

RDA 8.09.10 Release Notes (24 Nov 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.9 dated 10 October 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The TTY information line within the **Pa** (ambiguity) plot now lists both the full transmit pulsewidth as well as the width of the 3dB point of the compressed pulse. Both values are expressed in microseconds.

```
RVP8> pa  
BW:3.00MHz PW:30.02/0.60 usec PSL:-61.2dB ISL:-50.7dB...
```

In this example a three megaHertz thirty microsecond waveform is transmitted, and the effective compressed pulsewidth is 0.60 μ sec at its 3dB-down points.

2. The minimum range mask spacing that is enforced by **setup** has been reduced from 25m to 15m. This allows the RVP8 to select, for example, 16.6551m resolution when using a 72MHz IFD clock. Note that at this fine spacing the maximum filter impulse response length is limited to 5.0 μ sec in RxMode-0, and 10.0 μ sec in RxMode-5.
3. The RCP8 can now simulate the values in its A/D converter Q-BITE packet. Each of the ten channels takes on a sinusoidal variation whose period ranges from one minute to four days. This is handy for testing the Q-BITE interfaces in the **bitex** utility.
4. The GPARM status bit GI3S_BPHFAIL which indicates that the last burst pulse hunt had failed is now automatically reset as soon as a valid burst pulse reappears. Previously this error bit had to be explicitly cleared via the DSP driver.
5. For our time series customers, the source code to the **tsview**, **tsexport** and **tsimport** utilities is now supplied with the standard release.

Bug Repairs

1. Bad angle insertions (sudden changes in angle) will not be signalled until after the RVP8 initial startups are complete. This prevents those signals from appearing as startup errors for the remainder of the RVP8's operation.

RDA 8.09.9 Release Notes (10 Oct 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.8 dated 19 September 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. An important new maintenance capability has been added to RVP8 and RCP8 systems. SIGMET hardware can now be reflashed directly using an Altera ByteBlaster pod that is plugged into the parallel port of the Linux box itself. This allows field users to resurrect a clobbered board using nothing more than the RVP8/RCP8, a ByteBlaster pod, and short 25-pin extension cable. Previously this capability would have required a separate laptop running Altera software under a Windows OS, and historically has only been available at the SIGMET factory.

The user interface to invoke the ByteBlaster is deceptively simple -- just use a “-bb” suffix at the end of the device you’re trying to flash. To program a particular RVP8/Rx card in the normal manner via the PCI bus:

```
$ rdaflash rvp8rx-0
```

To program that same card (located anywhere) via a ByteBlaster plugged into the parallel port:

```
$ rdaflash rvp8rx-bb
```

The ByteBlaster pod should be plugged into the RVP8/RCP8 25-pin parallel port using a suitable length extension cable. The raw device **/dev/parport0** will be used, so make sure that its mode is manually changed to 666.

2. The RVP8’s Wide Dynamic Range receiver mode (RxMode #4) now has a 5dB (rather than 3dB) reserved interval at the top end of the HiGain channel, and sensitivity of the GI4S_IFDCHANERR bit to false alarms has been reduced.
3. SOPRM words #15 and #16 now contain 16-bit binary angle offsets that will be added to whatever live azimuth and elevation angles are measured by the RVP8. These bits were unimplemented in the RVP8, and in the RVP5/6/7 had conveyed which incoming TAG bits were to be inverted. These new SOPRM angles will be combined with (added to) whatever “TAG Offsets” have been specified in the **Mp** menu to determine the overall angular corrections. This new feature allows DSP driver writers to make dynamic changes to the AZ/EL offsets.
4. The change described in New Feature #4. of the 8.09.8 notes has been softened to allow PPP mode to run in non-Dual-Pol RxModes. Fixed-H or Fixed-V Tx must be selected.

Bug Repairs

1. The BATCH unfolding algorithm now works from the R0 power in the low-PRF data, not from the T0 power.

RDA 8.09.8 Release Notes (19 Sep 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.7 dated 12 September 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. Several new command line arguments have been added to the *rvp8ts_example* utility:

```
$ rvp8ts_example -?
RVP8 Timeseries API Demonstration Utility
Command line options
  -readts : Read the timeseries data (not just the headers)
  -spew   : Output binary timeseries to stdout
  -pack   : Output packed format, else floating
  -uiqbits : Insert User-IQ-Bits, and report their arrival
  -tginfo  : Report trigger transitional flags
  -tgerrors : Report PRT errors greater than 5 clocks
  -noheaders : Do not show any pulse header information
  -allheaders : Show information in all pulse headers
```

```
Record live packed timeseries to disk using:
rvp8ts_example -readts -pack -spew > foo
```

```
Monitor triggers for inconsistent PRTs using:
rvp8ts_example -tgerrors -noheaders
```

The *-noheaders* and *-allheaders* flags control how much information is printed as data are read from the TSAPI. If neither flag is given then progress messages are printed just like before. The *-tgerrors* flag can be used to detect triggering problems, especially on systems using an external trigger. Pulses whose previous/next PRTs differ by more than five AQ clocks will be flagged. An attempt is made to filter out pulses whose PRTs are different for “good” reasons, e.g., at the boundaries of a dual-PRF trigger sequence.

Also, the *rvp8ts_example* utility is now supplied as a compiled binary within each RDA release. Previously you would have to build it yourself.

2. The *Range Mask Spacing* parameter in the **Mt<n>** menu now shows the number of AQ clocks spanned by each increment:

```
Range mask spacing: 74.9481 meters (36.0000 clks)
```

This is handy when you want the range bins to fall on exact multiples of the clock.

3. The RVP8 now always powers up in FFT mode, rather than whatever mode it was in at the time of the last *save* command.
4. The RVP8’s PPP mode will now run only when the processor is configured in one of the three available dual polarization modes (RxModes 1, 2, and 3). The GLS_PMODERR

bit will be set in the GPARM latched status word if PPP mode is attempted in a single-Rx configuration.



Note: This was further changed in New Feature #4. of the 8.09.9 notes.

5. The thresholding of polarization parameters has been improved.
 - Thresholds for ZDR are explicitly chosen from **ascope** and the IRIS/TCO menu. In addition, the individual HH and VV powers must both exceed the LOG noise threshold in order for a ZDR value to be computed.
 - Threshold criteria for LDRH and LDRV are identical to those for ZDR.
 - Thresholds for RhoH, RhoV, RhoHV, PhiH, PhiV and PhiDP are inherited from velocity. In addition, the individual receiver contributions must all exceed their respective noise levels for a value to be computed. Note that the measured noise level is used directly here; the LOG threshold is not applied unless it happens to appear in the inherited threshold definitions for velocity.
 - Thresholding of KDP is based on having adequate phase data over an interval of ranges, and is therefore derived from the thresholding and statistics of PhiDP.

The above applies when “Unified Levels” are chosen in the **ascope** Thresholds Menu. When “Individual Levels” are selected, then the “Other” category applies to all of the polarization parameters other than ZDR which is still explicitly defined in the menu.

6. The RVP8’s Wide Dynamic Range receiver mode (RxMode #4) now sets the internal error flag *lWideChanBadRatio_c* whenever the ratio of powers in the two channels exceeds 8dB at a rangebin whose HiGain power falls within the *Overlap/Interpolate* interval. The GI4S_IFDCHANERR bit will also be set in the GPARM status whenever this happens. Previously the channel separation ratios were simply discarded (silently) whenever wildly bad ratios were seen.

Bug Repairs

1. The RVP8/Main and RVP8/Proc exit handlers now call the exit handlers for the current PROC section (if any) and for the current Major Mode. Previously this was not being done, which meant that mode-specific states (e.g., IPC facilities) would not necessarily be cleaned up after exiting the RVP8 entirely.
2. The *Range mask spacing* parameter in the **Mt<n>** menu had been quantized to the next higher centimeter value (to improve compatibility with IRIS). This was not a good idea, and that quantization has been removed. You will now get precisely the bin spacing that you ask for in the **Mt<n>** menu. However, if the range mask spacing is changed via the IRIS **setup** utility, the 1cm quantization will again be applied.
3. Two bugs were repaired in the PPP clutter filtered polarization parameters. ZDR was not being computed from the filtered data, and RhoHV was not being scaled properly by the filtered power in the two channels.

4. The 1-Dimensional speckle remover was not working properly on the polarization data.

RDA 8.09.7 Release Notes (12 Sep 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.6 dated 2 September 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The four RS-422 I/O signals on the 9-pin connector of the RVP8/Rx Rev.C card can now be configured for a variety of functions, making it easier to build minimal RVP8 systems that have only a single RVP8/Rx. The following choices are available in the **Mc** menu:

```

RVP8/Rx 9-Pin RS-422 Signal Assignments For All Pins:
-1:Unused          0:UserInput          1:UserOutput
 2:PulseWidthBits  3:TxPhaseBits
Pin-1 - 100:Trig1  101:Trig5  102:Polar1 : -1
Pin-2 - 200:Trig2  201:Trig6  202:Polar2 : -1
Pin-3 - 300:Trig3  301:Trig7           : -1
Pin-4 - 400:Trig4  401:Trig8  402:Trigin : -1

```

The default for each pin is that it is unused. All pins can be assigned as uncommitted I/O lines that can be written/read under program control using the *Rvp8RxRS422SetPin()* and *iRvp8RxRS422GetPins()* routines. Each of the pins can also be configured to output their respective bits from the 4-bit pulsewidth code, or the low four bits of the transmit phase. Lastly, special I/O assignments can be made to each pin individually for trigger output, polarization output, or external pretrigger input.

2. The RVP8 and RCP8 now provide support for generating coredumps on abnormal exit. Use the *-coredump* command line option to setup the proper runtime environment to create core images. On modern Linux systems there are many switches and hooks that need to be set in order for a process to dump core successfully. The *-coredump* flag causes the RVP8/RCP8 to setup the “safe” per-process states, and to issue warnings for system-wide states that are not set appropriately.

When the *-coredump* flag is not used, the RVP8 and RCP8 still may dump core if the conditions are just right. If you never want coredumps to occur they can be prevented with the shell command: **ulimit -c 0**.

3. The RVP8 now has the option of creating a log file named *rvp8.log* in the *IRIS_LOG* directory, rather than sending its startup and runtime messages to the standard error output. File logging is requested via the *-logfile* command line option, and is also implied whenever the *-daemon* flag is used. One old logfile will be kept at all times under the name *rvp8.log-1*.
4. The RVP8’s manipulation of measured AZ/EL angles has been improved to give more flexibility when the angle scale is something other than 1:1. Normally the following questions appear in the **Mp** menu:

```

TAG scale factors      AZ: 1.0000    EL: 1.0000
TAG offsets (degrees) AZ:  0.00    EL:  0.00

```

The scale factors being exactly unity indicate that one revolution of the mechanical axis corresponds to 360 degrees of spin in measured angle. In this case the only adjustment that may be needed is to add fixed offsets to the measured angles in order to arrive at the actual angles.

In some pedestal systems the gear ratios are not 1:1 and a more detailed conversion is required. The setup questions are then reworded as:

TAG scale factors	AZ: 1.0000	EL: 0.2500
TAG pre-MPY offsets	AZ: 0.00	EL: -175.00
TAG post-MPY offsets	AZ: 0.00	EL: 40.00

The process of converting a measured angle to an actual angle is as follows. The *PRE* offset is first added to the measured angle, and the result converted to an angle between -180 and +180 degrees. This angle is then multiplied by the scale factor, and the *POST* offset is added to the product to yield the final angle.

For example, suppose that the elevation axis of our pedestal has a 1:4 synchro that reads 15-deg when the antenna is really at zero degrees, and suppose that we want to have our final range of elevation angles be -5 to +85 degrees. The *POST* offset must be equal to the midpoint of the final desired range (since the intermediate -180 to +180 computation is symmetric about zero), and is therefore 40-deg. The *PRE* offset is then calculated so as to make a measured angle of 15 degrees map into a final angle of zero:

$$0 = 40 + 0.25 \times \text{Modulo}_{(-180 \text{ to } +180)}(PRE + 15)$$

hence *PRE* is -175 degrees. Note that the *POST* angle should be adjusted only when the desired final angle span is changed, whereas the *PRE* angle is adjusted to compensate for fixed offsets in the incoming angle measurements.

Bug Repairs

1. An intermittent bug was repaired in which the uplink instructions to the IFD would sometimes become incorrect after the RESET opcode was executed via the DSP driver. The symptoms of this were a persistent IFD PLL error report following an IRIS mode change. The error could only be cleared by restarting the RVP8, or by entering/exiting the RVP8 TTY setups.

RDA 8.09.6 Release Notes (2 Sep 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.5 dated 4 August 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. Dual-Polarization clutter filters are now available within the RVP8. A hybrid filtering approach is used in which the Dual-Pol algorithms still run within the Pulse-Pair major mode, but the clutter filters themselves are implemented using a DFT approach that is essentially equivalent to an FIR filtering of the raw timeseries data. In this way, the RVP8 Dual-Pol clutter filters are a significant improvement over the legacy IIR filters that were provided in the RVP7 signal processor.

When no clutter filter is selected (Filter #0) the Dual-Pol parameters are computed via DFT algorithms that are algebraically equivalent to the standard time-domain algorithms described in Appendix B. The implementation now utilizes DFTs of timeseries data rather than direct summation of correlation terms, but the results are numerically identical. Of course, having done this, it then becomes a simple matter to implement clutter notch filters via these intermediate transformed arrays.

The **Mf** setup menu should be used to configure the available clutter filters; only the **FIXED** and **VARIABLE** types can be selected (GMAP is not available for Dual-Pol). These spectral filters behave much like they do in FFT, RPH, etc., modes except that a zero value is substituted within the clutter notch (no interpolation across the clutter gap) and the largest **VARIABLE** span is applied to all Rx data within any given bin. Both of these modifications are needed because the clutter filter must produce identical side effects in all of the receiver channels that contribute to a given range.

We recommend starting with a set of **FIXED** width filters, each of which invokes the Hamming window explicitly. This allows you to keep the rectangular window as the default window when no filter is applied, so that the results in that case are identical to legacy behavior. To help with debugging, **ascope**'s "Spectra from DSP" during PPP mode now shows the clutter filtered data from the Co-Receive channel.

2. The TDWR support code in the IO62 FPGA now extends the *STC-Clock-Trigger* an additional 2047 36MHz clocks (56.86 μ sec). This makes it possible to redefine:

```
Trigger #5 - Start:    -1.00 usec
              #5 - Width: 66.67 usec      High: YES
```

to be:

```
Trigger #5 - Start:    -1.00 usec
              #5 - Width:  9.81 usec      High: YES
```

which then allows the RVP8 to synthesize trigger PRTs as low as 506 μ sec.

RDA 8.09.5 Release Notes (4 Aug 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.4 dated 18 July 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The RVP8 now takes a *-verbose* command line option that will add more information to whatever optional printouts have been selected. So far, only the *-showCPI* printout is augmented by prefixing both the real time and the data time to each CPI shown.
2. The RCP8 logic equations now contain two new builtin status variables: *sHostAlive* is true as long as the RCP8 is receiving valid XMT_XXX packets from the host computer, and *sHostControl* is true when the host computer is actually in control of the antenna. For example, the former will go false if the serial packet stream is dead, and the latter will go false if motion commands have been typed within the *Monitor Angles* menu.
3. This release includes the first version of the RDA kernel module for 2.6 Linux kernels such as in RedHat RHEL4.

Bug Repairs

1. The parity of the TDWR serial STC data stream was changed from NONE to EVEN.
2. An obscure PCI/DMA buffering error has been repaired in the RVP8's acquisition of live timeseries data from the RVP8/Rx card (all versions). Depending on the PRF and bin count, portions of (I,Q) data within an individual pulse could sometimes be corrupted, and might then show up as sporadic loss of clutter suppression within a radial. This is the oldest RVP8 bug in the entire history of the product, dating back to pre-release versions in May 2002.
3. A trigger synthesis bug was repaired that would cause BATCH triggers to have slightly incorrect periods across the PRT transitions. The effect would only occur when trigger PRT quantization was used along with one or more triggers having fractional start time.

RDA 8.09.4 Release Notes (18 Jul 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.3 dated 6 July 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The RVP8 TSAPI now contains an optional routine *rvp8tsEndCurrentAcqMode()* to announce the end of the current acquisition mode. This call can be issued by the timeseries writer when it knows that no more pulses will be written in the current manner. The advantage of doing this is that it gives readers (such as the RVP8 CPI finder) a clue for early exit from their processing routines.
2. The RVP8 front panel will now show “—Hz” whenever triggers are blanked.
3. The RVP8 CPI finder will now exit immediately whenever it is within it's 1-second timeout window and new opcode words are written to the RVP8. If a synchronous PROC command is running, then a timeout (zero pulse) ray will be output; but for a free running PROC command, no final ray will be output (since the number of output rays is indeterminate anyway).

Bug Repairs

1. The *IRvp8RxTrigBlanked()* routine was not returning the correct time of stable trigger blanking. This could cause spurious *Missing Burst Pulse* errors to be generated by the RVP8. This bug has been present since RDA-8.06.12.
2. The RVP8 CPI finder would sometimes not return properly alternating Hi/Lo Dual-PRF blocks when PROC commands were issued with deliberate delays between. This was visible in certain configurations of **ascope**. Also, the first CPI following certain PROC commands would sometimes timeout.
3. The range mask being stored in the timeseries API's *rvp8PulseInfo* structure was not correct when the *2-way (Tx+Rx) total waveguide length* was nonzero (the mask would be offset by the waveguide length). This caused a number of peculiar side effects, the worst being that **ascope** would display no data and a PRF of “NoTr” whenever the waveguide length exceeded half the range mask resolution for a given pulsewidth.



Note: A temporary work around for systems running 8.08.3 and earlier is to set the waveguide length to zero.

RDA 8.09.3 Release Notes (6 Jul 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09.1 dated 19 June 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The Rev.E-G RVP8/IFD can now produce a reference clock on its J4 SMA connector. A new setup question in the **Mc** section configures the desired frequency:

IFD auxiliary (J4) output clock: 12.00000 MHz

The frequency that is chosen must be a submultiple (2–128) of the frequency of the IFD's internal crystal oscillator. Even divisors will result in a symmetric square wave, whereas odd divisors yield an asymmetric waveform and the word “odd” will appear to remind you that the DC balance is not zero. The output power is approximately +15dBm.

A recommended use for this output is to drive the Clock-In port of an RVP8/Tx card in systems that use a fixed frequency IFD. The IFD's J4 output clock is very low jitter, and gives a superior locking reference for other components in the radar system.

2. The **rdadiags** utility can now be used to perform exhaustive I/O tests on every connector pin of the ORDA custom backpanel. These tests require an RDA system having four I/O-62 PCI cards as well as two external custom adapter panels.
3. The TDWRV1 softplane option now includes a feature in which five input status lines can be sampled synchronously on either the rising or falling edges of three of the user triggers.

J3 Pin(s)	Sampled-On	TDWR Signal
1/14	Trig-8 Rising	TRLFLT
2/15	Trig-7 Falling	STABFLT1
3/16	Trig-6 Falling	STABFLT2
7(TTL)	Trig-7 Rising	RFFM
8/21	Trig-6 Rising	STCFLT

Call `ilo62Tdwrv1GetLatchedStatus(Io_c)` within the RVP8 to retrieve the most recently sampled values of these input lines.

Bug Repairs

1. A timing skew was repaired in the Rev.E-G RVP8/IFD that caused IF sampling errors under certain power/temperature/signal conditions. The bug appears to be the result of changes in PLL synthesis by Altera's Quartus compiler within their 4.1–4.2–5.0 revs.
2. The RVP8 will now attempt to use all of the timeseries pulses that have been queued so far when assembling the first CPI following a PROC command. Previously, it would not look back as far as possible and this could cause a missing first ray during TS playback.

3. A race condition has been repaired in the RVP8's **rtctrl** (Real-Time Control) thread, in which a requested trigger bank change would sometimes not occur in response to a fired timer. This bug did not affect any out-of-the-box RVP8 features, but was noticed within a developer's code.
4. The **ascope** utility was not reading the current time correctly from the RVP8 when it was running in its timeseries and spectra modes. The time from the last Doppler parameter ray would be used instead.

RDA 8.09.2 Release Notes (23 Jun 2005)

No significant changes since 8.09.1.

RDA 8.09.1 Release Notes (19 Jun 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.09 dated 11 June 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. The *-perpetual* command line argument has been removed from both the RVP8 and RCP8 products. Please use the **rdadiags** utility for burn-in diagnostic testing.
2. The semantics of the CLTSIG_DEFAULT driver flag have been improved; the flag now causes the RVP8's *Residual Clutter LOG Noise Margin* parameters to be reloaded from their saved file values rather than from the values shown in the **Mf** menu. This means that the **Mf** menu is guaranteed to always show the current working values, in keeping with how all other RVP8 setup parameters are handled.
3. Two new timeseries "mismatch" bits have been added to the RVP8. Errors in placement of range mask bins are indicated by MMTS_BINPLACE, while MMTS_RMASKRES shows when the range mask resolutions differ by more than 2.5cm.

Bug Repairs

1. The 16-bit velocity and width parameters that are output by the RVP8 during Dual-PRF modes have been incorrect for several years. The velocities were being scaled down by the unfolding factor, and the widths were being scaled up.
2. The default reflectivities in BATCH mode now come directly from the raw LoPRF power sums in each bin. Previously, the range averaged LoPRF sums were being used (to reduce the variance), but this had the side effect of defeating the point clutter algorithm later in the process. Many thanks to the ORDA software team for identifying what was happening here.
3. When timeseries playback was stopped the RVP8 would sometimes keep returning rays from the last few seconds of TS data. The correct response now is that rays will never be output from retrograde timeseries data.

RDA 8.09 Release Notes (11 Jun 2005)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.08.14 dated 27 May 2005. If you are upgrading from an earlier version please also read the release notes that have been published since then.

New Features

1. An additional element *fdBAddNseThr* has been added to *struct rvp8BatchSetup* to allow a slightly higher noise threshold to be set for the BATCH surveillance powers versus the Doppler powers. The default value is zero, meaning that the same noise threshold will be used for both sets of pulses just as it always has been.

This new parameter is experimental. Please be sure to initialize it prior to calling the DSP driver routine *dspw_batchSetup()*. A conservative suggestion for reducing the density of speckles in BATCH mode is to set this parameter to 0.5dB, and also turn on the standard “1D” RVP8 speckle remover.

Bug Repairs

1. A bug was repaired in RVP8 BATCH mode wherein Doppler data might (very rarely) be unfolded into more than one range bin.
2. Timeseries data that were recorded using PRF-Sectors could not be played back properly on the RVP8.
3. The RVP8 algorithm for finding the next Coherent Processing Interval would sometimes fail to properly resume after a network timeout that interrupted the reporting of angles to the RVP8.