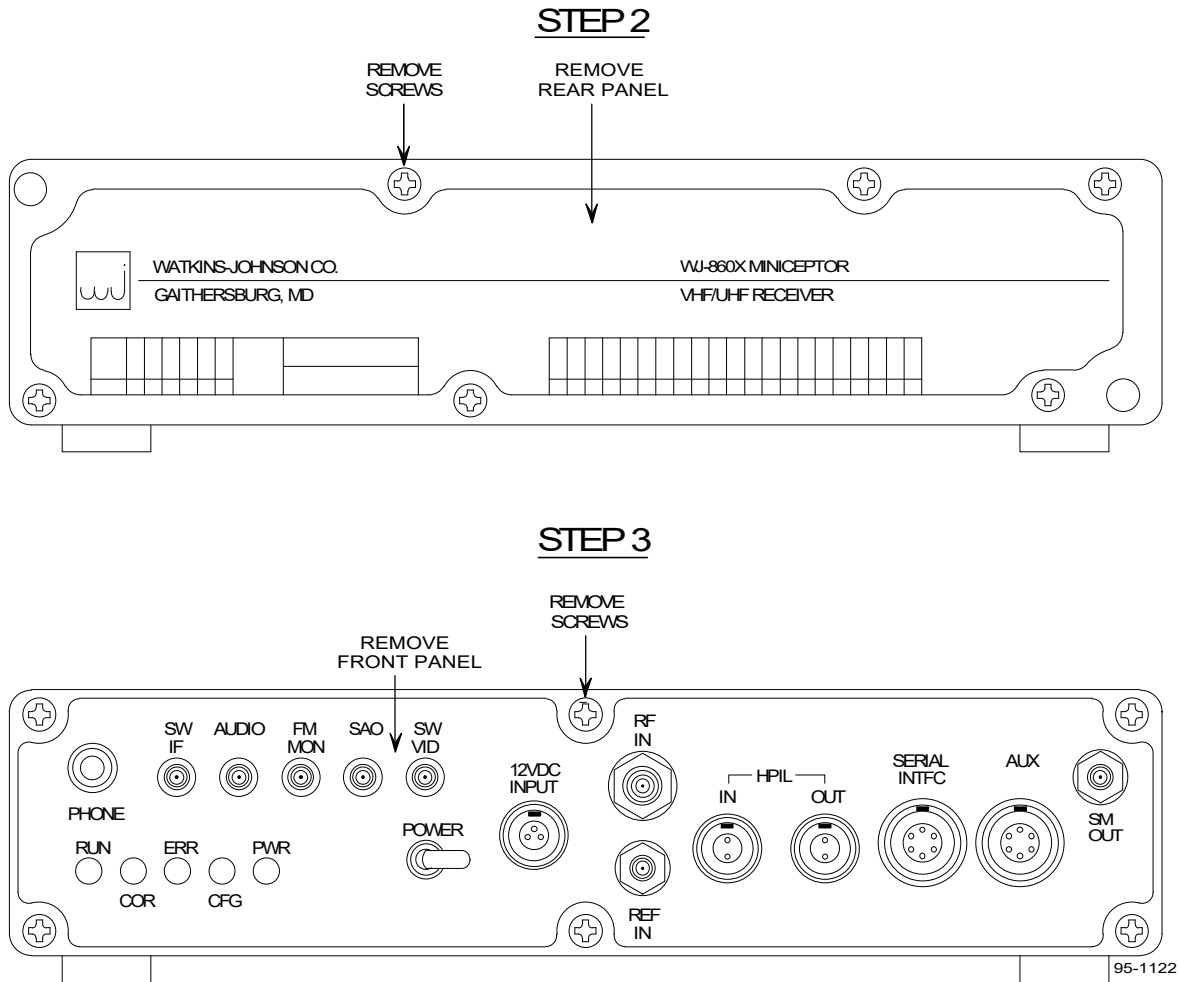
L.4 **INSTALLATION**

The 3 GHz Frequency Extender option may be installed at the factory or in the field. For field installation perform the following procedures:

**WARNING**

A shock hazard exists when performing the following procedures with power applied to the Miniceptor. Ensure power is removed from the Miniceptor before proceeding.

1. Disconnect all cabling from the Miniceptor.
2. Referring to **Figure L-1**, remove all screws to detach the rear panel of the Miniceptor.
3. Remove all screws to detach the front panel.
4. Carefully lift the top half of the unit from the bottom half and spread open clockwise, similar to opening a book (see **Figure L-2**).
5. Referring to **Figure L-2**, disconnect cable W6 from the RF Converter module (at J1).



**Figure L-1. Removing the Miniceptor's Front and Rear Panels**

6. Remove two screws, the connector bracket, and cable W6 from the unit. Remove W6 from the connector bracket.
7. Referring to **Figure L-3**, align the FE with the rear top half of the Miniceptor and hand tighten the retaining screw of the FE into the Miniceptor's chassis.
8. Install connector J4 of FE cable W3 onto the connector bracket that was removed in Step 6. Secure the connector bracket to the main chassis with the two screws that were removed in Step 6.
9. Connect FE cable W1 to connector J1 of the RF Converter module.
10. Connect FE cable W2 to connector J3 of the Synthesizer module.

11. Connect FE cable W4 to connector J4 of the Digital Controller module. The pin identified with a white dot on P1 of W4 inserts to pin receptacle 1 of J4.

**CAUTION**

Damage may occur to internal cabling and wiring if pinched or bent sharply when re-installing the top half of the unit to the bottom half. Ensure cables are properly positioned when reinstalling.

12. Ensuring all cabling is positioned properly, realign the bottom half of the Miniceptor with the top half.
13. Tighten the retaining screws on the rear of the FE to secure it to the Miniceptor's chassis.
14. Using a scribing tool, mark the FE option label on the rear panel that was removed in Step 2. If desired, write the serial number of the FE in the space provided near the serial number of the main chassis on the rear panel.
15. Reinstall the rear panel with the screws that were removed in Step 2.
16. Reinstall the front panel with the screws that were removed in Step 3. The Miniceptor may now be reconnected for operation.

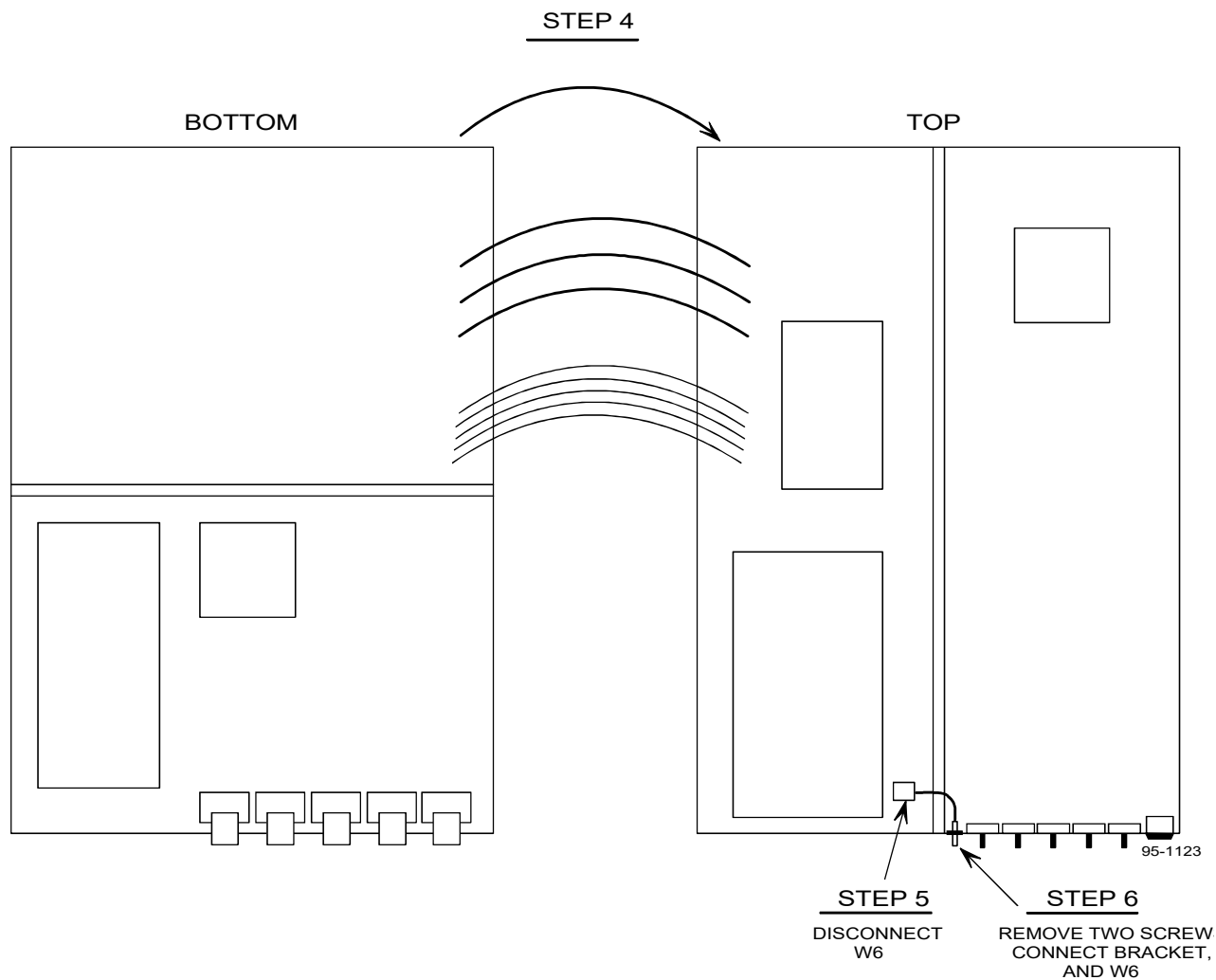


Figure L-2. Opening the Miniceptor and Removing W6

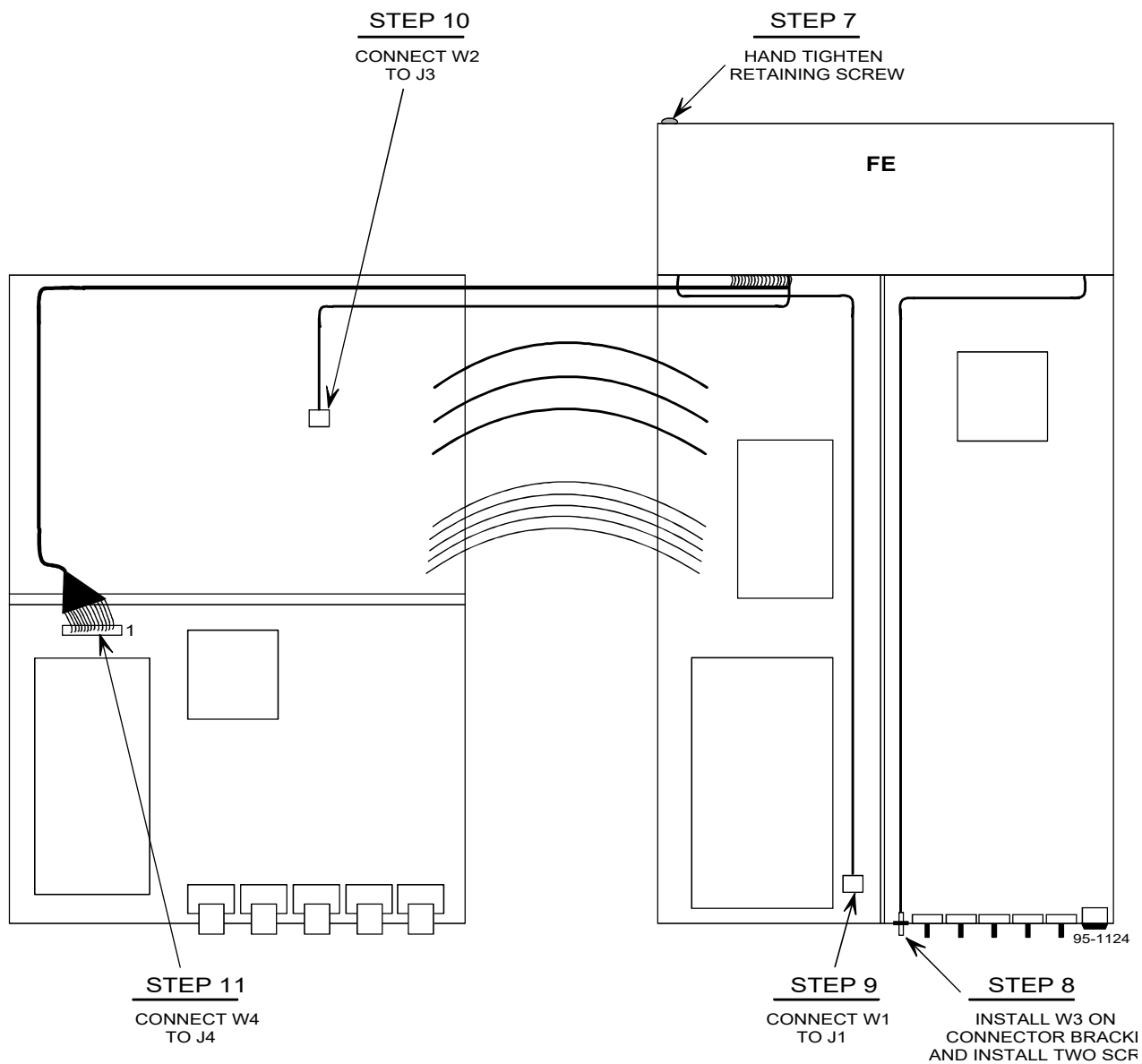


Figure L-3. Installing the FE and Connecting the Cables

L.5 **INPUT AND OUTPUT CONNECTORS**

L.5.1 **IF OUTPUT (W1P1)**

This connector provides the IF output of the FE. See **Tables L-2 and L-3** for the IF outputs of the FE versus the tuned frequency of the WJ-8607 and WJ-8607A Receivers. Output impedance is 50 ohms.

**Table L-2. 860X/3GFE Frequency Extender IF Output Versus WJ-8607 Receiver Tuned Frequency**

Band	Tuned Frequency (MHz)	1st LO (MHz)	Output Frequencies* (MHz)
1	512 - 629.9999	900	388 - 270.0001
2	630 - 689.9999	960	330 - 270.0001
3	690 - 929.9999	1200	510 - 270.0001
4	930 - 1009.9999	1440	510 - 430.0001
5	1010 - 1314.9999	1520	510 - 205.0001
6	1315 - 1419.9999	1800	485 - 380.0001
7	1420 - 1579.9999	1920	500 - 340.0001
8	1580 - 1709.9999	2080	500 - 370.0001
9	1710 - 1899.9999	2220	510 - 320.0001
10	1900 - 2031.9999	2400	500 - 368.0001
11	2032 - 2349.9999	2540	508 - 190.0001
12	2350 - 2399.9999	2850	500 - 450.0001
13	2400 - 2699.9999	2900	500 - 200.0001
14	2700 - 3000.0000	3200	500 - 200.0000

\* The spectrum of the IF output is inverted as compared to the RF input.

**Table L-3. 860X/3GFE Frequency Extender IF Output Versus WJ-8607A Receiver Tuned Frequency**

Band	Tuned Frequency (MHz)	1st LO (MHz)	Output Frequencies* (MHz)
1	511.1808 - 629.1455	900	388.8192 - 270.8545
2	629.1456 - 688.1279	960	330.8544 - 271.8721
3	688.1280 - 930.6111	1200	511.8720 - 269.3889
4	930.6112 - 1009.2543	1440	509.3888 - 430.7457
5	1009.2544 - 1317.2735	1520	510.7456 - 202.7265
6	1317.2736 - 1422.1311	1800	482.7264 - 377.8689
7	1422.1312 - 1579.4175	1920	497.8688 - 340.5825
8	1579.4176 - 1710.4895	2080	500.5824 - 369.5105
9	1710.4896 - 1900.5439	2180	469.5104 - 279.4561
10	1900.5440 - 2031.6159	2300	399.4560 - 268.3841
11	2031.6160 - 2352.7423	2540	508.3840 - 187.2577
12	2352.7424 - 2398.6175	2850	497.2576 - 451.3825
13	2398.6176 - 2700.0831	2900	501.3824 - 199.9169
14	2700.0832 - 3000.0000	3200	499.9168 - 200.0000

**L.5.2 10 MHz REFERENCE INPUT (W2P1)**

This connector accepts the 10 MHz, -25 dBm minimum reference from the Miniceptor. Nominal input impedance is 100 ohms.

**L.5.3 RF INPUT (W3J4)**

This connector accepts the RF input from the antenna via the Miniceptor's front panel RF IN connector. Nominal input impedance is 50 ohms.



#### L.5.4 **POWER AND DIGITAL INTERFACE (W4P1)**

This connector provides power inputs and the control interface between the FE and the Miniceptor. **Figure L-4** illustrates the pin assignments for this connector. Explanations of the signals resident on the specific pins of this connector are provided in the following paragraphs.

##### L.5.4.1 **Serial Data Input (Pin 2)**

The input on pin 2 is a serial data stream, from the Miniceptor's digital controller, consisting of 32-bit data words. These data words contain LO synthesizer and bandwidth filter select information.

##### L.5.4.2 **Clock Input (Pin 1)**

The input on this pin is a TTL level clock input used for synchronizing the serial data input to the FE's digital interface. The positive transition of the clock (from low to high) occurs in the middle of each data bit in the serial 32-bit data words input on pin 2.

##### L.5.4.3 **Enable Input (Pin 4)**

This TTL level input, when high, enables the FE's digital interface circuits, unlatching the serial data inputs. This signal is high for 1.5  $\mu$ sec at the end of each 32nd clock input on pin 1.

##### L.5.4.4 **AGC Input (Pin 5)**

The input on this pin is the AGC control voltage, ranging from +2 Vdc to +8 Vdc, from the Miniceptor's digital controller. This input controls an attenuator for automatic attenuation of the FE's IF output.

##### L.5.4.5 **Lock Detect Output (Pin 6)**

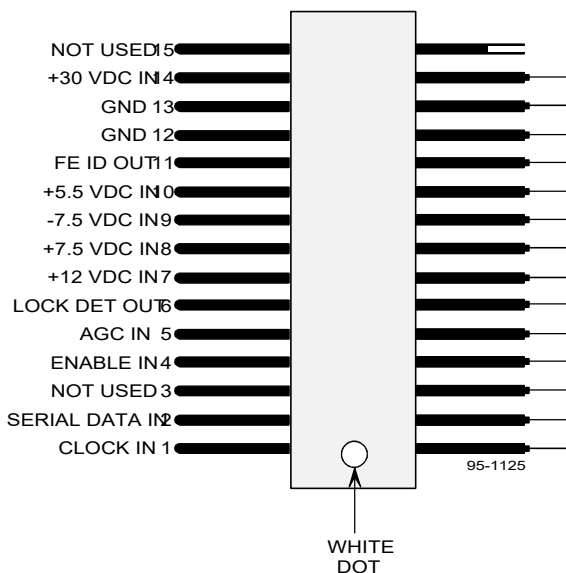
This output, when high, indicates a synthesizer phase-locked loop condition in the FE.

##### L.5.4.6 **Power Inputs**

Pins 7, 8, 9, 10, and 14 are the +12 Vdc, +7.5 Vdc, -7.5 Vdc, +5.5 Vdc, and +30 Vdc power inputs, respectively, to the FE. Pins 12 and 13 are ground.

##### L.5.4.7 **FE Identification (Pin 11)**

When the FE is electrically connected to the Miniceptor and +5.5 Vdc power is applied to the FE, this pin outputs a constant +5 Vdc signal for indication to the Miniceptor's digital controller that the FE is installed.



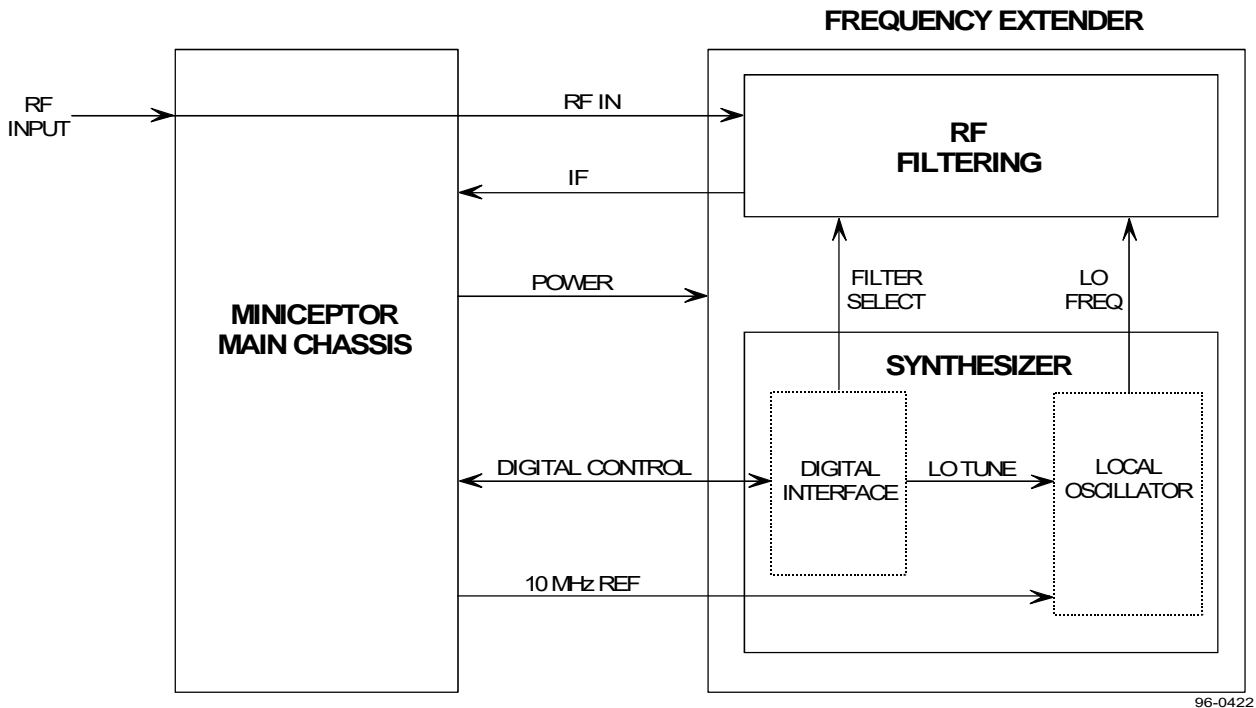
**Figure L-4. Connector W4P1, Pin Assignments**

L.6 **FUNCTIONAL DESCRIPTION**

**Figure L-5** is a functional block diagram of the FE which includes the functional relationship of the FE to the Miniceptor. As shown in the block diagram, the FE can be separated into two functional sections: Synthesizer and RF Filtering, which are further discussed in the following.

The RF input at the front panel of the Miniceptor is routed directly to the FE when installed. The RF is input to the FE's RF Filtering section where it encounters one out of nine possible band pass filter circuits. When the Miniceptor is tuned to frequencies between 512 and 3000 MHz, control signals are sent from the Miniceptor's digital controller to the RF Filtering section via the FE's digital interface. These control signals select the proper band pass filter in accordance with the tuned frequency.

The Synthesizer section of the FE provides an LO output in the range from 900 to 3200 MHz. The frequency is selected by digital control in response to the tuned frequency. The LO output, which is referenced to the 10 MHz reference from the Miniceptor, is mixed with the bandlimited signal in the RF Filtering section to produce an IF signal which is routed back to the Miniceptor for further processing. Refer to **Tables L-2** and **L-3** for a list of the resultant IF outputs of the FE versus the tuned frequency of the WJ-8607 and WJ-8607A Receivers. When the tuned frequency is within the normal tuning range of the Multiceptor, below 512 MHz, the RF filtering and LO circuits of the FE are bypassed.



**Figure L-5. Functional Block Diagram**

**L.7 UNIT NUMBERING METHOD**

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as 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)

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

**L.8 REFERENCE DESIGNATION PREFIX**

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

**L.9**                    **LIST OF MANUFACTURERS**

No additional manufacturers are required in support of the Frequency Extender option, compared to those listed in the base manual. Refer to the base manual for a complete listing of manufacturers.

**L.10**                    **PARTS LIST**

The following parts lists contain the major electrical components used in the 860X/3GFE and 860XA/3GFE Frequency Extender Options, along with mechanical parts which may be subject to unusual wear or damage. Electrically, both versions of the Frequency Extender options are identical. Mechanically, there are slight differences between the two. For this reason, a separate parts list is provided for both versions of the options. **Paragraph L.11** provides the parts listing for the 860X/3GFE option, while **paragraph L.12** provides the parts listing for the 860XA/3GFE option. When ordering replacement parts from Signia-IDT, Inc., specify the unit type, the serial number, and the option configuration. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in the base manual, and the manufacturer's part number, provided in **paragraphs L.11** and **L.12**, are supplied as a guide to aid the user of the equipment while in the field. However, the parts listed may not necessarily be identical with the parts installed in the unit. However, the parts listed in **paragraphs L.11** and **L.12** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are 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 improvements in semiconductors are made, it is the policy of Signia-IDT, Inc. to incorporate them in proprietary products. As a result, some transistors, diodes and integrated circuits which are installed in the unit may not agree with the parts lists or schematic diagrams of this manual. However, substitution of the semiconductor devices listed in this manual may be substituted with satisfactory results.

**L.10.1**                **PROVISIONING NOTE - INCONSISTENCIES  
IN PART NUMBERING CONVENTIONS**

The internal computer applications at Signia-IDT, Inc. have undergone upgrades to better serve our customers. With this upgrade came alterations to the numbering scheme for parts reporting to an end item. Due to these alterations, minor inconsistencies may exist between identifying parts numbers found on drawings, piece parts, or other documentation. No form fit and function specifications have been altered due to this change in the numbering scheme.

The inconsistencies take two forms. New part number conventions mandate the use of three-digit suffixes for part numbers used within computer applications. Part numbers having single-digit suffixes have been altered by the addition of leading zeroes. Therefore, a piece part with an identifying number having a suffix of “-2” may be represented in a computer-generated document with a part number having a suffix of “-002”. Also the new part numbering convention requires that the base portion of a part number be made up of six digits. Part numbers with base portions with less than six digits are expressed with leading zeroes to meet this requirement. Accordingly, a part number having a base of “34456” may appear as “034456”. If you have questions or concerns regarding the configuration identification of piece parts, contact the plant for additional information at 1-800-954-3577.

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REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L.11	<b><u>860X/3GFE FREQUENCY EXTENDER OPTION</u></b>				MAIN CHASSIS
	Revision 01				
A1	RF Assembly	1	797335-001		14632
A2	Synthesizer Assembly	1	797340-001		14632
C1	Capacitor, Feedthru, EMI: 1000 pF, 100 V, 10 Amp	9	54-790-018		33095
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Feedthru: 100 pF, 20%, 200 V	2	54-790-001-101M		33095
C5	Same as C4				
C6					
Thru	Same as C1				
C11					
W1	Cable Assembly	1	649730		14632
W2	Cable Assembly	1	17300-764-002		14632
W3	Cable Assembly	1	649731		14632
W4	Cable Assembly	1	17300-764-004		14632
W5	Cable Assembly	1	17300-764-005		14632

WJ-860X/FE FREQUENCY EXTENDER OPTION

APPENDIX L

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
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L.12      **860XA/3GFE FREQUENCY EXTENDER OPTION**      MAIN CHASSIS

	Revision 01				
A1	RF Assembly	1	797335-001		14632
A2	Synthesizer Assembly	1	797340-001		14632
C1	Capacitor, Feedthru, EMI: 1000 pF, 100 V, 10 Amp	9	54-790-018		33095
C2	Same as C1				
C3	Same as C1				
C4	Capacitor, Ceramic, Feedthru: 100 pF, 20%, 200 V	2	54-790-001-101M		33095
C5	Same as C4				
C6					
Thru	Same as C1				
C11					
E1	Terminal, Feedthru, Turret	1	160-2004-02-01		71279
W1	Cable Assembly	1	649730		14632
W2	Cable Assembly	1	17300-764-012		14632
W3	Cable Assembly	1	649731		14632
W4	Cable Assembly	1	17300-764-004		14632
W5	Cable Assembly	1	17300-764-005		14632

**NOTES**



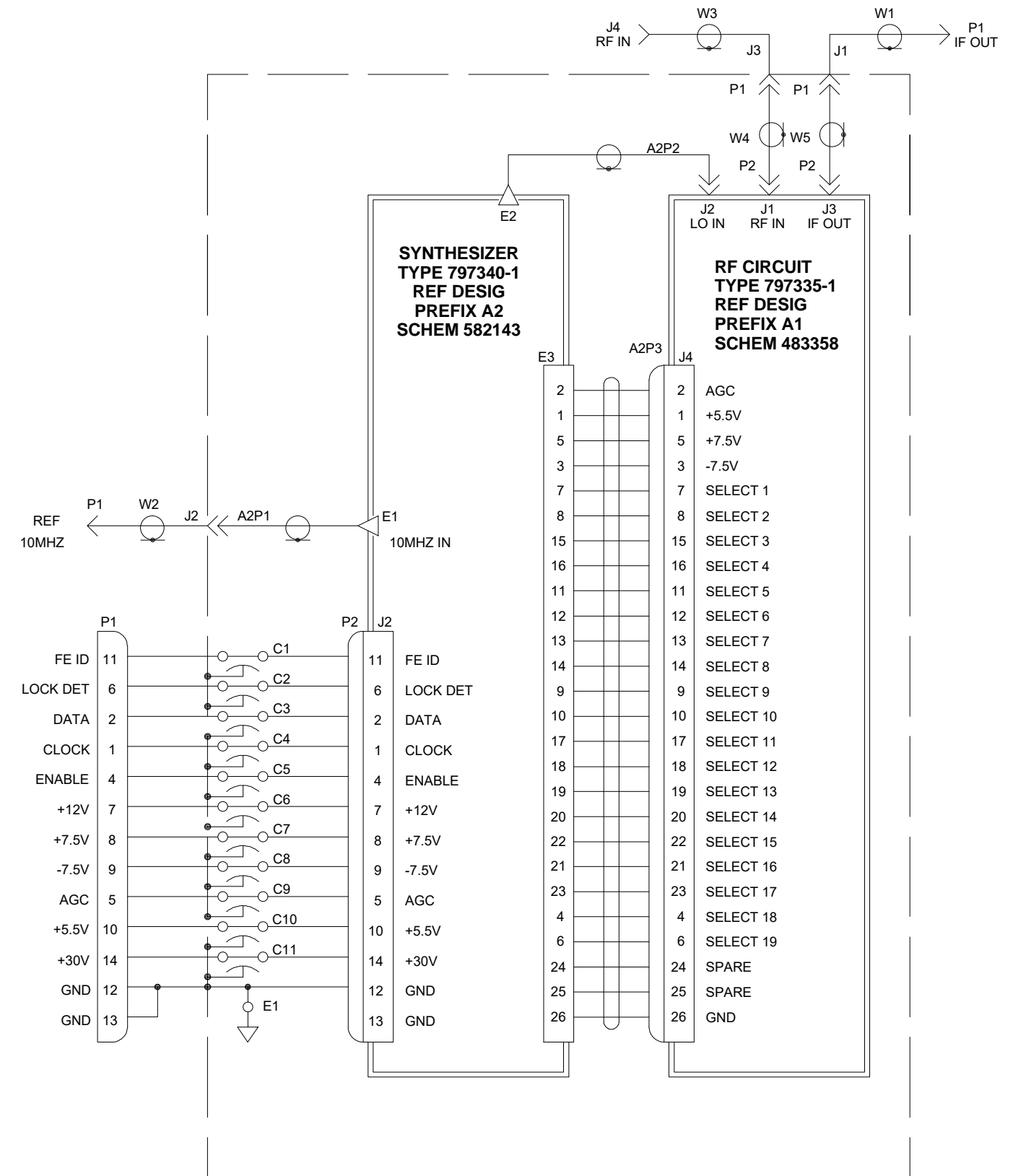


Figure L-6. Type 860X/3GFE and 860XA/3GFE Frequency Extender Main Chassis Schematic Diagram 483401 (X1)