

## **RDA 8.10.10 Release Notes (28 Oct 2006)**

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.9 dated 19 October 2006. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### **Bug Repairs**

1. A CPI pipelining bug was introduced in the 8.10.9 release, causing the RVP8 to output an incorrect first two PROC rays when the 3x3 filter was disabled.
2. Licenses generated for HydroClass in the RVP8 were missing the line of text describing the feature. The licenses did still work.

### **New Features**

1. The nexrad DCU interface in the RCP8 now can support either 13-bit or 14-bit angles. Selection is made in the “site custom” command.

## RDA 8.10.9 Release Notes (19 Oct 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.8 dated 20 September 2006. 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 pulse headers now contain complete INU and pedestal angle information for radar systems that are on moving platforms. These data are stored with every acquired pulse during timeseries archiving, and are also available for each PROC output ray via a new DSP\_HDR\_AUXANG flag.
2. A change was made to typedef `getAzElPosBtime_f` as a result of New Feature 1. The function now includes an optional auxiliary angle return argument which should be filled in whenever a) the pointer is not NULL, and b) the extra shipboard and pedestal information is indeed known.
3. The GM->iPPrms internal parameter list variable is now setup according to the first PROC command by the time that the `initProcMode()` routines are invoked.
4. When a processing mode error (GLS\_PMODERR) is detected the RVP8 will now signal some informative text giving a clue as to what went wrong. This is helpful because there are many possible sources for this single error.
5. The RCP8 now supports a new angle input method called "Custom", in which a custom RCP8 thread interacts with some external hardware to read antenna position and velocity. These data are then input to the standard RCP8 motion servos to produce a desired motor drive which is subsequently available for that same thread to output. The new variables in the `rcp8_aestatus` structure to support this are `iCustomPos`, `iCustomTach`, and `iDriveFinalOut`. There is also some example code in *open/canbus\_main.c* to show how these variables might be used.

### Bug Repairs

1. In some cases the RVP8 would not output any data at all when the GLS\_PMODERR error bit was set.

## **RDA 8.10.8 Release Notes (20 Sep 2006)**

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.7 dated 11 August 2006. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### **New Features**

1. Licensing for DualPol and HCLASS features is now implemented in the RVP8. If you request any of these parameters but do not have the corresponding license, then a zero array will be output and the GLS\_NOLICENSE bit will be set (causing ASCOPE and IRIS to issue a popup error message).

### **Bug Repairs**

1. The 3x3 speckle filter (introduced in RDA-8.10.7) was not working properly when the PROC command requested archive format (4-byte packed) output data. The four output parameters would all be zeroed.
2. The HCLASS parameter was not being output properly following any missing CPI.

## RDA 8.10.7 Release Notes (11 Aug 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.6 dated 30 June 2006. If you are upgrading from an earlier version please also read the release notes that have been published since then.

### New Features

1. The two-dimensional speckle filter is now fully implemented in the RVP8. This filter, described in Section 5.4.3, operates on a 3x3 cell centered on each output point by including data from two adjacent rays and two adjacent ranges. The eight surrounding neighbors are used to decide whether to keep isolated points (speckle removal), and whether to create new points by interpolation (gap filling). In the latter case the RVP8 offers an improvement over earlier processors when 8-Bit Velocity data are interpolated. New velocity values are computed properly as the vector average of all valid neighbors.
2. When range normalization is turned off, the RVP8 can now output dBZ and dBT in decibels of power relative to noise (P/N), in addition to the traditional signal-to-noise ratio (P-N)/N. The SOPRM command contains a new ZNS bit to control this feature, which should be input to the DSP driver via `dspw_options()`.
3. The RVP8 now supports an angle synchronization table that contains up to 4096 points. Previously this limit had been 1024. The `dspw_syn_table()` driver call will return DSP\_BIGSYNCTABLE error status if an attempt is made to write a longer table into an older processor.
4. RVP8 angle sync'ing can now work in two different modes.
  - The traditional “dynamic” sync algorithm that has been used for years is still available. In this mode each ray ends at a sync angle boundary and the number of pulses contained in the ray is fixed by the SOPRM sample size. Thus, the angular width of successive rays will change in order to keep the sample size constant.
  - A resurrected/improved form of the “static” algorithm that existed in very old processors, wherein the angular width of each ray matches the resolution of the sync angle table, and the number of pulses is allowed to vary. In this case the SOPRM sample size is reinterpreted as an upper bound on the number of pulses that will be present in each ray.

Up until now the RVP8 has always ignored the “Dyn” bit of the LSYNC opcode because dynamic sync'ing was the only algorithm available. However, that bit is now activated and *must be set* in order to get the same behavior as before. IRIS software will continue to work properly as long as dynamic angle sync'ing was previously selected in the **setup** utility.

5. The **speed** utility can now specify the type of angle sync'ing as “-angsyn d” (dynamic) or “-angsyn s” (static). If no letter is specified then dynamic sync is used as before.
6. Two new timeseries calibration numbers have been added to the `rvp8PulseInfo` structure. `fGdrOffset` is the ratio of the total gains (transmit plus receive) of the two co-receive

channels, and is derived from the `zdr_offset` parameter of the `SOPRM` command. `fXdrOffset` is the ratio of the receiver gains in a dual receiver system. This value is derived from `SOPRM ldr_offset` and is not required for the STAR or Alternating Single-Channel polarization modes.

7. The Melting-Layer-Height setup parameter is now accessible via the **Mp** menu.
8. The DPT2 (Dual-PRT Type-2) processing mode has been ported into the RVP8. In this mode the PRT varies from pulse to pulse according to the requested unfolding ratio, and unfolded velocities are computed directly from each individual CPI of pulses. This new code is available both for operational users as well as for code developers as a jumping off point for writing similar multi-PRT algorithms of their own.
9. The **Pr** and **Pb** plotting commands now have the option of writing their IF samples to a log file (*rvp8-pr.log* and *rvp8-pb.log*) in the `$IRIS_LOG` directory. Use the `'>'` and `'<'` keys to turn logging On/Off in order to append the data that are currently being viewed. The IF data are sampled, plotted and logged approximately five times per second in both the **Pr** and **Pb** plots, but the **Pr** command samples and records *nAvg* (the plot averaging factor) pulses spaced only a few milliseconds apart. Set *nAvg* to 1 if you want regularly spaced log file entries at 5Hz, or set it larger to get 5Hz clusters of pulses that are more closely grouped in time.

Each pulse of IF data is written to a single line of the log file using NAME=VALUE fields:

```
DATE=09-AUG-2006 TIME=14:18:18.836 AZ=46.20 EL=5.01 NSAMPS=360 SAMPS=319,-5012,...
```

Each field is separated by a *space* character, and the IF samples themselves are given as a comma-separated list of signed integers representing the original 16-bit A/D values.

## Bug Repairs

1. The RVP8 allows up to sixteen pulsewidths to be configured in its **Mt** menu. However, the upper twelve of these (#4–15) were not working properly such that PROC command output data would always be zeroed and the `MMTS_PWIDTH` (pulse width mismatch) bit would be set in the extended GPARAM. Also, GPARAM word #26 was only reporting the low two bits of the 4-bit pulsewidth selection.
2. Two fairly serious bugs were repaired related to burst pulse tracking.
  - The tracking offset would often make an abrupt hop when changing pulsewidths via the `SETPWF` command. The hop could sometimes be so large that the burst pulse would be entirely missing (outside of its window) afterward.
  - The tracking algorithm was not starting up automatically after booting the RVP8. It would only run after the TTY setup menu had been entered and exited.

## RDA 8.10.6 Release Notes (30 Jun 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.5 dated 30 May 2006. 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'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 **axis** menu:

```

Multiplicative angle scale factor:      1.0000
Angle offset from true orientation:    0.00 deg

```

The scale factor being exactly unity indicates 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 subtract 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:

```

Multiplicative angle scale factor:      0.2500
Angle offset prior to multiplication:  175.00 deg
Angle offset following multiplication:  -40.00 deg

```

The process of converting a measured angle to an actual angle is as follows. The *PRE* offset is first subtracted from 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 subtracted 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:

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

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. Also note that the signs of *PRE* and *POST* are opposite that of the RVP8 which has a similar angle adjustment feature.

2. The RCP8 now supports the Applied Systems transmitter model #377 as well as the older #177. The model number is selected in the **site custom** menu. The #377 status record contains one additional 4-byte string of analog information, and is 23 bytes long rather than 19. The associated Q-BITE record from the RCP8 therefore contains an additional

2-byte encoding of this value, making its Q-BITE length 11 rather than 9 bytes. All other control and status records are the same in both models.

3. The pulse-interference filter from the RVP7 has now been ported to the RVP8. The filter is documented in Section 5.1.5 of the RVP8 User's Manual, and is configured in the **Mp** menu as follows:

```
RVP8> mp
Processing Options
-----
Interference Filter - 0:None, Alg.1, Alg.2, Alg.3: 3
Threshold parameter C1: 10.00 dB
Threshold parameter C2: 12.00 dB
```

Several legacy algorithms are supported, but the only one that should be used for real operations is #3. The default 10dB and 12dB tuning parameters are a reasonable first guess, but these can be tuned to match the interference that is actually encountered at each site, i.e., to minimize the false alarm rate and maximize the removal rate.

4. An additional argument has been added to the typedef of `rawPulseCorrections_f` giving a read only history of the (I,Q) data that were contained in prior pulses. You may simply ignore this argument if you don't need it.

## RDA 8.10.5 Release Notes (30 May 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.4 dated 8 May 2006. 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 motors that expect unipolar analog drive in conjunction with a separate bit telling which direction to turn. Use the new setup question in the **axis** menu:

**Drive is normal(0), or always Neg(-1)/Pos(1): 0**

to choose whether the drive motors behave normally (sign of the drive voltage determines the direction of rotation), or require a drive that is always negative or always positive. In the latter cases the logic status variables **sPosDriveAZ** and **sPosDriveEL** will appear on each axis to indicate what the actual direction of drive is supposed to be. These bits can be routed to the backpanel via logic equations (assign to a “C” variable) and the *softplane.conf* file (map that “C” variable into an output pin).

2. The user-modifiable code located in the *site* portions of the RVP8 has been rearranged to make it easier to add new features and to incrementally modify existing major modes.
  - All of the routines that can be modified now reside in the *mt\_user.c* and *ct\_user.c* source files. Previously, the startup and shutdown hooks were located elsewhere.
  - The major mode exit handlers can now be stacked so that they will be called in reverse order upon exit. Use the two new routines *mtPushExitMajorMode()* and *ctPushExitMajorMode()* to add additional features to existing modes in a flexible manner.
  - A new demonstration file *rda/rvp8proc/site/demohclass.c* has been written to show the complete flow required to add an additional parameter (Hydrometeor Classification) to the RVP8. The demo code is extensively commented so that you can use it as a template for adding new parameters to existing major modes.
3. Melting height (in meters relative to the radar) has been added to the extended SOPRM opcode and can be specified using the new DSP driver *dspw\_meteorParams()* entry point.

### Setup Changes

1. We added a setup question to enable the HydroClass output in the RVP8 on dual pol systems only. Run **setup** on the RVP8, push the RVP button. In the box labelled “Optional Data Parameters” there is a new button “HydroClass (HClass)”, just before the SQI question.



## RDA 8.10.4 Release Notes (8 May 2006)

No significant changes since 8.10.3

## RDA 8.10.3 Release Notes (13 Apr 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.2 dated 29 March 2006. If you are upgrading from an earlier version please also read the release notes that have been published since then.



**Note: This was an internal release for inhouse production only.**

### New Features

1. The RVP8 can now operate with a different intermediate frequency for each pulsewidth. Previously a single IF selection was applied system-wide. Use the **Mt<n>** menus to set the IF separately for each pulsewidth, or you may continue to choose a common IF via the **Mb** menu, e.g.,

```
RVP8> mb
Burst Pulse and AFC
```

```
-----
Tx/Rx Intermediate Frequency: Various (58.0000 to 62.0000 MHz) 60
Tx/Rx Intermediate Frequency: 60.0000 MHz
```

2. The dual-frequency receiver option has been removed from the RVP8. This mode was inherited from the RVP7 wherein frequency multiplexing was the only way the hardware could handle more than one receive channel. Dual-IF systems require two STALOs, two different IF filters, etc., and are expensive and fussy to setup and maintain. The RVP8 offers much better solutions either by using two IFDs or a single IFD with two IF inputs.

### Bug Repairs

1. A sample timing error has been repaired on the Rev.E/F/G RVP8/IFD that would cause occasional bad samples from the secondary IF-Input channel. The primary IF-Input and Burst-Input channels were not affected, hence this bug is only of concern to customers running dual-Pol or wide-dynamic-range IFD modes.
2. An intermittent problem has been repaired on the RVP8/Rx Rev.C card in which the board would sometimes lose its serial and revision numbers following a reset. This was discovered during production burn-in tests, and should not affect any operational sites.

## RDA 8.10.2 Release Notes (29 Mar 2006)

These release notes cover changes made to the SIGMET Radar Data Acquisition platform. The last public release was RDA-8.10.1 dated 19 January 2006. 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 lines on the RVP8/Rx card can now optionally be inverted. The **Mc** menu now chooses not only the type of signal present on each line, but also its polarity.
2. The RVP8 now accepts a 1-pulse-per-second RS-422 signal from a GPS time source. It serves to indicate the precise instant that a given fractional seconds offset (usually zero) occurs. Use the **Mc** menu to enable this feature on Pin-3 of the RVP8/Rx 9-pin "D" connector, and also to choose the rising/falling edge and optional nonzero fractional seconds offset. A new bit was added to the GPARM Immediate Status #4 word telling when the GPS 1pps clock input is missing or out of tolerance.
3. The RVP8 timeseries pulse headers hold the UTC time of each pulse with nanosecond resolution (previously only millisecond resolution was available). When combined with the GPS 1pps feature, the absolute time of every transmitted pulse is now recorded to within approximately 50ns. Even without the GPS input, the Linux-only time keeping has been improved so that pulses are tagged with UTC times that are within 0.05ms of the Linux clock. This gives much better out-of-the-box time tags whose accuracy is largely determined by NTP time syncing.
4. When the RVP8 is configured to use the GPS 1pps clock you also have the option to generate radar triggers that are synchronous with 1-second intervals of absolute time. This allows two RVP8s that are located anywhere on Earth to fire their triggers in sync with each other. One constraint when using this feature is that the PRF in Hertz must be an integer that divides half the 72MHz IFD reference clock. The table below shows the valid PRFs that can be synthesized using absolute time.

50	60	64	72	75	80	90	96	100	120	125	<i>128</i>	144	150	160	180	192	200
225	240	250	<i>256</i>	288	300	320	360	375	<i>384</i>	400	450	480	500	576	600		
625	<i>640</i>	720	750	<i>768</i>	800	900	960	1000	1125	<i>1152</i>	1200	1250	<i>1280</i>	1440			
1500	1600	1800	1875	<i>1920</i>	2000	2250	<i>2304</i>	2400	2500	2880	3000	3125					
<i>3200</i>	3600	3750	<i>3840</i>	4000	4500	4800	5000	5625	<i>5760</i>	6000	6250	<i>6400</i>					
7200	7500	8000	9000	9375	<i>9600</i>	10000	11250	<i>11520</i>	12000	12500	14400						
15000	15625	<i>16000</i>	18000	18750	<i>19200</i>	20000											

The PRFs in italics are not available when your system includes a RVP8/Tx card that is synthesizing a pulsed transmit waveform (because of additional timing constraints with the Tx card). Absolute time sync'd triggers are enabled from the **Mc** menu, following the questions that setup the GPS 1pps electrical signal.

5. An external H/V (Horizontal/Vertical) polarization status flag can now be input to the RVP8/Rx card. Use the **Mc** menu to configure RS-422 differential input pins 2&7 to receive this signal (logic high corresponds to vertical polarization). The H/V flag will appear in Bit-0 of the `iPolarBits` element of each pulse of timeseries data.

6. Bit #4 of the GPARM latched status word will now be set whenever there is an error in polarization control and/or polarization status input. The flag is also signaled in **ascope** and **iris**. When the transmit polarization is fixed H or V, then this GLS\_POLERROR bit will be set if the H/V input flag does not match. During alternating polarization the error is set if the H/V flag is not alternating from pulse to pulse. No errors are flagged during simultaneous H+V mode.
7. The DSP Driver `dspw_prf( )` routine will now set the PRF much more accurately than before. Previously the period was quantized to 166ns based on the traditional SETPWF opcode, but the 1ns extended form is now used whenever the DSP hardware supports it.

## Bug Repairs

1. Repaired the **tsimport** utility to recover from a missing UDP packet. It will now drop the entire pulse which has a missing packet. The logging on the terminal is significantly improved. It now includes the time of each message. It now will correctly if the last packet of a ray is missing. It will also now log an entire missing ray with debug turned off. The double newlines are removed from the log.
2. The diagnostics for the IO62CP backpanel did not work properly when 220K resistors were installed in the S1/S2 slots.
3. Recursive calls to the RVP8 opcode interpreter from within a free-running PROC cmd would see a spurious XARG still dangling from the original PROC.
4. The RVP8 minimum prototype Rx filter bandwidth has been reduced from 50KHz to 5KHz to accommodate very long conventional (not compressed) pulses.
5. The three ORDA output control lines `PULSE_RATE_INT[ 2 . . 0 ]` are set according to the nominal PRF from the most recent SETPWF command. Previously these lines were not being controlled by the RVP8.

## RDA 8.10.1 Release Notes (19 Jan 2006)

### New Features

1. The `sig_microSleep( )` function now gives much more unified behavior across different platforms and different versions of operating systems. Also, the new function `sig_periodicSleep( )` is available for non-drifting wakeup applications.

## RDA-8.10 Release Notes (11 Dec 2005)

No significant changes since 8.09.12.