Sally Ride UHDAS installation and ADCP evaluation

Dr. Julia M Hummon
University of Hawaii
hummon@hawaii.edu

Table of Contents

1 Hardware and software setup.................................................................1
  1.1 ADCPs.................................................................................................2
  1.2 Computer...............................................................................................2
    1.2.1 Computer overview........................................................................2
    1.2.2 UHDAS overview...........................................................................2
    1.2.3 Serial Feeds....................................................................................3
    1.2.4 CODAS processing settings...............................................................4
2 ADCP Evaluation......................................................................................5
  2.1 Overview...............................................................................................5
    2.1.1 Default instrument settings (accessible via the UHDAS GUI)........5
  2.2 Calibrations - phase and amplitude.....................................................5
  2.3 Range....................................................................................................6
  2.4 Bubbles.................................................................................................6
  2.5 Biases Unrelated to Bubbles...............................................................7
  2.6 Acoustic Interference and (K-Sync) triggering.................................7
3 Recommendations......................................................................................9
  3.1 Installation............................................................................................9
  3.2 Operations............................................................................................9
4 Figures.......................................................................................................9
5 Appendix..................................................................................................23
  5.1 WH300 HAT (Harbor Acceptance Trial).............................................23
  5.2 OS150 HAT (Harbor Acceptance Trial)..............................................24
  5.3 OS38 HAT (Harbor Acceptance Trial)................................................25
6 Instrument Settings..................................................................................25
  6.1 Pingtypes..............................................................................................25
  6.2 Pingtypes and Triggering.................................................................27
  6.3 Interference Tests................................................................................29

1 Hardware and software setup

RV Sally Ride has three Acoustic Doppler Current Profilers (ADCPs) made by Teledyne RDI. These instruments are used to determine ocean currents beneath the ship. Data acquisition and processing at sea will be performed by the University of Hawaii Data Acquisition System (UHDAS), written and maintained by the University of Hawaii ADCP group. This document describes UHDAS and the installation of the system on the Sally Ride
in late July, 2016, and the state of the system as of mid-October 2016.

1.1 ADCPs

There are three Teledyne R.D.Instruments ADCPs: a 300kHz Workhorse and one each 150kHz and 38 kHz phased array Ocean Surveyor models (OS150 and OS38). All transducers are presently behind windows. The fluid in all three transducers wells (plus perhaps others) are interconnected with one fill/bleed valve. The wells are filled with fresh water.

Ocean Surveyors are phased array ADCPs with a flat face made up of many small transducers. They can ping in broadband mode or narrowband mode. The OS150 and OS38 therefore create up to four datasets between them: OS150BB, OS150NB, OS38BB, and OS38NB (for broadband and narrowband mode). With the WH300, that means the Sally Ride has up to 5 separate ADCP datasets (instrument+pingtype combinations).

1.2 Computer

1.2.1 Computer overview

Two computers were purchased by Scripps for UHDAS ADCP data acquisition. The computers were set up in at University of Hawaii but serial data logging was not tested until the SAT cruise, when it was discovered that they were broken – unable to do serial data acquisition (different vendor and motherboard from what was specified by UH).

An existing raspberry pi with UHDAS already installed was hastily configured and used for preliminary bottom track during the transit out of Puget Sound. A Pollywell computer was borrowed from a collection existing on the ship and built up to be the primary computer. This will be adequate for some time. The plan is to install and configure another fanless computer so the ship will have a spare, and address the rack-mount computer situation after more pressing issues are resolved.

The Polywell computer is running 64-bit Xubuntu 14.04. The operating system and code base were installed during the SAT in late July. The second fanless computer will also run Xubuntu 14.04 and should be installed on the ship by early November. Each computer has one hard drive. There is no backup drive on the computer, but Scripps has a backup process that pulls UHDAS data off the computer at regular intervals. The acquisition software gathers data from the ADCP and other serial feeds through an 8-port serial-USB device which uses FTDI chips for communication.

1.2.2 UHDAS overview

UHDAS logs and timestamps ADCP data from the WH300, OS150, and OS38 as well as heading (Gyro-Sperry, Seapath) and GPS positions (from Trimble and Seapath), and writes them to disk. During the processing stage, ADCP beam velocities are transformed into horizontal velocities and referenced to earth prior to automated editing and averaging. A daily email is automatically generated, which contains a snippet of processed data as well as diagnostics related to data acquisition, processing and computer system. The email is sent to shore, where it is monitored by UHDAS personnel, and where figures are generated from the
data snippet. Information from the email is available at this shoreside web site: http://currents.soest.hawaii.edu/uhdas_fromships.html

The UHDAS software populates a website with a variety of plots and links to data and documentation. The website and all of the raw and processed data should be accessible to scientists on board. The networking situation was in flux, so it is not clear what the final configuration will be. The UHDAS computers should be directly accessible to the network where scientists have their computers. If DNS is working, the web site should be available on the science network by the computer name “currents”.

1.2.3 Serial Feeds

UHDAS uses one process per serial port for data acquisition. The input streams are filtered by message, timestamped, and written to a directory named after the instrument being logged. More than one NMEA string can be acquired from a given serial stream. If the rate of repetition is too high, messages may be subsampled prior to recording (eg. the gyros on Sally Ride). The file sensor_cfg.py contains settings for serial acquisition, including ports, baud rates, and message strings. (NOTE that indentation must be respected when editing sensor_cfg.py, as it is written in Python). CODAS processing requires position and heading. We try to log all required input types from multiple sources, to allow for reprocessing (in case of gaps or failure in the primary serial feed).

### Serial messages logged

<table>
<thead>
<tr>
<th>Serial (raw) directory</th>
<th>instrument</th>
<th>parsed messages (rbin)</th>
<th>messages</th>
<th>serial port /dev/tty/</th>
</tr>
</thead>
<tbody>
<tr>
<td>seapath</td>
<td>SeaPath</td>
<td>‘gps’, ‘sea’</td>
<td>$INGGA; $PSXN,20; $PSXN,23</td>
<td>USB7</td>
</tr>
<tr>
<td>trimble</td>
<td>Trimble BD982</td>
<td>‘gps’, ‘hdg’</td>
<td>$GPGGA; $GNGGA; $INGGA; $GPHDT; $GNHD; $INHDT</td>
<td>USB6</td>
</tr>
<tr>
<td>gyro</td>
<td>Sperry</td>
<td>‘hdg’</td>
<td>$HEHDT</td>
<td>USB2</td>
</tr>
<tr>
<td>hydrins</td>
<td>Hydrins</td>
<td>‘gps’, ‘hdg’</td>
<td>$GNGGA; $GNHD</td>
<td>USB0</td>
</tr>
<tr>
<td>wh300</td>
<td>wh300</td>
<td>raw, log, log.bin</td>
<td>(binary adcp data + log files)</td>
<td>USB3</td>
</tr>
<tr>
<td>os150</td>
<td>RDI ADCP (150kHz)</td>
<td>raw, log, log.bin</td>
<td>(binary adcp data + log files)</td>
<td>USB4</td>
</tr>
<tr>
<td>os38</td>
<td>RDI ADCP (38kHz)</td>
<td>raw, log, log.bin</td>
<td>(binary adcp data + log files)</td>
<td>USB5</td>
</tr>
</tbody>
</table>

Table 1: There are 4 devices here with heading; Seapath is known to be accurate, and the rest can be compared to Seapath.

NOTE:
The ports used by the UHDAS computer are numbered 0,1,...7 (not 1,2,...8)

### 1.2.4 CODAS processing settings

Transducer-dependent settings:

<table>
<thead>
<tr>
<th>instrument</th>
<th>transducer angle</th>
<th>seapath offset (starboard)</th>
<th>seapath offset (fwd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>wh300</td>
<td>33.9</td>
<td>0m</td>
<td>6m</td>
</tr>
<tr>
<td>os150</td>
<td>24.8</td>
<td>3m</td>
<td>8m</td>
</tr>
<tr>
<td>os38</td>
<td>52.4</td>
<td>2m</td>
<td>9m</td>
</tr>
</tbody>
</table>

*Table 2: transducer-dependent setting used in at-sea processing. If a different position device is used for processing, the transducer-GPS offsets will have to be changed.*

Three types of ancillary data are used for automated at-sea processing:

1. position
2. reliable heading (gyro)
3. accurate heading

Those are highlighted below. If necessary, processing of UHDAS data can be redone at a later date using different supporting serial strings. Should there be a problem with the primary data feeds, reprocessing of UHDAS data on *Sally Ride* should be able to use appropriate settings chosen from the following.

<table>
<thead>
<tr>
<th>instrument</th>
<th>position/time</th>
<th>reliable heading</th>
<th>accurate heading</th>
</tr>
</thead>
<tbody>
<tr>
<td>seapath</td>
<td>$GPGGA$</td>
<td></td>
<td>$PSXN,20; PSXN,23$</td>
</tr>
<tr>
<td>hydrons</td>
<td>$xxGGA$</td>
<td></td>
<td>$GNHDT$</td>
</tr>
<tr>
<td>Trimble</td>
<td>$xxGGA$</td>
<td></td>
<td>$HEHDT$</td>
</tr>
<tr>
<td>gyro</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 3: subdirectory and ancillary NMEA serial message logged.*

Additional information about CODAS processing and UHDAS can be found here:
2 ADCP Evaluation

2.1 Overview

During the SAT cruise, UHDAS was run with all ADCPs pinging whenever possible; Ocean Surveyors had both BB and NB modes enabled. Defaults for each instrument and each ping type (and blanking) were the defaults recommended by the manufacturer with the exception of the OS38, where the bins are about 75% of the default. WH300 data were processed using 2min averaging, all the rest were processed using 5min averaging. These intervals cannot be changed in the at-sea automated processing. Periods of evaluation included Bottom Tracking on the way out of port, some transits between Multibeam test locations, and during periods of the multibeam acceptance trials when the EM712 was not being tested or calibrated. In general, they were not synchronized. The trip was quite short, resulting in enough data to obtain the heading offset for calibration, but very little in-depth testing. In addition, many of the serial feed were not working when the SAT cruise started.

Several cruises have taken place since the SAT cruise, and four cruise segments have sufficient data to glean calibration information.

RDI SAT tests not run:
- explicit speed vs range test
- comprehensive interference testing

2.1.1 Default instrument settings (accessible via the UHDAS GUI)

<table>
<thead>
<tr>
<th></th>
<th>WH300</th>
<th>OS150BB (off)</th>
<th>OS150NB</th>
<th>OS38BB (off)</th>
<th>OS38NB</th>
</tr>
</thead>
<tbody>
<tr>
<td>blank</td>
<td>4m</td>
<td>4m</td>
<td>4m</td>
<td>16m</td>
<td>16m</td>
</tr>
<tr>
<td>bin (pulse)</td>
<td>2m</td>
<td>4m</td>
<td>8m</td>
<td>12m</td>
<td>24m</td>
</tr>
<tr>
<td>bottomtrack</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>triggering</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

2.2 Calibrations - phase and amplitude

Preliminary transducer angle was calculated using data collected with Bottom Tracking on, during the SAT cruise. Serial feeds were changing during that short cruise, so a better
assessments of transducer angle (using Seapath) had to wait for more data to be collected. Four cruise segments from Aug/Sept were used for the calibrations, each of which had about 20 watertrack calibration points. Subsequent data collected with the Seapath functioning allowed a good estimate of transducer angle and a first guess at the GPS-ADCP offsets.

Ocean Surveyors should not need an amplitude calibration applied (scale factor), but it is common for them to require a multiplier of 1.003-1.005. The OS38 narrowband data did require a scale factor of about 1.005. OS150 narrowband required a larger scale factor than is common (1.014). Broadband has not been run long enough to determine whether there are biases between broadband and narrowband modes. It is recommended that for the next several months, as science trials are undertaken, that all three ADCPs be run, with OS150 and OS38 in interleaved mode, in order to assess whether there are unexpected biases or differences between them. The scale factor of 1.014 on the OS150 narrowband mode is a concern.

Discrete ceramic transducers, such as the WH300, require that the soundspeed be known at the transducer. The soundspeed is calculated using the instrument’s thermistor and a soundspeed equation. Because the WH300 well is filled with fresh water, there will always be a scale factor required in post-processing.

2.3 Range

Range is usually a function of ship speed and weather (bubbles), and distribution of scatterers in the ocean. This means the range of a given ADCP will depend on the species numbers and composition where the data are collected. In a biological desert, ADCP range will be reduced. Range can also be variable at a given location: since the animals have a diurnal vertical migration pattern, the vertical range of the instrument can vary in a 24-hour period. Range in broadband mode is more dependent on existence and migration of scatterers (in comparison to narrowband mode).

Generally, a faster ship is noisier and range decreases as ship speed increases. Bubbles are more complicated as they affect broadband and narrowband pings differently, and tend to block and bias the single pings. Poor weather and bubbles reduce the range, but more fundamentally often reduce the data quality to the point where range is irrelevant, i.e. there is not much data left and it is biased or otherwise untrustworthy.

Other factors such as electrical noise or acoustic noise can influence the range of an ADCP.

Ranges determined during ADCP testing:

<table>
<thead>
<tr>
<th>WH300</th>
<th>OS150 broadband</th>
<th>OS150 narrowband</th>
<th>OS38 broadband</th>
<th>OS38 narrowband</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2m bins)</td>
<td>(4m bins)</td>
<td>(8m bins)</td>
<td>(12m bins)</td>
<td>(24m bins)</td>
</tr>
<tr>
<td>50m-80m</td>
<td>150m- (over 200m)</td>
<td>370-400m</td>
<td>470m-670m</td>
<td>700m-850m</td>
</tr>
</tbody>
</table>

Table 4: Ranges from this cruise may not represent ranges from other regions with less scattering.

The range of the WH300 was entirely consistent with other instruments of that model.

The OS150 range was very good in both broadband mode and narrowband mode. Ranges of OS150 instruments vary enormously with latitude and scattering. Because of this, it is difficult to compare instruments from different ships (because cruise tracks and scattering conditions vary greatly). This OS150 seems to be doing quite well.
The OS38 however, had very poor range (600m). The instrument itself might be doing well, but there was apparently (according to Mantech Inc) a loud ambient acoustic signal in the 20kHz-40kHz range, which drastically curtailed the range of the OS38 in both broadband mode and narrowband mode. Typical ranges should be at least 50%-80% greater than on Sally Ride at present.

2.4 **Bubbles**

All three instruments were affected by bubbles. This was most notable during the EM122 patch test, when the ship ran reciprocal tracks in windy conditions with swell coming from a nearby storm. The cruise track and resulting data quality illustrated the difference the sea state and ship direction can have on ADCP data.

Bubbles cause trouble in several ways:

(1) A bubble plume can block the outgoing signal completely (no sound is returned from that ping, so no velocity at all). This reduces the Percent Good of the averaging period because there are no velocities available.

(2) A bubble plume distorts the outgoing ping resulting in a short profile, biased towards zero measured velocity. These short profiles must be edited out prior to averaging or there will be underway bias towards zero in the measured velocity, resulting in a bias in the ship’s direction of motion in the ocean velocity.

(3) Bubbles can distort the return ping, sometimes subtly, with a bias towards zero in the measured velocity near the ship, with less bias farther away. Range of these individual profiles is reduced.

All instruments had pings blocked by bubbles (i.e. reduced numbers of valid bins available), but there was little or no bias visible. This could become be a problem if the weather is significantly worse than we have seen so far. After single-ping editing the range of all instruments decreased slightly in heavier seas, but the greatest effect was simple loss of data (i.e. decreased Percent Good). Figures below will illustrate the loss of data.

2.5 **Biases Unrelated to Bubbles**

Since the velocities from all instruments and settings should agree, comparisons between ping types and instruments are a way to reveal problems. One typical cause of a difference between BB and NB modes is electrical interference (ground loops). More data should be collected with BB and NB modes enabled on OS150 and OS38, to help determine whether subtle exist.

There was no indication of ringing in either instrument when the default blanking interval was used.
2.6 Acoustic Interference and (K-Sync) triggering

Acoustic instruments rely on reflected sound, but use it in different ways. ADCPs measure the Doppler shift caused by the component of velocity measured along each of the 4 beams. Given typical ocean velocities, this is a small quantity that can be difficult to isolate, particularly from the weak returns at the edge of the instrument’s range. Therefore, the measurement is inherently noisy, and many pings (on the order of 50 to 300 in a 5 minute averaging period) are needed to adequately determine ocean velocities.

Since these various sonars can interfere with each other, it is natural to try timing their pings in such a way as to minimize this interference. Sally Ride has a device (a Kongsberg K-Sync) designed to enable this. Unfortunately this approach can also damage the data. For the ADCPs there are three problems:

1. Synchronizing (triggering) reduces the number of pings. Since the Doppler measurement is inherently noisy, reducing the ping rate increases the uncertainty of the results. If the number of pings drops too low, the data become essentially worthless.

2. If the ADCPs are set to ping when triggered, and another sonar such as the EM712 is pinging at the same time, the top few hundred meters of ocean velocity can be corrupted because of the long duration of the tone coming from the other instrument.

3. If there is still interference, synchronized ping timing ensures that the interference is always at the same depth. This means there will be no valid data at all from that depth. CODAS single-ping editing assumes asynchronous pinging, and uses the neighboring depths to ascertain the presence of interference to remove. If the pings are synchronized, the adjacent bins will also be corrupted and the ADCP CODAS processing will not be able to detect it.

If there is no science mandate otherwise, the ADCPs should not be synchronized to other devices. If there is a scientific need to run the ADCPs and synchronize them with other devices (e.g., EK80), proper settings should be used. There was insufficient time during these tests to learn what settings are most appropriate.

If an Ocean Surveyor is triggered, only use one pingtype (BB or NB, but not both)

Some attempts were made to test interference between instruments. Interference tests are time-consuming to carry out thoroughly, time-consuming to evaluate, and require that other sonars be secured for much of the testing period, therefore comprehensive interference testing is not possible on a short cruise when multiple sonar evaluations are expected.

It should be noted that the WH300 is heavily impacted by many other sonars. One figure from a cruise in August shows the WH300 Percent Good dropping to barely over 50% as different pings interfere. The Percent Good reduction is not enough to damage the velocity data, at least not when the seastate is quiet. If more pings were lost to bubbles, there would be loss of velocity data too.

General observations were:

– WH300:
– WH300 cannot be triggered (requires a special board in the deck unit)
– Everything interferes with the WH300
– The more sonars running, the worse its Percent Good will be, and the harder it is to edit out acoustic interference.
– All the ADCPs were able to edit out the single-ping interference from other sonars, provided they are run in an uncoordinated manner (not triggered). The interference is visible and affects the data if untreated, but the CODAS single-ping editing can remove it.

The MAC (Multibeam Advisory Committee) indicated that none of the ADCPs significantly impacts EM122 deep multibeam sonar bathymetry mapping. However, everyone agrees that the EM712 is adversely affected. If science cruise requirements need EM712 water or bottom-return data, or EM122 water-column data, it is up to the science team to decide whether to secure or trigger the ADCPs, with the knowledge that the upper 50-150m of ADCP data might be destroyed, and a low pingrate would also damage the ADCP data. It might still be worth it to run the OS38NB to get deep ocean currents, once the OS38 can reach its expected depths.

3 Recommendations

3.1 Installation

All sonars would benefit in range if the windows were removed. That may or may not be an option.

3.2 Operations

Because both OS150 and OS38 both appear to be working, and because NB mode is the deepest, most robust setting, defaults will be set to OS150NB (8m) and OS38NB (24m). There is no problem running either instrument in broadband mode if science on a cruise warrants it. For higher-resolution data, it might make sense to run the OS150 with BB and NB modes, since the WH300 seems to be weak and vulnerable to every other kind of ping. Broadband mode does have higher accuracy (can use smaller bins) but is far more prone to fail in the presence of bubbles or lack of scattering.

In general:

1. Run the ADCPs with their default settings as much as possible
2. Do not synchronize the ADCPs unless the scientific mission requires it
3. Sea state will affect data quality and range
4. Default settings for WH300: 2m bins, 120sec averages, bottom track on if under 100m.
5. Default settings for OS150: 8-m bins, narrowband mode, no bottom track
6. Default settings for OS38: 24-m bins, narrowband mode, no bottom track

Initially however, it would be best to run all instruments and all pingtypes so we can get a baseline comparison between BB mode and NB mode for the Ocean Surveyors.
4 Figures

Figure 1: Percent Good during EM122 patch test for all 5 ADCP/pingtype combinations.  
Figure 2: Percent Good during a cruise for WH300, OS150NB, OS38NB
Figure 1: During the EM122 patch test, moderate seas from the west caused bubbles during westward legs and degraded the incoming signal. Percent Good decreased markedly in all 5 instrument+pingtype combinations. Acoustic interference from other devices was edited out at the single-ping level by CODAS processing, leading to additional reduction of Percent Good. WH300 Percent Good was strongly impacted by acoustic interference, OS150 was somewhat impacted, and OS38 did not see the other acoustic signals. The velocities did not show any bias after the acoustic interference was removed.
Figure 2: Percent Good (percentage of bins with valid horizontal velocity) is variable and often low in the WH300 due to interference from other acoustic devices. OS150 narrowband was less affected; OS38 noarrowband was mostly immune.
5 Appendix 1

5.1 UHDAS raw file chunks

Cruise leg = sr1601_01

sr2016_206_52578 07/25 14:36 - 01/01 00:00 (206.689-0.000) wh300: [BB] (-1054151.2s) os150: [-- BB] (-1477002.8s) os38: [-- BB] (6.0s)

sr2016_206_53625 07/25 14:53 - 07/25 15:59 (206.621-206.667) wh300: [BB] (1.6s) os150: [-- BB] (2.2s) os38: [-- BB] (6.0s)

sr2016_206_57600 07/25 16:00 - 07/25 17:59 (206.667-206.750) wh300: [BB] (1.6s) os150: [-- BB] (2.2s) os38: [-- BB] (6.0s)

Cruise leg = sr1601_02

sr2016_206_69982 07/25 19:26 - 07/25 19:59 (206.810-206.833) wh300: [BB] (0.8s) os150: [NB --] (1.1s) os38: [NB --] (3.0s)

Cruise leg = sr1601_03

sr2016_206_81849 07/25 22:44 - 07/25 22:58 (206.947-206.957) wh300: [BB] (0.8s) os150: [NB --] (2.3s) os38: [NB --] (6.0s)

Cruise leg = sr1601_04

sr2016_207_62530 07/26 17:22 - 07/26 18:00 (207.724-207.750) wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [NB BB] (6.0s)

Cruise leg = sr1601_05

sr2016_207_70076 07/26 19:27 - 07/26 19:35 (207.811-207.817) wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [NB BB] (6.0s)

Cruise leg = sr1601_06

sr2016_207_70667 07/26 19:37 - 07/26 19:58 (207.818-207.832) wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [NB BB] (6.0s)

sr2016_207_72182 07/26 20:03 - 07/26 20:21 (207.835-207.848) wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [NB BB] (6.0s)

sr2016_207_73542 07/26 20:25 - 07/26 20:26 (207.851-207.852) wh300: [-- --] (- ----) os150: [NB BB] (2.2s) os38: [NB BB] (6.1s)

sr2016_207_73658 07/26 20:27 - 07/26 20:34 (207.853-207.857) wh300: [-- --] (- ----) os150: [NB BB] (2.2s) os38: [NB BB] (6.0s)

sr2016_207_74277 07/26 20:38 - 07/26 20:38 (207.860-207.860) wh300: [-- --] (- ----) os150: [NB BB] (2.2s) os38: [NB BB] (6.1s)
<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Cruise Leg</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/28 07:59</td>
<td>sr2016_209_21600</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 10:00</td>
<td>sr2016_209_28800</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 11:59</td>
<td>sr2016_209_36000</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 13:59</td>
<td>sr2016_209_45200</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 15:25</td>
<td>sr2016_209_55516</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 15:59</td>
<td>sr2016_209_55959</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 16:25</td>
<td>sr2016_209_57600</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 16:29</td>
<td>sr2016_209_59183</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [NB --]</td>
</tr>
<tr>
<td>07/28 16:59</td>
<td>sr2016_209_59371</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
<tr>
<td>07/28 16:35</td>
<td>sr2016_209_59737</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>os150: [--) --]</td>
</tr>
</tbody>
</table>

**cruise leg = sr1601_13**

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Cruise Leg</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/28 17:11</td>
<td>sr2016_209_61612</td>
<td>wh300: [BB] (1.6s) os150: [NB BB] (3.3s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 17:14</td>
<td>sr2016_209_61926</td>
<td>wh300: [BB] (1.6s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 17:48</td>
<td>sr2016_209_62084</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 17:58</td>
<td>sr2016_209_64151</td>
<td>wh300: [BB] (1.6s) os150: [NB BB] (3.3s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 18:00</td>
<td>sr2016_209_64763</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:02</td>
<td>sr2016_209_64800</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:09</td>
<td>sr2016_209_65014</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:11</td>
<td>sr2016_209_65397</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:13</td>
<td>sr2016_209_65541</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:16</td>
<td>sr2016_209_65676</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:18</td>
<td>sr2016_209_65840</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:21</td>
<td>sr2016_209_65958</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:23</td>
<td>sr2016_209_66124</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:26</td>
<td>sr2016_209_66233</td>
<td>wh300: [BB] (1.6s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:27</td>
<td>sr2016_209_66398</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:30</td>
<td>sr2016_209_66492</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:31</td>
<td>sr2016_209_66683</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:34</td>
<td>sr2016_209_66754</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:37</td>
<td>sr2016_209_66941</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 18:44</td>
<td>sr2016_209_67114</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 19:13</td>
<td>sr2016_209_67514</td>
<td>wh300: [BB] (1.6s) os150: [NB --] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:16</td>
<td>sr2016_209_69266</td>
<td>wh300: [--) --]</td>
</tr>
<tr>
<td>07/28 19:19</td>
<td>sr2016_209_69448</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:22</td>
<td>sr2016_209_69648</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:25</td>
<td>sr2016_209_69797</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:28</td>
<td>sr2016_209_69964</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:32</td>
<td>sr2016_209_70177</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (2.2s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 19:35</td>
<td>sr2016_209_70384</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 19:39</td>
<td>sr2016_209_70508</td>
<td>wh300: [BB] (0.8s) os150: [--) --]</td>
</tr>
<tr>
<td>07/28 21:13</td>
<td>sr2016_209_72000</td>
<td>wh300: [BB] (1.6s) os150: [NB BB] (3.3s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 21:25</td>
<td>sr2016_209_76441</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (3.4s) os38: [--) --]</td>
</tr>
</tbody>
</table>

**cruise leg = sr1601_14**

<table>
<thead>
<tr>
<th>Date/Time</th>
<th>Cruise Leg</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/28 21:54</td>
<td>sr2016_209_77186</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (3.5s) os38: [--) --]</td>
</tr>
<tr>
<td>07/28 22:19</td>
<td>sr2016_209_79563</td>
<td>wh300: [BB] (0.8s) os150: [NB BB] (3.4s) os38: [--) --]</td>
</tr>
</tbody>
</table>

**cruise leg = sr1601_15**
5.2 UHDAS instrument settings (grouped in chunks)
<table>
<thead>
<tr>
<th>Chunk</th>
<th>Type</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

sr1601_01

<table>
<thead>
<tr>
<th>Chunk</th>
<th>Type</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>206.608568</td>
<td>206.795347</td>
<td>on</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.608576</td>
<td>206.795331</td>
<td>on</td>
<td>(bb, 55, 4.0, 4.0, 4.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.608616</td>
<td>206.795298</td>
<td>on</td>
<td>(bb, 100, 12.0, 16.0, 13.2)</td>
</tr>
</tbody>
</table>

sr1601_02

<table>
<thead>
<tr>
<th>Chunk</th>
<th>Type</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>206.809984</td>
<td>206.944554</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.809992</td>
<td>206.944555</td>
<td>off</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.810017</td>
<td>206.944536</td>
<td>off</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
</tr>
</tbody>
</table>

sr1601_03

<table>
<thead>
<tr>
<th>Chunk</th>
<th>Type</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>206.947340</td>
<td>207.202764</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.947360</td>
<td>207.202768</td>
<td>on</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>206.947407</td>
<td>207.202728</td>
<td>on</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
</tr>
</tbody>
</table>

sr1601_04

<table>
<thead>
<tr>
<th>Chunk</th>
<th>Type</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Status</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>207.723734</td>
<td>207.809541</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>207.723755</td>
<td>207.809529</td>
<td>off</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>207.723801</td>
<td>207.809495</td>
<td>off</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
</tr>
<tr>
<td>Time</td>
<td>Channel</td>
<td>Position X</td>
<td>Position Y</td>
<td>Status</td>
<td>Parameters</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>------------</td>
<td>------------</td>
<td>--------</td>
<td>------------</td>
</tr>
<tr>
<td>0 1</td>
<td>207.811082</td>
<td>207.816637</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>207.811102</td>
<td>207.816628</td>
<td>off</td>
<td>(bb, 55, 4.0, 4.0, 4.0)</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>0 1</td>
<td>207.811149</td>
<td>207.816564</td>
<td>off</td>
<td>(bb, 100, 12.0, 16.0, 13.2)</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 2</td>
<td>207.817691</td>
<td>207.848040</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 6</td>
<td>207.817712</td>
<td>207.875803</td>
<td>off</td>
<td>(bb, 55, 4.0, 4.0, 4.0)</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>1 4</td>
<td>207.878799</td>
<td>207.931472</td>
<td>off</td>
<td>(bb, 60, 4.0, 4.0, 4.0)</td>
<td>(nb, 55, 8.0, 4.0, 8.0)</td>
</tr>
<tr>
<td>0 10</td>
<td>207.817758</td>
<td>207.931424</td>
<td>off</td>
<td>(bb, 100, 12.0, 16.0, 13.2)</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1</td>
<td>208.173218</td>
<td>208.173264</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173226</td>
<td>208.173264</td>
<td>off</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173250</td>
<td>208.173250</td>
<td>off</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 8</td>
<td>208.239162</td>
<td>208.646496</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 8</td>
<td>208.239182</td>
<td>208.646475</td>
<td>off</td>
<td>(bb, 55, 4.0, 4.0, 4.0)</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1</td>
<td>208.173218</td>
<td>208.173264</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173226</td>
<td>208.173264</td>
<td>off</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173250</td>
<td>208.173250</td>
<td>off</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 8</td>
<td>208.239162</td>
<td>208.646496</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 8</td>
<td>208.239182</td>
<td>208.646475</td>
<td>off</td>
<td>(bb, 55, 4.0, 4.0, 4.0)</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Channel</th>
<th>Position X</th>
<th>Position Y</th>
<th>Status</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1</td>
<td>208.173218</td>
<td>208.173264</td>
<td>off</td>
<td>(bb, 50, 2.0, 4.0, 2.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173226</td>
<td>208.173264</td>
<td>off</td>
<td>(nb, 50, 8.0, 4.0, 8.0)</td>
<td></td>
</tr>
<tr>
<td>0 1</td>
<td>208.173250</td>
<td>208.173250</td>
<td>off</td>
<td>(nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
</tr>
</tbody>
</table>
0 8 208.239229 208.646482 off (bb, 100, 12.0, 16.0, 13.2) (nb, 75, 24.0, 16.0, 24.0)

--------------- sr1601_10 ---------------

--------------- (wh300) ---------------
0 5 208.647848 208.970669 off (bb, 50, 2.0, 4.0, 2.0)
--------------- (os150) ---------------
0 5 208.647868 208.970644 off (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)
--------------- (os38) ---------------
0 5 208.647915 208.970619 off (bb, 100, 12.0, 16.0, 13.2) (nb, 75, 24.0, 16.0, 24.0)

--------------- sr1601_11 ---------------

--------------- (wh300) ---------------
0 1 209.062405 209.066359 off (bb, 50, 2.0, 4.0, 2.0)
--------------- (os150) ---------------
0 3 209.062425 209.089343 off (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)
--------------- (os38) ---------------
0 2 209.034778 209.089352 off (bb, 100, 12.0, 16.0, 13.2) (nb, 75, 24.0, 16.0, 24.0)

--------------- sr1601_12 ---------------

--------------- (wh300) ---------------
--------------- (os150) ---------------
0 1 209.062405 209.066359 off (nb, 50, 8.0, 4.0, 8.0)
--------------- (os38) ---------------
0 1 209.062405 209.066359 off (bb, 100, 12.0, 16.0, 13.2)

--------------- sr1601_13 ---------------

--------------- (wh300) ---------------
--------------- (os150) ---------------
0 2 209.713129 209.892573 on (bb, 50, 2.0, 4.0, 2.0)
--------------- (os38) ---------------
0 2 209.713156 209.748718 on (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)
1 3 209.749588 209.758246 off (nb, 50, 8.0, 4.0, 8.0)
2 1 209.760157 209.761621 off (bb, 55, 4.0, 4.0, 4.0)
3 1 209.781443 209.800717 on (nb, 50, 8.0, 4.0, 8.0)
4 10 209.801724 209.892545 off (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)
--------------- (os38) ---------------
<table>
<thead>
<tr>
<th>Device</th>
<th>Start Time (HH:MM:SS)</th>
<th>End Time (HH:MM:SS)</th>
<th>Status</th>
<th>(device, x, y, width, height)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sr1601_14</td>
<td>0 1 209.772654 209.774217 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 1 209.774809 209.776198 off (bb, 100, 12.0, 16.0, 13.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 1 209.809810 209.811650 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 1 209.812261 209.813997 off (bb, 100, 12.0, 16.0, 13.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 1 209.812261 209.813997 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 1 209.812261 209.813997 off (bb, 100, 12.0, 16.0, 13.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 1 209.812261 209.813997 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 1 209.812261 209.813997 off (bb, 100, 12.0, 16.0, 13.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 1 209.812261 209.813997 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Device</th>
<th>Start Time (HH:MM:SS)</th>
<th>End Time (HH:MM:SS)</th>
<th>Status</th>
<th>(device, x, y, width, height)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sr1601_15</td>
<td>0 1 210.219461 210.219998 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 1 210.219481 210.219991 off (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 1 210.262369 210.269561 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 1 210.269927 210.277689 off (bb, 70, 4.0, 4.0, 4.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 1 210.278115 210.285574 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Device</th>
<th>Start Time (HH:MM:SS)</th>
<th>End Time (HH:MM:SS)</th>
<th>Status</th>
<th>(device, x, y, width, height)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sr1601_15</td>
<td>0 1 210.219461 210.219998 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 1 210.219481 210.219991 off (bb, 55, 4.0, 4.0, 4.0) (nb, 50, 8.0, 4.0, 8.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 1 210.262369 210.269561 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 1 210.269927 210.277689 off (bb, 70, 4.0, 4.0, 4.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 1 210.278115 210.285574 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 1 210.313259 210.320871 off (nb, 75, 24.0, 16.0, 24.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9 1 210.321592 210.329042 off (bb, 24, 12.0, 16.0, 13.2)
10 1 210.333779 210.341195 off (bb, 24, 12.0, 16.0, 13.2) (nb, 12, 24.0, 16.0, 24.0)
11 1 210.341985 210.349597 off (nb, 12, 24.0, 16.0, 24.0)
12 1 210.350284 210.360952 off (bb, 24, 12.0, 16.0, 13.2)
13 1 210.361590 210.371785 off (bb, 24, 12.0, 16.0, 13.2) (nb, 12, 24.0, 16.0, 24.0)
14 1 210.372480 210.380118 off (nb, 12, 24.0, 16.0, 24.0)
15 1 210.380858 210.388416 off (bb, 24, 12.0, 16.0, 13.2)
16 1 210.388902 210.396403 off (bb, 24, 12.0, 16.0, 13.2) (nb, 12, 24.0, 16.0, 24.0)
17 1 210.397849 210.405430 off (nb, 12, 24.0, 16.0, 24.0)
18 1 210.405871 210.414423 off (bb, 24, 12.0, 16.0, 13.2)
19 2 210.414828 210.422444 off (bb, 24, 12.0, 16.0, 13.2) (nb, 12, 24.0, 16.0, 24.0)

------------------- sr1601_16 -------------------

------------------- (wh300) -------------------
------------------- (os150) -------------------
0 1 210.626892 210.627962 on (bb, 70, 4.0, 4.0, 4.0) (nb, 35, 8.0, 4.0, 8.0)
1 4 210.628334 210.891515 on (bb, 70, 4.0, 4.0, 4.0)

------------------- sr1601_01 -------------------

------------------- (wh300) -------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 50, 2.0, 4.0, 2.0) 4
None
------------------- (os150) -------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 55, 4.0, 4.0, 4.0) 4
None
------------------- (os38) -------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 100, 12.0, 16.0, 13.2) 4
None

------------------- sr1601_02 -------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  4
None

------------------- (os150) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 50, 8.0, 4.0, 8.0)  4
None

------------------- (os38) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 75, 24.0, 16.0, 24.0)  4
None

------------------- sr1601_03 ------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  12
None

------------------- (os150) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 50, 8.0, 4.0, 8.0)  12
None

------------------- (os38) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 75, 24.0, 16.0, 24.0)  12
None

------------------- sr1601_04 ------------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  2
None

------------------- (os150) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 55, 4.0, 4.0, 4.0)  2
1  (nb, 50, 8.0, 4.0, 8.0)  2
None

------------------- (os38) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 100, 12.0, 16.0, 13.2)  2
1 (nb, 75, 24.0, 16.0, 24.0) 2
None

================== sr1601_05 =================

-------------- (wh300) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 50, 2.0, 4.0, 2.0) 1
None
-------------- (os150) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 55, 4.0, 4.0, 4.0) 1
1 (nb, 50, 8.0, 4.0, 8.0) 1
None
-------------- (os38) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 100, 12.0, 16.0, 13.2) 1
1 (nb, 75, 24.0, 16.0, 24.0) 1
None

================== sr1601_06 =================

-------------- (wh300) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 50, 2.0, 4.0, 2.0) 2
None
-------------- (os150) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 55, 4.0, 4.0, 4.0) 6
1 (nb, 50, 8.0, 4.0, 8.0) 6
2 (bb, 60, 4.0, 4.0, 4.0) 4
3 (nb, 55, 8.0, 4.0, 8.0) 4
None
-------------- (os38) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 100, 12.0, 16.0, 13.2) 10
1 (nb, 75, 24.0, 16.0, 24.0) 10
None

================== sr1601_07 =================

-------------- (wh300) --------------
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  1
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 50, 8.0, 4.0, 8.0)  1
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (nb, 75, 24.0, 16.0, 24.0)  1
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  8
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 55, 4.0, 4.0, 4.0)  8
1  (nb, 50, 8.0, 4.0, 8.0)  8
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 100, 12.0, 16.0, 13.2)  8
1  (nb, 75, 24.0, 16.0, 24.0)  8
None

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0  (bb, 50, 2.0, 4.0, 2.0)  5
None
# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 55, 4.0, 4.0, 4.0) 5
1 (nb, 50, 8.0, 4.0, 8.0) 5
None

------------------- (os38) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 100, 12.0, 16.0, 13.2) 5
1 (nb, 75, 24.0, 16.0, 24.0) 5
None

================== sr1601_11 =================

------------------- (wh300) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 50, 2.0, 4.0, 2.0) 1
None

------------------- (os150) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 55, 4.0, 4.0, 4.0) 3
1 (nb, 50, 8.0, 4.0, 8.0) 3
None

------------------- (os38) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (nb, 75, 24.0, 16.0, 24.0) 6
1 (bb, 100, 12.0, 16.0, 13.2) 4
None

================== sr1601_12 =================

------------------- (wh300) --------------

------------------- (os150) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (nb, 50, 8.0, 4.0, 8.0) 1
None

------------------- (os38) --------------

# index (ping, NCells, CellSize, Blank, Pulse) nfiles
0 (bb, 100, 12.0, 16.0, 13.2) 1
None

================== sr1601_13 =================

------------------- (wh300) --------------
<table>
<thead>
<tr>
<th>index (ping, NCells, CellSize, Blank, Pulse) nfiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  (bb, 50, 2.0, 4.0, 2.0)     25</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os150)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 55, 4.0, 4.0, 4.0)     13</td>
</tr>
<tr>
<td>1  (nb, 50, 8.0, 4.0, 8.0)     16</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os38)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (nb, 75, 24.0, 16.0, 24.0)     2</td>
</tr>
<tr>
<td>1  (bb, 100, 12.0, 16.0, 13.2)     2</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>sr1601_14</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(wh300)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 50, 2.0, 4.0, 2.0)     2</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os150)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 55, 4.0, 4.0, 4.0)     2</td>
</tr>
<tr>
<td>1  (nb, 50, 8.0, 4.0, 8.0)     2</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os38)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 50, 2.0, 4.0, 2.0)     1</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(wh300)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 55, 4.0, 4.0, 4.0)     1</td>
</tr>
<tr>
<td>1  (nb, 50, 8.0, 4.0, 8.0)     1</td>
</tr>
<tr>
<td>2  (nb, 35, 8.0, 4.0, 8.0)     12</td>
</tr>
<tr>
<td>3  (bb, 70, 4.0, 4.0, 4.0)     12</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os150)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
<tr>
<td>0  (bb, 55, 4.0, 4.0, 4.0)     1</td>
</tr>
<tr>
<td>1  (nb, 50, 8.0, 4.0, 8.0)     1</td>
</tr>
<tr>
<td>2  (nb, 35, 8.0, 4.0, 8.0)     12</td>
</tr>
<tr>
<td>3  (bb, 70, 4.0, 4.0, 4.0)     12</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>(os38)</td>
</tr>
<tr>
<td># index (ping, NCells, CellSize, Blank, Pulse) nfiles</td>
</tr>
</tbody>
</table>
## Appendix 2

### 6.1 WH300 HAT (Harbor Acceptance Trial)

Connect the WH ADCP to power and the PC as described in the manual. Turn on power to the WH ADCP.

The results of all tests will be printed to the screen and saved to the log file WH_TESTS.TXT. A file called WH_TESTS.TXT with the results of this test will be created in the same directory as the BBTALK program is running from.

The following tests will be performed:

- **PA** Basic Internal System Tests
- **PC2** Sensor Verification Test
- **PC1** Beam Continuity Test

Program is delaying 20 seconds before continuing. Press <Enter> to continue.

PA -- Basic Internal System Tests

The following tests will verify that the internal electronics are performing correctly. These tests are best run when the transducer...
[face is submerged in water. A bucket of water deep enough to cover
the transducer beams is all that is needed. If done in air some tests
may fail.]

Program is delaying 10 seconds before continuing.
Press <Enter> to continue.

[===============================================================]

[ Sending a break to Wake Up the System

[BREAK Wakeup B]
WorkHorse Mariner ADCP Version 52.40
Teledyne RD Instruments (c) 1996-2010
All Rights Reserved.
>
[===============================================================]

[ Restoring factory defaults into temporary memory for TEST.

CR1
[Parameters set to FACTORY defaults]
>
[===============================================================]

[ Collecting system specific data.

TS?
TS 16/07/13,12:46:52 --- Time Set (yr/mon/day,hour:min:sec)
>PS0
Instrument S/N:  19167
Frequency:  307200 HZ
Configuration:  4 BEAM, JANUS
Match Layer:  10
Beam Angle:  20 DEGREES
Beam Pattern:  CONVEX
Orientation:  DOWN
Sensor(s):  HEADING TILT 1 TILT 2 TEMPERATURE
Temp Sens Offset:  -0.14 degrees C
CPU Firmware:  52.40 [0]
Boot Code Ver:  Required:  1.16 Actual:  1.16
DEMOD #1 Ver:  ad48, Type:  1f
DEMOD #2 Ver:  ad48, Type:  1f
PWRTIMG Ver:  85d3, Type:   7

Board Serial Number Data:
F4  00 00 06 FF 1C 36  09 REC727-1000-04E
91  00 00 06 FE B8 F5  09 CPU727-2011-00E
15  00 00 06 FF 02 7B  09 DSP727-2001-04H
20  00 00 07 28 58 4F  09 PIO727-3000-00G
>PS3
Beam Width:   3.7 degrees

Beam   Elevation   Azimuth
1    -70.06   269.90
2    -70.12   89.90
3    -70.11    0.09
4    -70.17  180.10

Beam Directional Matrix (Down):
Instrument Transformation Matrix (Down):

\[
\begin{bmatrix}
0.3411 & 0.0006 & 0.9400 & 0.2402 \\
-0.3400 & -0.0006 & 0.9404 & 0.2410 \\
-0.0006 & -0.3403 & 0.9403 & -0.2401 \\
0.0006 & 0.3393 & 0.9407 & -0.2409
\end{bmatrix}
\]

Beam Angle Corrections Are Loaded.

>)

[======================================================================]
[                                                                         ]
[ Starting the Automated Tests.                                          ]
[                                                                         ]
PA

PRE-DEPLOYMENT TESTS

CPU TESTS:
- RTC......................................PASS
- RAM......................................PASS
- ROM......................................PASS

RECORER TESTS:
- PC Card #0................................NOT DETECTED
- PC Card #1................................NOT DETECTED

DSP TESTS:
- Timing RAM................................PASS
- Demod RAM................................PASS
- Demod REG................................PASS
- FIFOs....................................PASS

SYSTEM TESTS:
- XILINX Interrupts... IRQ3 IRQ3 IRQ3 ...PASS
- Wide Bandwidth..........................PASS
- Narrow Bandwidth........................PASS
- RSSI Filter..............................PASS
- Transmit..................................PASS

SENSOR TESTS:
- H/W Operation............................PASS

>)

All of the above tests should have passed. Review the file WH_TESTS.TXT
to verify your tests results. Remember that some tests will fail
unless the transducer is immersed in water. Consult your Technical
Manual for trouble shooting tips if this test did not pass.

Program is delaying 15 seconds before continuing.
Press <Enter> to continue.
This test in itself does not calibrate or confirm the accuracy of the sensors. However, if you turn and till the ADCP while comparing the output to a known reference then you can confirm the accuracy.

The following test is best run when the transducer face is in air and the transducer is pointing the direction you intend to deploy the instrument.

This test will continue to run until you stop the test.

Program is delaying 20 seconds before continuing.
Press <Enter> to continue.

Sending a break to Wake Up the System

[BREAK Wakeup B]
WorkHorse Mariner ADCP Version 52.40
Teledyne RD Instruments (c) 1996-2010
All Rights Reserved.

Press any key to quit sensor display ...

PC2

All Sensors are Internal Only.

<table>
<thead>
<tr>
<th>Heading</th>
<th>Pitch</th>
<th>Roll</th>
<th>Up/Down</th>
<th>Attitude Temp</th>
<th>Ambient Temp</th>
<th>PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.96°</td>
<td>0.06°</td>
<td>0.41°</td>
<td>Down</td>
<td>13.69°C</td>
<td>12.50°C</td>
<td>0.0 kPa</td>
</tr>
</tbody>
</table>

The Sensor test is complete. The heading, pitch, roll sensors should have changed as you turned and tilted the system. The Up/Down setting should have agreed with the direction of your ADCP transducer. The ambient temperature and pressure (if installed) should have been reasonable values.

All of the above tests should have passed. Review the file WH_TESTS.TXT to verify your tests results. Consult your Technical Manual for troubleshooting tips if this test did not pass.

Program is delaying 10 seconds before continuing.
Press <Enter> to continue.

61.89° 0.05° 0.41° Down 13.74°C 12.50°C 0.0 kPa

PC1 -- Beam Continuity Test
The following test will confirm that each of the beams on your transducer is capable of receiving signals. This test must be run in air and free of external interference to pass.

This test will require you to rub each of the beams on the transducer. This is done with quick rubbing movements across each of the urethane faces.
Program is delaying 25 seconds before continuing. Press <Enter> to continue.

61.99º  0.08º  0.40º    Down        13.76ºC        12.52ºC         0.0 kPa

Sending a break to Wake Up the System

[BREAK Wakeup B]

BEAM CONTINUITY TEST

When prompted to do so, vigorously rub the selected beam's face.

If a beam does not PASS the test, send any character to the ADCP to automatically select the next beam.

Collecting Statistical Data...

48  53  54  55

Rub Beam 1 = PASS
Rub Beam 2 = PASS
Rub Beam 3 = PASS
Rub Beam 4 = PASS

The Beam Continuity test is complete. Each of the beams should have passed. Review the file WH_TESTS.TXT to verify your tests results. Consult your Technical Manual for trouble-shooting tips if this test did not pass.

All tests have been run and if passed your system is ready for deployment.

6.2 OS150 HAT (Harbor Acceptance Trial)
[ abort test at this time press <F2> now! ]

[ Connect the OS ADCP to power and the PC as described in the manual. ]
[ Turn on power to the OS ADCP. ]

[ The results of all tests will be printed to the screen and saved to the ]
[ log file OS_TESTS.TXT. A file called OS_TESTS.TXT with the results of ]
[ this test will be created in the same directory as the BBTALK program ]
[ is running from. ]

[ The following tests will be performed: ]
[ ]
[ PA   RAM, ROM, Recieve & Bandwidth Tests ]
[ PT3  Interference Verification Test ]
[ PT6  Bandwidth Verification Test ]

[ Program is delaying 60 seconds before continuing. ]
[ Press <Enter> to continue. ]

>

===============================================

[ Sending a break to Wake Up the System ]

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

>

===============================================

[ Restoring factory defaults into temporary memory for TEST. ]
[ ]
[ CR1 ]
[ Parameters set to FACTORY defaults ]

>

===============================================

[ Collecting system specific data. ]

[ TS? ]

TS 16/07/13,15:27:00.63 --------- Set System Date and Time
>PS0

  Frequency: 153600 HZ
  Configuration: 4 BEAM, JANUS
  Transducer Type: ROUND 32x32
  Beamformer Rev: A02 or later
    Beam Angle: 30 DEGREES
  Beam Pattern: CONVEX
  Orientation: DOWN
  CPU Firmware: 23.17
  FPGA Version: AA
  Sensors: TEMP SYNCHRO

>

===============================================

[ Starting the RAM and ROM Tests. ]

PA
RAM test..........PASS
ROM test............PASS
Receive test.......PASS
Bandwidth test.....PASS

> [ Both of the above test should display a PASS condition. You can review the file OS_TESTS.TXT to verify results. Consult your Technical Manual for trouble shooting tips if this test did not pass. ]
Program is delaying 30 seconds before continuing.
Press <Enter> to continue.

[ ]
[ PT3 -- Interference Verification Test ]
The following tests will verify that the internal electronics are not being interfered with. Be sure that all sonar devices and any other device which may emit a signal that can interfere with the ADCP is turned off. This includes some PC monitors.
Program is delaying 30 seconds before continuing.
Press <Enter> to continue.

[ ]
[ Sending a break to Wake Up the System ]

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

> [ Starting the Interference Test. ]
PT3
Correlation Magnitude:

<table>
<thead>
<tr>
<th>Lag</th>
<th>Bm1</th>
<th>Bm2</th>
<th>Bm3</th>
<th>Bm4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
<td>0.81</td>
</tr>
<tr>
<td>2</td>
<td>0.42</td>
<td>0.42</td>
<td>0.40</td>
<td>0.41</td>
</tr>
<tr>
<td>3</td>
<td>0.12</td>
<td>0.10</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>4</td>
<td>0.03</td>
<td>0.04</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>0.04</td>
<td>0.06</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>7</td>
<td>0.01</td>
<td>0.00</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

RSSI: 29 24 17 17

PASSED

> [ Review the file OS_TESTS.TXT to verify results. Compare the results from the above test to your Technical Manual. Remember that this test will fail unless the transducer is immersed in water and if there are external devices operating at the same time. Consult your Technical ]
PT6 -- Bandwidth Verification Test

The following tests will verify that the transducer and its receive circuitry are working properly. Be sure that all sonar devices and any other device which may emit a signal that can interfere with the ADCP is turned off. This includes some PC monitors.

Program is delaying 30 seconds before continuing.
Press <Enter> to continue.

............................................................................

Sending a break to Wake Up the System

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

> 

Starting the Bandwidth Test.
PT6
Receive Bandwidth:

<table>
<thead>
<tr>
<th>Expected</th>
<th>Bm1</th>
<th>Bm2</th>
<th>Bm3</th>
<th>Bm4</th>
</tr>
</thead>
<tbody>
<tr>
<td>15500</td>
<td>14965</td>
<td>15218</td>
<td>15169</td>
<td>15113</td>
</tr>
</tbody>
</table>

PASSED

>

Review the file OS_TESTS.TXT to verify results. Compare the results from the above test to your Technical Manual. Remember that this test will fail unless the transducer is immersed in water and if there are external devices operating at the same time. Consult your Technical Manual for trouble shooting tips if this test did not pass.

All tests have been run and if passed your system is ready for deployment.

jules@manamana groom]$ 6.3 OS38 HAT (Harbor Acceptance Trial)

OS ADCP Test

The following tests are basic tests which will confirm that your system is ready for use. All tests will need to be run with the system in
- water.

- !!!!!!!!!! MAKE SURE YOUR TRANSDUCER IS IN WATER AT THIS TIME !!!!!!!!!!

- Failure to do so may result in irreparable damage to your system! To abort test at this time press <F2> now!

- Connect the OS ADCP to power and the PC as described in the manual. Turn on power to the OS ADCP.

- The results of all tests will be printed to the screen and saved to the log file OS_TESTS.TXT. A file called OS_TESTS.TXT with the results of this test will be created in the same directory as the BBTALK program is running from.

- The following tests will be performed:

  - PA    RAM, ROM, Recieve & Bandwidth Tests
  - PT3   Interference Verification Test
  - PT6   Bandwidth Verification Test

- Program is delaying 60 seconds before continuing. Press <Enter> to continue.

- Sending a break to Wake Up the System

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

>  RS232 Communication Enabled

CR1
[Parameters set to FACTORY defaults]

>  RS232 Communication Enabled

Collecting system specific data.
TS?
TS 16/07/13,14:47:51.24 --------- Set System Date and Time

>PS0
  Frequency: 38400 HZ
  Configuration: 4 BEAM, JANUS
  Transducer Type: ROUND 36x36
  Beamformer Rev: A02 or later
  Beam Angle: 30 DEGREES
  Beam Pattern: CONVEX
  Orientation: DOWN
  CPU Firmware: 23.17
  FPGA Version: AA
  Sensors: TEMP SYNCHRO

>
Starting the RAM and ROM Tests.

PA

RAM test...........PASS
ROM test...........PASS
Receive test.......PASS
Bandwidth test.....PASS

Both of the above test should display a PASS condition. You can review the file OS_TESTS.TXT to verify results. Consult your Technical Manual for trouble shooting tips if this test did not pass.

Program is delaying 30 seconds before continuing.
Press <Enter> to continue.

---

PT3 -- Interference Verification Test

The following tests will verify that the internal electronics are not being interfered with. Be sure that all sonar devices and any other device which may emit a signal that can interfere with the ADCP is turned off. This includes some PC monitors.

Program is delaying 30 seconds before continuing.
Press <Enter> to continue.

---

Sending a break to Wake Up the System

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

---

Starting the Interference Test.

PT3

Correlation Magnitude:

<table>
<thead>
<tr>
<th>Lag</th>
<th>Bm1</th>
<th>Bm2</th>
<th>Bm3</th>
<th>Bm4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>2</td>
<td>0.41</td>
<td>0.40</td>
<td>0.38</td>
<td>0.38</td>
</tr>
<tr>
<td>3</td>
<td>0.09</td>
<td>0.08</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>4</td>
<td>0.05</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>0.03</td>
<td>0.06</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>0.03</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>7</td>
<td>0.04</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>

RSSI: 2 4 24 11

PASSED
Review the file OS_TESTS.TXT to verify results. Compare the results from the above test to your Technical Manual. Remember that this test will fail unless the transducer is immersed in water and if there are external devices operating at the same time. Consult your Technical Manual for trouble shooting tips if this test did not pass.

Program is delaying 30 seconds before continuing. Press <Enter> to continue.

---------
PT6 -- Bandwidth Verification Test
The following tests will verify that the transducer and its receive circuitry are working properly. Be sure that all sonar devices and any other device which may emit a signal that can interfere with the ADCP is turned off. This includes some PC monitors.

Program is delaying 30 seconds before continuing. Press <Enter> to continue.

---------
Sending a break to Wake Up the System

Ocean Surveyor Broadband/Narrowband ADCP
Teledyne RD Instruments (c) 1997-2008
All rights reserved.
Firmware Version: 23.17

> ---------
[ Starting the Bandwidth Test. ]
[ PT6 ]
[ Receive Bandwidth: ]

Expected Bm1 Bm2 Bm3 Bm4
-------- ------ ------ ------ ------
3875   3788   3787   3804   3832
PASSED

> ---------
Review the file OS_TESTS.TXT to verify results. Compare the results from the above test to your Technical Manual. Remember that this test will fail unless the transducer is immersed in water and if there are external devices operating at the same time. Consult your Technical Manual for trouble shooting tips if this test did not pass.

---------
All tests have been run and if passed your system is ready for deployment.