

# Inside SeaSonde

## SeaSonde Diagnostic Files

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The main purpose of this chapter is to cover in detail the files that begin with “**STAT\_**” located in “/Codar/SeaSonde/Data/Diagnostics”. These files provide many diagnostics for the SeaSonde.

There are currently two different types produced. The files ending in “.rdt” are radial processing diagnostics produced by the **SpectraToRadial** and the **RadialDiagnostics** tool. They cover, over time, information about the cross spectra and radial results.

The files ending in “.hdt” are produced by **SeaSondeController** and cover over time information about the receiver and transmitter; information like temperature, voltage supplies, GPS, transmit power and so on...

The STAT\_ files are based on the CTF (Codar Table File) format. Their filenames are of the form STAT\_XXXX\_YYYY\_MM\_DD.EXT where XXXX is the radial site code, yyyy is the year, mm is the month, and dd is the day. The .EXT will be .rdt for radial diagnostic text or .hdt for hardware diagnostic text. The processing tools are hard coded to create new STAT\_ files weekly on Sundays.

To plot more than one week of both .rdt and .hdt files simultaneously in DiagDisplay, select the STAT\_ files you want in the Finder (use shift and/or command key to help) and drag the multiple selection to DiagDisplay. Note, if you try to plot a year's worth or more, you will need a very fast machine or a lot of patience.

Note, that RadialArchiver tool 10.2.0 or later during radial processing will copy portions of these files (entries that cover the radial's time coverage) as extra tables in the radial LLUV output files. (A future version of DiagDisplay will be able to plot this data from the LLUV radials).

Also planned is to have SeaSondeController record current receiver settings into the .hdt file so that they can be tracked on a weekly basis.

## Receiver Hardware Diagnostic Files:

Contents of Hardware Diagnostic Text. (“.hdt”)

The files are identified by their content of the %FileType: key.

The key %FileType: <type> <subtype> must have a <type> of **DIAG** and a subtype of **rcvr**.

The table data time starts from the files %TimeStamp: key.

The %TableType: <type> <subtype> must have a <type> of <rcvr>, while the <subtype> 'rcv1' describes the current table column output and will change in the future as more columns are added or inserted. The best way to read this files is to use the %TableColumnType: key, which contain a list of four character codes describing each column. The %TableColumnType: key for the '%TableType: rcvr rcv1' output is:

```
%TableColumnTypes: TIME RTMP MTMP XTRP RUNT SP24 SP05 SN05  
SP12 XPHT XAHT XAFW XARW XP28 XP05 GRMD GDMD PLLL TYRS TMON  
TDAY THRS TMIN TSEC
```

The column character codes can be decoded as:

TIME	Recorded time of the data row in <i>minutes</i> from the %TimeStamp:
RTMP	Receiver front panel board temperature.
MTMP	Receiver AWGIII model temperature.
XTRP	Hexidecimal code for TransmitWatch tripped settings.
RUNT	Receiver runtime since it was last powered or the AWG module restarted.
SP24	External supply voltage for DC powered receivers.
SP05	+5VDC supply voltage on the receiver front panel board.
SN05	-5VDC supply voltage on the receiver front panel board.
SP12	+12VDC supply voltage on the receiver front panel board.
XPHT	Temperature on the transmitter front panel board.
XAHT	Temperature on the transmitter amplifier.
XAFW	Measure forward power inside the Transmitter
XARW	Measure reflected power inside the Transmitter
XP28	+28VDC supply voltage on the transmitter front panel board.
XP05	+5VDC supply voltage on the transmitter front panel board.
GRMD	Receiver GPS receive mode.
GDSP	Receiver GPS discipline mode.
PLLL	Number of times the receiver PLL was found to lose lock to the GPS Timing
TYRS	Year of measurement date.
TMOS	Month of measurement date.
TDAY	Day of measurement date.
THRS	Hour of measurement date.
TMIN	Minute of measurement date.
TSEC	Second of measurement date.

In the future there will also be these column types:

IAMP	DC Receiver supply current draw. (since Mar 2005)
RHUM	Receiver front panel PCPD humidity sensor.

Which measurements contain valid data will depend on the Receiver and Transmitter version you have.

AWGII Receivers will only have RTMP, RUNT valid measurements.

AWGIII Receivers with an older PCUSB Front Panel board will have RTMP, MTMP, & RUNT. XTRP is available on later firmware versions. GRMP, GDSP, PLLL are available only if a GPS and PLL are installed.

AWGIII Receivers with the PCPD (newer) Front Panel board will have RTMP, MTMP, RUNT, SP05, SN05, & SP12. GRMP, GDSP, PLLL are available only if a GPS and PLL are installed. SP24 is not zero only on DC Receivers (instead of 120/240V AC).

On newer Transmitters with 3 front panel lights and using a AWGIII Receiver, XPHT, XAFW, XARW, XP28, & XP05 are valid. XAHT is only available on transmitters built on or after July 2004.

## Details of each measurement:

**TIME** – The time from the diagnostics time stamp at which the values were saved. Each row in the file is the maximum or minimum (whatever's worse) detected value from SeaSondeController for each status update over the diagnostic output interval. In SeaSondeController, you can change this using the watchdog special control.

**RTMP** – This temperature sensor sits on the Front Panel board on both PCPD and PCUSB versions. It has 2°C accuracy. It is a good measurement of the general temperature of the receiver chassis. The current value can be found reading the 'HRPT' command response line 'RHOT:' in SeaSondeController.

**MTMP** – This temperature sensor is on the AWGIII board. It has 2°C accuracy. It will typically read 6 to 10°C higher than RTMP due to the power draw of the module. A higher delta than 10°C over RTMP may indicate that receiver chassis is unable to cool itself maybe because its cool fan has failed or the room temperature is too high. The current value can be found reading the 'HRPT' command response line 'AHOT:' in SeaSondeController.

**XTRP** – Is the Receiver's transmit-watch tripped settings. If this value is not '00' then drive to the transmitter was turned partially or entirely off during the diagnostic measurement. This value is hexi-decimal that combines all the possibly tripped settings. This report value is for Receivers with AWGIII modules. The GPS settings apply only to Receivers with GPS Timing. The bit values for the trip settings are:

+01 GPS is not ready. To be ready it must be in the Normal Discipline Mode, with no major alarms set, with minor alarms not set (VCONearLimit, AntennaOpen, Satallite Tracking, Disciplining, Position Valid)

+02 Receiver Chassis temperature exceeds the watch temperature value.

+04 SeaSondeController has not yet asked for status. (This is for the receiver to not start transmitting until the computer talks to the receiver. If the computer does not start up, then the receiver will not transmit with this watch set. It is hard to ever see this tripped value since SeaSondeController always start by getting the status first.)

+08 The PLL (Phase Lock Loop oscillator) was detected to have lost lock. (When running GPS timing it is important that the PLL locks up to the GPS reference clock.)

+10 The GPS Synchronization (Major Timing Alignment) was tripped. (For GPS Timing this stays tripped until the next GPS sync monitoring detects that no more alignments are needed.)

+80 The transmit watch is set to turn of transmit drive. This will be tripped until the transmit watch setting for this is turned off.

**RUNT** – Is the run time counter of the receiver's main controller module the AWG. Everytime the AWG module starts up due to power on or reset command or SP05 drops below 4.7V this value is reset to zero. It is in seconds but is not highly accurate (currently is about 5sec fast out of 10minutes). As long as the AWG module is running it will increment until it reaches 1628 days at which it will wrap back to zero. The current value can be found reading the STAT response or HRPT 'TIME:' response in SeaSondeController.

**SP24** – Will read non-zero only for DC supplied receivers. Most receivers are 120/240V AC supplied. This value is measured on the Front Panel board. It should read between 22 and 30V. When it drops below 22V, the Front Panel board will shutdown all other modules in the receiver, which will make it unavailable to the computer. The current value can be found reading the PRPT response 'SP24:' line in SeaSondeController.

**SP05** – Is the +5VDC supply reading in the receiver. If below +4.7V, you will not be able to read it as the AWGIII receiver will be in a reset condition; therefore, unavailable to the computer. This value is measured on the Front Panel board. The current value can be found reading the PRPT response 'SP05:' line in

SeaSondeController.

**SN05** – Is the –5VDC supply reading in the receiver. If low, the receiver may partly function but it won't be able to receive and valid data in SeaSondeAcquisition. This value is measured on the Front Panel board. The current value can be found reading the PRPT response 'SN05:' line in SeaSondeController.

**SP12** – Is the +12VDC supply reading in the receiver. If low, the receiver may partly function, but won't be able to generate good RF output, power the CrossLoop antennas and read any valid data with SeaSondeAcquisition.

**XPHT** – This temperature sensor sits on the Transmitter Front Panel board. It has 2°C accuracy. It is a good measurement of the general temperature of the Transmitter chassis. The current value can be found reading the 'XRPT' command response line 'XPHT:' in SeaSondeController.

[If the transmitter does not have the capability or is disconnected from the receiver, the XRPT command will give a failure response of 'Unable to Get Trasmmitter Chassis'.]

**XAHT** – This temperature sensor sits on the Transmitter Amplifier module near the RF Input connector. It is measured by the Front Panel board. It has 2°C accuracy. It is a good measurement of the temperature of the Transmitter Amplifier. If it is more than 10°C greater than XAHT, the amplifier may have a problem or the Transmitter is not being kept in a cool room/area. The current value can be found reading the 'XRPT' command response line 'XAHT:' in SeaSondeController. Note: This sensor is unavailable for transmitters built before July 2004.

**XAFW** – Is the measured forward power of the Transmitter RF output. The sensor is in a coupler device connected after the Amplifier and before the RF output. It converts the RF output to an averaged output voltage, which is measured by the Front Panel board and is converted to Watts by a lookup table in the AWGIII firmware. The current value can be found reading the 'XRPT' command response line 'XAFW:' in SeaSondeController. [AWGIII has different lookup tables for 5/12/25MHz and different coupler designs which are identified by the Front Panel board's firmware ID (This can be found, with the 'XFPV:' response to the 'XRPT' command in SeaSondeController.)]

**XARW** – Is the measured reflected power of the Transmitter RF output. The sensor is in the same coupler device as the XAFW. The coupler is actually symmetrical so that the RF ports could be swapped causing XARW and XAFW to be swapped. The current value can be found reading the 'XRPT' command response line 'XARW:' in SeaSondeController.

A low XAFW and low XAFR may mean the amplifier is not functioning.  
A low XAFW and a high XAFR may mean that the transmitter antenna is not connected or has a bad connection or antenna element. To prevent damage to the amplifier, the transmit drive should be turned off as soon as possible until this is corrected. The transmit drive can be turned off by setting 30db Atten and Xmit Off in SeaSondeController or by turning off/unplugging the Transmitter.

**XP28** – Is the +28VDC supply reading in the transmitter. (For DC Transmitters this is the DC supply voltage from the DC Receiver; it will typically be slightly lower than the Receiver's SP24 measurement due to small resistance in the wiring from the receiver to the transmitter.) It is measured by the Front Panel board. The current value can be found reading the 'XRPT' command response line 'XP28:' in SeaSondeController.

**XP05** – Is the +5VDC supply on the Transmitter Front Panel board. It is a DC2DC supply which converts the +28VDC to +5V to run the Front Panel board. The current value can be found reading the 'XRPT' command response line 'XP05:' in SeaSondeController.

**GRMD** – Is the Receiver GPS module receive mode. This tells how well the GPS can determine position and time. When it is working at its best the mode will be 7. The current setting can be determined in the SeaSondeController GPS special window.

The modes are:

Automatic 2D/3D

Single Satellite (Time Only)

–

Horizontal 2D

Full Position 3D

DGPR Reference

Clock Hold 2D

Overdetermined Clock

**GDSP** – Is the Receiver GPS module discipline mode (Accurate 1sec clock output) When it is working at its best the mode will be 0. The current setting can be determined in the SeaSondeController GPS special window.

The modes are:

Normal

Power Up

Auto Holdover

Recovery

Fast Recovery

-

Disabled

**PLLL** – Is the number of times the receiver AWGIII module found its PLL(Phase Locked Loop oscillator) to be unlocked during the diagnostic measurement time. With each status refresh, the AWGIII module monitors to see if the PLL ever lost lock since last check. If this number is continuously not zero, then there may be a problem with the PLL or GPS. When this is continuously unlocked, the receiver timing will be unable to sync to the GPS timing which will cause the receiver to receiver to continuously try to sync back up which will also cause SeaSondeAcquisition to lose its data sync.

## Radial Processing Diagnostic Files:

Contents of Radial Diagnostic Text. (“*.rdt*”)

The files are identified by their content of the %FileType: key.

The key %FileType: <type> <subtype> must have a <type> of **DIAG** and a subtype of **rads**.

The table data time starts from the files %TimeStamp: key.

The %TableType: <type> <subtype> must have a <type> of **rads** while the <subtype> **rad1** describes the current table column output and will change in the future as more columns are added or inserted. The best way to read this files is to use the %TableColumnType: key, which contain a list of four character codes describing each column. The %TableColumnType: key for the ‘%TableType: rads rad1’ output is:

```
%TableColumnTypes: TIME AMP1 AMP2 PH13 PH23 CPH1 CPH2 SNF1
SNF2 SNF3 SSN1 SSN2 SSN3 DGRC DOPV DDAP RADV RAPR RARC RADR
RMCV RACV RABA RTYP STYP TYRS TMON TDAY THRS TMIN TSEC
```

Each row in this file is the processing of a CSS into a short time radial or merging of short-time radials into final output radial. (also possibly a CSA into a radial).

The column character codes can be decoded as:

TIME	Recorded time of the data row in <i>seconds</i> from the %TimeStamp:
AMP1	Calculated antenna amplitude correction for loop1 to monopole.
AMP2	Calculated antenna amplitude correction for loop2 to monopole.
PH13	Calculated antenna phase correction for loop1 to monopole.
PH23	Calculated antenna phase correction for loop2 to monopole.
CPH1	Used antenna phase correction for loop1 to monopole.

CPH2	Used antenna phase correction for loop2 to monopole.
SNF1	Cross spectra Noise floor of loop1.
SNF2	Cross spectra Noise floor of loop2.
SNF3	Cross spectra Noise floor of monopole.
SSN1	Cross spectra Signal to Noise of loop1.
SSN2	Cross spectra Signal to Noise of loop2.
SSN3	Cross spectra Signal to Noise of monopole.
DGRC	Cross spectra range cell which had the highest SSN3 for which the noise floor and signal to noise were recorded.
DOPV	The total number of doppler cells in the cross spectra which were acceptable to process into radials. (Within First Order, Noise criteria, ...)
DDAP	The percentage of doppler cells that had dual angle MUSIC solutions
RADV	The total number of radial vectors solutions found at different bearings and ranges.
RAPR	The average number of radial vectors per range cell.
RARC	The number of range cells processed.
RADR	The maximum radial range calculated by where the number of radial vectors drops to below 20% of the average vectors per range.
RMCV	The maximum current velocity found. (This may be a negative number.)
RACV	The averaged absolute velocity. (always positive)
RABA	The averaged bearing of all radial vectors.
RTYP	The type of radial being processed.
STYP	The type of cross spectra being processed.
TYRS	Year of measurement date.
TMOS	Month of measurement date.
TDAY	Day of measurement date.
THRS	Hour of measurement date.
TMIN	Minute of measurement date.
TSEC	Second of measurement date.

## Details of each measurement:

**TIME** - Recorded time of the data row in *seconds* from the %TimeStamp:

**AMP1, AMP2** - Calculated antenna amplitude correction for loop1,2 to monopole. These values are calculated by the SpectraToRadial tool during radial processing. A big jump in the average state over time in one of these may indicate an antenna problem and should be investigated. SpectraToRadial uses

an average of the previous week of these to apply corrections to ideal antenna patterns. If using measured patterns and there is a big jump in the average state of these values over time then your antenna pattern may need to be-measured and also it may indicate an antenna problem and should be investigated.

**PH13, PH23** - Calculated antenna phase correction for loop1, loop2 to monopole. These values are calculated by the SpectraToRadial tool during radial processing. They should typically be close to the CPH1,CPH2 values being used but there are conditions where they may vary significantly. A big jump in the average state over time in one of these may indicate an antenna problem and should be investigated.

**CPH1, CPH2** - Antenna phase correction for loop1,loop2 used by the SpectraToRadial tool. These typically come from the Phases.txt file.

**SNF1, SNF2, SNF3** - Cross spectra Noise floor of loop1,loop2,monopole. These are calculated by averaging the noise levels (lack of signal) in each range cell. The values recorded here are for the range cell with the maximum signal to noise (see DGRC). These values are calculated by the SpectraToRadial tool during radial processing.

**SSN1, SSN2, SSN3** - Cross spectra Signal to Noise of loop1,loop2, and monopole. These are calculated by finding a peak signal at a single range cell and doppler to noise on just the monopole and measuring taking the difference from the signal level to the noise floor for each antenna. These values are calculated by the SpectraToRadial tool during radial processing.

**DGRC** - Cross spectra range cell which had the highest SSN3 for which the noise floor and signal to noise where recorded for all antennas. This value is calculated by the SpectraToRadial tool during radial processing.

**DOPV** - The total number of doppler cells in the cross spectra which were acceptable to process into radials. (Within First Order, Noise criteria, ...) This value is calculated by the SpectraToRadial tool during radial processing.

**DDAP** - The percentage of doppler cells that had dual angle MUSIC solutions. This value is calculated by the SpectraToRadial tool during radial processing.

**RADV** - The total number of radial vectors solutions found at different bearings and ranges. This value is calculated by the SpectraToRadial tool during radial processing.

**RAPR** - The average number of radial vectors per range cell. This value is calculated by the RadialDiagnostics tool during radial processing.

**RARC** - The number of range cells processed. The same value that comes from the number of range cells to process in the Header.txt file

**RADR** - The maximum radial range calculated by where the number of radial vectors drops to below 20% of the average vectors per range. This value is calculated by the RadialDiagnostics tool during radial processing.

**RMCV** - The maximum current velocity found. (This might be a negative number depending on the radial velocity direction) This value is calculated by the RadialDiagnostics tool during radial processing.

**RACV** - The averaged of the absolute current velocities for all radial vectors. (always positive) This value is calculated by the RadialDiagnostics tool during radial processing.

**RABA** - The averaged bearing of all radial vectors regardless of velocity. If the radial has 360deg of coverage, this value is meaningless and will appear random. Typical sites on shore will have limited angular coverage and this value should typical split that coverage and be somewhat stable over time. A sharp change in this value may indicate an antenna problem and should be investigated. This value is calculated by the RadialDiagnostics tool during radial processing.

**RTYP** - The type of radial being processed. The possible values are:

- 1 Ideal Pattern from CSS.
- 2 Measured Pattern from CSS.
- 5 Merged Radials from Ideal Pattern.
- 6 Merged Radials form Measured Pattern.

The Merged Radials are the output radials. Since they do not have a single cross spectra associated with them, the values for spectra in this row come from the previous CSS and should be ignored (done automatically by DiagDisplay). Their time entry will also be the same as the last CSS processed not the radial time stamp.

**STYP** - The type of cross spectra being processed. This is just the ASCII code of the third character of the cross spectra file name. This will typically be either a 'S' 83 or possibly an 'A' 65