D. Installation and Test Procedure

Customer: _____

Serial No. Main: _____

IFD(s): _____

Delivery Date: _____

Radar Mfg./Type: _____

_____

Customer Engineer: _____

SIGMET Engineer: _____

Overview

This installation and test procedure is designed to assist SIGMET field engineers and customers with the installation and testing of the RVP8 on a radar system. Because the tests also function as an installation procedure, they must be completed in order. Failure to perform one step may effect later tests.

A copy of the test results should be kept either on file or with the *RVP8 User's Manual*. Do not write in the manual since it will be replaced with an upgrade, instead make a copy and mark that.

Each test should be performed and signed off when it is completed. If a test does not pass, then the problem should be remedied and the test repeated. If the test still does not pass, then an additional sheet should be added to the test explaining the variance. A supplementary test sheet is at the end of the test procedure.

After you have successfully completed the installation steps and tests in this procedure, your RVP8 will be ready for connection to your application software such as SIGMET's IRIS system. There will be additional configuration and calibration to use the RVP8 with your application software.

The following page is a convenient summary check list for the tests. Use this as a check list for completing the installation and test procedure. We hope that you enjoy your new RVP8. Please contact us if you have any problems or comments regarding this product or procedure at support@sigmet.com.

Test Summary:

- ❑ D.1 Installation Check
- ❑ D.2 Power-up Check
- ❑ D.3 Setup Terminal
- ❑ D.4 Setup "V" Command (Internal Status)
- ❑ D.5 Setup "M" Command (Board Configuration)
- ❑ D.6 Setup "Mp" Command (Processing Options)
- ❑ D.7 Setup "Mf" Command (Clutter Filters)
- ❑ D.8 Setup "Mt" Command (General Trigger Setup)
- ❑ D.9 Initial Setup of Information for Each Pulse Width
- ❑ D.10 Setup "Mb" Command (Burst Pulse and AFC)
- ❑ D.11 Setup "M+" Command (Debug Options)
- ❑ D.12 Setup "Mz" Command (Transmitter Phase Control)
- ❑ D.13 Display Scope Check
- ❑ D.14 Burst Pulse Alignment
- ❑ D.15 Bandwidth Filter Adjustment
- ❑ D.16 Digital AFC Voltage Alignment
- ❑ D.17 Analog AFC Voltage Alignment
- ❑ D.18 MFC Functional Test
- ❑ D.19 AFC Functional Test
- ❑ D.20 Input IF Signal Level Check
- ❑ D.21 Dynamic Range Check
- ❑ D.22 Receiver Bandwidth Check
- ❑ D.23 Receiver Phase Noise Check
- ❑ D.24 Hardcopy of Final Setups
- ❑ D.25 IFD SigGen Test
- ❑ D.26 RVP8/Tx Card Test

All Tests Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.1 Installation Check

Test Goal

Verify that the RVP8 is properly connected to the radar system and document some of the basic radar characteristics. There are differences for TWT/Klystron vs magnetron radar systems.

⚠ **WARNING: These are factory configured for the expected voltage, but should be VERIFIED by the customer before power is applied to the system.**
AC Line Voltage _____ VAC

❑ Check the 3 power supply modules for proper configuration per **Section C.1.3.**

Test Procedure

❑ IF Digitizer (IFD) mounted in the radar receiver cabinet or other convenient location.

❑ IF Digitizer Power Supply properly connect to AC Line voltage.

❑ IFD IF input connection. IF Frequency _____MHz.

❑ RVP8 Chassis installed in (circle one) Rack Tabletop

Distance between IFD and RVP8 Chassis _____

❑ Downlink connection from IFD to RVP8 Chassis.

❑ Uplink connection from IFD to RVP8 Chassis.

❑ Trigger connections. List triggers in section D.8.

For magnetron systems, verify the following:

❑ IFD IF burst pulse connected.

STALO AFC is done by (circle one) Analog connection to IFD DAFC

Other_____

For Klystron or TWT systems only verify the following:

❑ IFD COHO connected to Burst Input.

Tx Card Installed (circle one) Yes No

Verify that SIGMET cards are functioning:

❑ As root type "service rvp8 stop"

❑ As operator type "rdadiags rvp8rx–0", "rdadiags io62–0", "rdadiags io62cp–0" (note any messages and refer to RVP8 A.3.3)

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.2 Power-Up Check

Test Goal

Verify that the IFD and RVP8 properly power–up.

Reference: *RVP8 User's Manual* section 2.3.6 .

Test Procedure

The front panel of the RVP8 shows summary power–up messages. Apply power to the RVP8 (or reset it) and the IFD. Verify the following:

For the IFD with RVP8 power on:

- ❑ When power is applied to the IFD, the red and green lights blink and then go to on.
- ❑ When the uplink is disconnected, the red light blinks and the green light is off.
- ❑ When the fiber cable is disconnected, the red light is on and the green light is off.

For the RVP8 with the IFD power on:

- ❑ The front panel display shows the correct text per section 2.3.6. indicating successful boot–up.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.3 Setup Terminal

Test Goal

Verify that the TTY Setups can be accessed and function properly.

Special Test Equipment

Keyboard, mouse and monitor (KVM) installed locally or on remote computer (with DspExport running).

Reference: *RVP8 User's Manual*, Section 3.1

Test Procedure

Follow the procedure in section 3.1 to access the TTY setups.

- ❑ As operator, type "dspx"
- ❑ Press the ESC key and verify that the RVP8 banner appears (see section 3.1).
- ❑ Type "Help" or "?" and verify that the list of commands is displayed.
- ❑ Type "q" or "quit" to exit the menus.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.4 Setup "V" Command (Internal Status)

Test Goal

Verify that the TTY setups for the Internal Status section are properly reported.

Special Test Equipment: KVM installed

Reference: *RVP8 User's Manual* Section 3.1.2

Test Procedure

Enter the TTY setups via dspx and issue the "V" command to display the internal status. Note that we will record the final values of all the settings at the end of the installation.

❑ Status information is correct per Section 3.1.2 and shows no faults.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.5 Setup "Mc" Command (Board Configuration)

Test Goal

Verify that the TTY setups for the Board Configuration section are properly configured for the customer application.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.1

Test Procedure

Enter the TTY setups and type the "Mc" command. Set all the values as required for your operation.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.6 Setup "Mp" Command (Processing Options)

Test Goal

Verify that the TTY setups for the Processing Options section are properly configured for the customer application.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.2

Test Procedure

Enter the TTY setups and type the "Mp" command. Set all the values as required. for your operation.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.7 Setup "Mf" Command (Clutter Filters)

Test Goal

Verify that the TTY setups for the Clutter Filters section are properly configured for the customer application.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.3

Test Procedure

Enter the TTY setups and type the "Mf" command. Set all the values as required for your operation.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.8 Setup "Mt" Command (General Trigger Setup)

Test Goal

Verify that the TTY setups for the General Trigger Setup section are properly configured for the customer application.

Background

The RVP8 can output up to 6 different triggers. These can be delayed by different amounts, and have different pulse widths. For example trigger 0 may go to fire the transmitter, while a slightly delayed trigger 1 may be used for triggering an oscilloscope. The timing can be different for each transmitter pulsewidth. The final timing adjustments will be done later in Section D.14. Enter in the table below the purpose of each trigger, as well as the nominal start time and pulse width. Note that start times are relative to range zero (middle of the burst pulse). We recommend a nominal pulsewidth of 3 microseconds. This chart will be used in the next section.

Magnetron radars using an analog COHO system often have a trigger generator circuit which produces a trigger for the COHO latching and also for the transmitter pulse. This circuit should be bypassed in an upgrade.

#	Purpose	Start Time	Width
0	_____	_____usec	_____usec
1	_____	_____usec	_____usec
2	_____	_____usec	_____usec
3	_____	_____usec	_____usec
4	_____	_____usec	_____usec
5	_____	_____usec	_____usec

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.4

Test Procedure

Enter the TTY setups and type the "Mt" command. Set all the values as required for your operation. Note that the PRF and pulse width set here are the current values, and values used at power-up.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.9 Initial Setup of Information for Each Pulse Width

Test Goal

Enter the initial values for the TTY Setups for each of the pulse widths. Note that the final values of trigger timing, FIR filter impulse response length and bandwidth will be adjusted later.

Background

The duty cycle of the transmitter is the product of the PRF and the pulse width in seconds. For example, a PRF of 1000 Hz and 1 microsecond pulse width is a duty cycle of 0.001. Thus a transmitter with a 0.001 duty cycle limit could function at 1000 Hz and 1 microsecond pulse width, or 500 Hz and 2 microsecond pulse widths.

The duty cycle limits of your radar should be obtained from your system documentation or radar manufacturer. The RVP8 supports up to four pulse widths (coded 0 to 3), although most transmitters typically support only two pulse widths. Record below the pulse width in microseconds and the maximum PRF that is allowed for each pulse width.

#	Pulse Width	Max PRF
0	_____ microseconds	_____ Hz
1	_____ microseconds	_____ Hz
2	_____ microseconds	_____ Hz
3	_____ microseconds	_____ Hz

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.5

Test Procedure

Enter the TTY setups and type the "Mt #" command, once for each pulsewidth. Enter the start time and widths for each trigger as documented on the previous page. For all unused triggers, set the width to zero. Next enter the Maximum PRF from the table above. Set the initial impulse response length to 1.5 times the pulsewidth, and the initial pass bandwidth to the inverse of the pulsewidth.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.10 Setup "Mb" Command (Burst Pulse and AFC)

Test Goal

Verify that the TTY setups for the Burst Pulse and AFC Configuration section are properly configured for the customer application.

Background: Magnetron vs Klystron Systems

Magnetron Systems: For magnetron systems, the phase and frequency of the burst pulse from the transmitter is measured at IF. The phase measurement is used for digital phase locking and 2nd trip echo filtering and recovery. The frequency measurement is used to implement an analog (+–10V) AFC output to control the STALO frequency. Note that an external AFC can be used rather than the RVP8 AFC, but is not recommended.

Klystron or TWT–based Systems: The COHO is measured instead of the burst pulse. Note that Klystron systems that use a phase shifter should input the phase shifted COHO into the IFD so that the RVP8 can digitally lock to the actual transmitted phase. For Klystron systems the AFC feedback loop is not used.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 3.2.6

Test Procedure

Enter the TTY setups and type the "Mb" command. Set all the values as required.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.11 Setup "M+" Command (Debug Options)

Test Goal

Verify that the TTY setups for the Debug Options section are properly configured for the customer application.

Special Test Equipment: KVM connected

Background

The RVP8 supports several test features that are configured in this section. For operational systems, the simulation features should be turned off. SIGMET recommends that the LED's be set to "1:Go/Proc" so that the front panel red LED will flash during each processing cycle.

Reference: *RVP8 User's Manual,* Section 3.2.7

Test Procedure

Enter the TTY setups and type the "M+" command. Set all the values as required.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.12 Setup "Mz" Command (Transmitter Phase Control)

Test Goal

Verify that the TTY setups for the Transmitter Phase Control section are properly configured for the customer application. This feature is not used for magnetron systems since these have inherent random phase that is measured, but not controlled.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual*, Section 3.2.8

Test Procedure

Enter the TTY setups and type the "M+" command. Set all the values as required.

❑ Parameters set.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.13 A-Scope Test

Test Goal

Verify that the display ascope utility functions properly.

Background

The ascope utility provides a completely independent radar control and plotting capability. This is used extensively for testing of the radar and the RVP8.

Reference: *IRIS Utilities Manual,* Section 3.

Special Test Equipment:
KVM connected

Test Procedure

- ❑ As operator, type the command 'ascope' and verify that the ascope utility comes up correctly and starts to update.
- ❑ Configure a "DEFAULT" start–up and save it. Then exit and restart ascope. Verify that the default startup is properly restored.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.14 Burst Pulse Alignment

Test Goal

Verify that the burst pulse is present and that its amplitude is sufficient. This test also aligns the burst pulse in the burst pulse sample window.

Special Test Equipment: KVM connected

Reference: *RVP8 User's Manual,* Section 4.3

Test Procedure

- ❑ Use ascope to select the desired pulsewidth at a save PRF.
- ❑ In the TTY setups, use the Mb command to turn off burst pulse tracking.
- ❑ Set the transmitter to radiate.
- ❑ Issue the Pb command to obtain the burst pulse display. Use the L/R commands to find the burst pulse. Use the l/r commands to fine tune the position of the burst pulse in the burst pulse window.
- ❑ Adjust the width of the burst pulse window using the I/i command to be slightly larger than the burst pulse (e.g., ~50%).
- ❑ Verify that the burst pulse power is in the range +1 to –12 dBm per the tabular display on the setup terminal.

  Record the burst pulse power

  Pulsewidth #0: _____ dBm
  Pulsewidth #1: _____ dBm
  Pulsewidth #2: _____ dBm
  Pulsewidth #3: _____ dBm
- ❑ Repeat the above procedure for each pulse width.

In the event that the burst pulse is not found, try to detect the burst pulse on an oscilloscope connected directly to the IF burst line (ahead of the IFD). On a magnetron radar, if the AFC is not working it is possible the IF frequency is outside the IFD anti-aliasing filter bandwidth. It may be necessary to go to manual frequency control to get this to work. If no burst pulse is detected, then the radar should be serviced by an experienced technician. If the burst pulse is power is too small or large, check the status of any attenuators or amps in the burst pulse signal path. It might be necessary to adjust the gain buy installing a fixed attenuator or amplifier.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.15 Bandwidth Filter Adjustment

Test Goal

Set the band width filter for each pulse width.

Reference: *RVP8 User's Manual,* Section 4.4

Special Test Equipment: KVM connected

Test Procedure

- ❑ Enter the Ps command mode and view the results on the display scope. Toggle the space bar to show both the spectrum of the burst pulse and the spectrum of the bandwidth filter response. Use the Z/z command to zoom the burst spectrum plot to approximately match the height of the bandwidth filter response (which will have a smoother shape than the burst pulse).
- ❑ Use the Ww/Nn commands to adjust the width of the bandwidth filter plot to be slightly narrower than the burst pulse. Then use the w/n commands to fine tune the filter width such that the "DC–Gain:" is either "ZERO" or less than –64 dB.
- ❑ Repeat for each pulse width that is used (use mt to change pulse width) and record:

	FIR Length	Bandwidth	DC Gain
Pulsewidth 0	_____usec	_____MHz	_____ dB
Pulsewidth 1	_____usec	_____MHz	_____ dB
Pulsewidth 2	_____usec	_____MHz	_____ dB
Pulsewidth 3	_____usec	_____MHz	_____ dB

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.16 Digital AFC (DAFC) Alignment (Optional)

Test Goal

Verify that the RVP8 DAFC output controls the STALO over the correct span.

Special Test Equipment: Setup TTY

Reference: *RVP8 User's Manual,* Section 2.4

Background

The RVP8 implements an AFC based on the measurement of the burst pulse frequency. The DAFC "T's" off the coaxial uplink cable. It translates the AFC requests from the RVP8 main chassis into digital output requests supporting up to 25 bits. A frequency control span of approximately +– 7 MHz is expected.

Document the STALO frequency that is desired. This is typically the RF frequency minus 30 or 60 MHz depending on the IF of your system.

RF Transmit frequency _____MHz

STALO Frequency _____MHz

Test Procedure

- ❑ Use the setup terminal to set the Digital AFC span as required in the Mb section.
- ❑ Use the setup terminal and display scope in the Pb (plot burst) mode to verify that the burst pulse is properly centered. Any pulsewidth can be used.
- ❑ Set to MFC using the "=" command, and adjust the control to the lowest setting using the "D" command. Record the results below.
- ❑ Raise the control using "U" to within 0.1 MHz of the IF frequency. Record the results.
- ❑ Raise the control using "U" to the highest setting. Record the results.
- ❑ Verify that sufficient span is covered, and the the power at the end points is sufficiently high to run the AFC loop.

	voltage	frequency
Midpoint:	_____A/D	_____ MHz.
Lower limit:	_____A/D	_____ MHz.
Upper limit:	_____A/D	_____ MHz.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.17 Analog AFC Voltage Alignment (Optional)

Test Goal

Verify that the RVP8 AFC output voltage is properly adjusted to match the STALO input control voltage.

Special Test Equipment

Calibrated Oscilloscope or Voltmeter.
Setup TTY

Background

The RVP8 implements an AFC based on the measurement of the burst pulse frequency. The analog control output is an SMA labeled "AFC" on the IFD module which connects to the STALO control voltage input. The output signal is an analog voltage in the range +–10V. A frequency control span of approximately +– 7 MHz (for a 30 MHz IF) is expected. Some STALOs contain a nominal frequency adjustment. The alignment procedure is different in that case.

Check the specification of the STALO and verify the following:

STALO analog control input range	_____V to _____V
STALO frequency control range	+/– _____ MHz

Test Procedure, initial setup

- ❑ Connect a scope or digital Voltmeter to the AFC line, either at the IFD or the STALO.
- ❑ Use the setup terminal and display scope in the Pb (plot burst) mode to verify that the burst pulse is properly centered. Any pulsewidth can be used.
- ❑ Set the test switches on the IFD to output the Midpoint Voltage
  SW1–A SW2–B

Test Procedure, STALO without adjustment

- ❑ Adjust the "Offset" pot by screwdriver on the IFD module until the the IF frequency display on the setup terminal is approximately the desired IF frequency (e.g., 30 MHz). Record the results below.
- ❑ Set the test switches on the IFD to output the AFC low test voltage.
  SW1–A SW2–A
  The voltage on the monitoring scope or Voltmeter will decrease. The burst pulse frequency may either increase or decrease depending on the nature of the voltage control in the STALO.
- ❑ Adjust the "Gain" pot by screwdriver on the IFD module until the frequency stops changing or until the burst pulse frequency is 7 MHz off the center frequency (e.g. for 30 MHz IF, either 23 or 37 MHz) whichever occurs at a higher voltage. Record the results.

❑ Set the test switches on the IFD to output the AFC high test voltage.
SW1–A SW2–C

❑ Reduce the gain slightly (CCW turn) and verify that the frequency changes such that it becomes closer to the center IF frequency. If it does not change, then continue to reduce the gain until it does. If the frequency is more than 7 MHz from the IF center frequency, then reduce the gain until the frequency is 7 MHz off. Record the results below.

Test Procedure, STALO with adjustment

❑ Adjust the "Offset" pot by screwdriver on the IFD module until the voltage is at the middle of the desired voltage span.

❑ Adjust the "Offset" pot on the STALO until the the IF frequency display on the setup terminal (Pb mode) is approximately the desired IF frequency (e.g., 30 MHz). Record the results below.

❑ Set the test switches on the IFD to output the AFC low test voltage.
SW1–A SW2–A
The voltage on the monitoring scope or Voltmeter will decrease. The burst pulse frequency may either increase or decrease depending on the nature of the voltage control in the STALO.

❑ Adjust the "Gain" pot by screwdriver on the IFD module until low end of the desired voltage span is reached, or until the burst pulse frequency is 7 MHz off the center frequency (e.g. for 30 MHz IF, either 23 or 37 MHz) whichever occurs at a higher voltage. Record the results below.

❑ Set the test switches on the IFD to output the AFC high test voltage.
SW1–A SW2–C

❑ Reduce the gain slightly (CCW turn) and verify that the frequency changes such that it becomes closer to the center IF frequency. If it does not change, then continue to reduce the gain until it does. If the frequency is more than 7 MHz from the IF center frequency, then reduce the gain until the frequency is 7 MHz off. Record below.

Test Procedure, final cleanup

❑ Set the switches back to the run position (SW1–B and SW2–B), and disconnect the T for the Voltmeter or scope monitor. This cable can introduce a lot of noise into the system.

	voltage	frequency
Midpoint:	_____Volts	_____ MHz.
Lower limit:	_____Volts	_____ MHz.
Upper limit:	_____Volts	_____ MHz.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.18 MFC Functional Test and Tuning (Optional)

Test Goal

Verify that the Manual Frequency Control (MFC) is functioning properly. Skip this test if you are not using the RVP8's AFC.

Reference: *RVP8 User's Manual,* Section 4.4

Special Test Equipment: KVM connected

Test Procedure

Enter the Ps command (Plot burst spectrum and AFC).

- ❑ Use the "=" command to enter the MFC (manual frequency control) mode. Verify that the MFC mode is indicated by the "Manual" notation next to the AFC % output indicator on the terminal.
- ❑ Use the U/u and D/d commands and verify that these commands shift the measured IF frequency (as displayed on the TTY) either up or down. The U command should increase the frequency and the D command should decrease the frequency. If the sense is reversed, then go to the Mb command menu and change the question "Burst frequency increases with increasing AFC voltage".
- ❑ Using the U/u and D/d commands, verify the limits of the AFC tuning and fill in the table below:

AFC %	Measured Freq (MHz)
–100%	_____
0%	_____
+100%	_____

The 0% AFC value should be within approximately +–0.2 MHz of the center IF frequency (e.g., 30 MHz) . The values at +– 100% should correspond to approximately +– 7 MHz of the center IF frequency, or at the maximum span that is supported by the STALO, whichever is less.

- ❑ Toggle the MFC mode to AFC by typing the "=" symbol and and verify that the terminal indicator changes from "Manual" to "AFC". Then exit the Ps menu.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.19 AFC Functional Test (Optional)

Test Goal

Verify that the AFC properly tracks the burst pulse frequency.

Reference: *RVP8 User's Manual,* Section 4.4

Special Test Equipment: KVM connected

Test Procedure

Use the setup terminal to enter the Ps mode and observe the output on a display scope. Verify the following:

- ❑ Verify that the system is in AFC mode by checking that the text on the terminal for the AFC % output says "AFC".
- ❑ Verify that the frequency displayed on the setup terminal is within +– 15KHz of the center IF frequency (the default value for the AFC hysteresis outer limit in the Mb command). For example in the range 29.985 to 30.015 MHz. If it is not in this range then verify that it moves within this range.
- ❑ Turn radiate off for 10 minutes and then turn the radiate back on. Observe that the AFC properly tracks the magnetron frequency as the magnetron warms.
- ❑ Similarly, set the control signal to the maximum and minimum values using MFC, then turn on AFC. Observe that the AFC properly tracks back to the correct frequency.
- ❑ Perform the tests above for each pulse width and verify that the AFC properly tracks the center frequency.
- ❑ For pulsewidth 0.
- ❑ For pulsewidth 1
- ❑ For pulsewidth 2.
- ❑ For pulsewidth 3.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.20 Input IF Signal Level Check

Test Goal

Verify that the input signal level is optimized for the IFD. This is done be observing the power in the noise using the Pr command.

Reference: *RVP8 User's Manual,* Section 4.5

Special Test Equipment: KVM connected

Test Procedure

❑ Set the transmitter to radiate and elevate the antenna to >45 degrees to minimize the effects of weather or clutter echoes (including earth noise). Be sure the antenna azimuth is pointed away from the sun or any known RF interference sources you may have.

i **Note: This entire procedure may also be performed with the transmitter off since, in theory, it is only measuring properties of the receiver. However, you may notice some noise interaction between the Tx and Rx.**

❑ Use the setup terminal to enter the Pr command and the display scope to view results. Use the Ll/Rr commands to move out in range to a start range of 50 km so that only noise is present.

Record the powers displayed on the setup terminal. You can use the V/v command to increase/decrease averaging of samples to make the noise measurement more stable.
Total: _____ dBm, Filtered: _____ dBm

❑ Now remove the cable connecting the IF signal into the IFD. Again record the powers:
Total: _____ dBm, Filtered: _____ dBm

❑ Add attenuation and/or amplification by an amount such that the Filtered noise power is approximately 6 dB higher when the signal is connected (See Section 2.2.8).

❑ After verifying the above rise in noise level, disconnect the output cable from the LNA and verify that the noise drops to the same level as when the IFD IF-Input was disconnected. This verifies that the dominant noise is indeed coming from the LNA, and not from any of the subsequent IF amplifiers.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.21 Dynamic Range Check

Test Goal

Verify the receiver dynamic range is in excess of 80 dB.

Important: This test requires the injection of an RF test signal over a 90 dB range. Damage to the LNA could occur. Check the LNA specification to verify the maximum signal that it can accept. The output from the signal generator (accounting for cable and coupler losses) should not be allowed to exceed this value.

Reference: *RVP8 User's Manual* section 4.5

Special Test Equipment:
KVM connected
RF signal generator

Test Procedure

- ❑ Run the radar and test signal generator for 20 minutes to allow proper warm-up of the system prior to the test. This will allow the AFC to stabilize.
- ❑ After warm-up is complete, turn the radiate off but leave the receiver on since the test signal generator may be damaged by the transmitter. The antenna should be elevated to 20 degrees and the azimuth should be set to point away from any known microwave sources including the sun.
- ❑ Use the setup terminal to enter the Mt command to set the pulse width to 0.
- ❑ Use the Mt 0 command to temporarily configure the FIR impulse response to 2.89 usec (I/i command) and 0.59 MHz bandwidth (N/n and W/w commands). These settings are for the purpose of benchmarking the receiver performance. Do not save this result since it would override your previously configured band width and impulse response.
- ❑ Connect the test signal generator to inject a signal at RF ahead of the LNA.
- ❑ Enter the Pr mode and make the following settings:
  Use the space bar to toggle to the power spectrum plot.
  Use the L/l and R/r commands to set the start to 50 usec.
  Use the T/t command to set the plot span to 50 usec
  Use the V/v command to set averaging to 10 samples
- ❑ Set the signal generator to a value that is approximately 20 dB above noise and observe the scope plot. Adjust the frequency of the test signal generator to make the frequency of the spectrum at the correct IF frequency.

  Turn off the signal generator RF output and record the "Filtered" noise power
  Siggen power: none RVP8 Filtered power:_____dBm

Turn on the signal generator RF with about 20 dB of signal above noise. Now reduce the power until you the Filtered power is approximately 1 dB above the noise level measured in the previous step. Verify this by toggling the signal generator RF ON and OFF. The samples will be a little noisy, but getting the signal exactly 1 dB above noise is not required. Record the signal generator setting for the 1 dB above noise power (minimum detectable power).

Siggen power (Pmin):_____dBm RVP8 Filtered power:_____dBm

❑ Increase the signal generator output power by 10 dB steps until saturation of the Filtered power is observed.

Important: Do not increase the signal generator power such that Total Power exceeds the Safe Total Power Limit for Pr command display +10 dBm or damage to the RVP8 A/D convertor could result.

Back off the siggen power to approximately 10 dB below saturation. Now use 1 dB steps to more carefully define the saturation point to within +– 1 dB (e.g., for a 0.2 dB roll–off). Record the signal generator setting.

Siggen power (Psat):_____dBm RVP8 Filtered power:_____dBm

The Receiver dynamic range is:

_____ dB = Psat – Pmin

❑ Verify that the receiver dynamic range is greater than or equal to 80 dB.

❑ Check that the signal generator frequency has not drifted by looking at the plot. If it is off by more than 0.1 MHz, retune and repeat the test.

❑ Exit Pr and do a "restore" to restore the saved settings.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.22 Receiver Bandwidth Check

Test Goal

Verify the receiver bandwidth is in excess of 14 MHz.

Background

For proper functioning of the high speed A/D convertors, it is necessary that approximately 14 MHz of broadband noise is available at the IFD. This noise does not interfere with the signal to noise ratio because the bandwidth filter is applied afterwards. The bandwidth of the anti-aliasing filter should be the limiting factor. This test uses the same hookup as the previous test (Section D.21). For dual polarization systems, you expect to get a narrower bandwidth.

Reference: *RVP8 User's Manual,* section 4.5

Special Test Equipment:

KVM connected
RF signal generator

Test Procedure

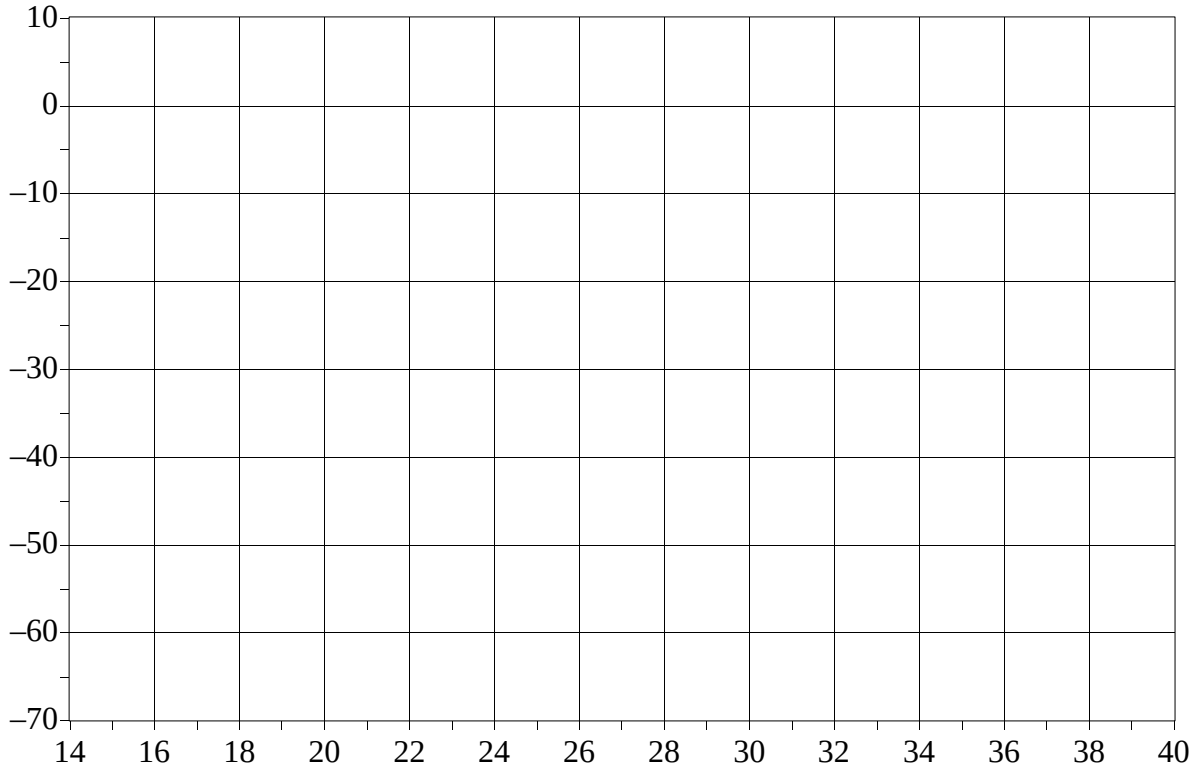
- ❑ Connect the test signal generator to inject a signal at RF ahead of the LNA.
- ❑ Enter the Pr mode and make the following settings:
  Use the space bar to toggle to the power spectrum plot.
  Use the L/l and R/r commands to set the start to 50 usec.
  Use the T/t command to set the plot span to 50 usec
  Use the V/v command to set averaging to 1 sample
- ❑ Set the signal generator power to a value that is approximately 60 dB above noise and observe the scope plot. Adjust the frequency of the test signal generator in 1 MHz steps to cover the whole range of the scope plot. Mark the total power measured on the plot below.
- ❑ Verify that the 3dB point gives approximately 14 MHz of bandwidth.

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

Graph of Total Power vs. IF frequency



D.23 Receiver Phase Noise Check

Test Goal

Verify the stability of the STALO by looking at the phase noise of a clutter target.

Background

For proper velocity calculations and for ground clutter rejection, it is required that the radar's STALO maintain a stable frequency, and that the transmitted pulse contain no amplitude or phase artifacts.

Special Test Equipment:

ascope utility per IRIS Utilities Manual Section 3.7.3
Known clutter targets with no weather signal

Test Procedure

- ❑ Configure the radar for normal operation expect pointing at a known clutter target.
- ❑ Run the ascope utility, and configure as follows: 16-bit time series, Spectrum not from DSP, spectrum size 256, Rectangular window, short pulse width, high PRF, no clutter filters. Select the maximum range and number of bins to get the maximum resolution over the target. For targets < 24 km, use 201 bins, 25 km. Select the range bin of the target. Record the Az, El, range and phse noise below.
- ❑ Try minor changes in Az, El, and Range to get the lowest phase noise. The goal is less than 1 degree within 20 km.

Az: _____ El:_____ Range:_____ Phase Noise:_____

Az: _____ El:_____ Range:_____ Phase Noise:_____

Az: _____ El:_____ Range:_____ Phase Noise:_____

Az: _____ El:_____ Range:_____ Phase Noise:_____

Az: _____ El:_____ Range:_____ Phase Noise:_____

Az: _____ El:_____ Range:_____ Phase Noise:_____

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.24 Hardcopy and Backup of Final Setups

Test Goal

Make a hardcopy of all the final setups, and attach to the tests.

Special Test Equipment:

KVM connected,
Printer or ftp access to a computer that supports a printer.

TTY Setups Hardcopy Listing

- ❑ Start script logging with commands "cd /usr/sigmet/config/listings", "script RVP8.26feb01".
- ❑ Enter the TTY setups and type the "??" command to list all the TTY setups.
- ❑ Exit **dspx**, and exit script logging with "exit".
- ❑ Print the file or ftp it to a computer that supports a printer.

/usr/sigmet/config Hardcopy Listings

Print the following files or ftp them to a computer that supports printing:

- ❑ setup_dsp.conf
- ❑ rvp8.conf
- ❑ softplane_dsp.conf

Backup of /usr/sigmet/config directory

Test Passed

For Customer _____ Date _____

For SIGMET _____ Date _____

D.25 IFD Stand-alone SigGen Bench Test

Test Goal

Verify that the RVP8/IFD electrical I/O is working properly in an isolated environment.

Background

These stand-alone production tests are are performed on every IFD prior to shipment.

Special Test Equipment:
IRIS dspx utility, IF Signal Generator, Voltmeter

Test Procedure

- ❑ Begin by running **dspx** and temporarily reverting to factory settings with 'f'.
- ❑ Enter the **Mb** menu and choose an IF frequency f_{IF} MHz that matches the center frequency of the IFD's anti-alias bandpass filter.
- ❑ Enter the **Pr** menu, and type "RRRTTVVVVV" to move the starting plot range to 30km, the plot interval to 20µsec, and the averaging factor to 10. Also type two space characters to switch to the spectral display plot.
- ❑ Attach an IF SigGen to the input of the anti-alias filter that feeds the "IF-In" IFD input.
- ❑ Set the SigGen for f_{IF} MHz at 0dBm. Verify that the filtered power is within 0.5dB of –1dBm, and that a single clean spectral line is plotted. Use the "Z" or "z" keys to zoom Up/Down as needed.
- ❑ Increase the SigGen power in 1dB steps until distortion harmonics are seen on the plot. This should occur at 6–7dBm.
- ❑ Reduce the SigGen power to –20dBm, and sweep the frequency in 1MHz steps over a 20MHz band centered on f_{IF}. Verify that the bandwidth of the anti-alias filter matches its designed value (14MHz BW for the 30, 57.5 and 60MHz filters, and 4MHz BW for the 16MHz filter).
- ❑ Switch the SigGen off, and verify that the noise floor filtered power is within the following limits. Note: a very good quality shielded test cable is required here.
  - –83dBm to –81.0dBm for IFD Rev.D
  - –86dBm to –84.0dBm for IFD Rev.E and higher
- ❑ Move the SigGen cable to the other IFD filter input, and swap the plots by flipping IFD SW2 to its "A" position. Repeat the above four tests, now on the "Burst-In" SMA port.
- ❑ Place IFD SW1 in its "A" position, and verify that the AFC output voltage varies in a negative-zero-positive pattern as SW2 is flipped from A-B-C. Use the **offset** pot to set a nominal 0-Volt output, and the **gain** pot to set a ±5V span.

D.26 RVP8/Tx Stand-alone Bench Test

Test Goal

Verify that the RVP8/Tx electrical I/O is working properly in an isolated environment.

Background

These stand-alone production tests are are performed on every RVP8/Tx prior to shipment.

Special Test Equipment: IRIS dspx utility, IF Signal Generator, RVP8/Rx & IFD

Test Procedure

- ❑ Begin by running **dspx** and temporarily reverting to factory settings with 'f'.
- ❑ In the **Mb** menu, choose an Intermediate Frequency that matches the RVP8/Tx analog output filters (e.g., 60MHz), and a Blackman window.

```
Receiver Intermediate Frequency:   60.0000 MHz
Design/Analysis Window– 0:Rect, 1:Hamming, 2:Blackman : 2
```

- ❑ Enter the **Pr** menu, and type "RRRTTZ" to move the starting plot range to 30km, the plot interval to 20μsec, and x2 zoom factor. Also type two space characters to switch to the spectral display plot. Exit the plot for now with "q".
- ❑ Setup the following in the **Mz** menu. Note that the frequency specified in the first question should match the U9 RVP8/Tx crystal (VCXO), and the output frequency should match the IF previously set in **Mb**.

```
Onboard synthesizer TxClk/VCXO: 81.00000 MHz
Lock TxClk to an external reference source: YES
  Source – 0:ClkBNC, 1:RxClk : 0
  PLL ratio of (12/27) ==> Reference at 36.0000 MHz
ClkBNC – 0:In/HiZ, 1:In/50Z, 2:TxClk, 3:RxClk, 4:RefClk : 1
Chan A – 0:Unused, 1:FixedFreq : 1
  FreeRunning fixed frequency : 60.00000 MHz
  Output power level : 0.0 dBm
  Gate the sinewave to produce a pulsed output: NO
```

- ❑ Connect the RVP8/Tx *Chan-A* output to the IF-In port of the IFD. It should be connected directly to the IFD's SMA input connector; not through any bandpass filter.
- ❑ Verify that the plot shows a single strong spectral line at the selected Intermediate Frequency, and that any spurious signals are down at least 60dB.
- ❑ Repeat the above three steps on the *Chan-B* output port of the RVP8/Tx card.
- ❑ Apply a 0dBm SigGen waveform at the selected reference frequency (e.g., 36MHz) to the *Clock* BNC input of the RVP8/Tx. Verify that the **V** command shows ***Tx/Clk:Okay***, indicating that the VCXO is locking properly.
- ❑ Reduce the SigGen output to –20dBm and verify that locking is still okay. Vary the frequency by ±10KHz (0.01MHz) and check that lock is lost. Return to the center frequency and verify that lock returns.

D.27 RVP8/Rx Stand-alone Bench Test

Test Goal

Verify that the RVP8/Rx electrical I/O is working properly in an isolated environment.

Background

These stand-alone production tests are are performed on every RVP8/Rx prior to shipment.

Special Test Equipment: IRIS dspx utility, RVP8/IFD

Test Procedure

❑ Begin by running **dspx** and temporarily reverting to factory settings with 'f'.

❑