

## **RDA 8.06.14 Release Notes (29 Oct 2004)**

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.13 dated 22 October 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### **New Features**

1. On the RCP8, in the “site custom” command, in the Orbit section there is a new question “Fixed time lag for Orbit angles”. Try this initially with the default value of 1 ms. This allows correcting for delays in transmitting the antenna angles from the Orbit controller. This value is internally quantized to 1 ms resolution.
2. The RCP8 skips antenna positions which are inconsistent with the previously known position. This is to reject obvious mistakes. These skips are now logged to the error output on the RCP8.
3. The ant\_rcv process now performs a sanity check on arriving antenna positions similar to what the RCP8 always did. Failures are logged. This means we will detect if somehow the antenna positions are damaged in network packets between the RCP8 and RVP8. You should change setup/rcp/advanced features/Packet logging to “error” to enable this logging.

### **Bug Repairs**

1. The IRIS antenna library ant\_rcv process computes much better average packet arrival times. This means, for example, that it is able to correctly compensate for the WSR88D DCU packet time alternations in the RVP8.
2. Antenna angles that are read from the IRIS Antenna Library are now smoothed and extrapolated in a much better manner than before.
3. The example code to read from the WSR88D DCU was supplying different velocities to the RCP8 and the ant\_lib. The ant\_lib got the DCU velocities, while the RCP8 got differenced position velocities. Now differenced velocities are used for both.

## RDA 8.06.13 Release Notes (22 Oct 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.12 dated 12 October 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The maximum time between successive RVP8 data acquisition DMA transfers from the RVP8/Rx card has been reduced from 160ms to 80ms. This will help reduce overall data latencies in the timeseries API. And in the rays read using the PROC command.
2. The RCP8 *hostio* thread now synchronizes its output antenna records to exactly match the arrival times of new angle information from external serial antenna controllers. For this to work properly, please set the “RCP8 Transmission Rate” to something well below the expected real update rate so that the two mechanisms don’t interfere with each other. For example, antenna packets from the WSR88D DCU arrive every 45ms (~22Hz), so an RCP8 transmission rate of 10Hz (or less) might be chosen. Antenna packets would then be output synchronous with the 45ms DCU rate, but will fall back to the 10Hz rate if the DCU stream is interrupted.
3. Two logging improvements have been made in both the RVP8 and RCP8: the startup time is printed following the initial banner, and signaled messages have millisecond time resolution and show the month and date more clearly than before.
4. On the RCP8, in the “site custom” command, in the DCU section there is a new question “Fixed time lag for DCU angles”. Try this initially with the default value of 4 ms. This is the delay cause by transmitting 8 bytes of data at 19200 baud. This value is internally quantized to 1 ms resolution.
5. In setup/rcp in the *Advanced Interface Features* section there is a new question “Packet Logging”. By default, leave that set to “None”. This is used to debug errors in the antenna position and INU packet reports. When turned on, a log file is created with an entry for each position packet including the time of arrival at ms resolution. The location of the log file is dependent on the antenna angle insertion source. If set to “Normal RCP”, then the ant\_rcv process will create a log file in the {IRIS\_LOG} directory. If set to “Native RCP8”, and the angles are coming from the WSR88D DCU, it will log on the error output of the RCP8. You should redirect that to a file in your /etc/init.d/rcp8 file. We cannot log high speed “Native RCP8” and “Native RVP8” sources.

### Bug Repairs

1. The RVP8 was not periodically updating the ten analog input lines from the standard backpanel when “Live angle input” was set to “None”.
2. The example code to read from the WSR88D DCU now correctly compensates for the 10 ms time quantization, and sends the corrected times both to the native ant\_lib, and in the position output packets.

## RDA 8.06.12 Release Notes (12 Oct 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.11 dated 7 October 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. A significant reduction was made to the RVP8's first ray latency, i.e., the time between the execution of an initial PROC command and the availability of the first output ray. This time delay used to be anywhere from 350ms to 1300ms, but is now reliably less than 300ms. Related to this, the **speed** utility now prints the first ray latency as part of its startup informational messages.
2. The I/O overhead has been reduced by about a factor of 15 for large blocks of data that are written from the DSP driver to the RVP8. The change is especially noticeable within the LRMSK, LFILT, LSYNC, LSIMUL, and XARGS opcodes which have tended to be I/O limited but now run much faster than before.
3. The RVP8's approach to trigger blanking has been improved in several important ways. Previously, a dedicated TBANK\_BLANK trigger pattern was used whenever triggers were supposed to be blanked. Although this would successfully blank the intended triggers, the side effects of switching to a totally different trigger pattern would ripple down and make the timeseries archive awkward to use.

The new approach to trigger blanking does not alter the trigger bank or trigger timing in any way, but rather, directly suppresses some subset of the user trigger lines within each blanked pulse. Thus, the non-blanked trigger lines remain completely unchanged, and software that looks for timing features in the (I,Q) data will still see those features in the blanked data. A new PHDRFLG\_BLANKED bit has been added to the timeseries headers to indicate whether triggers were blanked on each pulse, and the API calling conventions for trigger bank selection have changed slightly.

Perhaps the most significant side benefit of all this is that the RVP8 will now output rays smoothly and continuously within blanked sectors. Previously, the ray rate would drop to 1-ray/second within such intervals, which could be awkward for application code that needed a continuous data stream.

4. The RVP8 now leaves a reminder message on its front panel display if any problems were encountered during the initial startup procedure. The text "Startup Errors Noted" will flash briefly every few seconds on the bottom line of the display. This condition is (and always has been) detectable via the DSP driver by checking whether any bits are set in GPARM Diagnostic-Register-A.
5. Signal generator and Noise generator support is now fully integrated into the RCP8. The following variables can be used in *softplane.conf* as well as in logic equations:

Control Outputs	Status Inputs
-----	-----
cNoiseGenOn	sNoiseGenOn
cSigGenOn	sSigGenOn
cSigGenCW	sSigGenCW
cSigGen[7:0]	sSigGenFlt
	sSigGen[7:0] ( <i>not in logic eqn's</i> )

and the following enable/disable questions have been added to the *status* menu:

```

NOISEGEN-ON input is enabled: NO
SIGGEN-ON input is enabled: NO
SIGGEN-CW input is enabled: NO
SIGGEN-FAULT input is enabled: NO
SIGGEN-LEVEL input is enabled: NO

```

## Bug Repairs

1. The RCP8's "?V" equation editor command to list all known variables was omitting the "cSigGenOn" and "cSigGenCW" names.

## RDA 8.06.11 Release Notes (7 Oct 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.10 dated 21 September 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The *Plot Burst (Pb)* display now shows an additional center-of-mass tick mark whenever the burst pulse is centered within the middle 5% of the data window. This new tick mark moves with twenty times the sensitivity of the major mark, and allows you to make fine adjustments in burst timing (to within 25ns) even when the impulse response is long and 25ns could not be resolved on the plot itself. The magnified marker is very helpful when manually setting the “zero offset” timing of a long compressed pulse. Note: the marker is only shown when the impulse response is longer than 125 taps.
2. The algorithm for determining the center-of-mass of the burst pulse has been improved, and is now based on maximal cross correlation with the RVP8/Rx FIR coefficients being used to receive that pulse. The change is extremely important for accurately determining the center point of a long compressed pulse, and hence, for running burst pulse tracking and pulse compression at the same time. The new technique will find the center of the Tx pulse to within 25ns, and is unbiased even by severe amplitude distortions that may exist across the width of the pulse.

Why worry about such small shifts in the timing of the burst pulse? For a conventional gated CW pulse there really is no concern. But for a compressed Tx waveform whose bandwidth is 5MHz, the burst (I,Q) reference would miss the pulse energy entirely with even a mere 200ns offset. Because of the importance of accurate burst pulse timing, we recommend that all pulse compression systems turn on *Burst Pulse Tracking* in the **Mb** menu beginning with this release. Be sure to first center all pulsewidths manually using the **Pb** plot with tracking temporarily disabled. Use the new high-gain offset tick mark described above, along with the L/R l/r keys to shift the timing left and right. When all pulsewidths are properly centered, re-enable tracking and save all settings.

3. The RCP8 now provides a zero-delay least-squares smoothing filter that can be applied to the tachometer inputs. The old single-pole tach filter and drive filter have been removed because the phase delays that they introduced rendered them almost useless. In contrast, this new tachometer filter has zero delay within its passband, and thus will not introduce servo instabilities even with long modeling windows such as 0.5sec. The smoother is configured in the *Velocity* menu:

**Tach zero-delay-smoother window: 0.150 sec**  
**Model order within the window: 3**

Use the tachometer filter to “quiet down” the drive from the velocity servo in systems that have any of the following problems: backlash or looseness in the gears, electrical noise on the tachometer, or significant nonlinearity in the motor/power amp.

4. Improved trigger generator error messages are now displayed in the **Pb** plot. Previously, only the text “TIMING–ERROR” would be shown. Now, you will see “TgErr” followed by “Period” (the requested trigger period could not be attained), “Pattern” (the requested trigger starts and widths could not all be attained), or “Memory” (the pattern RAM on the RVP8/Rx PCI card is full).
5. The RVP8 is now more careful in its reporting of a missing burst pulse. The error will only be reported when the burst pulse is missing and no obvious internal explanation can be found, such as a) the RVP8 is not the timeseries writer, b) the RVP8 is running with simulated data, c) triggers are presently blanked, d) triggers have only recently been unblanked, or e) antenna library status from the transmitter is valid and indicates that radiate is off.
6. The stricter criteria described above for declaring a missing burst pulse are now applied within the XOP\_BPHUNT opcode so that requests to hunt for the burst will be ignored whenever the pulse might be missing for valid reasons. This repairs an IRIS/INGEST bug in which burst pulse hunting would begin inappropriately when a task happened to start in a blanked sector region.
7. The RVP8 now preserves its burst pulse analysis parameters across pulsewidth changes. This should give smoother pulsewidth transitions on systems whose triggers do not need to be interrupted when making the change. Previously, the burst frequency analysis and AFC wait times would be reset when a pulsewidth change occurred.
8. The RVP8 and RCP8 commands to restore both the saved and factory settings now first show you a list of all the changed values that are about to be loaded. For example:

```
RVP8> f
Restoring Factory Defaults...
The following changes will be loaded:
  rvp8NV.iPl1Numer : 5 ==> 1
  rvp8NV.iPl1Denom : 8 ==> 1
  rvp8NV.fifreq : 60 ==> 30
Continue? (Y)
```
9. The AZ/EL boundaries used by the PRFSECT opcode are now inclusive angles, i.e., the regions include the Upper/Lower AZ/EL edge limits themselves. This convention makes it simpler to define several contiguous regions without generating slivers in between.
10. The WSR88D “ModCharge” and “TrigCharge” triggers are now inhibited whenever the receiver protection handshake was last observed to have failed. Previously those triggers would continue firing, which could lead to a Tx overvoltage fault.

## Bug Repairs

1. Burst pulse tracking was not correctly shifting the waveforms generated by the RVP8/Tx digital transmitter card.
2. Trigger blanking was not working properly in the RVP8 unless the *–noDiagnostics* flag was included on startup. The symptoms were likely to be confusing because it would

resume working properly after processing either Dual-PRF rays or certain types of angle synced rays.

3. The second channel of dual-polarization data was not being recorded properly for RVP8 systems that used dual IFDs (rather than dual IFs in the same IFD). Everything was fine with the RVP8 parameter data, but the timeseries API was incorrectly indicating that only one Rx channel was in use.
4. Occasional missing rays have been repaired at the boundaries of PRF sectors defined by the RVP8's PRFSECT command. The sectors now work cleanly in all major modes and both with/without angle syncing. Some caveats should be observed:
  - Dual-PRF unfolding can not possibly work properly at PRF sector boundaries, so we recommend not using Dual-PRF and PRFSECT at the same time.
  - When PRF sectors are used in conjunction with angle syncing, it is best to set the PRF sector boundaries at the midpoint between individual sync angles. This will prevent the PRF seam from bobbling between two adjacent sync angles.

## RDA 8.06.10 Release Notes (21 Sep 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.9 dated 19 September 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### Bug Repairs

1. The new Serial-Line-Monitor stream was not always starting properly when its setup parameters (**M**+ menu) were changed in certain problematic sequences. The stream would always start properly, however, from a cold startup using saved settings.
2. The XOP\_THRESH opcode was exchanging the WSP and SQI thresholds; each was being stored in the other's slot. Likewise, the RBACK of those two values was also swapped. Both directions now follow the *RVP8 User's Manual* documentation, which has not been changed at all.
3. The small-sample-size correction for window type was not being applied properly to *width* data. This was causing an upward bias in reported widths for sample sizes in the teens and twenties.



## RDA 8.06.9 Release Notes (19 Sep 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.8 dated 16 September 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The minimum LOWPRF pulse count in BATCH mode has been reduced as far as it can possibly go: to two transmitted pulses, i.e., one usable pulse. This allows unfolding to be based on a single pulse if desired; hopefully, there would also be a lot of range averaging in such a case. The minimum HIPRF pulse count in BATCH mode remains at three (four usable).
2. The **rvp8ts\_example** utility now takes a *-headers* flag telling it to print information from all of the pulse headers that it reads from the Timeseries API. This can be useful for debugging your trigger waveform definitions and real-time callbacks that affect the trigger timing.
3. Two additional arguments have been added to *initProcSection\_dflt()*. Simply set them to FALSE and 0 to get the old behavior.
4. The RVP7's real-time serial status monitor has been ported into the RVP8. This legacy feature provides a periodic report of internal signal processor parameters via a serial TTY or FIFO. Use the **M+** (debug) menu to configure the contents of the stream:

```
Real Time TTY Monitor: YES
Pathname of TTY/FIFO : '/dev/ttyS0'
Serial data rate: 9600 baud
Update rate: 1.00 lines/sec
Show burst frequency      NO
Show burst pulse power    NO
Show AFC information       NO
Show pulse width          NO
Show PRF                   NO
Show LOG noise             NO
Show polarization         NO
Show IFD and link info     NO
Show burst timing slew    NO
```

The serial port can be either a standard Linux TTY device, or a Linux FIFO whose name ends in “-x”. In the latter case, another piece of software on the same machine can open that FIFO and read the serial status directly.

### Bug Repairs

1. The *pthread\_create()* library function is broken on the RHEL3.0 platform in that static priority threads can not be created directly from instructions in its *attr* argument. The result was that RVP8 and RCP8 threads have been running at standard SCHED\_OTHER

(timesharing) priority on this platform. We have worked around this C-Library bug by using `pthread_setschedparam()` to set the scheduling policy/priority after the thread is created. If anyone has more information on this OS bug please let us know.



**Important: This is a fairly serious bug that appears to affect process scheduling on all RHEL platforms. We recommend that the RDA-8.06.9 RHEL3.0 release be installed on all such machines.**

2. There was an off-by-one error in the RVP8's tagging of Timeseries API pulse header waveform numbers (iTgWave) when certain types of trigger patterns were defined. The effect in BATCH mode was that the RVP8 was only using N-2 of its long PRT pulses rather than N-1, i.e., it should always discard the first LOWPRF pulse as a clearing pulse, but it was discarding two. This could show up as an actual observable degradation of data since there are so few LOWPRF pulses to work with — if even one is missing, the variance of the unfolding reflectivity will increase a noticeable amount.
3. Improvements were made in the accuracy of placement of PRF “pie slice” sectors as defined by the PRFSECT opcode.

## RDA 8.06.8 Release Notes (16 Sep 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.6 dated 6 September 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then. Note that 8.06.7 was skipped in the public sequence.

### New Features

1. The “save” command in both the RVP8 and RCP8 now first shows you a list of all the changed values that are about to be saved. For example:

```
RVP8> save
The following changes will be saved:
  rvp8NV.iRvp8TxCard : -1 ==> 0
  rvp8NV.fAqClk : 72 ==> 35.9751
  rvp8NV.pwdefs[0].fmaxprf : 20000 ==> 500
  rvp8NV.pwdefs[0].fMaxInstPrf : 20000 ==> 500
  rvp8NV.fprf : 2000 ==> 500
  rvp8NV.fifreq : 60 ==> 30
  rvp8NV.lEnableBPT : 0 ==> 1
  rvp8NV.opprm.isamp : 250 ==> 25
Continue? (Y)
```

Confirming with YES (or just a carriage-return) will save the new settings; but if you see something that you didn't really intend to change, typing NO allows you to cancel out of the command without saving any changes at all.

2. The *thresholds* menu in the **ascope** utility now gives you the option to choose individual logic criteria and comparison levels for each of the parameters *dBZ*, *dBt*, *Vel*, *Width*, and *ZDR*. This capability is only available for RVP8 processors that support having separate threshold specs for each output parameter. The menu can still revert back to the unified levels that have always been supported, in which case the new *asc\_stats* saved structure is backward compatible with the old.
3. The *range\_mask\_gen()* function in the DSP library now returns an error mask of any arguments that were altered from their requested input values based on sanity checks done by the new *range\_mask\_check()* function.

### Bug Repairs

1. The Board-to-Board serial bits from the RVP88D to the RCP88D section of the custom ORDA backpanel were not working properly. A random fixed bit pattern was being received on the RCP8 side of the interface.
2. The BATCH mode “obscured” flags were being incorrectly set for weak reflectivity bins that were not actually being obscured by any other trips.
3. The **ascope** utility would crash with a *DSP-Timeout* message when transitioning into a pulsewidth whose finer range mask spacing would not permit the current max range to be

attained within the 8192-bit range mask of the LRMSK command. The max range is now forced down to a safe value (if necessary) whenever the pulsewidth is changed.

4. A rounding error within the SETPWF opcode was causing a “Trigger Pattern Altered” message whenever the requested PRF was extremely close to the maximum PRF.

## RDA 8.06.6 Release Notes (6 Sep 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.2 dated 24 August 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then. Note that 8.06.3 through 8.06.5 were skipped in the public sequence.

### New Features

1. A new INU setup question *Upper pedestal angle auto-soft-limit* has been added, with a default value of 75-degrees. This parameter should be set “comfortably short” of 90-deg to avoid the singularity in Earth $\leftrightarrow$ Pedestal coordinate transformations that occurs for all EL-Over-AZ antenna mounts. This soft limit will automatically override the default limit from the *Axis Elevation* command whenever INU stabilization is running.
2. The RVP8’s built-in sector blanking now can work with pedestal AZ/EL angles as well as with Earth AZ/EL angles. For stationary radar platforms the two coordinate systems are identical; but for moving platforms it is often desirable to blank the transmitter both for ship-based obstacles (pedestal coords) and for land-based obstacles (Earth coords).
3. Significant improvements have been made in the Dual-PRF and Angle-Sync algorithms located in *rvp8main/open/rtctrl.c*. By using timer driven trigger bank changes directly on the RVP8/Rx card (See New Feature #4. in RDA 8.06.2 notes), complex triggers now can be synthesized precisely and without regard to variations in interrupt latency on the Linux PC.

For example, here are **dsp**x stats for some angle synchronized BATCH data taken at 20 deg/sec consisting of four 4ms pulses followed by a varying number of 1ms pulses to fill each 1-degree interval. The time per ray is very stable at 50ms  $\pm$  1ms, which is about as good as one could do at synchronizing this particular waveform.

	AZ-Interval	EL-Interval	Samp	T(ms)
	-----	-----	-----	-----
0	245.47:246.51	0.00: 0.00	39	50.0
-1	244.52:245.47	0.00: 0.00	39	50.0
-2	243.48:244.52	0.00: 0.00	39	50.0
-3	242.52:243.48	0.00: 0.00	39	50.0
-4	241.51:242.52	0.00: 0.00	39	50.0
-5	240.50:241.51	0.00: 0.00	39	50.0
-6	239.53:240.50	0.00: 0.00	39	50.0
-7	238.46:239.53	0.00: 0.00	40	51.0
-8	237.47:238.46	0.00: 0.00	39	50.0
-9	236.46:237.47	0.00: 0.00	39	50.0
-10	235.50:236.46	0.00: 0.00	39	50.0

### Bug Repairs

1. The RCP8 was not powering up properly when running without an I/O-62 PCI card. This bug was introduced in RDA-8.05.10.

2. The sign of the earth/pedestal velocities reported by the RCP8 was negated when an auxiliary antenna with negated elevation angles was selected.
3. Various rounding errors were corrected that could cause the RCP8 position servo to be unstable when switching between the primary and auxiliary antenna.
4. A lockout interaction was repaired between the RVP8 *iqdata* and *rtctrl* threads whenever new trigger banks were queued to change via timer callbacks. The *iqdata* thread would sometimes be delayed by several hundred milliseconds, resulting in loss of incoming data from the RVP8/Rx card.
5. The RVP8/Main *userTriggerOutputs()* routine no longer forces the TBANK\_NORM and TBANK\_BLANK trigger bank selections. Rather, whatever trigger bank had been running prior to the call will simply continue to run (seamlessly) after the new waveform tables have been loaded.
6. Fixed malloc crash in **tsarchive**. This happened when playing files and mouse button 1 is pressed while selecting files.

## RDA 8.06.2 Release Notes (24 Aug 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06.1 dated 17 August 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The RCP8 now supports shipboard stabilization using a SeaPath MRU. The INU NV setup questions are working. The INU related front panel options are active. There is a new “monitor inu” interactive command, as well as INU alternative in the “monitor ang” command. Many of these features are directly ported from the RCP02, and were already documented in the manual. INU orientation information is directly inserted into the ant\_lib database if the “Antenna Angle Source” setup question is set to “Native RVP8”. This means that there are 3 different update rates for control/status, antenna orientation, and platform orientation.
2. The RVP8 spectral plots that are drawn in the **Pr** and **Ps** menus now show the peak power within each of the 500 frequency-axis resolution cells. Previously the average power was being plotted, which meant that very narrow spectral lines computed from very large sample sizes would be underestimated or even missed entirely. With the 72-MHz IFD, for example, a 200µsec IF data sample contains 14400 points. A narrow CW signal would occupy only one of these DFT points, so with the previous averaging scheme its power could be underestimated by as much as  $10\log(500/14400) = 14.6\text{dB}$ .
3. The RVP8 *rtCtrlCBTimer* structure now contains a new element *iTimerError* which is passed into your callback handler to indicate the difference between the actual number of ticks and the desired number of ticks on each call. This information used to be derivable with a little work, but is now contained in this handy field. The error value can be used to compensate for interrupt latency on a previous call by asking for a shorter wait on the next call. Also, the *iTimerWait* field is now an SINT4, and negative return values are ignored.
4. The RVP8’s internal real-time callback API now supports trigger bank changes that will take place at the precise instant that a timer or group of timers expires. Previously, when a callback routine would request new triggers, the timing of those changes would vary according to the latency of each individual Linux interrupt. Although the RVP8 uses Posix real-time scheduling priorities to minimize these latencies, the worst-case delays could not be kept below 20ms on systems busy with disk and network I/O, nor could they be guaranteed consistent from one kernel release to the next. This new API capability addresses one of the last few remaining issues with running a fully real-time RVP8 in a standard out-of-the-box Linux environment.
5. The *iFlags* word in the *rvp8PulseHdr* pulse header structure now contains a bit telling when any given trigger bank has just begun running. The PHDRFLG\_BNKBEGIN bit

will be set in the timeseries header whenever the RVP8 makes a trigger bank transition, regardless of how that transition was requested or whether the bank number actually got changed from before. Thus, these bits form a precise record of the exact times at which real-time Linux code was able to bring about trigger changes.

6. The **rvp8ts\_example** utility now takes a *-TgInfo* flag that causes it to report notable trigger events that are contained in the timeseries headers.
7. The RVP8 GPARM immediate status word #4 now contains a new `GI4S_RXPROTFLT` bit telling when a receiver protection fault has been detected. Presently this bit only applies to the WSR88D environment and signifies that a receiver protect command was issued by the RVP8 but was not matched by a receiver protect response from the radar. The **ascope** utility has been modified to popup this error whenever it occurs, and the fault is also propagated to the RCP8 portion of the WSR88D via `Rcp88d.RxB2B.bit03` in *softplane.conf*.
8. The ant\_lib *AntInsertPosition()* and *AntInsertPosAndVel()* functions now take pedestal angles in addition to the earth relative angles.
9. Because of the different update rates for different ant\_lib data, the *iant\_age()* function is replaced by the functions *iAntAgeSummary()* and *AntGetAges()*. *iAntAgeSummary()* returns the maximum of all applicable ages. Please change your code to use the new functions.

## Bug Repairs

1. The “Arg Spec” data type was not being recorded properly in **ascope**. A 16-bit field was being produced, but it was merely a copy of the “Mag Spec” data. The data format for recorded spectral phase is now 16-bit binary angle, and the format for recorded spectral magnitude is (and always has been) hundredths of decibels.
2. The RVP8 trigger generator would operate with blanked triggers for several milliseconds following reloading of its trigger waveform tables, e.g., when changing major modes or executing the SETPWF opcode. Now, the blanked/normal status is unaffected by table reloads and all trigger patterns remain completely continuous. This bug has been present since day one.
3. The RVP8/Rx and I/O-62 PCI card driver for the Matrix Orbital front panel display was intermittently failing and causing the display to be shutdown along with the diagnostic message *Front panel display has been disabled*. The repair for this was in the FPGA code for those two cards, so they will need to be reflashed after installing this release. This bug has been present since day one.



## RDA 8.06.1 Release Notes (17 Aug 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.06 dated 10 August 2004. 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 is now more flexible in deciding when it will phase lock its Rx (I,Q) data to the burst pulse. The **Mb** setup question:

**PhaseLock to the burst pulse:**

has been replaced with:

**PhaseLock to the burst pulse - 0:No, 1:Yes, 2:Auto:**

The “No” and “Yes” answers behave just like before; but the new “Auto” option tells the RVP8 to phase lock to the burst only when the burst power exceeds the *Minimum power for valid burst pulse* that is defined later in the **Mb** menu. Since it never makes sense to lock to the phase of a non-existent signal, the “Auto” option can be handy for dropping the RVP8 into non-locking mode whenever the burst pulse disappears, e.g., for offline test modes.

There are a few side effects of this change:

- When both BPL\_PHASELOCK\_OFF and BPL\_PHASELOCK\_ON are passed into *dspw\_burstPulseOpts()*, the effect is to choose “Auto” locking mode.
- The *dspExParm* parameter *lBurstPhaseLock* has been renamed *iBurstPhaseLock*, and now takes on the values BPLock\_XXX.

### Bug Repairs

1. The DB\_FLAGS and DB\_FLAGS2 data types were missing from *iDataFromDspIndex()* and *iData2FromDspIndex()*. Those routines convey the data types that are available from the RVP8 (or any SIGMET processor), along with their output order.
2. Coherent IF unwrapping was not working properly in the RVP8 when the **Mb** question *IF increases for an approaching target* was set to “No”. This would show up as zero Doppler targets having non-zero velocity in fully coherent systems in which phase locking to the burst was disabled.
3. The RVP8 “f” and “r” commands would sometimes not properly restore the acquisition clock frequency on 72-MHz IFDs.
4. ReadSocketPacket() and ReadSocketAck() now take timeouts. This means that applications will no longer block forever if **DspExport** locks up.
5. The rtq\_lib now forks the transmitter processes as daemon processes. This means that they cannot hold open things like the RVP8 socket connection.

## RDA 8.06 Release Notes (10 Aug 2004)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform, including primarily the RVP8 and RCP8 products. The last public release was RDA-8.05.10 dated 1 August 2004. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The RCP8 can now accept angle input from A/B/Index (quadrature) shaft encoders using a variety of styles of gearing and indexing. The following setup questions have been added to the "Axis" menu:

```

Angle input signal source: A/B/Index
Number of A/B ticks per Index pulse: 2048
Number of Index pulses per revolution: 6
Proximity sensor approximate angle: 110.0 deg
Reverse direction of A/B quadrature lines: NO
Sample lines from secondary I/O-62: NO

```

The first two questions choose the number of quadrature transitions (ticks) per index pulse and the number of index pulses per revolution. In this example, the encoder unit produces 2048 ticks between each index pulse, and the gearing is such that the encoder spins around six times for each full revolution of the antenna. The index pulses reset the measured angle to zero, or to the closest multiple according to the gear ratio. If the index pulse(s) correspond to nonzero angle(s), then use the standard *Angle offset from true orientation* question to set the offset of the one closest to zero.

An auxiliary proximity sensor must be used to resolve the ambiguity of the index pulses when the number of index pulses per revolution is greater than one. The sensor can be positioned anywhere along the axis and we only need to know its approximate angle. In the above example with 60-deg sectors per index pulse, contacting the proximity sensor at 110-deg will add some multiple of 60-deg to the present angle such that the result lies between 80-deg and 140-deg. To define your sensors, simply assign *sProxSwAZ* and/or *sProxSwEL* status inputs in *softplane.conf*.

There are fixed I/O-62 pin assignments for the angle encoder inputs:

<u>Signal</u>	<u>I/O-62 Pin(s)</u>	<u>Backpanel J3</u>
EL Index	5,26	1,14
EL "A"	6,27	2,15
EL "B"	7,28	3,16
AZ Index	8,29	4,17
AZ "A"	9,30	5,18
AZ "B"	10,31	6,19

You may choose either TTL or RS-422 electrical levels by assigning these pins as status inputs in *softplane.conf*. Simply assign them to some unused *sAux[]* lines, which also has the advantage that the inputs can be monitored in logic equations for debugging.

Note that for test purposes, a simple pair of quadrature signals toggling at 2Hz can be created using the RCP8 itself:

```
EQ00: t1_single_1 = t0_clock_1 & !t2_single_1
EQ01: t2_single_1 = (!t0_clock_1) & t1_single_1
```

2. The RVP8 GPARM representation of the measured “I” and “Q” DC offsets now uses packed High-SNR format rather than a simple signed integer. This permits the full dynamic range of offset levels to be accurately expressed. To maintain compatibility with the legacy representation, Bit-9 of GPARM Word-59 tells when the High-SNR format is being used. Application code should no longer reference *i\_nse* and *q\_nse* directly in *struct gparm*, but rather, use *fGetNoiseLevelDC()* to extract the DC levels. A trailing underscore has been added to those two element names in order to produce automatic compile-time errors if the old fields are referenced.
3. Related to #2., the *gparm* command within *dsp -nochat* now displays the “I” and “Q” DC offsets and standard deviations on a -1 to +1 scale rather than -128 to +128. The printed values also include seven decimal digits so that the full precision can be seen.
4. The constants FMAXPRF and FMINPRF have been removed from *rvp8.h*, and replaced by DSP\_RVP8\_MINPRF and DSP\_RVP8\_MAXPRF defined in *dsp.h*.
5. The *dsp -nochat* utility now handles end-of-file on its input stream more gracefully. This makes it easier to pipe a preformatted list of commands, opcodes and arguments directly into the signal processor.
6. During timeseries playback the RVP8 generally will not attempt to produce output rays when certain critical processing parameters do not match those of the playback data in the timeseries API. The new *dspw\_playbackTSOpts()* DSP driver routine gives finer control over how those decisions are made by allowing a mask of *MMTS\_xxx* bits that specify which mismatch criteria to ignore.
7. A new PROC header option *DSP\_HDR\_MMTS* has been added to output a bitmask of *MMTS\_xxx* bits that are mismatched between the RVP8 and the timeseries API. These are the raw mismatch bits themselves, and are not affected by the “ignore mask” defined in New Feature #6.

## Bug Repairs

1. A pipelining error on the new 72MHz Rx/IFD was causing the burst pulse sample to be incorrectly positioned in range relative to what was shown in the **Pb** menu. Moreover, because the phase unwrapping computations would then be incorrect, stationary targets would sometimes be seen as moving. Many thanks to the ORDA team for their help in uncovering this bug.
2. If burst pulse tracking was enabled in the **Mb** menu, allowed to run for a while, and then disabled in that same menu, the time offset that was computed while it was running would continue to be applied to the triggers.
3. In the RCP8 setup menus, string replies beginning with the letters 'U' or 'Q' could not be typed because they would be misinterpreted as the single-character “Up” or “Quit” special commands.

4. The “\*” command to measure noise levels from the *RVP8*> prompt has been removed. It was not working correctly, and could not easily be made to work correctly.
5. Repairs and improvements were made in the *RVP8* generation of triggers whose timing depends on the PRT of each individual pulse. We have abandoned the notion of having such triggers depend on the period of the previous pulse. The problem is that the *RVP8* can switch trigger banks and waveforms in response to many types of events, so it is almost impossible to know for sure what the previous PRT will wind up being for each and every pulse. Instead, each PRT-dependent pulse now just takes care of itself. Please retype the PRT multiplier (–1.0 to +1.0) into the **Mt<n>** menu for any trigger line of this sort.