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Hardware Diagnostic File Format

SeaSondeController produces hardware diagnostic files that start with **STAT_** and end with **.hdt** that helps to trouble shoot hardware issues. The .hdt file is built upon the Columnar Table Format (CTF) which is covered in a separate document for which you should be familiar with before reading this document.

To plot these files, use the **DiagDisplay** application in the Viewers folder. DiagDisplay can display multiple STAT files simultaneously, select the STAT_ files you want in the Finder (use shift and/or command key to select) and drag the multiple selection to DiagDisplay icon. Note, if you try to plot a year's worth or more, you will need a very fast machine or a lot of patience.

File Naming

These files are put into "/Codar/SeaSonde/Data/Diagnostics" and have the file naming format of STAT_XXXX_YYYY_MM_DD.**hdt**
where XXXX is the radial site code, yyyy is the year, mm is the month, and dd is the day. The processing tools are hard coded to create new STAT_ files weekly on Sundays.

Identification of the File

The first keyword of the file will typically be '%CTF: <version>' describing the version of the CTF file. Before version 1.00, the file will be missing this key; however, it is still readable with this standard.

Within the first ten lines of the file will must be a keyword of:
%FileType: <type> <subtype> <name>
The <**type**> must be **DIAG** to identify it as a diagnostic file.
The <**subtype**> must be **rcvr** to identify it as a hardware diagnostic file.

Table Data

The table data time starts from the files **%TimeStamp:** key.
The **%TableType: <type> <subtype>** must have a <type> of **rcvr** while the <subtype> **rcv2** 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 <subtype> **'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 <subtype> **'rcv2'** output is:
%TableColumnTypes: TIME RTMP MTMP XTRP RUNT SP24 SP05 SN05 SP12 XPHT XAHT XAFW XARW XP28 XP05 GRMD GDMD PLLL HTMP HUMI RBIA EXTA EXTB CRUN TYRS TMON TDAY THRS TMIN TSEC

The <subtype> **'rcv3'** output is:
%TableColumnTypes: TIME RTMP MTMP XTRP RUNT SP24 SP05 SN05 SP12 XPHT XAHT XAFW XARW X1VR XP28 XP05 GRMD GDMD PLLL HTMP HUMI RBIA EXTA EXTB CRUN TYRS TMON TDAY THRS TMIN TSEC

The <subtype> **'rcv4'** output is:
%TableColumnTypes: TIME RTMP MTMP XTRP RUNT SP24 SP05 SN05 SP12 XPHT XAHT XAFW XARW X1VR XP28 XP05 X2FH X2AH X2AF X2AR X2F5 X2AS X2VR GRMD GDMD PLLL HTMP HUMI RBIA EXTA EXTB CRUN TYRS TMON TDAY THRS TMIN TSEC

Each table row is the processing result of a single CSS into a short time radial or the merging of short-time radials into final output radial.

<u>The column character codes can be decoded as:</u>

TIME	Recorded time of the data row in seconds from the %TimeStamp:
RTMP	Receiver front panel board temperature.
MTMP	Receiver AWGIII model temperature.
XTRP	Hexadecimal code for Transmit Watch 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
X1VR Calculated Transmitter VSWR from forward,reflected power.
XP28 Supply voltage on the transmitter front panel board.
XP05 +5VDC supply voltage on the transmitter front panel board.
X2FH Second transmitter Temperature on the front panel board.
X2AH Second transmitter Temperature on the amplifier.
X2AF Second transmitter Measure forward power.
X2AR Second transmitter Measure reflected power.
X2VR Second transmitter Calculated VSWR from forward,reflected power.
X2AS Second transmitter Supply voltage on the front panel board.
X2F5 Second transmitter +5VDC voltage on the 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
HTMP Receiver front panel high accuracy temperature.
HUMI Receiver front panel high accuracy relative humidity percentage.
RBIA Receiver DC powered current draw in amps.
EXTA Receiver external signal input A.
EXTB Receiver external signal input B.
CRUN Computer run time in minutes.
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.

Older AWGII Receivers will only have RTMP, RUNT valid measurements.

Older 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 & RBIA are not zero only on DC Supplied Receivers.

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.

On Dual Transmitter systems, the diagnostics will contain extra columns for the second transmitter.

Each table row in the file is the maximum or minimum (which ever is 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.

Details of Each Measurement

TIME – The time from the diagnostics time stamp at which the values were saved.

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 enclosed module and power draw. A higher delta than 10°C over RTMP may indicate that receiver chassis is unable to cool itself maybe because its cooling 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 hexadecimal 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 (VCO Near Limit, Antenna Open, Satellite 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.)
+20 The External Halt Signal is active.
+40 Currently unused.
+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. Every time 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. 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 this value as the AWGIII receiver will be in a reset condition; therefore, unavailable to the computer and you won't get any status entries during this condition. 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 Transmitter 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 30 dB Atten and Xmit Off in SeaSondeController or by turning off/unplugging the Transmitter.

X1VR – Is the calculated VSWR of the forward and reflected measurements. It's (1+sqrt(XARW/XAFW))/(1-sqrt(XARW/XAFW). If VSWR is >5:1 then there's a problem with the antenna or cabling.

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.

X2FH – This temperature sensor sits on the Transmitter2 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 Transmitter Chassis'.]

X2AH – This temperature sensor sits on the Transmitter2 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.

X2AF – Is the measured forward power of the Transmitter2 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.)]

X2AR – 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 X2AR and X2AF to be swapped. The current value can be found reading the 'XRPT' command response line 'X2AR:' in SeaSondeController.

A low X2AF and low X2AR may mean the amplifier is not functioning.
A low X2AF and a high X2AR 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 30 dB Atten and Xmit Off in SeaSondeController or by turning off/unplugging the Transmitter.

X2VR – Is the calculated VSWR of the forward and reflected measurements. It's (1+sqrt(X2AR/X2AF))/(1-sqrt(X2AR/X2AF). If VSWR is >5:1 then there's a problem with the antenna or cabling.

X2AS – 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.

X2F5 – 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:

0 Automatic 2D/3D
1 Single Satellite (Time Only)
2 -
3 Horizontal 2D
4 Full Position 3D
5 DGPR Reference
6 Clock Hold 2D
7 Overdetermined Clock

GDSP – Is the Receiver GPS module discipline mode (Accurate 1 sec 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:

0 Normal
1 Power Up
2 Auto Holdover
3 Recovery
4 Fast Recovery
5 -
6 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.

RBIA – Is the current draw in amps for Receiver DC powered receivers.

EXTA – Is the count of the number of times external signal input A was detected a logic high level each status check by SeaSondeController before writing out the status report. This is only used for special SeaSonde setups.

EXTB – Is the count of the number of times external signal input B was detected a logic high level each status check by SeaSondeController before writing out the status report. This is only used for special SeaSonde setups.

CRUN – Is the computer run time in seconds. This value will reset to 0 each time the computer restarts either from Sentinel or other causes. When this value jumps back near zero and the receiver RUNT jump backs near zero, then it is mostly likely that the site lost power.

Revision History

First Draft Oct 28, 2016

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