INSTALLATION, OPERATION, AND INTERMEDIATE LEVEL MAINTENANCE MANUAL

FOR THE

WJ-8611 DIGITAL VHF/UHF RECEIVER

P/N 181122-001, Revision T

DRS Technologies
DRS Signal Solutions, Inc.
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

July 2008

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-8611 DIGITAL VHF/UHF RECEIVER

REVISION RECORD

Revision	Description	Date
A	Initial issue.	9/95
B	Update per Engineering Change.	1/96
C	Updated Local Control operation functions. Added I/O mating connector data to include part number and manufacturer. Updated Main Chassis parts list to include accessory items.	5/96
D	Updated to include CE markings of unit. Added new bandwidths. Reorganized foldouts. Revised warnings and cautions. Provided details on mechanical parts subject to wear or breakage. Revised numbering of remove and replace procedures.	11/96
E	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
F	Incorporated ECO 038860.	8/98
G	Incorporated ECO 039163 to reflect addition of WJ-8611/SM Signal Monitor Option and changes to parts lists and schematics related to ECOs 038903, 038995, 039024, and 039159. Revised software history to reflect ECO 039059. Added **Appendix A**.	12/98
H	Incorporated ECO 039336.	12/98
J	Incorporated ECO 040062.	11/99
K	Incorporated ECO 040756.	10/00
L	Incorporated ECO 040490. Updated schematics. Added front panel circuit description and block diagram.	01/01
M	Incorporated ECO 041130.	02/01
N	Incorporated ECO 041580.	09/01
P	Incorporated ECO 042093.	08/02
Q	Incorporated ECO 042597.	12/02
R	Incorporated ECO 044391.	4/04
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SECTION 1

GENERAL DESCRIPTION

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SECTION 1 GENERAL DESCRIPTION

1.1 ELECTRICAL CHARACTERISTICS

The WJ-8611 Digital VHF/UHF Receiver is a fully synthesized general purpose surveillance receiver that combines a high quality analog RF tuner with the power of a Digital Signal Processing-based (DSP-based) IF and Demodulation section. It tunes over a 2 to 1000 MHz frequency range, with a 10 Hz tuning resolution (specifications apply in the 20 to 1000 MHz range). The standard receiver offers a selection of seventeen IF bandwidths ranging from 200 Hz to 200 kHz. The detection mode selections are AM, FM, CW, SSB, and ISB. A five-band tracking preselector, at the receiver front end, improves performance by limiting the interfering signals at the input. The preselector tracks with the tuned frequency and limits the input spectrum to approximately 20% of the tuned frequency. The detailed specifications for the WJ-8611 Digital VHF/UHF Receiver are provided in **Table 1-1**.

Accurate frequency tuning is provided using analog coarse tuning, coupled with DSP controlled fine tuning. The coarse tuning is provided by three synthesized local oscillators that provide an analog IF output with a 1 kHz tuning resolution. A highly stable 10 MHz internal reference, with a $\pm$ 0.5 x 10^{-6} accuracy, is used as the common time base for the synthesizer circuits. Fine tuning to a 10 Hz resolution is performed using a DSP algorithm after the signal has been digitized.

Many of the receiver functions such as fine tuning, IF filtering, gain control and demodulation are performed digitally, using DSP techniques. This results in stable, repeatable performance over a wide range of operating conditions. Digital filters produce IF filter performance with superior amplitude and group delay characteristics.

The receiver provides a 21.4 MHz IF output that is derived from the analog circuitry of the RF assembly, and audio and video outputs that are reconstructed into analog signals after the signal has been processed by the DSP circuits. A digital IF output is provided for use with external digital signal processing equipment. It consists of the complex In-phase (I) and Quadrature-phase (Q) components of the received signal. A pre-detected 250 kHz IF output is also provided.

In addition to manual operation, the WJ-8611 Digital VHF/UHF Receiver provides flexible scanning capabilities, using a user programmable 200 channel memory, a search memory, and group of dedicated memory control keys that permit memory programming and activation of automatic operating modes such as F1-F2 and Channel scans.

The standard receiver supports remote control from either a serial or a parallel interface. It can be configured for single-drop, full-duplex RS-232C or IEEE-488 operation. Internal switches determine which interface is active and its operating characteristics. The configuration may be modified in the field to accommodate a wide range of controlling devices.

Table 1-1. Table of Specifications

Frequency Range	2 to 1000 MHz (specifications apply to 20 to 1000 MHz)
Tuning Resolution	10 Hz
RF Input Impedance	50 ohms, nominal
Input VSWR	2:1, typical; 3:1, maximum
Noise Figure	12 dB, maximum
Preselection	20% bandwidth, tracking filter
Intermodulation Performance:	
2nd-Order Input Intercept Point	+40 dBm, typical
3rd-Order Input Intercept Point	+4 dBm, minimum
Image Rejection	80 dB, minimum
Blocking	Attenuation of a desired -90 dBm RF signal by a -5 dBm interfering signal offset by 20 MHz is < 3 dB.
IF Rejection	80 dB, minimum
Maximum Input Signal	+20 dBm, without damage
Internally Generated Spurious	<-110 dBm equivalent input
Reciprocal Mixing	With an input signal at rated sensitivity level in the 50-kHz bandwidth, an out-of-band signal removed by 350 kHz and 70-dB higher in level will not degrade the specified S+N/N ratio of the desired signal by more than 3 dB.
LO Level at RF Input	-90 dBm, maximum
LO Phase Noise	<-95 dBc/Hz @ 10 kHz offset
Synthesizer Lock Time	10 msec, maximum to within 1 kHz
Internal Frequency Accuracy	$\pm 0.5 \times 10^{-6}$ (5 to 40°C)
IF Bandwidths (6 dB BW)	200 kHz, 150 kHz, 100 kHz, 60 kHz, 50 kHz, 35 kHz, 30 kHz, 20 kHz, 15 kHz, 10 kHz, 8 kHz 6.4 kHz, 5 kHz, 3.2 kHz, 1 kHz, 500 Hz, 200 Hz
IF Shape Factor	<1.5:1 (60 dB/6 dB), typical
AFC	Automatic with disable
Gain Control Modes	Manual (MGC) and Automatic (AGC)
Gain Control Range	90 dB, minimum
Manual Gain Resolution	1 dB, nominal
COR/Squelch Range	Adjustable from -130 to -30 dBm
COR/Squelch Resolution	1 dB, nominal
Detection Modes	AM, FM and CW, all bandwidths USB and LSB for 3.2 kHz BW ISB for 6.4 kHz BW
Variable BFO Range	±8 kHz
Variable BFO Resolution	10 Hz steps
Signal Monitor Output	Nominally 12 dB above the RF input, 10 MHz bandwidth
Switched Video Output Level	1.0 V peak-to-peak into 50 ohms (for 30% deviation FM or 50% AM modulation)
Video Frequency Response	dc to 1/2 the selected IF bandwidth
Line Audio Output Level	0 dBm into 600 ohms, nominal
Sensitivity	See **Table 1-2**
Control Interface	RS-232 and IEEE-488
Power Requirements	90 to 264 Vac, 48 to 440 Hz
Power Consumption	50 W, maximum

Table 1-1. Table of Specifications (Continued)

Environmental:	
Vibration	MIL-STD-810E method 514.4 categories 1, 8, and 9 (Basic transportation, Ground Mobile, and Shipboard)
Shock	MIL-STD-810E method 516.4, procedure VI, Bench Handling
Operating Temperature	MIL-STD-810E methods 501.3 and 502.3
Storage Temperature	-40°C to +80°C
Altitude	MIL-STD-810E method 500.3
	Humidity MIL-STD-810E method 507.3, procedure III
Mean Time Between Failure (MTBF)	In excess of 10,000 hours per MIL-HDBK-217E, Ground-fixed environment
Mean Time To Repair (MTTR)	< 30 minutes
CE Approvals	Low Voltage Directive 72/23/EEC EMC Directive 89/336/EEC

Table 1-2. Sensitivity

Bandwidth (kHz) Modulation	60:6-dB IFBW Shape Factor	Sensitivity (dBm)* 20 to 1000 MHz
0.5 CW	1.5:1 max	-114
1.0 CW	1.5:1 max	-113
5.0 AM	1.5:1 max	-106
10 AM/FM	1.5:1 max	-103
20 AM/FM	1.5:1 max	-100
50 AM/FM	1.5:1 max	-96
100 AM/FM	1.5:1 max	-93
200 AM/FM	1.5:1 max	-90

*Sensitivity Conditions

AM - An input signal AM modulated 50% by a 1-kHz tone produces a minimum video output S+N/N ratio of 10 dB.

FM - An input signal FM modulated at a 1-kHz rate with a peak deviation equal to 30% of the selected IFBW produces a minimum video output S+N/N ratio of 17 dB. (Note: A 400 Hz modulation rate is required for IFBWs of 10 kHz or less.)

CW - A continuous RF input signal produces a minimum audio output S+N/N ratio of 16 dB.

1.2 MECHANICAL CHARACTERISTICS

The WJ-8611 Digital VHF/UHF Receiver is a half-rack unit, measuring 8.25 inches (20.96 cm) wide, 5.25 inches (13.34 cm) high, and 18.0 inches (45.72 cm) deep (excluding front and rear panel support bracket clearance). Panel support brackets, slide attachment holes, and special mounting hardware are provided with the unit for a side-by-side mounting of two units into a standard 19-inch equipment frame. The complete unit weighs less than 15 pounds (6.8 kg) and consumes less than 50 watts of power. Refer to **Figure 2-1** for the critical dimensions diagram of the WJ-8611 Digital VHF/UHF Receiver.

The front panel contains large, bright LED displays, providing a clear indication of the receiver's operating status. The displays consist of a 9-digit frequency window that displays the tuned frequency to 10 Hz resolution. A separate parameter window provides the status of key operating parameters. In addition, many of the operating keys contain LEDs that reflect their functional status. The operating controls are functionally grouped to provide straightforward, user-friendly operation. A group of parameter control keys (directly below the parameter display), a numeric keypad, and a 2-1/2 inch tuning wheel provide the means for front panel control.

All input and output connectors, except for the front panel PHONES jack, are located on the rear panel. An N-type connector is utilized for the RF input. An SMA connector is provided for the 250-kHz IF output. All other analog signal lines, except of the audio terminal bus, are BNC-type. Three multi-pin connectors are utilized for the Digital IF Output, and the IEEE-488, and RS-232 outputs. A 6-pin terminal bus provides the Line A and Line B audio outputs.

The top and bottom covers and the main chassis are constructed of aluminum. An aluminum deck separates the top and bottom sections of the chassis and provide the mounting surface for the Digital Assembly, Power Supply, and the RF Assembly. The top and bottom covers are secured in place with 11 Phillips head screws. Removal of the top cover provides access to the RF Assembly. Removal of the bottom cover provides access to the Digital Assembly and the Switching Power Supply.

1.3 EQUIPMENT SUPPLIED

The equipment supplied with the WJ-8611 Digital VHF/UHF Receiver consists an Intermediate Maintenance Manual and an accessory kit consisting of:

1 Ea. Line Cord
1 Ea. Line Fuse, 1 Amp 3 AG Slow Blo
1 Ea. Support Bracket
1 Ea. Support Bracket, Center
1 Ea. Handle Assembly, Rear
1 Ea. Handle Assembly, Rear

1.4 EQUIPMENT REQUIRED BUT NOT SUPPLIED

To obtain full utilization of the receiver, equipment from the following list should be selected:

- VHF/UHF Antenna, 50-ohm, 20 to 1000 MHz
- Headphones, 600-ohm
- Line Audio Monitoring Equipment
- Signal Monitor/Spectral Display Unit, 21.4 MHz Input Frequency, 50-ohms
- IEEE-488 or RS-232C Compatible Computer for Remote Control

1.5 SOFTWARE RELEASE HISTORY

The WJ-8611 software has two components the Control software and the A/D Gain Control software. The initial version of the Control Software software is version 01.00.00, which was released on October 6, 1995. The initial version of the A/D Gain Control Software software is version 01.00.00, which was released on October, 6 1995. The Control software includes the following software areas: Internal Control, Remote, Front Panel, DSP A, DSP B, Filters, FLEX 1, and FLEX 2.

Version 01.00.03 of the Control software was released on February 7, 1996. This release made improvements and corrected problem areas as follows.

- Corrected program error caused LO3 to unlock.
- Corrected a power supply error occurring during equipment power up.
- Corrected errors in the F1-F2 channel scans when operating from the remote host.
- Corrected errors in switching from F1-F2 scans to F1-F2 without LOCKOUT scans.
- Modified method of checking global EPROM checksum.
- Added ability to specify filter gain.
- Corrected file access problems.

Version 01.00.04 of the Control software was released on June 24, 1996. This release made improvements and corrected problem areas as follows.

- Corrected excessive DSP B communication errors at high temperatures.
- Corrected excessive time (10 to 12 seconds) for front panel illumination during power up.

- EPROM addresses were changed to accommodate use of different EPROM components.
- Corrected problems in manufacturing test commands.
- Corrected problem in which the EXE bit was being set in the SRQ hierarchy by the *RST command.

Version 01.00.05 of the Control software was released on July 17, 1996. This release corrected failure to communicate properly through the RS-232 interface after being energized (when deenergized for more than a few minutes). This release also provided a method of assuring that version numbers stored temporarily in RAM always match permanently stored values in EPROM.

Version 01.00.06 of the Control software was released on August 13, 1996. This release corrected premature reaction to signals from front panel pushbuttons during program booting.

Version 01.00.07 of the Control software was released on October 1, 1996. This release provided two new bandwidth filters at 8 kHz and 30 kHz. This release also corrected very slow AGC reaction to signal level increases. The addition of the two new bandwidths affects the operator selection of bandwidth using the BWS Command. The bandwidth selection numbers in the BWS command are different in units with this software version installed from units with earlier versions installed. To avoid selection of incorrect bandwidths, operators should be aware of the software configuration in their individual unit and use the correct bandwidth numbers. With this version the selection numbers for the 17 available bandwidths are as specified for the BWS Command in **Table 4-1** of this document. Prior to incorporation of this software version, selection numbers for the 15 previously available bandwidths were as follows:

1 = 0.00020 MHz	9 = 0.02000 MHz
2 = 0.00050 MHz	10 = 0.03500 MHz
3 = 0.00100 MHz	11 = 0.05000 MHz
4 = 0.00320 MHz	12 = 0.06000 MHz
5 = 0.00500 MHz	13 = 0.10000 MHz
6 = 0.00640 MHz	14 = 0.15000 MHz
7 = 0.01000 MHz	15 = 0.20000 MHz
8 = 0.01500 MHz	

Version 1.00.12 of the Control software was released on July 22, 1997. This release fixed a software error that affected the Fsync signal and that caused loss of demodulated output due to out-of-sync I/Q signal paths. It fixed an RS-232 communications error that was introduced when software was updated to support the WJ-9168. It also changed the *CLS command function to clear the power-on bit of the ESR register.

Version 1.00.13 of the Control software was released on August 18, 1997. DSP B was upgraded with improved I/Q output including squelch and scan error fixes. The communications rate to the preselector I/F was reduced.

Version 01.01.00 of the Control software was released on December 4, 1998. It added an argument to the *OPT? Query to indicate the presence of the 8611/SM option. It modified the VCO frequency ranges, which were set to incorrect values previously.

1.6 WJ-8611 OPTIONS

1.6.1 8611/SM SIGNAL MONITOR OPTION

The 8611/SM Signal Monitor Option adds the capability of providing frequency and signal strength information about the 21.4 MHz IF signal to a controlling computer enabling the computer to provide a panoramic (PAN) IF representation of it. This IF PAN display is useful as an aid to receiver tuning or to observe signal activity. This capability is made possible through the mechanical and electrical integration of the WJ-9168 Signal Monitor Module (SMM) within the WJ-8611. Refer to **Appendix A** for further details.

NOTES

SECTION 2

INSTALLATION

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SECTION 2 INSTALLATION

2.1 UNPACKING AND INSPECTION

The WJ-8611 Receiver and its accessories is shipped cushioned between molded-in-place packing material in a double walled shipping carton. After unpacking the equipment, retain the shipping container and its packing material until the equipment has been thoroughly inspected and it is ensured that reshipment is not necessary. Perform the following initial inspection:

1. Carefully inspect the outside of the shipping container for discoloring, stains, charring, or other signs of exposure to heat, moisture, or liquid chemicals. Check for any signs of excessive shock or careless handling.

2. Remove all equipment and accessories from the shipping container. If items are missing, contact the factory or your local sales representative.

3. Remove and retain the white 5x6 inch PRODUCT DISCREPANCY REPORT card. This card should be used if reshipment of the equipment is required. It also contains important warranty adjustment information.

4. Carefully inspect the equipment for dents, scratches, damage or loose pushbuttons or knobs, or any other signs of physical abuse or careless handling during shipment.

If damage is found, forward an immediate request to the delivery carrier to perform an inspection and prepare a concealed-damage report. Do not destroy any packing material until it has been examined by an agent of the carrier. Concurrently, report the nature and extent of the damage to the factory, giving equipment serial numbers, so that the necessary action can be taken. Under U. S. shipping regulations, claims for damage must be collected by the cosignee; do not return the equipment to the factory until a claim for damages has been established.

2.2 INSTALLATION

The paragraphs that follow provide a guide to the installation of the WJ-8611 Digital VHF/UHF Receiver. Refer to **Foldout FO-1** for the critical dimensions of the WJ-8611 Digital VHF/UHF Receiver.

2.2.1 INTERNAL SWITCH CONFIGURATION

Prior to installation of the WJ-8611 Digital VHF/UHF Receiver into its final location, it is recommended that the internal configuration switches be set for its intended operating configuration. The configuration is set by two DIP switches (A2S1 and A2S2), accessible when the receiver's bottom cover is removed. The setting of A2S1 determines the control mode that the receiver assumes at power up (Configuration or Normal), whether or not the receiver's standard front panel is installed. It also determines if the IEEE-488 bus address can be modified from the front panel. The configuration of switch A2S2 determines the default selections for the type of remote interface that will be operational (IEEE-488 or RS-232), and the IEEE-488 bus address or RS-232 baud rate. Refer to **Figure 2-1** as a guide for the configuration of the switches. Changes to these switches should be performed with the receiver powered OFF. When the receiver is powered ON, the changes are implemented. The receiver is shipped from the factory with all switches in the OFF position.

INTERFACE CONTROL MODE

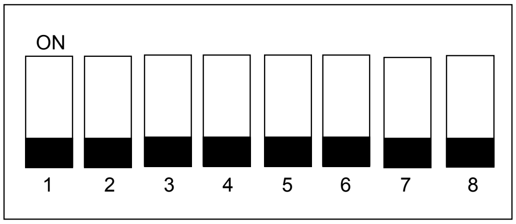
Switch A2S1 provides control over the selection of the control mode that the remote interface assumes on receiver power up. It also determines if the receiver's IEEE-488 bus address can be modified from the configuration menu at the front panel.

Switch position 1 of A2S1 may be used to place the receiver into the Configuration Mode, providing access to the factory configuration data contained in EEPROM on the receiver's Digital Assembly (A2). This data consists of the Configuration Date, Receiver Model and Serial Number, and the Tuning Data for the RF preselector in the receiver's RF Assembly (A3). In this mode, this configuration data may be accessed or changed over the IEEE-488 or RS-232 interface. The commands and queries associated with the Configuration Mode are outlined in **Table 2-1**.

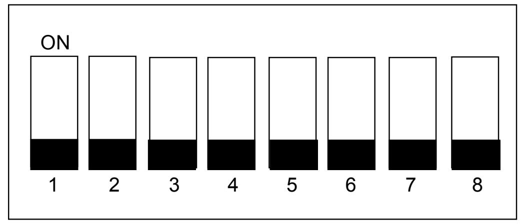
CAUTION **Configuration commands should only be used by qualified maintenance personnel.**

Switch position 4 of A2S1 provides an indication to the receiver's control processor of the status of the front panel. For the standard WJ-8611 receiver, this switch should be in the OFF position, indicating that the front panel, with its controls and indicators, is present. When this switch is in the ON position, it indicates that the standard front panel is not installed.

A2S1 SETTINGS



A2S2 SETTINGS



NOTES: OFF = 0; ON = 1
SEE **FO-11** FOR A2S1 AND A2S2 LOCATIONS.
WJ-8611 IS SET FOR DEFAULT ADDRESS OF 6 AT THE FACTORY.
DARK SEGMENTS DEPICT SWITCH POSITIONS.

Switch	Function
S1 -1	Configuration Mode : Normal - OFF (Default) Configuration - ON
S1 -2	Not Used
S1 - 3	Not Used
S1 - 4	Front Panel Recognition Standard Front Panel Present - OFF (Default) Standard Front Panel Not Present - ON
S1 - 5	Not Used
S1 - 6	IEEE-488 Address Update: Front Panel Update Enabled - OFF (Default) Front Panel Update Disabled - ON
S1 - 7	Not Used
S1 - 8	Not Used
S2 - 1 to 5	IEEE-488 Bus Address (0 -30), (S2-1 = MSB; S2-5 = LSB) (Default OFF)
S2 - 6	Not Used
S2 -7	Interface Type: RS-232 - OFF (Default) IEEE-488 - ON
S2 - 8	RS-232 Baud Rate User Defined - OFF (Default) 9600 - ON

01-0251

Figure 2-1. WJ-8611 Receiver Internal Configuration Switch

CAUTION **Configuration commands should be used only by qualified maintenance personnel.**

Table 2-1. Configuration Mode Commands and Queries

Command	Query	Description
#CDT mm,dd,yy	#CDT?	Sets or reads the date that the current configuration was performed. Range: mm - 1-12 dd - 1-31 yy - 00-99
#CSN nrf	#CSN?	Writes or reads the receiver serial number. Range: nrf = 0-99999
#MDL nrf	#MDL?	Writes or reads the receiver's model number. Example: nrf = 8611
#PRA nrf,nrf,...,nrf	#PRA?	Loads or reads the preselector configuration data for preselector band A. Range: nrf = 0-255 (17 Data Bytes)
#PRB nrf,nrf,...,nrf	#PRB?	Loads or reads the preselector configuration data for preselector band B. Range: nrf = 0-255 (17 Data Bytes)
#PRC nrf,nrf,...,nrf	#PRC?	Loads or reads the preselector configuration data for preselector band C. Range: nrf = 0-255 (17 Data Bytes)
#PRD nrf,nrf,...,nrf	#PRD?	Loads or reads the preselector configuration data for preselector band D. Range: nrf = 0-255 (18 Data Bytes)
#PRE nrf,nrf,...,nrf	#PRE?	Loads or reads the preselector configuration data for preselector band E. Range: nrf = 0-255 (20 Data Bytes)

Switch position 6 of A2S1 protects the IEEE-488 bus address from changes at the receiver front panel. It sets the IEEE-488 bus to the address set by A2S2, pins 1-5 (Down), or it permits the address to be updated in the configuration menu at the front panel (Up). Refer to **paragraph 3.2.9** for details concerning the front panel configuration menu.

REMOTE INTERFACE CONFIGURATION

Switch A2S2 provides configuration control over the default selections of the interface type and its operating characteristics. The type interface that is active is determined by switch position 7 of A2S2 (A2S2-7). With A2S2-7 in the UP position, the RS-232 interface is selected, and the RS-232 connector at the rear panel is available for remote control. Placing A2S2-7 into the DOWN position selects the IEEE-488 interface, making the IEEE-488 connector available for remote control.

Switch positions 1-5 of A2S2, determine the IEEE-488 bus address when the IEEE-488 interface is active. The switch settings reflect the bus address in binary, with position 5 being the least significant digit. Values ranging from 0 through 30 may be used. Address 31 (positions 1-5 DOWN) is not a valid address and should not be used.

Switch position 8 of A2S2 determines the RS-232 interface baud rate. When A2S2-8 is in the Down position, the baud rate is fixed at 9600 baud. When in the UP position, the baud rate may be selected in the configuration menu at the front panel. From the front panel, baud rates of 1200, 2400, 4800, 9600, 19200, or 38400 baud may be selected.

2.2.2 RACK MOUNTING

The WJ-8611 Digital VHF/UHF Receiver, illustrated in **Foldout FO-1**, is packaged in a 5.25-inch (13.34 cm) x 8.25-inch (20.96 cm) x 18-inch (45.72 cm) half-rack enclosure. Panel support brackets, slide mounting holes, and mounting hardware are provided for rack mounting. The standard configuration allows side-by-side mounting of two WJ-8611 Receivers in a standard 19-inch equipment frame. Type 110QD-18-2 chassis slides are recommended for mounting the WJ-8611 Receivers in the standard configuration.

CAUTION **The WJ-8611 Receiver is not designed to be supported in equipment frames solely by its front panel support brackets. Jonathan Type 110QD-18-2 slide mounts are recommended. Mounting holes are provided on the receiver side panels for slide installation. Type 10-32 x 5/16” pan head screws (MS51958-60) are recommended for mounting the slides. Using screws longer then 1/2” will permanently damage the unit.**

SUPPORT BRACKET INSTALLATION

Figure 2-2 illustrates the methods and hardware required to rack-mount two WJ-8611 receivers in the standard side-by-side configuration. All illustrated accessory items are furnished with each receiver to facilitate this installation.

CHASSIS SLIDE INSTALLATION

Jonathan Type 110QD-18-2 chassis slides (not supplied) are designed to allow installation of a 17-inch wide chassis into a 19-inch wide standard equipment rack. Capable of supporting loads up to 100 pounds, these slides mount easily into bracketed equipment racks utilizing machined bar nuts. **Figure 2-3** illustrates the installation of slide mounts into an equipment rack, with special attention given to bracket hole spacing.

Each of the Type 110QD-18-2 slide mounts consists of two functional pieces: a chassis section for mounting to the equipment, and a cabinet section for mounting to the equipment rack. Three 10-32 x 5/16 pan head screws are used to install each chassis section to a receiver side panel. After both chassis sections have been securely tightened to the equipment, the cabinet sections are installed into the equipment frame. The WJ-8611 Receiver requires 5.25 inches of vertical rack space. Four holes are used to secure the cabinet section of the slide to the equipment frame mounting rails. The two inner holes on each bracket secure the slide to the equipment frame. The two outer holes are used to secure the receiver's front panel to the equipment frame. Slide locks permit quick disconnect of the chassis section of the slide from the cabinet section for equipment removal. A #10 threaded grounding stud is located on the receiver rear panel for grounding the receiver to the equipment frame.

2.2.3 POWER REQUIREMENTS

The WJ-8611 Receiver will operate with line voltages ranging from 90 to 264 Vac, at line frequencies from 48 to 440 Hz. Its internal switching power supply adjusts to accommodate voltages in this range. No external power source voltage selection is required. The power consumption of the WJ-8611 Receiver is 50 W, maximum.

PART NO.	NOMENCLATURE
282576-2	FRONT SUPPORT BRACKET
282575-1	CENTER SUPPORT BRACKET
384036-1	SPACER SUPPORT BRACKET
10382-A-0832-2	HANDLE ASSEMBLY
283496-1	OUTSIDE REAR HANDLE
283496-2	INSIDE REAR HANDLE

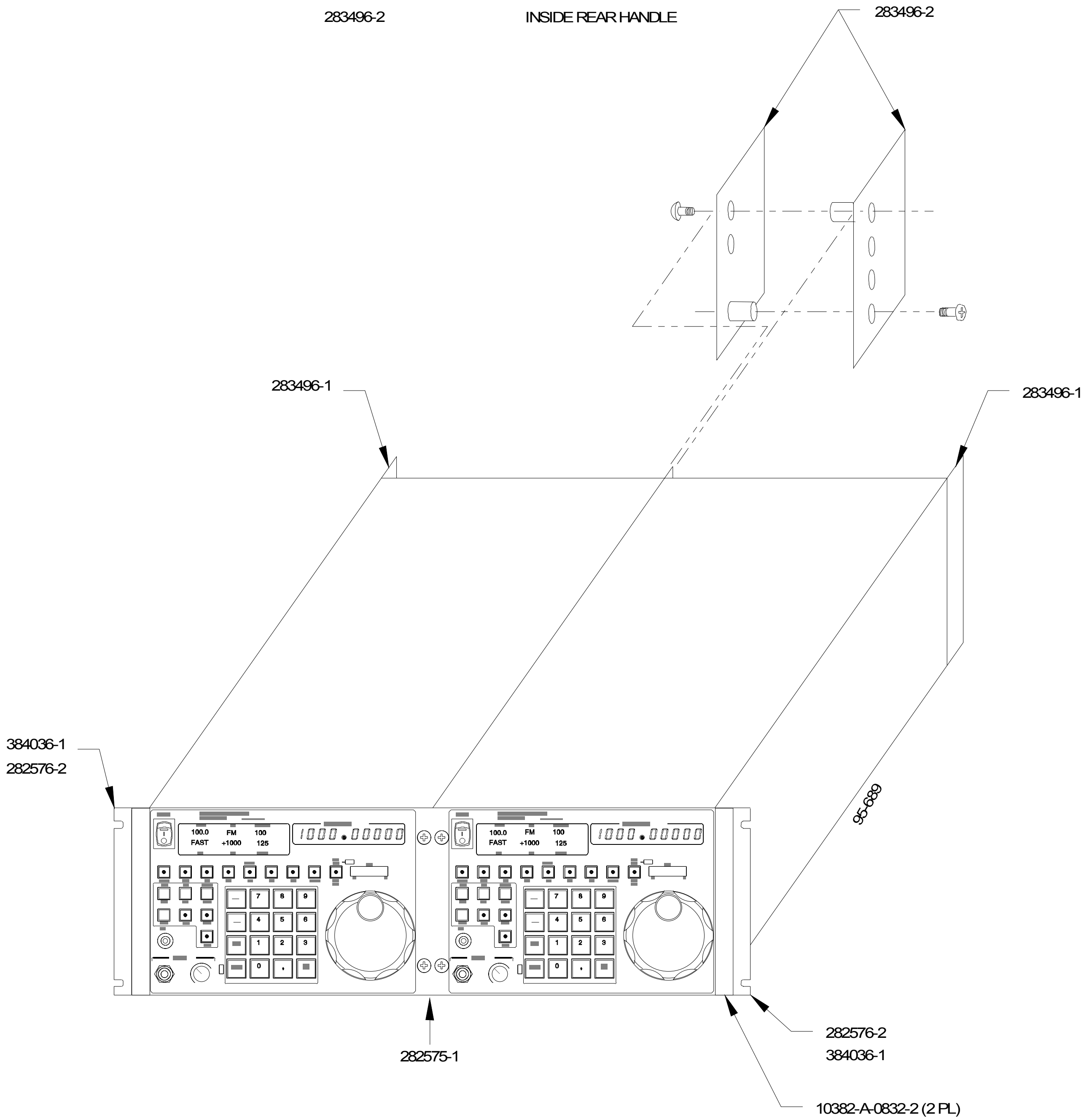


Figure 2-2. WJ-8611, Configuration of Rack Mounting Accessories

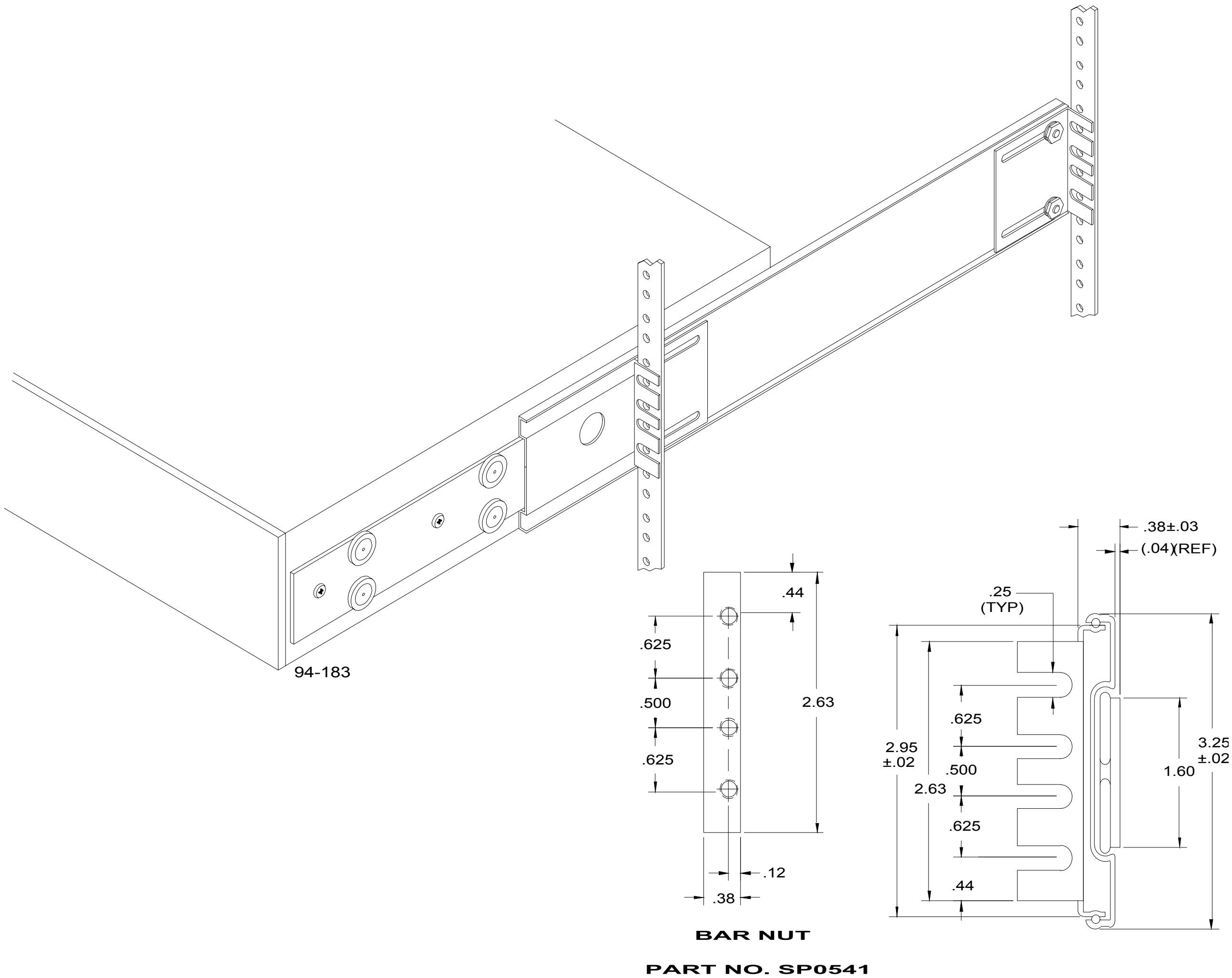


Figure 2-3. Installation of Jonathan Type 110QD-20-2 Slide Mounts

A 1 amp slo-blo fuse (F1) located on the receiver rear panel provides over-current protection. To replace this fuse, turn off the receiver and unplug the line cord from the rear panel. Using a small flat blade screwdriver, remove the F1 fuse cap and remove the fuse. Replace the fuse with a 250 V, 1 amp slo-blo fuse (Busman P/N MDL1).

2.2.4 CONNECTOR SIGNALS

With the exception of the front panel PHONES jack, all external input and output connectors of the WJ-8611 Receiver are located on the rear panel. **Table 2-2** lists all of the external input and output connectors and also provides a brief description of each connector function. A more detailed description of the connectors is provided in the paragraphs that follow. Refer to **Figure 2-4** as a reference for the rear panel connector locations. It is recommended that only shielded cables be used with the WJ-8611 to ensure electro-magnetic compatibility with other devices.

RF IN, ANTENNA INPUT (J4)

This N-type connector provides a nominal 50-ohm input for connection of an antenna or other RF signal source. The receiver is capable of tuning from 0 to 1000 MHz. The input is capable of withstanding maximum input signal levels of +20 dBm without damage to the input protection circuitry.

Table 2-2. WJ-8611 Digital VHF/UHF Receiver Input/Output Connectors

Connector	Reference Designator	Description/Function	Mating Connector (Cage Code)	Comment
RF IN	J4	50-ohm N-Type. RF antenna input or other signal source.	3031-7388-10 (16179)	Not Supplied
SDU	A3A2J1	50-ohm BNC. 21.4 MHz Signal Monitor Output.	221165-2 (00779)	Not Supplied
EXT REF	A3A2J2	50-ohm BNC. External Reference Input (1, 2, 5, or 10 Mhz).	221165-2 (00779)	Not Supplied
COR	A2J6	50-ohm BNC. Carrier-operated-relay output.	221165-2 (00779)	Not Supplied
VIDEO	A2J8	50-ohm BNC. DC to 1/2 of the selected IF Bandwidth.	221165-2 (00779)	Not Supplied
250 kHz IF	A2J21	50-ohm SMA. Analog 250 kHz IF output.	9001-9023-005 (19505)	Not Supplied
LINE AUDIO	A2TB1	600-ohm Terminal Bus. Line A (1,2,3) and Line B (4,5,6) audio output.	ELFP06210 (14632)	P/O Accessory Kit
DIGITAL IF OUT	J3	15-pin D-Type. Digital IF I/Q data.	3357-9215 (53387)	Not Supplied
RS-232	J1	25-pin D-Type. RS-232 remote serial interface port.	748050-1 (00779)	Not Supplied
IEEE-488	J2	24-pin Champ. IEEE-488 remote parallel interface port.	554947-2 (00779)	Not Supplied
POWER	FL1J1	3-prong male receptacle. Line voltage input (90-264 Vac).	17600 (14632)	P/O Accessory Kit

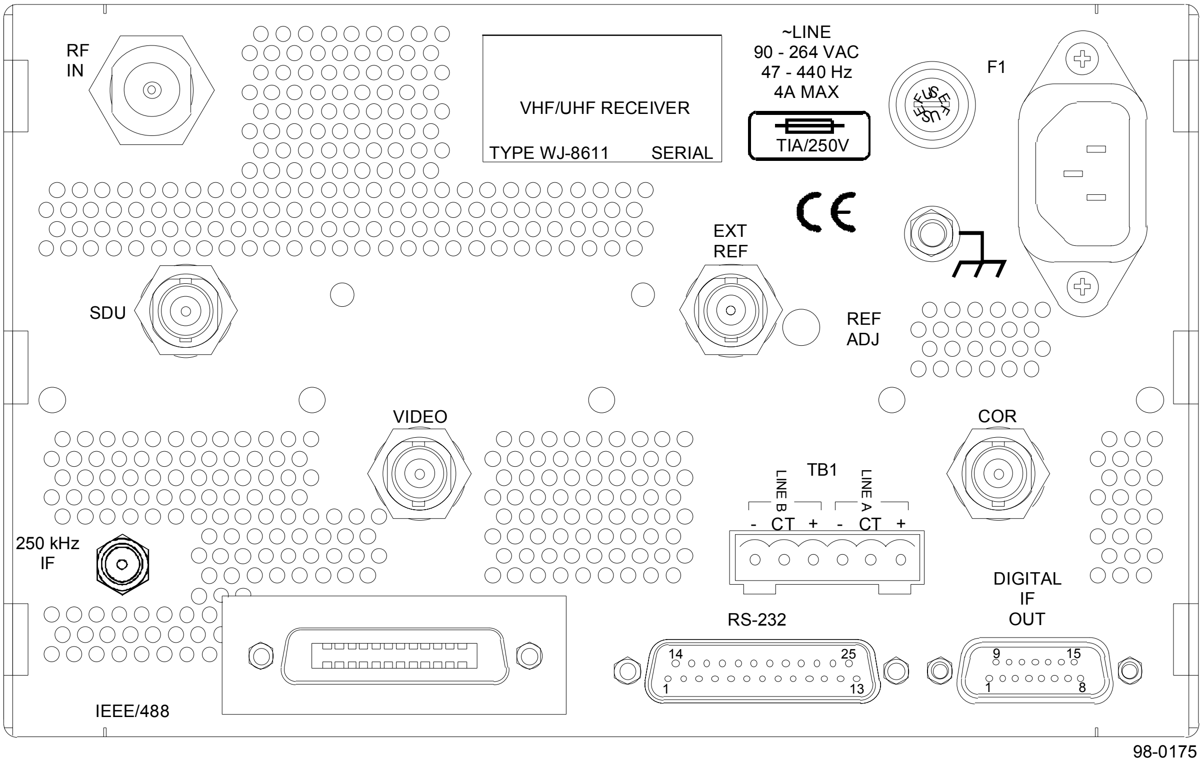


Figure 2-4. WJ-8611 Digital VHF/UHF Receiver Rear Panel

SDU SPECTRUM DISPLAY UNIT OUTPUT (A3A2J1)

The Spectrum Display Unit output is a BNC female connector, with an output impedance of 50 ohms. It provides a sample of the receivers 21.4 MHz intermediate frequency (IF), with the RF tuned frequency centered within 1 kHz of 21.4 MHz. The bandwidth of the spectrum is 10 MHz, typical, and the signal level is approximately 14 dB greater than the input level at the RF input connector.

EXT REF, EXTERNAL REFERENCE INPUT (A3A2J2)

This female BNC connector accepts an input from an external reference signal for use as the receiver's time base. It accepts input signal frequencies of 1, 2, 5, or 10 MHz, at a minimum level of 125 mV rms from a 50 ohm source. The WJ-8611 Receiver automatically senses the input signal and locks to the external reference if the signal is within the allowable specified limits.

COR, CARRIER-OPERATED-RELAY OUTPUT (A2J6)

The Carrier-Operated-Relay output is a 50-ohm female BNC connector that provides a TTL output that indicates when signal activity exceeds the programmed squelch threshold. A logic "0" level indicates an active signal, above threshold, and a logic "1" indicates no signal above threshold. The COR output provides a 100 mA current sink to ground. The maximum voltage that can be applied is +24 Vdc.

VIDEO, VIDEO OUTPUT (A2J8)

The Video Output is a female BNC connector with a 50-ohm output impedance. It provides the DC-coupled output of the post-detected signal, with a bandwidth equal to one-half of the selected IF bandwidth. The output signal level is 1 V peak-to-peak for a 50% AM or 30% FM modulated signal at or above the rated sensitivity of the selected IF bandwidth.

250 kHz IF (A2J21)

This connector provides a 250 kHz IF output that is a 200-kHz wide sample of the IF output generated by the unit's 2nd LO/2nd Converter Subassembly (A3A2). This signal will be approximately 34 dB above the level of the RF input signal until the input level reaches –40 dBm. At this point the unit's automatic gain control (AGC) will hold the output at a constant –10 dBm (±6 dB). The output impedance at this SMA connector is 50 ohms.

TB1, LINE AUDIO, (A2TB1)

The Line Audio output is a 6-pin terminal that provides two center-tapped balanced line audio outputs. The impedance between the Line (+) and Line (-) of each output is 600 ohms. The impedance between either the Line (+) or the Line(-) and the center tap (CT) is 300 ohms. Terminals 1 (+), 2 (CT), and 3 (-) comprise the Line A audio output, and terminals 4 (+), 5 (CT), and 6 (-) comprise the Line B output. The output signal level at each of these outputs is nominally 0 dBm (±3 dB) for signals above the AGC threshold. The audio bandpass is from .1 to 13 kHz.

With the AM, FM, CW, USB, or LSB detection modes selected, the Line A and Line B audio signals are identical. With the ISB (Independent Sideband) selected the audio outputs provide simultaneous reception of both sidebands. The lower sideband is provided at Line A and the upper sideband is provided at Line B.

DIGITAL IF OUT (J3)

The Digital IF Output connector (J3) is a 15-pin subminiature-D type connector that provides a serial interface for post-filtered baseband data in quadrature-I/Q format. The physical signals are provided as differential-TTL (RS-422/485), intended to drive 120-ohm terminated twisted pair wire. The signals may be run single-ended (unterminated) for short distances. For single-ended operation, it does not matter whether the differential positive or negative sense is used. **Table 2-3** lists the signals resident at each pin of this connector.

Table 2-3. Pin Assignments for the DIGITAL IF OUT Connector (J3)

Signal	Pin	Description
Clock A	1	10 MHz Shift Clock (differential positive)
Clock B	9	10 MHz Shift Clock (differential negative)
Data A	3	Serial Data (differential positive)
Data B	11	Serial Data (differential negative)
Stb A	2	Start-of-Data Strobe (differential positive)
Stb B	10	Start-of-Data Strobe (differential negative)
I/Q* A	4	I or Q Data Indicator (1 = I, 0 = Q)
I/Q* B	12	I or Q Data Indicator (0 = I, 1 = Q)
5V	14	5V power
+12V	7	+12V power
-12V	15	-12V power
GND	8	Ground (power)

The data words are 16-bit, twos-complement integers. The words are paired as complex data points, first I then Q. The complex I/Q pairs are scaled so that full scale represents a signal 90 dB above the WJ-8611's noise floor. The total useful range is approximately 90 dB, as measured from the noise floor to full scale. The absolute power level represented by full scale varies with the selected bandwidth. This guarantees that signals near the noise floor will be represented at any bandwidth. For signals exceeding the full scale setting, the data will be invalid. Specifically, the I/Q words' numeric representation will "wrap" from positive full scale to negative full scale.

The data rate of the complex I/Q pairs follows the data rates used by the receiver for demodulation. These rates are:

IF BW	I/Q Pair Data Rate
200 Hz – 1 kHz	3.90625 ksps
3.2 kHz – 6.4 kHz	31.25000 ksps
8 kHz – 20 kHz	62.50000 ksps
30 kHz – 200 kHz	250.00000 ksps
ISB demod (6.4 kHz)	15.625000 ksps

Note that the above rates are for I/Q pairs, and not the individual data word strobe rate. There are two data words for each I/Q pair. **Figure 2-5** illustrates the timing for transfer of individual I and Q data words. The positive phase of the differential signals is shown. The data and control signals change on the negative edge of the clock which places the clock rising edge at mid-bit of the data. Note that the strobe occurs one cycle before the data word starts. The 10 MHz clock signal is always present.

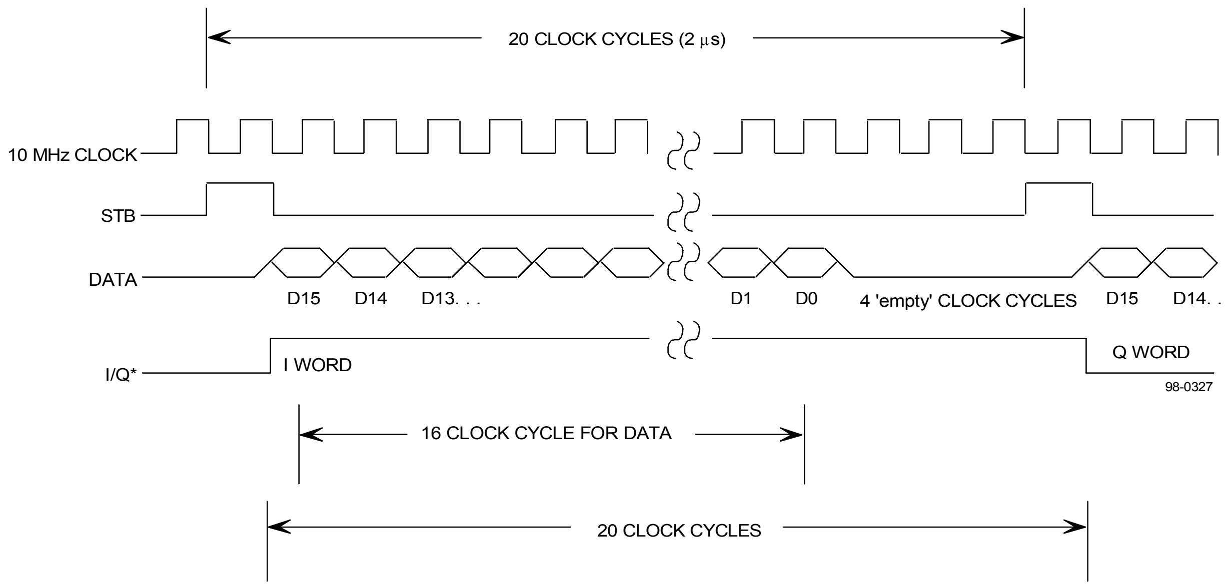


Figure 2-5. Timing Diagram for I/Q Data Transfers at the DIGITAL IF OUT Connector

Figure 2-6 illustrates two examples of the strobe over a longer period of time (several I/Q pair transfers). The first line shows the strobe at the 250 ksps pair rate (2 µs period) used for bandwidths 30 kHz and greater. The second line shows the strobe for the 62.5 ksps pair rate (16 µs period). Note that the strobes for a single I/Q pair are always 20 clocks or 2 µs apart. For the 250 ksps I/Q pair rate example, the strobe appears to have a 500 kHz rate because of the 2:1 ratio between the I/Q pair period (1/250 ksps = 4 µs) and the 2 µs between I and Q strobes. For the lower data rates, there is a gap between the I/Q pairs as shown in 62.5 ksps pair rate example. The lower data rates are similar to the 62.5 ksps case, with periods equal to the inverse of the specific rate.

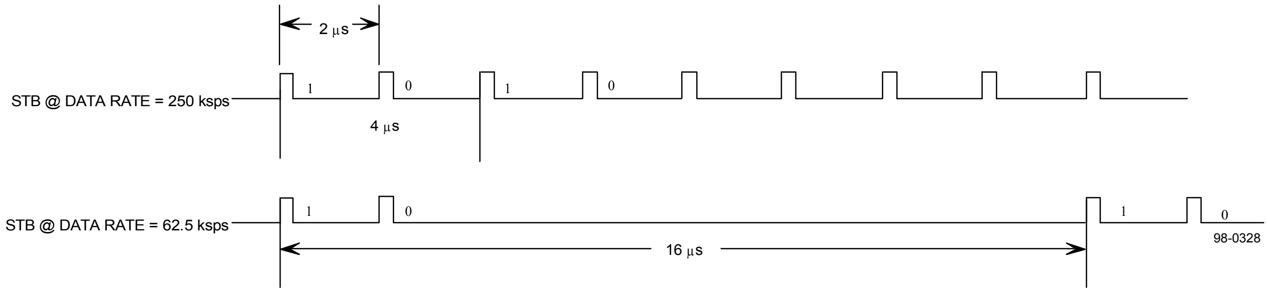


Figure 2-6. Strobe Output Over Several I/Q Pair Transfers

2.3 EQUIPMENT MALFUNCTIONS

This unit was thoroughly inspected and factory adjusted for optimum performance prior to shipment. If an apparent malfunction is encountered after installation, verify that the correct input signals are present at the proper connectors. Prior to taking any corrective maintenance action or breaking any seals, contact your local sales representative, or the factory Customer Service Department to prevent the possibility of voiding the terms of the warranty. Contact the factory via mail, telephone, wire, or cable at:

DRS Signal Solutions, Inc.
Customer Service Department
700 Quince Orchard Road
Gaithersburg, Maryland 20878-1794

Toll Free: 1-800-954-3577
TELEFAX: (301) 948-5666

If reshipment is necessary, follow the instructions in the following paragraph (Preparation for Reshipment or Storage). Do not return the equipment until a Return for Maintenance Authorization (RMA) number has been obtained from the factory Customer Service Department. See Item 10 in the General Terms and Conditions of Sale paper for more information on equipment returns.

2.4 PREPARATION FOR RESHIPMENT OR STORAGE

If the unit must be prepared for reshipment, the packaging method should follow the pattern established in the original shipment. Use the best packaging materials available to protect the unit during reshipment or storage. When possible, use the original packing container and cushioning materials. If the original packing materials are not available, use the following procedures:

1. Wrap the unit in sturdy paper or plastic.

2. Place the wrapped unit in a strong shipping container and place a layer of shock-absorbing material (3/4-inch minimum thickness) around all sides of the unit to provide a firm cushion and to prevent movement inside the container.

3. If shipping the unit for service, fill out all information on the 5x6 PRODUCT DISCREPANCY REPORT card that was provided with the original shipment. Also ensure that the Return for Maintenance Authorization (RMA) number is recorded on the card. (See **paragraph 2.3** for details on obtaining this number.) If this card is not available, attach a tag to the unit containing the following information:

    a. Return for Maintenance Authorization (RMA) number.
    b. Type/Model number of the equipment.
    c. Serial number.
    d. Date received.
    e. Date placed in service.
    f. Date of failure.
    g. Warranty adjustment requested, yes or no.
    h. A brief description of the discrepant conditions.
    i. Customer name and return address.
    j. Original Purchase Order/Contract number.

4. Thoroughly seal the shipping container and mark it FRAGILE.

5. Ship to:

   DRS Signal Solutions, Inc.
   700 Quince Orchard Road
   Gaithersburg, Maryland 20878-1794
   U.S.A

When storing the equipment for extended periods, follow the above packing instructions to prevent damage to the equipment. The safe limits for storage environment are:

Temperature: -40 to +70°C
Humidity: less than 95%

SECTION 3

LOCAL OPERATION

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SECTION 3 LOCAL OPERATION

3.1 LOCAL OPERATION

This section provides information related to the local operation of the WJ-8611 Digital VHF/UHF Receiver using its front panel controls and indicators. **Paragraph 3.2** describes each of the local controls, and its function in the operation of the receiver. It is recommended that these descriptions be reviewed for familiarization with the control functions.

3.2 CONTROLS AND INDICATORS

The receiver front panel contains all of the controls and indicators associated with local operation of the WJ-8611 Digital VHF/UHF Receiver. Refer to **Figure 3-1** as a reference for the controls and indicators descriptions that follow.

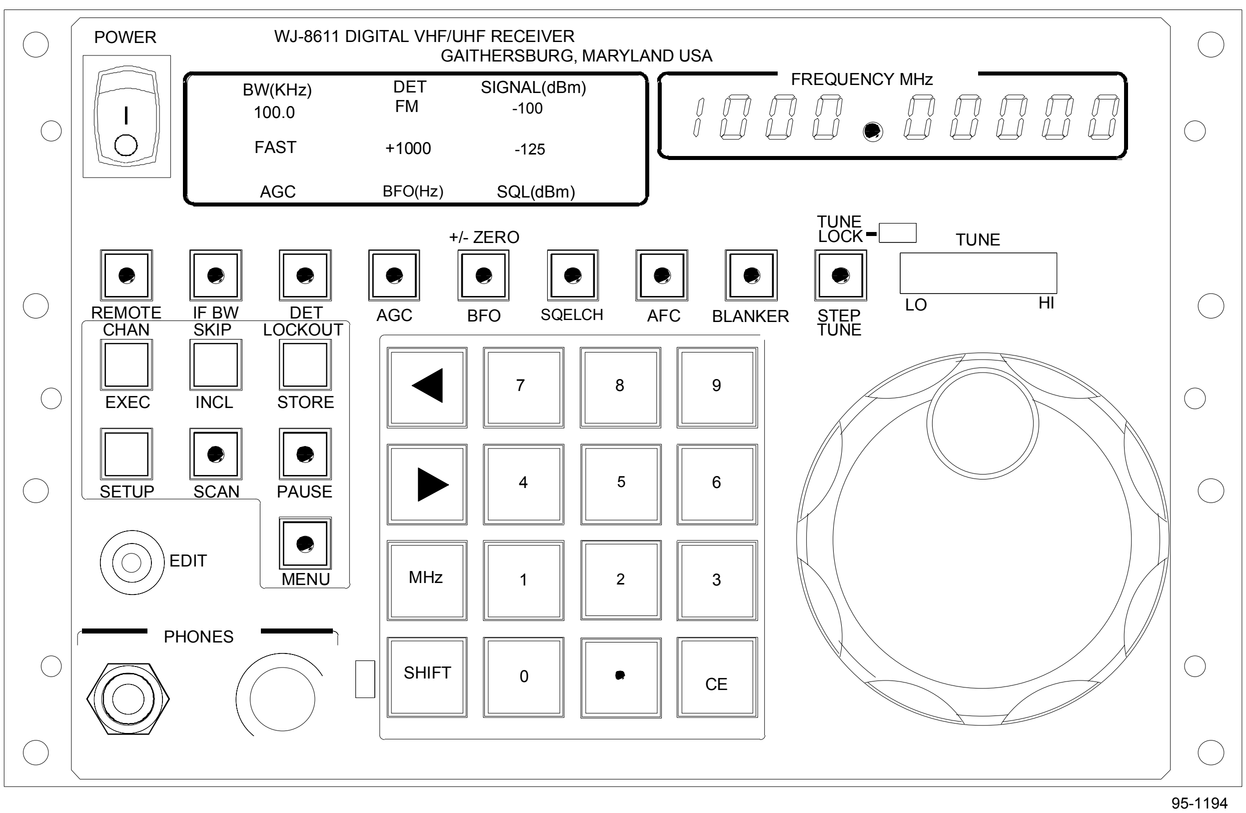

Figure 3-1. WJ-8611 Digital VHF/UHF Receiver Front Panel

3.2.1 TUNED FREQUENCY DISPLAY

The tuned frequency display is a nine-character numeric display, located at the top right-hand corner of the front panel. The label FREQUENCY MHz directly above the display defines its primary function. This display shows the current tuned frequency, in MHz. Additionally, when numeric entries are made from the keypad, each keypad entry is displayed in the entered sequence, as a positive acknowledgment of each key press. Termination of the keypad entry or pressing the Clear Entry (CE) key terminates the entry sequence and restores the frequency display.

3.2.2 PARAMETER DISPLAY

The Parameter display, located to the left of the tuned frequency, is an alpha-numeric display used to perform a variety of functions, based on the current control mode that is active. Normally, this display provides the currently active IF bandwidth [BW(kHz)], detection mode [DET], signal strength [SIGNAL(dBm)], active gain control mode [AGC], BFO offset [BFO(Hz)] and squelch level [SQL(dBm)], as illustrated in **Figure 3-2**. It also provides displays associated with memory programming, scan setup, configuration setup, and step tuning set up operations. As these operations are activated, the parameter display is replaced with the display associated with the currently active operation.

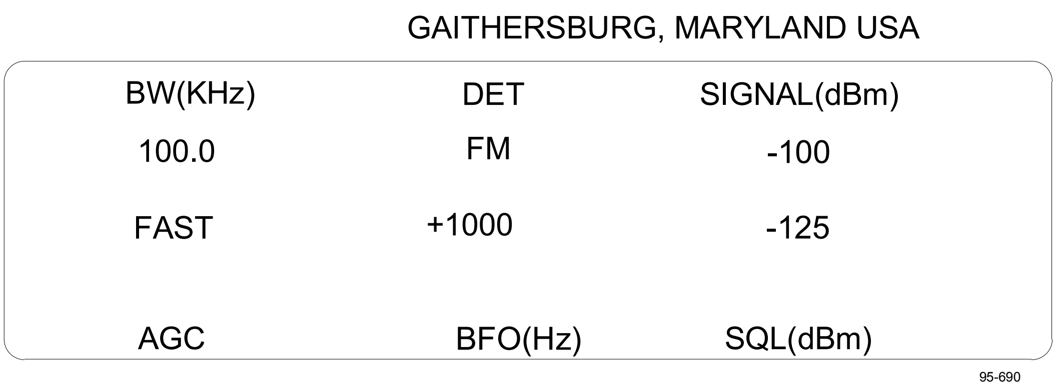

Figure 3-2. Parameter Display

3.2.3 TUNING METER (TUNE)

The tuning meter, located directly below the tuned frequency display is a nine-LED bar display that provides an aid for fine tuning of a signal. When the receiver is center tuned on a signal, the center LED of this display is illuminated. As the receiver is tuned above the signal frequency, the LEDs on the HI side of the display are illuminated, indicating that the receiver is tuned above the signal. As the receiver is tuned below the signal frequency, the LEDs on the LO side of the display are illuminated.

3.2.4 POWER SWITCH

The POWER switch is a two-position rocker switch that applies power to the receiver and initiates the receiver power up sequence. Pressing the upper portion of the switch places the switch into the ON position. Pressing the lower portion places the switch into the OFF position.

3.2.5 PHONE AUDIO CONTROL KNOB (PHONES)

The PHONES knob, located to the right of the PHONES jack, varies the volume of the audio signal at the PHONES jack. It has no affect on the rear panel audio outputs. A clockwise rotation of this knob increases the volume of a nominal audio signal up to approximately 50 milliwatts, maximum into a 600 ohm load. Counterclockwise rotation decreases the volume level.

3.2.6 EDIT CONTROL KNOB (EDIT)

The EDIT control knob is a multiple function control that is used for receiver parameter selection in configuration menu control, and in control of memory and scan setup operations. Its controlled function is determined by the current operation being performed with the dedicated control keys.

3.2.7 TUNING WHEEL

The tuning wheel is a 2-1/2 inch diameter knob located in the lower right-hand corner of the front panel. Its function is to change the receiver's tuned frequency. It is functional in the normal and step tuning modes of operation. Clockwise rotation of the tuning wheel increases the frequency in increments determined by the flashing digit in the frequency display or by the programmed STEP TUNE SIZE in the step tuning mode. Counter-clockwise rotation decreases the tuned frequency. The tuning wheel permits tuning in a range from 0.00000 to 1000.00000 MHz. The frequency display does not wrap around to the other limit (i.e., it will not go from 0.00000 to 1000.00000 when decreasing and will not go from 1000.00000 to 0.00000 when increasing).

The tune rate, selectable from the configuration menu sets the rate that the tuning wheel increments and decrements the frequency. With the FAST rate selected, the greatest number of frequency changes per rotation of the wheel is obtained, approximately 120 increments per rotation. The SLOW rate provides fewer frequency changes per increment, approximately 15 increments per rotation. The accelerated rate selection provides a variable rate of change. The number of frequency increments per rotation increases as the wheel is rotated faster.

3.2.8 DEDICATED CONTROL KEYS

The dedicated control keys, mounted directly below the parameter display, provide control over specific receiver parameter selections. They work in conjunction with the front panel EDIT knob and the numeric keypad to provide control over their associated function. The operation of these control keys vary, based of the key that is selected. The paragraphs that follow describe each key and its methods of control. Refer to **Figure 3-1** as a reference for the location of these keys.

REMOTE CONTROL KEY

The REMOTE key is used to select the Local or Remote control mode of operation from the front panel. The LED on the key provides an indication of its control status. When the receiver is in the remote mode, the LED is lit. While in remote, all front panel controls, except for the REMOTE key, PHONES control, and the POWER switch are disabled. Pressing this key while the LED is illuminated extinguishes the LED and returns the receiver to the LOCAL control mode. If a remote controlling device places the receiver into the Remote with Local Lockout mode, the REMOTE key is also disabled. In this case, local control can only be obtained by the remote controlling device releasing control, or by cycling the receiver POWER switch.

IF BANDWIDTH (IF BW) CONTROL KEY

The IF BW control key is used to select the desired IF bandwidth from the 17 available selections provided by the receiver. It is also used in conjunction with the configuration menu (**paragraph 3.2.9**) to customize the selection of bandwidths to conform to specific operational applications. When this key is pressed, the LED on the IF BW key illuminates, indicating that the IF bandwidth function is under active control. The IF BW key may be repeatedly pressed to step through the list of the available bandwidths. With each key press, the bandwidth increases to the next wider bandwidth in the selection list. When the IF BW LED is lit, the EDIT knob may also be used for bandwidth selection. Clockwise rotation of the edit knob increments through the IF bandwidth list, and counterclockwise rotation decrements through the list. Bandwidth selection may also be performed using the numeric keypad. By pressing the number representing the position of the IF bandwidth in the list, and terminating the entry by pressing the IF BW key, the desired bandwidth is activated. **Table 3-1** lists numeric position of the IF bandwidths. Refer to **paragraph 1.5** for a discussion of changes in these numeric positions in relation to the unit software configuration (Version 01.00.07).

In the AM, FM, and CW detection mode, any of the listed bandwidths may be selected. IF bandwidth selection is automatic when a single sideband detection mode is selected, and changing of the bandwidth is not permitted. For Independent Sideband (ISB), the 6.4 kHz IF bandwidth is automatically activated. For Upper Sideband (USB) and Lower Sideband (LSB), the 3.2 kHz IF bandwidth is activated.

Table 3-1. Numeric Entry of IF Bandwidth

Position	IF BW	Position	IF BW
0	0.2 kHz	9	20.0 kHz
1	0.5 kHz	10	30.0 kHz
2	1.0 kHz	11	35.0 kHz
3	3.2 kHz	12	50.0 kHz
4	5.0 kHz	13	60.0 kHz
5	6.4 kHz	14	100.0 kHz
6	8.0 kHz	15	150.0 kHz
7	10.0 kHz	16	200.0 kHz
8	15.0 kHz		

DETECTION MODE (DET) CONTROL KEY

The DET control key is used to select from the six available detection mode choices. When this key is pressed, the LED on the DET key illuminates, and the currently active detection mode displayed in the parameter display window flashes. This indicates that the detection mode function is under active control. Repeated pressing of this key steps through the list of detection mode selections, consisting of: AM, FM, CW, USB, LSB, and ISB. When the DET key is illuminated, the EDIT knob rotation is directed toward detection mode selection.

GAIN CONTROL KEY (AGC)

The AGC control key selects the receivers gain control mode. When this key is pressed, the LED on the key illuminates, and the currently active gain control mode displayed in the parameter display flashes. This indicates that the gain control selection mode is under active control. Each press of the AGC key cycles the display between the possible choices of FAST, SLOW, or MANUAL. When the manual gain control mode is selected, a three-digit number, representing the manual attenuation level in dB, flashes in the parameter display. With all three digits flashing, entering a value ranging from 0 to 100, and terminating the selection with the AGC button updates the attenuation level to the new value. Pressing the AGC key one additional time causes only the least significant digit of the attenuation value to flash. With the least significant digit is flashing, the EDIT knob, or direct numeric keypad entry may be used for attenuation level updates. When the manual gain control mode is active, pressing the AGC key again selects the AGC SLOW gain control mode. The AGC FAST gain control mode, commonly used for AM and FM type signals, typically provides an attack time of 10 msec and a release time of 200 msec. The AGC SLOW selection, commonly used for CW and single sideband signals, typically provides an attack time of 10 msec and a release time of 3 seconds.

BEAT FREQUENCY OSCILLATOR CONTROL KEY (BFO - +/- ZERO)

The BFO +/- ZERO key is selectable only when the CW detection mode is active. It is used to introduce an offset signal into the signal path so that an unmodulated CW type signal will produce an audible output. This is a dual functioned key, with the numeric keypad's SHIFT key determining the key function.

The unshifted mode is used to select a BFO offset frequency in the range from -8000 to +8000 Hz, in 10, 100, or 1000 Hz increments. With the CW mode active, pressing the BFO key illuminates the key's LED and displays a four-digit BFO value in the parameter display. Either the 10, 100, or 1000 Hz digit flashes indicating that the BFO offset selection mode is active and is under control of the EDIT knob. Each press of the BFO key moves the flashing digit to change the BFO tuning resolution of the EDIT knob. When the resolution is at the 1000 Hz digit, pressing BFO again wraps around to the 10 Hz digit. If desired, direct BFO offset entry may be performed by entering the desired value at the numeric key pad and terminating the entry with the BFO key. For direct entry, the BFO Offset must be entered with the 1 Hz digit included. The last digit entered is a placeholder and does not affect the frequency display. The 1 Hz digit is always zero.

In the shifted mode, the BFO key enables an operator to select between a positive (+) offset, a negative (-) offset, or the offset may be set to ZERO (no offset). With the CW detection mode active, and when the receiver front panel is in the shifted mode (SHIFT LED illuminated), each press of the BFO key toggles between these three settings. If the BFO value is positive, the +/- ZERO function changes the polarity to negative without affecting the absolute value of the offset. The next press zeros the offset value, removing any BFO offset (+0000). A third press of the key sets the BFO offset polarity to positive, and restores the original absolute value of the offset.

SQUELCH CONTROL KEY

The SQUELCH control key sets the squelch level of the receiver. It determines the minimum signal strength level that is required before the receiver recognized the signals presence, and activates the audio outputs. Typically, the squelch level is set to just above the noise level when no signal is present. Squelch activates to disable the audio when only noise is present. When a signal breaks the threshold, squelch is deactivated and the audio outputs are turned on.

When the SQUELCH key is pressed, the LED on the key illuminates, and one of the digits in the SQUELCH field of the parameter display flashes, indicating that the squelch update mode is under active control by the EDIT knob. With each press of the SQUELCH key the display changes from a flashing: 1 dB digit, 10 dB digit, OFF, or ON. When in this mode, the receiver's squelch setting may be set by rotation of the EDIT knob, or by direct entry at the numeric keypad. Rotation of the EDIT knob changes the squelch level in 1 dB or 10 dB increments, based on the digit that is flashing in the Squelch (SQL) display. The control range is from -30 to -130 dBm. If the absolute value is increased beyond -130, the squelch is set to the OFF position. If the absolute value is decreased beyond -30, the squelch is set to the ON position.

Direct entry is performed by entering a value ranging from 30 to 130 and terminating the entry with the SQUELCH key. This value represents squelch levels of from -30 to -130 dBm. Entering a value of 29 or 131 sets the squelch to ON or OFF, respectively. When squelch is set to ON, the squelch is active at all times. No signal will be recognized, and the audio outputs are disabled, regardless of its level. When squelch is set to OFF, The receiver circuits are always active, and the audio outputs are active, even when no signal is present.

AUTOMATIC FREQUENCY CONTROL KEY (AFC)

The AFC control key sets the automatic frequency control function on or off. This function is selectable in the AM and FM detection modes and only when the active IF bandwidth is set to 3.2 kHz or greater. When AFC is active, the LED on the AFC key is lit. Each press of the key toggles AFC ON (LED lit) or OFF (LED extinguished). When active, the automatic frequency control function attempts to fine tune a signal that exceeds the squelch threshold into the center of its IF bandwidth for best reception. This function is most useful when the receiver is performing an F1-F2 scan. It attempts to center tune an acquired signal before reporting the signal contact to the receiver front panel.

NOISE BLANKER CONTROL KEY (BLANKER)

The BLANKER control key is used to activate or disable the noise blanking function. This function, when active, reduces the effects of noise bursts at the audio outputs by blanking the output momentarily when the noise bursts occur. The BLANKER function may be activated in the AM, LSB, and USB detection modes, and it provides a 1 to 10 msec blanking range. The BLANKER key activates (LED on) and disables (LED off) the blanking function, toggling between on and off with each key press. Weak signals near the ambient noise level, prevent the BLANKER from distinguishing noise and the actual signal. This condition could cause unreliable operation. A signal-to noise ratio of at least 12 dB ensures reliable BLANKER operation. The actual setting of the blanker value is performed in the Configuration Menu, as described in **paragraph 3.2.9.**

STEP TUNE/TUNE LOCK CONTROL KEY

The STEP TUNE / TUNE LOCK control key is a dual function control, with the numeric keypad's SHIFT key determining the key function. When the SHIFT key is pressed at the keypad (SHIFT LED illuminated), the TUNE LOCK function is selectable. When the TUNE LOCK key is pressed, an LED to the right of the key illuminates, indicating that the tuning wheel is disabled. Rotation of the tuning wheel will have no affect on the receiver's tuned frequency. This function affects the tuning wheel only. Direct entry of frequencies from the numeric keypad may still be performed. The tune lock function may be disabled by pressing the left (<) or right (>) arrows on the keypad. The SHIFT LED must be extinguished before the left and right arrow keys are enabled. This may be accomplished by pressing the SHIFT key to extinguish the LED.

When the receiver front panel is in the unshifted mode (SHIFT LED extinguished), the STEP TUNE function is selectable. Pressing the STEP TUNE key illuminates the key's LED and replaces a parameter display with a STEP TUNE SIZE display. When in this mode, the size of the tuning increments may be set to any value ranging from 000.01 kHz (10 Hz) to 100.00 kHz, using direct keypad entry or by using the EDIT knob. The resolution of the EDIT knob tuning is set by pressing the STEP TUNE key as required to place the flashing digit on the digit representing the desired tuning resolution (.01 kHz to 100.00 kHz resolution). Rotation of the EDIT knob sets the step size to the desired value. Once the step size is set, rotation of the tuning wheel changes the receiver's tuned frequency by the programmed step tune size. If the receiver front panel is placed in the shifted mode (SHIFT LED illuminated), the numeric keypad's left (<) and right (>) keys may also be used to step tune the receiver. When the front panel is in the unshifted mode (SHIFT LED extinguished), pressing the numeric keypad's left (<) or right (>) keys disables the step tuning mode and restores normal tuning.

3.2.9 NUMERIC KEYPAD

The numeric keypad, located in the center of the receiver front panel, provides a means for direct entry of numeric parameters into the receiver. The following entries may be performed using the numeric keypad:

- Receiver Tuned Frequency, when terminated with the MHz key
- BFO Offset Frequency, when terminated with the BFO key
- Step Tune Size Frequency, when terminated with the STEP TUNE key

- Squelch Level, when terminated with the SQUELCH key
- Manual Attenuation Level, when terminated with the AGC key
- IF Bandwidth Selection, when terminated with the IF BW key
- Configuration Menu Entries, when terminated with the MENU key
- Scan Set up Operations, when terminated with the SETUP key
- Memory Operations, when terminated with the STORE/LOCKOUT, EXEC/CHAN, or INCL/SKIP key.

NUMERIC KEYS (0 - 9 AND DECIMAL POINT)

The numeric and decimal point keys are available for entry of numeric data into the receiver. When numeric entries are made, each keypad entry is displayed in the tuned frequency display, in the entered sequence, as a positive acknowledgment of each key press. Termination of the keypad entry or pressing the Clear Entry (CE) key terminates the entry sequence and restores the frequency display. As each key is pressed, the frequency display is updated.

FREQUENCY TERMINATION KEY (MHz)

The MHz key is used for termination of direct frequency entries. As frequency digits are entered, they are displayed in the Tuned Frequency window. The frequency change does not occur until the entry is terminated with the MHz key.

CLEAR ENTRY KEY (CE)

The Clear Entry key (CE) is used to clear a numeric entry that is in progress. When this key is pressed, the entry is terminated without affecting the receiver's current setting. The CE control key is also used to reset the receiver to its default state. IF the CE key is held in during power up, the receiver is reset, and the words "COLD START!" are momentarily displayed in the parameter display. The receiver memory is cleared, and the receiver is set to its default state. The CE key also clears front panel error messages. The CE key can also be used to clear the receiver's 200-channel Channel and Lockout memories. See **paragraph 3.4.3**. Do not press the CE key three times in a row unless intending to clear the memories.

ARROW KEYS (LEFT/RIGHT ARROW)

The left (<) and right (>) arrow keys provide a number of operations associated with receiver tuning control. In the normal tuning operation, these keys select the tuning resolution of the tuning wheel. Each press of one of these keys moves the flashing digit in the tuned frequency display to the left or right by one digit. The flashing digit determines the tuning resolution. If the front panel is in the shifted mode (SHIFT LED lit), the left and right keys increment (left) and decrement (right) the flashing digit in the tuned frequency display to increase or decrease the frequency. If the receiver is in the step tuning mode (STEP TUNE LED lit), and the front panel is in the shifted mode, the left and right arrow keys increase and decrease the tuned frequency by the programmed step tune size.

The left and right arrow keys are also used to escape from the tune lock or step tuning modes, and to restore normal tuning. Pressing either of these keys returns the receiver to the normal decade tuning mode. The SHIFT LED must be extinguished before the left or right arrow keys are enabled.

SHIFT KEY (SHIFT)

The SHIFT key places the front panel into the shifted mode of operation, where a number of the control keys perform additional functions. An LED to the immediate left of the SHIFT key illuminates when the shift mode is activated. The SHIFT key performs a toggle function, switching between the shifted and standard (unshifted) modes with each key press. The front panel keys that are operational in the shifted mode are:

- +/- ZERO - Shifted function of BFO
- TUNE LOCK - Shifted function of STEP TUNE
- CHAN - Shifted function of EXEC
- SKIP - Shifted function OF INCLUDE
- LOCKOUT - Shifted function of STORE

3.2.10 CONFIGURATION MENU/MEMORY/SCAN SETUP CONTROL KEYS

The Configuration Menu, Memory, and Scan setup keys, illustrated in **Figure 3-3**, provide a means of changing the receiver configuration from the front panel, and provides memory programming and setup controls associated with the Channel and F1-F2 scan operations. The paragraphs that follow detail the controls associated with each of these operations.

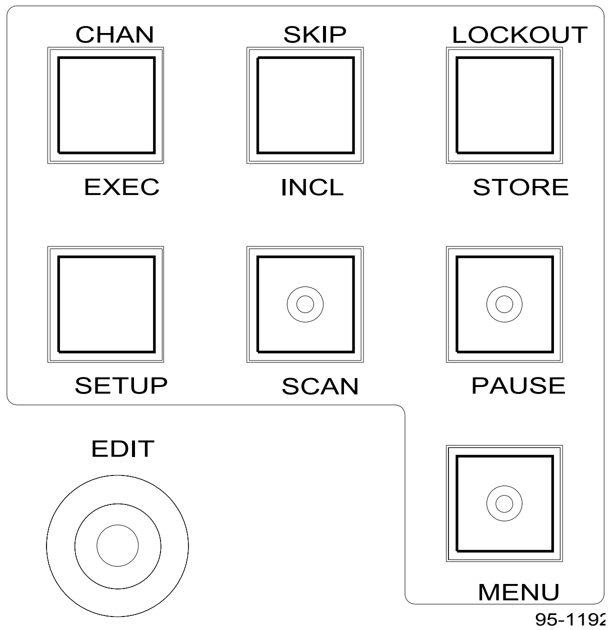

Figure 3-3. Configuration Menu, Memory, and Scan Setup Control Keys

CONFIGURATION MENU (MENU) CONTROL KEY

The MENU key places the receiver front panel into a menu-driven receiver configuration mode, where the receiver's operation configuration may be tailored for a specific installation or application. When the MENU key is first pressed, the parameter display is replaced with a configuration menu in which the various configurations may be selected. The EDIT key, and in some cases the numeric keypad and the dedicated control keys, are used to modify the selected item provided by the menu. Each additional press of the MENU key increments the display to the next menu in the sequence. There are nine menus to assist in the configuration, as follows:

1. **IF BANDWIDTH SELECT** - The IF Bandwidth Select menu determines which IF bandwidths are included in the list of selections available to the IF BW control key. Rotation of the EDIT knob steps through, and displays, each of the 17 available IF bandwidth selections in sequence. At each selection a choice is made to either "INCLUDE" or "SKIP" the displayed bandwidth. Pressing the IF BW control key toggles the Include/Skip status, and then increments to the next higher available bandwidth. When in this menu, pressing one of the dedicated control keys, other than REMOTE or IF BW exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu.

2. **BITE** - Initiates the receiver's Built-In-Test function and returns a message indicating the receiver's operational status. When the BITE menu is first selected the message "PENDING" is displayed. Rotation of the EDIT knob activates the BITE function. Upon completion of the tests, and if no failure is detected, "PASSED" is displayed. Otherwise, the displayed message describes the failure condition. If a failure message is displayed, pressing the CE key in the numeric keypad, clears the message and Displays "PENDING". For multiple failure messages, the CE key is used to step through each message in sequence. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu. The failure messages associated with BITE are:

SRAM FAILURE	RAM write/read test failure
EEPROM FAILURE	EEPROM write/read test failure
EPROM FAILURE	EPROM checksum test failure
DSP A COMM ERROR	DSP A to Control Processor communication test failure
A->B COMM ERROR	DSP A to DSP B communication test failure
DSP A CHKSUM ERR	DSP A memory checksum test failure
DSP B COMM ERROR	DSP B to Control Processor communication test failure
GCP COMM ERROR	DSP B to Gain Control Processor communication test failure
B->A COMM ERROR	DSP B to DSP A communication test failure
DSP B CHKSUM ERR	DSP B memory checksum test failure
IEEE488 ERROR	IEEE-488 Interface write/read test failure
FP COMM ERROR	Control Processor to front panel processor communication test failure

DUART ERROR	RS-232 Interface Write/Read test failure
FILTER ERROR	Digital filter write/read test failure
LO 1 UNLOCK	1st LO synthesizer unlocked
LO 2 UNLOCK	2nd LO synthesizer unlocked
LO 3 UNLOCK	3rd LO synthesizer unlocked
REF LO UNLOCK	Reference synthesizer unlocked
+24V PS ERROR	+24Vdc power supply voltage incorrect
+\- 13.5V PS ERROR	+/-13.5 Vdc power supply voltage incorrect

3. **REMOTE** - The Remote menu selects the type interface that is active for remote control. When in this menu, clockwise rotation of the EDIT knob selects the IEEE-488 remote interface. Counter-clockwise rotation selects the RS-232 interface. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu, based on the type remote interface that is selected. If the IEEE-488 interface is selected, pressing the MENU key skips over menu 4 and selects the ADDRESS menu, menu 5. If the RS-232 interface is selected, pressing the MENU key selects menu 4.

4. **BAUD RATE** - The Baud Rate menu is available for selection when the RS-232 interface is selected in the REMOTE menu. The affect of this menu is based on the hardware configuration of DIP switch A2S2, switch 8. If this switch position is in the DOWN position, the RS-232 baud rate is fixed at 9600 and cannot be changed. If the switch is in the UP position, the EDIT knob may be used to select one of six available baud rates. Clockwise rotation of the EDIT knob moves the interface up through the selection list (1200, 2400, 4800, 9600, 19200, 38400). Counterclockwise rotation moves the interface down through the list. When in this menu, pressing one of the dedicated control keys, other than REMOTE exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the TUNE RATE menu, menu 6.

5. **ADDRESS** - The Address menu is available for selection when the IEEE-488 interface is selected in the REMOTE menu. The affect of this menu is based the hardware configuration of DIP switch A2S1,

switch 6. If the switch is in the DOWN position, the hardware configured IEEE-488 bus address is displayed but cannot be changed. If the switch is in the UP position, the address may be changed using the EDIT knob. The selection range is from 1 to 30, with clockwise rotation of the EDIT knob increasing the value. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu.

6. **TUNE RATE** - The TUNE RATE menu selects how responsive the tuning wheel is when rotated. It sets the number of incremental frequency changes that occur per rotation of the wheel. Rotation of the EDIT knob sets the rate to FAST, SLOW, or ACCELERATED. When in this menu, pressing one of the dedicated control keys, other than REMOTE exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu.

   FAST - The FAST rate provides the greatest number of incremental frequency changes per tuning wheel rotation. At this selection, a complete rotation provides approximately 120 tuning increments.

   SLOW - The SLOW rate provides a less responsive tuning wheel response. With this selection, a complete rotation provides approximately 15 tuning increments.

   ACCELERATED - The ACCELERATED rate provides a variable tuning rate. The number of incremental frequency changes per rotation change with the speed that the tuning wheel is turned. As the wheel is rotated faster, the changes per rotation increase.

7. **REF** - The REF menu displays the source of the reference signal that is being used as the receiver's timebase. If no external reference signal is connected to the receiver, the receiver automatically switches to its internal reference and "INTERNAL" is displayed. If a valid external reference is used, the reference frequency is displayed (EXTERNAL 1 MHz, EXTERNAL 2 MHz, EXTERNAL 5 MHz, or EXTERNAL 10 MHz). If an invalid external reference frequency is connected to the receiver, the receiver becomes unlocked and an error message "REF LO UNLOCK" is displayed. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu.

8. **DETECTION MODE MATCH** - The Detection Mode Match menu selects how the receiver's IF bandwidth and gain control selections respond to detection mode changes. With the Detection Mode Match set to OFF, the currently selected IF bandwidth and gain control selections remain constant when the detection mode is changed. These parameters must be reset to appropriate values for the selected detection. With the Detection Mode Match ON, the receiver remembers the last IF bandwidth and gain control selections used for each detection mode. Each time the detection mode is changed, the IF bandwidth and gain control selections are recalled from the last time that that detection mode was utilized. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key selects the next item in the Configuration Menu.

9. **BLANKER** - The Blanker menu sets the width of the noise blanking pulse, used when the BLANKER function is active. The control range for this function is from 1 to 10 msec, selectable in 1 msec increments by the EDIT knob. This menu provides real-time control over the time, permitting optimum pulse width adjustment while listening to the active signal. When in this menu, pressing one of the dedicated control keys, other than REMOTE, exits the Configuration Menu and returns the receiver to its normal operating mode. Pressing the MENU key wraps around to the first Configuration Menu selection (IF BW SELECT).

SCAN SETUP MENU (SETUP) CONTROL KEY

The SETUP key provides a menu for programming the details associated with the desired scan operation. Pressing the SETUP key initializes the SETUP display that provides the menu for selecting the scan type (Channel, F1->F2, or F1->F2 W/LK), the start and stop parameters, and the scan dwell times. The menu items associated with the SETUP Menu are as follows:

1. **SCAN TYPE** - The first press of the SETUP key displays the menu for the selection of the scan type. Rotation of the EDIT knob steps through the Channel, F1->F2, and F1->F2 W/LK (F1-F2 with Lockouts) selections. This selection determines the type entries that are requested in the next two menu items.

   With the Channel Scan selected, the next two presses of the SETUP key request the Start and Stop channel numbers, as described in **step 2**.

   With either the F1->F2 of the F1->F2 W/LK selected, the next two presses of the SETUP key request the F1 (Start Frequency) and the F2 (Stop Frequency) values, in MHz, as described in **step 3**.

2. **START/STOP PARAMETERS** - With the Channel type scan selected, the next two menu entries provide displays to select the range of memory channels that are to be included in the Channel Scan sequence. The first display requests the Start memory channel and the next requests the Stop memory channel. The desired memory channel numbers in the 1 to 200 range are entered at the numeric keypad, with the entry terminated with the SETUP key. When programming the start and stop channel numbers, the stop channel number must be equal to or greater than the start channel number. Otherwise, the message “OUT OF RANGE” is displayed in the display, and the entry is not accepted. When the start and stop channel numbers are entered, the menu dwell times are requested as described in **step 5**.

3. **F1/F2 PARAMETERS** - With the F1->F2 or F1->F2 W/LK type scan selected, the next two menu entries provide displays to select the actual start and stop frequencies that are to be used in the scan operation. The first display requests the F1 (Start Frequency), and the next display requests the F2 (Stop Frequency). The desired F1 and F2 frequencies in the range of from 0.00000 to 1000.00000 MHz are entered at the numeric keypad, with the entry terminated with the SETUP key. When programming the start and stop frequencies, the F2 frequency must be greater than the F1 frequency. Otherwise, the message “OUT OF RANGE” is displayed in the display, and the entry is not accepted. When the F1 and F2 frequencies are entered, the Step Size is requested, as described in **step 4**.

4. **STEP SIZE** - The Step Size display is includes in the Setup menu only when the F1->F2 or F1->F2 W/LK type scan is selected. It determines the size of the scan frequency increments taken during the F1->F2 and F1->F2 W/LK type scans. The desired step size, in the range of from .01 to 100.00 kHz, is entered at the numeric keypad, with the entry terminated with the SETUP key.

5. **PRE DWELL** - The Pre Dwell display is included in the Setup Menu for all scan types. It determines the time that the receiver stops at each increment of a scan sequence, waiting for a signal to break the programmed squelch threshold. The pre dwell time can range from 0 to 1000, in 1 msec increments. Values ranging from 0 to 999 msec specify the pre dwell time in msec. A value of 1000 selects an infinite pre dwell time.

6. **SIGNAL DWELL** - The Signal Dwell display is included in the Setup Menu for all scan types. It determines the time that the receiver remains on an acquired signal. The signal dwell setting can range from 0 to 601, in 1 second increments. Values ranging from 0 to 600 specify the signal dwell time in seconds (0 to 10 minutes). A value of 601 specifies an infinite dwell time.

7. **POST DWELL** - The Post Dwell display is included in the Setup Menu for all scan types. It determines how long the receiver waits

at an acquired signal's frequency after the signal falls below the programmed squelch level. The post dwell setting can range from 0 to 61, in 1 second increments. Values ranging from 0 to 60 specify the post dwell time in seconds. A value of 61 specifies an infinite dwell time.

3.3 MANUAL OPERATION

The Manual Mode of operation provides an operator with continuous control over receiver operation. In this mode, the receiver's control parameters may be directly modified using the front panel controls. When operating the receiver in the manual mode, the following functions and parameter adjustments are under control of the local operator:

- Frequency Tuning
- Parameter Selections
- Memory Programming and Recall
- Configuration Menu Selection.
- Scan Setup Operations
- Execution of Scan Operations
- Phone Audio Level Adjustment

3.3.1 FREQUENCY TUNING

The WJ-8611 Digital VHF/UHF Receiver has a 0.00000 to 1000.00000 MHz tuning range, with a selectable tuning resolution down to 10 Hz. Tuning in the 2 to 20 MHz range provides HF tuning capabilities adequate for many applications. In this range, the noise figure is typically 8 dB. In the manual operating mode, tuning is performed at the front panel by rotation of the tuning wheel, by direct entry from the keypad, or, in the SHIFT mode, by using the Left (←) and Right (→) arrow keys. In automatic operating modes (i.e., F1-F2 or Channel scan), the tuned frequency is obtained from the receiver's preprogrammed memory.

TUNING WHEEL - The tuning wheel provides dynamic control over the tuned frequency while monitoring the received audio and the TUNE meter display. Rotation of the tuning wheel increases or decreases the tuned frequency at a rate determined by a flashing digit in the frequency display (decade tuning), or by a selected step size (step tuning).

DECADE TUNING - The decade tuning resolution is determined by the flashing digit in the tuned frequency display. It allows tuning resolutions ranging from 10 Hz to 1000 MHz to be selected. The left (←) and right (→) arrow keys move the flashing cursor to the desired digit, determining the minimum tuning resolution in decade increments. The left (←) key, increases the increment size by moving the flashing digit to the left. The right (→) key decreases the increment size by moving the flashing digit to the right.

STEP TUNE - Step Tuning is activated when the STEP TUNE key is pressed, and the LED on the key is lit. When this tuning mode is active, the current step tune size is displayed in place of the parameter display. Rotation of the tuning wheel increases or decreases the tuned frequency by the displayed Step Tune Size value. The size of the steps can be modified within a 000.01 to 100.00 kHz range, using the EDIT knob, or the value can be directly entered at the numeric keypad. For EDIT knob control, the STEP TUNE key determines the resolution of the edit function. Each press of the key moves a flashing digit in the step tune display to the left by one digit. When the 100 kHz digit is reached, pressing the STEP TUNE key returns the flashing digit to the .01 kHz digit. For direct keypad entry, the step size value is entered in kHz, with the entry terminated by the STEP TUNE key. The Step Tune mode can be disabled at any time by pressing either the left or right arrow keys, returning the tuning mode to decade tuning.

ARROW KEY TUNE - The left and right arrow keys can be used in place of the tuning wheel for incrementing or decrementing the tuned frequency in discrete increments. When the front panel is placed in the Shift mode (SHIFT LED lit), the arrow keys control the tuned frequency. Pressing the left key increments the frequency, and pressing the right key decrements the frequency. The size of the increments is determined by the flashing digit, or by the Step Tune Size.

NUMERIC ENTRY -The numeric keypad provides a quick means of entering a tuned frequency. When a numeric key is pressed, the tuned frequency display reflects each key press in the order of its entry. The tuned frequency is entered in MHz, with the entry terminated by the MHz key. Entering leading zeros to the left of the decimal point, and trailing zeros to the right of the decimal point is not required.

3.3.2 DETECTION MODE SELECTION

The WJ-8611 Digital VHF/UHF Receiver provides a selection of six detection modes, consisting of AM, FM, CW, USB, LSB, and ISB. Selection of the desired detection mode is performed by pressing the DET key. When the key is pressed, the LED on the key lights, and the currently active detection mode flashes in the DET field of the parameter display. Each press of the DET key increments through the list of available detection modes, and activates the displayed mode. When in this selection mode, the EDIT knob may also be used for selection. In addition to determining the type of demodulation that is used, the detection mode selection may also affect the IF bandwidth, AFC selection, and the way that the audio is output to the rear panel and to the PHONES jack.

AM

The AM selection provides demodulation of amplitude modulated signals. In this detection mode, all of the available IF bandwidths are available for selection, based on the bandwidth characteristics of the received signal. The Automatic Frequency Control (AFC) feature is also available for selection, as long as a bandwidth of 3.2 kHz or greater is active. The Line A and Line B audio outputs, and the Left and Right Audio at the PHONES jack contain identical audio signals.

FM

The FM selection provides demodulation of frequency modulated signals. In this detection mode, all of the available IF bandwidths are available for selection, based on the bandwidth characteristics of the received signal. The Automatic Frequency Control (AFC) feature is also available for selection, as long as a bandwidth of 3.2 kHz or greater is active. The Line A and Line B audio outputs, and the Left and Right Audio at the PHONES jack contain identical audio signals.

CW

The CW selection provides demodulation of continuous wave or interrupted continuous wave type signals. In this detection mode, all of the available IF bandwidths are available for selection. The Automatic Frequency Control (AFC) feature is not available for selection. The Line A and Line B audio outputs, and the Left and Right Audio at the PHONES jack contain identical audio signals.

USB

The USB selection provides demodulation of the upper sideband of single sideband type signals. In this detection mode, the IF bandwidth is automatically set to 3.2 kHz, and cannot be changed. The Automatic Frequency Control (AFC) feature is not available for selection. The Line A and Line B audio outputs, and the Left and Right Audio at the PHONES jack contain identical audio signals.

LSB

The LSB selection provides demodulation of the lower sideband of single sideband type signals. In this detection mode, the IF bandwidth is automatically set to 3.2 kHz, and cannot be changed. The Automatic Frequency Control (AFC) feature is not available for selection. The Line A and Line B audio outputs, and the Left and Right Audio at the PHONES jack contain identical audio signals.

ISB

The ISB selection provides simultaneous demodulation of the upper and lower sidebands of single sideband type signals. In this detection mode, the IF bandwidth is automatically set to 6.4 kHz, and cannot be changed. The Automatic Frequency Control (AFC) feature is not available for selection. The Line B audio output, and the Left PHONES output contain audio extracted from the lower sideband of the signal. The Line A audio output and the Right PHONES output contain the audio extracted from the upper sideband.

3.3.3 DETECTION MODE MATCH

Unless programmed otherwise, each time that the detection mode is changed, the IF bandwidth and the mode of gain control (AGC FAST, AGC SLOW, or MANUAL) remains at its previous selection and must be set to accommodate the signal characteristics of the signal type. (USB, LSB, and ISB IF bandwidths are set automatically.) The Detection Mode Match feature, available in the Configuration Menu (**paragraph 3.2.9**), causes the selected IF bandwidth and the gain control mode to be remembered when the detection mode is changed. The next time that the detection mode is activated, IF bandwidth and gain control mode is restored to the last selections for that mode. With the Detection Mode Match set to ON, each of the detection mode selections will retain the last selected IF bandwidth and gain control mode setting. In the manual gain mode, the detection match feature does not store the actual attenuation setting.

3.3.4 IF BANDWIDTH SELECTION

There are a total of seventeen IF bandwidth selections programmed into the receiver, ranging from 200 Hz to 200 kHz. The receiver can be configured to create a selection list where anywhere from 2 to all 17 bandwidths are available for selection. (The 3.2 kHz and 6.4 kHz IF Bandwidths cannot be excluded from the available list.) The receiver defaults with all 17 IF bandwidths included in the selection list. The IF BW key is used to select the active IF Bandwidth from the selection list. When the key is pressed, the LED on the key lights, and the currently active IF Bandwidth flashes in the BW(kHz) field of the parameter display. Each press of the IF BW key increments through the list of available bandwidths, increasing the bandwidth size with each press. When the widest available bandwidth is reached, the display wraps around to the beginning of the list. When in the IF BW selection mode, the EDIT knob may also be used for IF bandwidth selection. Any bandwidth included in the selection list may be activated when the receiver is in the AM, FM, or CW detection mode. If the receiver is in the USB or LSB detection mode, the IF BW key is disabled, and the 3.2 kHz bandwidth is activated. If the receiver is in the ISB detection mode, the IF BW key is disabled and the 6.4 kHz bandwidth is activated.

IF BANDWIDTH

SELECTION LIST

The IF Bandwidth selection list is created in the IF Bandwidth Select menu of the Configuration menu. Once in this menu, the desired selection list can be created to tailor the bandwidth selections for a specific installation or application. Creation of the IF Bandwidth selection list is performed as follows:

1. Press the MENU key as required to display the IF BW Select menu, as follows:

   1.IF BW SELECT
   0.2 INCLUDE

2. Rotate the EDIT knob to step through the IF bandwidth list. At each step, the IF bandwidth is displayed with the word “INCLUDE” or “SKIP” to its immediate right.

3. Pressing the IF BW control key toggles the Include/Skip status, and then increments to the next higher available bandwidth. If the status was INCLUDE, pressing the IF BW key changes the status to SKIP. Rotation of the EDIT knob moves to the next bandwidth in the list without changing the bandwidth status.

4. Continue through the bandwidth list until the selection list is complete. Bandwidth selections with INCLUDE displayed next to the bandwidth value are included in the selection list. Bandwidth selections with SKIP next to the value are excluded from the list.

5. When the selection list is completed, press the DET key to exit the Configuration menu.

3.3.5 GAIN CONTROL MODE SELECTION

There are three gain control modes that are available for selection: AGC FAST, AGC SLOW, and MANUAL. In either of the AGC modes, the receiver automatically adjusts its gain level to accommodate varying signal strength levels. AGC provides a minimum of 90 dB of gain control range. In the Manual gain control mode, the receiver gain is manually set by entering an attenuation value ranging from a minimum of 0 dB to a maximum of 100 dB. (The gain control range is specified to a minimum of 90 dB.) The type of gain control is selected by pressing the AGC key. When the AGC key is pressed, the LED on the key lights, and the AGC field of the parameter display flashes with the currently selected gain control mode. Each press of the AGC key steps through the gain control selections. Rotation of the EDIT knob can also be used to select the gain mode. When the Manual gain mode is selected, a three-digit number representing the last entered attenuation level, flashes all three digits. If the AGC key is pressed again, only the least significant digit flashes. With the single digit flashing the EDIT knob allows setting the attenuation in 1 dB increments. Entering a value at the keypad, in the 0 to 100 range, and terminating the entry by pressing AGC enters the value directly. The gain control mode characteristics are as follows:

FAST - The Fast AGC mode is commonly used with AM and FM type signals. It provides a fast attack and fast decay response. The typical attack time is 10 msec, and the release time is 200 msec.

SLOW - The Slow AGC mode is commonly used with CW or SSB type signals that have suppressed or intermittent carriers. It provides a fast attack time of 10 msec. However, the release time is lengthened to maintain a relativity constant gain with wide variations in carrier levels. The release time for the Slow AGC mode is typically 3 seconds.

MANUAL - The Manual gain mode provides no automatic control of the receiver gain. When an attenuation level is set, it remains constant, regardless of the received signal's strength. The receiver gain is "Gain-Bandwidth" normalized so that the rated output occurs close to the rated sensitivity level. As the IF bandwidth is increased, the absolute gain is decreased.

3.3.6 SQUELCH OPERATION

The SQUELCH key allows the entry of the receiver's squelch level to determine the signal level at which the receiver recognizes a received signal as valid. It sets the signal threshold where the receiver activates the audio output, and is used in the receiver scan operations to determine if the scan should stop on a signal contact. When the SQUELCH key is pressed, the LED on the key lights and the SQL(dBm) field of the parameter display flashes with the currently selected squelch level. The squelch level may be set in the range from -30 to -130 dBm, in 1 dB increments. A setting of -29 turns the squelch ON at all times, preventing the receiver from recognizing a signal contact, regardless of the signal level. A setting of -131 sets the squelch to OFF. When the squelch is OFF, the squelch threshold is set below the noise floor, causing the audio to be active at all times, even if no signal is present. A chevron, to the left of the SQL(dBm) field of the display, provides an indication of the squelch status. When the signal level is above the selected threshold (Squelch OFF), the chevron is displayed. When the signal is below the threshold (Squelch ON), the chevron is extinguished.

Each press of the squelch key steps the SQL(dBm) field through its four selection modes, as follows:

OFF - The OFF selection turns squelch off, providing a continuous audio output.
1 dBm DIGIT - This selection displays the last selected squelch level with the 1 dBm digit flashing. When this selection mode is active, rotation of the EDIT knob changes the level in 1 dB increments. A value may also be entered at the key pad, terminated with the SQUELCH key.

10 dBm DIGIT - This selection displays the last selected squelch level with the 10 dBm digit flashing. When this selection mode is active, rotation of the EDIT knob changes the level in 10 dB increments. A value may also be entered at the key pad, terminated with the SQUELCH key.

ON - The ON selection turns the squelch ON at all times, disabling the audio output.

The Squelch level should be set above the noise floor to disable the output when only noise is present. When properly set, signal levels slightly above the noise floor break the threshold and provide the audio. Setting the threshold too high could cause the receiver to not respond to weak signals. By tuning the receiver to a point where no active signal is present, an operator can adjust the threshold until the audio output is disabled, or until the chevron extinguishes, as follows:

1. Tune the receiver to a point where no signal is present.
2. Set the threshold level to a level that activates the audio output and displays the squelch status chevron.
3. Increase the threshold level until the noise at the audio output is disabled, and the chevron is extinguished.
4. Tune the receiver to the desired signal. The above procedure sets the threshold slightly above the ambient noise level. Slight additional adjustment may be required, depending on changes in the ambient noise level.

3.3.7 NOISE BLANKING OPERATION

The Noise blanker feature reduces the affects of noise bursts at the audio outputs by blanking the output momentarily when the noise bursts occur. It is selectable in the AM, LSB, and USB detection modes. The effectiveness of the Blanker feature is reduced with weak signal activity. A signal-to-noise ratio of at least 12 dB ensures reliable Blanker operation. When the BLANKER key is pressed, the LED on the key lights, and the noise blanking feature is activated. When the Blanker feature is active, pressing the BLANKER key disables blanking and extinguishes the LED.

The noise blanker provides a blanking pulse of from 1 to 10 msec, selectable from the menu 9 of the Configuration Menu. This value should be set with the Blanker feature active, and when a signal with interfering noise bursts is present. The noise blanker value should be set for the best audio output while listening to the audio, as follows:

Activate the Configuration Menu by pressing the MENU key.

Press the MENU key until the Blanker menu is displayed, similar to the following:

9.BLANKER
01 msec

Using direct keypad entry, terminated by the MENU key, or the EDIT knob, adjust the blanking time to produce the best audio response.

Exit the Configuration Menu by pressing the DET key.

3.3.8 BEAT FREQUENCY OSCILLATOR OPERATION

The Beat Frequency Oscillator feature is available for selection when the receiver detection mode is set for CW operation. This feature injects an offset frequency into the signal path so that unmodulated signals produce an audible output. The BFO feature permits adjustment of the offset frequency by ±8.000 kHz, adjustable in 10 Hz increments, to alter the pitch of the audio output. When the CW detection mode is selected, the BFO feature is activated by pressing the BFO key. When active the LED on the key lights, and one of the digits in the BFO field of the display flashes. Each press of the BFO key moves the flashing digit to the next digit, determining the resolution of the EDIT knob. Selection of the BFO frequency may be performed by direct keypad entry (in kHz), terminated by the BFO key, or by rotation of the EDIT knob.

The secondary function of the BFO key (when the SHIFT LED is lit) is the +/-ZERO function. It determines the frequency sense of the frequency offset. Each press of the key switches the BFO between a positive offset value, a negative offset value, or zero offset (+0000).

3.4 MEMORY PROGRAMMING

The WJ-8611 Receiver contains a 200-channel programmable memory for storage and retrieval of receiver parameters, and a 200-channel lockout memory for storage of lockout frequencies associated with F1-F2 frequency scans. Each of these memory sections is programmed with the receiver parameters used for the receiver's Channel and F1-F2 scan operations. Before a scan operation is initiated, the appropriate memory must be programmed with the parameter data that is to be used in the operation. The paragraphs that follow describe the memory programming operations and the memory applications.

3.4.1 CHANNEL MEMORY

The Channel memory provides 200 channels of programmable memory for storage of complete receiver parameter setups. It is used for channel scan operations, or the stored data can be retrieved from any individual memory channel to quickly set the receiver to commonly used frequencies. Each memory channel stores the following parameter data:

Tuned Frequency	Fixed frequency in the 0 to 1000.00000 MHz range.
Include Status	A flag that determines if that channel is to be included or skipped during a Channel Scan.
IF Bandwidth	IF bandwidth in the 0.2 to 200 kHz range from the available bandwidth selection list.
Squelch Level	Squelch in the -29 to -131 dBm range sets the signal recognition level.
Detection Mode	AM, FM, CW, USB, LSB, ISB.
Gain Control Mode	Fast AGC, Slow AGC, Manual Gain.
Attenuation Level	Attenuation in the 0 to 100 dB range, used to set the Manual gain level.
AFC Status	Sets AFC On or Off when the channel is executed.
BFO Offset	Sets the BFO Offset in the ±8000 Hz range when the CW detection mode is programmed.

CHANNEL PROGRAMMING

Programming of the Channel memory is locally performed by tuning the receiver to the desired frequency, and selecting the receiver parameters to optimize the signal response. If the stored parameters are going to be included in a channel scan, it is important that the squelch level is set properly to assure that the receiver is able to recognize when an active signal is present (refer to Squelch Operation in **paragraph 3.3.6**). When the parameters are properly set, the data is stored in memory by pressing the STORE key. Parameters can be stored in consecutive memory channels, or a specific memory channel can be specified prior to pressing the STORE key. If the STORE key is pressed without specifying a channel, a memory VIEW menu is displayed in the parameter display, displaying the next available memory channel, as follows:

```
i001          VIEW

     0020.00000
```

In the above example, the i001 field is the memory channel number, and its Include status (i). The 0020.00000 field is the value of the last frequency stored in the currently displayed memory channel. Pressing the

STORE key a second time stores the new data into the memory channel and increments the memory display to the next channel number in sequence. While this display is present, the EDIT knob may be used to step through the channels to view the stored data in other channels or to select a different channel for storage.

If it is desired that parameters be stored in a specific memory channel, the channel number (1 to 200) is entered at the keypad, and terminated by the STORE key. In this instance, the parameters are immediately stored in the selected channel, the current channel is momentarily displayed with the new data, and the menu is incremented to the next menu channel in sequence.

INCLUDE/SKIP STATUS - Each memory channel is designated with an include (i) or skip (s) indicator preceding the memory channel number in the memory VIEW display. It determines if the channel is to be included in a channel scan sequence or if that channel is to be excluded from the scan. The INCLUDE/SKIP key sets the status of indicator. In the unshifted mode, the INCLUDE/SKIP key performs an Include function. Pressing the SHIFT key prior to the INCLUDE/SKIP key lights the SHIFT LED and causes the key to perform a Skip function. When the key is pressed, the display is updated with the selected status and the display increments to the next channel number. The Skip and Include status only affects the activation during a channel scan. It does not affect recalling or executing a memory channel.

MEMORY RECALL AND EXECUTE - The Recall and Execute functions permit the information stored in the memory channels to be reviewed, using the CHAN/EXEC key. When the front panel is in the shift mode (SHIFT LED LIT), the key performs a channel recall function (CHAN). The receiver remains at its currently selected operating parameters while the memory data is reviewed. The receiver can still monitor an active signal during this operation. If the shift mode is disabled, the CHAN/EXEC key can be pressed to execute the displayed channel, setting the receiver to the parameters in the currently displayed memory channel. When the receiver front panel is unshifted (SHIFT LED extinguished), the receiver tunes to the parameters contained in the memory channels as the memory is reviewed. In this mode, the memory data is displayed for the selected channel, and the receiver tunes to each channel to permit monitoring the signal activity at the stored frequencies. In either of these memory review modes, a specific memory channel can be viewed by entering the desired channel number, and terminating the entry by pressing the CHAN/EXEC key. When the memory View menu is displayed, the EDIT knob may be used to step through the memory channels.

3.4.2 LOCKOUT MEMORY

The Lockout Memory is used in connection with the receivers F1-F2 W/LK scan mode (Frequency Scan with Lockout). It permits portions of the scanned frequency spectrum to be locked out to prevent the receiver from stopping on signal activity of no interest. If a scanning receiver encounters a signal in a locked out area, it ignores the signal regardless of its signal strength, relative to the programmed squelch level. The receiver is capable of storing up to 200 lockout channels. Lockouts are entered by specifying the frequency range in terms of the center frequency and bandwidth. A lockout is entered into memory in the following manner:

1. Tune the receiver to the signal that is to be locked out.

2. Select an appropriate IF bandwidth to surround or include the entire spectrum of the signal. For signal activity with bandwidths greater than 200 kHz, two or more lockout channels may be required to totally lock out the signal spectrum.

3. When the center frequency and bandwidth are set, press the SHIFT key to enter into the front panel shift mode, and press the LOCKOUT key (LOCKOUT/STORE). The Lockout menu appears in the parameter display, and the frequency and bandwidth are stored in memory. When stored, the display increments to the next available lockout channel.

4. The lockouts are stored in Lockout memory in the order that they are entered. If desired, a specific channel can be designated by entering the channel number at the keypad and terminating the entry by pressing the LOCKOUT key. The EDIT knob may also be used to step through the lockout channels to review the stored data or to designate the channel number for the next lockout entry.

3.4.3 CLEAR MEMORY

The Clear Memory function is a three-step sequence that clears the receiver's 200-channel Channel and Lockout memories. It is initiated by pressing the Clear Entry (CE) key in succession. Pressing the CE key two times displays a warning that the next key press will clear the memory (NEXT=CLR MEM). If the key is pressed a third time, the memory is cleared, and a confirmation is displayed (MEM CLEAR). The Clear Memory sequence can be aborted at any time before the third key press, by pressing a key other than CE.

3.5 SCAN OPERATIONS

The Scan mode is an automatic mode of operation, where the receiver is pre-programmed to search through a specified frequency band or to step through a series of discrete frequencies in search of signal activity. There are three types of scan operations that can be performed by the WJ-8611

Receiver. The scan type is chosen in a Scan setup menu prior to activating the scan operation. The scan types are: Channel Scan, F1-F2 Scan, and F1-F2 Scan with Lockouts. Before entering into one of these scan modes, the receiver's memory and scan menu must be programmed with the parameters associated with the desired scan mode.

The Channel Scan mode uses parameter data stored in the receiver's 200-channel memory to obtain the specific receiver parameters for the channels included in the scan sequence. It steps through the discrete frequencies stored in each channel and stops on any frequency that has signal activity that exceeds the specified squelch threshold level. As the receiver steps through each channel, the stored parameters for the channel are displayed in the front panel displays, and the receiver is set to the parameters. If a signal is detected, the receiver stops on the signal, displays its current tuned frequency, and activates the audio outputs for monitoring the signal intelligence. If no active signal is found, the receiver moves to the next channel in the sequence. When the receiver reaches the last designated channel in the sequence, the scan restarts at the first designated channel. The receiver parameters used by the Channel Scan are unique for each channel in the sequence, based of the data stored in memory.

The F1-F2 Scan mode uses a Start Frequency (F1) and Stop Frequency (F2) selected in the Scan Setup menu. In this mode, the entire spectrum within the F1 and F2 range is searched for signal activity greater than the specified squelch threshold level. As the scan progresses, the frequency display is updated with the frequency at each incremental step of the scan. If a signal is detected, the receiver stops on the signal, displays its current tuned frequency, and activates the audio outputs for monitoring the signal intelligence. If no signal is detected at a scan increment, the scan steps to the next increment. When the stop frequency (F2) is reached, the scan returns to the start and resumes scanning. In the F1 F2 scan, the receiver parameters used for the scan are constant throughout the scan. All of the operating parameters used by the scan are determined by their setting when the scan is activated.

The F1-F2 with Lockouts Scan mode functions in the same manner as the F1-F2 mode, except this mode uses the lockout data, stored in lockout memory. This lockout data determines if the scan should stop on an acquired signal. If a detected signal is within the bandwidth of a frequency in lockout memory, the activity is ignored and the scan progresses to the next increment of the scan. Using this scan function, areas in the scan spectrum that contain signal activity of no interest can be passed over without interfering with the scan operation.

In each of these scan types, three dwell timers are set to determine how the timing of the scan is performed. The Pre Dwell determines how long the scan pauses at each frequency, waiting for a signal to break threshold before it proceeds. The Post Dwell determines how long the scan remains on an active signal, monitoring its activity. The Post dwell determines how long the scan remains on a frequency after the signal falls below the threshold level. These timers are set in the Scan Setup Menu.

3.5.1 SCAN SETUP

The SETUP menu provides a menu for programming the details associated with the desired scan operation. This menu selects the type scan that is to be performed, its start and stop parameters, and the dwell timer settings. The menu sequence that is presented by the Setup menu is determined by the type of scan operation that is selected in the first entry of the menu. The procedures that follow describe the setup procedures for each scan type.

CHANNEL SCAN SETUP PROCEDURE

For Channel Scan operations, the Setup menu selects the range of memory channels and the dwell timer settings that are to be used in the scan. Prior to entering into the Setup menu for selection of the Channel scan operating characteristics, it is recommended that the memory be reviewed. Verify that the Include/Skip status of the memory channels to be included in the scan are properly programmed. The setup procedure for a channel scan operation is performed as follows:

1. Press the SETUP key to enter into the Setup mode and display the SCAN SETUP menu in the Parameter display. If the display does not initialize with the one of the scan types displayed, continue pressing the SETUP key until the second line of the menu displays one of the three scan types (CHANNEL, F1->F2, or F1->F2 W/LK). Rotate the EDIT knob to select CHANNEL in the scan type menu.

2. Press the SETUP key to select the START CHAN display. This is the first memory channel number that will be used in the channel scan sequence.

3. From the numeric keypad, enter the number of the memory channel where the scan is to start. The start channel number must be in the 1 to 200 range, and must be lower than the stop channel that will be entered in the next step. Terminate the numeric entry by pressing the SETUP key. When the setup key is pressed, the entry is momentarily displayed in the menu, and the display increments to the STOP CHAN selection.

4. The STOP CHAN display determines the channel number where the scan sequence ends. From the numeric keypad, enter the number of the memory channel where the scan is to end. The stop channel must be in the 1 to 200 range, and must be greater than the start channel entered in the previous step. Terminate the numeric entry by pressing the SETUP key. When the setup key is pressed, the entry is momentarily displayed in the menu, and the display increments to the PRE DWELL selection.

5. The PRE DWELL parameter determines the time that the receiver stops at each increment of a scan sequence, waiting for a signal to break the programmed squelch threshold. The pre dwell time can range from 0 to 1000, in 5 msec increments. Values ranging from 0 to 995 msec specify the pre dwell time in msec. Step values are rounded to the nearest 5 msec increment. A value of 1000 selects an infinite pre dwell time. From the numeric keypad, enter the desired Pre Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the display increments to the SIG DWELL selection.

6. The SIG DWELL parameter determines the time that the receiver remains on an acquired signal. The signal dwell setting can range from 0 to 601, in 1 second increments. Values ranging from 0 to 600 specify the signal dwell time in seconds (0 to 10 minutes). A value of 601 specifies an infinite dwell time. It the signal falls below the squelch level before the timer expires, the scan resumes to the next increment. From the numeric keypad, enter the desired Signal Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the display increments to the POST DWELL selection.

7. The POST DWELL parameter determines how long a the receiver waits at an acquired signal's frequency after the signal falls below the programmed squelch level. The post dwell setting can range from 0 to 61, in 1 second increments. Values ranging from 0 to 60 specify the post dwell time in seconds (0 to 60 seconds). A value of 61 specifies an infinite dwell time. From the numeric keypad, enter the desired Post Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the SETUP menu mode is terminated.

F1-F2 AND F1-F2 W/LK SCAN SETUP PROCEDURE

For F1-F2 and F1-F2 W/LK (With Lockouts) operations, the Setup menu selects the actual start and stop frequencies that define the frequency spectrum that is to be scanned. These menus also select the dwell timer settings that are to be used in the scan. The setup for F1-F2 and F1-F2 W/LK scans are identical. The only difference between these scan modes is that the latter mode utilizes the lockout frequencies stored in the Lockout memory. The setup procedure for an F1-F2 type scan operation is performed as follows:

1. Press the SETUP key to enter into the Setup mode and display the SCAN SETUP menu in the Parameter display. If the display does not initialize with one of the scan types displayed, continue pressing the SETUP key until the second line of the menu displays one of the three scan types (CHANNEL, F1->F2, or F1->F2 W/LK). Rotate the EDIT knob to select F1->F2 or F1->F2 W/LK in the scan type menu.

2. Press the SETUP key to select the F1 display. This is the start frequency that will be used in the F1->F2 scan sequence.

3. The F1 display determines the frequency where the F1-F2 scan begins its search. The frequency range is from 0.00000 to 1000.00000 MHz, with a 10 Hz resolution. When programming the start and stop frequencies, the F1 frequency must be less than the F2 frequency that will be entered in the next step. From the numeric keypad, enter the frequency (in MHz) where the scan is to begin. Terminate the entry by pressing the SETUP key. When the setup key is pressed, the entry is momentarily displayed in the menu, and the display increments to the F2 selection.

4. The F2 display determines the frequency where the F1-F2 scan ends its search. The frequency range is from 0.00000 to 1000.00000 MHz, with a 10 Hz resolution. When programming the stop frequency, the F2 frequency must be greater than the F1 frequency entered in the previous step. From the numeric keypad, enter the frequency (in MHz) where the scan is to end. Terminate the entry by pressing the SETUP key. When the setup key is pressed, the entry is momentarily displayed in the menu, and the display increments to the STEP selection.

5. The STEP display determines the size of the scan frequency increments taken during the F1->F2 and F1->F2 W/LK type scans. The desired step size range is from .01 to 100.00 kHz, with a 10 Hz resolution. When entering this parameter, it is important that the selected size is not greater than the IF bandwidth that is to be used in the scan operation. Otherwise, gaps in the frequency coverage will result. Typically, step sizes of approximately 1/2 of the selected IF

bandwidth are used. From the numeric keypad, enter the step size (in kHz). Terminate the entry by pressing the SETUP key. When the setup key is pressed, the entry is momentarily displayed in the menu, and the display increments to the PRE DWELL selection.

6. The PRE DWELL parameter determines the time that the receiver stops at each increment of a scan sequence, waiting for a signal to break the programmed squelch threshold. The pre dwell time can range from 0 to 1000, in 5 msec increments. Values ranging from 0 to 995 msec specify the pre dwell time in msec. A value of 1000 selects an infinite pre dwell time. Step values are rounded to the nearest 5 msec increment. From the numeric keypad, enter the desired Pre Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the display increments to the SIG DWELL selection.

7. The SIG DWELL parameter determines the time that the receiver remains on an acquired signal. The signal dwell setting can range from 0 to 601, in 1 second increments. Values ranging from 0 to 600 specify the signal dwell time in seconds (0 to 10 minutes). A value of 601 specifies an infinite dwell time. It the signal falls below the squelch level before the timer expires, the scan resumes to the next increment. From the numeric keypad, enter the desired Signal Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the display increments to the POST DWELL selection.

8. The POST DWELL parameter determines how long a the receiver waits at an acquired signal's frequency after the signal falls below the programmed squelch level. The post dwell setting can range from 0 to 61, in 1 second increments. Values ranging from 0 to 60 specify the post dwell time in seconds (0 to 60 seconds). A value of 61 specifies an infinite dwell time. From the numeric keypad, enter the desired Post Dwell time, and terminate the entry by pressing the SETUP key. When the entry is terminated, the value is momentarily displayed in the menu, and the SETUP menu mode is terminated.

3.5.2 SCAN INITIALIZATION

Once the memory has been programmed, and the scan characteristics have been selected, the scan operation is ready to be activated. To begin the scan, press the SCAN key. The LED on the KEY lights, and the scan operation starts. During the scan, the front panel displays, are continuously updated with the current parameters for each increment of the scan. During the scan, the front panel controls, except for REMOTE, SCAN, and PAUSE, are disabled. When a Channel scan is initialized, all of the parameters used for each increment of the scan are obtained from the channel memory and the Setup menu. For F1-F2 type scans, only the start frequency, stop frequency, increment size, and the dwell timer setting are preset by the Setup menu. All of the other operating parameters must be selected in the manual mode before the scan is started.

When a scan is in progress, it may be stopped using one of two methods. Pressing the SCAN key, when the scan is in progress, stops the scan and places the receiver into the manual operating mode. The receiver remains set to the last parameters set by the scan mode. When the scan is stopped with the PAUSE key, the scan is placed into a pause mode. In this mode, both the SCAN and PAUSE LEDs are lit. The scan stops and full manual control is restored. However, this mode allows the scan to be restarted at the point it was halted, without having to return to the beginning of the sequence. When in the pause mode, pressing the PAUSE key again resumes the scan at the point where it was halted. Pressing the SCAN key when in the pause mode, terminates the scan and places the receiver into the manual operating mode.

3.6 RECEIVER COLD START

The receiver Cold Start operation provides a means of quickly clearing all receiver memory, resetting the front panel parameters to a default setting, and resetting internal registers in the receiver circuitry. This operation is performed by holding the CE key in the pressed position while the receiver is powered ON. When the words "COLD START !" are displayed in the parameter display, the cold start operation is complete and the key can be released. At the completion of the cold start, the receiver is set as follows:

Tuned Frequency	20.00000 MHz
Tuning Resolution	10 Hz
IF Bandwidth	10.0 kHz
Detection	AM
Gain	Slow
Squelch	Off
AFC	Off
Blanker	Off
Tune Lock	Off

3.7 BUILT IN TEST FUNCTION

The built-in-test function (BITE) tests the internal circuitry and critical receiver functions to verify proper receiver operation. This function is performed each time that the receiver is powered ON, and any BITE failures are reported to the front panel. If one or more failures occur, pressing the CE key clears the error report from the front panel display. If multiple errors are reported, the highest priority is reported first. Pressing the CE key clears the first report, and displays the next in the list. When all errors have been reported, the normal receiver display is restored. The possible error conditions are as follows:

SRAM FAILURE	RAM write/read test failure

EEPROM FAILURE	EEPROM write/read test failure
EPROM FAILURE	EPROM checksum test failure
DSP A COMM ERROR	DSP A to Control Processor communication test failure
A->B COMM ERROR	DSP A to DSP B communication test failure
DSP A CHKSUM ERR	DSP A memory checksum test failure
DSP B COMM ERROR	DSP B to Control Processor communication test failure
B->A COMM ERROR	DSP B to DSP A communication test failure
DSP B CHKSUM ERR	DSP B memory checksum test failure
IEEE488 ERROR	IEEE-488 Interface write/read test failure
FP COMM ERROR	Control Processor to front panel processor communication test failure
DUART ERROR	RS-232 Interface Write/Read test failure
FILTER ERROR	Digital filter write/read test failure
LO 1 UNLOCK	1st LO synthesizer unlocked
LO 2 UNLOCK	2nd LO synthesizer unlocked
LO 3 UNLOCK	3rd LO synthesizer unlocked
REF LO UNLOCK	Reference synthesizer unlocked
+24V PS ERROR	+24Vdc power supply voltage incorrect
+/-13.5V PS ERROR	+/-13.5Vdc power supply voltage incorrect

In addition to the automatic BITE operation on receiver power up, this function can be manually initiated from the front panel if a confidence test is required. Bite is manually activated from the Configuration Menu as follows:

1. Press the MENU key to enter into the Configuration Menu mode.

2. Press the MENU key, as required, until the 2.BITE PENDING menu is displayed.

3. Rotate the EDIT knob to activate BITE.

At the completion of the BITE tests, the word "PASSED" is displayed to indicate no failures. If a failure is detected, the error is displayed. Pressing the DET key exits the Configuration Menu and restores the normal display.

NOTES

SECTION 4

REMOTE CONTROL

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SECTION 4 REMOTE CONTROL

4.1 REMOTE CONTROL

The WJ-8611 Digital VHF/UHF Receiver is capable of being controlled remotely by an external computer equipped with an RS-232 serial or IEEE-488 parallel interface. The 1data is transmitted and received over the interface using ASCII-standard encoded characters. The receiver's parallel IEEE-488 interface uses the standard 24-pin IEEE-488 connector. This interface provides a bit parallel, byte serial data transfer for high speed data transfers over short distances. The standard IEEE-488 protocol and handshaking are supported, using eight data byte transfer lines, three data transfer lines and five bus management lines. The RS-232 serial interface the standard 25-pin D-type RS-232 connector. It is configured as a three-wire interface. The current software utilizes the transmit line (TXD), the receive line (RXD), and a signal ground connection.

The active interface is determined by the configuration of the receiver, using two DIP switches mounted on the receiver's Digital Assembly, as described in **paragraph 2.2.1**. Interface selection can also be performed from the receiver front panel Configuration Menu.

Either of the interfaces permits complete control over the receiver operations. The information in this section provides all of the commands and formatting information necessary to control and monitor the receiver operations. Before attempting to control the receiver over the remote interface, it is recommended that **Section 3** of this manual be reviewed for familiarization with the various receiver operations.

4.1.1 RS-232 SERIAL INTERFACE

The RS-232 interface (J1) provides single-drop full duplex operation, capable of simultaneous transmission and reception of data. The interface is programmed for three-wire operation, using the TXD, RXD, and Ground connections at pins 2, 3, and 7, respectively. The interface supports XON/XOFF, and ACK/NAK software handshaking only. Hardware handshaking such as RTS (request to send), CTS (clear to send), DTR (data terminal ready), and DSR (data set ready) are electrically wired but not supported by the control software. Provisions must be made at the controlling device for interfacing with the receiver without using these handshake lines.

The baud rate of the receiver and controlling device must be set to the same rate. The receiver supports six baud rates: 1200, 2400, 4800, 9600, 19200, and 38400 baud. The appropriate rate must be set at each device to provide a compatible interface. Refer to **Section 2** of this manual for details concerning baud rate selection.

The data word frame used for serial data transfer is fixed at ten bits. It consists of one start bit, eight data bits, and one stop bit. No parity bit is used.

4.1.2 IEEE-488 PARALLEL INTERFACE

The IEEE-488 interface (J2) provides parallel interfacing with up to fourteen other devices on the bus. It provides talk and listen capabilities between the receiver and the controlling device in a bit-parallel, byte-serial form. Sixteen interconnecting lines and eight ground shield lines form the interface. These lines consist of eight bi-directional data lines, three data byte transfer lines, and five bus management lines. Data and address information is transferred over the data bus lines (DIO 1-DIO8). The three data byte transfer lines (DAV, NRFD, and NDAC) indicate the availability and validity of the information of the data bus lines, the readiness of the listening device to accept data, and when the data has been accepted. Four of the five management lines are used to indicate when the data bus is carrying data or address information (ATN), to request service (SRQ), to clear the interface (IFC), and to indicate the end of a transfer sequence (EOI). The fifth management line (REN) is not used in this configuration.

The IEEE-488 interface provides the receiver with talk and listen capabilities, when commanded by the controlling device. Through the interface, the receiver can initiate a service request (SRQ) and reply to a serial poll initiated by the controller. It can respond to a selected device clear (SDC) and a universal device clear (DCL).

In order to communicate over the IEEE-488 interface, the receiver must be set to a unique bus address. To avoid bus conflicts, no other device on the bus can share the same address. The available addresses for IEEE-488 operation are from 1 to 30. The address is set by a DIP switch on the receiver's Digital Assembly. Refer to **paragraph 2.2.1** for details on setting the bus address. Additionally, the capability of setting and changing the bus address from the front panel is provided. Refer to paragraph **3.2.9**.

4.2 COMMAND MESSAGE FORMAT

Command messages for the WJ-8611 Receiver are exclusively ASCII-encoded data, consisting of command headers and arguments. The command headers consist of three character mnemonics. The arguments associated with the command follow the command in a "forgiving" format (nrf). All queries to the receiver consist of a command header, followed by a question mark (?).

The command messages are divided into three categories, based on the function of the message: They are: device message, communication messages, and configuration messages. These message categories are detailed in **Tables 4-1**, **Table 4-2**, and **Table 4-3**, respectively.

A command message may consist of a single command and its argument, or multiple commands may be sent by transmitting the commands in a string. All commands in the string must be separated by a semicolon (;) (e.g., FRQ 20;DET 1 CR LF).

4.2.1 MESSAGE TERMINATORS

Message terminators are used to signal the end of a command or string of commands. A properly formatted RS-232 or IEEE-488 message is sent with a carriage return line feed terminator (CR LF), or just line feed (LF). The receiver recognizes the LF character as the end of the message. When responding to a query over the RS-232 interface, the receiver always terminates its message with carriage return, line feed (CR LF). When responding to a message over the IEEE-488 bus, the receiver always terminates its message with carriage return, line feed (CR LF), and with the EOI line of the interface (end or identify) set TRUE.

4.2.2 QUERY RESPONSE FORMATS

Query responses from the receiver are transmitted in a fixed-field format. The response begins with the three-character mnemonic of the query (in upper case characters), followed by a numeric argument. A space is always inserted between the mnemonic and the argument. Numeric arguments are represented with the least number of digits possible, while still representing the entire range of the value. If a negative value is allowed in the argument, a positive or negative sign is always given. Responses due to multiple queries are linked together in a query string, with each query mnemonic and its argument separated from other queries with a semicolon. The receiver always terminates the response message with a carriage return, linefeed (CR LF).

4.2.3 NUMERIC ARGUMENT REPRESENTATION

Arguments for commands and queries are represented in this manual by an nrX designation, where X is either f, 1, or 2). The nrf representation is used for command numeric arguments. The nr1 and nr2 representation is used for query response arguments.

Numeric arguments that are used with commands to the receiver are accepted in a forgiving numeric representation (nrf). This implies that the receiver is a forgiving listener. However, responses from the receiver are always in a fixed nr1 or nr2 format. The specific description of the numeric representations are as follows:

- **nrf** - The nrf (forgiving numeric representation) data element for commands is composed of the sequential fields listed below. All fields (1-5) are optional with one restriction: at least one digit must be present with the active data element of the argument.

Field	Data
1	Plus (+) or minus (-) sign.
2	Any number of digits, up to eight.
3	A decimal point (.).
4	Any number of digits, up to eight.
5	An upper-case "E" or lower-case "e" followed by an optional sign and at least one digit, but no more than two digits.

  If the receiver receives an nrf of a precision greater than it can handle, it rounds the number rather than truncating it. When rounding, the unit ignores the sign of the number and rounds up on values equal to or greater than one-half. It rounds down on values less than one-half.

- **nr1** - The nr1 is a numeric response format for integers, composed of an optional sign field, followed by any number of digits. The decimal point is implicitly defined to always follow the last digit and is therefore, not present in the response element.

- **nr2** - The nr2 response data format is composed of an optional sign field, followed by any number of digits, a decimal point, and any number of digits. At least one digit is always present on each side of the decimal point.

4.3 RECEIVER DEVICE MESSAGES

The Receiver Device Messages are commands and queries that affect the operational parameters of the receiver. These commands are listed in **Table 4-1**. In order for the receiver to recognize a command, the receiver must be in the remote mode of operation. The receiver can be placed into the remote mode pressing the REMOTE key on the front panel, or the remote control command (CTL 1 or CTL 2) may be sent before any other messages are transmitted to the receiver.

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
BND nrf		Selects the RF preselector frequency band manually. This command overrides the current preselector band selection that was set by the tuned frequency. It is used for test purposes only. Range: 0 to 5 Where: BND 0 = Bypass BND 1 = Band A, 500 - 1000 MHz BND 2 = Band B, 250 - 500 MHz BND 3 = Band C, 125 - 250 MHz BND 4 = Band D, 60 - 125 MHz BND 5 = Band E, 20 - 60 MHz
BND?	BND nr1	Requests the currently active preselector band. Reset: Selected by the tuned frequency Default: Selected by the tuned frequency
BWA?	BWA nr1	Requests the currently active IF bandwidth. Range: 1 - 17. See BWS command. Reset: BWA 8 Default: BWA 8
BWC nrf		Selects an IF bandwidth by specifying its size in MHz. If the specified size is not a standard IF bandwidth the command is ignored and the EXE error bit is set in the Event Summary Register. Range: 0000.00020 0000.01500 0000.00050 0000.02000 0000.00100 0000.03000 0000.00320 0000.03500 0000.00500 0000.05000 0000.00640 0000.06000 0000.00800 0000.10000 0000.01000 0000.15000 0000.20000
BWC?	BWC nr2	Requests the current IF bandwidth , in MHz Reset: BWC 0000.01000 Default: BWC 0000.01000
BWL?	BWL nr2,nr2,nr2,nr2, nr2,nr2,nr2,nr2, nr2,nr2,nr2,nr2, nr2,nr2,nr2,nr2, nr2	Requests a list of the IF bandwidths available in the receiver for selection.

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
BWS nrf		Selects an IF bandwidth by specifying its IF bandwidth slot number. (See **paragraph 1.5** on Software Version 01.00.07.) Range: 1 - 17 Where: 1 = 0.00020 9 = 0.01500 2 = 0.00050 10 = 0.02000 3 = 0.00100 11 = 0.03000 4 = 0.00320 12 = 0.03500 5 = 0.00500 13 = 0.05000 6 = 0.00640 14 = 0.06000 7 = 0.00800 15 = 0.10000 8 = 0.01000 16 = 0.15000 17 = 0.20000
BWS?	BWS nr1	Requests the selected IF bandwidth by its slot number. Reset: BWS 08 Default: BWS 08
BYP nrf		Selects the bypass path in the RF preselector to disable the front end bandpass filtering. Range: 0, 1 Where: BYP 0 - Bypass off BYP 1 - Bypass on
BYP?	BYP nr1	Requests the current bypass path status. Reset: BYP 0 Default: BYP 0
CFG?	CFG nr1	Requests the status of the receiver's configuration mode. The data returned consists of one byte identifying whether the receiver is in the normal or configuration mode. Where: CFG 0 = Normal mode CFG1 = Configuration mode Reset: CFG0 Default: CFG0
CLM nrf		Clears memory channels, lockout channels, or all memory. Range: 1-3 Where: 1 = Memory channels only 2 = Lockout channels only 3 = Both memory and lockout channels
CLT nrf		Sets the COR loss timer. The loss timer specifies the amount of time, in msec, that a signal must be below the COR threshold after detection, before the signal loss is reported. Range: 0 - 2000 msec
CLT?	CLT nr1	Requests the current COR loss timer setting. Reset: CLT 0000 Default: CLT 0000

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
COD nrf COD?	 COD nrf	Sets the COR output delay timer. The output delay timer establishes the time that the COR output is held active after a signal falls below the programmed threshold. This timer starts after the COR loss timer (CLT) times out. The range is from 0 to 5 second, in 1 second increments. Requests the current COR output delay timer setting. Reset COD 0 Default: COD 0
COO nrf COO?	 COO nr1	Set the COR Output Override mode. When set to On, the COR Output Override will force the COR output to the high (inactive) state. Range 0 or 1 Where: COO 0 – Override Off COO 1 – Override On Request the current setting of the COR Output Override mode. Reset: 0 Default: 0
COR nrf COR?	 COR nr1	Sets the threshold, above which the receiver recognizes a signal as a valid contact. The COR threshold range is from 0 to 80, in 1 dB increments, representing the level in dB above the noise floor of the selected IF bandwidth. A COR value of -01 turns COR off. Requests the current COR threshold setting. Reset: COR +00 Default: COR +00
CST?	CST nr1	Request the current COR status. Range: CST 0 - COR off CST 1 - COR on
CTL nrf CTL?	 CTL nr1	Selects the control mode of the WJ-8611 Receiver. Range: 0 - 2 Where: CTL 0 = Local receiver control CTL 1 = Remote receiver control CTL 2 = Remote with local control locked out Requests the receiver's current control mode. Reset: CTL 0 Default CTL 0

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
DET nrf		Selects the receiver detection mode. Range: 1 - 6 Where: 1 = AM 4 = USB 2 = FM 5 = LSB 3 = CW 6 = ISB
DET?	DET nr1	Requests the currently active detection mode. Reset: DET 1 Default: DET 1
DWS?	DWS nr1	Requests the current dwell status when the receiver is in a scan mode. Range: 0 -3 Where: 0 = No dwell timers are active 1 = Pre-dwell timer active 2 = Signal dwell timer active 3 = Post-dwell timer active.
ENA		Resume a suspended scan. It is used to restart a scan from the point where it was halted by a SUS (Suspend) command.
FMO?	FMO nr1	Requests the FM offset value, representing the location of the signal within the selected IF bandwidth. The value returned is the percentage of the active IF bandwidth in the range of from -50 to +50. A positive value indicates that the signal frequency is greater than the receiver's tuned frequency.
FRA nrf		Selects the start frequency (in MHz) for a frequency-to-frequency (F1-F2) sector scan. This frequency must be less than the value sent with the FRB command. Range: 0 to 999.99999
FRA?	FRA nr2	Requests the currently programmed start frequency (F1) for a frequency-to-frequency (F1-F2) sector scan. Reset: FRA 0000.00000 Default: FRA 0000.00000
FRB nrf		Selects the stop frequency (in MHz) for a frequency-to-frequency (F1-F2) sector scan. This frequency must be greater than the value sent with the FRA command. Range: 0.00001 to 1000.00000
FRB?	FRB nr2	Requests the currently programmed stop frequency (F2) for a frequency-to-frequency (F1-F2) sector scan. Reset: FRB 1000.00000 Default: FRB 1000.00000

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
FRQ nrf		Sets the receiver tuned frequency in MHz. The resolution for this tuning command is 10 Hz. Range: 0 to 1000.00000
FRQ?	FRQ nr2	Requests the current tuned frequency of the receiver. Reset: FRQ 20.00000 Default: FRQ 20.00000
INC nrf		Selects the frequency-to-frequency scan (F1-F2) increment size, in MHz. The resolution for the scan increment size is 10 Hz. Range: 0.00001 - 0.10000
INC?	INC nr2	Requests the currently programmed frequency-to-frequency scan (F1-F2) increment size, in MHz. Reset: INC 0.00001 Default: INC 0.00001
LCK nrf, nrf,nrf		The three fields associated with this command selects each lockout channel and stores the start and stop frequencies of the lockout frequency band into the selected channel. The channel number assigned with this command remains constant as channels are added or deleted. The data assigned with the LCK command overwrites any previously stored data in the selected channel. The Upper frequency parameter must be greater than the Lower frequency, and the frequency resolution is 10 Hz. The minimum frequency range between field 3 and field 2 is 200 Hz. The maximum range between field 3 and field 2 is 200 kHz. Range: Field 1: Channel Number, range 1 - 200 Field 2: Lower Frequency of lockout, range 0.00000 - 999.99980 Field 3: Upper Frequency of lockout, range 0.00020 - 999.99999
LDW nrf		Sets the signal lost dwell time, in seconds, for an F1-F2 or channel scan. The LDW parameter is the time the receiver waits after the signal is lost before continuing the scan. Range: -1 - 60 Where: 0 - 60 = Dwell time in seconds -1 = Infinite dwell time
LDW?	LDW nr1	Requests the currently programmed signal lost dwell timer setting. Reset: +00 Default: +00

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
OPR nrf		Selects the receiver operation mode. Range: 1 - 3 Where: 1 = Manual 2 = F1-F2 Sector scan 3 = Channel scan
OPR?	OPR nr1	Request the current receiver operating mode. Reset: OPR 1 Default OPR 1
PDW nrf		Sets the pre-dwell time, in msec, for an F1-F2 or channel scan. The PDW parameter is the time the receiver waits at a new scan increment for signal activity to break the COR threshold. The resolution of the PDW parameter is 5 msec. Range: -1 - 995 Where: 0 - 995 = Pre-dwell time in msec (5 msec increments) -1 = remain on frequency until a signal is acquired.
PDW?	PDW nr1	Requests the currently programmed pre-dwell timer setting. Reset: PDW 000 Default: PDW 000
PRE nrf		Sets the preselector tuning voltage for the current tuned frequency. It is used for test purposes only. Range: 0 - 255 Where: 0 - 255 = tuning voltages from 0 to +30 Vdc
PRE?	PRE nr1	Requests the tuning voltage set by the PRE command or set by the tuned frequency Reset: Set by the receiver tuned frequency Default: Set by the receiver tuned frequency
RAC nrf		Set the report action control register. The RAC command permits the report action control register to be set for determining the action that will be performed during F1-F2 and channel scans. The report action is set by setting the individual bytes of the register to logic 1, using the binary value of the associated bit. BIT Value Action 0 1 Not used 1 2 Not used 2 4 Ignore the lockout list 3-7 Not used
RAC?	RAC nr1	Requests the currently programmed value stored in the RAC register.

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
RCE nrf		Recall and execute the specified memory channel. Range: 1 -200
REF?	REF nr1	Requests the current source of the receiver's reference frequency. Range: 0 - 4 Where: 0 = Internal reference 1 = 10 MHz External reference 2 = 5 MHz External reference 3 = 2 MHz External reference 4 = 1 MHz External reference
RLK? nrf	LCK nr1, nr2, nr2	Requests the currently programmed lockout parameters in the specified lockout channel. The returned values are in the form of the LCK command, consisting of the channel number, start, and stop frequencies. Range: 1 - 200, Channel 0000.00000 - 1000.00000, Start or Stop frequency Reset: No change Default: All lockout channels contain 0000.0000.
RMD? nrf	SMD nr1,nr1,nr2,nr1,nr1, nr1,nr1,nr1,nr1,nr1,nr1,nr1,nr2,nr2, nr2,nr1,nr2,nr2	Recalls the parameters from the specified memory channel. Refer to the SMD command for the field definitions of the response. Range: 0 - 200 Reset: No Change Default: Default Memory Channels (see SMD command)
SCS?	SCS nr1	Requests the current receiver scan status. Range: 0-2 Where: 0 = No Scan 1 = Scan Active 2 = Scan Pause
SDW nrf SDW?	 SDW nr1	Sets the signal dwell timer. The SDW parameter is the time, in seconds, that the receiver spends listening to a signal acquired during an F1-F2 or channel scan operation. Range: -1 to 600 Where: -1 = Infinity, Receiver stays on the signal until it is lost, or an ADV command is sent. 0 - 600 = the time in seconds that the receiver stay at an active frequency. Requests the currently programmed signal dwell time. Reset: SDW +000 Default: SDW +000

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
SGS?	SGS nr1	Requests the current receiver signal strength. Range: +10 to -130 Where: +10 to -130 = Signal Strength in dBm <<<< = Insufficient signal >>>> = Signal overload **** = Signal Strength invalid
SGV?	SGV nr1,nr1,nr1, nr1	Requests a list of the receiver's current scan direction (SPI), COR status (CST), signal strength (SGS), and FM offset (FMO). Where: SPI = 1 CST = 0 or 1 SGS = See SGS command FMO = -50 to +50
SLM?	SLM nr1	Requests the number of unused lockout memory channels. Range: 0 - 200 Reset: SLM 200 Default: SLM 200
SMD nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf,nrf, nrf,nrf,nrf		Sets up the selected memory channel for a channel scan operation. The SMD command contains the channel number and a field dependent list of the signal parameters. Each data item in the list is separated by a comma. Any blank data field causes the associated parameter to remain unchanged. The data may be terminated after any completed field, causing any fields following the termination to remain unchanged. Any field specified as "Dummy value" are not stored in memory, but must have its field included in the list. Field: 1 Channel Number, 0-200 2 Include. 0 = Channel not included in scan 1 = Channel included in Scan (default) 3 Tuned Frequency, 0.00000 - 1000.00000 (default 20.00000) 4 Bandwidth Slot, 1 - 15 (default 7) 5 COR, -1 to 80 (default 0) 6 Detection, 1 - 6 (default 1) 7 AGC, 0 -2 (default 2) 8 Attenuation, 0 - 100 (default 000) 9 AFC, 0 -1 (default 0) 10 Pre-dwell, Dummy Value (default 0) 11 Signal Dwell, Dummy Value (default 0) 12 Signal Lost timer, Dummy Value (default 0) 13 Start Frequency, Dummy Value (default 0) 14 Stop Frequency, Dummy Value (default 0) 15 Increment, Dummy Value (default 0) 16 Signal Direction, Dummy Value (default 0) 17 BFO, -8000 - +8000 (default 0) 18 IF Offset, Dummy Value (default 0)

Table 4-1. Receiver Device Messages (Continued)

Command	Response	Description
SPI?	SPI nr1	Request the currently selected sweep direction. Not implemented. A value of 1 is always returned.
SQL nrf SQL?	 SQL nr1	Sets the receiver squelch level in -dBm. Range: 29 - 131 Where: 29 = Squelch on regardless of signal level 30 - 130 = Squelch level in -dBm 131 = Squelch off regardless of signal level Requests the currently programmed squelch level. Reset: SQL 131 Default: SQL 131
STL nrf,nrf,...,nrf STL?	 STL nr1,nr1,(nr1:nr1), nr1...	The STL command permits entry of a list of memory channels that are to be used in a Channel scan. The list may have a maximum of 200 entries. Range: 1 - 200, 200 entries maximum Requests the currently programmed channel scan list. Reset: STL 001, ..., 200 Default: STL 001, ..., 200 Example: STL 001,002,020,101
STO nrf		Stores the current receiver parameters into the selected receiver memory channel. Range: 1 - 200
SUS		Suspends a currently active scan, in the same manner as the front panel PAUSE key. The scan may be resumed from the point where it was paused, using the ENA command.
SWD nrf SWD?	 SWD nr1	Not currently implemented. Request the currently selected sweep direction. Not currently implemented. A value of SWD 1 is always returned.
ULC nrf		Unlock the selected lockout channel. Range: 1 - 200

4.4 COMMUNICATION MESSAGES

The commands in this message category are always valid. They are used to establish communications between the WJ-8611 Receiver and the remote controlling device. The mnemonics associated with this message category are listed in **Table 4-2**. Common communication messages are prefixed with an asterisk.

Table 4-1. Receiver Device Messages

Command	Response	Description
ADV		Advances to the next increment of the scan. It is used when the receiver is in dwell.
AFC nrf		Selects or disables the Automatic Frequency Control. Range: 0 or 1 Where: AFC 0 - AFC off AFC 1 - AFC on
AFC?	AFC nr1	Requests the status of the Automatic Frequency Control function. Reset: AFC 0 Default: AFC 0
AGC nrf		Selects the receiver's gain control mode Range: 0 - 2 Where: AGC 0 - Manual Gain Control AGC 1 - Slow AGC AGC 2 - Fast AGC
AGC?	AGC nr1	Requests the active gain control mode. Reset: AGC 1 Default AGC 1
ATN nrf		Sets the receivers signal attenuation. This command controls the gain of the receiver when in the manual gain control mode. It permits from 0 to 100 dB of attenuation to be selected, in 1 dB increments. Range: 0 - 100
ATN?	ATN nr1	Requests the current receiver attenuation value. Reset: ATN 000 Default: ATN 000
BFO nrf		Sets the BFO frequency in kHz, in 10 Hz steps. This command can be sent at any time, but it is only valid in the CW detection mode. Range: -8.00 to +8.00
BFO?	BFO nr2	Requests the current BFO frequency. Reset: BFO +1.00 Default: BFO +1.00
BLK nrf		Sets the receiver's noise blanking parameter. Range: 0 to 10 Where: BLK 0 = Blanking off BLK 1 - 10 = Blanking time in msec.
BLK?	BLK nr1	Requests the current noise blanker setting. Reset: BLK 0 Default: BLK 0

Table 4-2. Communication Messages

Command	Response	Description
*CLS		This command causes all of the Communication Status registers to be cleared.
DEE nrf		Sets the receiver's Device Dependent Error Enable register bits to determine which conditions will initiate a Service Request (SRQ) to the controlling device. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 31 Bit Value Function 0 1 +13 Vdc Error Bit Enable 1 2 +24 Vdc Error Bit Enable 2 4 (LOR) Local Oscillator Error Bit Summary Enable 3 8 (DPR) DSP Error Bit Summary Enable 4 16 (DVR) Hardware Device Error Bit Summary Enable 5-7 Not Used
DEE?	DEE nr1	Requests the status of the Device Dependent Error Enable register. The response data is a decimal number containing the sum of the bit values of the Device Dependent Error Enable register, as defined in the DEE command description.
DER?	DER nr1	Requests the status of the Device Dependent Error register. The response is a decimal number containing the sum of the bit values of the Device Dependent Error register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 31 Bit Value Function 0 1 +13 Vdc Error 1 2 +24 Vdc Error 2 4 (LOR) Local Oscillator Error (LOR register) 3 8 (DPR) DSP Error (DPR register) 4 16 (DVR) Hardware Device Error (DVR register) 5-7 Not Used

Table 4-2. Communication Messages (Continued)

Command	Response	Description
DPE nrf		Sets the DSP Error Enable register bits to determine which error conditions will cause the DSP Error bit (bit 3) to be set in the Device Dependent Error register. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 255 Bit Value Function 0 1 (BCS) DSP B Checksum Error 1 2 (BAC) DSP B to DSP A response Error 2 4 (GCP) DSP B to Gain Control Processor Communication Error 3 8 (BCM) DSP B to Control Processor Communication Error 4 16 (ACS) DSP A Checksum Error 5 32 (ABC) DSP A to DSP B response Error 6 64 Not Used 7 128 (ACM) DSP A to Control Processor Communication Error
DPE?	DPE nr1	Requests the status of the DSP Error Enable register. The response data is a decimal number containing the sum of the bit values of the DSP Error Enable register, as defined in the DPE command description. Reset: No Change Default: DPE 000
DPR?	DPR nr1	Requests the status of the DSP Error Status register. The response is a decimal number containing the sum of the bit values of the DSP Error register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 255 Bit Value Function 0 1 (BCS) DSP B Checksum Error 1 2 (BAC) DSP B to DSP A response Error 2 4 (GCP) DSP B to Gain Control Processor Communication Error 3 8 (BCM) DSP B to Control Processor Communication Error 4 16 (ACS) DSP A Checksum Error 5 32 (ABC) DSP A to DSP B response Error 6 64 Not Used 7 128 (ACM) DSP A to Control Processor Communication Error

Table 4-2. Communication Messages (Continued)

Command	Response	Description
DVE nrf		Sets the Hardware Device Error Enable register bits to determine which hardware error conditions will cause the DVR Error bit (bit 4) to be set in the Device Dependent Error register. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 255 Bit Value Function 0 1 (ROM) EPROM Checksum Error Enable 1 2 (E^2P) EEPROM Write/Read Error Enable 2 4 (RAM) RAM Write/Read Error Enable 3 8 (FRP) Front Panel Communication Error Enable 4 16 (DRT) DUART (RS-232) Write/Read or Communication Error Enabled 5 32 (VID) Video Filter Write/Read Error Enabled 6 64 (IFE) IF Filter Write/Read Error Enabled 7 128 (TMT) BIT Timeout Error Enabled
DVE?	DVE nr1	Requests the status of the Hardware Device Error Enable register. The response data is a decimal number containing the sum of the bit values of the DVE Error Enable register, as defined in the DVE command description.
DVR?	DVR nr1	Requests the status of the Hardware Device Error register. The response is a decimal number containing the sum of the bit values of the DVR Error register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 255 Bit Value Function 0 1 (ROM) EPROM Checksum Error 1 2 (E^2P) EEPROM Write/Read Error 2 4 (RAM) RAM Write/Read Error 3 8 (FRP) Front Panel Communication Error 4 16 (DRT) DUART (RS-232) Write/Read or Communication Error 5 32 (VID) Video Filter Write/Read Error 6 64 (IFE) IF Filter Write/Read Error 7 128 (TMT) BIT Timeout Error Reset: No Change Default: DVR 000

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*ESE nrf		Sets the Event Summary Enable register bits to determine which Error conditions will be passed to the status byte to initiate a Service Request (SRQ) to the controlling device. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 189 Bit Value Function 0 1 (OPC) Operation Complete Enable 1 - Not Used 2 4 (QYE) Query Error Enable 3 8 (DDE) Device-Dependent Error Summary Enable 4 16 (EXE) Execution Error Enable 5 32 (CME) Command Error Enable 6 - Not Used 7 128 (PON) Power On Enable
*ESE?	*ESE nr1	Requests the status of the Event Summary Enable register. The response data is a decimal number containing the sum of the bit values of the Event Summary Enable register, as defined in the ESE command description.
*ESR?	*ESR nr1	Requests the status of the Event Summary register. The response is a decimal number containing the sum of the bit values of the Event Summary register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 189 Bit Value Function 0 1 (OPC) Operation Complete 1 - Not Used 2 4 (QYE) Query Error 3 8 (DDE) Device-Dependent Error Summary 4 16 (EXE) Execution Error 5 32 (CME) Command Error 6 - Not Used 7 128 (PON) Power On
*IDN?	*IDN (See example)	Requests the Receiver's identity. The fields in the response provide information in the following order: manufacturer, model number, serial number, and software version number. Example: *IDN WJ, 8611-nn, 00000, 00.00.01

Table 4-2. Communication Messages (Continued)

Command	Response	Description
LOE nrf		Sets the LO Error Enable register bits to determine which local oscillator error conditions will cause the LOR Error bit (bit 2) to be set in the Device Dependent Error register. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 15 Bit Value Function 0 1 (REF) Reference Oscillator Error Enable 1 2 (LO1) 1st LO Error Enable 2 4 (LO2) 2nd LO Error Enable 3 8 (LO3) 3rd LO Error Enable 4-7 Not Used
LOE?	LOE nr1	Requests the status of the LO Error Enable register. The response data is a decimal number containing the sum of the bit values of the LOR Error Enable register, as defined in the LOE command description.
LOR?	LOR nr1	Requests the status of the LO Error register. The response is a decimal number containing the sum of the bit values of the LOR Error register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 15 Bit Value Function 0 1 (REF) Reference Oscillator Error 1 2 (LO1) 1st LO Error 2 4 (LO2) 2nd LO Error 3 8 (LO3) 3rd LO Error 4-7 Not Used
*OPC		Operation Complete switch. When this command is sent with a data string, the OPC bit of the Event Summary register is set upon completion of the commanded operation. An SRQ is generated with the OPC bit (bit 0) of the Event Summary register set.
*OPC?	*OPC 1	An *OPC 1 string will be loaded into the output buffer (returned at the completion of the operation in the input buffer).
*OPT?	*OPT nr1	Requests that the receiver reports its installed options. Bit Value Function 0-2 0 Not Used 3 8 Signal Monitor Option 4-7 Not Used

Table 4-2. Communication Messages (Continued)

Command	Response	Description
RSE nrf		Sets the Receiver Status Enable register to enable interrupts to be passed from the Receiver Status register to the Status Byte register via the RSB bit (bit 0) of the Status Byte. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 19 Bit Value Function 0 1 (THB) Signal above COR threshold Enable 1 2 (ABS) Signal Fell below threshold Enable 2 Not Used 3 Not Used 4 16 (PRS) F1-F2 or Channel Scan suspended on signal Enable 5 - 7 Not Used
RSE?	RSE nr1	Requests the status of the Receiver Status Enable register. The response data is a decimal number containing the sum of the bit values of the Receiver Status Enable register, as defined in the RSE command description.
RSR?	RSR nr1	Requests the status of the Receiver Status register. The information in this register is latched. It is cleared by the *CLS command or by reading the register contents. The response is a decimal number containing the sum of the bit values of the Receiver Status register. A logic "1" at the bit location indicates an error condition from its respective function. Range: 0 - 19 Bit Value Function 0 1 (THB) Signal above COR threshold 1 2 (ABS) Signal Fell below threshold 2 Not Used 3 Not Used 4 16 (PRS) F1-F2 or Channel Scan suspended on signal 5 - 7 Not Used
*RST		Reset device Parameters. This command resets all device parameters to their default condition.

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*SRE nrf		Sets Service Request Enable register to determine the conditions that will generate a service request (SRQ) to the external controlling device. The data byte associated with this command is a bit-mapped byte, with the individual bits flagging which functions are enabled. A logic "1" at the bit location enables the function. Range: 0 - 113 Bit Value Function 0 1 (RSB Receiver Status Bit Enable 1 - Not Used 2 - Not Used 3 - Not Used 4 16 (MAV) Message Available 5 32 (ESB)Event Summary Bit Enable 6 64 (RQS) Request Service Bit Enable 7 - Not Used
*SRE?	*SRE nr1	Requests the status of the receiver's Service Request Enable register. The response data is a decimal number containing the sum of the bit values of the Service Request Enable register, as defined in the *SRE command description.
*STB?	*STB nr1	Requests the status of the receiver's Status Byte register. Range: 0 - 113 Bit Value Function 0 1 (RSB) Receiver Status Bit 1 - Not Used 2 - Not Used 3 - Not Used 4 16 (MAV) Message Available 5 32 (ESB)Event Summary Bit 6 64 (RQS) Request Service Bit 7 - Not Used

Table 4-2. Communication Messages (Continued)

Command	Response	Description
*TST?		Runs the receiver's Built-in Test function and responds with a decimal number. The value of the number is the sum of the bit values of the failed tests, as follows: Bit / Value / Test Function 0 / 1 / SRAM failure. 1 / / Not Used. 2 / 4 / EPROM Failure. 3 / 8 / DSP A Communication Error. 4 / 16 / DSP A to DSP B Communication Error. 5 / 32 / DSP A Checksum Error. 6 / 64 / DSP B Communication Error. 7 / 128 / DSP B to Gain Control Processor Communication Error. 8 / 256 / DSP B to DSP A Communication Error. 9 / 512 / DSP B Checksum Error. 10 / / Not Used. 11 / 2048 / DUART Write/Read Error 12 / 4096 / IF Filter Write/Read Error 13 / 8192 / Video Filter Write/Read Error 14 / / Not Used 15 / / Not Used 16 / / Not Used 17 / / Not Used 18 / 262144 / +13.5 Vdc Power Supply Error 19 / 524288 / +24 Vdc Power Supply Error 20 / 1048576 / Bit Timeout
*WAI		When sent with a string of commands, the *WAI command places the receiver into a wait state until all of the commands are processed.

4.5 CONFIGURATION MESSAGES

The commands in the Configuration Message category are valid only when the receiver configuration DIP switches are set for the configuration mode. Refer to **paragraph 2.2.1** for the receiver's Configuration Switch configuration. These commands are used to configure the receiver's tracking preselector with data for proper front end tuning. The configuration Messages are listed in **Table 4-3**.

CAUTION **The receiver configuration messages provide access to factory programmed receiver data associated with the proper operation of the receiver. Extreme care should be exercised when entering into this mode.**

Table 4-3. Configuration Messages

Command	Response	Description
#CDT nrf,nrf,nrf		Sets the date that the current configuration was performed. The three fields associated with this command define in date in month, day, year format. Range: Field 1 mm - 1-12 Field 2 dd - 1-31 Field 3 yy - 00-99
#CDT?	#CDT nr1,nr1,nr1	Requests the date of the last configuration update. Default: #CDT 00,00,00 Example: #CDT 09,25,95
#COP nrf		Enter options installed in unit. Currently not used.
#COP?	#COP nr1	Requests options installed in unit. Currently not used.
#CSN nrf		Writes the receiver serial number. Range: 0 - 99999
#CSN?	#CSN nr1	Requests the programmed serial number of the unit. Default: #CSN 99999 Example: #CSN 00001
#MDL nrf		Writes the receiver's model number. Range: 0 - 99
#MDL?	#MDL nr1	
#PRA nrf,nrf,...,nrf		Loads or reads the preselector configuration data for preselector band A. The data list associated with this command consists of 17 bytes that are used to develop the tuning voltage for band A. Range: 0 - 255 (17 Data Bytes)
#PRA?	#PRA nr1,nr1,...,nr1	Requests the preselector configuration data list for band A. The response includes the 17 factory programmed data bytes that define the tuning response of preselector band A.

Table 4-3. Configuration Messages (Continued)

Command	Response	Description
#PRB nrf,nrf,...,nrf		Loads the preselector configuration data for preselector band B. The data list associated with this command consists of 17 bytes that are used to develop the tuning voltage for band B. Range: 0 - 255 (17 Data Bytes)
#PRB?	#PRB nr1,nr1,...,nr1	Requests the preselector configuration data list for band B. The response includes the 17 factory programmed data bytes that define the tuning response of preselector band B.
#PRC nrf,nrf,...,nrf		Loads or reads the preselector configuration data for preselector band C. . The data list associated with this command consists of 17 bytes that are used to develop the tuning voltage for band C. Range: 0 - 255 (17 Data Bytes)
#PRC?	#PRC nr1,nr1,...,nr1	Requests the preselector configuration data list for band C. The response includes the 17 factory programmed data bytes that define the tuning response of preselector band C.
#PRD nrf,nrf,...,nrf		Loads or reads the preselector configuration data for preselector band D. . The data list associated with this command consists of 18 bytes that are used to develop the tuning voltage for band D. Range: 0 - 255 (18 Data Bytes)
#PRD?	#PRD nr1,nr1,...,nr1	Requests the preselector configuration data list for band D. The response includes the 18 factory programmed data bytes that define the tuning response of preselector band D.
#PRE nrf,nrf,...,nrf		Loads or reads the preselector configuration data for preselector band E. . The data list associated with this command consists of 20 bytes that are used to develop the tuning voltage for band E. Range: 0 - 255 (20 Data Bytes)
#PRE?	#PRE nr1,nr1,...,nr1	Requests the preselector configuration data list for band E. The response includes the 20 factory programmed data bytes that define the tuning response of preselector band E.

4.6 RECEIVER STATUS SUMMARY

Foldout FO-2 illustrates the architecture of the receiver's status registers that are associated with the Communication messages. It is composed of fourteen eight-bit registers, whose logic gating allows a programmer flexibility in remote operations. The registers are arranged into seven pairs, consisting of status registers and corresponding enable registers. The Status Registers are set by the control microprocessor in the receiver's Digital Assembly in response to specified events that occur in the receiver. Each of the Status Register's corresponding Enable Register is used to allow the status bits to be routed through the register structure to the Status Byte. When the appropriate paths are enabled, events that occur in the receiver are passed through to the receiver's Status Byte Register to generate a service request (SRQ) over the remote interface. The structure of the register pairs allows a programmer to mask specific bits, controlling which events are permitted to cause a service request to be sent.

The Status Byte Register and its Service Request Enable Register comprise the top level register pair that monitors the status of the lower level registers. The generation of the service request is based on the inputs to the Status Byte Register and the setting of its Enable Register. The ANDed combination of bits 00 and 05 are logically ORed to determine the setting of bit 06 (RQS). When the RQS bit is set, a service request is asserted. **Table 4-4** describes the Bits of the Status Byte Register that are defined in this configuration.

4.6.1 STATUS BYTES

The information that follows describes the operation of the SRQ interrupt, and the STB? query. The operation of these is very similar. The SRQ interrupt allows the controller to establish which event has caused the receiver to assert the SRQ. The "*STB?" query response includes similar information, as detailed below.

SRQ - For RS-232 operations, the SRQ is a one byte control character (ESC) initiating a service request. When SRQ is generated, it is immediately followed by the output that is the decimal equivalent of the enabled bits of the Status Byte Register, if enabled. This clears the SRQ and the Status Byte Register. For IEEE-488 operations, the SRQ is asserted by setting the dedicated SRQ line of the interface. The *STB? query or a serial poll is then sent to obtain the source of the request. A serial poll clears the Status Byte Register, the *STB? query does not. The evaluation of each bit in this status byte is in **Table 4-4**.

***STB? Query** - The Status Byte Register is also read using the *STB? query. Sending *STB? does not clear the SRQ status line or the Status Byte Register.

The Service Request Enable Register allows the status bits to generate service requests. Setting a status bit sets service request only if the corresponding enable bit is set. Service Request Enable register bit six is ignored and reported as zero. This bit would correspond to the RQS bit of the Status Byte Register which triggers a service request.

Table 4-4. Status Byte Register, Bit Evaluation

Bit	Mnemonic	Description
00	RSB	Receiver Status Bit - This bit, when set, indicates that an event has caused one or more bits in the Receiver Status Register to be set. This bit is cleared by *CLS or by reading the contents of the Receiver Status Register (RSR?)
01 - 03	Not Used	
04	MAV	Message Available Bit - This bit is set when a message is available for transmission to the Controlling device.
05	ESB	Event Summary Bit - This bit is set when one or more bits in the Events Summary Register are set and the associated bit(s) in the Event Summary Enable Register are set.
06	RQS	Request Service Bit - This bit, when set, indicates that the unit has asserted service request (SRQ).
07	Not Used	

4.6.2 EVENT SUMMARY STATUS REGISTER

The following paragraphs detail the function and use of the Event Summary Register and the *ESR? query. **Table 4-5** provides the bit evaluation of this register and defines the bit functions.

The Event Summary Register is read destructively by the *ESR? query, which clears the register. The *CLS command also clears the register. The power-up sequence of the receiver automatically sets the Power On bit (PON), and resets the remaining bits.

The Event Summary Enable Register allows the event flags of the Event Summary Register to be reflected in the ESB bit of the Status Byte Register. Setting an event flag is reflected in the ESB bit only if the corresponding bit in the Event Summary Enable register is set. The Event Summary Enable Register bits are set with the *ESE command. The argument following the command is the decimal equivalent of the binary value that determined each bits status. The *ESE? query returns a decimal value that reflects the current setting of the Event Summary Enable Register.

Table 4-5. Event Summary Register, Bit Evaluation

Bit	Mnemonic	Description
00	OPC	Operation Complete - This bit is set on the completion of an operation that has been designated by the *OPC command.
01	Not Used	
02	QYE	Query Error - Set on an attempt to read data from the output buffer with no data pending, or on output buffer overflow.
03	DDE	Device Dependent Error - This bit is set when one or more bits in the Device-Dependent Error Register is set and reporting is enabled by the Device Dependent Error Enable Register.
04	EXE	Execution Error - This bit is set when an out of range argument is sent with a valid message header or when a valid message can not be executed due to a device error condition.
05	CME	Command Error - This bit is set when an unrecognized message header is received.
06	Not Used	
07	PON	Power On - This bit is set during the receiver's power-up sequence. It is also set when a Device or Selected Device Clear message is received.

4.6.3 RECEIVER STATUS REGISTER

The Receiver Status Register allows the occurrence of specific operational events to be reported to the Status Byte Register when enabled by associated bits of the Receiver Status Enable Register. The status of this register discloses the reason for the RSB bit of the Status Byte Register to be set. The *RSR? reads the latched contents of this register and clears the register. It is also cleared by a *CLS command. **Table 4-6** describes the bit evaluation of the Receiver Status Register.

Table 4-6. Receiver Status Register, Bit Evaluation

Bit	Mnemonic	Description
00	THB	Signal Above Threshold - This bit indicates when a received signal exceeds the squelch threshold. This is an edge triggered event that is set when a signal goes from below the threshold to above the threshold.
01	ABS	Signal Absent - This bit indicates when a received signal falls below the squelch threshold. This is an edge triggered event that is set when a signal goes from above the threshold to below the threshold
02, 03	Not Used	
04	PRS	Suspended On Signal - This bit is set when the receiver acquires a signal during a Channel or F1-F2 Scan, and the scan is suspended on the signal.
05-07	Not Used	

4.6.4 DEVICE DEPENDENT ERROR REGISTER

The Device Dependent Error Register determines what error conditions have caused the DDE bit of the Event Summary Register to be set. The DEE command is used to set the enable register to determine which error categories are allowed to set the DDE bit of the Event Summary Register. The DER? query reads the contents of the Device Dependent Error Register and clears the bits. **Table 4-7** describes the bits of the Device Dependent Error Register.

Table 4-7. Device Dependent Error Register, Bit Evaluation

Bit	Mnemonic	Description
00	13V	13.5V Power Fault - This bit is set when the receiver's 13.5 V power source is out of specification.
01	24V	24 V Power Fault - This bit is set when the receiver's 24 V power source is out of specification.

Table 4-7. Device Dependent Error Register, Bit Evaluation (Continued)

Bit	Mnemonic	Description
02	LOS	Local Oscillator Unlock - This bit is set when one of the frequency synthesizers in the RF Assembly has failed (unlocked).
03	DSP	DSP Error - This bit is set when an error condition exist in the Digital Signal Processor circuitry.
04	DVC	Hardware Device Error - This bit is set when a hardware error condition is present.
05-07	Not Used	

4.6.5 LOCAL OSCILLATOR ERROR REGISTER

The Local Oscillator Error Register determines which of the local oscillator error conditions have caused the LOS bit of the Device Dependent Error Register to be set. The LOE command sets the enable bits to select which conditions are enabled. The LOR? query reads the contents of the error register to identify the error condition. The bits associated with the Local Oscillator Error Register are described in **Table 4-8**.

Table 4-8. Local Oscillator Error Register, Bit Evaluation

Bit	Mnemonic	Description
00	REF	Reference Error - Bit is set on an error condition is the receiver's reference oscillator.
01	LO1	1st LO Unlock - Bit is set on an unlocked condition in the 1st local oscillator.
02	LO2	2nd LO Unlock - Bit is set on an unlocked condition associated with one of the 2nd LO synthesizer circuits.
03	LO3	3rd LO Unlock - Bit is set on an unlocked condition in the 3rd LO synthesizer.
04-07	Not Used	

4.6.6 DSP ERROR REGISTER

The DSP Error Register determines which of the Digital Signal Processor error conditions have caused the DSP bit of the Device Dependent Error Register to be set. The DPE command sets the enable bits to select which conditions are enabled. The DPR? query reads the contents of the error register to identify the error condition. The bits associated with the DSP Error Register are described in **Table 4-9**.

Table 4-9. DSP Error Register, Bit Evaluation

Bit	Mnemonic	Description
00	BCS	DSP B Checksum Error - Occurs at power up, or at the completion of BITE when the checksum test for DSP B fails.
01	BAC	DSP B to DSP A Error - Bit is set on a communication error between DSP B and DSP A. It occurs when DSP A does not respond to DSP B.
02	GCP	Gain Control Error - This bit is set on a communication error between DSP B and the Gain Control Processor. It occurs when the Gain Control Processor does not respond to DSP B.
03	BCM	DSP B to Control Error - This bit is set on a communication error between DSP B and the Control Processor. It occurs when DSP B does not respond to the Control Processor.
04	ACS	DSP A Checksum Error - Occurs at power up, or at the completion of BITE when the checksum test for DSP A fails.
05	ABC	DSP A to DSP B Error - Bit is set on a communication error between DSP A and DSP B. It occurs when DSP B does not respond to DSP A.
06	Not Used	
07	ACM	DSP A to Control Error - This bit is set on a communication error between DSP A and the Control Processor. It occurs when DSP A does not respond to the Control Processor.

4.6.7 HARDWARE DEVICE ERROR REGISTER

The Hardware Device Error Register determines which of the hardware error conditions have caused the DVC bit of the Device Dependent Error Register to be set. The DVE command sets the enable bits to select which conditions are enabled. The DVR? query reads the contents of the error register to identify the error condition. The bits associated with the Hardware Device Error Register are described in **Table 4-10**.

Table 4-10. Hardware Device Error Register, Bit Evaluation

Bit	Mnemonic	Description
00	ROM	EPROM Check Error - Occurs at power up, or at the completion of BITE when the checksum test for the Control Processor's EPROMs fails.
01	E^2P	EEPROM Error - Occurs on power up or at the completion of BITE when the Control Processor's EEPROM fails a write/read test.
02	RAM	RAM Error - Occurs on power up or at the completion of BITE when the Control Processor's random-access-memory fails a write/read test.
03	FRP	Front Panel Error - This bit is set on a communication error between the front panel and the Control Processor. It occurs when the front panel does not respond to the Control Processor.
04	DRT	DUART Error - Occurs on power up or at the completion of BITE when the DUART, used for RS-232 communications, fails a write/read test.
05	VID	Video Filter Error - Occurs on power up or at the completion of BITE when the Digital Filters, used for Video Filtering, fail a write/read test.

Table 4-10. Hardware Device Error Register, Bit Evaluation (Continued)

Bit	Mnemonic	Description
06	IFE	IF Filter Error - Occurs on power up or at the completion of BITE when the Digital Filters, used for IF Filtering, fail a write/read test.
07	TMT	BITE Timeout - Occurs on power up or during BITE when the built-in-test exceeds the test time allotted.

SECTION 5

CIRCUIT DESCRIPTIONS

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SECTION 5 CIRCUIT DESCRIPTIONS

5.1 WJ-8611 DIGITAL VHF/UHF RECEIVER FUNCTIONAL DESCRIPTION

The WJ-8611 Digital VHF/UHF Receiver is a Digital Signal Processor (DSP) based receiver that provides frequency coverage in the 20 to 1000 MHz frequency range. The receiver circuitry consists of the Type 797228-1 RF Tuner Assembly (A3), the Type 797168-1 Digital Control PC Assembly (A2), the Type 797229-1 Front Panel Assembly (A1), and the Type 766032-1 Switching Power Supply (PS1). The functional interconnection of these assemblies is illustrated in **Foldout FO-3**. Refer to this illustration for the following overall functional description.

The RF Tuner Assembly (A3) provides coarse tuning of the RF signal and down-conversion of the signal to an intermediate frequency (IF) that is suitable for analog to digital conversion. It also performs the signal conditioning that ensures that the Digital Control PC Assembly (A2) is able to create an accurate digital representation of the analog signal of interest. This section receives the incoming RF signal activity in the 20 to 1000 MHz frequency range, and using three mixing stages, provides an IF output that is centered at 250 kHz. The 250 kHz IF output is bandwidth limited to 200 kHz, thus providing an appropriate signal that is suitable for digitization. It is then directed to the Digital Control PC Assembly (A2) where it is digitized and sent to the DSP circuitry for further processing. A second IF output that is centered at 21.4 MHz is sent to the rear panel. The 21.4 MHz IF output is a wide band output for use with an external signal monitor or spectral display unit.

Control of the RF Tuner Assembly (A3) is obtained from the Digital Control PC Assembly (A2) by way of a serial control bus and parallel control lines. The parallel control lines (RF16, and IF 1/ 2/ 4/ 8/ 16) set the gain of the RF signal path to ensure that the signal level does not overload the digitizing circuitry in the Digital Control PC Assembly (A2). The serial control bus lines (RFB DATA/ CLK/ STB/ A0/ A1/ A2) provide synthesizer tuning and selection of the appropriate tuning band for the five-band tracking preselector in the RF Tuner Assembly (A3). Additionally, an analog tuning voltage line (PRE TV) provides a 0 to +5V level that tunes the selected preselector tuning band to center its response around the RF tuned frequency. The control signals supplied by the RF Tuner Assembly (A3) provide the Digital Control PC Assembly (A2) with an indication of its operating status. Four LOCK lines (1st/ 2nd/ 3rd/ REF LOCK) indicate the operating status of each of the synthesizers in the RF Tuner Assembly (A3). A logic ”1” on each of these lines indicates that the respective synthesizer is locked on frequency and operating normally. The Reference sensing line (REF SENSE) indicates when an external reference is connected to the receiver. When an external reference signal is connected to the receiver, this line assumes a logic “0” condition. It causes the control processor in the Digital Control PC Assembly (A2) to send frequency control data to the reference synthesizer to lock the reference oscillator to the external signal.

The Digital Control PC Assembly (A2) contains a control processor, a high speed A/D converter, and Digital Signal Processing (DSP) circuitry for processing of the signal data. It also contains D/A conversion and analog circuitry for reconstruction of the analog signals. The A/D converter circuit accepts the 250 kHz IF signal from the RF Tuner Assembly (A3) and converts it into 12-bit digital data that can be interpreted by the DSP processors. This data is converted to a serial data stream and is routed through digital filtering circuits and to the Digital Signal Processor (DSP) circuits for further processing. The DSP circuitry converts the digitized IF signal data from a continuous time domain signal into discrete time samples that are stored in random-access-memory (RAM) and processed digitally to perform wide range operations, such as:

- Receiver Fine Tuning to a 10 Hz resolution,
- IF Bandpass Filtering,
- Input Signal Strength Determination,
- Receiver Gain Control,
- Signal Detection and Demodulation,
- Noise Blanking.

Upon completion of the signal processing, the serial data stream, representing the demodulated audio and video signal intelligence, is converted back to analog signals and are routed to the audio and video outputs. At the rear panel, terminal bus TB1 provides the audio at LINE A, and LINE B. With AM, FM, CW, or SSB detection modes selected, both of these line audio outputs contain the same signal. In the ISB detection mode, the lower sideband is output at LINE B, and the upper sideband is output at LINE A. A Digital IF Output is provided to the rear panel via connector A2J14 and Cable W4. This is a post filtered IF in the form of its complex I and Q components. The IF data is output serially as a series of 16-bit I (In-phase) and Q (Quadrature-phase) word pairs, transferred at a 10 MHz clock rate. Along with the data, the interface provides a data strobe and qualifying line that identify the start of each data word and the phase that it represents.

The Digital Control PC Assembly (A2) supports receiver control from three control sources. It communicates with the Front Panel Assembly (A1) using a serial communications link to provide front panel display updates (TXD, J29, pin 3) and to accept data generated by front panel key presses (RXD, J29, pin2). The remaining control ports connect to the rear panel for remote control by an external controlling device. The IEEE-488 I/O port supports bit-parallel, byte-serial control with an IEEE-488 (GPIB) equipped computer. The RS-232 I/O port supports serial communications with an RS-232 equipped computer.

The power for all of the assemblies in the WJ-8611 Receiver is provided by the Type 766032-1 Switching Power Supply (PS1). It accepts an input voltage ranging from 90 to 264 Vac, with line frequencies ranging from 47 to 63 Hz. The +13.5 Vdc, -13.5 Vdc, and +5.5 Vdc outputs are supplied directly to the Digital Control PC Assembly (A2). They are then distributed to each of the assemblies in the receiver.

5.2 TYPE 797228-1 RF TUNER ASSEMBLY (A3) CIRCUIT DESCRIPTION

The RF Tuner Assembly (A3) functions as the analog tuner for the WJ-8611 VHF/UHF Digital Receiver. It selects a specific signal of interest from the RF spectrum, and down-converts the selected signal to an intermediate frequency suitable for digitization. It also provides the Digital Control PC Assembly (A2) with a highly stable 100 MHz reference signal that is used to generate the various clock signals required by the Digital Control PC Assembly (A2). The RF Tuner Assembly (A3) consists of the Part 482902-1 1st LO/1st Converter PC Assembly (A3A1) and the Part 482903-1 2nd LO/2nd Converter PC Assembly (A3A2). These assemblies are mechanically and electrically interconnected and function as an analog tuner. Operating power and control of this analog section is provided by the Digital Control Assembly (A2) . Refer to the schematic diagram in **Foldout FO-18** as a reference for the RF Tuner Assembly (A3) functional description.

The RF input enters the RF Tuner Assembly (A3) at connector J1 of the 1st LO/1st Converter PC Assembly (A3A1). This input spectrum ranges from 0 to 1000 MHz. In this assembly, the signal is passed through a 5-band preselector or a preselector bypass path and is converted to a 1350 MHz 1st IF signal. The 1st IF output is the result of mixing the RF input with the 1st LO synthesizer signal. The 1st LO signal ranges from 1370 to 2350 MHz, and has a tuning resolution of 2.5 MHz. The conversion process, and IF filtering provides the 1350 MHz IF output with a 3 dB bandwidth of approximately 14 MHz. The 10 MHz reference for the 1st LO synthesizer is provided from the 2nd LO/2nd Converter PC Assembly (A3A2) and is accepted at the 10 MHz REF Input (E2).

The IF Output from the 1st LO/1st Converter PC Assembly (A3A1) is supplied to the 2nd LO/2nd Converter PC Assembly (A3A2) where the 2nd and 3rd conversion stages produce the 21.4 MHz Signal Monitor Output (A3A2J1) and 250 kHz IF output (A3A2P1). The 10 MHz internal reference generator produces two additional outputs. It provides the 10 MHz reference at terminal E4 that is used by the 1st LO synthesizer. It also produces the 100 MHz REF output at connector A3A2P2. This reference output is used by the Digital Control PC Assembly (A2) to produce all of the digital clock frequencies required by the various digital circuits. This signal is produced by phase locking a 100 MHz VCO to the 10 MHz reference standard.

The reference generator contained in the 2nd LO/2nd Converter PC Assembly (A3A2) uses a 10 MHz temperature compensated voltage controlled crystal oscillator TCVCXO as its reference. If it is desired, the reference can be locked to an external frequency standard, an external reference of 1, 2, 5, or 10 MHz may be attached at the EXTERNAL REF connector (J2). Applying an external reference signal causes a synthesizer to be activated, locking the TCVCXO to the external signal.

5.2.1 PART 482902-1 1ST LO/1ST CONVERTER PC ASSEMBLY (A3A1)

The functional block diagram of the 1st LO /1st Converter PC Assembly (A3A1) is illustrated in **Foldout FO-4**. Refer to this illustration for the following module description.

The 1st LO/1st Converter PC Assembly (A3A1) consists of an input protection circuit, a five-band tracking preselector, the 1st LO synthesizer, the 1st IF circuits, and a selectable 16 dB attenuator. It is the first stage of tuning and produces the 1350 MHz 1st IF output. The Output of this assembly is a 14 MHz wide, 1350 MHz IF signal. The overall assembly gain is approximately +12 dB with the 16 dB attenuator bypassed.

The Input protection circuit provides protection for the pin diode switching circuits at the input to the tracking preselector. It enables the receiver to withstand continuous input levels of up to +20 dBm without experiencing damage. The RF signal entering at connector J1 is routed through this circuit to the tracking preselector. The 5-band tracking preselector provides bandpass filtering at the input, to limit the bandwidth of the signals that are passed to the 1st converter. Under strong signal conditions, it improves the receiver’s overall performance by attenuating out-of-band signals before distortion products can be produced. Each band is a tunable filter that tracks with the receiver’s tuning, and limits the spectrum to approximately 20% of the tuned frequency. The Digital Control PC Assembly (A2) provides two control signals for the tracking preselector circuit. The preselector band, or bypass path, is selected by the serial data (DATA1, P1, pin 15), and its associated clock (CLK1, P1, pin 14) and strobe (PRESELECTOR STB, P1, pin 16) lines. The serial data is converted to a group of six enable lines that select the signal path through the preselector. **Table 5-1** lists the switching frequencies for the preselector and indicates the appropriate switching voltages at the band select test points.

Table 5-1. Preselector Band Selection

Tuned Frequency	Preselector Band	TP1	TP5	TP8	TP6	TP7	TP3
500 -1000 MHz	A	-5V	+5V	+5V	+5V	+5V	+5V
250 - 500 MHz	B	+5V	-5V	+5V	+5V	+5V	+5V
125 - 250 MHz	C	+5V	+5V	-5V	+5V	+5V	+5V
60 - 125 MHz	D	+5V	+5V	+5V	-5V	+5V	+5V
20 - 60 MHz	E	+5V	+5V	+5V	+5V	-5V	+5V
*Bypass	F	+5V	+5V	+5V	+5V	+5V	-5V

* The Bypass may only be selected when the receiver is tuned below 100 MHz.

In addition to the selection of the tuning band, the preselector tuning voltage (PRE TV, P1, pin 9) is provided by the Digital Control PC Assembly (A2) to center the preselector response about the tuned frequency of the receiver. This analog voltage enters the 1st LO/1st Converter Assembly as an analog voltage ranging from 0 to +5V. It is then passed through a scaling circuit that increases the voltage range to 0 to +24 V. Test Point TP2 provides a point to verify the preselector tuning voltage and the scaling circuit. The actual voltage that is provided is determined by tuning data stored in non-volatile memory in the Digital Control PC Assembly (A2). This data is factory selected to produce the best overall response by the preselector.

From the preselector, the RF spectrum is amplified and filtered prior to conversion. The lowpass filter is an elliptical filter that provides a flat response from 0 to 1000 MHz and rapidly rolls off above the 1000 MHz point. It provides a minimum of 30 dB of attenuation at the receiver's 1350 MHz IF frequency. The filtering provides improved IF rejection and also provides reverse isolation to reduce 1st LO radiation at the RF Input.

The 1st Converter mixes the RF input spectrum with the 1st LO signal to produce the 1st IF signal. The 1st LO signal ranges from 1370 MHz (when the receiver is tuned to 20.0000 MHz) to 2350.0 MHz (when the receiver is tuned to 1000.0000 MHz). Tuning is performed in 2.5 MHz increments. The resultant output is an up-converted IF with the frequency sense of the spectrum inverted. For example, for RF tuned frequencies ranging from 20.851 to 23.350 MHz, the 1st LO frequency is fixed at 1372.5 MHz. After the conversion, a 20.851 MHz RF signal will appear at 1351.649 MHz in the 1st IF, and a 23.350 MHz RF signal will appear at 1349.150 MHz. The IF spectrum, with the signals of interest positioned within the 1349.150 to 1352.649 MHz range, is then bandpass filtered to select the correct mixing product from the mixer and to limit the overall bandwidth of the IF to approximately 14 MHz.

A selectable 16 dB attenuator at the output of 1st Converter section provides a means of reducing the assembly gain under strong signal conditions. This circuit works in conjunction with up to 31 dB of selectable attenuation provided by the 2nd LO/2nd Converter PC Assembly (A3A2) to prevent the signal level from exceeding the capabilities of the Digital Control PC Assembly (A2). A signal with sufficient strength to exceed the gain control capabilities of the 2nd LO/2nd Converter PC Assembly (A3A2) will cause the 1st LO/1st Converter PC Assembly (A3A1) attenuation to be activated. The Digital Control PC Assembly (A2) sets the RF16 control line (RF16, P1, pin 13) to logic “1” to introduce the receiver’s final 16 dB of attenuation. A logic “0” on the RF16 control line disables the 16 dB attenuator by selecting a 0 dB bypass path.

Tuning of the 1st converter circuit is performed by the 1st LO synthesizer. This local oscillator circuit provides the 1st converter with a 1370 to 2350 MHz signal tunable in 2.5 MHz increments, as the receiver is tuned through its 20 to 1000 MHz range. The frequency of the 1st LO synthesizer, as it relates to the receiver tuned frequency is calculated using the following formula:

$$\begin{aligned} \text{FREQLO1} &= [\text{INT}((\text{RF}-18.351)/2.5)] \times 2.5 + 1370 \quad \text{or} \\ &= [\text{INT}((\text{RF}+1.649)/2.5)] \times 2.5 + 1350 \end{aligned}$$

Where: FREQLO1 is the 1st LO frequency, in MHz
RF is the Tuned Frequency, in MHz

The oscillator consists of a six-band VCO, of which five of the bands are currently used. Band 4 is not used. Each band covers a portion of the required frequency range. Data for tuning of the 1st LO synthesizer is provided by the serial control bus originating in the Digital Control PC Assembly (A2). The serial data (DATA1, P1, pin 15), and its associated clock (CLK1, P1, pin 14) and strobe (1ST LO STB, P1, pin 11) lines carries three 8-bit tuning bytes that contain the VCO band select, ÷N/÷A tuning, and the VCO loop gain factor (G0/G1) data. The serial data is converted to a group of eighteen parallel control lines that control the entire synthesizer operation. Test points TP11 through TP16 provide an indication of the VCO band switching. At these test points, a +10 V level indicates that the associated band is active, and a level of approximately 0V indicates an inactive band. **Table 5-2** lists the switching frequencies for the VCO bands and the appropriate switching voltage test points. Test points TP26 through TP35 contain the most current ÷N and ÷A data. Test points TP21 and TP22 contain the loop gain factors. These test points may be viewed to verify that tuning data is being updated by the Digital Control PC Assembly (A2).

Table 5-2. 1st LO Synthesizer Tuning Bands

Band	Tuned Frequency Range	1st LO Frequency Range	Switching Test Point
1	20.0000 - 192.5000 MHz	1370.0 - 1542.5 MHz	TP 13
2	195.0000 - 400.0000 MHz	1545.0 - 1750.0 MHz	TP 12
3	402.5000 - 610.0000 MHz	1752.5 - 1960.0 MHz	TP 11
4	Not Used		TP 14
5	612.5000 - 822.5000 MHz	1962.5 - 2172.5 MHz	TP 16
6	825.0000 - 1000.0000 MHz	2175.0 - 2350.0 MHz	TP 15

The frequency of the 1st LO synthesizer is controlled by a tuning voltage produced by the synthesizer's phase detector. It is the result of comparing a frequency divided sample of the VCO output frequency with a fixed reference. The 10 MHz reference signal entering the assembly at terminal E2 is divided by a factor of eight to produce a 1.25 MHz square wave at the phase detector reference input (TP23). When the synthesizer is locked on frequency, the ÷N and ÷A counters divide the VCO frequency sample down to equal the reference frequency. This is visible at TP4 as a series of voltage spikes at a 1.25 MHz rate. The results of this frequency comparison produce the tuning voltage. At TP24, the tuning voltage will range from approximately +1.5 to +16 V, depending on where in the active VCO band the oscillator is tuned. If the synthesizer fails to lock on frequency, this voltage will swing to its minimum or maximum extreme (0 V or +22V).

The operating power for the 1st LO/1st Converter PC Assembly (A3A1) is supplied through connector P1 from the 2nd LO/2nd Converter PC Assembly (A3A2). The input voltages are +5.5 Vdc at pins 2 and 3, +24 Vdc at pin 4, +13 Vdc at pin 6, and -13 Vdc at pin 7. These voltages are routed through regulation circuitry in the assembly and are distributed to the various circuits in the assembly.

5.2.2 PART 482903-1 2ND LO/2ND CONVERTER PC ASSEMBLY (A3A2)

The functional block diagram of the 2nd LO /2nd Converter PC Assembly (A3A2) is illustrated in **Foldout FO-5**. Refer to this illustration for the following module description.

The 2nd LO/2nd Converter PC Assembly (A3A2) accepts the 1350 MHz IF from the 1st LO/1st Converter PC Assembly (A3A1) and performs the 2nd and 3rd stages of signal conversion to produce two IF outputs. The wideband 21.4 MHz Signal Monitor Output (J2) supplies a 50-ohm output to the rear panel for use with an external signal monitor or spectrum display unit. Its level is approximately 14 dB greater than the receiver's RF input level. The 250 kHz IF output (P1) provides a 200 kHz wide IF signal to the Digital Control PC Assembly (A2) to be digitized prior to

Digital Signal Processing. The Digital Control PC Assembly (A2) monitors the level of this signal, and is gain controlled to prevent the signal level from exceeding 0.2 V peak-to-peak. In addition to these IF outputs, the 2nd LO/2nd Converter PC Assembly (A3A2) produces the reference signals that provides the time-base for the Digital Control PC Assembly (A2) and all of the synthesizers in the RF Tuner Assembly (A3)

The 1350 MHz IF entering the assembly at connector A3A2E5 is immediately applied to a double-balanced mixer, where it is mixed with the 1327.75 to 1330.249 MHz 2nd LO signal. This conversion process creates the receiver's 21.4 MHz 2nd IF signal and provides the 1 kHz tuning resolution. For example, for RF tuned frequencies ranging from 20.851 to 23.350 MHz, the 1st LO/ 1st Converter PC Assembly (A3A1) produces an IF output spectrum with the signals of interest positioned within the 1349.150 to 1352.649 MHz range. This 2.5 MHz wide IF spectrum is applied to the 2nd Converter input. The 2nd converter tunes within this 2.5 MHz range, in 1 kHz increments, to center the desired signal in the 21.4 MHz 2nd IF passband. A 20.851 MHz RF input signal appears as 1351.649 MHz at the 2nd Converter input. If the receiver is tuned to this RF frequency, the 2nd LO synthesizer produces a 1330.249 MHz LO signal, thus down-converting the desired signal (1351.649 MHz - 1330.249 MHz = 21.4 MHz). A 23.350 MHz RF signal appears as 1349.150 MHz at the 2nd converter input. If the receiver is tuned to this RF frequency, the 2nd LO synthesizer is tuned to 1327.75 MHz, and this signal is down-converted to 21.4 MHz (1349.150 MHz - 1327.750 MHz = 21.4 MHz). The IF spectrum is bandpass filtered and then split into two signal paths. The first signal path provides amplification and filtering to provide the 21.4 MHz Signal Monitor output at the receiver rear panel, via A3A2J1. The second path is further processed to produce the 250 kHz IF output.

From the 2nd converter, the 21.4 MHz signal is directed through an attenuation circuit that provides from 0 to 31 dB of attenuation. The level of attenuation is controlled by the Digital Control PC Assembly (A2) , via the IF 1, 2, 4, 8, and 16 control lines (A2P3, pins 13 through 17). These lines form a five-bit parallel word. Its binary value determines the amount of attenuation in 1 dB increments. Test points TP46 and TP47 permit verification that the 8 dB attenuation stage is selected. When the 8 dB stage is selected, the even-numbered test point (TP46) is at logic low and its odd-numbered counterpart is at logic high. This pattern prevails with the other attenuation control monitoring points. TP48 and TP49 monitor the 4 dB attenuation stage. TP50 and TP51 monitor the 2 dB attenuation stage. TP52 and TP53 monitor the 1 dB attenuation stage. TP54 and TP55 monitor the 16 dB attenuation stage. (Refer to **Foldout FO-20**.) The IF signal is amplified and further filtered down to a 200 kHz bandwidth to limit the bandwidth of the signal that is sent to the Digital Control PC Assembly (A2). A third conversion is used to produce the final 250 kHz IF output at A3A2P1. At the 3rd converter, the 21.4 MHz 2nd IF is mixed with a fixed 21.65 MHz 3rd LO frequency. The resulting 3rd IF, centered at 250 kHz, is amplified, filtered and presented at A3A2P1. This output is band-limited to 200 kHz and its amplitude is limited to a maximum level of 0.2 V peak-to-peak when loaded into 50 ohms.

There are four synthesizer circuits contained in the 2nd LO/ 2nd Converter PC Assembly (A3A2). They are the 10 MHz reference generator, the 100 MHz synthesizer, the 2nd LO synthesizer, and the 3rd LO synthesizer.

The reference generator contained in the 2nd LO/2nd Converter PC Assembly (A3A2) uses a 10 MHz temperature compensated voltage controlled crystal oscillator TCVCXO as its tuned circuit. It produces a stable 10 MHz signal that is supplied to each of the synthesizers in the receiver. It also supplies its 10 MHz reference to a 100 MHz synthesizer to produce the 100 MHz reference for the circuitry in the Digital Control PC Assembly (A2). The reference generator is designed for free running operation, or, an externally supplied 1, 2, 5, or 10 MHz reference may be applied at rear panel connector J2. Application of a reference signal at a level of at least 0 dBm triggers an auto-sensing circuit to notify the Digital Control PC Assembly (A2) that an external signal has been applied. It sets the REF SENSE line (A3A2P3, pin 33) to logic “0” when a signal is present, or to logic “1” when no signal is applied. Applying an external reference signal causes a reference synthesizer to be activated, and an attempt is made to lock the TCVCXO to the external signal. The Digital Control PC Assembly (A2) sends tuning data to attempt to lock the reference synthesizer to each of the allowable frequencies (1, 2, 5, 10 MHz) and monitors the REF LOCK line (A3A2P3, pin 29) for a locked condition (logic ”1”). If no lock is obtained, or if the external reference signal is removed, the Digital Control PC Assembly (A2) disables the reference synthesizer and switches the TCVCXO to internal free-running operation. In the internal reference mode the TCVCXO frequency is set by a fixed DC bias voltage. Potentiometer R325 permits fine-tuning of the TCVCXO for a 10.0000 MHz output when in the Internal Reference mode. The output of the reference generator is buffered and routed to the other synthesizers in the receiver for use as a common time-base. Two of the outputs (TP30 and TP31) are used as the reference for the 2nd LO synthesizer. The output at TP32 provides the output for the 3rd LO synthesizer, and the TP33 output is the reference for the 100 MHz synthesizer. The final 10 MHz output (TP34) is directed out terminal E4 and is used by the 1st LO/ 1st Converter PC Assembly (A3A1) as its time-base.

The 100 MHz synthesizer, phase-locked to the 10 MHz reference signal, provides its output to the Digital Control PC Assembly (A2) via connector A3A2P2. It consists of a 100 MHz VCO, a divide-by-ten feedback path, and a phase detector. One input to the phase detector is a 10 MHz reference from the reference generator. The second phase detector input is the divided down sample from the VCO. When the oscillator is operating at the correct frequency, the divided-down VCO sample is equal to 10 MHz. Any deviation from the required output frequency is reflected by a frequency difference between the VCO sample and the 10 MHz reference. The phase detector then attempts to correct the VCO frequency by changing the tuning voltage that is applied to the VCO's tuned circuit. The tuning voltage present at TP35 is typically between +7 and +15 V for a normally operating 100 MHz synthesizer. Capacitor C67 adjusts the VCO for its proper operating characteristics. It is adjusted for the proper tuning voltage level at TP35.

The 3rd LO synthesizer is a fixed frequency synthesizer. It produces a fixed 21.65 MHz output for the third conversion stage. The circuit consists of a 21.65 MHz VCO, a feedback path and a phase-locked-loop (PLL) control circuit that contains the phase detector and frequency dividers. When the receiver is first powered on, the Digital Control PC Assembly (A2) sends the 3rd LO serial tuning data (DATA, CLK, and STB3) to the PLL control circuits and the synthesizer remains at the fixed frequency. The 10 MHz reference is used as the reference for the synthesizer's phase detector. It is also applied to a frequency doubler to produce a 20 MHz signal that is applied to a mixer in the synthesizer's feedback path. A sample of the VCO's 21.65 MHz output is fed back to the control circuit through the mixer. The mixer provides the difference frequency of 1.65 MHz to the control circuitry. Under normal operating conditions, the phase detector provides a tuning voltage of approximately +6 V to the VCO for frequency control. Capacitor C204, in the tuned circuit is adjusted for the +6 V tuning voltage at TP16.

The operational status of the 3rd synthesizer is available to the Digital Control PC Assembly (A2) at the 3RD LOCK line (A2P3, pin 32). A logic "1" on this line indicates normal operation. If the synthesizer should unlock, the 3rd LO LOCK line is set to logic "0". Additionally, a 3rd LO lock indicator provides a visual indication the synthesizer's status. If the synthesizer should unlock, indicators DS4 and DS5 will illuminate.

The 2nd LO synthesizer is a three-loop design, two of which are controlled by two phase-locked-loop synthesizers. It produces an output frequency from 1327.750 MHz to 1330.249 MHz, in 1 kHz increments. Control over the 2nd LO output frequency is performed by the operation of the 2nd LO Step Loop and the 2nd LO Resolution Loop synthesizers. Their frequencies are set by serial data from the Digital Control PC Assembly (A2). These synthesizers, in turn, set the tuning voltage of the 2nd LO output VCO. The frequency of the 2nd LO VCO output is determined by the following formula:

$FREQ_{LO2} = FREQ_{LO1}$ - 21.400 MHz - RF

Where: $FREQ_{LO2}$ is the 2nd LO Output Frequency, in MHz
$FREQ_{LO1}$ is the 1st LO frequency, in MHz
RF is the Tuned Frequency, in MHz

The Step Loop Synthesizer provides coarse tuning of the 2nd LO VCO to set the output to within 500 kHz of the desired frequency. It provides a 1325.5 to 1327.5 MHz signal, with a 500 kHz tuning resolution. This signal is mixed with a sample of the 2nd LO output frequency in the synthesizer's feedback path. The down-converted output frequency is then applied to a phase detector for frequency control. The frequency of the feedback signal ranges from 2.25 MHz to 2.749 MHz. The 2nd LO Resolution Loop Synthesizer controls the fine tuning that provides the 2nd LO VCO's 1 kHz resolution. The Resolution Loop VCO provides an output frequency ranging from 180.0 to 220.0 MHz, tunable in 80 kHz increments. Its output is divided by a factor of 80 to provide a 2.25 to 2.749 MHz output to the 2nd LO Output VCO's phase detector. The tuning resolution is 1 kHz, due to the frequency division. At the phase detector, the feedback signal is compared with the Resolution Loop output to develop the tuning voltage that locks the 2nd LO VCO to the desired frequency. **Table 5-3** lists the relationship between the Step Loop, Resolution Loop, and the 2nd LO Output frequencies. The frequencies of the Step Loop and Resolution Loop are determined by the following formulas:

$$FREQ_{STEP} = [(INT(FREQ_{LO2} - 1327.75/0.5)) \times 0.5] + 1325.5$$

$$FREQ_{RES} = (FREQ_{LO2} - FREQ_{STEP}) \times 80$$

Where: $FREQ_{LO2}$ is the 2nd LO Output Frequency, in MHz
$FREQ_{STEP}$ is the 2nd LO Step Loop frequency, in MHz
$FREQ_{RES}$ is the 2nd LO Resolution Loop frequency, in MHz

Table 5-3. 2nd LO Synthesizer Tuning Frequencies

Step Loop (MHz)Res = 500 kHz	Resolution Loop (MHz) Res = 80 kHz	Resolution Loop ÷ 80 (MHz) Res = 1 kHz	2nd LO Output (MHz) Res = 1 kHz
1325.50	180.0 - 220.0	2.250 - 2.749	1327.750 - 1328.249
1326.00	180.0 - 220.0	2.250 - 2.749	1328.250 - 1328.749
1326.50	180.0 - 220.0	2.250 - 2.749	1328.750 - 1329.249
1327.00	180.0 - 220.0	2.250 - 2.749	1329.250 - 1329.749
1327.50	180.0 - 220.0	2.250 - 2.749	1329.750 - 1330.249

In a normally operating 2nd LO Synthesizer, the 2nd LO output VCO is controlled by a tuning voltage that ranges from +5 to +15 V at test point TP6. The individual tuning voltages for the Step and Resolution Loop VCOs each range from +1.5 to +15 V at test points TP9 and TP56, respectively. Each of the phase-locked-loop circuits provide a lock indication to the Digital Control PC Assembly (A2) to provide an indication of the operating status of the 2nd LO circuit. The LOCK2

STEP, LOCK2 RES, and LOCK2 TRANS lock indications are summed with the LOCK3 indication from the 3rd LO synthesizer to provide the 2nd LOCK status indication to the Digital Control PC Assembly (A2) (A2P3, pin 31). Three Lock Detect LEDs also provide a visual indication of the synthesizer status. During normal 2nd LO operation, the LOCK2 STEP LED (DS3), the LOCK2 RES LED (DS1), and the LOCK2 TRANS LED (DS2) should all be extinguished.

Operating power and control data from the Digital Control PC Assembly (A2) is routed into the 2nd LO/2nd Converter PC Assembly (A3A2), via the A3A2P3 interface cable. It is then distributed to the various circuits in the 2nd LO/2nd Converter and in the 1st LO/1st Converter PC Assembly (A3A1). The control data from the Digital Control PC Assembly (A2) consists of an analog 0 to +5V preselector tracking voltage (PRE TV), a 6-bit parallel control bus for RF and IF gain control (RF 16, and IF 1/2/4/8/16), and a serial control bus for synthesizer tuning and preselector band selection.

The serial control bus provides serial data into the 2nd LO/2nd Converter PC Assembly (A3A2) where it is directed to the appropriate circuits. The serial data, consisting of a series of 8-bit control words, is provided at pin 20 of cable A3A2P3 (RFB DATA). Its serial transfer is synchronized with the data clock at A3A2P3 pin 19 (RFB CLK). During the data transfer, the data and clock signals are directed to all of the circuits in the RF Tuner Assembly (A3). No circuit responds to the data until the strobe line (RFB STB) at A3A2P3, pin 21, is pulsed. The strobe line is maintained at a logic "1" state until the data has been transferred. At the completion of the transfer of a data block, a logic "0" pulse on the RFB STB line causes the intended circuit to accept and respond to the new control data. The RFB A0, A1, and A2 lines entering at A3A2P3, pins 23, 24, and 25, determine the actual circuit that responds to the data. These lines direct the RFB STB pulse to the intended circuit, assuring that the proper circuit accepts the data. They form a 3-bit binary word that directs the strobe to the appropriate circuit, as illustrated in **Table 5-4**.

Table 5-4. Serial Control Bus Data Distribution

RFB Control			Description	
A2	A1	A0	Signal	Responding Circuit
0	0	0	PRESEL STB	Preselector band or bypass selection.
1	0	0	EN4	Reference synthesizer tuning data, when external reference is present.
0	1	0	STB3	3rd LO synthesizer tuning data.
1	1	0	1ST LO STB	1st LO synthesizer tuning data to the 1st LO/1st Converter.
0	0	1	STB2 RES	2nd LO synthesizer resolution loop tuning data.
1	0	1	STB2 STEP	2nd LO synthesizer coarse loop tuning data.
0	1	1	REF	Reference synthesizer enable (1)/disable (0).
1	1	1	Not Used	

The six gain control lines (RF 16, and IF 1/2/4/8/16) set the RF and IF attenuation level to prevent the 250 kHz IF output (A2P1) from overdriving the analog-to-digital converter in the Digital Control PC Assembly (A2). The data provided at these lines are the result of the sampling in the Digital Control PC Assembly (A2) of the signal amplitude after it has been digitized, and is not a direct result of manual or automatic gain control. The overall attenuation ranges from 0 to approximately 47 dB, controlled in 1 dB increments. This attenuation is intended to prevent the signal level at the 250 kHz output from exceeding 0.2 V peak-to-peak.

The IF 16/8/4/2/1 control lines set the level of an attenuator contained in the 2nd LO/2nd Converter PC Assembly (A3A2). A 4-bit control word, formed by the IF 1/2/4/8 lines, sets the attenuation of a 0 to 15 dB programmable attenuator. It provides from 0 to 15 dB of attenuation selectable in 1 dB increments. IF 16 controls the selection of a 16 dB attenuator. With IF 16 at logic “1” the 16 dB attenuator is in the signal path, inserting an additional 16 dB of attenuation into the signal path. A logic “0” at this input bypasses the 16 dB attenuator. The result of these control lines is a selectable attenuation ranging from 0 to approximately 31 dB that may be injected into the signal path between the 1350 MHz IF Input (A2E5) and the 250 kHz IF Output (A2P1) of the 2nd LO/2nd Converter PC Assembly (A3A2). This attenuation has no affect on the 21.4 MHz signal at the Signal Monitor Output (J1).

The RF 16 control line enters the 2nd LO/2nd Converter PC Assembly (A3A2) at A2P3, pin 18 and is sent directly to the 1st LO/1st Converter Assembly through J10, pin 16. This line controls the selection of a 16 dB attenuator in the 1st LO/1st Converter PC Assembly (A3A1). This attenuator is activated only during strong signal conditions, after the 2nd LO/2nd Converter PC Assembly (A3A2) attenuation has been set to maximum.

5.3 TYPE 797168-1 DIGITAL CONTROL PC ASSEMBLY (A2) CIRCUIT DESCRIPTION

The Digital Control PC Assembly (A2) consists of four major functional sections: the Control and Interface section; the IF Digitization section; the Digital Signal Processing section, and the Analog Reconstruction and Output section. The combination of these functional groups provides receiver control and performs many of the signal processing tasks associated with signal conditioning and demodulation of the intelligence. Digitization of the analog IF, and the use of digital signal processing algorithms, permits a broad range of operating functions without additional hardware requirements. Refer to **Foldout FO-6** as a reference for the following functional description.

The Control Processor section maintains control over all receiver operations. It consists of an MC 68331 16-bit microprocessor, Programmable Flexible Logic circuits, and a dedicated MC 68HC711D3 gain control microprocessor. This section sends control data to the RF Tuner Assembly (A3) by way of a serial control bus, down-loads the operating programs for the two DSP processors, via the 16-bit data bus contained on the Digital Control PC Assembly (A2), and provides a control interface to communicate with the receiver's front panel controls and rear panel RS-232 Serial or IEEE-488 Parallel interfaces. It also configures the two programmable Flexible Logic integrated circuits that provide the interfacing logic between the various digital processing circuits. On receiver power up, the control processor configures the two programmable Flexible Logic integrated circuits that provide the interfacing logic between the various digital processing circuits. It then downloads the operating programs for the two DSP processors, and sends receiver parameter data to the DSP Processors. The DSP processors then use this data to determine the processing tasks associated with signal conditioning and demodulation of the intelligence.

Two DIP switches (S1 and S2), contained in the Control Processor section, permit the WJ-8611 Receiver to be configured for its intended operating environment. On receiver power up, the control processor reads these switches to determine the operating configuration of the receiver. Switch S2 selects the default configuration of the receiver's remote interface. It selects the type interface that will be active (IEEE-488 or RS-232) and determines the receiver's IEEE-488 bus address or the RS-232 baud rate. When the IEEE-488 mode is selected, the bus address can be set to a value of from 0 to 30, using switch positions 1 to 5. In the RS-232 mode, the 9600-baud rate or a user-defined baud rate can be selected by switch position 8 (the user-defined baud rate defaults to 38400 baud unless otherwise configured). Switch position 7 determines which of the interfaces will be selected.

Switch S1 determines the operating mode that the receiver assumes at power up and enables or disables front panel control of the receiver's IEEE-488 address selection. Switch position 1 determines if the receiver powers up in the normal operating mode (switch closed) or if the configuration mode is active (switch open). Position 6 of S1 permits the receiver's IEEE-488 address to be changed at the front panel (switch closed). If this switch is open, address changes can only be performed at DIP switch S2. **Table 5-5** provides a summary of the S1 and S2 switch configurations.

Control over the RF Tuner Assembly (A3) operations is maintained by the serial control bus, consisting of the RFB CLK, RFB DATA, and RFB STB serial data and timing lines (J1, pins 19, 20, and 21), and the RFB A0, RFB A1, and RFB A2 parallel control lines (J1, pins 23, 24, and 25). These lines provide the data for synthesizer tuning and preselector band selection. It also controls the tuning of the Tracking Preselector in the RF Tuner Assembly (A3) via the preselector tuning voltage line PRETV (J1 pin 10).

This is an analog voltage line that ranges from 0 to +3 Vdc at TP69. It is scaled prior to being output to provide a voltage ranging from 0 to +5 Vdc at pin 10 of J1. The serial data and timing lines are shared by all of the control registers for the synthesizers and the preselector, in the RF Tuner Assembly (A3). The control processor transfers the control data as a series of data blocks (RFB DATA, J1, pin 20) that are clocked into the data registers of the RF Tuner Assembly (A3) by the RFB CLK signal (J1, pin 19). The data clock is a sequence of 8-bit clock bursts that synchronize the data transfer. When a data transfer is complete, the RFB STB data strobe line forces the intended data register in the RF Tuner Assembly (A3) to accept the data. The data is directed to the appropriate data register by the RFB A0/ A1/ A2 parallel control lines. Each time data is transferred, the binary address on these lines determines which register receives the data. Refer back to **Table 5-4** for specific details regarding control data transfer.

Table 5-5. Configuration Switch Summary

Switch	Function
S1 -1	Configuration Mode: Normal - Up Configuration - Down
S1 -2	Not Used
S1 - 3	Not Used
S1 - 4	Front Panel Recognition Front Panel Present - Up No Front Panel Present - Down
S1 - 5	Not Used
S1 - 6	IEEE-488 Address Update: Front Panel Update Enabled - Up Front Panel Update Disabled - Down
S1 - 7	Not Used
S1 - 8	Not Used
S2 - 1 to 5	IEEE-488 Bus Address (0 -30)
S2 - 6	Not Used
S2 -7	Interface Type: RS-232 - Up IEEE-488 - Down
S2 - 8	RS-232 Baud Rate: User Defined - Up 9600 - Down

The Control Processor monitors the status of the RF Tuner Assembly (A3) via five status lines. Three lock detection lines (1ST LOCK, 2ND LOCK, and 3RD LOCK, J1, pins 30, 31, and 32) provide the control processor with a continuous status of the 1st, 2nd, and 3rd synthesizers. A logic "1" indicates normal locked condition, while a logic "0" indicates that the respective synthesizer is unlocked. The two remaining status lines are associated with the reference generator in the RF Tuner Assembly (A3). The REF SENSE line (J1, pin 32) indicates to the control processor when an external reference signal (1, 2, 5, or 10 MHz) has been connected to the receiver. In addition to providing the status to the Control Processor, these lines also provide a visual indication of the status by lighting status LEDs on the RF Tuner Assembly (A3). The REF LOCK line (J1, pin 29) indicates when the reference generator is locked onto the external reference signal. When an external reference is applied to the receiver, the REF SENSE line goes to a logic '0". The control processor then attempts to tune the reference synthesizer to lock onto the external signal. Serial control data is sent to tune the synthesizer to each of the permitted reference frequencies, and the REF LOCK line is monitored. A logic "1" on the REF LOCK line indicates that the synthesizer is locked. If no lock is obtained after all of the permitted frequencies are tested, the control processor sends serial data to the RF Tuner Assembly (A3) that disables the reference synthesizer and switches to the internal reference.

In addition to monitoring the lock detect and sense lines, the Control Processor Section also monitors the level of the 250 kHz IF input signal after it is digitized. It attempts to prevent the IF signal from exceeding the input limits of the A/D converter in the IF Digitization section. If the input level at the 250 kHz IF Input (J2) exceeds 0.2V peak-to-peak, the MC 68HC711D3 gain control microprocessor sends parallel control data to the RF Tuner Assembly (A3) to add sufficient attenuation into the signal path to reduce the signal level. Control lines IF 1, IF 2, IF 4, and IF 8 (J1, pins 13-15) provide control data to the programmable attenuator in the 2nd LO/2nd Converter. They set the attenuation from 0 to 31 dB in 1 dB increments. The binary value provided by these control line logic levels directly reflects the attenuation level in dB. If the 2nd LO/2nd Converter PC Assembly (A3A2) attenuator range is not sufficient to lower the signal amplitude to an acceptable level, an additional stage of attenuation is switched in. The RF 16 line (J1, pin 18) controls the selection of a 16 dB attenuator in the 1st LO/1st Converter PC Assembly (A3A1). A logic "1" on this line activates the attenuator to add an additional 16 dB of attenuation into the signal path. A logic "0" selects a bypass path that disables the attenuation. The combined affect of all of the attenuation circuits in the RF Tuner Assembly (A3) is a total of approximately 47 dB of attenuation selectable in 1 dB increments.

The IF Digitization section converts the 250 kHz IF signal into a continuous stream of 12-bit data words that can be read by the Digital Signal Processing section. The input to this section is a 250 kHz IF signal from the RF Tuner Assembly (A3), entering at connector J2 of the Digital Control PC Assembly (A2). This signal is band-limited to 200 kHz by an anti-alias filter in the RF Tuner Assembly (A3), and the signal amplitude is limited to a maximum of from 6 to 10 dB below the full-scale range of the A/D converter used for digitization. Upon entering the assembly, the signal is routed through a 20 dB amplifier prior to digitization. Test point TP77 provides a point to verify the incoming analog signal after amplification. The peak-to-peak amplitude of the signal at this point is approximately ten times the peak-to-peak level at the J2 input connector (approximately 20 V peak-to-peak), with a DC level of +2.05V. The analog signal is applied to a 12-bit analog to digital converter where the signal is sampled at a 1 MHz rate and is converted into the stream of 12-bit digital words. In addition to the analog signal, the input to the A/D converter circuit contains DC bias circuit, and a low level noise signal from a filtered noise source. The amplitude of the noise input is factory set by R96 to provide for the best A/D converter performance. The DC bias is set to the center of the A/D converter's input range for the best peak-to-peak signal handling performance. The bias is set by R447 to +2.05V at TP77. The parallel data representing the IF signal is interfaced with the Digital Signal Processing section by the Flexible Logic integrated circuits in the Control Processor section. The signal is converted to serial data that can be handled by the DSP circuits.

The Digital Signal Processing (DSP) section consists of a series of Programmable Serial I/O Digital Filters, a Numerically Controlled Oscillator, and two 32-bit DSP Processors (DSP A and DSP B). These processing components interface with the Control Processor section and other support circuits through two programmable Flexible Logic integrated circuits.

The Programmable filters, along with Numerically Controlled Oscillator, aid in the signal processing by performing fine tuning of the receiver to a 10 Hz resolution by performing IF and video filtering. The outputs are the complex I (In phase) and Q (Quadrature) signals that are provided to the DSP Processors for further processing. The DSP algorithms associated with manual and automatic gain control, automatic frequency control, signal strength calculations, noise blanking, and demodulation of the signal intelligence is handled by the two 32-bit DSP processors. Upon completion of the signal demodulation, the digital data is converted to a stream of parallel data bytes that are applied to the Analog Reconstruction and Output section through the interface provided by the Flexible Logic circuits.

An additional output from the Flexible Logic circuits provides I and Q IF data from the Programmable Serial I/O Digital Filters to the rear panel Digital IF Interface (J14) for output to external digital signal processing equipment. This output is the post filtered IF signal in the form of complex I and Q data. The output consists of I and Q data words, each 16 bits in length, that are transferred out at a 10 MHz rate. Each 16-bit data word is accompanied by a data strobe that marks the start of each word for synchronization of the data with the receiving equipment. Finally, an I/Q qualifier provides an indication of the type data being output (Logic "1"=I data; Logic "0"= Q data). The differential outputs from the interface are:

the 10 MHz clock (CLK A and CLK B); the I/Q data (DATA A and DATA B); the data strobe (STB A and STB B); and an I/Q qualifier (I/Q A and I/Q B). Their differential configuration is designed to interface with MC3450 or MC3452 line receivers. The 10 MHz clock rate is constant for all selected IF bandwidths. The strobe frequency and the I and Q word rate varies depending on the active IF bandwidth. **Table 5-6**, lists the I and Q word transfer rate and the strobe frequency for the various IF bandwidth selections. The only exception to the listed data transfer rates occurs when the ISB detection mode is selected. The ISB mode always uses a 6.4 kHz bandwidth, its I and Q word transfer rate is 15.125 kHz, and its strobe rate is 30.25 kHz.

Table 5-6. I and Q Data Transfer Rates

IF Bandwidth		I and Q Word Transfer Rate	Strobe Rate
200 kHz 150 kHz 100 kHz	60 kHz 50 kHz 35 kHz	250 kHz	500 kHz
	30 kHz 20 kHz 15 kHz 10 kHz	62.5 kHz	125 kHz
	8 kHz 6.4 kHz* 5.0 kHz 3.2 kHz	31.25 kHz	62.5 kHz
	1.0 kHz .5 kHz .2 kHz	3.90265 kHz	7.8053 kHz

*If ISB detection mode is selected, the I and Q data transfer rate is 15.125 kHz and the strobe rate is 30.25 kHz.

The Analog Reconstruction and Output section receives audio/video data from the DSP circuitry, and converts the digital data to analog output signals. The Flexible Logic interface provides two output channels, each containing a serial data signal, a D/A converter clock, and a synchronization signal for synchronization of the data frames. The first output channel consists of the VD DAC DATA, the VD DAC CLOCK, and the VD DAC SYNC1 signals. The second output channel consists of the ISB DAC DATA, the ISB DAC CLOCK, and the ISB DAC SYNC1 signals. In all detection modes, except for ISB, only the VD DAC DATA is used. After conversion to an analog signal, the audio is split and is available at both the LINE A and LINE B audio outputs. The Left and Right Phone audio outputs also contain the same audio signal. When in the ISB detection mode, each sideband uses a separate channel. The VD DAC DATA signal carries the upper sideband audio, and the ISB DAC

DATA signal carries the lower sideband audio. The lower sideband signal is sent to the LINE B and LEFT PHONES outputs. The upper sideband is sent to the LINE A and RIGHT PHONES output.

The timing for the circuitry in the Digital Control PC Assembly (A2) is derived from a 100 MHz reference signal entering the assembly at connector A2J4. This reference is supplied to a clock distribution circuit in the Control Processor section where a series of frequency dividers develop and distribute the individual clock signals. A divide-by-five divider, followed by a frequency doubler circuit, produces a 40 MHz clock for use by the Programmable Serial I/O Digital Filters in the Control Processor section, and by the Digital-to-Analog converter (D/A) in the Reconstruction and Output section. This 40 MHz clock is also used by two programmable Flexible Logic circuits to clock the control logic and produce additional timing and synchronization signals for the operations performed by the Digital Control PC Assembly (A2). The 40 MHz clock signals are available at test points TP4, TP5, and TP6. The remaining outputs from the clock distribution circuit provide the Control Processor section with its microprocessor and IEEE-488 clock signals. The 100 MHz reference signal is divided by a factor of six to produce the 16.6 MHz (16.67 MHz) control microprocessor clock. The clock is further divided (by a factor of 4) to obtain a 4.2 MHz (4.167 MHz) clock for use by the IEEE-488 remote interface.

5.4 TYPE 797229-1 FRONT PANEL ASSEMBLY (A1) CIRCUIT DESCRIPTION

The Front Panel Assembly (A1) consists of the Part 482554-2 Front Panel Control PC Assembly (A1A1), the Part 482929-1 Display PC Assembly (A1A2), and the Part 383947-1 Interconnect PC Assembly (A1A3) as shown in **Foldout FO-14**. This assembly provides the man/machine interface to the WJ-8611 Digital VHF/UHF Receiver. Refer to the Front Panel Assembly (A1) Functional Block Diagram in **Foldout FO-7** as a reference for the following assembly description.

Within the sub-assemblies listed above, the Front Panel Assembly (A1) can be broken down into four functional sections: the Control and Interface section; the Dot Matrix Display section; the Switch/Indicator and Keypad section; and the Frequency, Tune Meter and Miscellaneous Indicator Display section.

The Control and Interface section maintains all front panel operations and consists of a 16-bit microcontroller, memory circuits, motion encoders, and an RS-232 Interface. The 16-bit microcontroller processes all operator inputs, updates the displays and indicators, and performs the interface to the Digital Control Assembly (A2) for receiver control. Likewise, new display data from the Digital Control Assembly (A2) is processed by the front panel microcontroller. This occurs during power up to initialize the display to its power down status or to provide updates of changing parameters associated with memory or remote operations. Full-duplex, serial communications with the Digital Control Assembly (A2) is performed using an RS-232 Driver/Receiver.

Display and indicators are updated via manipulation of the 19-bit Address Bus (A0 – A18) and the 16-bit Data Bus (D0 – D15). Operating instructions and data tables for the microcontroller are stored in the 64K x 16 EPROM chip. A 32K x 8 Static RAM (SRAM) chip provides temporary memory space.

Encoders are utilized for both the Frequency Tuning wheel (optical) and the Edit Control knob (mechanical). The encoders detect changes to control settings and provide two sets of square waves (CH A and CH B) to the microcontroller. The Frequency Encoder outputs are routed to an Up/Down counter to determine the direction and distance the wheel has turned. The Edit Control or “Mode” Encoder outputs a two-bit Gray Code, which is routed directly to the microcontroller. The Gray Code contains the turning direction and distance information required.

The front panel also provides the audio and control setting for the Phones Jack. The connection to the Digital Control Assembly (A2) is made through connector E1.

The Parameter Display on the front panel is actually four 8-digit, green 5 x 5 Dot Matrix ICs. Chip select (DISPLAY 0:3), Data, and Display Clock signals from the microcontroller are multiplexed together to produce Serial Load (SLOAD 0-3), SDCLK, and SDATA outputs. These signals are used by the four Dot Matrix ICs to display the appropriate parameters.

The Front Panel Assembly (A1) features a switch matrix consisting of a 16-key keyboard and 16 individual pushbuttons. Each key forms a junction between a column input and a row output of the 8 x 4 switch matrix. The microcontroller continuously monitors for switch closure by setting a logic high on each of the eight columns, one at a time, and then reading the data returned by the row outputs. Data signals are buffered (DIGIT/COL 0:7) and then routed to the switch matrix as KPCOL 0-7. The row outputs (KPROW 0-3) are routed directly to the microcontroller. Active switches with indicators are lit via the SEGDRIVE and DIGIT/COL Buses.

The SEGDRIVE and DIGIT/COL Buses also activate the Frequency Display, the Tune Meter Display, the Decimal LED, the Tune Lock LED, the Shift LED, and key-embedded indicators. Both buses originate at the microcontroller as part of the Data bus. The signals are buffered and routed through drivers before being applied to the appropriate display/LED. The entire operating frequency is displayed by nine seven-segment displays.

5.5 TYPE 766032-1 SWITCHING POWER SUPPLY (PS1)

The Switching Power Supply (PS1), illustrated in the WJ-8611 Main Chassis schematic diagram, **Foldout FO-21**, Provides the DC operating voltages for the WJ-8611 Receiver. It receives its line voltage input from the Input Power connector (FL1J1) and power filter (FL1). In the electrical path to the power supply, the input voltage is fused at the rear panel by a 1.0 Amp Slo-Blo fuse (F1), and routed to the front panel POWER switch (A1S1). From the Power switch, the AC line voltage enters the power supply at connector PS1J1.

The Switching Power Supply (PS1) is capable of providing reliable outputs to the receiver over a wide range of input voltages and line frequencies. It operates from 97 to 253 Vac, at line frequencies ranging from 47 to 440 Hz. The input circuitry of this supply requires no mechanical switching for voltage selection and it provides built-in protection against transients. The power supply outputs consist of two +5 Vdc outputs (PS1J1, pins 2 and 3), +13.5 Vdc (PS1J1, pin 1), and -13.5 Vdc (PS1J1, pin 6). These outputs are connected to the Digital Control PC Assembly (A2) where they are distributed to the various assemblies in the receiver.

NOTES

SECTION 6

MAINTENANCE

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SECTION 6 MAINTENANCE

6.1 GENERAL

The WJ-8611 Digital VHF/UHF Receiver has been designed to operate for extended periods of time with a minimum of routine maintenance. Cleaning, inspection and performance testing should be performed at regular intervals, consistent with the facility's normal scheduling and after repairs have been made.

6.2 CLEANING AND LUBRICATION

The receiver should be kept free of dust, moisture, grease and other foreign matter to ensure trouble-free operation. Use low pressure air, if available, to remove accumulated dust from the interior of the receiver. A clean, dry cloth or soft bristled brush may also be used for this purpose. No lubrication is required.

6.3 INSPECTION FOR DAMAGE AND WEAR

Many existing or potential troubles can be detected by making a thorough visual inspection of the unit. For this reason, as a first step in troubleshooting, a complete visual inspection should be made whenever the unit is inoperative. Inspect mechanical parts such as pin connectors and interconnecting cables for looseness, wear and other signs of deterioration. The circuit card assemblies should be checked to assure that they are properly secured to the chassis and making good electrical contact. Electronic components that show signs of deterioration due to causes, such as overheating, should be inspected and a thorough investigation of the associated circuitry should be made to verify proper operation. Often, damage due to heat is a result of other, less apparent problems in the circuit.

6.4 TEST EQUIPMENT REQUIRED

Procedures for testing the WJ-8611 Receiver have been developed for performance using a minimum of common test equipment. The test equipment listed in **Table 6-1**, or equivalents, are required to perform the troubleshooting procedures and performance tests described in this section.

6.5 TROUBLESHOOTING AND FAULT ISOLATION

The tests procedures that are provided in this section verify proper receiver operation and assist in fault isolation to a malfunctioning assembly. They have been developed to set known laboratory conditions that eliminate external conditions as a possible cause of the malfunction. Use the performance tests in **paragraph 6.6** and the circuit descriptions in **Section 5** to assist in fault isolation.

Table 6-1. Required Test Equipment

Equipment	Recommended Type	Requirement
Variable Autotransformer	W5MT3W	Voltage Range - 90 to 264 VAC
RF Millivoltmeter RF Probe "T" Adapter 50 Ohm Termination	Boonton 92B Boonton 91-12F Boonton 91-14A Boonton 91-15A	dB Scale Referenced to 50 Ohm Load
Distortion Analyzer	HP-334A	Harmonic Distortion Measurement
AC Voltmeter	HP-400EL	dB Scale Referenced to 600 Ohm
Digital Voltmeter	Fluke 8001A	AC/DC Voltage Measurement
Frequency Counter	HP-5315A	1 GHz Frequency Range
Oscilloscope	Tektronix 466	Storage Oscilloscope
Headphones	Telex PH-6	600-Ohm, Stereo, with 1/4-inch Tip-Ring Jack
Frequency Standard	HP-5061A	Cesium Beam Standard, 10 MHz

6.6 WJ-8611 DIGITAL VHF/UHF RECEIVER PERFORMANCE TESTS

The receiver performance tests that follow are designed to verify proper operation of the WJ-8611 Receiver, and each of its operational modules. In performance of the tests, the receiver may be controlled by the front panel controls or by an external controlling computer, connected to one of the rear panel remote interface connectors. Refer to **Section 4** for a list of remote commands and queries associated with remote operation.

6.6.1 POWER CONSUMPTION

1. Adjust the W5MT3W Variable Autotransformer voltage for 117 VAC.

2. Plug the WJ-8611 Receiver's AC power cord into the variable autotransformer and power the receiver on.

3. Set the receiver as follows:

Tuned Frequency:	250.00000 MHz
Detection:	AM
IF BW:	10.0 kHz
Gain Control:	AGC Fast
Squelch:	Off

4. Set the Signal Generator to produce a 250.000 MHz output at a level of -90 dBm. Set the generator modulation for 1 kHz, 50% modulation. Connect the signal generator's RF Output to the RF Input of the receiver.

5. Plug a stereo headphone into the front panel PHONES Jack. Adjust the PHONES Level to produce a clear audio tone in the headphones.

6. Verify that the power consumption level does not exceed 50 Watts.

7. While monitoring the audio tone in the headphones, slowly decrease the autotransformer output voltage until the audio tone cuts off, and the receiver shuts down. Verify that the line voltage at shut down is 90 VAC or less.

6.6.2 FRONT PANEL CONTROL AND INDICATOR PERFORMANCE

1. Apply power to the receiver, and observe the power-up sequence. Verify that all of the front panel LED displays and indicators light with uniform brilliance during the power-up LED test.

2. Using the numeric keypad arrow keys, select each of the tuning rates and verify that the flashing digit in the frequency display responds to the arrow key presses. While viewing the frequency display, rotate the tuning wheel clockwise and counterclockwise. Verify that the frequency tunes in response to the tuning wheel rotation.

3. Operate each of the front panel dedicated control keys and observe the associated LED on the key lights at each selection. At each selection, rotate the EDIT knob, verifying its control over the active function.

6.6.3 REFERENCE FREQUENCY TIMEBASE ACCURACY

1. Connect the 10 MHz cesium beam standard to the external reference input on the frequency counter. Connect the 50-ohm input on the frequency counter to the receiver’s SDU output, as illustrated in **Figure 6-1**.

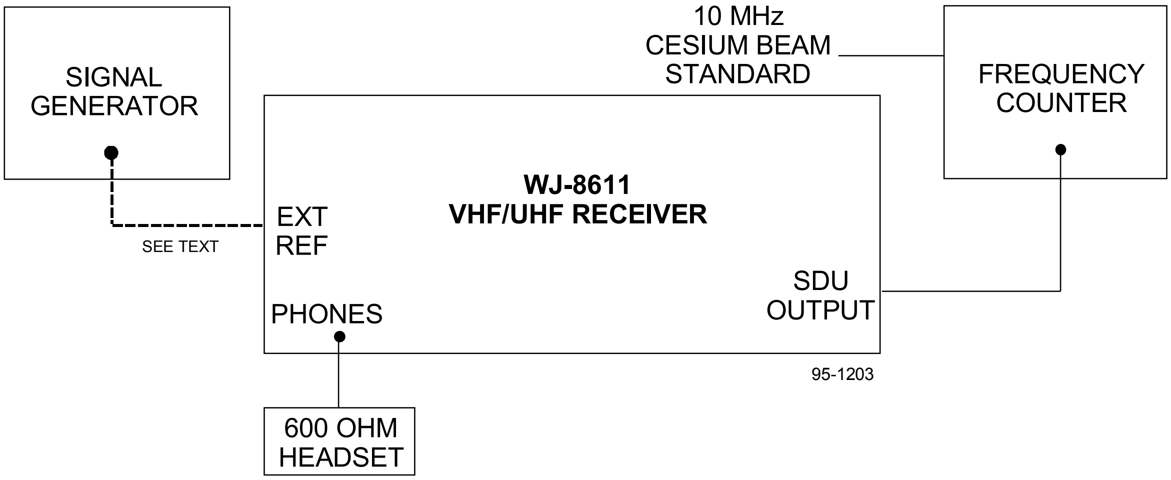

Figure 6-1. Reference Frequency Performance Test, Equipment Connection

2. Set the receiver as follows:

Tuned Frequency:	0.00000 MHz
IF BW:	20.0 kHz
Detection:	AM
Gain Control:	AGC Fast
Squelch:	Off

3. Verify that the frequency at the SDU output is between 21.399989 and 21.400011 MHz, as indicated on the frequency counter.

4. Set the signal generator as follows:

Frequency:	10.0000 MHz
Output Level:	-5 dBm
Modulation	Off

5. Connect the signal generator to the receiver's External Reference connector (EXT REF). Press the front panel MENU key as required to display the Reference menu (7.REFERENCE). Verify that the menu displays "EXT 10 MHz".

6. Remove the 10 MHz signal from the EXT REF connector. Verify that the REFERENCE menu indicates that the INTERNAL reference is active.

7. While observing the Reference menu, set the signal generator to 5.0000 MHz, 2.0000 MHz and 1.0000 MHz. When setting each of these references, disconnect the signal generator from the receiver's EXT REF connector while the new reference frequency is being tuned. When the precise frequency is tuned, reconnect the EXT

REF input. Verify the Reference menu reflects the value of the reference frequency being used, as follows:

Ref. Freq.	Reference Display
5.0000 MHz	EXT 5.0 MHz
2.0000 MHz	EXT 2.0 MHz
1.0000 MHz	EXT 1.0 MHz

6.6.4 SDU OUTPUT PERFORMANCE TEST

1. Connect the signal generator to the RF Input of the receiver. Connect the RF millivoltmeter and 50-ohm load to the SDU Output, as illustrated in **Figure 6-2**.

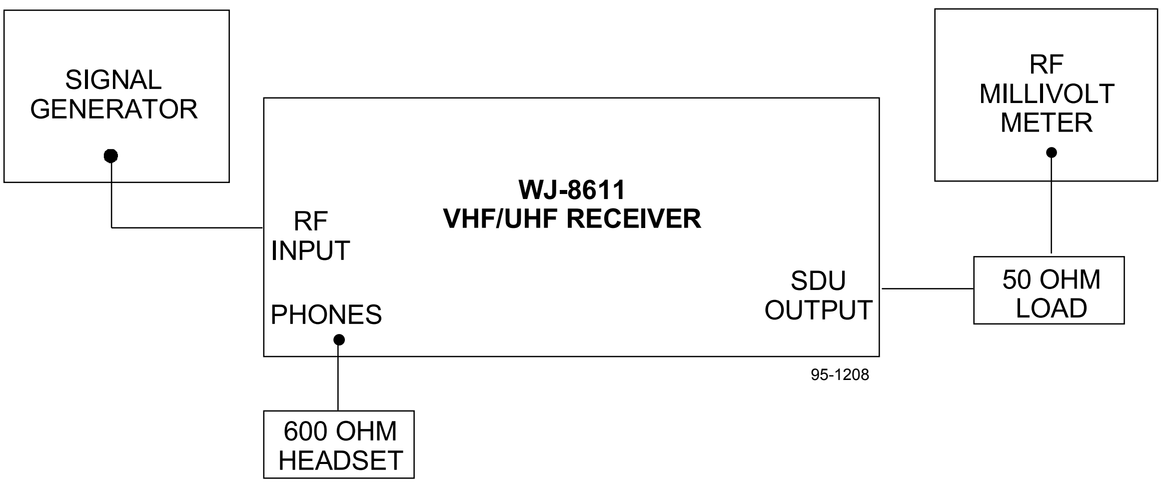

Figure 6-2. SDU Output Performance Test Equipment Connection

2. Set the Receiver as follows:

Tuned Frequency	995.00000 MHz
Detection Mode	AM
IF BW	200 kHz
Gain Control	AGC Fast
Squelch	On

3. Set the signal generator as follows:

Frequency	995.0000 MHz
Output Level	-60 dBm
Modulation	Off

4. Observe the signal level at the SDU Output, as indicated on the RF millivoltmeter. The level should be at least -48 dBm, indicating at least 12 dB of gain from the RF Input to the SDU Output.

6.6.5 SIGNAL STRENGTH ACCURACY

1. Connect the signal generator to the RF Input of the receiver.

2. Set the signal generator as follows:

Frequency:	250.0000 MHz
Output Level:	-90 dBm
Modulation	Off

3. Set the receiver as follows:

Tuned Frequency:	250.00000 MHz
IF BW:	20.0 kHz
Detection	AM
Gain Control	AGC Fast
Squelch:	Off

4. Verify the SIGNAL(dBm) display on the front panel indicates between -80 and -110 dBm.

5. While observing the SIGNAL(dBm) display, set the signal generator output to -55 dBm, and then to -15 dBm. Verify that the display responds as follows:

Input Level	SIGNAL(dBm) Display
-55 dBm	-40 to -70 dBm
-15 dBm	0 to -30 dBm

6.6.6 SQUELCH OPERATION PERFORMANCE TEST

1. Connect the test equipment as illustrated in **Figure 6-3**.

2. Set the signal generator as follows:

Frequency:	250.0000 MHz
Output Level:	-20 dBm
Modulation	AM, 50%, 1 kHz

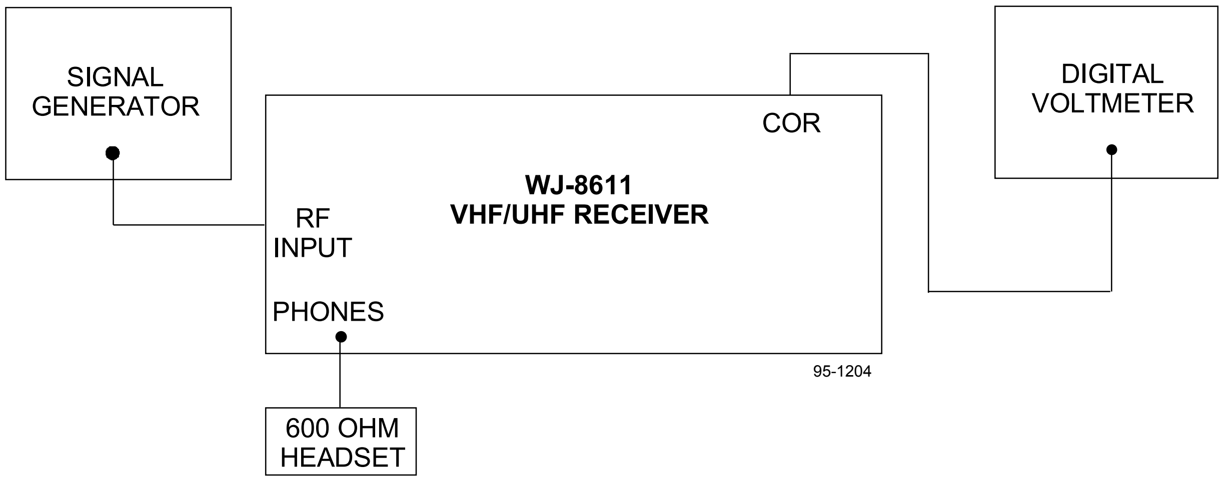

Figure 6-3. Squelch Operation Performance Test, Equipment Connection

3. Set the receiver as follows:

Tuned Frequency:	250.00000 MHz
IF BW:	10.0 kHz
Detection	AM
Gain Control	AGC Fast
Squelch:	Off

4. Set the Digital Voltmeter as follows:

Range:	20V
Mode:	DC Volts

5. Using the SQUELCH Key set the Squelch function to “ON”. Verify that no audio is present at the headphones. Verify that approximately +5 Vdc is present at the COR output, as measured by the digital voltmeter.

6. Using the SQUELCH Key set the Squelch function to “OFF”. Verify that an audio output is present at the headphones. Adjust the PHONES Level control for a comfortable listening level.

7. Set the signal generator output level to -120 dBm. Set the receivers SQUELCH setting to -101 dBm. Observe that the Audio output is disabled, and the COR output voltage reads approximately +5 Vdc.

8. While listening to the headphone audio, slowly increase the signal generator output level until the level just exceeds the squelch threshold, and the audio is present at the headphones. Note the signal generator output level where the threshold is broken. Verify that the generator output level is within the -107 an -96 dBm range. Also, verify that the COR output level is approximately 0 V, as indicated on the digital voltmeter.

9. Set the receiver's SQUELCH level to -60 dBm, and set the signal generator output to -40 dBm. With the squelch level exceeded, the voltmeter should read near 0 V. Set the signal generator output to a level of -80 dBm. With the signal below the squelch level, the voltmeter should read approximately +5 Vdc.

6.6.7 WJ-8611 SENSITIVITY PERFORMANCE TEST

1. Connect the test equipment as illustrated in **Figure 6-4**.

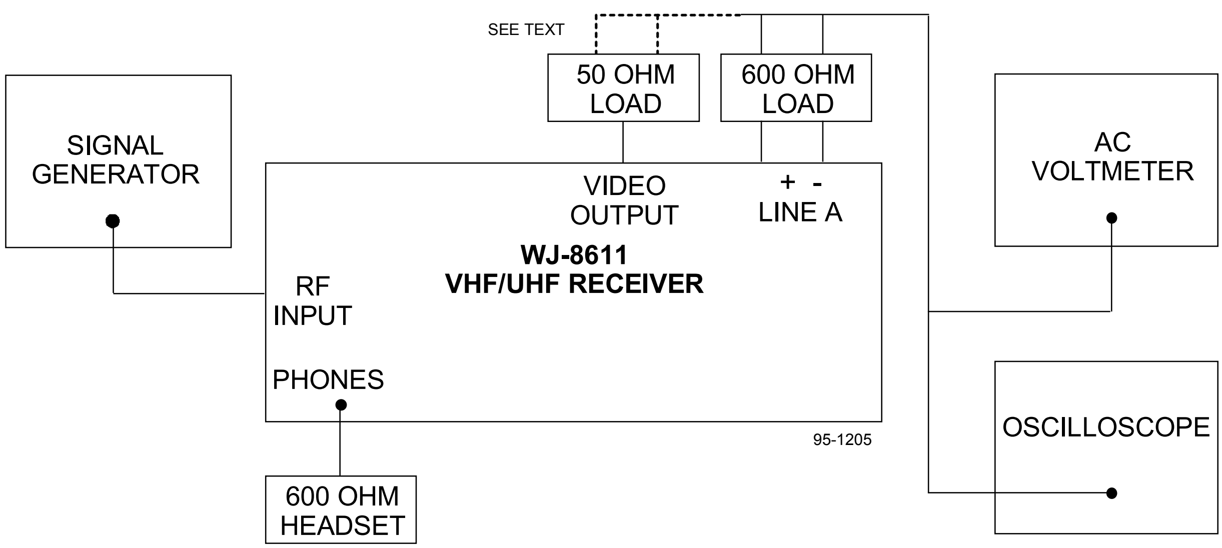

Figure 6-4. Sensitivity Performance Test, Equipment Connection

2. Set the receiver as follows:

Tuned Frequency	250.00000 MHz
Detection Mode	AM
IF BW	See **Table 6-2**
Gain Control	Manual
Attenuation	000 (Maximum Gain)
Squelch	Off

3. Set the signal generator as follows:

Frequency	250.0000 MHz
Output Level	See **Table 6-2**
Modulation	AM, 400 Hz, 50%

4. Set the receiver IF bandwidth and corresponding signal generator output level and AM modulation to each of the settings listed in **Table 6-2**. For each of the selected IF bandwidths perform the AM sensitivity tests describe in **steps 5-7**.

5. Adjust the receiver attenuation level to produce a reading of at least 0.25 Vrms on the AC voltmeter, with the oscilloscope displaying an undistorted sinewave. Note the AC voltmeter indication on the dB scale as a reference level.

6. While observing the AC voltmeter turn off the signal generator's modulation. Note the decrease in the LINE A audio output level with the modulation removed. The decrease in signal level should be a minimum of 10 dB less than the level observed in **step 5**, reflecting a S+N/N ratio of at least 10 dB.

7. Repeat **steps 5 and 6** using each of the IF bandwidths and associated signal generator output levels listed in **Table 6-2**.

8. Set the receiver as follows:

Tuned Frequency	250.00000 MHz
Detection Mode	FM
IF BW	See **Table 6-2**
Gain Control	AGC Fast
Squelch	Off

9. Remove the AC voltmeter from the Line A Audio output, and connect it to the VIDEO Output, using a 50-ohm termination.

10. Set the receiver IF bandwidth and corresponding signal generator output level and FM modulation to each of the settings listed in **Table 6-2**. For each of the selected IF bandwidths, perform the FM sensitivity tests describe in **steps 11-13**.

11. With the signal generator FM modulation on, observe the video signal level on the AC voltmeter dB scale. Note the AC voltmeter indication as a reference level.

12. While observing the AC voltmeter, turn off the signal generator's modulation. Note the decrease in the video output level with the modulation removed. The decrease in signal level should be a minimum of 17 dB less than the level observed in **step 11**, reflecting a S+N/N ratio of at least 17 dB.

13. Repeat **steps 10 through 12** using each of the IF bandwidths and associated signal generator output levels listed in **Table 6-2**.

Table 6-2. Sensitivity Performance Test Parameters

IF Bandwidth	Sensitivity Level	AM/FM Modulation	FM Peak Deviation
5.0 kHz	-106 dBm	400 Hz	1.5 kHz
6.4 kHz	-105 dBm	400 Hz	1.92 kHz
10 kHz	-103 dBm	400 Hz	3.0 kHz
20 kHz	-100 dBm	400 Hz	6.0 kHz
100 kHz	-93 dBm	400 Hz	30.0 kHz
200 kHz	-90 dBm	400 Hz	60.0 kHz

6.6.8 AUDIO OUTPUT DISTORTION PERFORMANCE TEST

1. Connect the test equipment as illustrated in **Figure 6-5**.

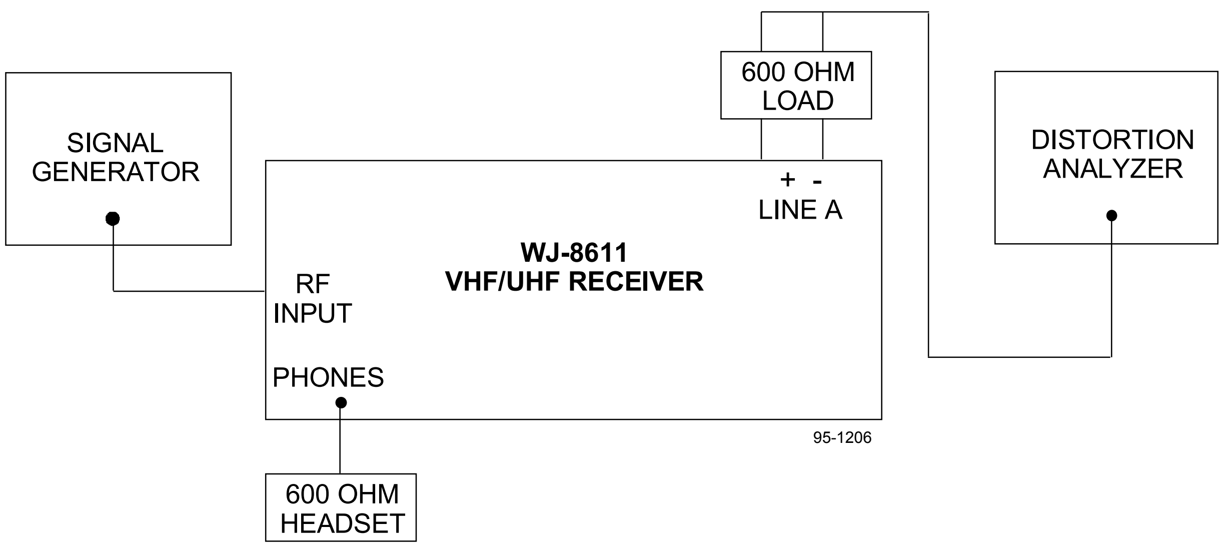

Figure 6-5. Audio Output Performance Test, Equipment Connection

2. Set the receiver as follows:

Tuned Frequency	250.00000 MHz
Detection Mode	AM
IF BW	20 kHz
Gain Control	AGC Fast
Squelch	Off

3. Set the signal generator as follows:

Frequency	250.0000 MHz
Output Level	-60 dBm
Modulation	AM, 50%, 400 Hz

4. Set the distortion analyzer as follows:

Mode	Manual
Frequency Range	X10
Function	Voltmeter
Meter Range	1 Volt

5. Verify that the detected audio level is 0 dBm, ±3 dB.

6. Set the distortion analyzer function control and meter range to the SET LEVEL positions. Adjust the sensitivity control for a 100% indication on the meter (an indication of “1” on the 0-1 scale).

7. Set the distortion analyzer function control to the Distortion position. Slowly adjust the distortion analyzer frequency control for a minimum indication on the meter. Reset the meter range as required for the best meter resolution. Verify that the total harmonic distortion measured does not exceed 5%.

6.6.9 VIDEO OUTPUT AND GAIN CONTROL RANGE PERFORMANCE TEST

1. Connect the signal generator to the RF Input of the receiver. Connect the AC voltmeter, and 50-ohm load to the Video Output, as illustrated in **Figure 6-6**.

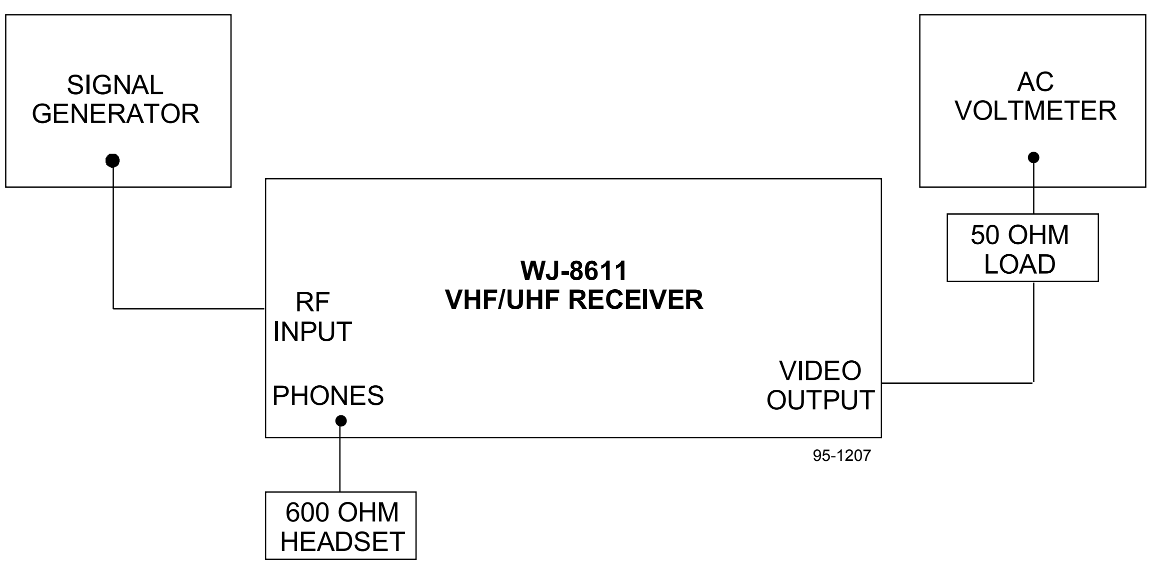

Figure 6-6. Video Output Performance Test, Equipment Connection

2. Set the receiver as follows:

Tuned Frequency	250.00000 MHz
Detection Mode	AM
IF BW	5 kHz
Gain Control	AGC Fast
Squelch	Off

3. Set the signal generator as follows:

Frequency	250.0000 MHz
Output Level	-106 dBm
Modulation	AM, 50%, 400 Hz

4. Note the video level on the voltage level displayed on the AC voltmeter. The output level should range from 0.25 to 0.50 Vrms. Note the video level indication on the dB scale of the AC voltmeter as a reference.

5. While observing the video level on the AC voltmeter, increase the signal generator output level, in 10 dB increments, until an output level of -16 dBm is reached (90 dB change). Note the video signal level at each 10 dB increase in level.

6. Verify that the video amplitude varies by no more than ±3 dB throughout the 90 dB increase in the RF input signal level.

6.7 WJ-8611 MODULE PERFORMANCE TESTS

The module test procedures in this section assist in isolating a fault to a malfunctioning module or subassembly. These procedures should only be performed if the receiver test procedures in **paragraph 6.6** fail to provide the specified results. In performance of these tests, remove the top and bottom covers of the receiver to gain access to the internal circuitry. The Digital Control PC Assembly (A2) contains configuration data programmed in EEPROM that is vital for the proper operation of the 1st LO/1st Converter PC Assembly (A3A1). If it is determined that replacement of the Digital Control PC Assembly (A2) or the 1st LO/1st Converter PC Assembly (A3A1) is required, contact the factory before replacement is attempted.

CAUTION **The test procedures in this section should only be performed by skilled technicians who are thoroughly familiar with fault isolation and repair of electronic equipment.**

6.7.1 TYPE 766032 SWITCHING POWER SUPPLY (PS1) PERFORMANCE TEST

1. Apply power to the receiver and observe the power-up test sequence.

2. From the under side of the receiver, locate connector E1 on the Type 797168 Digital Assembly (A2). Refer to **Foldouts FO-8** and **FO-11**.

3. Using the digital voltmeter, measure the output voltages provided by the power supply at the A2E1 connector. When measuring the output voltages do not remove connector P1 from the A2E1 as the power supply load is required for proper voltage regulation. Verify the voltage levels at the following A2E1 pin connections:

Test Point	Expected Result
A2E1, pin 1	+13.5 Vdc ±.5V
A2E1, pin 2	+5.5 Vdc +.1V, -0V
A2E1, pin 3	+5.5 Vdc +.1V, -0V
A2E1, pin 6	-13.5 Vdc ±.5V

4. If the results obtained in step 3 are not as described, check the line voltage present at pin 3 of the PS1J1 connection. Verify that the voltage at this connector reflects the current AC line voltage at the power source.

6.7.2 TYPE 797228 RF TUNER ASSEMBLY (A3) PERFORMANCE TEST

1. Refer to **Foldouts FO-8** and **FO-13**. From the top of the receiver, observe the status LED indicators near the A3A2E3 connector of the RF assembly while the receiver powers up. Verify that after power up, all of the LEDs extinguish except for the REF indicator.

2. Set the signal generator to produce a 10 MHz CW output signal, at a level of -5 dBm. Connect the signal generator to the EXT REF connector at the receiver rear panel. Observe that the REF LED, DS6, extinguishes and the SENSE LED, DS9, lights. Verify that no other LEDs are illuminated.

3. Remove the signal generator from the EXT REF connector.

4. Refer to **Foldouts FO-8** and **FO-12**. Observe the DS1 LED on the 1st LO/1st Converter PC Assembly (A3A1). Verify that this LED is extinguished.

5. Connect the signal generator to the RF Input of the receiver. Connect the RF millivoltmeter and 50-ohm load to the SDU Output.

6. Set the Receiver as follows:

Tuned Frequency	20.00000 MHz
Detection Mode	AM
IF BW	200 kHz
Gain Control	AGC Fast
Squelch	On

7. Set the signal generator to produce a 20.000 MHz CW signal, with an output level of -60 dBm.

8. Observe the signal level at the SDU Output, as indicated on the RF millivoltmeter. The level should be at least -48 dBm, indicating at least 12 dB of gain from the RF Input to the SDU Output.

9. Return the signal generator to 20.0000 MHz.

10. Refer to **Foldouts FO-8** and **FO-13**. From the underside of the receiver, remove connector A3A2P1 from the J2 connector on the Digital Assembly. Using the oscilloscope, monitor the signal at the center pin of A3A2P1. Verify that the signal is present. Verify that a 250 kHz ±1 kHz sinewave is present. The amplitude of the signal will be 0.2V peak-to-peak or less.

11. Reconnect A3A2P1 to the J2 connector.

12. From the underside of the receiver, remove the A3A2P2 connector from J4 on the Digital Assembly (A2). Using the oscilloscope, check the signal at the center pin of A3A2P2. The signal should be a 100 MHz sinewave at a level of from 2 to 2.5 V peak-to-peak.

13. Reconnect A3A2P1 to the J2 connector. [When A3A2P2 is disconnected, the Digital Assembly is totally disabled. After it is reconnected, perform a COLDSTART power-up to ensure a reliable restart of the control processor. Power the receiver off. While holding the "CE" key pressed, power the receiver on. When the message "COLDSTART!" is displayed, release the "CE" key.]

14. If the results obtained in **steps 1 through 13** are not as indicated, verify the control link from the Digital Assembly. From the SETUP menu, set the receiver to perform an F1-F2 scan between 20 and 1000 MHz. Set the step size to 100 kHz. Set the Squelch to ON. Press the SCAN key to initiate the scan.

15. Refer to **Foldouts FO-8** and FO-**12**. While the receiver is scanning, monitor the 1st LO STB line at pin 11 of connector E1 on the 1st LO/1st Converter PC Assembly (A3A1) with channel 1 of the oscilloscope. Set the oscilloscope to trigger on channel 1. Connect channel 2 of the oscilloscope at pin 14 of E1 (CLK1). Verify that a series of positive strobe pulses are present at pin 11 to update the RF Assembly's parameters during the scan. Verify that two clock bursts are present at pin 14 for each strobe pulse. The CLK 1 signal consists of a sixteen-pulse burst, followed by an eight-pulse burst.

16. Remove the test equipment and reinstall any connectors removed during the testing.

6.7.3 TYPE 797168 DIGITAL CONTROL PC ASSEMBLY (A2) PERFORMANCE TEST

1. Initiate a COLD START! power-up by holding the front panel "CE" key pressed while the receiver is powered on. When the message "COLD START!" is displayed, release the "CE" key.

2. Refer to **Foldout FO-11, Sheet 1**. From the underside of the receiver, check the red RUN LED, DS1, on the Digital Assembly. Verify that the LED is flashing, indicating that the control processor is operational.

3. Verify that the proper 100 MHz reference from the RF assembly is present by observing the 40 MHz output of the clock distribution circuitry at TP75. Using an oscilloscope and 10:1 probe, verify the 50% duty cycle square wave. Using a frequency counter, verify the frequency at TP75 is 40.000 MHz.

4. If the 40 MHz signal is not present at TP75, remove the A3A2P2 connector from J4. Using the oscilloscope, check the signal at the center pin of A3A2P2. The signal should be 100 MHz sinewave at a level of from 2 to 2.5V peak-to-peak. [When A3A2P2 is disconnected, the Digital Assembly is totally disabled. After it is reconnected, perform a COLDSTART power-up, as described in step 1 of this procedure to ensure a reliable restart of the control processor.]

5. Using the digital voltmeter, Verify the proper module operating voltages at the listed test points.

Test Point	Expected Result
A2E1, pin 1	+13.5 Vdc ±.5V
A2E1, pin 2	+5.5 Vdc +.1V, -0V
A2E1, pin 3	+5.5 Vdc +.1V, -0V
A2E1, pin 6	-13.5 Vdc ±.5V
TP54	+12 Vdc ±.5V
TP58	-12 Vdc ±.5V
TP61	+5 Vdc ±.25V
TP72	+5 Vdc ±.25V
TP73	-5 Vdc ±.25V

6. Connect the signal generator to the rear panel RF Input connector.

7. Set the receiver as follows:

Tuned Frequency	20.00000 MHz
Detection Mode	USB
Gain Control	AGC Slow
Squelch	Off

8. Connect the oscilloscope at the Line A audio output.

9. Set the signal generator to produce a 20.0010 MHz CW output at a level of -50 dBm.

10. Observe the 1 kHz signal present on the oscilloscope display. Note the peak-to-peak signal level as a reference.

11. While observing the signal level, slowly tune the signal generator up in frequency to 20.0030 MHz. Verify that the signal level remains constant throughout the frequency range.

12. Set the signal generator to 19.9990 MHz, and set the receiver detection mode to LSB. Note the peak-to-peak signal level on the oscilloscope as a reference.

13. While observing the signal level, slowly tune the signal generator down in frequency to 19.9970 MHz. Verify that the signal level remains constant throughout the frequency range.

14. Remove the oscilloscope from the Line A audio output and connect it to the Line B output. Repeat steps 9 through 14 for the Line B output.

15. Remove the test equipment, and reinstall all connectors to the assembly.

6.7.4 TYPE 797229 FRONT PANEL ASSEMBLY (A1) PERFORMANCE TEST

1. Initiate a COLD START! power-up by holding the front panel “CE” key pressed while the receiver is powered on. When the message “COLD START!” is displayed, release the “CE” key.

2. During the receiver power-up, observe the front panel displays to determine if the alphanumeric displays and LEDs respond to power-up display test. If no display activity is observed, check the serial communications cable (W5), between the Front Panel Assembly (A1J7) and the Digital Assembly (A2J29), for proper connection. Verify that connector A1P1 is seated properly on the Digital Assembly (J5).

3. Verify that the configuration switches on the Digital Assembly are configured for normal front panel operation. Verify that switch 4 of A2S1 is in the UP position.

4. Using a digital voltmeter, verify that the proper operating voltages are being provided at pins 11 and 12 of A1E1. If this voltage is not present, proceed to the Type 797168 Digital Assembly Performance test procedure to verify its operation.

5. Using the oscilloscope, verify the serial communications link with the Digital Assembly (A2). On the Digital Assembly, connect the oscilloscope at pin 3 (TXD) of connector J29. Do not remove connector P2 from J29 when measuring; the pins can be accessed from the top of the connector. A continuous stream of RS-232 data should be present at all times, as the receiver communicates display data to the front panel. If the data from the Digital Assembly is not present, proceed to the Type 797168 Digital Assembly Performance test procedure to verify its operation.

6. Connect the oscilloscope at pin 2 (RXD) of J29. A constant level of approximately -7 Vdc should be present until one of the front panel controls is operated. Operate each of the front panel controls and observe that the data level switches between -7V and +7V as the control is exercised, and the data is sent from the Front Panel to the Digital Assembly.

7. Remove the test equipment and reinstall any connectors removed during the testing.

6.8 MODULE REMOVAL AND REPLACEMENT PROCEDURES

The procedures that follow provide details associated with the removal and replacement of the assemblies contained in the WJ-8611 Digital VHF/UHF Receiver. Refer to the component location drawings provided in **Section 7** of this manual as a reference for the location of these assemblies.

CAUTION **This equipment contains components that are subject to damage from Electrostatic Discharge. Be sure to take preventative measures when handling the assemblies in this receiver.**

WARNING

Disconnect the Main Supply before removing the top cover of the WJ-8611. There are voltages present that could cause electrical shock.

6.8.1 RF TUNER ASSEMBLY (A3) REMOVAL AND REPLACEMENT

1. Disconnect power from the receiver.

2. With a Phillips-screwdriver, remove the 22 screws that secure the top and bottom cover of the receiver.

3. Locate cable W2, which connects the rear panel RF IN connector to the RF Assembly. With a 5/16-inch wrench, remove W2P1 from the A3A1J1 connector.

4. From the underside of the receiver, disconnect the coaxial connectors attached to J4 and J2 of the Digital Assembly (A2). Disconnect the 50-pin ribbon cable from J1 of the Digital Assembly. Note the cable routing for the reinstallation of the assembly.

5. With a Phillips-screwdriver, remove the six screws that secure the RF Assembly to the receiver's mounting deck. Refer to **Figure 6-7** for screw location.

6. At the receiver rear panel, remove the hex-nuts and washers from the EXT REF and SDU connectors with a 9/16-inch wrench.

7. While holding the RF Assembly in place on its mounting standoffs, place the receiver on its side. With a Phillips-screwdriver, remove the two Phillips-head screws and lock-washers located between the EXT REF and SDU connectors of the rear panel.

8. Carefully slide the RF Assembly slightly toward the front of the receiver until the EXT REF and SDU connectors clear the receiver rear panel. While guiding the assembly's ribbon cable and two coaxial cables through the access hole in the receiver's deck, carefully remove the assembly.

9. Reinstallation of the assembly is performed in reverse order of the removal.

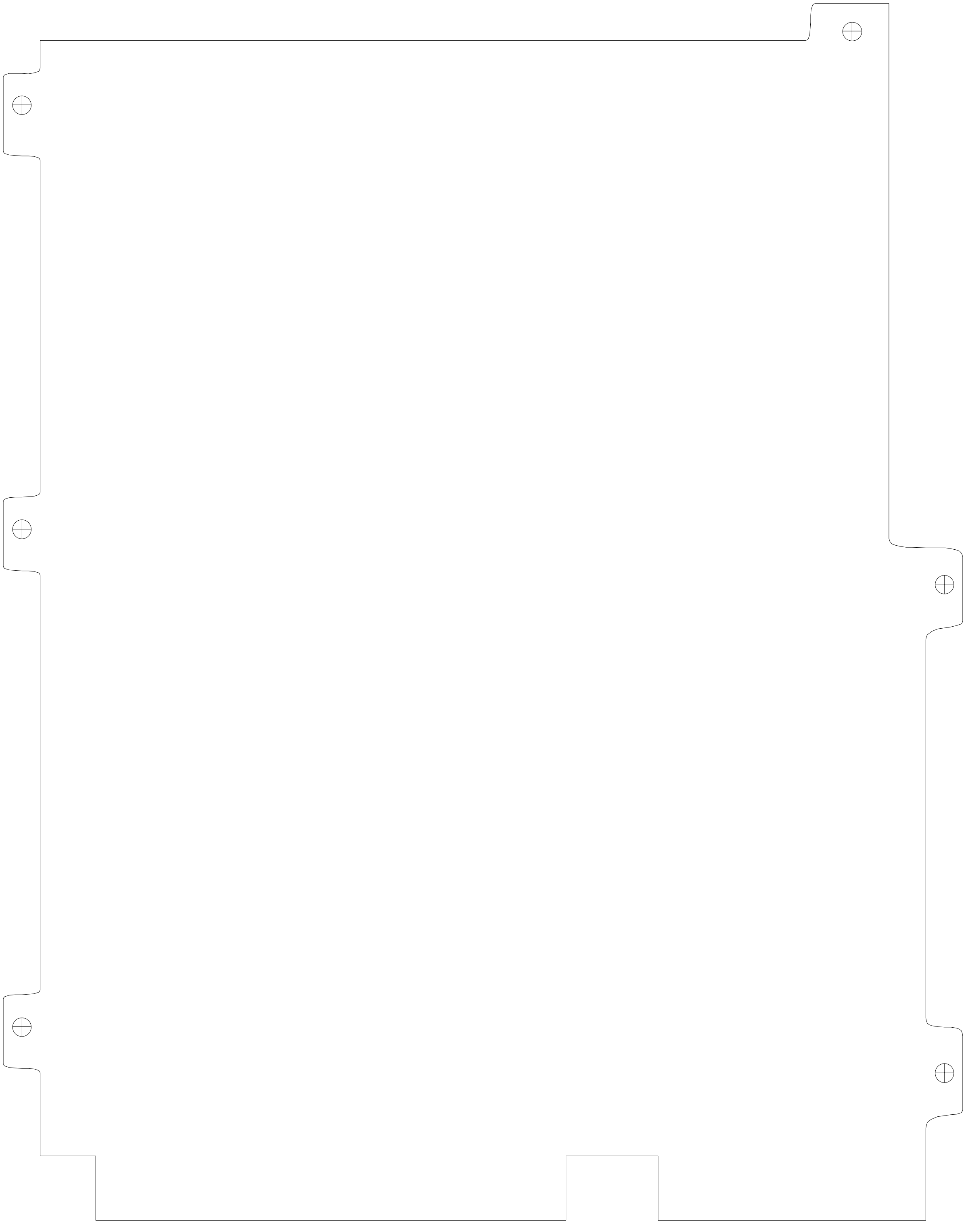

Figure 6-7. Type 797228-1 RF Tuner Assembly (A3) Screw Location

6.8.2 DIGITAL CONTROL PC ASSEMBLY (A2) REMOVAL AND REPLACEMENT

1. Disconnect power from the receiver.

2. Remove the receiver bottom cover to gain access to the internal assemblies.

3. At the receiver rear panel, remove the hex-nuts and washers from the VIDEO, 250 kHz IF, and COR connectors.

4. From the underside of the receiver, disconnect the following cables from the Digital Assembly.

J2	A2P1 Coaxial
J3	FAN Power
J4	A2P2 Coaxial
J5	Front Panel Ribbon Cable
J11	W1P1 RS232 Cable
J12	W3P1 IEEE-488 Cable
J14	W4P1 DIGITAL IF OUT
J29	W5P2 To Front Panel
A2E1	W6P1 Power Supply Input

WARNING

If scrapping this assembly, remove lithium battery BT1 and dispose of it in a hazardous waste container or handle in accordance with hazardous waste procedures. Refer to Figure FO-10 sheet 1, for component location.

5. Remove the six 1.25-inch and one 9/16-inch Phillips-head screws that secure the Digital Assembly to the receiver's mounting deck.

6. Carefully slide the Digital Assembly toward the front of the receiver until the connectors clear the rear panel.

7. Reinstallation of the assembly is performed in reverse order of the removal.

6.8.3 FRONT PANEL ASSEMBLY (A1) REMOVAL AND REPLACEMENT

1. Disconnect power from the receiver.
2. Remove the receiver top and bottom covers to gain access to the internal assemblies and cabling.
3. From the top of the receiver, unplug the AC twisted pair cable (S1J1) from its P1 connector.
4. From the underside of the receiver, unplug the AC twisted pair cable (S1P1) from its W7P2 connector. Disconnect the twenty-four-pin ribbon cable from J5 on the Digital Assembly (A2). Disconnect six-pin cable connector W5P2 from J29.
5. Remove the six Phillips-head screws that secure the front panel to the receiver chassis.
6. Gently pull the front panel forward until the circuit boards clear the mounting brackets. It may be necessary to move the panel to the side to clear the brackets.
7. Reinstallation of the assembly is performed in reverse order of the removal.

6.8.4 PART 482554 FRONT PANEL CONTROL PC ASSEMBLY (A1A1) REMOVAL AND REPLACEMENT

1. Remove front panel, as described in the Type 797229 Front Panel Assembly (A1) Removal and Replacement Procedure (**paragraph 6.8.3**).
2. Remove knobs from Edit and Phones controls. Remove 5/16-inch nut and lock-washer hardware securing the Edit Knob and Phones control. Remove the ½-inch nut and lock-washer securing the Phones jack. Unplug the tuning wheel cable from J3.
3. Remove the four Phillips-head screws from the PC board, securing the board to the front panel standoffs.
4. Slowly lift the board from its seat on the standoffs. As the board is lifted, the PC board mounted connector (J9) will unplug from its connection at P1 of the Part 482929 Display PC Assembly (A1A2).
5. Remove the cable from connector J8.
6. Reinstallation of the assembly is performed in reverse order of the removal. When reinstalling the board, carefully align J9 with P1 as the assembly is being set in place. Reinstall the screws and control knobs.

6.8.5 PART 482929 DISPLAY PC ASSEMBLY (A1A2) REMOVAL AND REPLACEMENT

1. Remove the Type 797229 Front Panel Assembly (A1) and the Part 482554 Front Panel Control PC Assembly (A1A1) as described in **paragraphs 6.8.3** and **6.8.4**.
2. Remove six Phillips-head screws securing the assembly in place.
3. Carefully lift the board out.
4. Reinstallation of the assembly is performed in reverse order of the removal.

6.8.6 TYPE 766032 SWITCHING POWER SUPPLY (PS1) REMOVAL AND REPLACEMENT

1. Disconnect power from the receiver.
2. Remove the receiver top and bottom covers to gain access to the internal assemblies.
3. From the underside of the chassis, unplug W6P1 from A2E1 of the Digital Control PC Assembly (A2). Remove cable from cable restraint.
4. From the underside of the chassis, unplug W7P2 from S1P1. Remove cable from cable restraint.
5. From the top of the chassis, disconnect ground cable from the standoff at the rear left side panel.
6. Take careful note of the cable routing to assist in the reinstallation process.
7. From the top of the chassis, remove the four Phillips-head screws securing the power supply module to the receiver deck.
8. Carefully lift the power supply free of the deck, from the underside of the chassis.
9. Reinstallation of the assembly is performed in reverse order of the removal.

SECTION 7

REPLACEMENT PARTS LIST

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SECTION 7 REPLACEMENT PARTS LIST

7.1 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.

7.2 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).

7.2.1 PROVISIONING NOTE - INCONSISTENCIES IN PART NUMBERING CONVENTIONS

The internal computer applications at the factory 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.

7.3 LIST OF MANUFACTURERS

Mfr. Code	Name and Address
0CF99	Siemens - Electrogeraete-Abt Zkd Hochstr 17 D-8000 Munich, Germany
0HR85	Pulsar Microwave Corp. 10 BlanJen Ter. Clifton, NJ 07014
0HSF8	Nepenthe 2471 E. Bay Shore Rd., No. 600 Palo Alto, CA 94303
0TZP6	Sumida Electric Co. 637 E. Golf Rd., Suite 209 Arlington Heights, IL 60005
0VUE0	Raltron Electronics Corp. 2315 N.W. 107 Avenue Miami, FL 33172
00779	Amp, Inc. 2800 Fulling Mill Rd. PO Box 3608 Middletown, PA 17105-3608
01295	Texas Instruments, Inc. Semiconductor Div. 13500 N. Central Expy. PO Box 655303 Dallas, TX 75265-5303
02113	Coilcraft, Inc. 1102 Silver Lake Rd. Cary, IL 60013-1658
02114	Amperex Electronic Corp. Ferroxcube Div., 5083 Kings Hwy. Saugerties, NY 12477
02735	RCA Corp. Solid State Div. 2872 Woodcock Blvd., Suite 304 Atlanta, GA 30341-4002
04713	Motorola, Inc. Semiconductor Products Sector 5005 E. McDowell Rd. Phoenix, AZ 85008-4229
05245	Corcom, Inc. 1600 Wincheste Rd. Libertyville, IL 60048-1267
06090	Raychem Corp. 300 Constitution Dr. Menlo Park, CA 94025-1111
06540	New Haven Mfg. Corp. Amatom Electric Hardware Division 446 Blake Street New Haven, CT 06515-1238
06665	Analog Devices 1500 Space Park Dr. Santa Clara, CA 95050
1ES66	Maxim Integrated Products 120 Sangabriel Dr. Sunnyvale, CA 94086

Mfr. Code	Name and Address
1FN41	Atmel Corp. 2125 Onel Dr. San Jose, CA 95131
1HJ31	M/A-COM Inc. 63 3rd Ave. Burlington, MA 01803
1Z447	RCA Corp. Solid State Div. 2872 Woodcork Blvd., Suite 304 Atlanta, GA 30341-4002
11556	Adams-Russel Co., Inc. Antenna and Microwave Div. Haverhill Rd. Amesbury, MA 01913
12855	Trak Microwave Co. 4726 Eisenhower Blvd. Tampa, FL 33634-6391
14482	Watkins-Johnson Co. 3333 Hillview Ave. Palo Alto, CA 94304-1204
14591	Trans-Tech, Inc. Sub. of Alpha Industries, Inc. 5520 Adamstown Rd.. Adamstown, MD 21710-9619
14632	DRS Signal Solutions, Inc. 700 Quince Orchard Rd. Gaithersburg, MD 20878-1706
15542	Mini-Circuits Laboratory Div. of Scientific Components Corp. 13 Neptune Ave. PO Box 350165 Brooklyn, NY 11235
16179	M/A-COM, Inc. M/A-COM Control Components Div. 21 Continental Blvd. Merrimack, NH 03054-4304
16428	Cooper Industries, Inc. Belden Division 350 NW N Street Richmond, IN 47374
16546	Mepco/Central Lab A North American Phillips Co. 4561 Colorado Blvd. Los Angeles, CA 90039-1103
17540	Alpha Industries, Inc. HQ/Semiconductor Div. 20 Sylvan Road P.O. Box 1044 Woburn, MA 01801-1854
17856	Siliconix, Inc. 2201 Laurelwood Rd. Santa Clara, CA 95054-1516
18324	Signetics Co. Military Products Div. 1275 S. 800 E. St Orem, UT 84058
19505	Applied Engineering Products 104 John W. Murphy Dr. PO Box 510 New Haven, CT 06513
20462	Prem Magnetics, Inc. 3519 N. Chapel Hill McHenry, IL 60050-2504
22526	Dupont E I Denemours & Co, Inc. Dupont Connector Systems Rt. 141 and Rt. 48 BMP19 Wilmington, DE 19880-0019

Mfr. Code	Name and Address	Mfr. Code	Name and Address
24355	Analog Devices, Inc. Rt. 1 Industrial Pk. PO Box 9106 Norwood, MA 02062	2W944	Papst Mechatronic Corp. Aquidneck Industrial Park Newport, RI 02840
24539	Avantek, Inc. 3175 Bowers Ave. Santa Clara, CA 95054-3292	31433	Kemet Electronics Corp. 2835 Kemet Way Simpsonville, SC 29681-2457
25088	Siemens Corp. 186 Wood Ave., S. Iselin, NJ 08830-2704	32901	Image Information Inc. 1101 Bristol Rd. Mountainside, NJ 07092-2301
26742	Methode Electronics, Inc. 7447 W. Wilson Ave. Chicago, IL 60656-4548	33297	NEC Electronics USA, Inc. Electronic Arrays Div. 550 E. Middlefield Rd. Mountain View, CA 94043-4008
27014	National Semiconductor Corp. 2900 Semiconductor Drive Santa Clara, CA 95051-0606	34335	Advanced Micro Devices, Inc. 901 Thompson Pl. PO Box 3453 Sunnyvale, CA 94086-3453
27264	Molex, Inc. 2222 Wellington Ct. Lisle, IL 60532-1613	34369	Harris Corp. Harris Controls and Composition Div. 407 John Rodes Blvd. PO Box 430 Melbourne, FL
28480	Hewlett-Packard Co. Corporate Hq. 3000 Hanover St. Palo Alto, CA 94304-1112	34371	Harris Corp. Semiconductor Sector 200 Palm Bay Blvd. PO Box 883 Melbourne, FL 32902-0883
29990	American Technical Ceramics 1 Norden Ln. Huntington Station, NY 11746-2102	3G472	Harris Semiconductor Div. of Harris- Intertype Corp. Melbourne, FL
2J929	Axis Electronics 22 Cessna Court Gaithersburg, MD 20879-4145	3N087	Mill-Max Mfg. Corp. 190 Pine Hollow Rd. Oyster Bay, NY 11771-4704

Mfr. Code	Name and Address	Mfr. Code	Name and Address
4J627	Engineered Assemblies & Components Corp. 380 North St. Teterboro, NJ 07608	54583	TDK Electronics Corp. 12 Harbor Park Dr. Port Washington, NY 11550
4T165	NEC Electronics USA, Inc. Electron Div. 401 Ellis St. PO Box 7241 Mountain View, CA 94039	55027	Q-Bit Corp. 2575 Pacific Ave., NE Palm Bay, FL 32905
4W716	Specialty Electric, Inc. Airport Way Hailey, ID 83333	55322	Samtec, Inc. 810 Progress Blvd. PO Box 1147 New Albany, IN 47150-2257
50101	Frequency Sources, Inc. Loral Microwave - FSI 75 Technology Dr. Chelmsford, MA 01824-3737	56289	Sprague Electric Co. World Hqs. 267 Lowell Rd. Hudson, NH 03051-4900
51406	Murata Erie North America, Inc. Headquarters and Georgia Opns. 2200 Lake Park Dr. Smyrna, GA 30080	58982	Precision Connector Designs, Inc. Centennial Park 2 Technology Dr. Peabody, MA 01960
53387	Minnesota Mining & Manufacturing Co. Electronic Products Div. 3M Austin Ctr. Austin, TX 78769-2963	59124	KOA Speer Electronics Bolivar Drive PO Box 547 Bradford, PA 16701
53469	Plessey Semiconductors Corp. 1500 Green Hills Rd. PO Box 660017 Scotts Valley, CA 95067-0017	59993	International Rectifier Semiconductor Div. 233 Kansas St. El Segundo, CA 90245-4316
54473	Matsushita Electric Corp. of America M/S 7H-4 2 Panasonic Way Secaucus, NJ 07094	61271	Fujitsu Microelectronics, Inc. 3545 N. 1st St, Bldg 1 San Jose, CA 95134-1804

Mfr. Code	Name and Address
61441	Saronix 4010 Transport St. Palo Alto, CA 94303-4913
61772	Integrated Device Technology, Inc. 2975 Stender Way Santa Clara, CA 95054
62104	California Eastern Laboratories, Inc. 4590 Patrick Henry Dr. Santa Clara, CA 95054-3309
63155	Synergy Microwave, Inc. 483 McLean Blvd and 18th Ave Paterson, NJ 07504
64155	Linear Technology Corp. 1630 Mccarthy Blvd Milpitas, CA 95035-7487
67183	Altera Corp 2610 Orchard Pky San Jose, CA 95134-2020
67349	Phillips Components, Inc. 23141 La Cadena Dr, Suite P Laguna Hills, CA 92653
6Y440	Micron Semiconductor, Inc. 2805 E. Columbia Rd. Boise, ID 83706-9698
71400	Bussman Mfg. Div of Cooper Industries, Inc. 114 Old State Road Ellisville, MO 63021
72982	Erie Specialty Products, Inc. 645 W. 11th St. Erie, PA 16512
75915	Littelfuse Tracor, Inc. Sub. of Tracor, Inc. 800 E. Northwest Hwy. Des Plaines, IL 60016-3049
76493	Bell Industries, Inc. J. W. Miller Div. 306 E. Alondra Blvd. PO Box 2859 Gardena, CA 90247-1059
7J069	TDK Corp. of America 4015 W. Vincennes Rd. Indianapolis, IN 46268-3008
80294	Bourns Instruments, Inc. 1200 Columbia Ave., Bldg C Riverside, CA 92507
8J671	Crane Component Co. 4000 Crane Centre Dr. Streetsboro, OH 44240-5076
8S746	Skigma, Inc. 80 Martin Lane Elk Grove Village, IL 60007
95146	Alco Electronic Products, Inc. 1551 Osgood St. North Andover, MA 01845-1014
95275	Vitramon, Inc. PO Box 544 Bridgeport, CT 06601-0544
95505	Resco-Washington 10523 Ewing Road Beltsville, MD 20705
96341	M/A Com, Inc. M/S 702 South Ave. Burlington, MA 01803

Mfr. Code	Name and Address	Mfr. Code	Name and Address
KQ536	Harwin, Inc 4173 Main St. Bridgeport, CT 06606	TBD02	Sumida Electric 5999 New Wilke Rd. Suite 110 Rolling Meadows, IL 60008
TOKO	Toko, Inc. Eastern Regional Office 107 Mill Plain Rd. Danbury, CT 06811	TBD03	Wyle Electronics 7180 Columbia Gateway Dr. Suite 100 Columbia, MD 21046
TBD01	Custom Cables 10401 - 47th Ave. Beltsville, MD 20705		

7.4 PARTS LIST

The following parts list contains all the electrical components used in the unit, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from the factory specify the unit type and the serial number, and the option configuration. Also include the reference designation and description for each item ordered. The list of manufacturers, provided in **paragraph 7.3**, and the manufacturer's part number, provided in **paragraph 7.5**, are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph 7.5** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacture provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are identified 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 the factory 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.

Refer to the foldout section of the manual for component location drawings and schematics.

7.5 TYPE WJ-8611 VHF/UHF RECEIVER MAIN CHASSIS

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision J1				
A1	Front Panel Assembly	1	797229-2	14632	
A2	Digital Control PC Assembly	1	797168-1	14632	
A3	RF Tuner Assembly	1	797228-1	14632	
B1	Blower Fan, 6-15V, 250mA, 5300 RPM	1	612	2W944	
B1P1	Connector, Plug, 3 position	1	102241-1	00779	
F1	Fuse, Cartridge, 1 Amp, 3AG SLow	1	MDL1	71400	
FL1	Filter, Power Line	1	1EF1F	05245	
J1	Connector, Receptacle, 25 position D Sub Min	1	205207-1	00779	
J2	Connector, Receptacle, 24 Pin	1	554349-1	00779	
J3	Connector, Plug, 15 position	1	8315-6000	53387	
J4	Connector, Jack, For RG-188 Cable	1	3004-7388-10	16179	
P1	Connector, Receptacle, 2 position	1	1-480318-0	00779	
W1	Cable Assembly	1	383929-1	14632	
W1P1	Connector, Housing, 10 position	1	87456-6	00779	
W2	Cable Assembly	1	383930-1	14632	
W2P1	Connector, Plug, SMA, For RD-316	1	9001-9023-019	19505	
W3	Cable Assembly	1	383522-2	14632	
W3P1	Connector, Plug, 24 Socket	1	66900-124	22526	
W4	Cable Assembly	1	383931-1	14632	
W4P1	Connector, Plug ,16 position, Female	1	66900-216	22526	
W5	Cable Assembly	1	383932-1	14632	
W5P1	Connector, Receptacle, 10 Pin, Male	1	M80-8881005	KQ536	
W5P2	Connector, Plug 6 position	1	65043-034	22526	
W6	Cable Assembly	1	383933-1	14632	
W6P1	Connector, Housing, 8 position	2	09-50-8081	27264	
W6P2	Same as W6P1				
W7	Cable Assembly	1	383934-1	14632	
W7P1	Connector, Housing, 5 position	1	09-50-3051	27264	
W7P2	Connector, Plug, 2 position	1	1-480319-0	00779	
	Accessory Items				
	Revision D1				
AI-1	Cord, Line, 3 Pin, 6 Ft 7 In	1	17600	16428	
AI-2	Fuse, Cartridge, 1 Amp, 3AG SLow	1	MDL1	71400	
AI-3	Terminal, 6 position	1	ELFP06210	58982	
AI-4	Label, Decoder, Self-adhesive	1	384072-1	14632	
AI-5	Center Support Bracket	1	282575-1	14632	
AI-6	Support Bracket	1	282576-2	14632	
AI-7	Handle	1	10382-A-0832-2	06540	
AI-8	Rear Handle Assembly	1	283496-2	14632	
AI-9	Rear Handle Assembly	1	283496-1	14632	
AI-10	Manual, WJ-8611	1	181122-001	14632	

7.5.1 TYPE 797229-2 FRONT PANEL ASSEMBLY — REF DESIG PREFIX A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision F1				
A1	Front Panel Control PC Assembly	1	482554-2	14632	
A2	Display PC Assembly	1	482929-1	14632	
A3	Interconnect PC Assembly	1	383947-1	14632	
J1	Phone Jack Assembly	1	482957-1	14632	
FB1	Ferrite Bead	2	56-590-65-4A	02114	
FB2	Same as FB1				
C1	Capacitor, Ceramic, Disc .01µF, ±20%, 50V	2	34453-1	14632	
C2	Same as C1				
S1	Switch Assembly	1	482958-1	14632	
S1P1	Connector, Receptacle, 2 position	1	1-480318-0	00779	
S1J1	Connector, Plug 2 position	1	1-480319-0	00779	
MP1	Switch Cap 12mm Marked “7”	1	383072-7	14632	
MP2	Switch Cap 12mm Marked “8”	1	382072-8	14632	
MP3	Switch Cap 12mm Marked “9”	1	383072-9	14632	
MP4	Switch Cap 12mm Marked “4”	1	382072-4	14632	
MP5	Switch Cap 12mm Marked “5”	1	383072-5	14632	
MP6	Switch Cap 12mm Marked “6”	1	382072-6	14632	
MP7	Switch Cap 12mm Marked “1”	1	383072-1	14632	
MP8	Switch Cap 12mm Marked “2”	1	382072-2	14632	
MP9	Switch Cap 12mm Marked “3”	1	383072-3	14632	
MP10	Switch Cap 12mm Marked “0”	1	382072-10	14632	
MP11	Switch Cap 12mm Marked “MHz”	1	383072-14	14632	
MP12	Switch Cap 12mm Marked “.”	1	382072-15	14632	
MP13	Switch Cap 12mm Marked “CE”	1	383072-16	14632	
MP14	Switch Cap 12mm Marked “SHIFT”	1	382072-19	14632	
MP15	Switch Cap 12mm Marked “>”	1	383072-17	14632	
MP16	Switch Cap 12mm Marked “<”	1	382072-18	14632	
MP17	Switch Cap, Gray, 7.5mm	4	482077-2	14632	
MP18 thru MP20	Same as MP17				
MP21	Switch Cap, 7.5 mm w/LED Lens Cover	12	482077-2	14632	
MP22 thru MP32	Same as MP21				
MP33	Knob, Spinner	1	380038-2	14632	
MP34	Knob, Crank	1	280065	14632	
MP35	Knob, Spring	1	1700	14632	
MP36	Knob, Round	1	1R01G802B7F001	86797	
MP37	Knob skirt, Round	1	1R01G802A7F001	86797	
U1	Encoder, Optical Panel	1	HRPG-ASCA-16C	28480	
W1	Cable, Assembly 44 Position	1	CC2215	6E390	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

7.5.1.1 TYPE 482554-2 FRONT PANEL CONTROL PC ASSEMBLY REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision C1				
E1	Cable, Assembly 24 Position	1	IDMD-12-T-13-C	55322	
C1	Capacitor, Ceramic, .047µF, ±10%, 50V	37	841415-023	14632	
C2	Capacitor, Ceramic, .01µF, ±10%, 50V	6	841415-019	14632	
C3	Same as C2				
C4					
Thru	Same as C1				
C6					
C7	Capacitor, Ceramic, .10µF, ±10%, 100V	4	VJ1812Y104KXBMT	95275	
C8	Same as C7				
C9	Same as C7				
C10	Same as C1				
C11	Same as C1				
C12	Capacitor, Tantalum, 47µF, ±20%, 16V	3	841293-30	14632	
C13	Same as C12				
C14	Same as C1				
C15	Capacitor, Tantalum, 4.7µF, ±20%, 20V	7	841293-25	14632	
C16	Capacitor, Ceramic, 22pF, ±5%, 50V	2	841415-003	14632	
C17	Same as C16				
C18					
Thru	Same as C1				
C20					
C21	Same as C15				
C22					
Thru	Same as C2				
C24					
C25	Same as C15				
C26	Same as C1				
C27	Same as C15				
C28	Same as C1				
C29	Same as C15				
C30					
Thru	Same as C1				
C37					
C38	Same as C15				
C39	Capacitor, Ceramic, 100pF, ±5%, 50V	36	841415-007	14632	
C40					
Thru	Same as C1				
C42					
C43	Not Used				
C44	Capacitor, Tantalum, 1.0µF, ±20%, 35V	5	841293-33	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C45 Thru C48	Same as C44				
C49	Not Used				
C50	Same as C15				
C51 Thru C54	Same as C1				
C55	Same as C7				
C56 Thru C62	Same as C1				
C63	Same as C2				
C64	Same as C12				
C65	Not Used				
C66	Not Used				
C67	Same as C1				
C68	Same as C1				
C69 Thru C79	Same as C39				
C80	Capacitor, Ceramic, 100pF, ±2%, 50V	4	841416-049	14632	
C81 Thru C83	Same as C80				
C84	Not Used				
C85	Not Used				
C86 Thru C101	Same as C39				
C102	Capacitor, Ceramic, 1000pF, ±10%, 50V	17	841415-013	14632	
C103 Thru C117	Same as C102				
C118 Thru C125	Same as C39				
C126	Not Used				
C127	Same as C102				
C128	Same as C1				
CR1	Diode, Switching, PIN,	9	MMBD7000LT1	04713	
CR2 Thru CR9	Same as CR1				
DS1	LED, Red	2	LSS260-DOE7502	25088	

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
DS2	Same as DS1				
J1	Connector, Header, 3 position	1	26-48-2035	27264	
J2	Connector, Plug, 3 Pin Post Header	1	640456-3	00779	
J3	Connector, Plug, 5 position Rt Angle	1	640457-5	00779	
J4	Connector, Header	1	M80-8691822	2J929	
J5	Not Used				
J6	Not Used				
J7	Connector, Receptacle, 10-position, Rt Angle	1	M80-8661022	KQ536	
J8	Connector, 44 position	1	PGM44DS-G40T30	8J671	
J9	Connector, Header, 16 Pin	1	ESQ-108-12-G-D	55322	
J10	Not Used				
J11	Not Used				
L1	Inductor, Choke, 1µH	3	NLC565050T-1R0K	54583	
L2	Same as L1				
L3	Same as L1				
L4	Inductor, 4.7 µH, ±10%, Q=7	1	NLC565050T-4R7K	7J069	
Q1	Transistor, PNP	16	MMBT2907ALT1	04713	
Q2 Thru Q16	Same as Q1				
R1	Resistor, Fixed, 10kΩ, ±5%, .1W	68	841414-097	14632	
R2 Thru R7	Same as R1				
R8	Jumper .05Ω, Max.	9	841417	14632	
R9	Same as R8				
R10	Same as R8				
R11	Resistor, Fixed, 56Ω, ±5%, .1W	18	841414-043	14632	
R12	Same as R11				
R13	Same as R1				
R14	Same as R1				
R15	Resistor, Fixed, 1.0kΩ, ±5%, .1W	6	841414-073	14632	
R16	Same as R1				
R17	Not Installed				
R18	Same as R15				
R19	Resistor, Fixed, 330kΩ, ±5%, .1W	1	841414-133	14632	
R20	Resistor, Fixed, 10MΩ, ±5%, .1W	1	841414-169	14632	
R21	Resistor, Fixed, 4.7kΩ, ±5%, .1W	12	841414-089	14632	
R22 Thru R28	Same as R21				
R29	Same as R11				
R30	Not Used				
R31	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R32	Same as R1				
R33	Same as R1				
R34	Same as R21				
R35	Same as R8				
R36 Thru R38	Same as R21				
R39 Thru R62	Same as R1				
R63	Same as R8				
R64	Not Used				
R65	Same as R1				
R66	Not Used				
R67	Resistor, Fixed, 2.2kΩ, ±5%, .1W	16	841414-081	14632	
R68	Resistor, Fixed, 22.0Ω, ±5%, .125 W	16	841296-025	14632	
R69	Same as R67				
R70	Same as R68				
R71	Same as R67				
R72	Same as R68				
R73	Same as R67				
R74	Same as R68				
R75	Same as R67				
R76	Same as R68				
R77	Same as R67				
R78	Same as R68				
R79	Same as R67				
R80	Same as R68				
R81	Same as R67				
R82	Same as R68				
R83	Same as R67				
R84	Same as R68				
R85	Same as R67				
R86	Same as R68				
R87	Same as R67				
R88	Same as R68				
R89	Same as R67				
R90	Same as R68				
R91	Same as R67				
R92	Same as R68				
R93	Same as R67				
R94	Same as R68				

REF DESIG PREFIX A1A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R95	Same as R67				
R96	Same as R68				
R97	Same as R67				
R98	Same as R68				
R99	Resistor, Fixed, 100kΩ, ±5%, .1W	3	841414-121	14632	
R100 Thru R102	Same as R1				
R103 Thru R106	Same as R15				
R107 Thru R110	Same as R1				
R111	Same as R99				
R112	Same as R99				
R113 Thru R116	Same as R1				
R117	Resistor, Fixed, 100Ω, ±5%, .1W	5	841414-049	14632	
R118 Thru R121	Same as R117				
R122 Thru R124	Not Used				
R125	Same as R8				
R126	Same as R8				
R127	Not Used				
R128	Not Used				
R129	Resistor, Fixed, 100Ω, ±5%, .1W	2	841414-049	14632	
R130	Same as R129				
R131 Thru R134	Not Used				
R135	Same as R8				
R136	Not Used				
R137 Thru R144	Same as R11				
R145 Thru R160	Same as R1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A1A1

R161 Thru R166	Same as R11				
R167	Not Used				
R168	Same as R11				
R169	Not Used				
R170	Resistor, Fixed, 22Ω, ±5%, .1W	2	841414-033	14632	
R171	Same as R170				
R172	Same as R8				
U1	Integrated Circuit, Microcontroller,	1	MC68HC16Z1CFC16	04713	
U2	Integrated Circuit, Hex Schmittt Inverter	1	74HC14	02735	
U3	Integrated Circuit, Presettable Synchronous 4-Bit Counter	3	74HC191	02735	
U4	Same as U3				
U5	Integrated Circuit, Octal Tri-State Buffer	1	74HC244 SOL20	04713	
U6	Integrated Circuit, Sensing Undervoltage	1	MC34064D-5	04713	
U7	Integrated Circuit,Dual D Flip-Flop With Preset And Clear	2	74HC74	04713	
U8	Same as U7				
U9	Integrated Circuit, SRAM, 32K X 8		MT5C2568DJ-20	6Y440	
U10	Integrated Circuit, EPROM 64KX16	1	TMS27PC210A-12FNL	01295	
XU10	Socket, Leadless Chip Carrier	1	213-044-601	26742	
U11	Not Used				
XU11	Not Used				
U12	Integrated Circuit, INTRFC +5V Powered DUAL RS	1	MAX232CWE	1ES66	
U13	Not Used				
U14	Integrated Circuit, Octal D Flip-Flops With Clear	4	74HC273	34371	
U15	Same as U14				
U16	Same as U14				
U17	Integrated Circuit, Multivibrator Dual Retriggerable	1	74HC123	02735	
U18	Integrated Circuit, Quad 2-Input OR Gate	2	74HC32	02735	
U19	Same as U14				
U20	Same as U18				
U21	Integrated Circuit, Quad 2-Input AND Gate	1	74HC08	02735	
U22	Integrated Circuit, Dual 4-Input NAND Gate	1	74HC20	02735	
U23	Same as U3				
U24	Integrated Circuit, Parallel-In, Serial-Out 8-Bit Shift Register	1	74HC165	02735	
U25	Integrated Circuit, Darlington Arrays Quad Drivers	2	ULN2068B	56289	
U26	Same as U25				
Y1	Xtal, 32.768 kHz	1	RSM-200-32.768KHz	0VUE0	

7.5.1.2 TYPE 482929-1 DISPLAY PC ASSEMBLY — REF DESIG PREFIX A1A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision B2				
C1	Capacitor, Ceramic, Disc, 0.1 µF, ±20%, 50V	4	34475-1		
C2 Thru C4	Same as C1				
C5	Capacitor, Electrolytic, Aluminum, 1000µF, 6.3V	5	ECE-AOJV102S	54473	
C6 Thru C9	Same as C6				
DS1	LED, Green Rectangular	9	HLMP-S500	28480	
DS2 Thru DS9	Same as DS1				
DS10	LED, Green Diffused	1	HLMP-1503	28480	
DS11	LED, Yellow Rectangular	2	HLMP-S300	28480	
DS12	Same as DS11				
J1	Connector, 44 position	1	PGM44DS-G40T30	8J671	
P1	Connector, 16-Pin Terminal Strip	1	HTSW-108-07-G-D	55322	
R1	Resistor, Fixed, Film, 2.7Ω ±5%, 0.125W	2	CF1, 8-2.7 OHMS/J	59124	
R2	Same as R1				
R3	Not Used				
S1	Switch, Subminiature With Green Led	12	TR2-21-L5	8S746	
S2	Switch, Subminiature SPST Pushbutton	20	TR1-01	8S746	
S3	Same as S2				
S4	Same as S2				
S5	Same as S1				
S6	Same as S2				
S7	Same as S1				
S8	Same as S2				
S9	Same as S1				
S10	Same as S2				
S11 Thru S13	Same as S1				
S14 Thru S16	Same as S2				
S17	Same as S1				
S18 Thru S20	Same as S2				
S21	Same as S1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A1A2

S22 Thru S24	Same as S2				
S25	Same as S1				
S26 Thru S28	Same as S2				
S29	Same as S1				
S30	Same as S1				
S31	Same as S2				
S32	Same as S2				
U1	Display, 7-Segment, Green	9	HDSP-7803	28480	
U2 Thru U4	Same as U1				
U5	Not Used				
U6 Thru U10	Same as U1				
U11	Not Used				
U12	Not Used				
U13	Display, 8-Digit, Green 5x5 Dot Matrix	4	SCD5583	25088	
U14 Thru U16	Same as U13				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

7.5.1.3 TYPE 383947-1 INTERCONNECT PC ASSEMBLY — REF DESIG PREFIX A1A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
P1	Connector, Header	1	M80-8871805	KQ536	
R1	Encoder Modification	1	283494-2	14632	
U1	Encoder Modification	1	283494-1	14632	

7.5.2 TYPE 797168-1 DIGITAL CONTROL PC ASSEMBLY REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision Z1				
E1	Connector, Header, 8-position Rt Angle	1	26-48-2086	27264	
BT1	Battery, 3V Rechargeable, Lithium	1	VL2330-1HF	4J627	
C1	Capacitor, Ceramic, .047µF, ±10%, 50V	229	841415-023	14632	
C2 Thru C12	Same as C1				
C13	Capacitor, Tantalum, 33µF, ±20%, 16V	26	841293-22	14632	
C14 Thru C32	Same as C1				
C33	Same as C13				
C34	Same as C13				
C35 Thru C40	Same as C1				
C41	Capacitor, Ceramic, 100pF, ±5%, 50V	33	841415-007	14632	
C42 Thru C44	Same as C1				
C45	Capacitor, Ceramic, 20pF, ±2%, 50V	2	841416-032	14632	
C46	Capacitor, Ceramic, 82pF, ±2%, 50V	2	841416-047	14632	
C47	Same as C1				
C48	Same as C1				
C49	Capacilor, Tantulum, 33.0µF, 25V	7	T495X336K025AS	31433	
C50	Same as C13				
C51	Same as C49				
C52 Thru C54	Same as C1				
C55	Same as C49				
C56	Same as C1				
C57	Same as C1				
C58 Thru C59	Same as C13				
C60	Same as C49				
C61	Same as C13				
C62	Capacitor, Ceramic, .01µF, ±10%, 50V	3	841415-019	14632	
C63	Same as C49				
C64	Same as C49				
C65	Capacitor, Tantalum, 68µF, ±20%, 6.3V	2	841293-24	14632	
C66	Same as C65				
C67	Same as C62				
C68	Same as C13				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

C69	Same as C13				
C70	Same as C1				
C71	Same as C1				
C72	Same as C13				
C73	Same as C1				
C74	Same as C1				
C75	Same as C13				
C76	Same as C1				
C77	Same as C13				
C78	Same as C1				
C79	Same as C1				
C80	Same as C13				
C81	Same as C1				
C82	Same as C13				
C83	Same as C13				
C84	Capacitor, Ceramic, 1500pF, ±2%, 50V	5	841416-077	14632	
C85	Capacitor, Ceramic, 680pF, ±10%, 50V	2	841415-012	14632	
C86	Same as C84				
C87	Not Used				
C88 Thru C90	Same as C1				
C91	Capacitor, Tantalum, 4.7µF, ±20%, 16V	2	T491A475K016AS	31433	
C92	Same as C1				
C93	Same as C91				
C94	Same as C1				
C95	Same as C13				
C96 Thru C120	Same as C1				
C121	Same as C13				
C122	Same as C1				
C123	Same as C1				
C124	Capacitor, Tantalum, 3.3µF, ±20%, 16V 1=335 Type	14	841293-36	14632	
C125	Same as C124				
C126	Capacitor, Ceramic, 330pF, ±5%, 50V	1	841415-010	14632	
C127	Capacitor, Ceramic, 560pF, ±2%, 50V	1	841416-067	14632	
C128	Capacitor, Ceramic, 47pF, ±2%, 50V	1	841416-041	14632	
C129	Same as C1				
C130	Same as C1				
C131	Capacitor, Ceramic, 22pF, ±5%, 50V	10	841415-003	14632	
C132	Capacitor, Ceramic, 820pF, ±2%, 50V	1	841416-071	14632	
C133	Capacitor, Ceramic, 43pF, ±2%, 50V	1	841416-040	14632	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C134	Same as C45				
C135	Same as C1				
C136	Same as C1				
C137	Same as C131				
C138	Same as C41				
C139	Same as C1				
C140	Same as C1				
C141	Same as C124				
C142	Same as C124				
C143	Same as C84				
C144	Same as C84				
C145	Same as C1				
C146	Same as C1				
C147	Same as C131				
C148	Same as C84				
C149	Capacitor, Ceramic, 330pF, ±2%, 50V	1	841416-061	14632	
C150	Same as C1				
C151	Same as C1				
C152	Same as C131				
C153	Capacitor, Ceramic, .033µF, ±10%, 50V	10	841415-022	14632	
C154	Capacitor, Ceramic, 100pF, ±2%, 50V	1	841416-049	14632	
C155	Capacitor, Ceramic, 1200pF, ±2%, 50V	2	841416-075	14632	
C156	Capacitor, Ceramic, 4700pF, ±10%, 50V	1	841415-017	14632	
C157	Capacitor, Ceramic, 620pF, ±2%, 50V	1	841416-068	14632	
C158	Capacitor, Ceramic, .1µF, ±10%, 50V	4	841250-25	14632	
C159	Same as C1				
C160	Same as C1				
C161	Same as C131				
C162	Same as C153				
C163 Thru C168	Same as C1				
C169	Same as C131				
C170	Same as C131				
C171 Thru C175	Same as C1				
C176	Capacitor, Ceramic, 2200pF, ±10%, 50V	2	841415-015	14632	
C177	Same as C176				
C178	Same as C158				
C179	Same as C158				
C180	Same as C124				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

C181	Same as C124				
C182	Same as C153				
C183	Same as C124				
C184	Same as C124				
C185	Same as C153				
C186	Capacitor, Ceramic, 36pF, ±2%, 50V	2	841416-038	14632	
C187	Same as C186				
C188 Thru C203	Same as C1				
C204	Same as C62				
C205 Thru C213	Same as C1				
C214	Same as C158				
C215 Thru C220	Same as C1				
C221	Same as C131				
C222	Same as C131				
C223	Same as C1				
C224	Same as C41				
C225	Same as C41				
C226	Same as C1				
C227	Same as C41				
C228	Same as C41				
C229 Thru C236	Same as C1				
C237	Same as C13				
C238	Same as C1				
C239	Capacitor, Tantalum, 4.7µF, ±10%, 50V	2	T495X475K050AS	31433	
C240	Same as C239				
C241	Capacitor, Tantalum, 1.0µF, ±20%, 35V	1	841293-33	14632	
C242	Capacitor, Ceramic, .47µF, ±20%, 25V	2	VJ1210Y474MXXMT	95275	
C243	Same as C242				
C244	Not Used				
C245	Same as C1				
C246	Same as C1				
C247	Same as C124				
C248	Same as C124				
C249	Same as C13				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

C250 Thru C253	Same as C1				
C254	Same as C41				
C255	Same as C41				
C256	Same as C1				
C257	Same as C1				
C258	Same as C131				
C259	Same as C1				
C260	Same as C155				
C261 Thru C282	Same as C1				
C283 Thru C285	Same as C13				
C286	Same as C1				
C287	Same as C13				
C288 Thru C296	Same as C1				
C297	Same as C45				
C298	Same as C1				
C299	Same as C1				
C300	Same as C13				
C301	Same as C1				
C302	Same as C1				
C303	Same as C124				
C304 Thru C310	Same as C1				
C311	Same as C124				
C312	Capacitor, Tantulum, 10 µF, ±20%, 6V	2	841293-38	14632	
C313 Thru C315	Same as C1				
C316	Same as C85				
C317	Same as C46				
C318 Thru C322	Same as C1				
C323	Same as C41				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C324	Same as C41				
C325	Same as C1				
C326	Same as C1				
C327	Same as C41				
C328	Same as C41				
C329	Same as C1				
C330	Same as C1				
C331	Same as C41				
C332	Same as C1				
C333	Same as C1				
C334 Thru C340	Same as C41				
C341	Same as C1				
C342	Same as C312				
C343 Thru C354	Same as C41				
C355 Thru C360	Same as C153				
C361 Thru C363	Same as C1				
C364	Same as C124				
C365	Same as C124				
C366	Same as C13				
C367	Same as C13				
C368	Same as C1				
C369	Same as C41				
C370 Thru C373	Same as C1				
C374	Capacitor, Tantalum, 47µF, ±20%, 10V	2	841293-23	14632	
C375	Same as C374				
C376	Same as C1				
CR1	Diode, Switching	8	MMBD7000LT1	04713	
CR2 Thru CR4	Same as CR1				
CR5	Diode, Rectifier, Schottky	1	10MQ040	59993	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
CR6 Thru CR9	Same as CR1				
DS1	LED, Red	1	LSS260-DOE7502	25088	
F2	Fuse, 5A	1	451.005	75915	
F2	Fuse, 2A	1	451.002	75915	
J1	Connector, 50-Pin Terminal Strip	4	HTSW-125-07-G-D	55322	
J2	Connector, Receptacle, SMB	2	2009-7511-000	19505	
J3	Connector, Header,	1	3-102202-4	00779	
J4	Same as J2				
J5	Connector, 24-Pin Terminal Strip	2	HTSW-112-07-G-D	55322	
J6	Connector, BNC Rt Angle	2	227677-1	00779	
J7	Connector, Header, 10 PIN	5	TSW-105-07-G-D	55322	
J8	Same as J6				
J9	Same as J2				
J10	Same as J7				
J11	Same as J7				
J12	Same as J5				
J13	Same as J7				
J14	Connector, 16-Pin Terminal Strip	2	HTSW-108-07-G-D	55322	
J15	Connector, Header, 8 Pin Header	1	TSW-104-07-G-D	55322	
J16	Same as J1				
J17	Same as J9				
J18	Same as J1				
J19	Same as J9				
J20	Same as J1				
J21	Connector, Jack, SMP, Right Angle	1	482254-1	14632	
J22 Thru J27	Not Used				
J28	Same as J14				
J29	Connector, 6-Pin Terminal Strip	1	HTSW-103-07-G-D	55322	
JP1A	Connector, 4-Pin	2	ULPSMD02S16-01	4W716	
JP1B	Same as JP1A				
JP2	Connector, Double Row, 4-Pin	1	ULPSMD02S33-02	4W716	
L1	Inductor 150nH, ±5%,	2	841438-029	14632	
L2	Same as L1				
L3	Inductor 1000µH, ±10%	6	NLF453232-102K	7J069	
L4	Inductor, COIL 100µH, ±10%	3	CD54-101KC	TBD02	
L5	Same as L4				
L6	Same as L4				
L7 Thru L11	Same as L3				
L12	Inductor, Choke 10µH	2	NLC565050T-100K	54583	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L13	Same as L12				
Q1	Transistor, PNP	3	MMBT-3906	04713	
Q2	Transistor, FET	1	MTD5P06E	04713	
Q3	Transistor, NPN	3	MMBT3904LT1	04713	
Q4	Transistor, TMOS	2	MTD10N05E	04713	
Q5	Same as Q4				
Q6	Same as Q1				
Q7	Same as Q3				
Q8	Same as Q1				
Q9	Same as Q3				
Q10	Transistor	1	MMBT6429L	04713	
Q11	Transistor	1	SST-310T1	17856	
Q12	Transistor, NPN	1	MMBT2222ALT1	04713	
R1	Resistor, Fixed, 3.3kΩ, ±5%, .1W	12	841414-085	14632	
R2	Same as R1				
R3	Resistor, Fixed, 10kΩ, ±5%, .1W	231	841414-097	14632	
R4	Resistor, Fixed, 10Ω, ±5%, .1W	26	841414-025	14632	
R5 Thru R9	Same as R4				
R10	Resistor, Fixed, 100Ω, ±5%, .1W	31	841414-049	14632	
R11	Same as R10				
R12	Same as R4				
R13	Same as R4				
R14	Resistor, Fixed, 150Ω, ±5%, .1W	2	841414-053	14632	
R15	Same as R14				
R16	Same as R3				
R17	Same as R3				
R18	Resistor, Fixed, 1.0 kΩ, ±5%, .1W	12	841414-073	14632	
R19	Same as R18				
R20	Same as R18				
R21	Same as R3				
R22	Resistor, Fixed, 2.2kΩ, ±5%, .1W	9	841414-081	14632	
R23 Thru R25	Same as R3				
R26	Same as R18				
R27	Resistor, Fixed, 4.7kΩ, ±5%, .1W	6	841414-089	14632	
R28	Not Used				
R29	Same as R3				
R30	Same as R3				
R31	Same as R1				
R32	Same as R1				
R33	Same as R3				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R34	Jumper .05Ω, Max	32	841417	14632	
R35 Thru R37	Not Used				
R38	Same as R1				
R39	Same as R34				
R40	Same as R1				
R41	Same as R34				
R42	Same as R1				
R43	Same as R34				
R44 Thru R50	Not Used				
R51	Same as R3				
R52	Not Used				
R53 Thru R55	Same as R3				
R56 Thru R58	Not Used				
R59	Same as R3				
R60	Same as R3				
R61	Not Used				
R62	Same as R22				
R63 Thru R73	Same as R3				
R74	Same as R34				
R75	Not Used				
R76	Resistor, Fixed, 470Ω, ±5%, .1W	3	841414-065	14632	
R77	Not Used				
R78	Same as R3				
R79	Resistor, Fixed, 680kΩ, ±5%, .1W	3	841414-141	14632	
R80 Thru R82	Same as R3				
R83	Same as R79				
R84 Thru R86	Same as R3				
R87	Same as R18				
R88	Resistor, Fixed, 15kΩ, ±5%, .1W	1	841414-101	14632	
R89	Same as R79				
R90	Resistor, Fixed, 22kΩ, ±5%, .1W	4	841414-105	14632	
R91	Same as R27				
R92	Same as R3				
R93	Resistor, Fixed, 100kΩ, ±5%, .1W	10	841414-121	14632	
R94	Same as R93				
R95	Same as R4				
R96	Resistor, Variable, 10KΩ, ±20%	1	3313J-1-103E	80294	
R97	Same as R3				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R98	Same as R93				
R99	Same as R93				
R100 Thru R102	Same as R4				
R103	Resistor, Fixed, 47Ω, ±5%, .1W	7	841414-041	14632	
R104	Resistor, Fixed, 22Ω, ±5%, .1W	2	841414-033	14632	
R105	Same as R104				
R106	Same as R76				
R107	Same as R4				
R108	Same as R4				
R109	Same as R103				
R110	Same as R4				
R111	Same as R4				
R112	Not Used				
R113 Thru R115	Same as R3				
R116	Not Used				
R117	Same as R3				
R118	Same as R4				
R119	Not Used				
R120	Same as R3				
R121	Same as R3				
R122	Not Used				
R123	Not Used				
R124	Same as R3				
R125	Same as R3				
R126	Not Used				
R127	Not Used				
R128 Thru R131	Same as R3				
R132	Same as R4				
R133	Same as R4				
R134	Same as R3				
R135 Thru R136	Same as R27				
R137 Thru R138	Same as R3				
R139	Same as R103				
R140	Same as R4				
R141	Same as R4				

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R142					
Thru	Same as R3				
R145	R146	Not Used			
R147	Not Used				
R148	Resistor, Fixed, 47kΩ, ±5%, .1W	3	841414-113	14632	
R149	Same as R18				
R150	Resistor, Fixed, 1.8kΩ, ±5%, .1W	2	841414-079	14632	
R151	Resistor, Fixed, 620Ω, ±5%, .1W	2	841414-068	14632	
R152	Same as R148				
R153	Same as R90				
R154	Same as R90				
R155	Resistor, Fixed, 220kΩ, ±5%, .1W	2	841414-129	14632	
R156	Same as R155				
R157	Resistor, Fixed, 68Ω, ±5%, .1W	2	841414-045	14632	
R158	Same as R157				
R159	Resistor, Fixed, 1.5kΩ, ±5%, .1W	4	841414-077	14632	
R160					
Thru	Same as R159				
R162					
R163	Same as R10				
R164	Same as R10				
R165	Same as R3				
R166	Same as R3				
R167	Same as R103				
R168	Same as R103				
R169	Resistor, Fixed, 6.8kΩ, ±5%, .1W	1	841414-093	14632	
R170	Same as R22				
R171	Same as R157				
R172	Not Used				
R173	Not Used				
R174	Same as R157				
R175	Not Used				
R176	Not Used				
R177	Same as R34				
R178	Same as R10				
R179					
Thru	Same as R3				
R185					
R186	Same as R34				
R187					
Thru	Same as R3				
R200					
R201	Same as R34				
R202	Same as R10				
R203	Not Used				
R204	Not Used				
R205	Not Used				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R206	Same as R22				
R207	Same as R1				
R208	Resistor, Fixed, 5.1kΩ, ±5%, .1W	1	841414-090	14632	
R209	Resistor, Fixed, 510Ω, ±5%, .1W	1	841414-066	14632	
R210 Thru R214	Same as R3				
R215	Not Used				
R216 Thru R222	Same as R3				
R223	Same as R18				
R224	Same as R90				
R225	Resistor, Fixed, 1.1kΩ, ±5%, .1W	1	841414-074	14632	
R226	Same as R103				
R227 Thru R229	Same as R4				
R230	Same as R18				
R231	Same as R3				
R232	Resistor, Fixed, 12kΩ, ±5%, .1W	1	841414-099	14632	
R233	Same as R3				
R234	Same as R93				
R235 Thru R243	Same as R3				
R244	Same as R10				
R245	Same as R10				
R246 Thru R252	Same as R3				
R253	Same as R93				
R254	Resistor, Fixed, 220Ω, ±5%, .1W	3	841414-057	14632	
R255	Not Used				
R256	Not Used				
R257 Thru R260	Same as R34				
R261 Thru R264	Same as R3				
R265	Same as R18				
R266	Same as R3				
R267	Not Used				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R268	Same as R34
R269	Same as R254
R270	Same as R103
R271	Same as R34
R272	Not Used
R273 Thru R276	Same as R10
R277 Thru R281	Same as R3
R282 Thru R285	Same as R10
R286 Thru R290	Same as R3
R291 Thru R302	Same as R34
R303	Not Used
R304	Same as R34
R305	Same as R3
R306	Same as R3
R307	Same as R148
R308	Same as R18
R309	Not Used
R310	Same as R34
R311	Same as R150
R312	Same as R151
R313	Same as R10
R314	Same as R93
R315 Thru R323	Not Used
R324	Same as R34
R325 Thru R345	Same as R3
R346 Thru R348	Not Used

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R349	Resistor, Fixed, 91Ω, ±5%, .1W	1	841414-048	14632	
R350	Not Used				
R351	Not Used				
R352 Thru R415	Same as R3				
R416	Same as R76				
R417	Same as R4				
R418	Not Used				
R419	Same as R22				
R420	Same as R93				
R421	Resistor, Fixed, 5.6kΩ, ±5%, .1W	4	841414-091	14632	
R422 Thru R424	Same as R421				
R425	Same as R254				
R426	Same as R93				
R427 Thru R443	Same as R3				
R444	Same as R18				
R445	Same as R18				
R446	Same as R27				
R447	Varistor 100kΩ, ±20%, .25W	1	3314G-1-104E	80294	
R448	Same as R4				
R449	Same as R22				
R450	Same as R1				
R451	Same as R22				
R452	Same as R1				
R453	Same as R22				
R454	Same as R1				
R455	Same as R22				
R456	Same as R1				
R457	Same as R10				
R458	Same as R93				
R459	Same as R10				
R460	Same as R10				
R461	Not Used				
R462	Same as R27				
R463	Same as R3				
R464 Thru R470	Same as R10				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

R471 Thru R473	Not Used				
R474 Thru R477	Same as R10				
R478	Same as R3				
R479	Same as R3				
R480	Not Used				
R481	Not Used				
R482	Resistor, Fixed, 56Ω, 5%, .1W	1	841414-043	14632	
S1	Switch, DIP, SPST	2	CHS-08A	16546	
S2	Same as S1				
T1	Transformer, Audio, 600CT	2	SPT-130	20462	
T2	Same as T1				
U1	Integrated Circuit, Octal Bus Transceiver	2	74F245 SOL20	01295	
U2	Integrated Circuit, Digital Signal Processor 40 MHz	2	TMS320C31PQL-40	01295	
U3	Integrated Circuit, 1-Of-8 Decoder, Demultiplexer	2	74F138 SO16	04713	
U4	Integrated Circuit, Dual D Flip-Flop With Preset And Clear	1	74HC74 SO14	04713	
U5	Integrated Circuit, Fast Dual JK Pos-Edge-Trig Flip-Flop	1	74F109 SO16	04713	
U6	Integrated Circuit, Quad 2-Input AND Gate	1	74F08 SO14	18324	
U7	Integrated Circuit, SRAM,128K X 8	4	MT5C1008DJ-25	6Y440	
U8 Thru U10	Same as U7				
U11	Same as U1				
U12	Same as U2				
U13	Same as U3				
U14	Integrated Circuit, EEPROM 16K (2K X 8)	1	AT28C16-25JC	1FN41	
U15	Integrated Circuit, Quad 2-Input AND Gate	2	74ACT08 SO14	34371	
U16	Not Used				
U17	Integrated Circuit, SRAM 32K X 8	4	MT5C2568DJ-25	6Y440	
U18 Thru U20	Same as U17				
U21	Integrated Circuit, Hex Inverter Schmitt Trigger	1	74F14 SO14	04713	
U22	Integrated Circuit, CMOS Binary Counter	2	74FCT161T SOL16	61772	
U23	Same as U22				
U24	Integrated Circuit, F-Logic Dual D-Type Flip Flops	2	74F74 SO14	04713	
U25	Voltage, Regulator, 3 Terminal,-5V	1	MC79M05CDT	04713	
U26	Amplifier, JFET-Input Op Amp	3	TL061CD	04713	
U27	Same as U26				
U28	Same as U26				
U29	Amplifier JFET-Input Dual Op Amp	2	MC34002D	04713	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A2

U30	Amplifier, Wide BW Op Amp	1	AD9617JR	24355	
U31	Integrated Circuit, A/D Converter, 12 BIT	1	ADC12062CIV	27014	
U32	Not Used				
U33	Integrated Circuit, FIR Filter	6	HSP43124SC-45	3G472	
U34 Thru U38	Same as U33				
U39	Integrated Circuit, 1-Of-8 Decoder, Demultiplexer	2	74ACT138 SO16	34369	
U40	Integrated Circuit, Octal Buffer	1	74ACT244 SOL20	04713	
U41	Integrated Circuit, Numerically Controlled Oscillator	1	HSP45106JC-25	34371	
U42	Integrated Circuit, D/A Converter	3	AD1851R	24355	
U43	Amplifier, Op Amp	7	NE5534D	18324	
U44	Integrated Circuit, Op Amp	1	AD797BR	24355	
U45	Same as U42				
U46 Thru U48	Same as U43				
U49	Integrated Circuit, Analog Multiplexer, DemultiplexeR	1	74HC4053 SO16	02735	
U50	Integrated Circuit, Dynamic Range Processor	1	SSM-2122P	06665	
U51	Same as U43				
U52	Same as U43				
U53	Integrated Circuit, 32-Bit Microcontroller	1	MC68331CFC16	04713	
U54	Integrated Circuit, SRAM 128K X 8	2	MT5C1008DJ-25PLT	6Y440	
U55	Same as U54				
U56	Integrated Circuit, EPROM,2MB, Programmed	1	842129-001	14632	
XU56	Socket, Leadless Chip Carrier.	2	NEP95-32-SMC-451	0HSF8	
U57	Integrated Circuit, EPROM, 2MB, Programmed	1	842130-001	14632	
XU57	Same as XU56				
U58	Integrated Circuit, Switch	1	DG411DY	17856	
U59	Integrated Circuit, Voltage Reference	2	LM4040CIM3-4.1	27014	
U60	Integrated Circuit, 8 Channel Track, Hold	1	AD7828LP	24355	
U61	Integrated Circuit, Hex Inverter	2	74ACT04 SO14	34371	
U62	Integrated Circuit, Octal D-Type Flip-Flop 3-State	2	74ACT574 SOL20	34371	
U63	Integrated Circuit, DUART	1	SC26C92C1A	18324	
U64	Integrated Circuit, Differential Bus Transceiver	2	LTC485CS8	64155	
U65	Same as U64				
U66	Integrated Circuit, Gpib Interface, IEEE-488	1	TMS9914AFNL	01295	
U67	Integrated Circuit, 8 Channel Bidirectional Transceiver	1	SN75ALS160DW	01295	
U68	Integrated Circuit, Interface Bus Transceiver	1	SN75ALS162DW	01295	
U69	Integrated Circuit, FLEX, SRAM Based Logic	2	EpF,8452AQC160-5	67183	
U70	Same as U69				
U71	Integrated Circuit, Non-Inverting Octal Buffer, Line Driver	4	74FCT244 SOL20	61772	

REF DESIG PREFIX A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U72	Same as U71				
U73	Same as U71				
U74	Integrated Circuit, Microcontroller, Programed	1	842133-001	14632	
XU74	Socket, Leadless Chip Carrier	2	213-044-601	26742	
U75	Same as U24				
U76	Integrated Circuit, Switching Regulator	1	LT1172CS8	64155	
U77	Same as U42				
U78	Amplifier, JFET-Input Op Amp	1	MC34001D	04713	
U79	Integrated Circuit, Bus 16-Bit XCVR.	1	74ACTQ16245 SSOP48	27014	
U80	Integrated Circuit, Octal Bidirectional XCVR	2	74ACT245 SOL20	34369	
U81	Integrated Circuit, Line Driver	5	SN75155D	01295	
U82	Integrated Circuit, Quad 2-Input OR Gate	1	74ACT32 SO14	34371	
U83	Same as U15				
U84	Integrated Circuit, SRAM Non-Volatile Controller	1	BQ2203ASN	TBD03	
U85	Same as U81				
U86	Same as U43				
U87	Same as U59				
U88	Not Used				
U89	Same as U81				
U90	Same as U81				
U91	Integrated Circuit, Line Driver	1	MC3453D	01295	
U92	Integrated Circuit, 8-Bit Shift Register	6	74HC595 SO16	04713	
U93 Thru U97	Same as U92				
U98	Integrated Circuit, Voltage Regulator, +5V	1	MC78M05CDT	04713	
U99	Same as U61				
U100	Integrated Circuit, Quad 2-Input OR Gate	1	74F32 SO14	04713	
U101	Not Used				
U102	Same as U39				
U103	Same as U71				
U104	Same as U81				
U105	Same as U29				
U106	Same as U80				
U107	Same as U62				
U108	Integrated Circuit, EPLD, 32-Macrocell Device, Programmed	1	842131-001	14632	
XU108	Same as XU74				
U109	Integrated Circuit, EPLD, 16-Macrocell Device, Programmed	1	842132-001	14632	
XU109	Socket, 28-Pin J-Lead	1	213-028-602	26742	
VR1	Diode, Zener 10 V	1	MMBZ5240BLT1	04713	
XTB1	Connector, Header, 6-Position	1	ELFH06210	58982	
Y1	Xtal, Quartz, 3.6864 MHz	1	NMS037-20	61441	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

7.5.3 TYPE 797228-1 RF TUNER ASSEMBLY REF DESIG PREFIX A3

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision E1				
A1	1st LO, 1st Converter PC Assembly	1	482902-1	14632	
A2	2nd LO, 2nd Converter PC Assembly	1	482903-1	14632	
MP1	Rod	2	283608-1	14632	
MP2	Same as MP1				

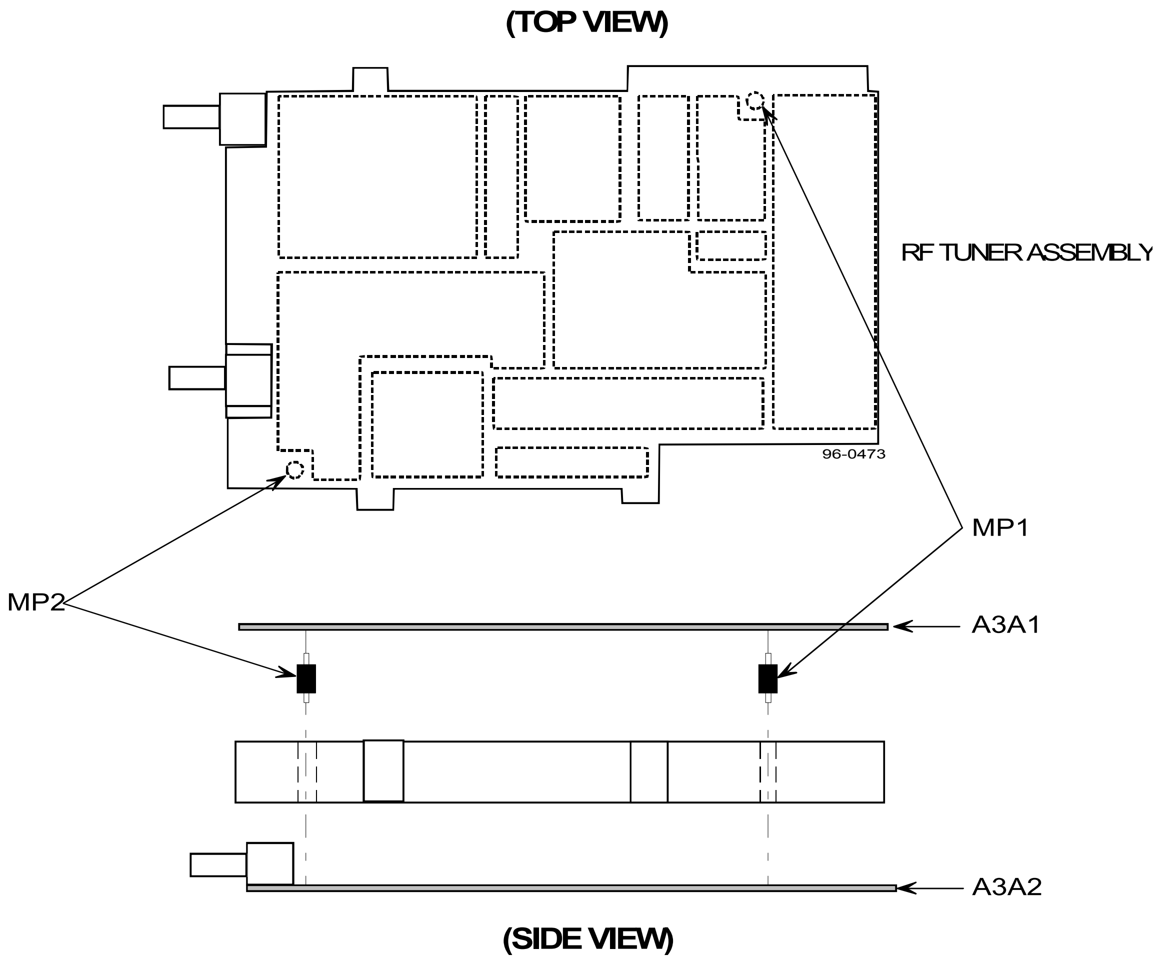

Figure 7-1. Type 797228-1 RF Tuner Assembly, Component Location

7.5.3.1 TYPE 482902-1 1ST LO, 1ST CONVERTER PC ASSEMBLY

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision W1				
E1	Socket Strip 16	1	ESQ-116-44-G-S	55322	
E2	Socket, Receptacle PC Mount, 1 position.	2	SS-101-G-3	55322	
E3	Same as E2				
C1	Capacitor, Ceramic, .047µF, ±10%, 50V	139	841415-023	14632	
C2 Thru C29	Same as C1				
C30	Capacitor, Ceramic, 22pF, ±5%, 50V	27	841415-003	14632	
C31	Same as C1				
C32	Capacitor, Ceramic, 33pF, ±5%, 50V	1	841415-004	14632	
C33	Same as C1				
C34	Same as C30				
C35	Same as C1				
C36	Capacitor, Tantalum, 4.7µF, ±20%, 20V	3	841293-25	14632	
C37	Capacitor, Ceramic, 100pF, ±5%, 50V	32	841415-007	14632	
C38	Capacitor, Ceramic, 3.0pF, ± .1 pF, 500V	2	ATC100B3ROBP500X	29990	
C39	Capacitor, Ceramic, 3.9pF, ±.1pF, 500V	4	ATC100B3R9BP500X	29990	
C40 Thru C42	Same as C39				
C43	Same as C38				
C44	Same as C1				
C45	Same as C37				
C46	Same as C1				
C47	Same as C1				
C48	Same as C37				
C49	Same as C37				
C50 Thru C53	Same as C1				
C54	Same as C37				
C55	Same as C1				
C56	Same as C1				
C57	Capacitor, Ceramic, 4.7pF, ±.1pF, 50V	1	841416-017	14632	
C58	Same as C37				
C59	Same as C37				
C60	Same as C1				
C61 Thru C64	Same as C37				
C65	Capacitor, Ceramic, 1000pF, ±10%, 50V	27	841415-013	14632	
C66	Same as C37				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C67	Same as C1				
C68	Capacitor, Tantalum, 3.3µF, ±20%, 16V	2	841293-36	14632	
C69	Same as C1				
C70	Same as C68				
C71 Thru C77	Same as C1				
C78 Thru C82	Same as C37				
C83 Thru C87	Same as C1				
C88	Capacitor, Tantalum, 68µF, ±20%, 10V	3	T491D686K010AS	31433	
C89	Capacitor, .47µF, ±10%, 25V	7	VJ1210Y474KXXMT	95275	
C90	Same as C36				
C91	Same as C89				
C92	Same as C1				
C93 Thru C97	Same as C37				
C98	Same as C88				
C99	Same as C36				
C100	Same as C1				
C101	Capacitor, Tantalum, 100µF, ±20%, 10V	10	T495X107K010AS	31433	
C102	Same as C1				
C103	Same as C1				
C104	Same as C65				
C105	Capacitor, Ceramic, 680pF, ±10%, 50V	1	841415-012	14632	
C106	Same as C1				
C107	Same as C65				
C108	Same as C1				
C109	Same as C1				
C110	Same as C88				
C111	Capacitor, Tantalum, 1.0µF, ±20%, 35V	1	841293-05	14632	
C112 Thru C114	Same as C1				
C115 Thru C126	Same as C65				
C127	Capacitor, Ceramic, .01µF, ±10%, 50V	1	841415-019	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A1

C128 Thru C131	Same as C89				
C132	Capacitor, Ceramic, 2200pF, ±10%, 50V	2	841415-015	14632	
C133	Capacitor, Ceramic, 68pF, ±5%, 50V	1	841415-006	14632	
C134	Capacitor, Ceramic, 1500pF, ±10%, 50V	1	841415-014	14632	
C135	Capacitor, Ceramic, 150pF, ±5%, 50V	1	841415-008	14632	
C136	Capacitor, Ceramic, 3300pF, ±10%, 50V	1	841415-016	14632	
C137	Capacitor, Ceramic, 330pF, ±5%, 50V	1	841415-010	14632	
C138 Thru C140	Same as C1				
C141	Same as C37				
C142	Same as C37				
C143	Capacitor, Tantalum, 33µF, ±20%, 16V	3	841293-22	14632	
C144	Same as C1				
C145 Thru C147	Same as C30				
C148	Capacitor, Ceramic, 1.5pF, ±.05pF, 150V	1	ATC100A1R5AW150X	29990	
C149	Same as C30				
C150	Same as C1				
C151 Thru C153	Same as C30				
C154	Capacitor, Ceramic, 1.8pF, ±.05pF, 150V	1	ATC100A1R8AW150X	29990	
C155	Same as C30				
C156	Same as C1				
C157 Thru C159	Same as C30				
C160	Capacitor, Ceramic, 3pF, ±.01pF, 50V	1	841416-012	14632	
C161	Same as C30				
C162 Thru C166	Same as C1				
C167	Same as C143				
C168	Same as C1				
C169	Same as C1				
C170	Capacitor, Tantulum, 33µF, 16V	1	T495X336K025AS	31433	
C171	Same as C143				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C172 Thru C176	Same as C1				
C177 Thru C179	Same as C65				
C180	Same as C1				
C181	Same as C1				
C182 Thru C184	Same as C30				
C185	Capacitor, Ceramic, 1pF, ±.05pF, 150V	2	ATC100A1R0AW150X	29990	
C186	Same as C30				
C187	Same as C1				
C188	Same as C1				
C189	Same as C65				
C190 Thru C197	Same as C1				
C198	Same as C30				
C199	Same as C30				
C200	Capacitor, Ceramic, .7pF, ±.05pF, 150V	1	ATC100A0R7AW150X	29990	
C201	Same as C1				
C202	Same as C65				
C203	Same as C30				
C204	Same as C30				
C205	Same as C1				
C206	Same as C30				
C207	Same as C30				
C208	Same as C185				
C209	Same as C1				
C210	Same as C65				
C211	Same as C30				
C212	Same as C30				
C213 Thru C218	Same as C1				
C219	Same as C30				
C220 Thru C223	Same as C1				
C224	Same as C37				
C225	Same as C1				
C226	Same as C1				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C227	Same as C1				
C228 Thru C230	Same as C37				
C231 Thru C233	Same as C1				
C234	Same as C37				
C235	Same as C101				
C236	Same as C101				
C237 Thru C241	Same as C1				
C242 Thru C244	Same as C65				
C245 Thru C248	Same as C1				
C249	Same as C65				
C250	Same as C65				
C251 Thru C253	Same as C1				
C254	Same as C65				
C255	Same as C101				
C256	Same as C101				
C257	Same as C1				
C258	Same as C101				
C259	Same as C101				
C260	Same as C1				
C261	Same as C101				
C262	Same as C101				
C263	Same as C1				
C264	Capacitor, Ceramic, 4700pF, ±10%, 50V	1	841415-017	14632	
C265	Same as C132				
C266 Thru C268	Same as C1				
C269	Same as C37				
C270	Same as C1				
C271	Capacitor, Ceramic, 3.3pF, ±.1pF, 50V	1	841416-013	14632	
C272	Same as C1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A1

C273	Same as C1				
C274	Capacitor, Ceramic, 15pF, ±2%, 50V	1	841416-029	14632	
C275	Same as C89				
C276	Same as C1				
C277	Capacitor, Ceramic, 2.2pF, ±.1pF, 150V	2	ATC100A2R2BW150X	29990	
C278	Capacitor, Ceramic, 3.9pF, ±.1pF, 150V	1	ATC100A3R9BW150X	29990	
C279	Same as C277				
C280	Same as C37				
C281	Same as C37				
C282	Same as C1				
C283	Same as C101				
C284	Same as C1				
CR1	Diode, PIN	20	HSMP-3892 T31	28480	
CR2	Diode, Varactor	22	MA4ST409CK	96341	
CR3 Thru CR6	Same as CR2				
CR7	Diode, Varactor	6	MA4ST406CK	96341	
CR8 Thru CR10	Same as CR7				
CR11	Same as CR2				
CR12	Same as CR7				
CR13	Same as CR7				
CR14	Diode, Varactor	4	MA4ST401CK	96341	
CR15	Same as CR14				
CR16	Same as CR1				
CR17	Same as CR1				
CR18	Same as CR14				
CR19	Same as CR14				
CR20 Thru CR25	Same as CR1				
CR26	Diode, Varactor	4	MA4ST405CK	1HJ31	
CR27 Thru CR29	Same as CR26				
CR30 Thru CR33	Same as CR1				
CR34 Thru CR45	Same as CR2				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
CR46 Thru CR49	Same as CR1				
CR50	Diode, Switching PIN,	9	MMBD7000LT1	04713	
CR51 Thru CR55	Same as CR50				
CR56	Diode, Tuning	6	BB811E7263	25088	
CR57	Same as CR50				
CR58 Thru CR62	Same as CR56				
CR63 Thru CR65	Same as CR1				
CR66 Thru CR69	Same as CR2				
CR70	Same as CR50				
CR71	Same as CR50				
DS1	LED, Red Subminiature	1	HLMP-6620-031	28480	
FB1	Not Used				
FB2	Not Used				
FB3	Ferrite, Bead	1	CB70-201209T	54583	
FL1	1350 MHz Bandpass Filter Assembly	1	383840-1	14632	
XFL1-2	Socket	2	0329-0-15-15-34-27-10	3N087	
J1	Connector, Receptacle, SMA, Rt Angle	1	9647-7513-000	19505	
JP1	Connector, 4-Pin	5	ULPSMD02S33-02	4W716	
JP2 Thru JP5	Same as JP1				
L1	Inductor, 4.7µH, ±20%	28	B82422-A1472-M	25088	
L2	Inductor, 220nH, ±5%	6	841438-033	14632	
L3 Thru L6	Same as L2				
L7	Inductor, 27nH, ±5%	6	841438-011	14632	
L8	Same as L2				
L9	Same as L7				
L10	Same as L1				
L11 Thru L14	Same as L7				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L15 Thru L22	Same as L1				
L23	Inductor, 18nH, ±5%	6	841438-007	14632	
L24 Thru L28	Same as L23				
L29	Same as L1				
L30	Inductor, 82nH, ±5%	7	841438-023	14632	
L31	Same as L30				
L32	Same as L1				
L33	Same as L1				
L34 Thru L38	Same as L30				
L39	Same as L1				
L40	Inductor, Spring, 8.0nH, ±5%	2	A03T	02113	
L41	Inductor, Spring, 12.5nH, ±5%	5	A04T	02113	
L42 Thru L45	Same as L41				
L46	Same as L40				
L47	Inductor, Spring, 2.5nH, ±10%	2	A01T	02113	
L48	Inductor, 100nH, ±5%	2	841438-025	14632	
L49	Same as L1				
L50	Inductor,1.0µH, ±20%	7	B82422-A1102-M	25088	
L51	Same as L1				
L52 Thru L54	Same as L50				
L55	Inductor, Coil 100µH, ±10%	1	CD105-101KC	0TZP6	
L56 Thru L58	Same as L1				
L59	Inductor, 150nH, ±5%	1	841438-029	14632	
L60	Inductor, 820µH, ±5%	1	841444-071	14632	
L61	Inductor, 680µH, ±5%	1	841444-069	14632	
L62	Inductor, 10nH, ±10%	8	841438-001	14632	
L63 Thru L65	Same as L62				
L66	Inductor, Spring 28nH, ±5%	5	B08T	02113	
L67	Same as L66				
L68	Same as L62				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A1

L69	Same as L66				
L70	Same as L1				
L71	Same as L66				
L72	Same as L50				
L73	Same as L62				
L74	Same as L66				
L75	Inductor, Thin Film Chip, 8.2nH	6	KL732BTE8N2G	59124	
L76 Thru L79	Same as L1				
L80	Same as L47				
L81 Thru L84	Same as L1				
L85 Thru L89	Same as L75				
L90	Same as L50				
L91	Same as L50				
L92	Inductor, Spring 5.0nH, ±10%	2	A02T	02113	
L93	Same as L92				
L94	Same as L62				
L95	Same as L62				
L96	Same as L48				
Q1	Transistor, FET, 0.5-6 GHz	2	ATF-21186	28480	
Q2	Not Used				
Q3	Not Used				
Q4	Transistor, PNP	15	MMBT2907ALT1	04713	
Q5	Same as Q4				
Q6	Transistor, NPN	9	MMBT2222ALT1	04713	
Q7	Same as Q6				
Q8	Transistor, N-Channel Enhancement	2	2N7002-LT1	17856	
Q9	Same as Q8				
Q10	Same as Q6				
Q11	Same as Q6				
Q12	Same as Q4				
Q13	Same as Q6				
Q14	Same as Q4				
Q15	Same as Q6				
Q16	Same as Q4				
Q17	Transistor, NPN	4	NE85633-T1	4T165	
Q18	Same as Q17				
Q19	Same as Q17				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
Q20	Same as Q4				
Q21	Same as Q6				
Q22	Same as Q4				
Q23	Same as Q17				
Q24	Same as Q6				
Q25	Same as Q4				
Q26	Same as Q6				
Q27	Same as Q4				
Q28	Transistor, NPN	2	NE85635	62104	
Q29	Same as Q28				
Q30 Thru Q33	Same as Q4				
Q34	Same as Q1				
Q35	Same as Q4				
Q36	Same as Q4				
R1	Resistor, Fixed, 680Ω, ±5%, .1W	21	841414-069	14632	
R2	Resistor, Fixed, 27kΩ, ±5%, .1W	22	841414-107	14632	
R3	Same as R2				
R4	Resistor, Fixed, 1.0kΩ ±5%, .1W	35	841414-073	14632	
R5	Same as R2				
R6	Same as R4				
R7	Same as R2				
R8	Same as R1				
R9	Same as R1				
R10	Same as R2				
R11	Same as R2				
R12	Same as R4				
R13	Resistor, Fixed, 4.7kΩ, ±5%, .1W	15	841414-089	14632	
R14 Thru R16	Same as R2				
R17	Same as R4				
R18	Same as R1				
R19	Resistor, Fixed, 18kΩ, ±5%, .1W	2	841414-103	14632	
R20 Thru R22	Same as R2				
R23	Same as R1				
R24	Same as R1				
R25 Thru R27	Same as R2				
R28	Same as R4				
R29	Same as R2				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R30	Same as R2				
R31	Same as R1				
R32	Same as R1				
R33	Same as R4				
R34 Thru R38	Same as R2				
R39 Thru R41	Same as R1				
R42	Resistor, Fixed, 10kΩ, ±5%, .1W	35	841414-097	14632	
R43	Jumper .05Ω, MAX 1A MIN@70C	1	841417	14632	
R44	Same as R42				
R45	Same as R1				
R46	Resistor, Fixed, 10Ω, ±5%, .1W	36	841414-025	14632	
R47	Same as R42				
R48	Resistor, Fixed, 22Ω, ±5%, .1W	5	841414-033	14632	
R49	Resistor, Fixed, 47Ω, ±5%, .1W	5	841414-053	14632	
R50	Same as R48				
R51	Resistor, Fixed, 390Ω, ±5%, .1W	1	841414-063	14632	
R52	Not Used				
R53	Same as R46				
R54	Resistor, Fixed, 1.5Ω, ±5%, .1W	1	841414-005	14632	
R55	Resistor, Fixed, 330Ω, ±5%, .1W	4	841414-061	14632	
R56	Same as R49	10	841414-041	14632	
R57	Same as R49				
R58	Same as R4				
R59	Resistor, Fixed, 47kΩ, ±5%, .1W	3	841414-113	14632	
R60	Same as R46				
R61	Same as R46				
R62	Resistor, Fixed, 2.2Ω, ±5%, .1W	2	841414-009	14632	
R63	Same as R62				
R64	Same as R48				
R65 Thru R67	Same as R9				
R68	Same as R48				
R69	Resistor, Fixed, 2.2kΩ, ±5%, .1W	3	841414-081	14632	
R70	Resistor, Fixed, 100Ω, ±5%, .1W	18	841414-049	14632	
R71	Same as R42				
R72	Same as R42				
R73	Same as R69				
R74	Same as R46				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R75	Same as R49				
R76	Same as R46				
R77	Same as R49				
R78	Same as R42				
R79	Same as R46				
R80 Thru R83	Same as R42				
R84 Thru R86	Same as R46				
R87 Thru R89	Same as R42				
R90	Resistor, Fixed, 470Ω, ±5%, .1W	9	841414-065	14632	
R91	Same as R90				
R92	Same as R90				
R93 Thru R96	Same as R46				
R97	Same as R4				
R98	Same as R46				
R99	Same as R42				
R100	Same as R46				
R101	Same as R4				
R102	Resistor, Fixed, 33kΩ, ±5%, .1W	1	841414-109	14632	
R103	Same as R42				
R104	Same as R42				
R105 Thru R109	Same as R70				
R110	Same as R46				
R111	Same as R4				
R112	Same as R46				
R113	Same as R42				
R114	Same as R42				
R115	Same as R4				
R116	Same as R59				
R117	Same as R19				
R118	Same as R46				
R119	Same as R46				
R120	Resistor, Fixed, 220Ω, ±5%, .1W	7	841414-057	14632	
R121	Same as R70				
R122	Same as R70				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A1

R123	Resistor, Fixed, 8.2kΩ, ±5%, .1W	2	841414-095	14632	
R124	Same as R70				
R125	Same as R70				
R126	Same as R4				
R127	Same as R4				
R128	Same as R123				
R129	Resistor, Fixed, 22kΩ, ±5%, .1W	2	841414-105	14632	
R130	Same as R42				
R131	Same as R4				
R132	Same as R46				
R133	Same as R42				
R134	Same as R42				
R135	Resistor, Fixed, 100kΩ, ±5%, .1W	2	841414-121	14632	
R136	Same as R129				
R137	Same as R59				
R138	Same as R42				
R139	Same as R135				
R140	Same as R42				
R141	Same as R42				
R142	Resistor, Fixed, 91kΩ, ±5%, .1W -55+125C	7	841414-120	14632	
R143	Same as R70				
R144	Same as R42				
R145 Thru R163	Same as R4				
R164	Same as R70				
R165	Same as R70				
R166	Same as R49				
R167	Same as R70				
R168	Same as R49				
R169	Same as R142				
R170	Same as R142				
R171	Same as R13				
R172	Same as R13				
R173	Same as R142				
R174	Same as R13				
R175	Same as R13				
R176	Same as R142				
R177	Same as R13				
R178	Same as R13				
R179	Same as R46				
R180	Resistor, Fixed, 360Ω, ±5%, .1W	6	841414-062	14632	
R181	Same as R1				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R182	Same as R120				
R183	Same as R13				
R184	Resistor, Fixed, 68Ω, ±5%, .1W	5	841414-045	14632	
R185	Resistor, Fixed, 33Ω, ±5%, .1W	14	841414-037	14632	
R186	Same as R185				
R187	Same as R46				
R188	Same as R180				
R189	Same as R1				
R190	Same as R120				
R191	Same as R13				
R192	Same as R184				
R193	Same as R185				
R194	Same as R185				
R195	Same as R46				
R196	Same as R180				
R197	Same as R1				
R198	Same as R120				
R199	Same as R184				
R200	Same as R185				
R201	Same as R185				
R202	Same as R13				
R203	Same as R13				
R204	Same as R69				
R205	Same as R4				
R206	Same as R46				
R207	Resistor, Fixed, 6.8kΩ, ±5%, .1W	1	841414-093	14632	
R208	Same as R42				
R209	Same as R48				
R210	Same as R46				
R211	Same as R180				
R212	Same as R1				
R213	Same as R120				
R214	Same as R184				
R215	Same as R185				
R216	Same as R185				
R217	Same as R142				
R218	Same as R13				
R219	Same as R13				
R220	Same as R142				
R221	Same as R13				
R222	Same as R13				
R223	Same as R120				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R224	Same as R184				
R225	Same as R185				
R226	Same as R46				
R227	Same as R180				
R228	Same as R1				
R229	Same as R185				
R230	Same as R120				
R231	Same as R185				
R232	Same as R70				
R233	Same as R185				
R234	Resistor, Fixed, 3.3kΩ, ±5%, .1W	2	841414-085	14632	
R235	Not Used				
R236	Same as R46				
R237	Same as R180				
R238	Same as R1				
R239 Thru R245	Not Used				
R246 Thru R248	Same as R1				
R249	Same as R46				
R250 Thru R255	Same as R42				
R256 Thru R258	Same as R46				
R259	Same as R42				
R260	Same as R42				
R261 Thru R263	Same as R90				
R264	Same as R46				
R265	Resistor, Fixed, 180Ω, ±5%, .1W	2	841414-055	14632	
R266 Thru R268	Not Used				
R269	Same as R90				
R270	Resistor, Fixed, 15Ω, ±5%, .1W	2	841414-029	14632	
R271	Same as R90				
R272	Same as R49				
R273	Same as R70				
R274	Same as R70				
R275	Same as R46				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R276	Same as R270				
R277	Same as R55				
R278	Same as R55				
R279	Same as R185				
R280	Resistor, Fixed, 150Ω, ±5%, .1W	4	841414-053	14632	
R281	Same as R280				
R282	Same as R46				
R283	Same as R185				
R284	Same as R280				
R285	Same as R280				
R286	Resistor, Fixed, 6.8Ω, ±5%, .1W	1	841414-021	14632	
R287	Same as R90				
R288	Same as R234				
R289	Same as R70				
R290	Same as R55				
R291	Same as R42				
R292	Resistor, Fixed, 7.5kΩ, ±5%, .1W	1	841414-094	14632	
R293	Same as R4				
R294	Resistor, Fixed, 7.5Ω, ±5%, .1W	1	841414-022	14632	
R295	Same as R265				
R296	Same as R46				
R297	Not Used				
U1	Amplifier, RF	1	QBH-147	55027	
U2	Mixer	1	WJ-SM4TH	14482	
U3	Amplifier	1	VNA-25	15542	
U4	Amplifier, GAAS	2	CGY-50	0CF99	
U5	Same as U4				
U6	Amplifier, CMOS, Dual Operational	1	LMC662CM	27014	
U7	Integrated Circuit 8-Stage Shift, Store Register	4	HEF4094BTD	18324	
U8	Amplifier,. JFET, Quad Opamp	2	MC33184D	04713	
U9	Amplifier, JFET, Operational Amplifier	1	TL061CD	04713	
U10	Integrated Circuit, Voltage Regulator, -5V	1	MC79L05ACD	04713	
U11	Integrated Circuit, Dual 4-Bit Decade And Binary Counters	2	74HC390	02735	
U12	Same as U11				
U13	PAL, A Counter	1	842211-1	14632	
U14	PAL, N Counter	1	842210-1	14632	
U15	Integrated Circuit, Dual D Flip-Flop With Preset And Clear	1	74HC74	04713	
U16	Integrated Circuit, Quad 2-Input NOR Gate	1	74HC02	02735	
U17	Amplifier, JFET-Input Dual Op Amp	1	MC34002D	04713	
U18	Voltage Regulator, Adjustable	1	MC1723CD	04713	
U19 Thru U21	Same as U7				

REF DESIG PREFIX A3A1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U22	Integrated Circuit, F-Logic Quad 2-Input NOR Gate	1	74F02 SO14	27014	
U23	Same as U8				
U24	Powersplitter, 500-2000 MHz	1	SPL, 2EF-01	12855	
U25	Integrated Circuit, Voltage Regulator, +5V	4	TK11550MT	TOKO-	
U26	Integrated Circuit, Wide Band Amplifier	1	UPC2711T	4T165	
U27	Integrated Circuit, Divide By 2 Prescaler	1	UPB584G	33297	
U28	Integrated Circuit, Wideband Amplifier	1	UPC2713T-E3	62104	
U29	Integrated Circuit, Dual Modulus Prescaler	1	MC12026AD	04713	
U30 Thru U32	Same as U25				
U33	Integrated Circuit, Cmos Op. Amp.	1	LMC6482IM	27014	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

7.5.3.2 TYPE 482903-1 2ND LO, 2ND CONVERTER PC ASSEMBLY

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision V1				
E1	Terminal, Coax, Rt Angle	2	D-607-10	06090	
E2	Same as E1				
E3	Cable, Assembly 50-Position	1	IDMD-25-T-6.0	55322	
E4	Socket, Receptacle PC Mount, 1 Position	2	SS-101-G-3	55322	
E5	Same as E4				
AT1	Attenuator, 4 Bit Digital, 1 To 15 dB	1	AT-210	11556	
A2P1	Connector, Plug, SMB	2	2105-7521-025	06090	
A2P2	Same as A2P1				
C1	Capacitor, Ceramic, 47pF, ±2%, 50V	4	841416-041	14632	
C2	Capacitor, Ceramic, 220pF, ±2%, 50V	1	841416-057	14632	
C3	Capacitor, Ceramic, 270pF, ±2%, 50V	3	841416-059	14632	
C4	Capacitor, Ceramic, 100pF, ±2%, 50V	3	841416-049	14632	
C5	Capacitor, Ceramic, 33pF, ±2%, 50V	5	841416-037	14632	
C6	Capacitor, Ceramic, 470pF, ±2%, 50V	3	841416-065	14632	
C7	Capacitor, Ceramic, 56pF, ±2%, 50V	2	841416-043	14632	
C8	Capacitor, Ceramic, 150pF, ±2%, 50V	3	841416-053	14632	
C9	Capacitor, Ceramic, .047µF, ±10%, 50V	151	841415-023	14632	
C10 Thru C14	Same as C9				
C15	Capacitor, Tantalum, 4.7µF, ±20%, 20V	5	841293-37	14632	
C16	Same as C9				
C17	Same as C5				
C18	Capacitor, Ceramic, 330pF, ±2%, 50V	4	841416-061	14632	
C19	Same as C7				
C20	Same as C18				
C21 Thru C25	Same as C9				
C26	Capacitor, Ceramic, 100pF, ±5%, 50V	28	841415-007	14632	
C27 Thru C33	Same as C26				
C34 Thru C36	Same as C9				
C37	Capacitor, Ceramic, 10pF, ±2%, 50V	4	841416-025	14632	
C38	Capacitor, Ceramic, 22pF, ±2%, 50V	6	841416-033	14632	
C39	Capacitor, Ceramic, 560pF, ±2%, 50V	1	841416-067	14632	
C40	Same as C3				
C41 Thru C44	Same as C9				
C45	Capicitor, Tantulum, 6.8 µF, ±20%, 10V	13	841293-37	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C46 Thru C48	Same as C9				
C49	Same as C38				
C50	Same as C37				
C51	Same as C9				
C52	Capacitor, Tantalum, 68µF, ±20%, 10V	10	841293-31	14632	
C53	Capacitor, Ceramic, 4700pF, ±10%, 50V	3	841415-017	14632	
C54	Same as C53				
C55 Thru C58	Same as C9				
C59	Capacitor, Ceramic, 10pF, ±5%, 50V	5	841415-001	14632	
C60	Same as C9				
C61	Capacitor, Ceramic, 6800pF, ±10%, 50V	1	841415-018	14632	
C62	Same as C9				
C63	Capacitor, Ceramic, 2200pF, ±10%, 50V	1	841415-015	14632	
C64	Same as C38				
C65	Same as C38				
C66	Same as C38				
C67	Capacitor, Variable, 2-6pF, 100V	1	TZBX4Z060BE110TOO	72982	
C68	Same as C26				
C69	Same as C9				
C70	Same as C9				
C71	Same as C52				
C72	Same as C9				
C73	Same as C45				
C74	Same as C9				
C75	Capacitor, Ceramic, 4.7pF, ±.1pF, 50V	2	841416-017	14632	
C76 Thru C79	Same as C9				
C80	Capacitor, Ceramic, 1000pF, ±10%, 50V	16	841415-013	14632	
C81	Same as C9				
C82	Same as C9				
C83	Same as C52				
C84	Same as C52				
C85	Same as C80				
C86 Thru C90	Same as C9				
C91	Same as C18				
C92	Same as C18				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
C93	Same as C9				
C94	Capacitor .47µF, ±10%, 25V	9	VJ1210Y474KXXMT	95275	
C95	Same as C94				
C96 Thru C99	Same as C9				
C100	Same as C53				
C101	Same as C94				
C102	Same as C94				
C103	Capacitor, Ceramic, .8pF, ±.05pF, 150V	2	ATC100A0R8AW150X	29990	
C104	Capacitor, Ceramic, .9 pF, ±.05pF, 150V	2	ATC100A0R9AW150X	29990	
C105	Capacitor, Ceramic, 3.3pF, ±.1pF, 50V	1	841416-013	14632	
C106	Same as C9				
C107	Same as C9				
C108	Same as C59				
C109	Same as C45				
C110 Thru C112	Same as C9				
C113	Capacitor, Ceramic, 3.6pF, ±.1pF, 50V	2	841416-014	14632	
C114	Same as C80				
C115	Same as C59				
C116	Same as C9				
C117	Same as C113				
C118 Thru C121	Same as C9				
C122	Capacitor, Ceramic, 1.3pF, ±.1pF, 50V	1	841416-004	14632	
C123	Same as C59				
C124	Same as C9				
C125	Same as C45				
C126	Same as C4				
C127	Same as C80				
C128	Same as C4				
C129	Same as C9				
C130	Same as C9				
C131	Same as C15				
C132	Same as C80				
C133	Capacitor, Ceramic, 2.2 pF, ±.1 pF, 50V	1	841416-009	14632	
C134	Same as C80				
C135	Same as C104				
C136	Same as C26				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

C137	Same as C9				
C138	Same as C15				
C139	Same as C103				
C140	Same as C9				
C141	Same as C26				
C142 Thru C146	Same as C9				
C147	Capacitor, Ceramic, .022µF, ±10%, 50V	1	841415-021	14632	
C148	Same as C3				
C149	Same as C9				
C150	Same as C45				
C151 Thru C158	Same as C80				
C159	Same as C59				
C160 Thru C163	Same as C9				
C164	Same as C45				
C165	Same as C9				
C166	Same as C9				
C167	Same as C45				
C168	Same as C9				
C169	Same as C45				
C170	Same as C9				
C171	Capacitor, Ceramic, 15pF, ±2%, 50V	2	841416-029	14632	
C172	Same as C171				
C173	Same as C9				
C174	Same as C9				
C175	Capacitor, Ceramic, 470pF, ±5%, 50V	2	841415-011	14632	
C176	Same as C175				
C177	Capacitor, Tantalum, 6.8µF, ±20%, 16V	6	841293-26	14632	
C178	Same as C9				
C179	Same as C177				
C180	Same as C9				
C181	Same as C177				
C182	Same as C177				
C183	Capacitor, Ceramic, 4700pF, ±2%, 50V	8	841314-089	14632	
C184	Capacitor, Ceramic, 1000pF, ±2%, 50V	2	841314-073	14632	
C185	Same as C184				
C186	Capacitor, Ceramic, 2700pF, ±2%, 50V	1	841314-083	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

C187	Same as C9				
C188	Same as C45				
C189 Thru C192	Same as C9				
C193	Capacitor, Ceramic, 820pF, ±2%, 50V	2	841314-071	14632	
C194	Same as C193				
C195	Same as C183				
C196	Same as C9				
C197	Same as C183				
C198	Same as C9				
C199 Thru C202	Same as C183				
C203	Same as C5				
C204	Capacitor, Variable, 4.5-20pF, 50V	1	TZBX4R200BE110TOO	72982	
C205	Same as C8				
C206	Same as C8				
C207	Same as C5				
C208	Capacitor, Ceramic, 390pF, ±2%, 50V	3	841416-063	14632	
C209	Same as C9				
C210	Same as C38				
C211	Same as C6				
C212	Same as C9				
C213	Same as C45				
C214	Same as C9				
C215	Same as C1				
C216 Thru C219	Same as C9				
C220	Same as C208				
C221 Thru C224	Same as C9				
C225	Same as C45				
C226	Same as C9				
C227	Capacitor, Ceramic, 82pF, ±2%, 50V	1	841416-047	14632	
C228 Thru C230	Same as C9				
C231	Same as C45				
C232	Same as C26				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

C233	Same as C9				
C234	Same as C1				
C235	Same as C5				
C236	Same as C208				
C237	Same as C37				
C238	Same as C183				
C239	Same as C9				
C240	Same as C52				
C241	Same as C52				
C242 Thru C248	Same as C9				
C249	Capacitor, Ceramic, .033µF, ±10%, 50V	1	841415-022	14632	
C250	Capacitor, Tantalum, .33µF, ±20%, 35V	1	841293-01	14632	
C251	Not Used				
C252	Same as C80				
C253	Same as C1				
C254	Capacitor, Ceramic, 51pF, ±2%, 50V	1	841416-042	14632	
C255	Capacitor, Ceramic, 180pF, ±2%, 50V	1	841416-055	14632	
C256	Same as C37				
C257 Thru C260	Same as C9				
C261	Same as C80				
C262 Thru C265	Same as C9				
C266	Same as C177				
C267	Same as C177				
C268	Same as C52				
C269	Same as C94				
C270	Capacitor, Tantalum, 4.7µF, ±20%, 20V	1	841293-25	14632	
C271	Same as C94				
C272	Same as C94				
C273	Same as C9				
C274	Same as C52				
C275 Thru C286	Same as C26				
C287	Same as C52				
C288	Same as C52				
C289 Thru C296	Same as C9				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

C297	Same as C45				
C298	Same as C45				
C299	Same as C9				
C300	Same as C9				
C301	Same as C26				
C302	Same as C6				
C303 Thru C309	Same as C9				
C310 Thru C312	Same as C26				
C313 Thru C320	Same as C9				
C321	Same as C15				
C322	Same as C94				
C323	Same as C94				
C324 Thru C326	Same as C9				
C327	Capacitor, Variable, 7-50pF, 50V	2	TZBX4R500BE110TO	72982	
C328	Same as C75				
C329	Same as C327				
C330	Same as C9				
C331	Capacitor, Tantalum, 100µF, ±20%, 6V	2	841293-32	14632	
C332	Not Used				
C333	Not Used				
C334	Same as C331				
C335	Not Used				
C336	Capacitor, Ceramic, 1.5 pF, ±.05pF, 150V	2	ATC100A1R5AW150X	29990	
C337	Capacitor, Ceramic, 3.6 pF, ±.1 pF, 150V	1	ATC100A3R6BW150X	29990	
C338	Same as C336				
C339	Same as C9				
CR1	Diode PIN Diode	4	HSMP-3822-T31	28480	
CR2 Thru CR4	Same as CR1				
CR5	Diode, Switching	13	MMBD7000LT1	04713	
CR6	Same as CR5				
CR7	Diode, Varactor	1	MA4ST401CK	96341	
CR8	Diode, Schottky Barrier	3	HSMS-2812-T31	28480	
CR9	Same as CR8				
CR10	Same as CR5				
CR11	Diode, Tuning	2	BB811E7263	25088	
CR12	Same as CR8				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
CR13	Same as CR5				
CR14	Same as CR5				
CR15	Same as CR11				
CR16	Same as CR5				
CR17	Same as CR5				
CR18	Diode, Tuning	2	KV38S2	50101	
CR19	Same as CR18				
CR20	Diode	1	MMBV105G	04713	
CR21					
Thru	Same as CR5				
CR26					
DS1	LED, Red Subminiature	5	HLMP-6620-031	28480	
DS2					
Thru	Same as DS1				
DS5					
DS6	LED, Red	4	LSS260-DOE7502	25088	
DS7					
Thru	Same as DS6				
DS9					
FB1	Ferrite Bead	4	CB70-201209T	54583	
FB2					
Thru	Same as FB1				
FB4					
FL1	Filter, Modified	1	283590-1	14632	
FL2	Filter, EMI 4700pF, 50V	2	NFM61R30T472B1	51406	
FL3	Same as FL2				
J1	Connector, BNC, Rt. Angle	2	227677-1	00779	
J2	Same as J1				
J3	Connector, Header, 16 PIN	1	TSW-116-07-G-S	55322	
JP1	Connector, 4-Pin	6	ULPSMD02S33-02	4W716	
JP2					
Thru	Same as JP1				
JP6					
L1	Inductor 270nH, ±5%	1	841438-035	14632	
L2	Inductor 220nH, ±5%	1	841438-033	14632	
L3	Inductor 1200nH, ±5%	1	841438-051	14632	
L4	Inductor 470nH, ±5%	2	841438-041	14632	
L5	Inductor 1800nH, ±5%	1	841438-055	14632	
L6	Inductor 120nH, ±5%	2	841438-027	14632	
L7	Inductor 1000nH, ± 15%	5	841438-049	14632	
L8	Inductor 390nH, +-5%	1	841438-039	14632	
L9	Inductor 4.7µH, ±20%	14	B82422-A1472-M	25088	
L10	Inductor 1.0µH, ±20%	10	B82422-A1102-M	25088	
L11	Inductor 180nH, ±5%	2	841438-031	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

L12	Same as L7				
L13	Same as L11				
L14	Same as L9				
L15	Same as L9				
L16	Inductor 100nH, ±5%	3	841438-025	14632	
L17	Inductor 2700nH, ±5%	1	841438-059	14632	
L18	Inductor	2	20681-344	14632	
L19	Same as L18				
L20	Same as L9				
L21	Same as L9				
L22	Inductor 330nH, ±5%	2	841438-037	14632	
L23	Inductor 33nH, ±5%	6	841438-013	14632	
L24	Inductor 22nH, ±5%	2	841438-009	14632	
L25	Same as L9				
L26	Same as L23				
L27	Inductor 10nH, ±10%	1	841438-001	14632	
L28	Same as L23				
L29	Same as L23				
L30	Same as L9				
L31	Same as L24				
L32	Same as L23				
L33	Same as L9				
L34	Same as L16				
L35	Same as L23				
L36	Same as L10				
L37	Same as L9				
L38	Same as L9				
L39	Inductor 1500nH, ±5%	2	841438-053	14632	
L40	Same as L39				
L41	Inductor 10µH, ±20%	1	B82422-A1103-M	25088	
L42	Inductor 47µH, ±10%	3	NL322522-470K	54583	
L43	Same as L4				
L44	Same as L6				
L45	Same as L22				
L46	Same as L9				
L47	Same as L42				
L48	Same as L42				
L49	Same as L9				
L50	Same as L9				
L51	Inductor 6.8µH, ±5%	1	841444-021	14632	
L52	Inductor 680nH, ±5%	1	841438-045	14632	
L53	Same as L7				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
L54	Same as L7				
L55	Inductor 43nH, ±5%,	1	841438-016	14632	
L56	Same as L7				
L57 Thru L59	Same as L10				
L60	Inductor, Power 100µH, +20, -15%	1	PM105S-101M	76493	
L61	Same as L10				
L62	Same as L10				
L63	Same as L9				
L64 Thru L66	Same as L10				
L67	Same as L16				
L68	Inductor 4.7nH, ±2%	2	KL732BTE4N7G	59124	
L69	Same as L68				
P1	Connector, Plug, SMB Female	2	2105-7521-025	95505	
P2	Same as P1				
Q1	Transistor, NPN	4	MRF5812	04713	
Q2	Transistor, PNP	16	MMBT-3906	04713	
Q3	Same as Q2				
Q4	Same as Q1				
Q5	Same as Q2				
Q6	Same as Q1				
Q7	Same as Q2				
Q8	Same as Q2				
Q9	Transistor, NPN	1	841381-2 (BFQ19)	14632	
Q10	Transistor, NPN	3	MMBR2857-LT1	04713	
Q11	Same as Q2				
Q12	Transistor, NPN CASE	7	MMBT2222ALT1	04713	
Q13	Transistor, NPN	2	NE85633-T1	4T165	
Q14	Same as Q10				
Q15	Same as Q10				
Q16	Same as Q13				
Q17	Same as Q1				
Q18	Same as Q2				
Q19	Same as Q2				
Q20	Transistor	3	SST-310T1	17856	
Q21	Same as Q2				
Q22 Thru Q25	Same as Q12				
Q26	Same as Q2				
Q27	Same as Q20				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
Q28	Same as Q20				
Q29	Same as Q12				
Q30	Same as Q2				
Q31	Same as Q2				
Q32	Transistor, NPN	8	MMBT3904LT1	04713	
Q33	Same as Q2				
Q34	Same as Q32				
Q35	Same as Q2				
Q36	Same as Q32				
Q37	Same as Q2				
Q38 Thru Q41	Same as Q32				
Q42	Same as Q2				
Q43	Same as Q32				
Q44	Transistor, N-Channel MOSFET	1	2N7002-LT1	17856	
Q45	Same as Q12				
R1	Resistor, Fixed, 47Ω, ±5%, .1W	12	841414-041	14632	
R2	Resistor, Fixed, 680Ω, ±5%, .1W	17	841414-069	14632	
R3	Resistor, Fixed, 3.3Ω, ±5%, .1W	7	841414-013	14632	
R4	Same as R3				
R5	Resistor, Fixed, 3.3kΩ, ±5%, .1W	11	841414-085	14632	
R6	Resistor, Fixed, 560Ω, ±5%, .1W	3	841414-067	14632	
R7	Same as R5				
R8	Resistor, Fixed, 8.2Ω, ±5%, .1W	3	841414-023	14632	
R9	Resistor, Fixed, 330Ω, ±5%, .1W	7	841414-061	14632	
R10	Resistor, Fixed, 2.7Ω, ±5%, .1W	1	841414-011	14632	
R11	Resistor, Fixed, 4.7kΩ, ±5%, .1W	27	841414-089	14632	
R12	Resistor, Fixed, 1.0kΩ, ±5%, .1W	29	841414-073	14632	
R13	Resistor, Fixed, 22Ω, ±5%, .1W	3	841414-033	14632	
R14	Resistor, Fixed, 15Ω, ±5%, .1W	1	841414-029	14632	
R15	Resistor, Fixed, 10Ω, ±5%, .1W	50	841414-025	14632	
R16	Same as R12				
R17	Resistor, Fixed, 82Ω, ±5%, .1W	4	841414-047	14632	
R18	Resistor, Fixed, 33Ω, ±5%, .1W	4	841414-037	14632	
R19	Same as R17				
R20	Same as R15				
R21	Same as R12				
R22	Same as R15				
R23	Same as R18				
R24	Same as R1				
R25	Same as R2				
R26	Same as R3				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

R27	Same as R3				
R28	Same as R5				
R29	Same as R6				
R30	Same as R5				
R31	Same as R8				
R32	Resistor, Fixed, 4.7Ω, ±5%, .1W	4	841414-017	14632	
R33	Same as R17				
R34	Same as R17				
R35	Resistor, Fixed, 820Ω, ±5%, .1W	3	841414-071	14632	
R36	Same as R15				
R37	Resistor, Fixed, 10kΩ, ±5%, .1W	31	841414-097	14632	
R38	Same as R12				
R39	Same as R12				
R40	Same as R11				
R41	Same as R12				
R42	Same as R11				
R43	Same as R37				
R44	Same as R37				
R45	Same as R15				
R46	Resistor, Fixed, 470Ω, ±5%, .1W	10	841414-065	14632	
R47	Same as R46				
R48	Same as R46				
R49	Same as R12				
R50	Same as R12				
R51	Same as R9				
R52	Same as R1				
R53	Same as R15				
R54	Resistor, Fixed, 6.8kΩ, ±5%, .1W	9	841414-093	14632	
R55	Same as R5				
R56	Same as R32				
R57	Resistor, Fixed, 180Ω, ±5%, .1W	2	841414-055	14632	
R58	Same as R9				
R59	Same as R15				
R60	Resistor, Fixed, 18Ω, ±5%, .1W	8	841414-031	14632	
R61	Same as R60				
R62	Same as R60				
R63	Same as R15				
R64	Same as R15				
R65	Same as R38				
R66	Same as R15				
R67	Same as R15				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R68	Same as R35				
R69	Same as R54				
R70	Same as R5				
R71	Same as R32				
R72	Same as R57				
R73	Same as R9				
R74	Same as R15				
R75	Resistor, Fixed, 220kΩ, ±5%, .1W	3	841414-129	14632	
R76	Same as R54				
R77	Same as R54				
R78	Same as R75				
R79	Same as R54				
R80	Same as R54				
R81	Resistor, Fixed, 220Ω, ±5%, .1W	8	841414-057	14632	
R82	Resistor, Fixed, 22kΩ, ±5%, .1W	8	841414-105	14632	
R83 Thru R85	Same as R82				
R86	Same as R37				
R87	Same as R37				
R88	Same as R15				
R89	Same as R81				
R90	Same as R12				
R91	Same as R12				
R92	Same as R5				
R93	Resistor, Fixed, 7.5kΩ, ±5%, .1W	1	841414-094	14632	
R94	Same as R15				
R95	Same as R12				
R96	Same as R12				
R97	Resistor, Fixed, 1.5kΩ, ±5%, .1W	3	841414-077	14632	
R98	Same as R9				
R99	Same as R13				
R100	Same as R12				
R101	Same as R97				
R102	Same as R11				
R103	Same as R81				
R104	Same as R15				
R105	Same as R15				
R106	Same as R81				
R107	Same as R82				
R108	Same as R54				
R109	Same as R37				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R110	Same as R13				
R111	Same as R54				
R112	Same as R54				
R113	Resistor, Fixed, 18kΩ, ±5%, .1W	1	841414-103	14632	
R114	Same as R1				
R115	Same as R15				
R116	Resistor, Fixed, 300Ω, ±5%, .1W	4	841414-060	14632	
R117	Same as R60				
R118	Same as R116				
R119	Not Used				
R120	Not Used				
R121	Not Used				
R122	Resistor, Fixed, 1.5Ω, ±5%, .1W	1	841414-005	14632	
R123	Resistor, Fixed, 2.2kΩ, ±5%, .1W	7	841414-081	14632	
R124	Same as R123				
R125	Same as R97				
R126	Same as R123				
R127	Same as R81				
R128	Same as R12				
R129 Thru R131	Same as R15				
R132	Resistor, Fixed, 100Ω, ±5%, .1W	29	841414-049	14632	
R133	Same as R15				
R134	Same as R12				
R135	Resistor, Fixed, 5.6kΩ, ±5%, .1W	2	841414-091	14632	
R136	Same as R123				
R137	Same as R123				
R138	Same as R135				
R139	Same as R2				
R140	Same as R15				
R141	Same as R81				
R142	Resistor, Fixed, 68Ω, ±5%, .1W	9	841414-045	14632	
R143	Same as R15				
R144 Thru R146	Same as R60				
R147	Same as R116				
R148	Same as R60				
R149	Same as R116				
R150	Same as R15				
R151	Same as R142				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R152	Same as R132				
R153	Same as R142				
R154	Resistor, Fixed, 150Ω, ±5%, .1W	3	841414-053	14632	
R155	Same as R18				
R156	Same as R154				
R157 Thru R159	Same as R46				
R160	Same as R2				
R161	Same as R3				
R162	Same as R3				
R163	Same as R5				
R164	Same as R6				
R165	Same as R5				
R166	Same as R8				
R167	Same as R3				
R168	Same as R37				
R169	Same as R12				
R170	Same as R12				
R171 Thru R174	Same as R132				
R175	Resistor, Fixed, 1.8kΩ, ±5%, .1W	2	841414-079	14632	
R176	Same as R175				
R177	Same as R15				
R178	Same as R15				
R179	Jumper, .05Ω, Max	2	841417	14632	
R180	Not Used				
R181	Same as R15				
R182	Same as R15				
R183	Same as R15				
R184	Same as R12				
R185	Same as R82				
R186	Same as R11				
R187	Resistor, Fixed, 20 kΩ, ±5%, .1W	1	841414-104	14632	
R188	Same as R15				
R189	Same as R1				
R190	Resistor, Fixed, 9.1kΩ, ±5%, .1W	4	841414-096	14632	
R191 Thru R193	Same as R190				
R194	Resistor, Fixed, 33kΩ, ±5%, .1W	3	841414-109	14632	

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

REF DESIG PREFIX A3A2

R195	Same as R194				
R196	Same as R15				
R197 Thru R200	Same as R2				
R201	Same as R12				
R202	Same as R15				
R203	Same as R18				
R204	Same as R32				
R205	Not Used				
R206	Same as R179				
R207	Not Used				
R208	Same as R12				
R209	Same as R46				
R210	Same as R1				
R211	Same as R1				
R212	Same as R37				
R213	Same as R37				
R214	Same as R1				
R215	Same as R1				
R216	Same as R15				
R217	Same as R142				
R218	Same as R1				
R219	Same as R15				
R220	Same as R15				
R221 Thru R223	Same as R46				
R224	Same as R12				
R225	Same as R81				
R226	Same as R81				
R227	Same as R37				
R228	Same as R37				
R229	Same as R15				
R230	Same as R132				
R231	Same as R132				
R232	Resistor, Fixed, 47kΩ, ±5%, .1W	1	841414-113	14632	
R233	Resistor, Fixed, 100kΩ, ±5%, .1W	6	841414-121	14632	
R234	Resistor, Fixed, 470kΩ, ±5%, .1W	1	841414-137	14632	
R235	Same as R37				
R236	Same as R11				
R237	Same as R12				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R238	Same as R12				
R239	Same as R132				
R240	Same as R132				
R241	Same as R154				
R242	Resistor, Fixed, 1.0MΩ, ±5%, .1W	2	841414-145	14632	
R243	Same as R242				
R244	Same as R12				
R245	Same as R132				
R246	Same as R11				
R247	Same as R132				
R248	Same as R132				
R249	Same as R11				
R250	Same as R132				
R251	Same as R15				
R252	Same as R12				
R253	Same as R12				
R254	Same as R37				
R255 Thru R266	Same as R132				
R267	Same as R15				
R268	Same as R37				
R269	Same as R15				
R270 Thru R285	Same as R11				
R286	Same as R37				
R287	Same as R37				
R288 Thru R291	Same as R15				
R292	Same as R1				
R293	Same as R2				
R294	Same as R12				
R295	Same as R2				
R296	Same as R15				
R297	Same as R2				
R298	Same as R15				
R299	Same as R37				
R300	Same as R233				
R301	Resistor, Fixed, 2.2MΩ, ±5%, .1W	1	841414-153	14632	
R302	Same as R194				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R303	Resistor, Fixed, 390Ω, ±5%, .1W	1	841414-063	14632	
R304	Same as R75				
R305	Same as R37				
R306	Same as R12				
R307	Same as R233				
R308	Same as R15				
R309	Same as R11				
R310	Same as R233				
R311 Thru R313	Same as R132				
R314	Resistor, Fixed, 68kΩ, ±5%, .1W	2	841414-117	14632	
R315	Same as R314				
R316	Resistor, Fixed, 1.5MΩ, ±5%, .1W	2	841414-149	14632	
R317	Same as R316				
R318	Same as R15				
R319	Same as R15				
R320	Same as R123				
R321	Same as R82				
R322	Same as R82				
R323	Same as R233				
R324	Same as R37				
R325	Resistor, Variable, Film, 10KΩ, ±10%, .25W	1	3262X-1-103	80294	
R326	Same as R37				
R327	Same as R5				
R328	Same as R9				
R329	Same as R233				
R330	Same as R15				
R331 Thru R335	Same as R142				
R336	Same as R1				
R337	Same as R15				
R338	Resistor, Fixed, 270Ω, ±5%, .1W	1	841414-059	14632	
R339	Same as R2				
R340 Thru R344	Same as R37				
R345	Same as R5				
R346	Same as R11				
R347	Same as R2				
R348	Same as R12				
R349 Thru R352	Same as R2				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
R353 Thru R358	Same as R37				
R359	Same as R11				
R360	Same as R9				
R361	Same as R35				
T1	Transformer, Power Splitter	3	B5F458PS-1007=P3	TOKO	
T2	Transformer, RF	2	B5F458DB-1011=P3	TOKO	
T3	Same as T1				
T4	Same as T1				
T5	Same as T2				
U1	Mixer, Double Balanced	1	X1M-11-A	0HR85	
U2	Power Divider	1	SPD-C1	63155	
U3	Integrated Circuit, PLL	3	MC145158DW-2	04713	
U4	Amplifier	4	NE5534D	18324	
U5	Integrated Circuit, Two Modulus Prescaler	1	MB504PF,	61271	
U6	Integrated Circuit, Voltage Regulator, +5V	3	TK11550MT	TOKO	
U7	Integrated Circuit, Prescaler, Divide By 10-20-40-80	2	MC12080D	04713	
U8	Same as U4				
U9	Integrated Circuit, Quad 2-Input NOR Gate	1	74HC02	02735	
U10	Integrated Circuit, Dual D Flip-Flop With Preset And Clear	2	74HC74	04713	
U11	Amplifier	1	MC33172D	04713	
U12	Integrated Circuit, Wide Band Amplifier	1	UPC2712T	4T165	
U13	Mixer, Double Balanced	1	IAM-81008-TR1	24539	
U14	Integrated Circuit, Wide Band Amplifier	2	UPC2711T	4T165	
U15	Amplifier	1	VNA-25	15542	
U16	Integrated Circuit, PLL Frequency Synthesizer	1	MC145201F	27014	
U17	Same as U4				
U18	Integrated Circuit, Wideband Amplifier	1	UPC2713T-E3	62104	
U19	Same as U14				
U20	Integrated Circuit,	1	SD5400CY	17856	
U21	Integrated Circuit, Op Amp	1	AD797AR	24355	
U22	Same as U3				
U23	Amplifier, CMOS, Dual Op Amp	2	LMC662CM	27014	
U24	Amplifier	1	MSA-0711	24539	
U25	Same as U4				
U26	Mixer, Double Balanced Mixer And Oscillator	2	NE602AD	18324	
U27	Same as U26				
U28	Integrated Circuit, CMOS, Quad 2-Input Exclusive OR Gate	1	74AC86	34371	
U29	Same as U6				
U30	Integrated Circuit, CMOS Quad 2-Input NOR Gate	1	74AC02	1Z447	
U31	Integrated Circuit, CMOS, Dual D Flip-Flop	1	74AC74	02735	
U32	Amplifier JFET-Input Operational Amplifier	1	MC34001D	04713	
U33	Same as U7				
U34	Same as U6				

REF DESIG PREFIX A3A2

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
U35	Integrated Circuit, Voltage Regulator, -5V	1	MC79L05ACD	04713	
U36	Integrated Circuit, Quad 2-Input OR Gate	1	74HC32	02735	
U37	Integrated Circuit, CMOS, 3-To-8 Line Decoder, Demultiplexer	1	74HC238	02735	
U38	Integrated Circuit, Hex Inverter	2	74HC04	04713	
U39	Same as U23				
U40	Integrated Circuit, Quad 2-Input NAND Gate	1	74HC00	02735	
U41	Same as U10				
U42	Amplifier, JFET Input Operational Amplifier	1	TL062CD	04713	
U43	Same as U3				
U44	Integrated Circuit, Programmable Precision Reference	1	TL431CD	04713	
U45	Oscillator, TCVCXO	1	92658	14632	
U46	Same as U38				
U47	Integrated Circuit, Wideband Amplifier	1	UPC2709T	62104	
VR1	Diode, Zener, 5.1V	1	MMBZ5231BLT1	04713	
Z1	Resonator, 1615 MHz	2	SR8800LPQ1615BY	14591	
Z2	Same as Z1				

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR

7.5.4 TYPE 766032-1 POWER SUPPLY — REF DESIG PREFIX PS1

REF DESIG	DESCRIPTION	QTY PER ASSY	MANUFACTURERS PART NO.	MFR. CODE	RECM VENDOR
	Revision A				
PS1	Power Supply, 90-264 Vac Input	1	180892	14632	

APPENDIX A

8611/SM SIGNAL MONITOR OPTION

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APPENDIX A

LIST OF TABLES

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8611/SM SIGNAL MONITOR OPTION

A.1 GENERAL DESCRIPTION

The 8611/SM Signal Monitor Option is capable of providing frequency and signal strength information about a 21.4 MHz IF signal received at the WJ-8611 rear panel to a controlling computer. This enables a computer operating the WJ-RCS Receiver Control Software application to display a panoramic (pan) representation of the IF signal. The IF PAN display is useful as an aid to receiver tuning or to observe signal activity. This capability is made possible through the mechanical and electrical integration of the WJ-9168 Signal Monitor Module (SMM) within the WJ-8611.

A.2 ELECTRICAL CHARACTERISTICS

The 8611/SM option allows selection of one of two signal monitor inputs centered at 21.4 MHz. Since the 8611/SM can handle a signal with a bandwidth of up to 10 MHz, it is ideal for digitizing the WJ-8611's rear panel SDU output. The 8611/SM provides a choice of two resolution bandwidths (8 kHz and 25 kHz) and seven sweep spans ranging between 0.1 to 10.0 MHz, providing the operator a means to optimize the monitor presentation. The tuning resolution of the 8611/SM option is 2.5 kHz with a ± 2.0 kHz tuning accuracy. The electrical integration of the WJ-9168 with the WJ-8611 allows the two devices to appear as a single device controlled on an IEEE-488 control bus via a single address due to common command parsing. The addition of the 8611/SM option increases the WJ-8611's overall power consumption by a maximum of 2.5 Watts. Refer to **Table A-1** for a full list of specifications for the WJ-9168.

A.3 MECHANICAL CHARACTERISTICS

The 8611/SM Monitor option consists of the addition of the WJ-9168 and associated internal cabling within the unit, the addition of three rear panel connectors, and the addition of an accessory cable (W11) for interconnection between the WJ-8611's SDU output and a new SM input. The WJ-9168 is mounted internally on the right side panel. The 8611/SM option adds approximately 2 lbs. (4.4 kg) to the overall weight of the WJ-8611.

A.4 EQUIPMENT SUPPLIED

The following equipment is supplied with the 8611/SM option:

- *WJ-9168 Installation, Operation, and Organizational Level Maintenance Manual* (P/N 181247-001);
- P/N 17300-774-003 Cable Assembly (W11) for connecting the WJ-8611's SDU output with one of the option's SM inputs.

Table A-1. 8611/SM Signal Monitor Option Specifications*

Center Frequency	21.4 MHz
Full Span	10.0 MHz
Sweep Spans	0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10.0 MHz
Resolution Bandwidths	25 kHz, 8 kHz
Tuning Resolution	2.5 kHz
Tuning Accuracy	±2.0 kHz
Full Scale Input Level	-45 dBm, nominal
Input, Maximum	+10 dBm, with no damage
Dynamic Range	Greater than 60 dB
3rd-Order Intercept	Greater than +5 dBm
Image and IF Rejection	-60 dBc
LO Level at IF Inputs	-70 dBm, maximum
Active Control Interfaces	IEEE-488 (at WJ-8611 rear panel) interface parses command messages and handles communications with WJ-9168 via internal RS-485 half-duplex interface at 38.4 kBaud
Inactive Control Interfaces	RS-232 and RS-422, full duplex (single drop & multidrop); RS-232 pass-thru mode
RS-232 Baud Rates	2400, 9600, 19.2 k & 38.4 k Baud
Weight	Less than 2 lbs. (4.4 kg)
Dimensions	0.85" x 3.0" x 7.75" (H x W x D) (including connectors) 2.15 cm x 7.6 cm x 19.6 cm
Power Requirements	+10 to +16 Vdc
Power Consumption	2.5 W, max
Temperature Range*	
Maximum Operating	-20 to +55°C
Non-Operating	-40 to +70°C
Humidity	Less than 95%, non-condensing
Shock	Meets environmental conditions of MIL-E-5400T, paragraphs 3.2.24.6.1 pertaining to equipment shock.
Vibration	Meets environmental conditions of MIL-STD-810D, method 514.3, section I-3.2.4, category 4, propeller aircraft. Figure 514.3-25(a) defines the power spectral density with Li=0.3 (g^2/Hz), Fi=68 Hz.

*All specifications herein apply over an operating temperature range of +20 to +30°C.

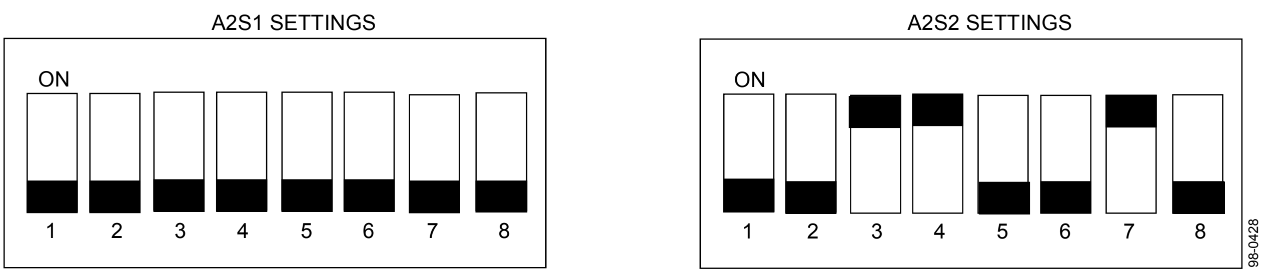
A.5 CONFIGURATION DETAILS

The WJ-8611 and the WJ-9168 are configured at the factory for the 8611/SM implementation. No further action by the operator is required. The following paragraphs discuss the configuration setup in detail.

WJ-8611

The WJ-8611 is configured for 8611/SM operation at the factory. The 8611/SM option is only compatible with WJ-8611 control software Version 01.01.00 or higher. In addition, the Digital Control PC Assembly has been modified to provide a +13.5 Vdc supply voltage at A2J7, pin 3.

The operator may select between using the IEEE-488 interface or the interface labeled RS-232 by front panel control. Upon activating one of the interfaces, the other is deactivated. At power-up, the unit returns to the remote mode that was active when the unit was powered down. With the 8611/SM option, DIP switch settings on the Digital Control Board are set at the factory so that the WJ-8611 defaults to the IEEE-488 interface upon loss of memory. **Figure A-1** depicts the factory settings for the WJ-8611's A2S1 and A2S2 configuration switches when the 8611/SM option is installed. Refer to **paragraph 2.2.1** for detailed information on DIP switch setup and **paragraph 3.2.10** for information on selecting the remote interface from the front panel.



NOTES: OFF = 0; ON = 1
SEE **FO-11** FOR A2S1 AND A2S2 LOCATIONS.
WJ-8611 IS SET FOR IEEE-488 BUS ADDRESS OF 6 AT THE FACTORY.
DARK SEGMENTS DEPICT SWITCH POSITIONS.

Figure A-1. WJ-8611 A2S1 and A2S2 Settings for 8611/SM Option

WJ-9168 SMM

The WJ-9168 is configured at the factory for the implementation of the 8611/SM. No further action by the operator is required. The WJ-9168 is not directly connected to the IEEE-488 bus; control is relayed by the WJ-8611 via an RS-422 interface internal to the receiver. All required power is also supplied by the WJ-8611. In the 8611/SM application, the WJ-9168 is configured at the factory for RS-422 single-drop remote operations and a baud rate of 38.4 kbps via internal DIP switches. As configured at the factory, the WJ-9168's RS-232 is inactive.

It is possible to reconfigure the WJ-9168 for use with receivers, which, unlike the WJ-8611, have multi-drop RS-232 interfaces. In this event, the RS-232 interface associated with the rear panel SM CTL connector can be employed. For detailed information about reconfiguring the WJ-9168 for RS-232 applications, refer to the *WJ-9168 Installation, Operation, and Organizational Level Maintenance Manual* (P/N 181247-001). **Figure A-2** depicts the appropriate settings for the WJ-9168's A2S1 DIP Switch required to return the WJ-9168 to the as-shipped configuration associated with the 8611/SM option.

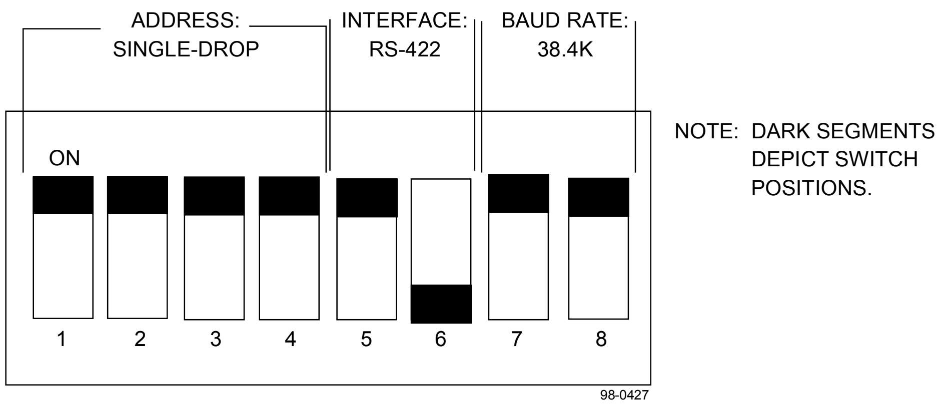


Figure A-2. WJ-9168 SMM DIP Switch (A2S1) As-Shipped Settings for 8611/SM Option

A.6 INSTALLATION

The 8611/SM option is installed at the factory. The following paragraphs provide information about connectors associated with the option. These connectors are depicted in **Figure A-3**.

A.6.1 SM IN 1 INPUT

The SM IN 1 input connector (W9J5) accepts an IF signal centered at 21.4 MHz up to 10 MHz in width. The source of the input signal may be from the WJ-8611's SDU output or from another receiver. The maximum input level that can be received at this input without damaging the equipment is +10 dBm. This SMA connector has an input impedance of 50 ohms. Cable W11 (P/N 17300-774-003) is provided to make the interconnection between this input and the WJ-8611's SDU output. The SM IN 1 input is selected for IF pan processing via the $A801_H$ command.

A.6.2 SM IN 2 INPUT

The SM IN 2 input connector (W10J6) accepts an IF signal centered at 21.4 MHz up to 10 MHz in width. The source of the input signal may be from the WJ-8611's SDU output or from another receiver. The maximum input level that can be received at this input without damaging the equipment is +10 dBm. This SMA connector has an input impedance of 50 ohms. Cable W11 (P/N 17300-774-003) is provided to make the interconnection between this input and the WJ-8611's SDU output. The SM IN 2 input is selected for IF pan processing via the $A802_H$ command.

A.6.3 SM CTL INPUT/OUTPUT

The SM CTL connector (W8J7) is a 9-pin D connector that provides an alternative control interface to the WJ-9168 when not controlled through the WJ-8611's IEEE-488 interface. Also, the SM CTL connector can accept two spectrum inversion control inputs from external receivers. Refer to **Figure A-3** for the SM CTL pin configuration. **Table A-2** summarizes the functions associated with these pins.

Pins 1 and 4 of this connector are spectrum inversion inputs associated with the SM 1 IN and the SM 2 IN RF inputs, respectively. These inputs can be driven by external receivers which normally have inverted IF spectrums or which compensate for tuning schemes that invert the IF spectrum at particular frequency bands. When a control signal is received by the WJ-9168, it flips the spectrum display 180 degrees, allowing a seamless IF display despite tuning the receiver across frequency bands with opposite spectrum inversions. The tuning scheme of the WJ-8611 requires no such compensation. The WJ-8654 and WJ-8615P are two receivers that provide such a control output. Pin 9 can be used as a common ground for pin 1 and 4 inputs.

While the SM CTL connector does provide physical access to the WJ-9168's single-drop and multi-drop RS-232 interfaces, the WJ-9168's factory configuration de-activates these RS-232 interfaces in favor of an RS-422 interface internally connected to the WJ-8611. Pins 2, 3, and 5 are used for RS-232 interconnection. Pins 6, 7, and 8 are used for RS-232 pass-through mode. Refer to the *WJ-9168 Installation and Operation Manual* for further details.

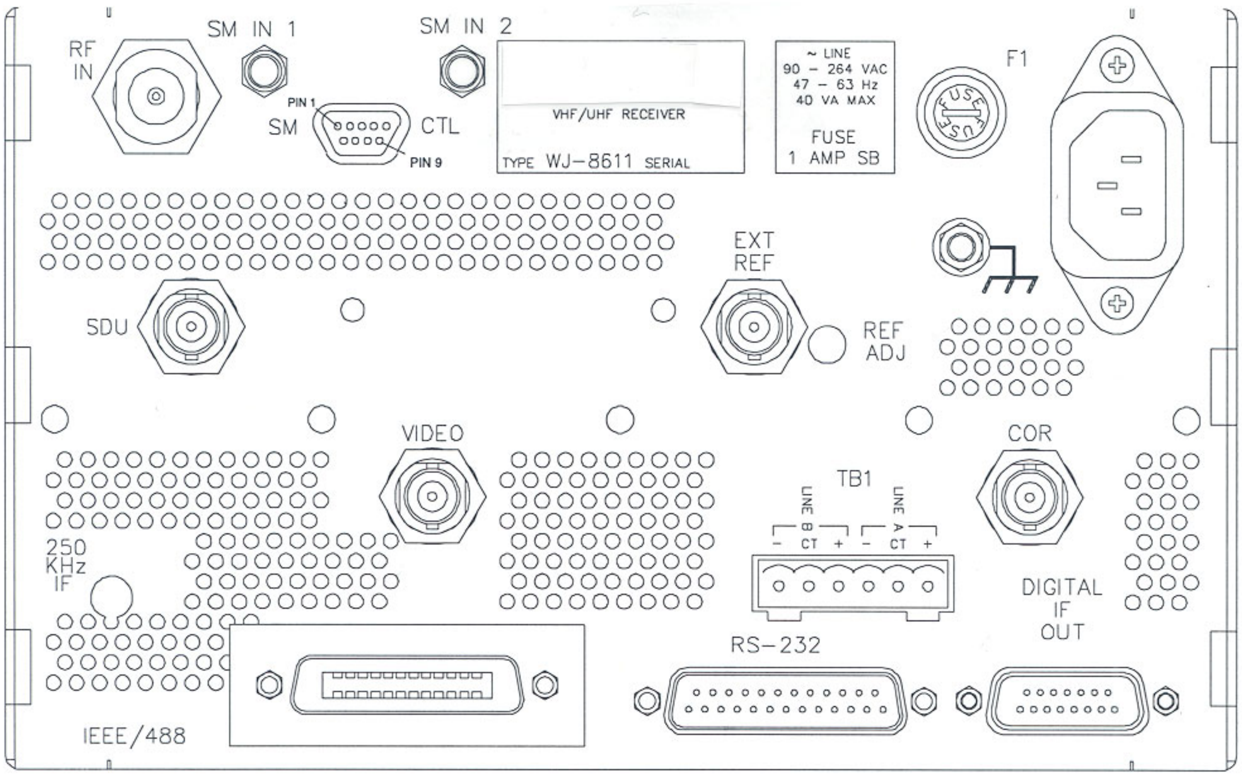


Figure A-3. WJ-8611 Rear Panel View with 8611/SM Inputs and Outputs

Table A-2. SM CTL Connector Pin Functions

Signal	Pin	I/O	Type	Description
RS232 TXD (O)[1]	3	O	RS-232	RS-232 data, 2 wire interface
RS232 RXD (I)[1]	2	I	RS-232	RS-232 data, 2 wire interface
GND[1]	5	-		RS-232 interface ground
RS232 RxD DCE (I)[1,2]	8	I	RS-232	RS-232 data, 2 wire interface, secondary
RS232 TxD DCE (O)[1,2]	7	O	RS-232	RS-232 data, 2 wire interface, secondary
GND[1]	6	-		RS-232 interface ground
SPTINV 1	1	I	CMOS	Spectrum Invert from SM 1 IN Receiver
SPTINV 2	4	I	CMOS	SPecTrum Invert from SM 2 IN Receiver
GND	9			GND associated with SPTI_1 and SPTI_2

[1] Interface associated with this signal is de-activated with factory configuration

[2] The RS232_RxD DCE (Pin 8) line connects to the receiver's TxD line. The RS232_TxD DCE (Pin 7) line connects to the receiver's RxD line.

A.7 WJ-RCS RECEIVER CONTROL SOFTWARE OPERATIONS

The WJ-8611 and the WJ-9168 can be both controlled by an IEEE-488 controller using the WJ-RCS Receiver Control Software application. This application program requires a secondary IEEE-488 address for the WJ-9168 in addition to the primary bus address for the WJ-8611. When configuring the SM Interface, set the secondary address before setting the primary address. Proceed as follows:

Receiver	
Primary Address	6
Secondary Address	0
SigMon Number 1	1
SigMon Input	1
SM Interface 1	
Secondary Address	2 (set before primary address)
Primary Address	6

The setting of the secondary address for the WJ-9168 is a nuance of the WJ-RCS application and is not required when writing your own control programs. Refer to the Control Software Operation Manual for WJ-RCS Receiver Control for Windows (P/N 181445-001) for other operating details.

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A.8 REMOTE OPERATIONS USING AN RS-232 INTERFACE

The 8611/SM can be reconfigured for operations using an RS-232 interface for use with other receivers. If this alternative is desired, refer to the *WJ-9168 Installation, Operation, and Organizational Level Maintenance Manual* (P/N 181247-001). Keep in mind that the WJ-8611 only has as a single-drop RS-232 interface, so its joint operation with the WJ-9168 cannot be accomplished with a multi-drop RS-232 interface.

A.9 WRITING YOUR OWN CONTROL PROGRAMS FOR THE 8611/SM

Writing application programs to jointly control the WJ-8611 and the 8611/SM is straight-forward for an IEEE-488 interface bus in that the controller perceives the internal WJ-9168 and the WJ-8611 as a single entity. The information provided in the following paragraphs has been tailored to the implementation of the 8611/SM option. **Table A-3** provides a list of remote commands used to program the 8611/SM option.

A.9.1 HOW THE WJ-8611 AND THE WJ-9168 INTERACT IN THE 8611/SM OPTION

With the implementation of the 8611/SM option, the WJ-8611 and the WJ-9168 are addressed via a single IEEE-488 bus address. Refer to **paragraph A.5** for address configuration details.

Upon power-up, the WJ-8611 unit checks its option configuration to determine whether it contains an 8611/SM option. This also can be determined by an operator by sending the *OPT? query. See **Table 4-2** for details.

The 8611/SM is designed so that upon initialization the WJ-9168 is placed in a termination mode that causes all of its response messages to be terminated with FD_H. The WJ-8611 passes the FD_H termination with the message to the controller. When sending signal monitor messages from the controller, terminate them with FD_H. The WJ-9168 responds to all received messages. In order to prevent bus conflicts, the WJ-8611 waits for the completion of the WJ-9168 message or the expiration of an internal timer before accepting another signal monitor message. The initial timer is initiated upon the passing of a message to the WJ-9168 and expires after 8 seconds.

The WJ-8611 does not report the status of the 8611/SM through its status reporting architecture. To check the status of the WJ-9168, send the Built-In Test command $A9_H$. See **Table A-3**.

A.9.2 COMMAND FORMAT

Each of the binary commands that control the WJ-9168 is one byte long. All command bytes used in IEEE-488 applications are followed by data parameter bytes. The following list describes the basic command format.

- The MSB of each command equals 1 (all commands have their MSNibble = "A_H"; binary "1010").
- All data parameter fields have an MSB = 0.
- There is always a command terminator FD_H.
- The WJ-9168 acknowledges all commands with either an ACK (06_H) or a NACK (15_H) character after the command and any associated data has been received. All responses are terminated with FD_H.
- The WJ-9168 will always generate a NACK response to a command with an out-of-range parameter.
- Invalid command bytes are ignored by the WJ-9168 with one exception. The unit will generate a NACK response to a communications error (noise or frame). This condition does not create a problem since the WJ-9168 is the only device on the WJ-8611's internal network.
- The WJ-9168 provides query command responses (such as BIT) after the ACK acknowledge.

A.9.3 DATA FORMAT

The WJ-9168 transfers panoramic signal strength information as a series of binary data bytes. Each data byte represents the level of signal energy at one point in the IF spectrum being swept by the unit. These binary data bytes are transmitted in a block format. The particular data block transfer format is selected by the Select Data Transmission Mode (AC_H) command, which is sent to the signal monitor module prior to the start of data transfer. This command allows selection of any one of three data transfer modes: in 40-byte blocks, in single full-sweep blocks, or as a continuous data stream broken into full-sweep blocks. These block transfer formats are described below. Data within the data blocks in any of the three modes is arranged in relationship to the frequency spectrum being swept and is transmitted in the following format:

Data Point Format: 1 byte/data point
Unipolar 8 bit binary, range 0-250
data represents LOG scale, at 0.286 dB per unit

Calibration points: Data code 210_{10} = -55 dBm input level
Data code 70_{10} = -95 dBm input level

Data Value (dBm) = -95 dBm + 0.286 (Input Level Code minus the Data Code for -95 dBm)

Example: Input Level Code = 135

Data Value (dBm)= -95 + 0.286 (135 - 70)
= -95 + 18.6
= -76.4

MULTIPLE BLOCKS/ MULTIPLE SWEEP DATA TRANSFER

This type of data transfer is initiated when the Select Data Transmission Mode (AC_H) command is sent with the 00_H argument (i.e., the default argument). In this data transfer mode, the WJ-9168 begins the transfer of panoramic signal strength information when the Start Processing command ($A2_H$) is given. The number of blocks transmitted is determined by the Sweep Span Select command ($A0_H$) and the Compression command ($A1_H$) parameters.

Once the Start Processing command ($A2_H$) is given, the WJ-9168 begins the transfer of panoramic Signal Strength information. This data is transmitted in a block format as described in the following:

Block Format: Variable block size; FULL or PARTIAL
FULL block size = 41 bytes
Block prefix = number of data points in block
40 (28_H) = full 40 point block
1-39 = number of points in partial block

There is always an integer number of blocks for a single frequency sweep. Every block, except possibly the final block of the sweep, is a FULL block with its prefix equal to 40. The last block in the sweep may be a PARTIAL block, containing enough data points to complete the sweep; its prefix is equal to the number of points in the block. The next sweep starts fresh with a new FULL block.

Examples:
Span #06_H; 160 points/sweep = four blocks/sweep; all blocks = FULL.
Span #02_H; 200 points/sweep = five blocks/sweep; all blocks = FULL.
Span # $0D_H$; 100 points/sweep = three blocks/sweep; two blocks = FULL; third block = 20 points.

The Compression command (Al_H) reduces the number of data points transmitted in a sweep. The command allows a reduction of data points by a factor of either 2 or 4, but the sweep data is still transmitted in the standard block format. In the following examples, the compression factor is 2 (one-half the number of points).

Example: Span #06_H; 80 points/sweep actually sent; two blocks/sweep; all blocks = FULL.
Span #02_H; 100 points/sweep actually sent; three blocks/sweep; two blocks = FULL; third block = 20 points.

The sweep does not include both end points of the IF spectrum. For example, a sweep span parameter of 00_H indicates a 10 MHz span with a 25 kHz step size. The 400 point sweep is actually from 16.400 MHz to 26.375 MHz inclusive (26.4 MHz - 25 kHz = 26.375 MHz).

SINGLE BLOCK/SINGLE SWEEP DATA TRANSFER

This type of data transfer is set up when the Select Data Transmission Mode (AC_H) command is sent with the 01_H argument. In this data transfer mode, the WJ-9168 begins the transfer of panoramic signal strength information when a Start Processing command ($A2_H$) is sent. The data is transmitted in one variable length block. Another data block is not transmitted until a Send Next Data Block command ($A4_H$) is sent. The length of this block for a given transmission is established by the sweep length that has been set by the last Sweep Span Select ($A0_H$) and Compression ($A1_H$) commands.

Block Format: Single block of variable size depending on sweep span and compression selections. Three-byte prefix (identifier byte, FE_H, and two-byte value which indicates the number of data points in the block).

Examples: If the $A0_H$ command argument is 00_H, and the $A1_H$ command argument is 00_H, the sweep contains 400 data points (refer to **Table A-3**). The single block of data transferred contains 400 data bytes (one for each point).

If the $A0_H$ command argument is 06_H, and the $A1_H$ command argument is 01_H, the sweep contains 80 data points (160 points compressed by 1/2 as described in **Table A-3**). The single block of data transferred contains, therefore, 80 data bytes (one for each point).

The data bytes are preceded by an identifier byte (FE_H) and a two-byte value, which indicates the length of the block. Since this format uses a variable length data block, the block is always a full block, never partial. If a Stop Processing command is sent during transmission of the data block, two to four additional data points may be sent before the data stream is stopped and an ACK response to the Stop Processing command is sent.

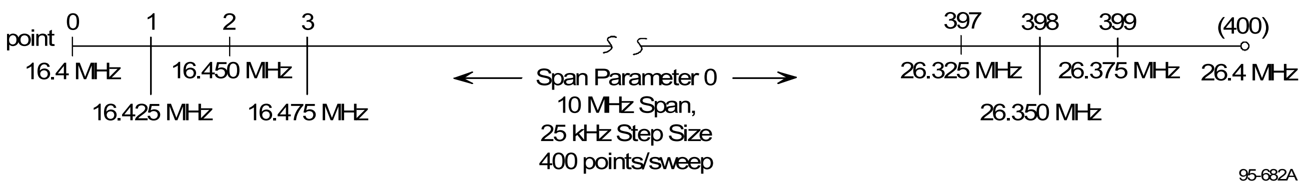
CONTINUOUS SINGLE BLOCK/SINGLE SWEEP DATA TRANSFER

This type of data transfer is set up when the Select Data Transmission Mode (AC_H) command is sent with the 02_H argument. In this data transfer mode, the WJ-9168 begins the transfer of panoramic signal strength information when a Start Processing command ($A2_H$) is sent. The data is transmitted in variable length blocks set up under the same protocol used for the single block transmission described above (i.e., the length of the block established by the sweep length set by the $A0_H$ and $A1_H$ commands). The data bytes in each block are similarly preceded by an identifier byte (FE_H) and a two-byte value, which indicates the length of the block. Since this format uses a variable length data block, each block is always a full block, never partial. Successive blocks of data are transmitted continuously until the Stop Processing command ($A3_H$) is sent. When the Stop Processing command is sent, two to four additional data points may be sent before the data stream is stopped and an ACK response to the Stop Processing command is sent.

DATA SPECTRAL ORIENTATION

Since the WJ-9168 can handle both upright and inverted spectral inputs, the included endpoint changes depending on the SPTI command setting. For upright spectral inputs, the low frequency end point is included. For inverted spectral inputs, the high frequency endpoint is included. These spectrum differences are illustrated in **Figure A-4**.

An upright IF spectrum would be displayed as:



An inverted IF spectrum would be displayed as:

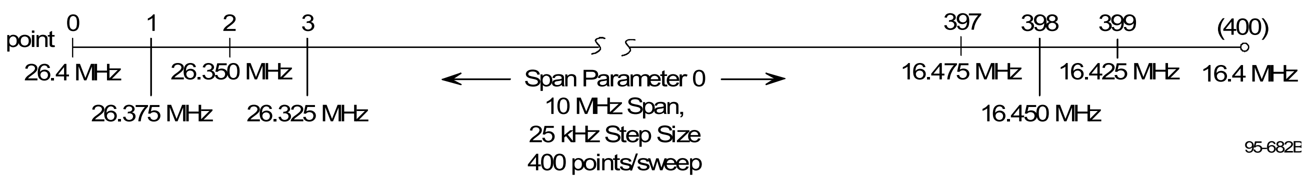


Figure A-4. Sweep Span Differences for Upright and Inverted Spectrums

Table A-3. 8611/SM Commands

Command	Function	Description
$A0_H$	Sweep Span Select	Primary sweep setup command for the WJ-9168. This command determines the resolution bandwidth and frequency step size most appropriate for the selected span. The number of data points per frequency step size is fixed. However the number of points that are transferred may be reduced utilizing the Data Compression ($A1_H$) command.

Code	Sweep Span	Resol. BW	Step Size	# Points
00_H	10 MHz	25 kHz	25 kHz	400
01_H	10 MHz	25 kHz	12.5 kHz	800
02_H	5 MHz	25 kHz	25 kHz	200
03_H	5 MHz	25 kHz	12.5 kHz	400
04_H	5 MHz	8 kHz	5 kHz	1000
05_H	2 MHz	25 kHz	25 kHz	80
06_H	2 MHz	25 kHz	12.5 kHz	160
07_H	2 MHz	25 kHz	5 kHz	400
08_H	2 MHz	25 kHz	2.5 kHz	800
09_H	1 MHz	25 kHz	25 kHz	40
$0A_H$	1 MHz	25 kHz	12.5 kHz	80
$0B_H$	1 MHz	8 kHz	5 kHz	200
$0C_H$	1 MHz	8 kHz	2.5 kHz	400
$0D_H$	0.5 MHz	25 kHz	12.5 kHz	40
$0E_H$	0.5 MHz	8 kHz	5 kHz	100
$0F_H$	0.5 MHz	8 kHz	2.5 kHz	200
10_H	0.2 MHz	8 kHz	5 kHz	40
11_H	0.2 MHz	8 kHz	2.5 kHz	80
12_H	0.1 MHz	8 kHz	5 kHz	20
13_H	0.1 MHz	8 kHz	2.5 kHz	40
14_H	*Reserved*			
15_H	*Reserved*			
16_H	*Reserved*			

Default: 00_H

Example: $A002_H$ - Set 5 MHz Sweep Span, 25 kHz Resolution Bandwidth, 25 kHz Step Size.

Table A-3. 8611/SM Commands (Continued)

Command	Function	Description
$A1_H$	Data Compression	This command selects the effective display resolution, and provides a simple form of data compression. If less than the maximum number of points is selected, the WJ-9168 chooses the peak value from a set of points and sends only this value. Thus, if the Compression parameter is 02_H, then the number of points sent is 1/4 of the maximum, and the WJ-9168 sends the peak value of every four data points. If the resolution bandwidth is 25 kHz, the effective display resolution will be 100 kHz. This command is effective in reducing the data handling and display load on the host computer. Data Range: 00_H - Maximum Number of Points 01_H - 1/2 of the Maximum Number of Points 02_H - 1/4 of the Maximum Number of Points Default: 00_H Example: $A101_H$ - Set Compression for 1/2 of the Maximum Number of Points
$A2_H$	Start Processing	This command begins the sweep mode according to the current sweep parameters. The data transfer format depends on the selected data transmission mode. Subsequent blocks of data must be requested with the Send Next Data Block command ($A4_H$). Note that the sweep continues while prior data is being transferred. The sweep function remains in effect until the Stop Processing command ($A3_H$), or another command is received. When the sweep parameters are changed, the sweep must be restarted with the Start Processing command. There is one situation that can halt the frequency sweep. This is when the data buffer is full. If the Selected Data Transfer mode (AC_H) is 00_H, then the WJ-9168 only stores a limited number of data points (two blocks of data). If the controlling computer does not request the next block of data with the Send Next Data Block command, the WJ-9168 sweep data buffers will fill. This will temporarily halt the sweep until data transfer is restarted.
$A3_H$	Stop Processing	Halt any data processing currently underway. The Start Processing command must be used to begin processing again; processing will start with a new sweep and new data block. Any prior sweep or data block information is lost.
$A4_H$	Send Next Data Block	Unless the Select Data Transmission Mode (AC_H) is set to 02_H, data is sent one block at a time. When a block has been sent, the controlling computer must request each new block with this command. Suspending data transmission allows the controlling computer to perform other processing or use the interface for other communications between WJ-9168 data blocks. Also, slower computers will not be overwhelmed with a continuous string of data. The Send Next Data Block Command does not provide an ACK/NACK response. This eliminates the display program's need to strip extra characters from the data stream.

Table A-3. 8611/SM Commands (Continued)

Command	Function	Description
$A5_H$	Fixed Tune Mode	This command tunes the WJ-9168 to a fixed frequency within its 10 MHz span range. The device does not sweep. The Signal Strength query command may be used to measure and report the signal strength while the WJ-9168 is fixed at the desired frequency. The WJ-9168 has 10 MHz tuning span, ranging from 16.4 MHz to 26.4 MHz inclusive with 2.5 kHz tuning resolution, yielding a total of 4001 possible tuning points. The two-byte binary data field gives the frequency to which the WJ-9168 tunes. Its format is two-byte, MOD 128 (7 bits) each byte. The most significant bit of each byte is "0". **<u>DATA FIELD</u>**: Two-byte tune-frequency (MOD 128) Parameters examples: 0000_H 16.4000 MHz point 0 0001_H 16.4025 MHz point 1 • • • • • • • • • $007F_H$ 16.7175 MHz point 127 0100_H 16.7200 MHz point 128 • • • • • • • • • $1F1F_H$ 26.3975 MHz point 4000 $1F20_H$ 26.4000 MHz point 4001 $0F21_H$ - $FFFF_H$ not defined, invalid data. Example: $A5007F_H$ - Select the 127th Point in the Spectrum (16.7175 MHz Fixed Frequency)
$A6_H$	Signal Strength	Reports signal strength when the WJ-9168 is not sweeping. The data corresponds to whatever frequency the WJ-9168 is tuned to at the time. The reported data is a single byte with the same binary format used in the data blocks. The WJ-9168 responds with its signal strength data byte immediately upon receipt (and processing) of the command.

Table A-3. 8611/SM Commands (Continued)

Command	Function	Description
$A7_H$	SPTI Selection	Selects Spectral Inversion option. Many receivers have IF outputs that are spectrally inverted (such as the WJ-8654). Others have IF outputs that change their "spectral sense' depending upon what band they are tuned to (such as the WJ-8654 equipped with a microwave frequency extender). With options 0 and 1, the WJ-9168 has its "spectral sense" fixed for either normal or inverted spectrums. With options 2 and 3, the "spectral sense" is controlled by active high or active low hardware signals available on the 8611/SM SM CTL connector available on the WJ-8611 rear panel. **<u>DATA FIELD:</u>** 00_H Software Selected Normal 01_H Software Selected Inverted 02_H Hardware Line Selected Active HI 03_H Hardware Line Selected Active LO Default: 02_H - Hardware Line Selected Active HI Example: $A701_H$ - Select Inverted Spectrum
$A8_H$	Input Select	Selects either IF input #1 or IF input #2 for processing. **<u>DATA FIELD:</u>** 01_H - IF Input #1 02_H - IF Input #2 Default: 01_H Example: $A802_H$ - Select IF Input #2
$A9_H$	Built-In-Test	Built-In-Test (BIT) provides information on current WJ-9168 status. The WJ-9168 periodically monitors various aspects of its own operation. The BIT command reports these results; the BIT command does not actually perform any testing. The report is a single byte whose bits are assigned as follows: <u>Bit</u> <u>Definition</u> 7 PLL unlocked, 2nd LO. 6 PLL unlocked, 1st LO. 5 Unit in low power mode after receiving "SLEEP mode 0" command. 4 Input dc supply voltage out of tolerance. 3 Power supply voltages out of tolerances. 2 RAM error detected during power-up initialization. 1 Invalid setup switch settings. 0 Reset or warm-boot occurred. A bit value of "0" indicates correct operation; a bit value of "1" indicates an error or a problem.

Table A-3. 8611/SM Commands (Continued)

Command	Function	Description
$A9_H$ (Cont.)		If a bit is set for any reason, it remains set until the BIT command is issued to read the WJ-9168 status. Thus, if there is an intermittent problem, the status byte will indicate it, even though the error condition may not be currently in effect. The error bits are cleared automatically after the status byte is read with the BIT command. Keep the following in mind when using BIT. 1. The RAM test and switch setting evaluation happens only once during power-up initialization. Errors detected with these items WILL NOT be reset after BIT reports. The only way to clear these error indications is to fix the problem and restart the unit. RAM is internal to the WJ-9168's HC11 micro-controller. 2. The LO PLLs give a LOCKED indication when the unit is in the low-power sleep mode. Even though the PLLs are actually unlocked, their operation is considered correct, and hence is not flagged as an error. 3. The WJ-9168 does not have a 2nd LO PLL; its 2nd LO PLL will always indicate a locked condition. 4. The WJ-9168 responds with its BIT data byte immediately upon receipt (and processing) of the command.
AA_H	Request Unit ID	Requests the WJ-9168 to report its Unit Identification. The response is a 3 byte binary message constructed as follows: Bytes 0, 1 = WJ-9168 (unit designation) Byte 2 = unit revision level Example -- |_23_H_| |_$D0_H$_| |_01_H_| or WJ-9168 Revision 1 byte 0 1 2
AC_H	Select Data Transmission Mode	This command selects the IF sweep data transfer mode in accordance with the argument values. The command is sent before the $A2_H$ command to establish the type of data transfer to be accomplished. The argument values set the format as follows: 00_H Transfer data in 40-byte blocks described in **paragraph A.9.3**. 01_H Transfer data in a single block representing data points for one full frequency sweep as established by previous $A0_H$ and $A1_H$ commands. Subsequent blocks are sent whenever a Send Next Data Block ($A4_H$) command is received. 02_H Transfer data continuously in blocks with each block representing data points for one full frequency sweep as established by previous $A0_H$ and $A1_H$ commands. This transfer operation is ended by the Stop Processing Command ($A3_H$).

Table A-3. 8611/SM Commands (Continued)

Command	Function	Description
AD_H	Set Termination Mode	This command sets the WJ-9168 to either send or not send a termination at the end of a response message. The argument set is as follows: 00_H – No termination 01_H – FD_H termination Reset: $AD00_H$ – No termination Default: $AD00_H$ – No termination Example: $AD01_H$ – FD_H termination
AF_H	Sleep	This command provides a remote power-down feature, such as that provided on the WJ-8654 Microceptor receiver. There are three Sleep modes as described in the following: <u>Mode 0</u>: The Low Power Idle Mode is slightly different from the two main sleep functions (modes 1 and 2). The RF circuitry is shut down to conserve power, but the micro-controller and all communication interfaces remain fully functional. The unit is restored to normal operation when it receives a command requiring normal operation of its RF circuits, specifically START, Fixed Tune, and Signal Strength. Since the micro-controller is fully operational in the low power mode, all setup information is retained and sweep setups may be changed. <u>Mode 1</u>: This command physically shuts off WJ-9168 power within the unit, leaving only a small monitor circuit active. Any WJ-9168 activity prior to sleep is halted; there is no backup of setup or operational information. Sending a signal monitor message via the IEEE-488 bus restores operation. The first byte sent to a "sleeping" unit will wake it, but will be lost; therefore, the "waking" byte should be a dummy byte. Any ASCII character that does not disturb any other devices that may be on the interface can be used. The unit wakes as if power has just been applied; it performs its power-up initializations, then waits for further instructions. Any prior setup information is lost when entering the sleep mode. <u>Mode 2</u>: Mode 2 is not applicable to the 8611/SM option implementation. **<u>DATA FIELD</u>**: 00_H WJ-9168 Low Power Idle Mode 01_H WJ-9168 Sleep 02_H Not Applicable Example: $AF01_H$ - Select Sleep Mode 1

A.10 REPLACEMENT PARTS LIST

A.10.1 LIST OF MANUFACTURERS

14632 DRS Signal Solutions, Inc.
700 Quince Orchard Road
Gaithersburg, MD 20878-1706

A.10.2 PARTS LIST

The following parts list contains the top-level electrical components associated with the 8611/SM option. For a more detailed parts listing of the WJ-9168 Signal Monitor Module, refer to the *WJ-9168 Signal Monitor Module Installation and Operation Manual* (P/N 181247-00X).

A.10.3 8611/SM WJ-8611 SIGNAL MONITOR OPTION

	Revision A			
1	Signal Monitor Module	1	WJ-9168	14632
W8	Signal Monitor Control Cable	1	384477-001	14632
W9	SMA Male-to-SMA Female Cable	1	17300-774-001	14632
W10	SMA Male-to-SMA Female Cable	1	17300-774-002	14632
W11	External SMA Male-to-BNC Male Cable	1	17300-774-003	14632

A.11 8611/SM SIGNAL MONITOR OPTION SCHEMATIC DIAGRAM

Figure A-5 is a schematic diagram of the 8611/SM option depicting the WJ-9168 interconnection to the WJ-8611 Digital Control Assembly (A2) and the rear panel connectors.

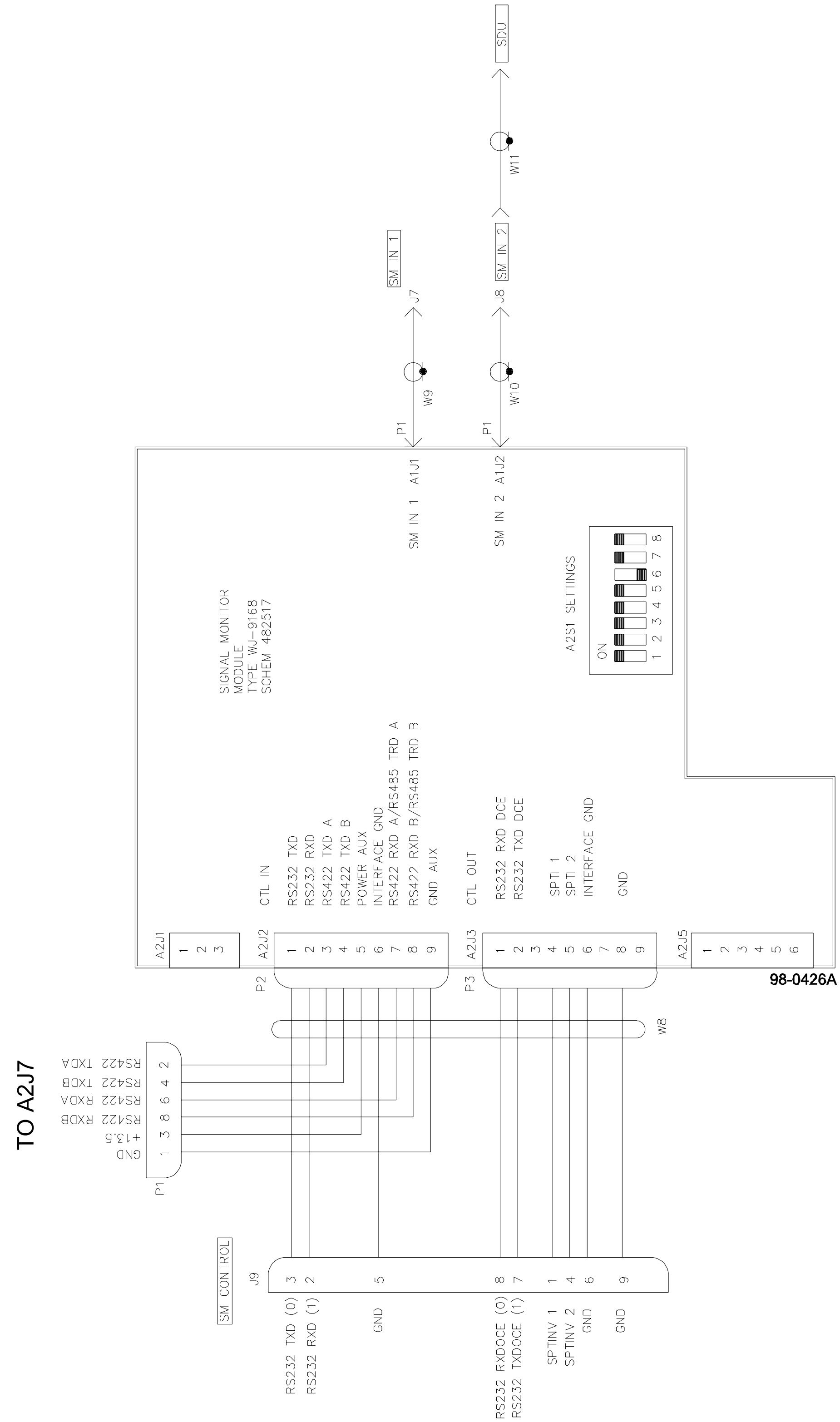


Figure A-5. 8611/SM Signal Monitor Option Schematic Diagram (384476) Rev A

FOLDOUTS

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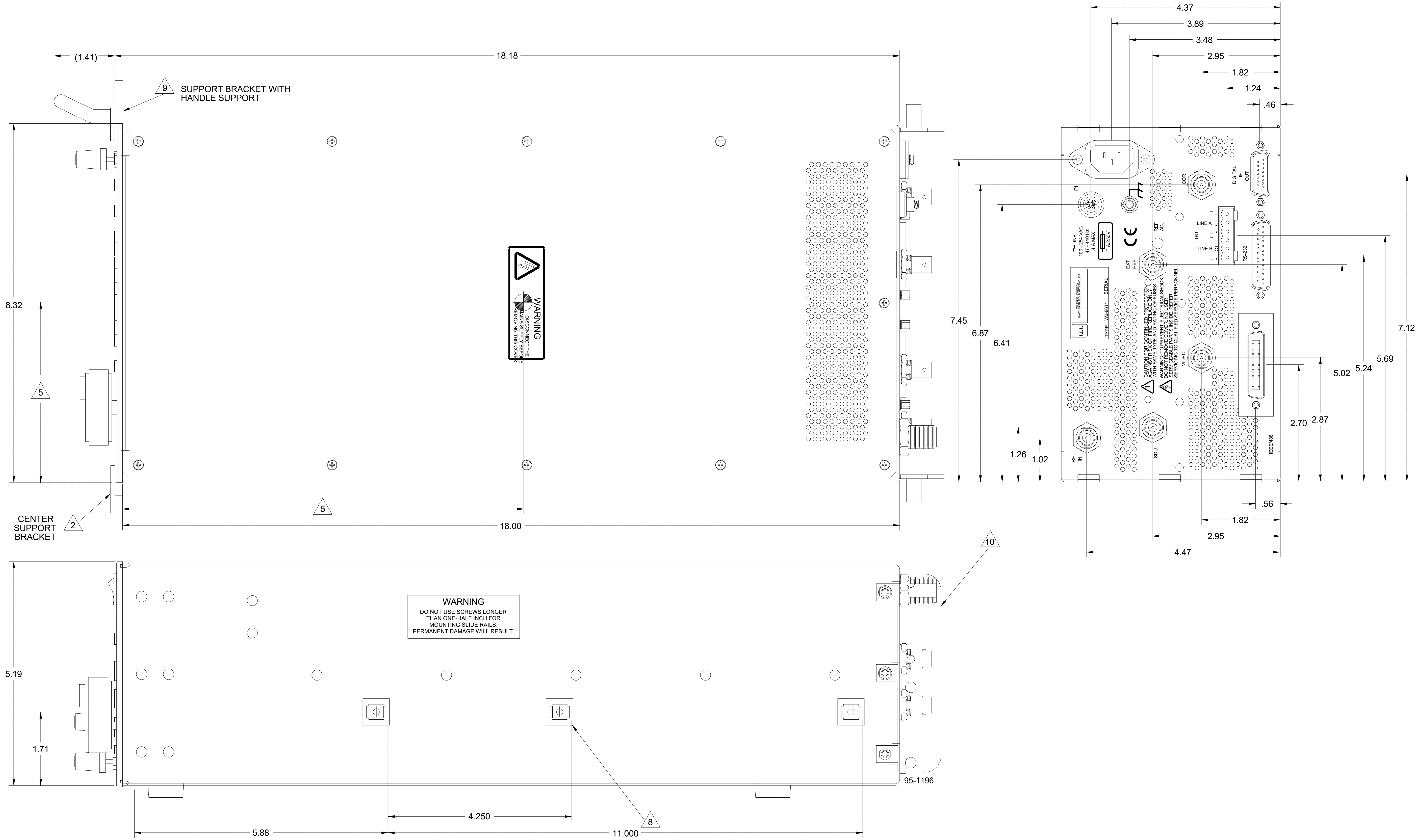
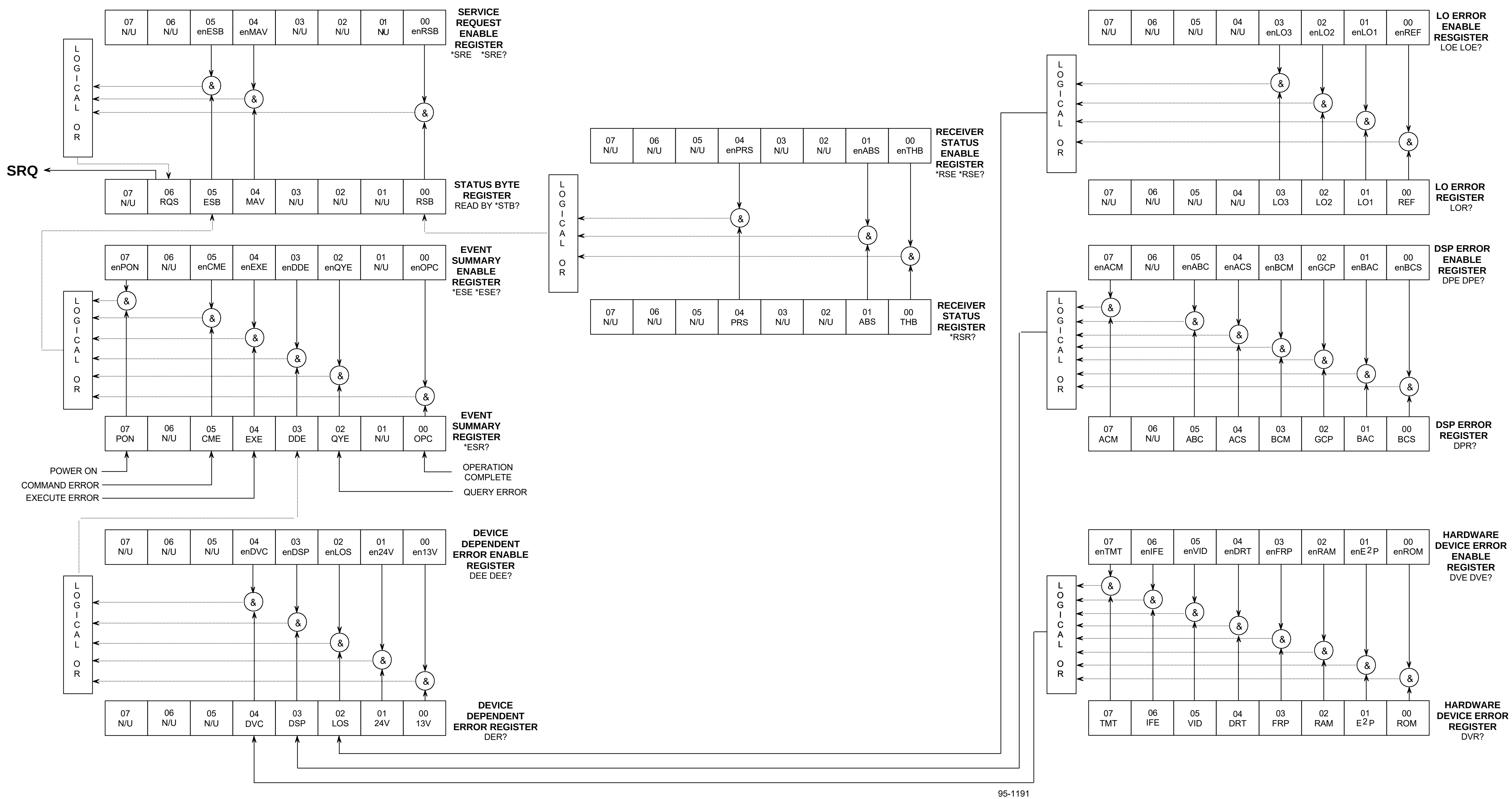
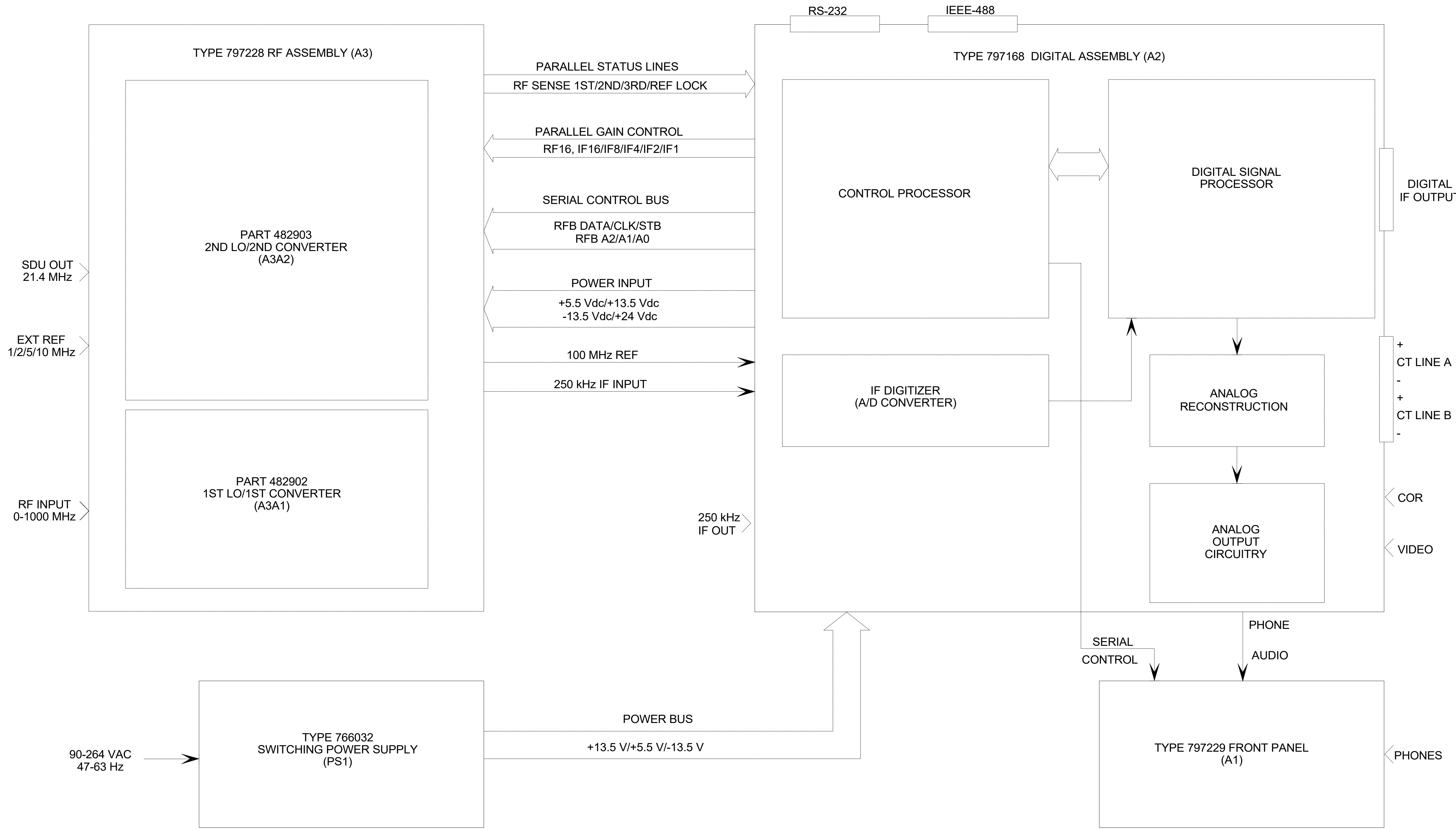


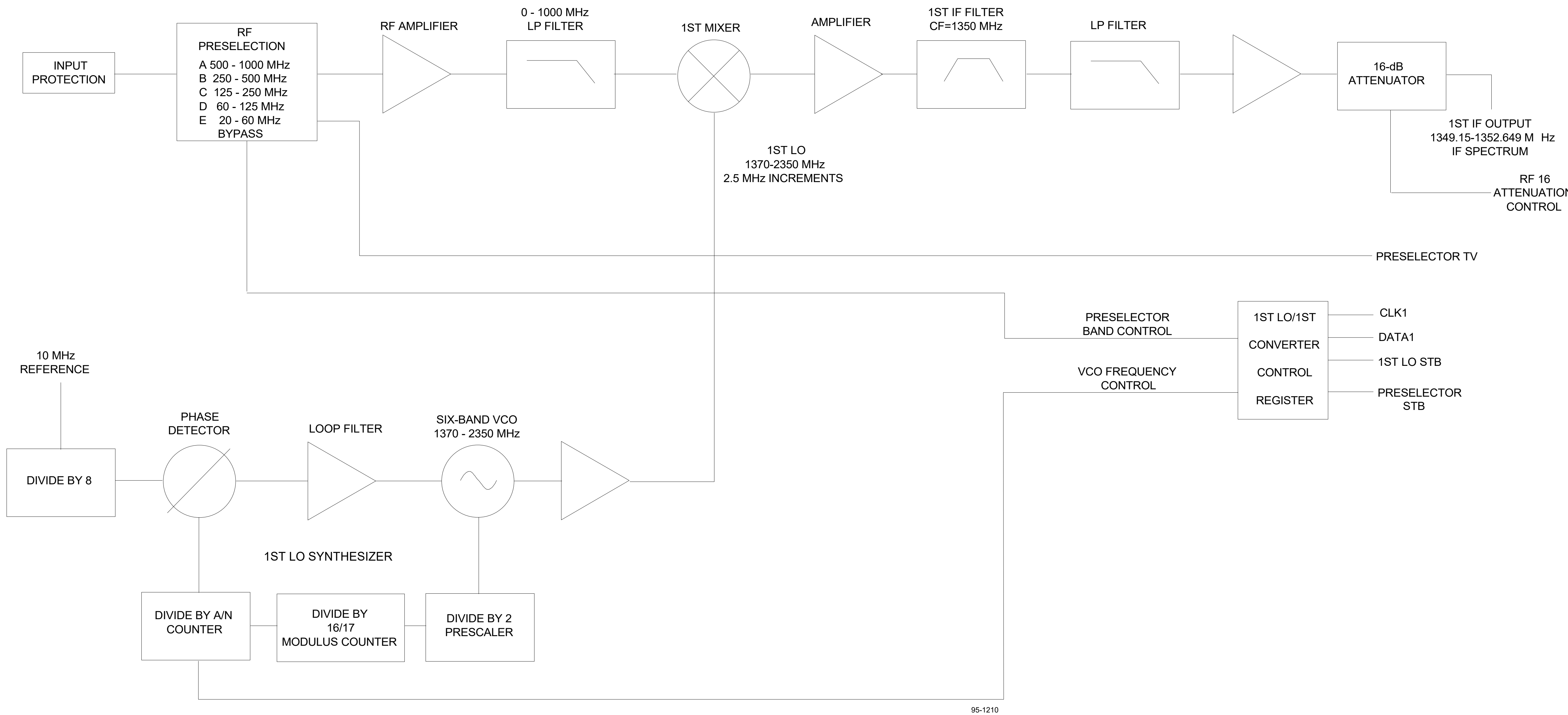
FO-1. WJ-8611 Digital VHF/UHF Receiver Critical Dimensions



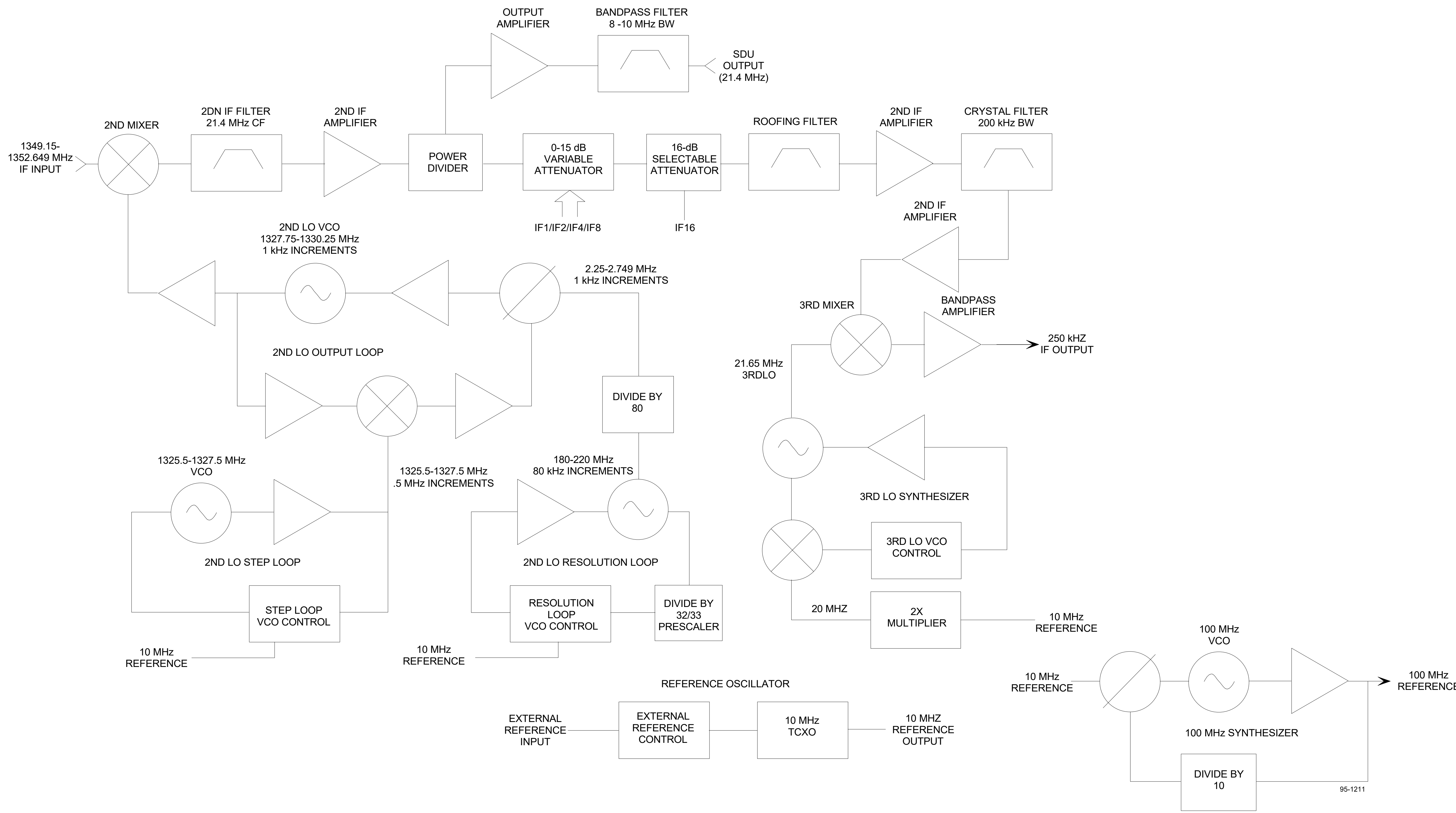
FO-2. WJ-8611 Status Data Structure



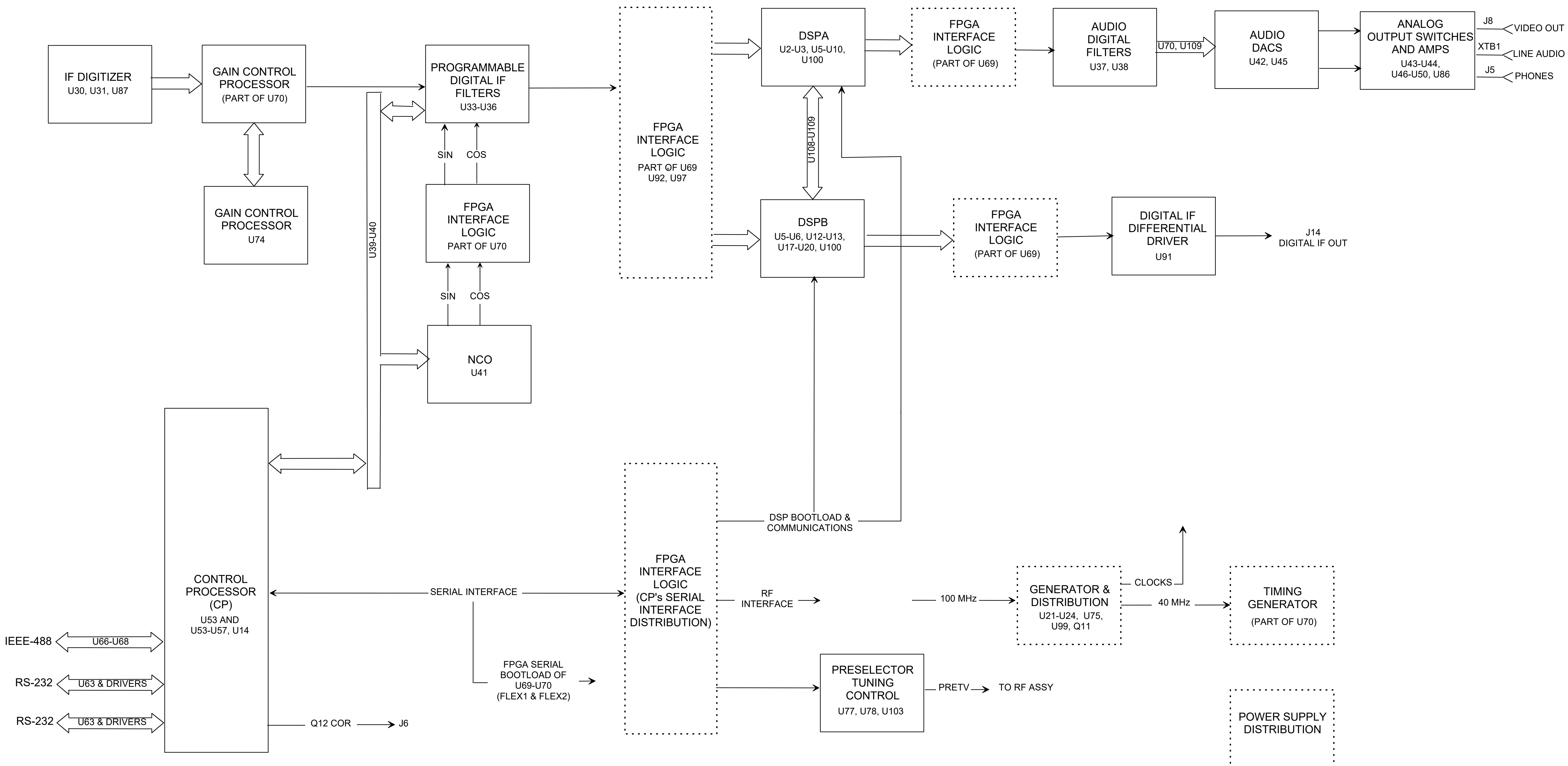
FO-3. WJ-8611 Digital VHF/UHF Receiver Functional Block Diagram



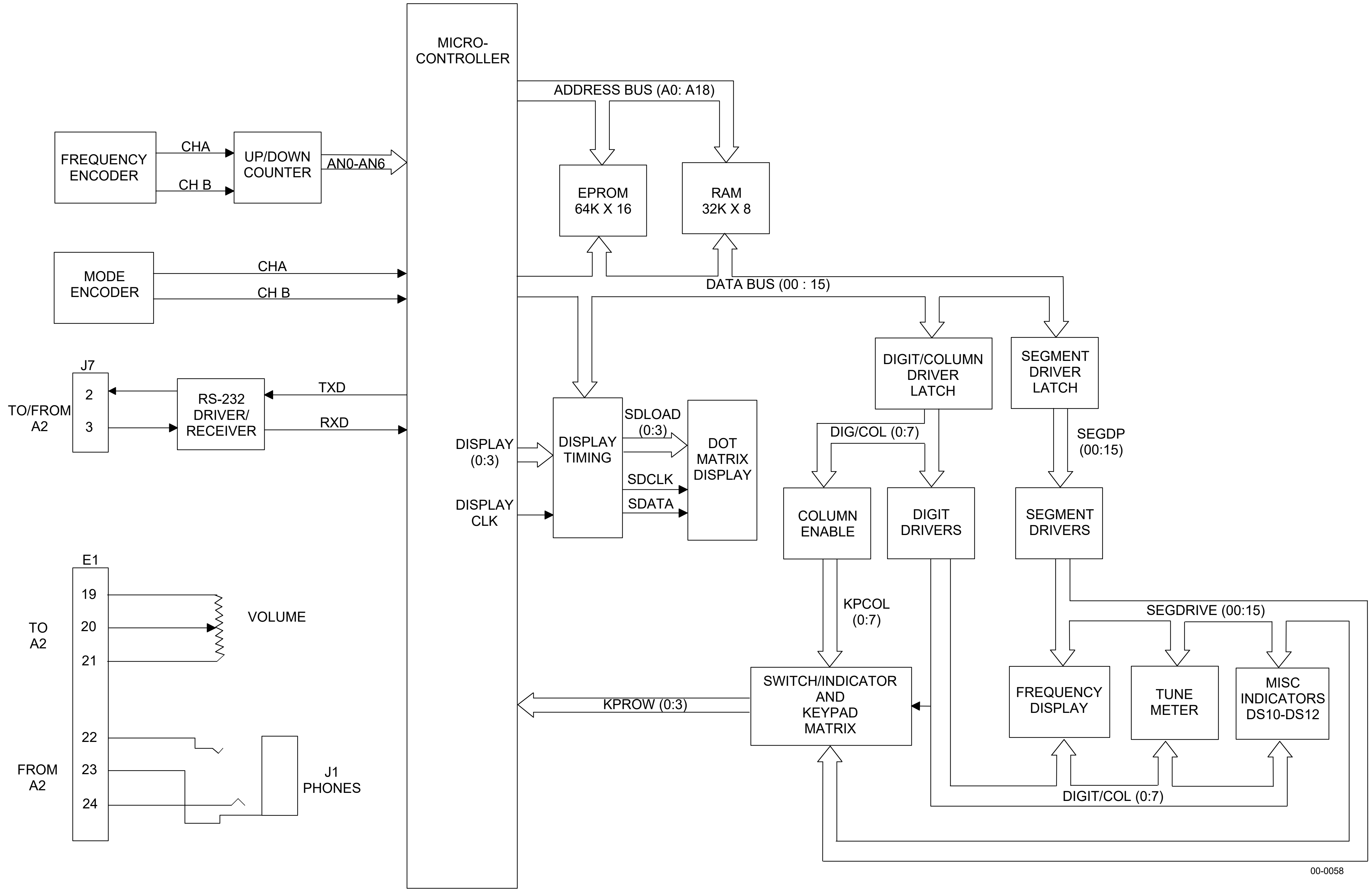
FO-4. Part 482902-1 1st LO/1st Converter PC Assembly (A3A1) Functional Block Diagram



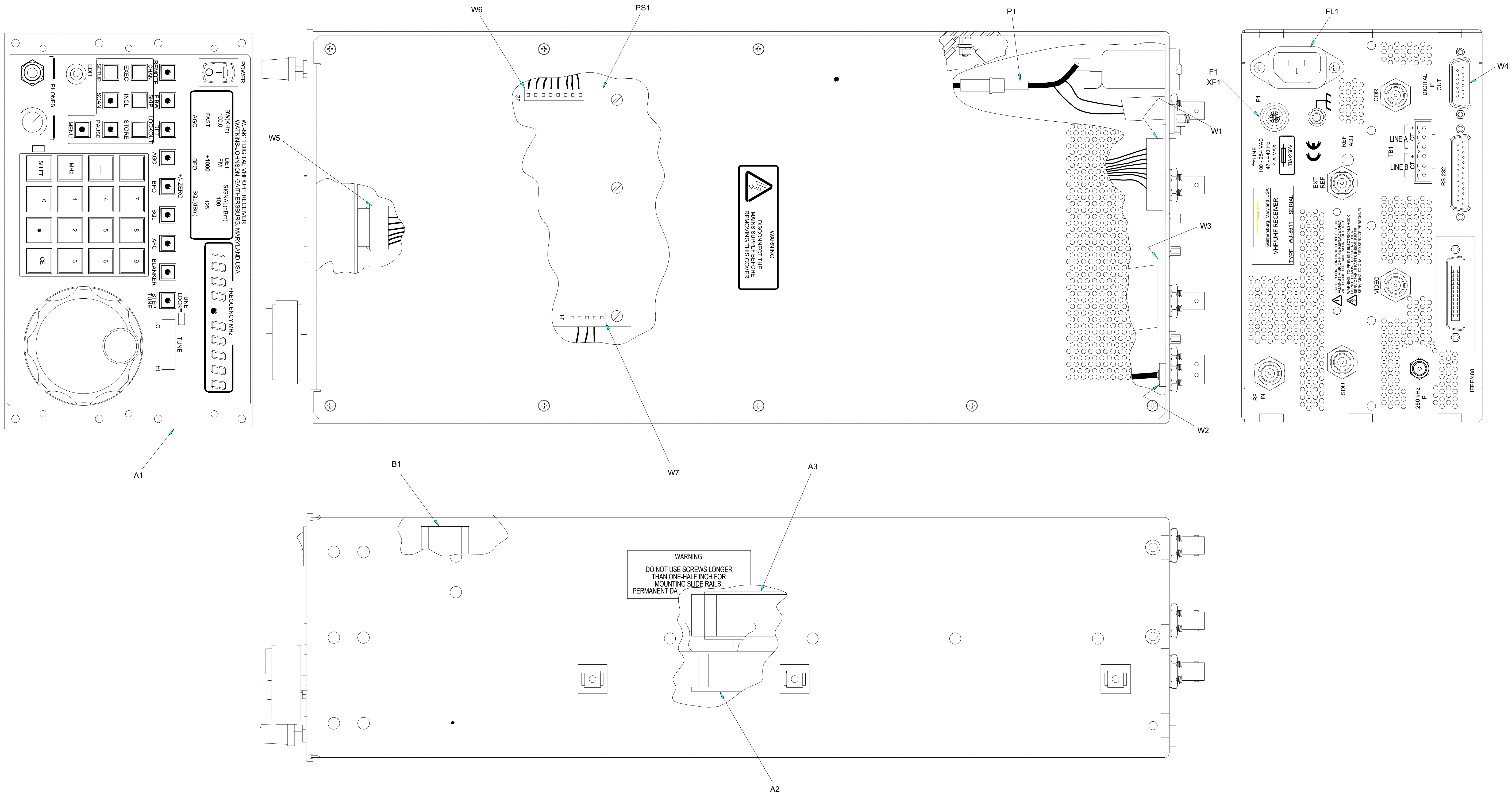
FO-5. Part 482903-1 2nd LO/2nd Converter PC Assembly (A3A2) Functional Block Diagram



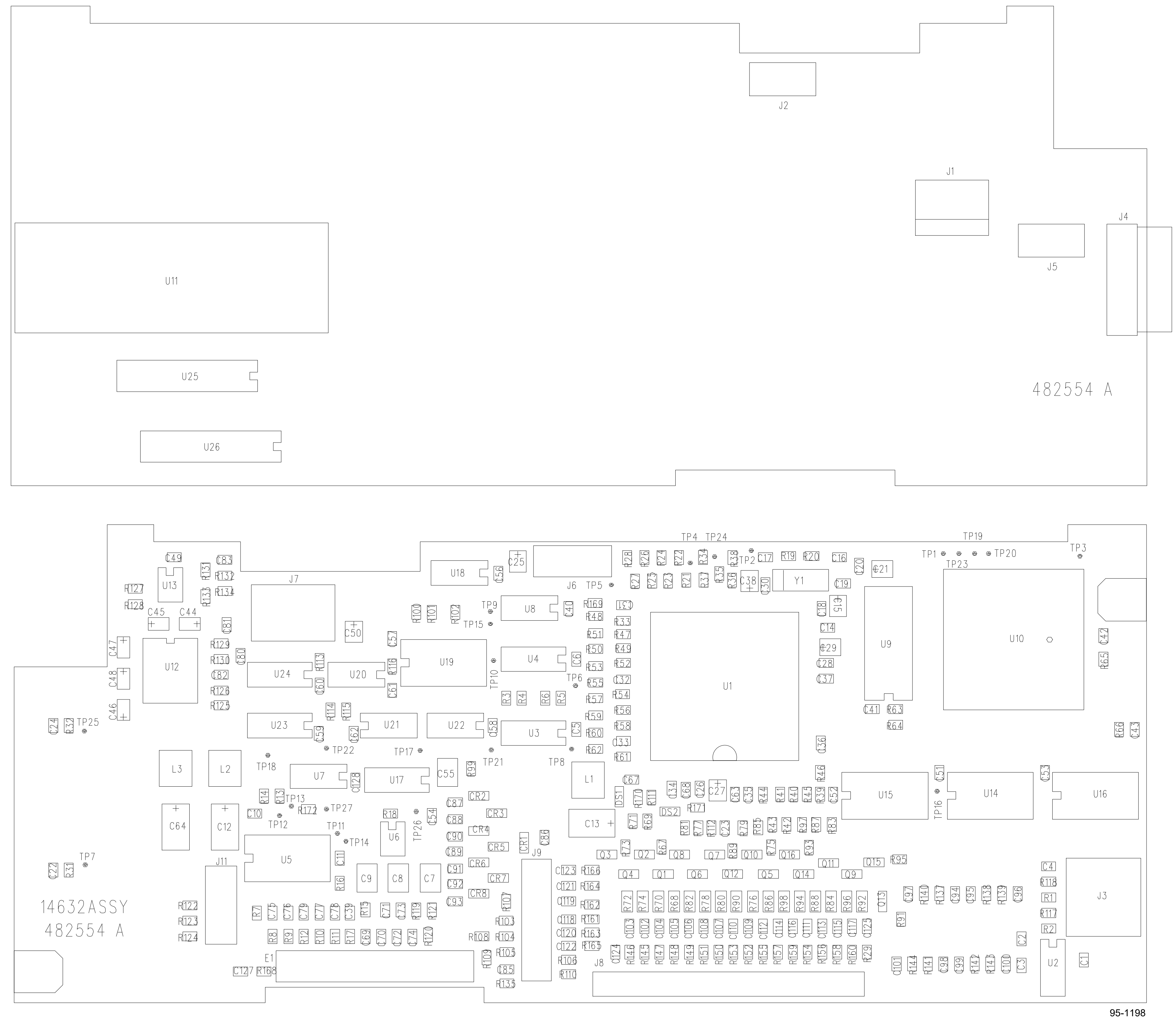
FO-6. Type 797168 Digital Control PC Assembly (A2) Functional Block Diagram



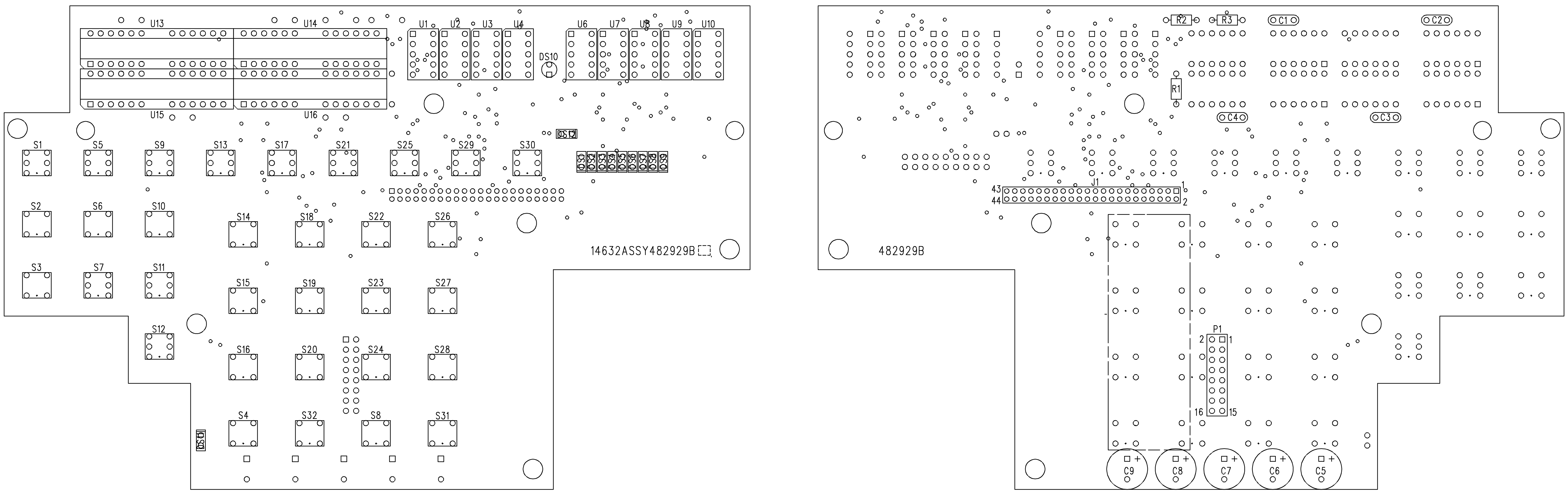
FO-7. Type 797229-1 Front Panel Assembly (A1)
Functional Block Diagram



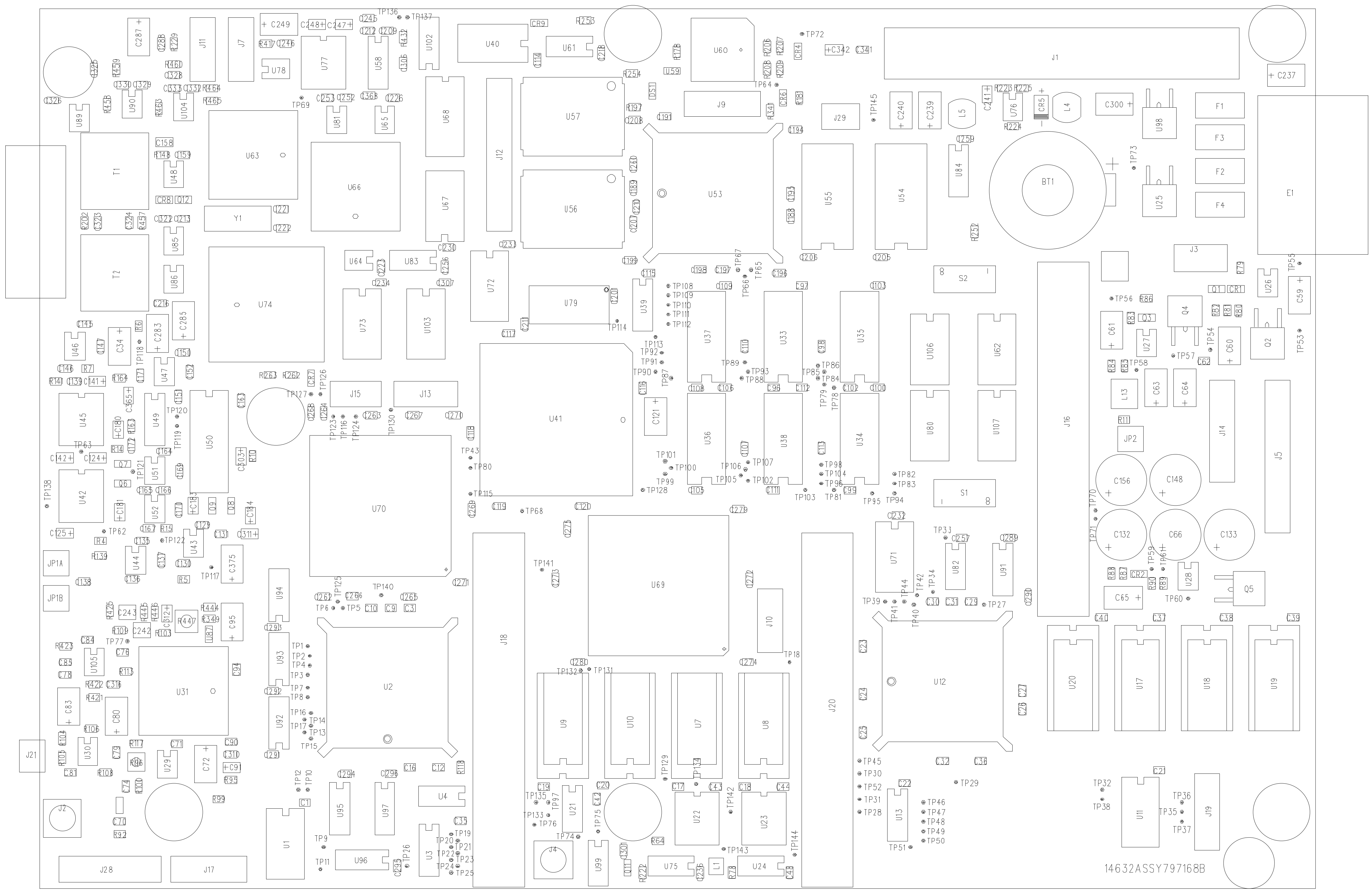
FO-8. WJ-8611 Digital VHF/UHF Receiver, Module Location Drawing 581957



FO-9. Part 482554 Front Panel Control PC Assembly (A1A1) Component Location Drawing 482547

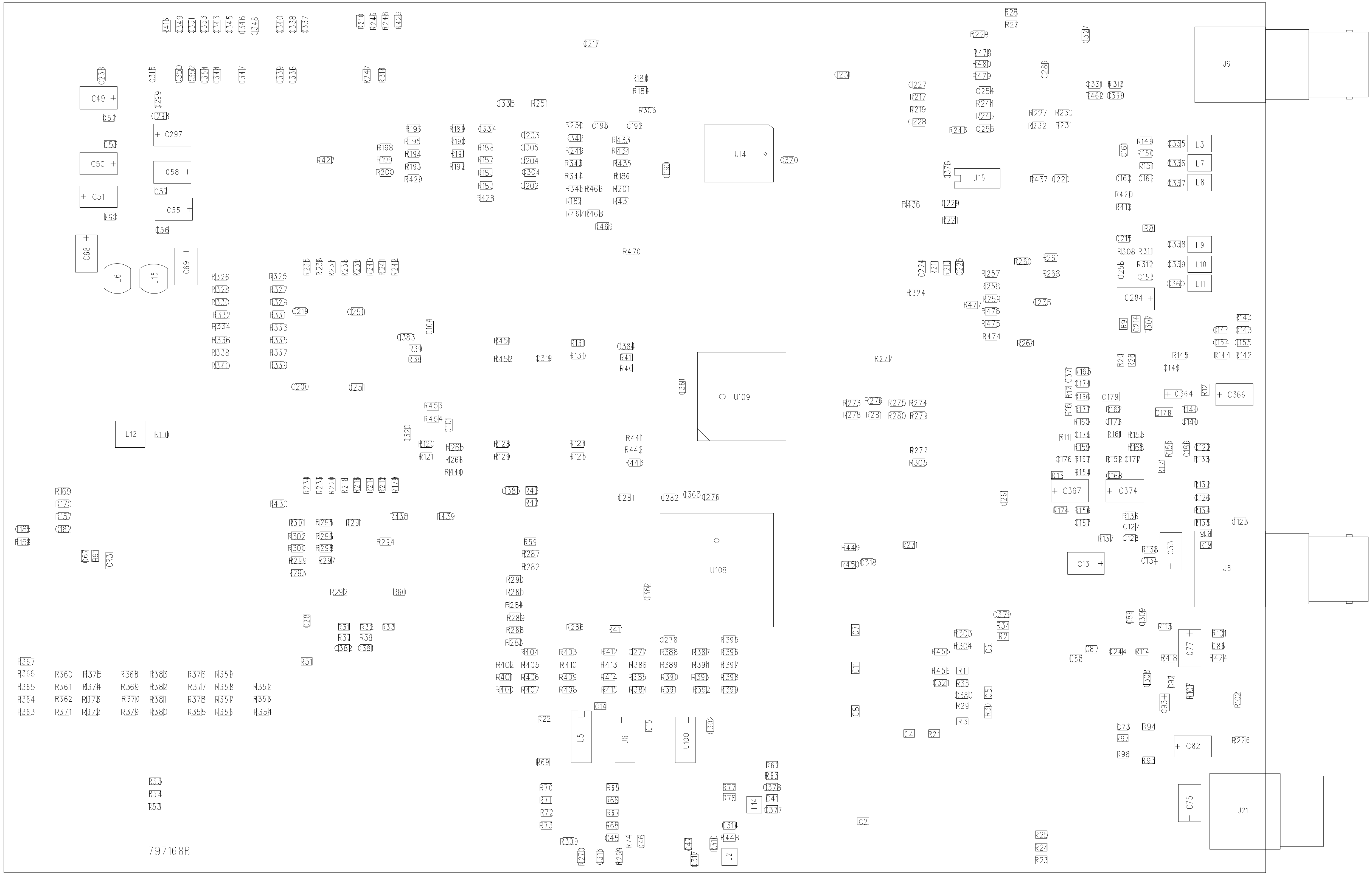


FO-10. Part 482929 Display PC Assembly (A1A2)
Component Location Drawing 482929



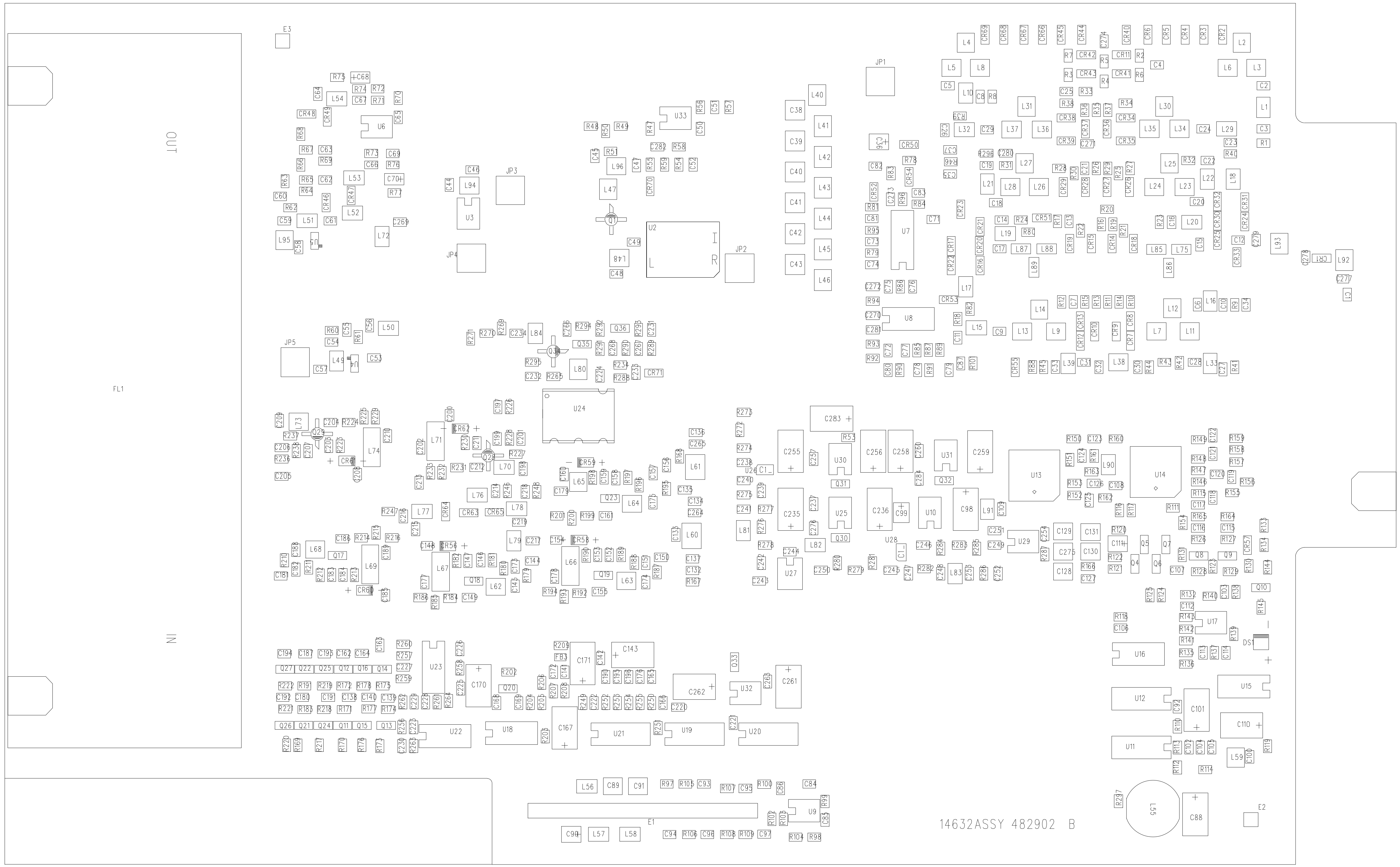
(TOP VIEW)

FO-11. Type 797168 Digital Control PC Assembly (A2), Component Location Drawing 797168 (Sheet 1 of 2)



(BOTTOM VIEW)

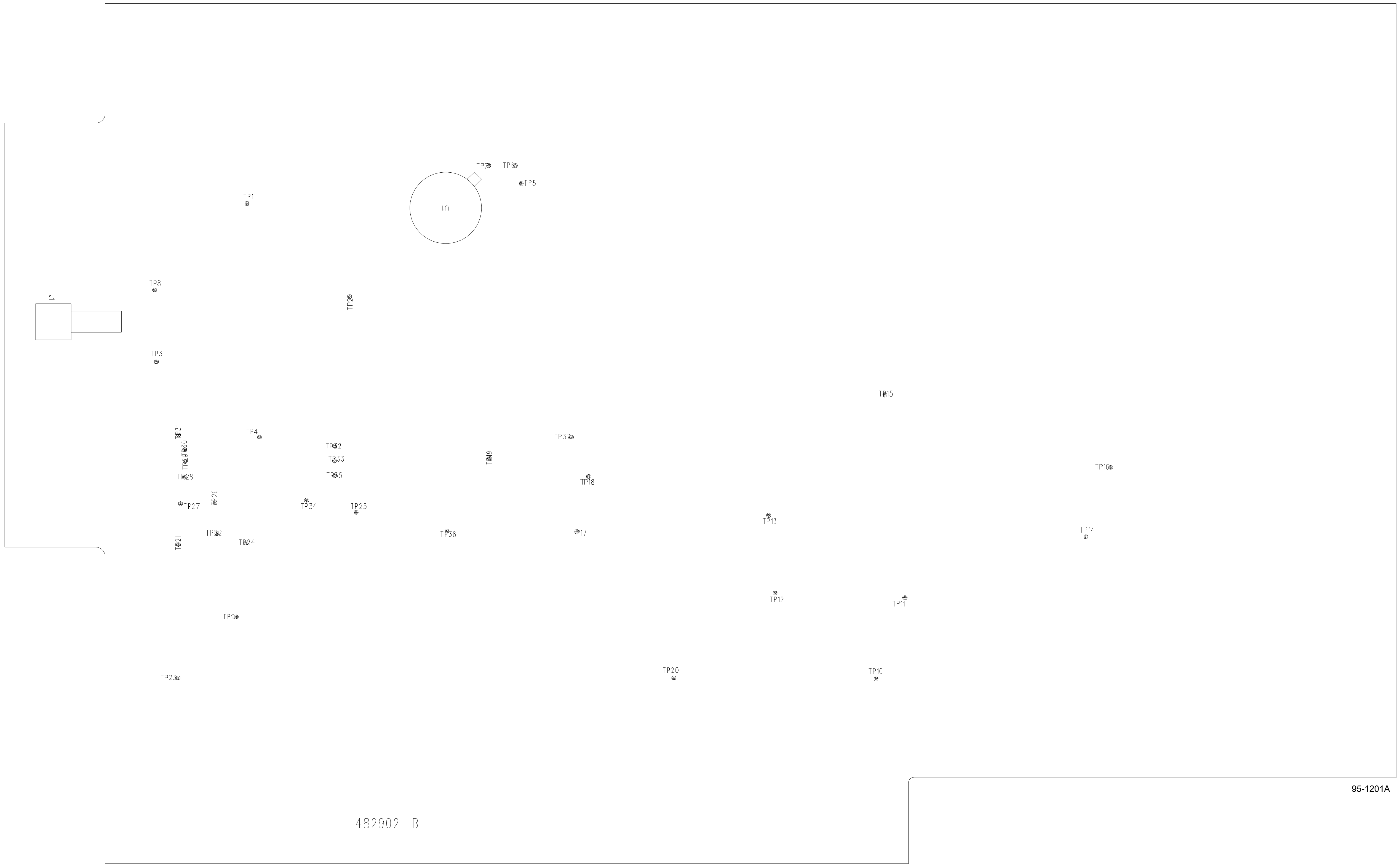
FO-11. Type 797168 Digital Control PC Assembly (A2), Component Location Drawing 797168 (Sheet 2 of 2)



95-1201

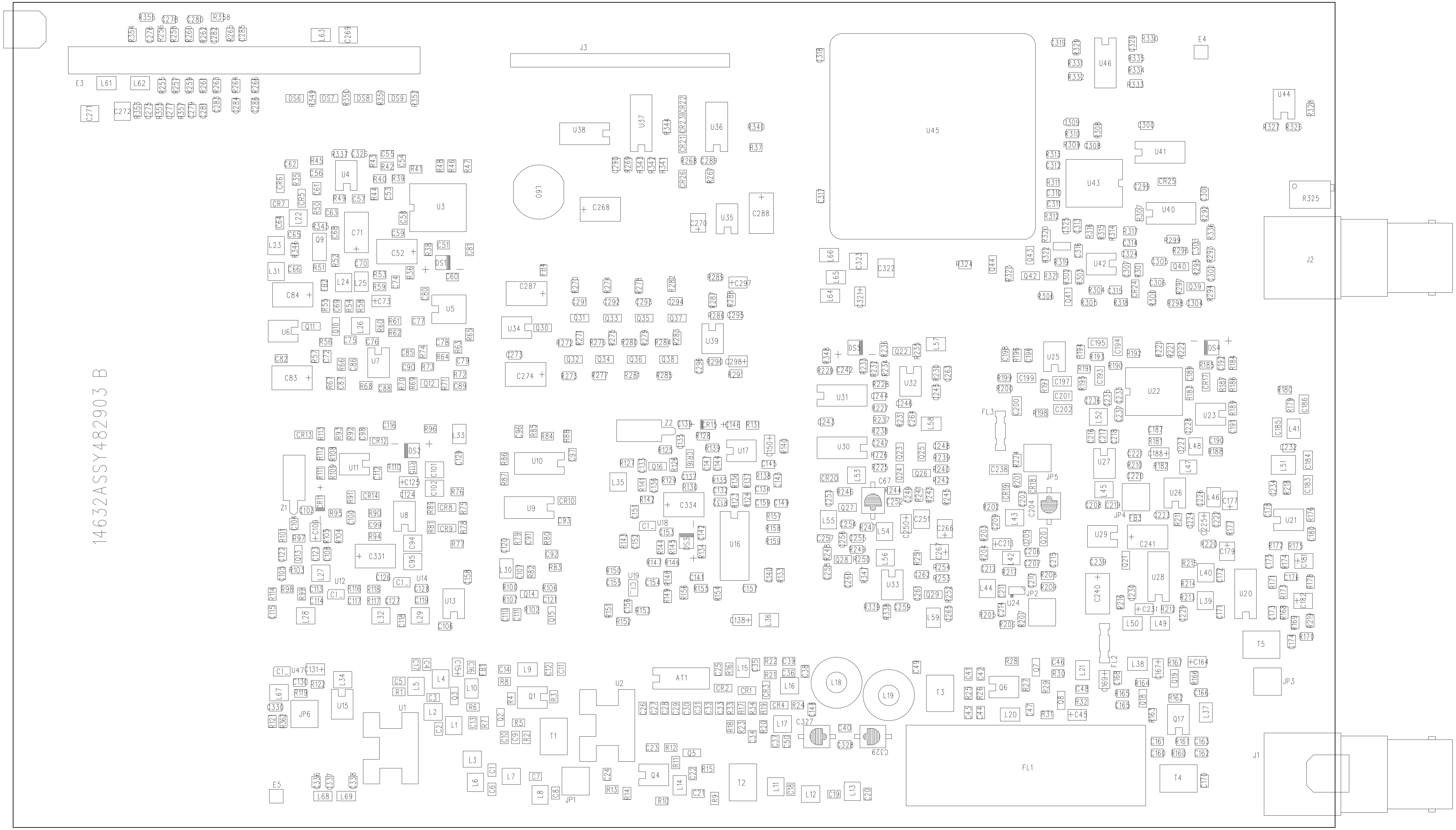
(TOP VIEW)

FO-12. Part 482902 1st LO/1st Converter PC Assembly (A3A1), Component Location Drawing 482902 (Sheet 1 of 2)



(BOTTOM VIEW)

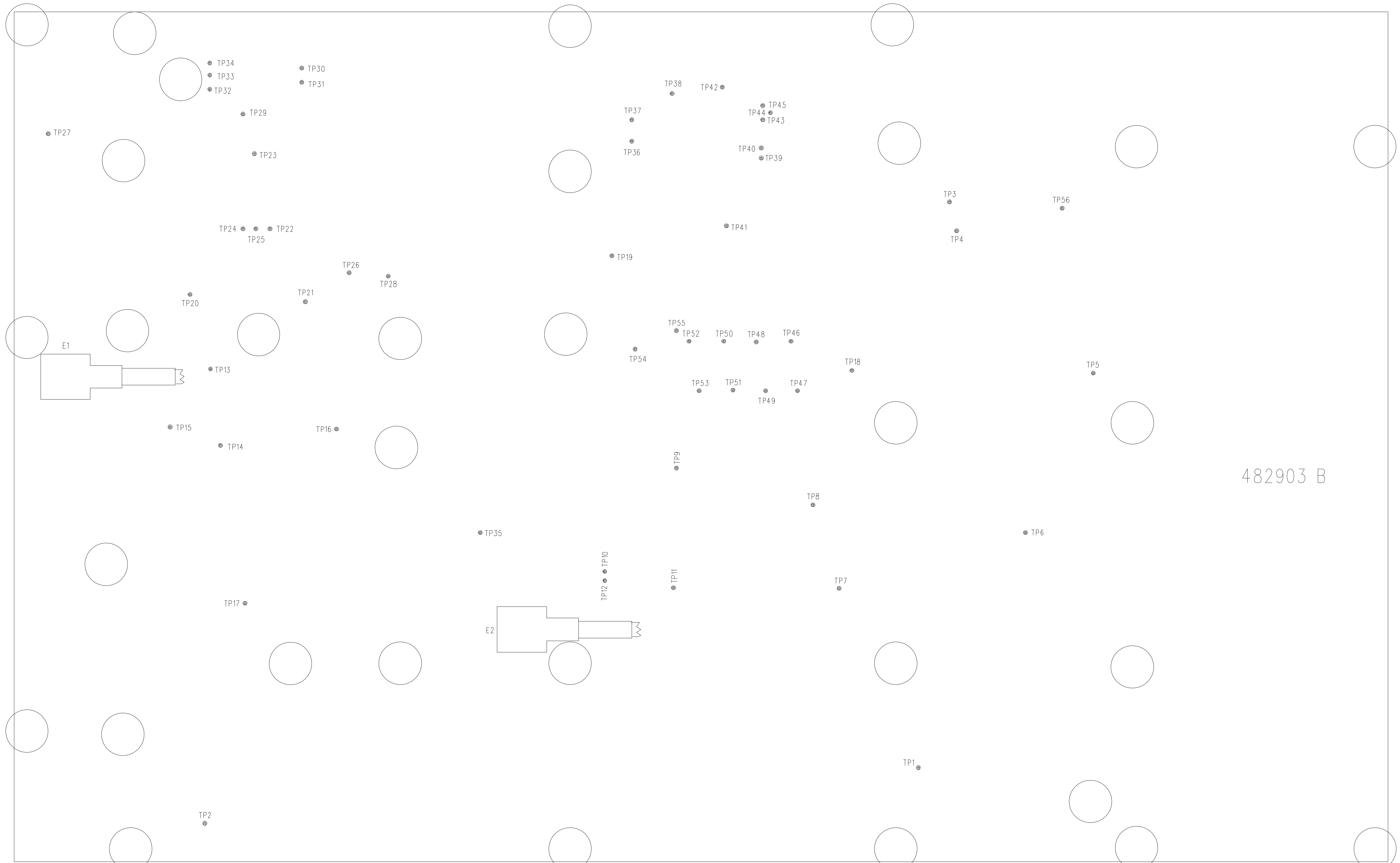
FO-12. Part 482902 1st LO/1st Converter PC Assembly (A3A1), Component Location Drawing 482902 (Sheet 2 of 2)



(TOP VIEW)

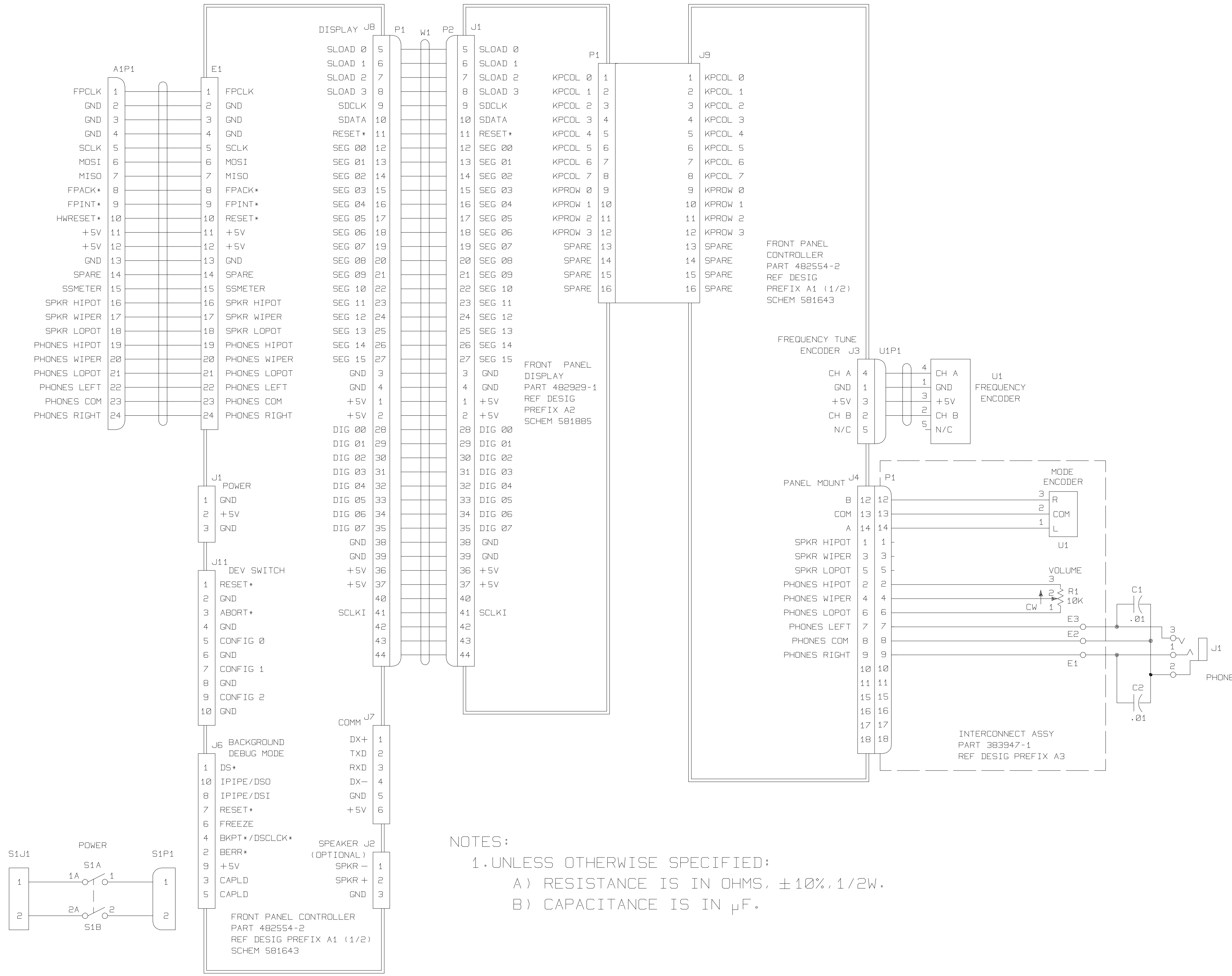
95-1202

FO-13. Part 482903 2nd LO/2nd Converter PC Assembly (A3A2), Component Location Drawing 482903 (Sheet 1 of 2)

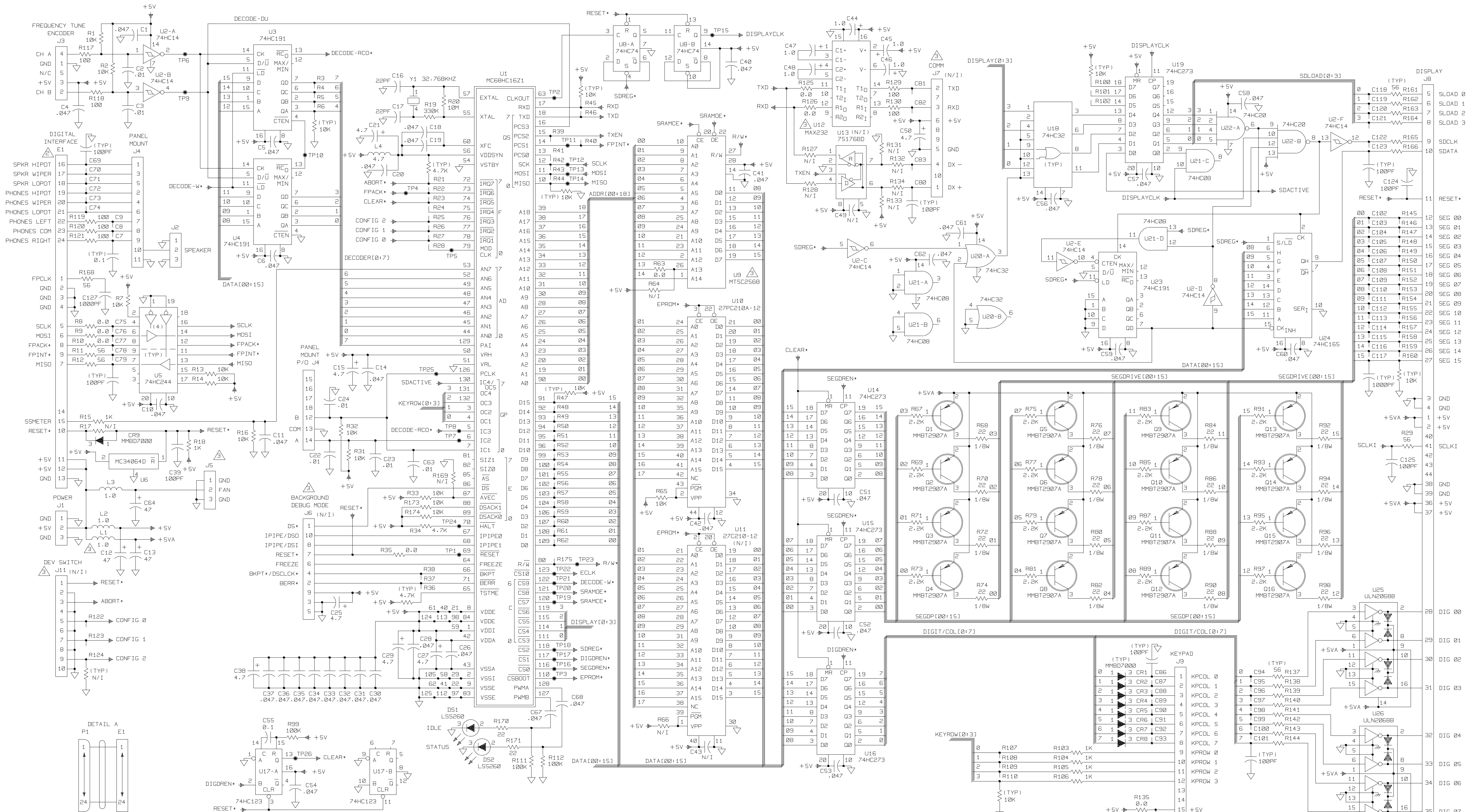


(BOTTOM VIEW)

FO-13. Part 482903 2nd LO/2nd Converter PC Assembly (A3A2), Component Location Drawing 482903 (Sheet 2 of 2)



FO-14. Type 797229-2 Front Panel Assembly (A1)
Schematic Diagram 482930 (A)



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
   B) CAPACITANCE IS IN µF.
   C) INDUCTANCE IS IN µH.

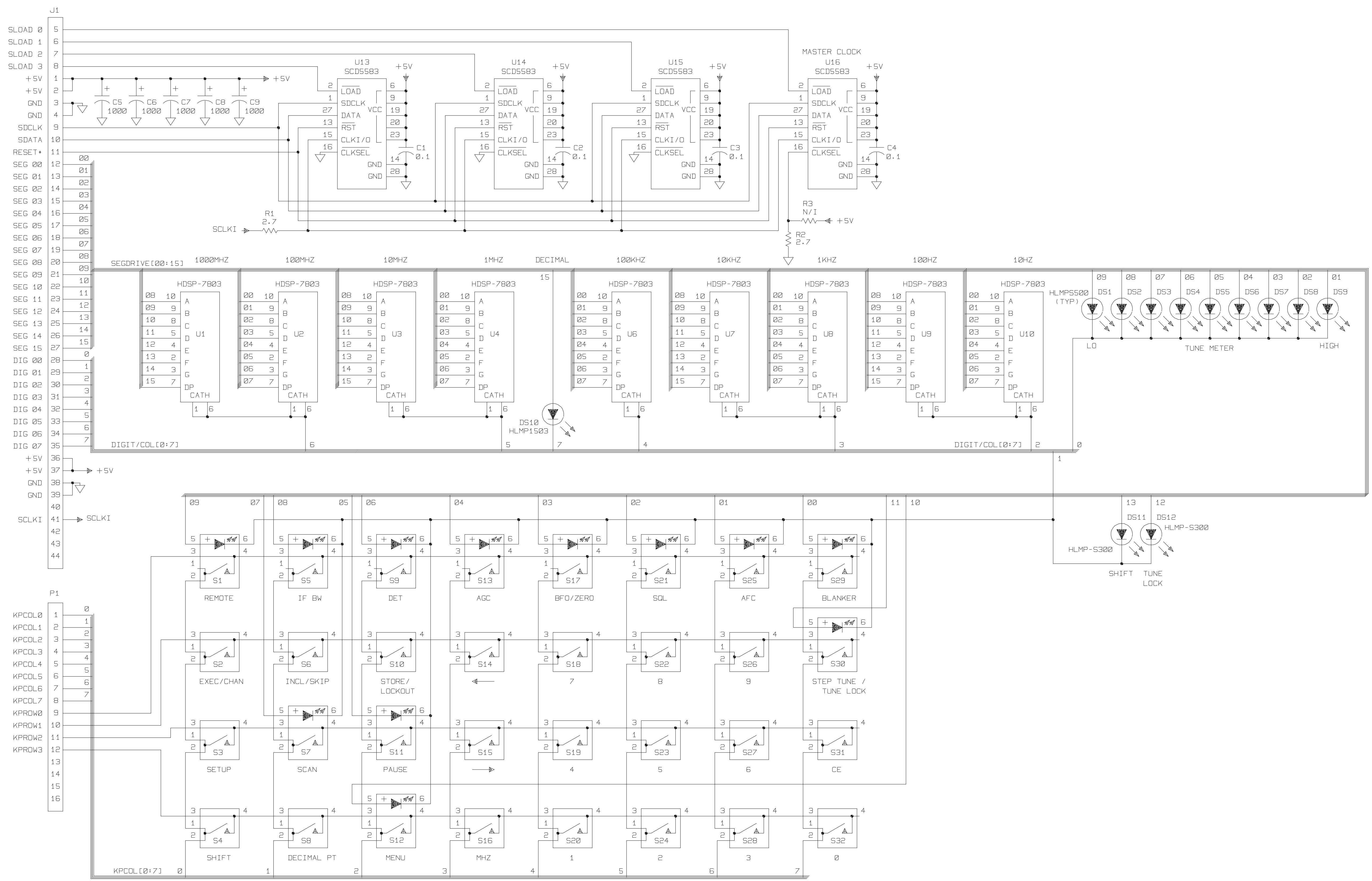
2 DUE TO SCHEM SIZE P1 WAS NOT SHOWN CONNECTED TO E1. SEE DETAIL A FOR CONNECTIONS.

3 SEE TABLE FOR DASH NO. TABULATION.

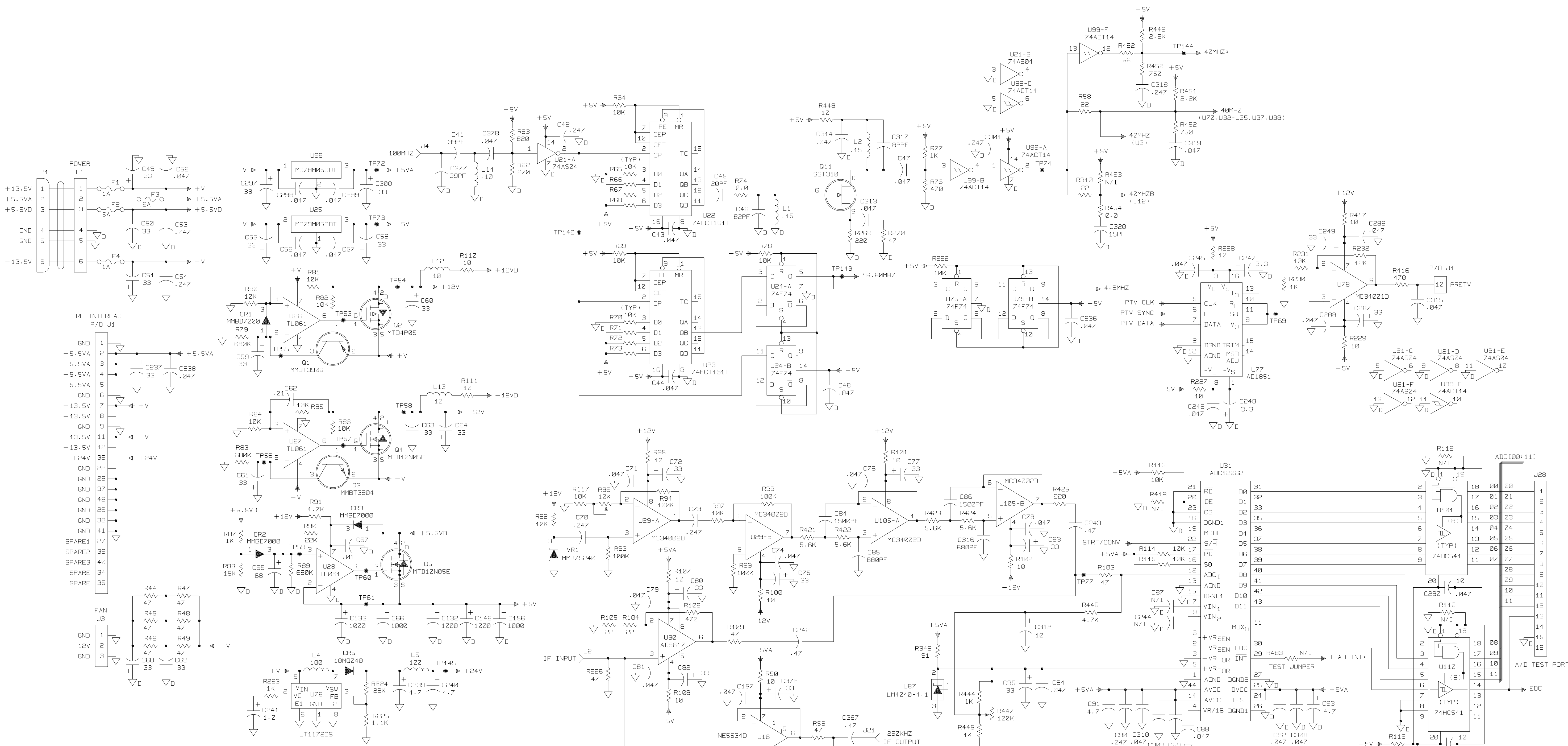
3

PART	J5	J6	J7	J10	J11	L1	U9	U12
482554-1	INSTALLED	N/I	N/I	N/C	N/I	1.0UH	N/I	N/I
482554-2	N/I	N/I	INSTALLED	N/C	N/I	220UH	INSTALLED	INSTALLED

FO-15. Part 482554-2 Front Panel Control PC Assembly (A1A1), Schematic Diagram 581643 (G)



FO-16. Part 482929-1 Display PC Assembly (A1A2), Schematic Diagram 581885 (B1)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - A) RESISTANCE IS IN OHMS, ±5%, 1/10W.
   - B) CAPACITANCE IS IN μF.
   - C) INDUCTANCE IS IN μH.

2. IT IS POSSIBLE TO USE VARIOUS DENSITY MEMORY CHIPS FOR U7, U8, U9, U10, U17, U18, U19, U20, U56 & U57. TABLE A LISTS POSSIBLE OPTIONS OTHER THAN WHAT IS SHOWN IN SCHEMATIC.

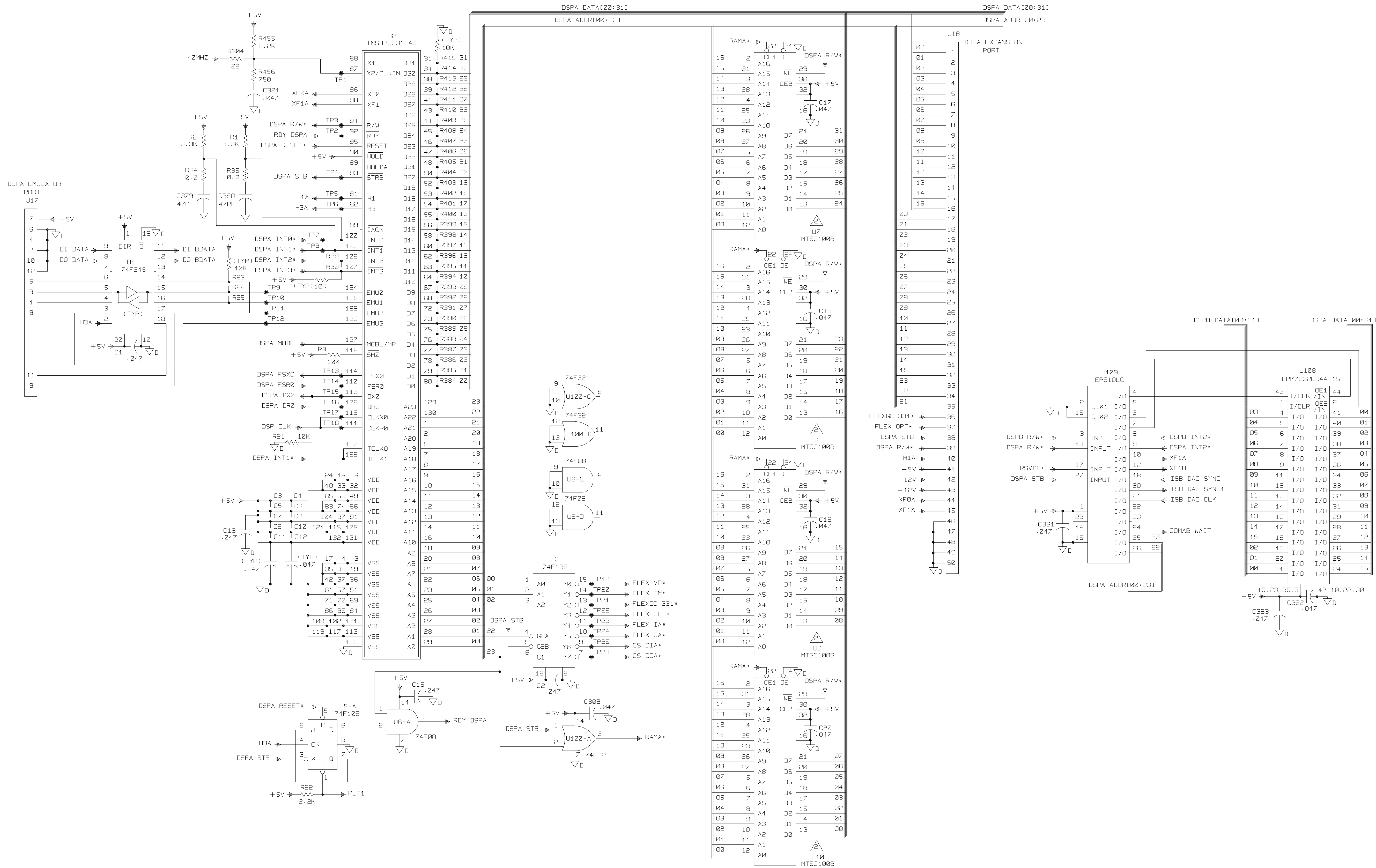
TABLE A

REF DES	DESCRIPTION	OPTIONS
U7, U8, U9, U10	128K X 8 SRAM **	(N/A)
U17, U18, U19, U20	32K X 8 SRAM **	MT5C2568
U56, U57	512K X 8 EPROM ***	AM27C040
	512K X 8 FLASH ***	AM29F040

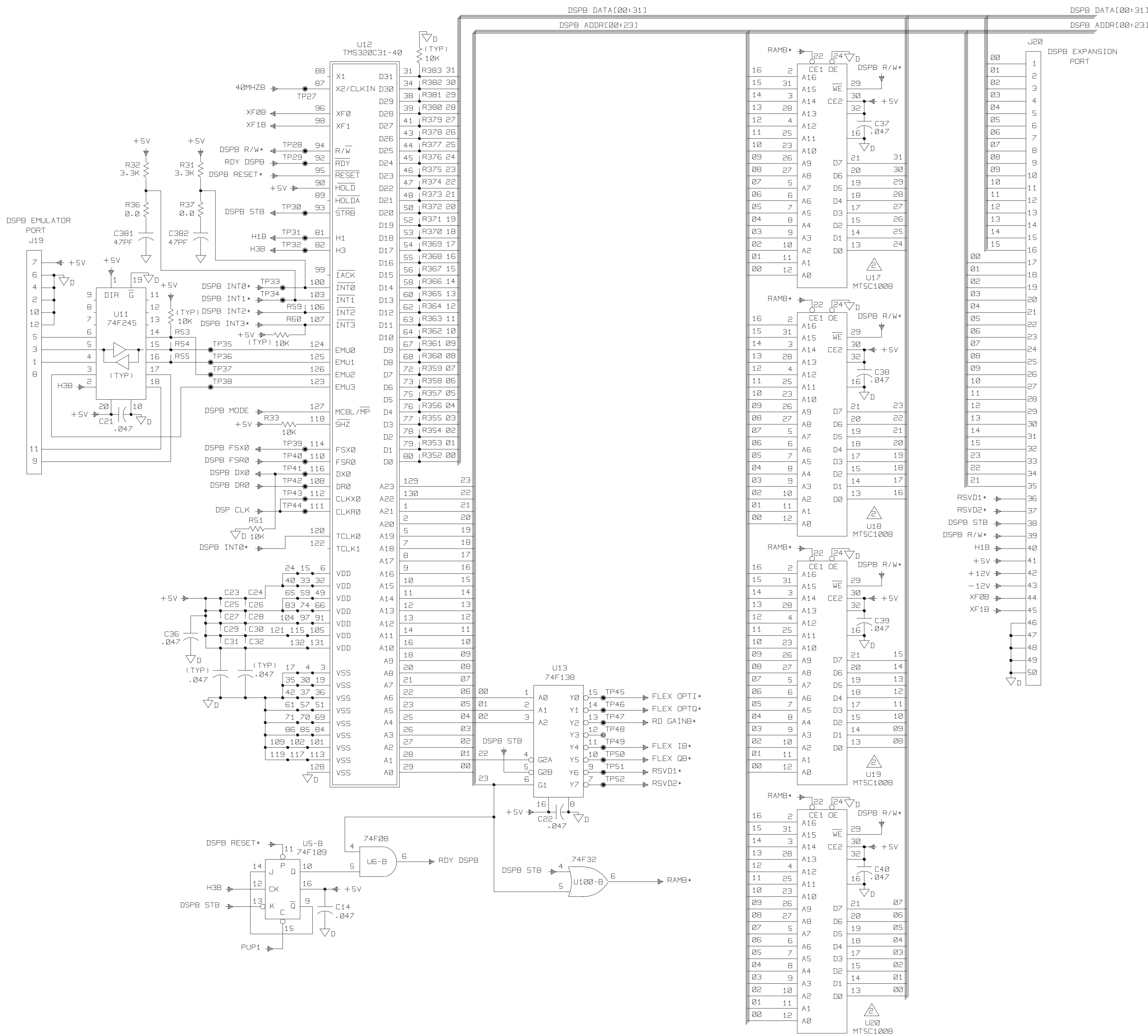
** A 32-PIN 128K X 8 SRAM IS SHOWN ON THE SCHEMATIC. WHEN A 28-PIN 32K X 8 IS INSTALLED, PINS 1 THRU 28 CORRESPOND TO PINS 3 THRU 30 ON THE 32-PIN CHIP.

*** A 32-PIN 256K X 8 EPROM IS SHOWN ON THE SCHEMATIC. WHEN A 32-PIN 512K X 8 EPROM IS INSTALLED, PIN 1 IS VPP AND PIN 31 IS A18. WHEN A 512K X 8 FLASH IS INSTALLED, PIN 1 IS A18 AND PIN 31 IS $\overline{WE}$.

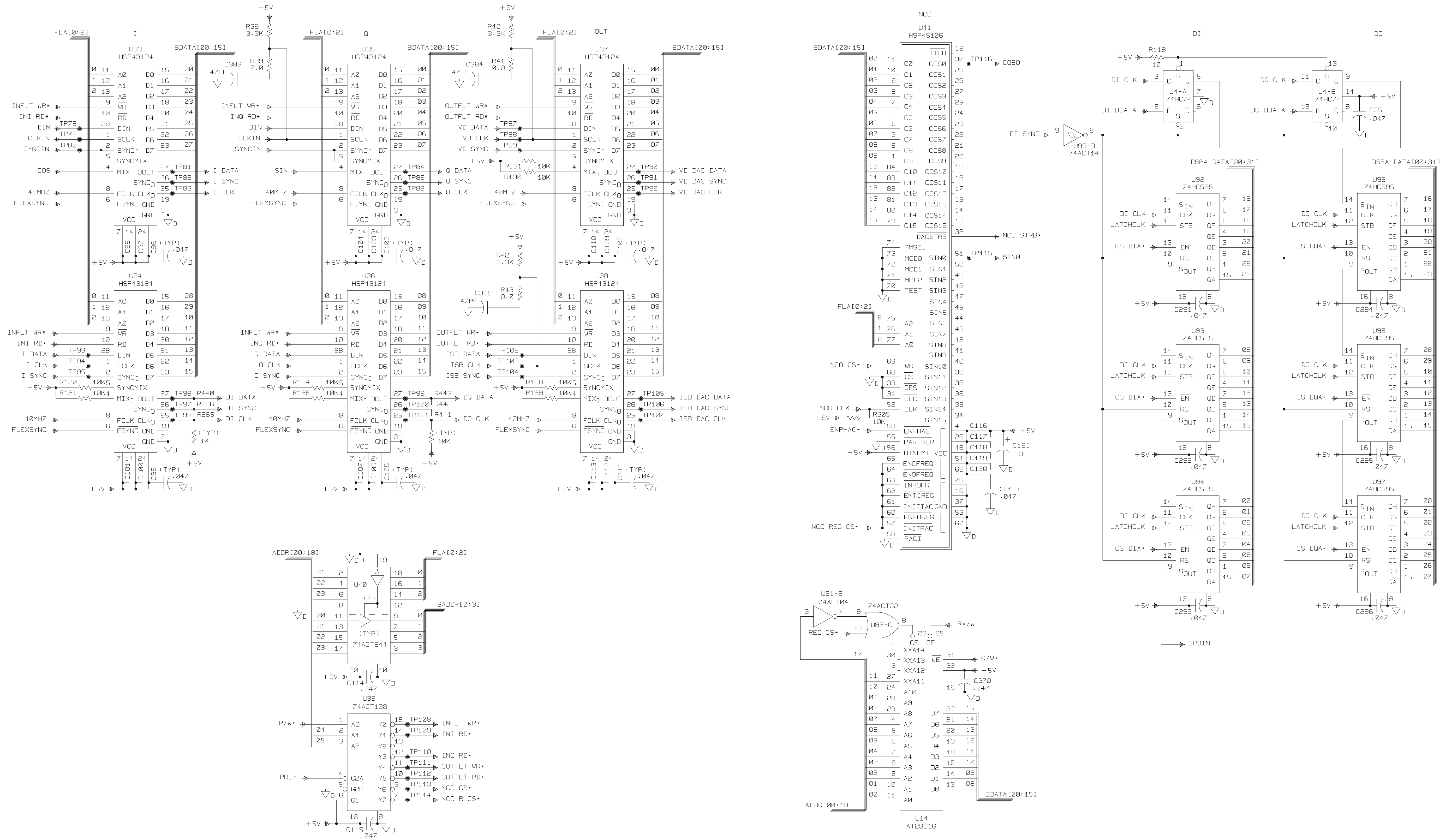
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 1 of 7) (S)



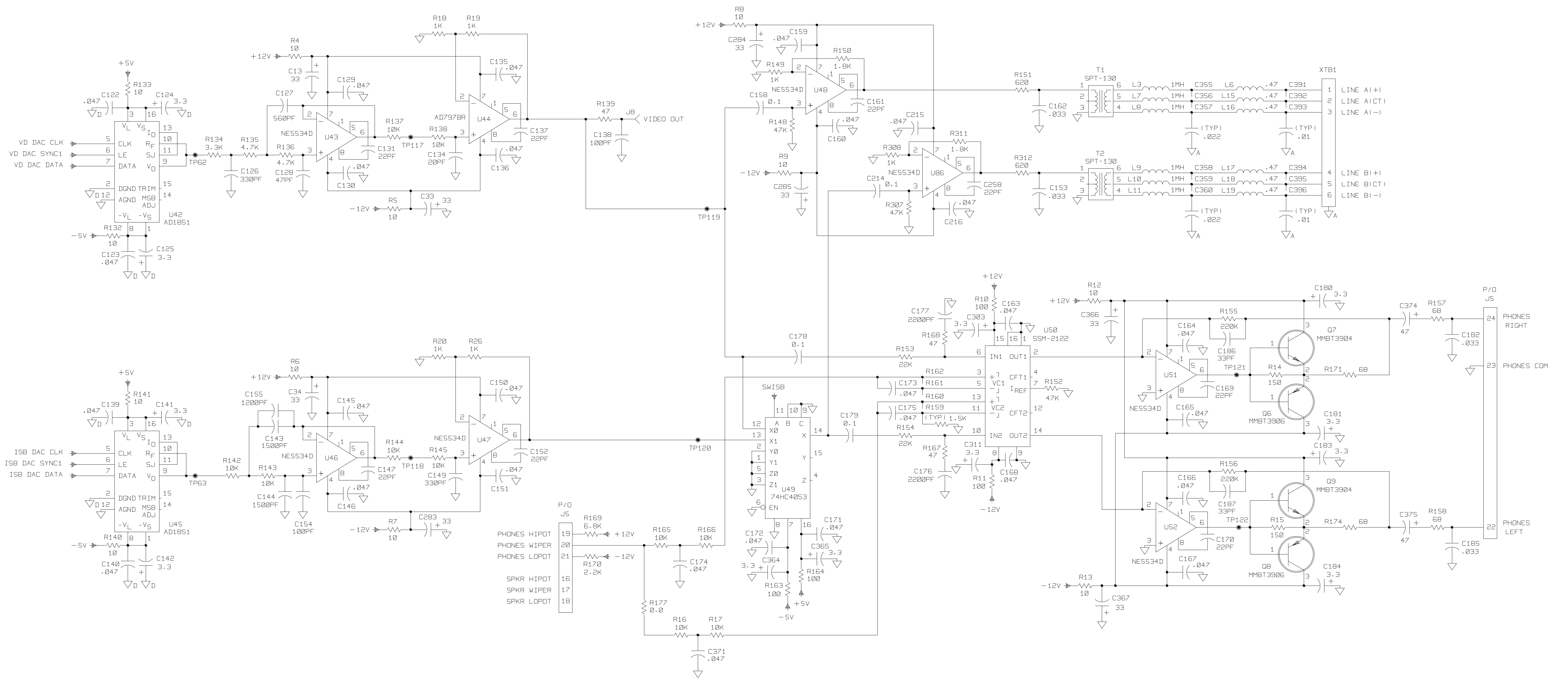
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 2 of 7) (S)



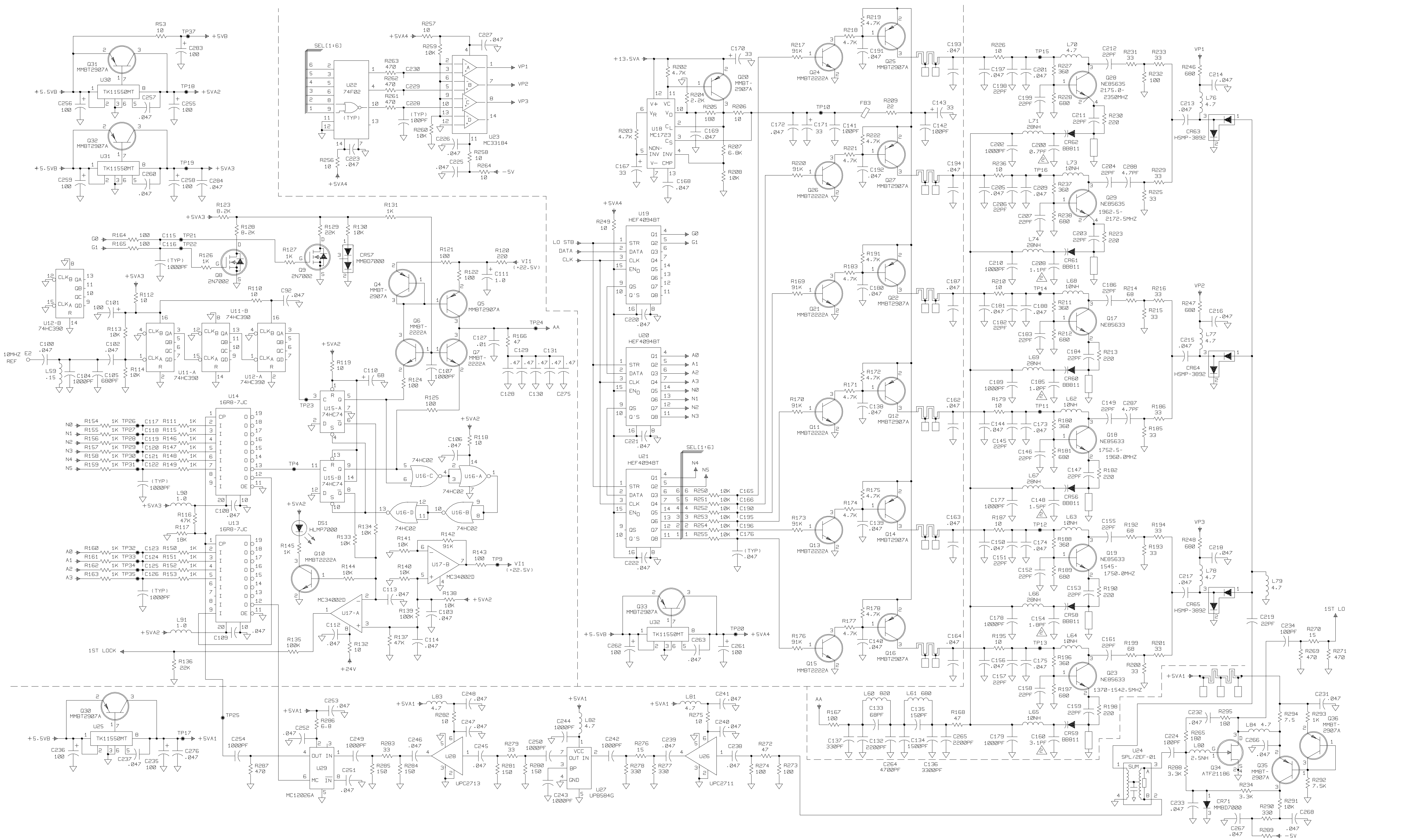
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 3 of 7) (S)



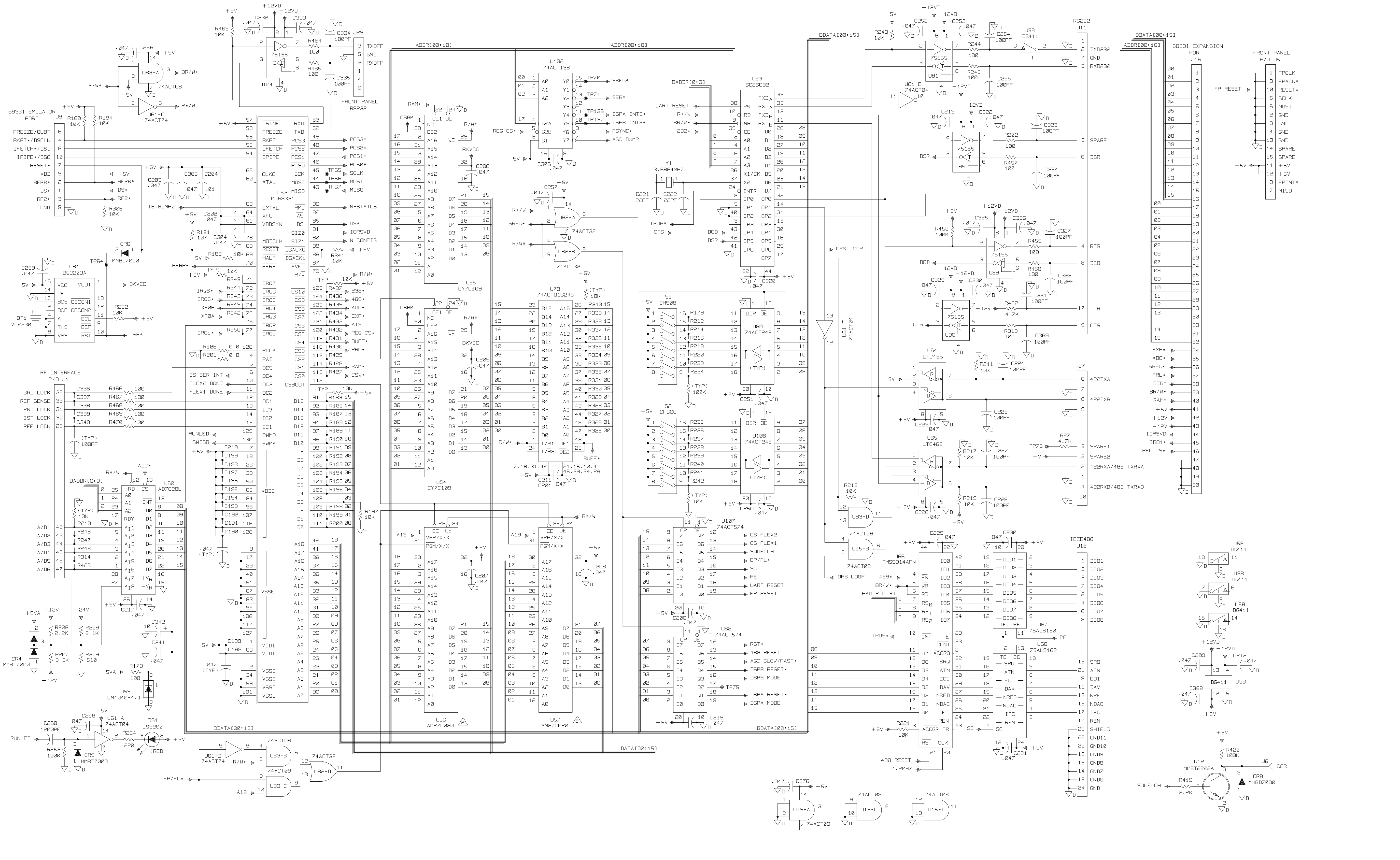
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 4 of 7) (S)



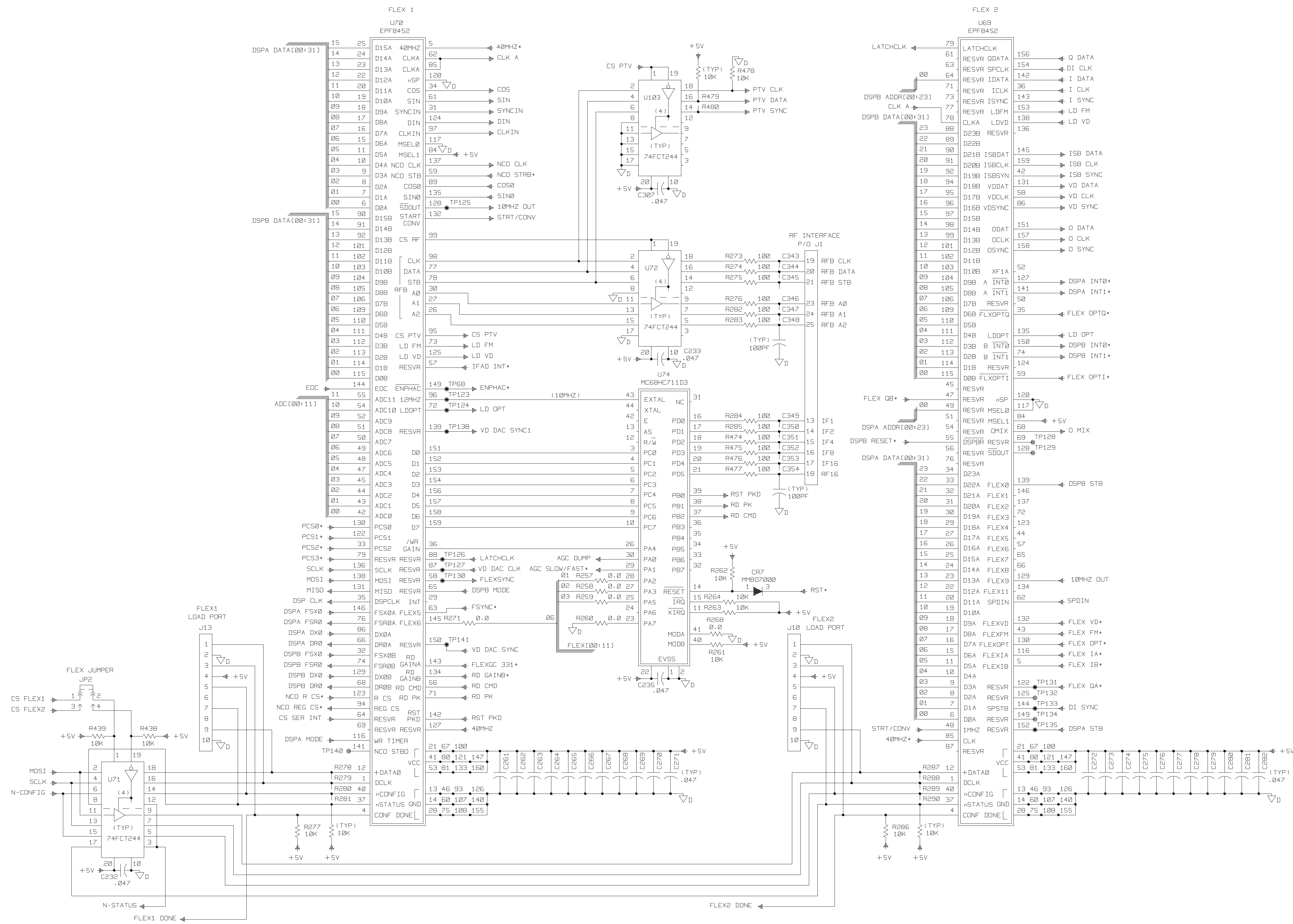
FO-17. Type 797168-1 Digital Control PC Assembly (A2),
Schematic Diagram 581765 (Sheet 5 of 7) (S)



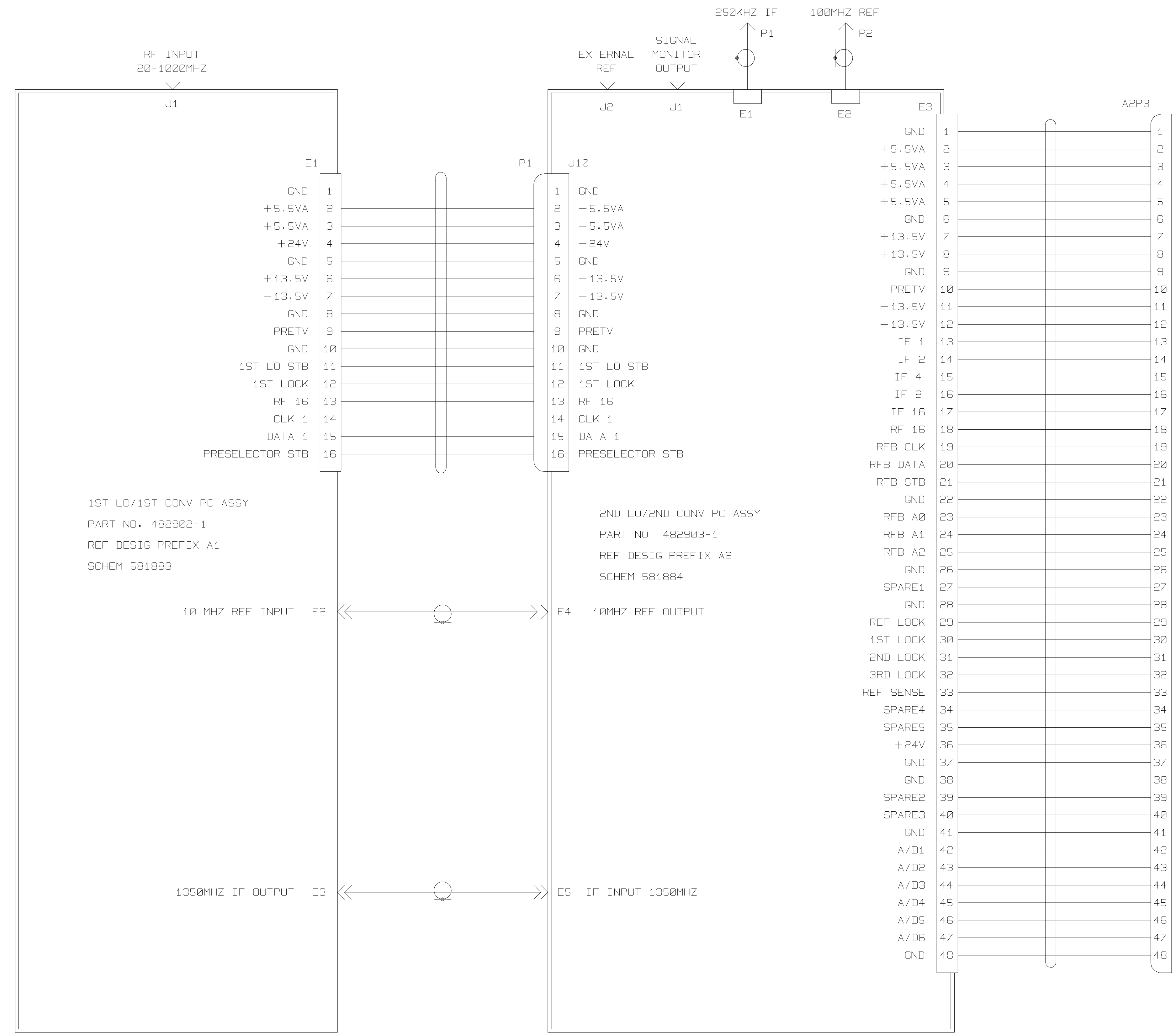
FO-19. Part 482902-1 1st LO/1st Converter PC Assembly (A3A1), Schematic Diagram 581883 (Sheet 2 of 2) (R)



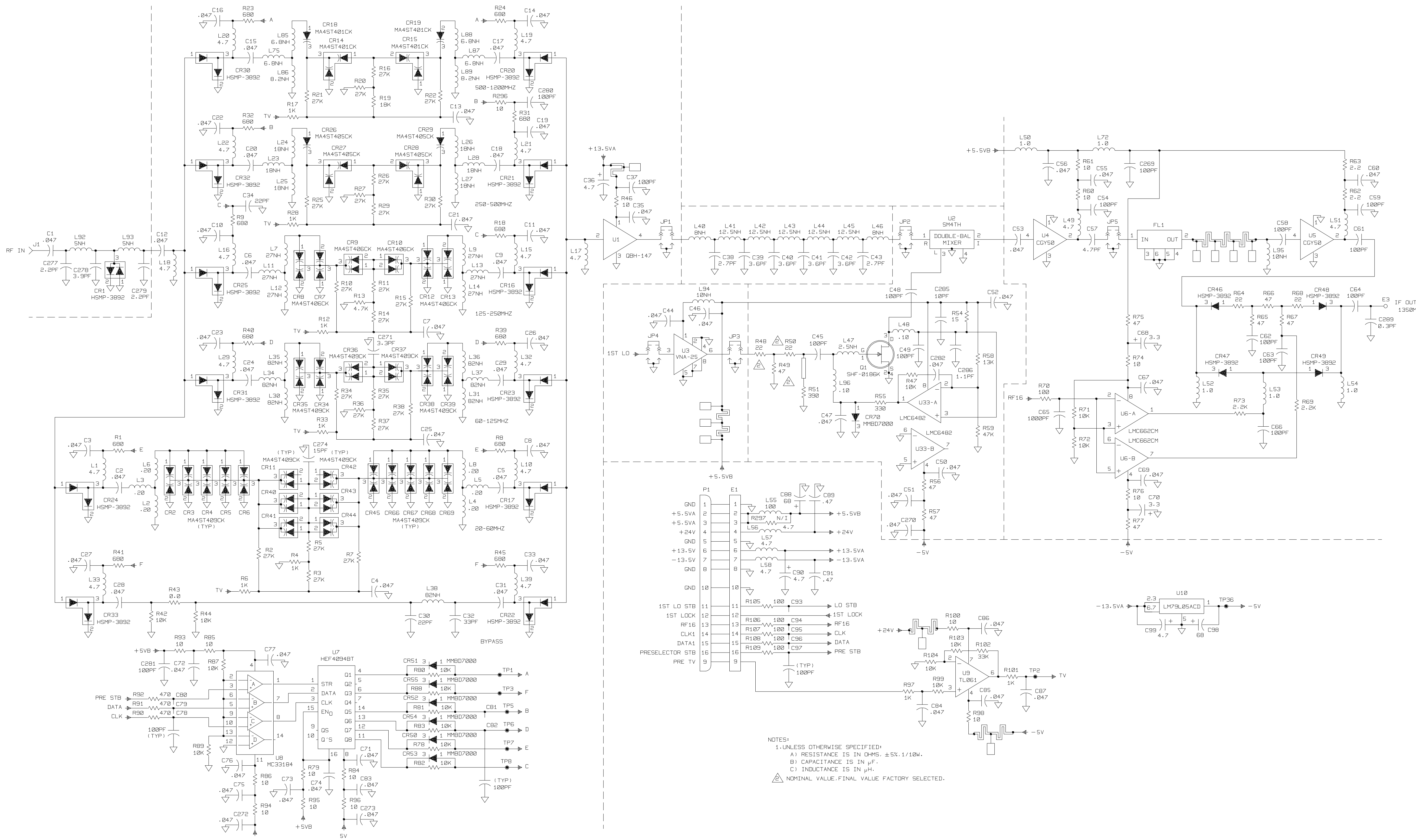
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 6 of 7) (S)



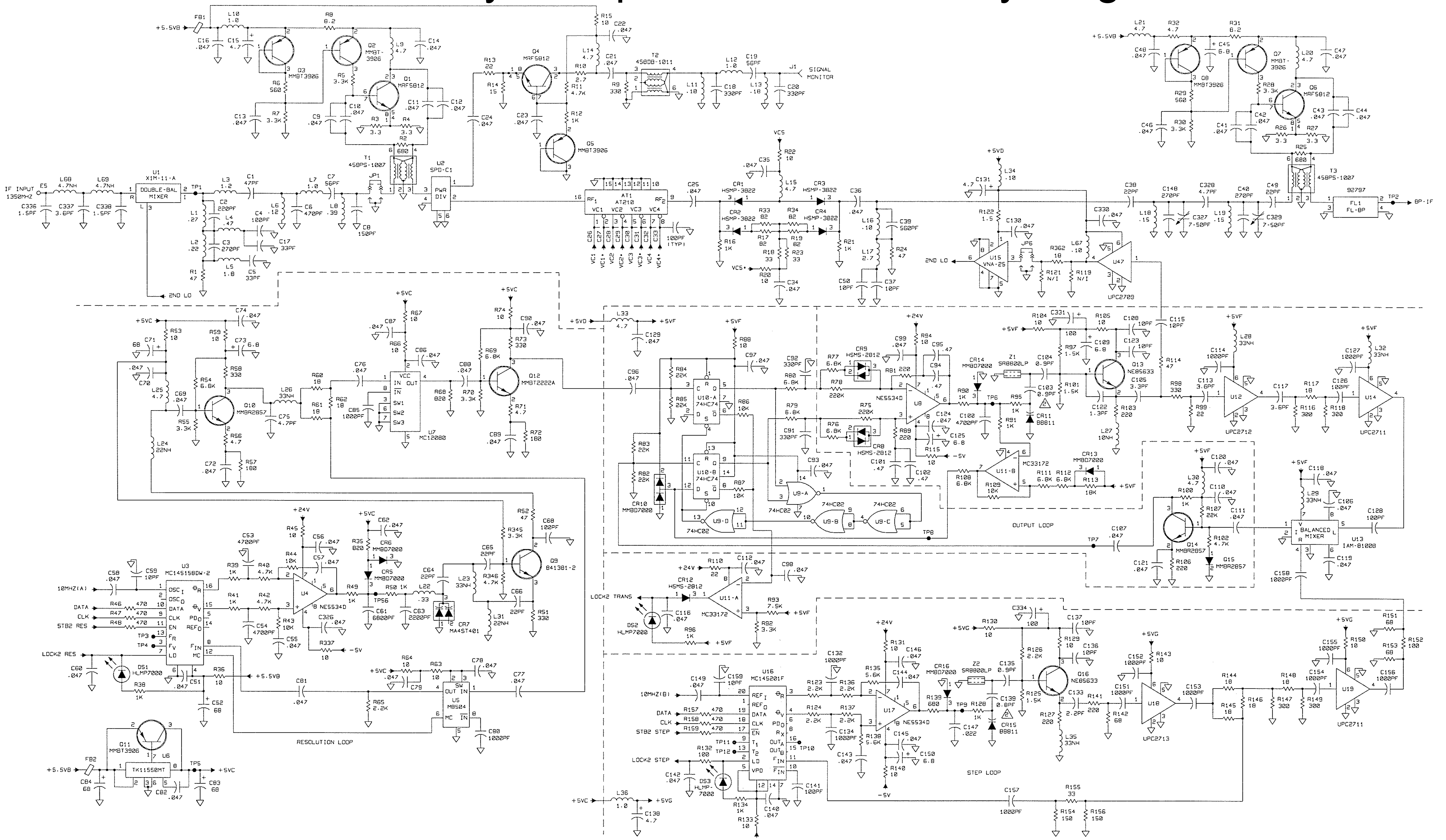
FO-17. Type 797168-1 Digital Control PC Assembly (A2), Schematic Diagram 581765 (Sheet 7 of 7) (S)



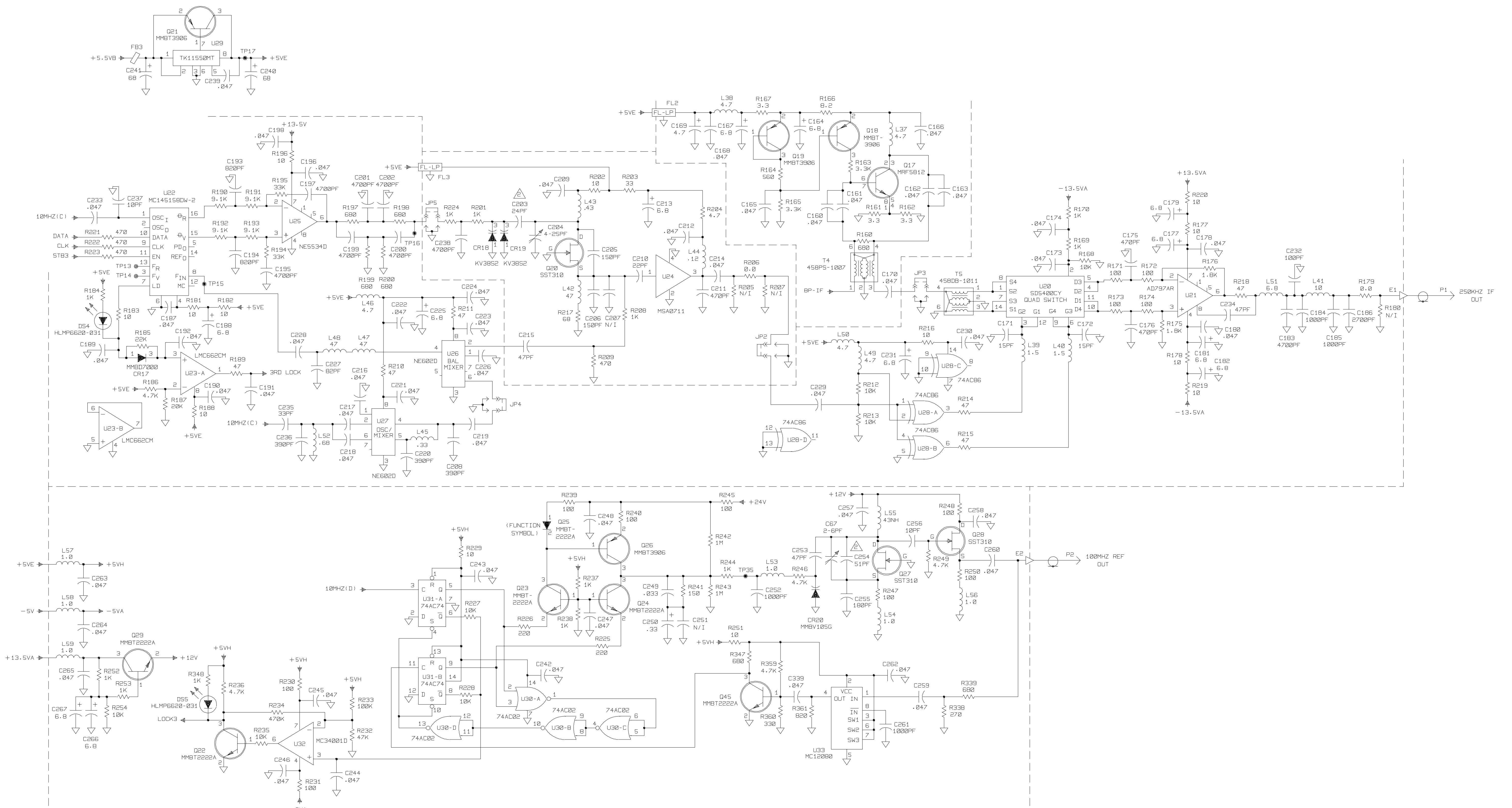
FO-18. Type 797228-1 RF Tuner Assembly (A3), Schematic Diagram 482883 (A)



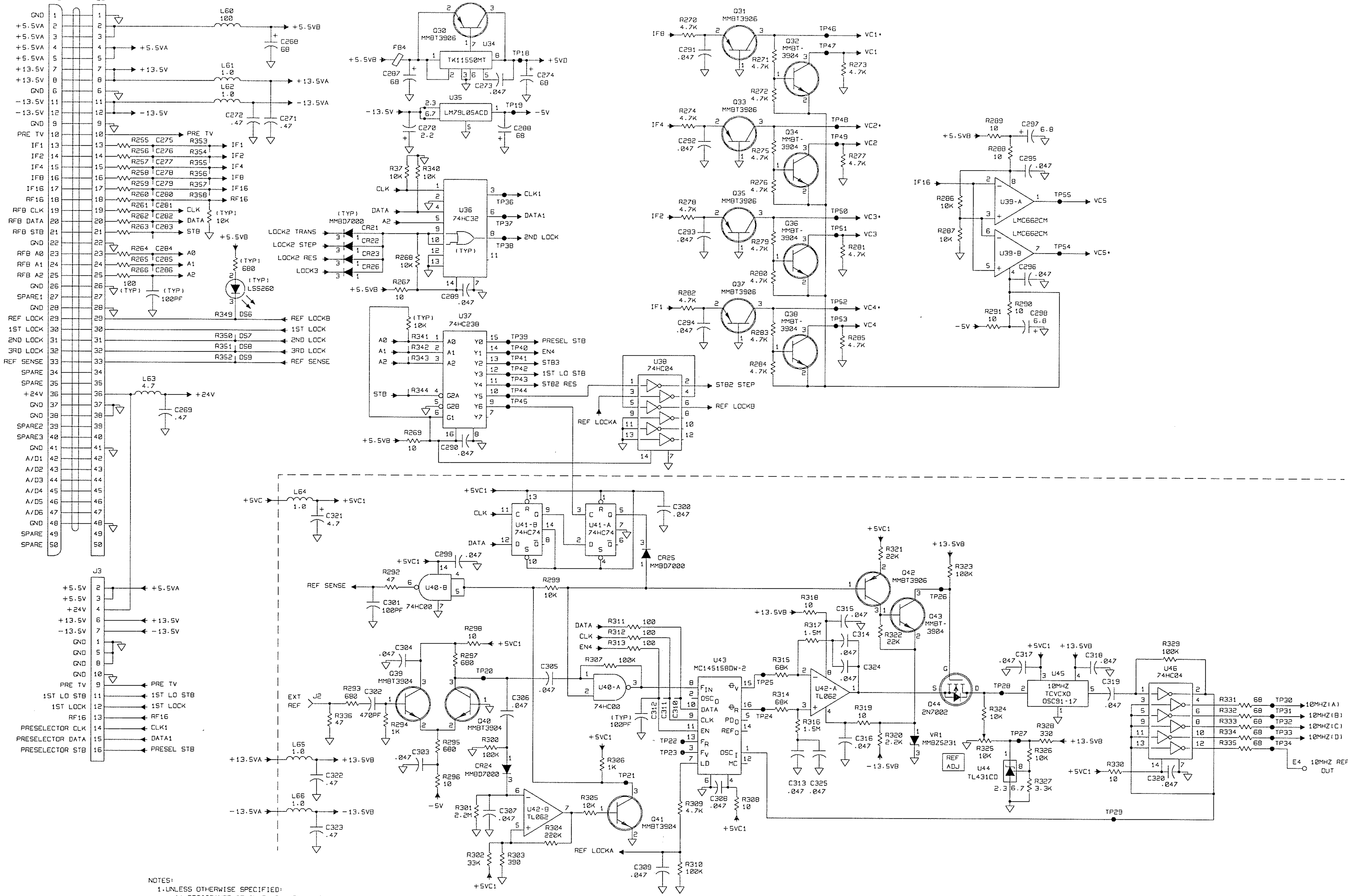
FO-19. Part 482902-1 1st LO/1st Converter PC Assembly (A3A1), Schematic Diagram 581883 (Sheet 1 of 2) (R)



FO-20. Part 482903-1 2nd LO/2nd Converter PC Assembly (A3A2), Schematic Diagram 581884 (Sheet 2 of 3) (Q)



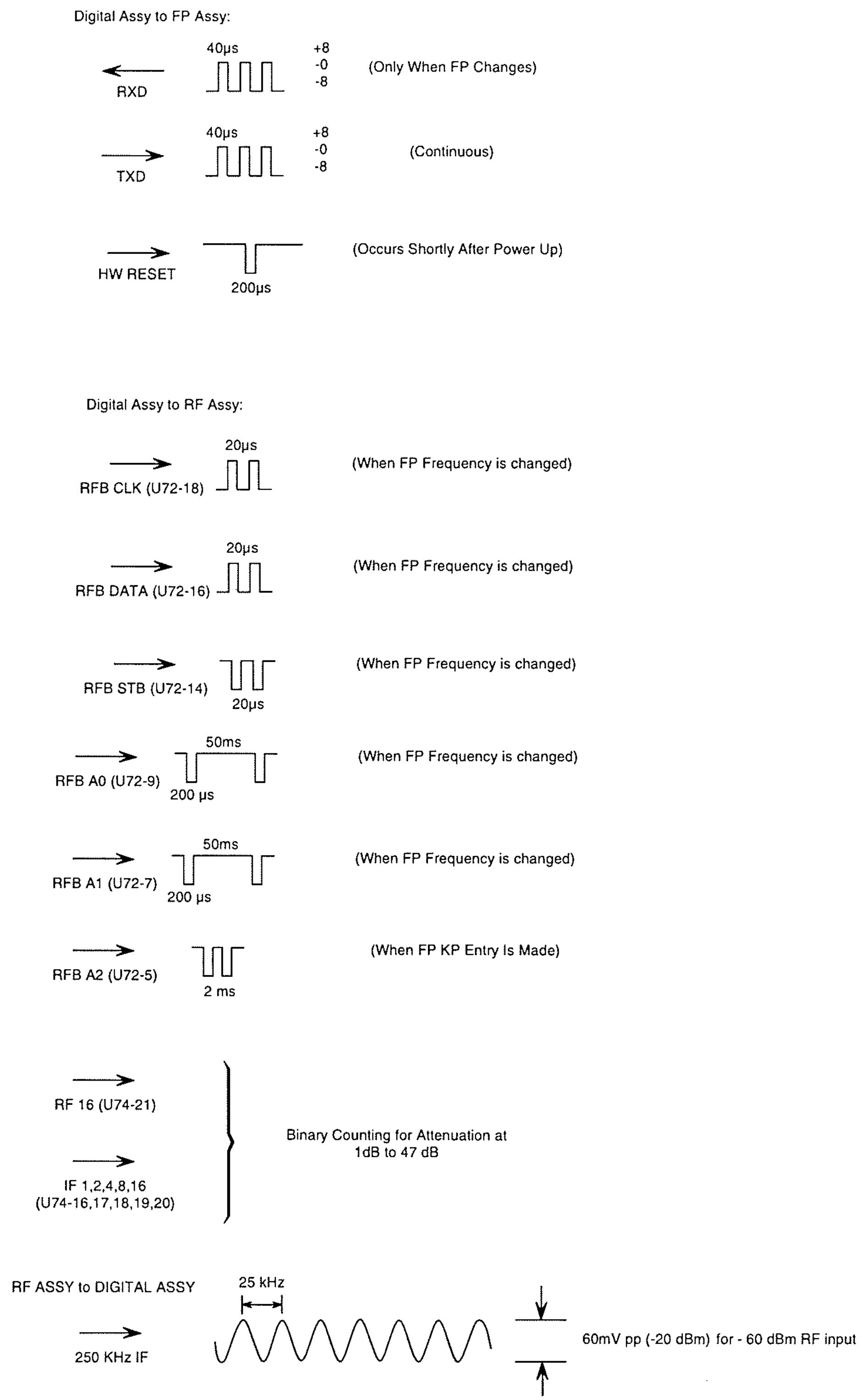
FO-20. Part 482903-1 2nd LO/2nd Converter PC Assembly (A3A2), Schematic Diagram 581884 (Sheet 3 of 3) (AB)

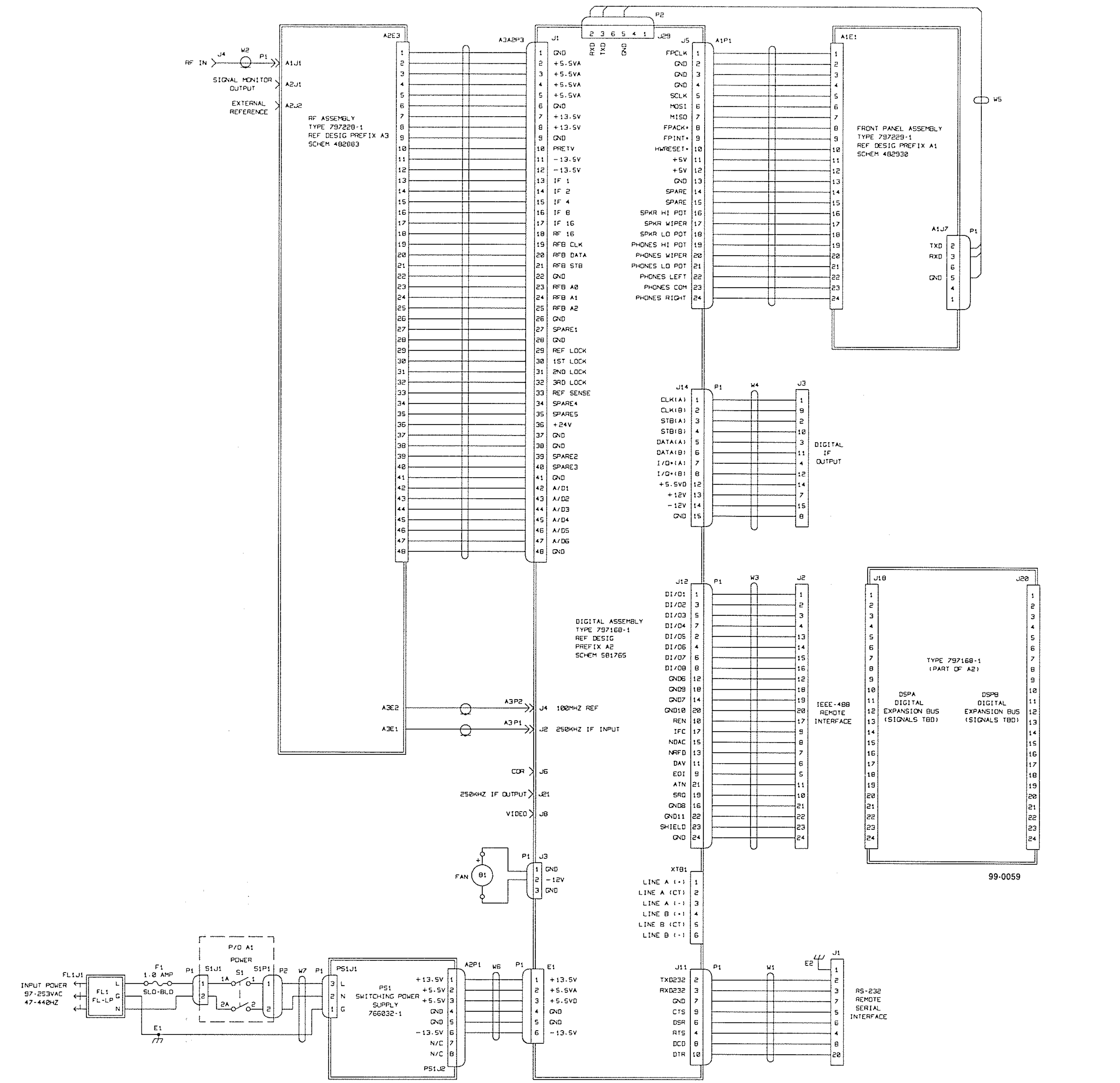


NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS IN OHMS. ±5%.1/10W.
B) CAPACITANCE IS IN μF.
C) INDUCTANCE IS IN μH.

⚠ NOMINAL VALUE. FINAL VALUE FACTORY SELECT.

FO-20. Part 482903-1 2nd LO/2nd Converter PC Assembly (A3A2), Schematic Diagram 581884 (Sheet 1 of 3) (Q)





FO-21. Type WJ-8611 Digital VHF/UHF Receiver Main Chassis, Schematic Diagram 581871 (C)