TN400 ADCP cruise report

Purpose: troubleshoot the electrical noise in the os75.

Abstract:
When electrical interference was present in the computer lab with the long cable, it went away when we went down to the laundry room and used the short cable, and was still present when we logged data back up in the computer lab with the long cable. The electrical noise is getting in through the long cable.

The electrical noise is intermittent. The presence of electrical noise in the velocities was only obvious at slower-than-underway speeds, possibly because the range decreased just enough to hide it. The stability of the temperature signal correlated strongly with the presence (or absence) of noise in the velocities.

Electrical noise is intermittent, but is getting in through the long RDI cable. Moving the deck unit and UPS to the laundry room to use the short cable removed the electrical noise.

Tests:
- Only the first test (laundry room) did not use a UPS.
  Electrical interference depended on the power source

All the rest did use UPS power
- second test (computer lab): No electrical interference was found regardless of outlet

- third test
  - (a) "part08" (computer lab): Electrical interference was found under many circumstances
  - (b) "part11" (laundry): no electrical noise
  - (c) "part12" (computer lab): Electrical noise still present

Test 1:
Speed and power source testing in the laundry room with the short RDI cable. No UPS was used for these tests. Electrical interference was present on some of the power sources. Only one caused interference problems with broadband mode.

Test 2:
Two speed tests with different sources of power from UPS - the circuit (main UPS for the computer lab) and the old pre-shipyard rack-mounted UPS, powered from different power sources (plugs). No interference was detected.

Test 3:
Test 3 was precipitated by a serendipitous slowdown of the ship to change which engine was being
used for the autopilot. Electrical interference was detected when the ship slowed down.

Since the electrical interference was apparently back, we immediately started testing. This time, we started with the usual long RDI cable and the deck unit in the rack. We worked out a plan with the engine room to test the two engines in autopilot and to try different power sources. The electrical noise was persistent.

(A) Engine and Power Tests

We tested the use of autopilot on either port and starboard engine, and tested a variety of power sources (main lab UPS, rack-mounted UPS on clean power or dirty power) and the electrical noise was persistent. These tests used the long RDI cable, with the deck unit and the power all in the computer lab. The interference is identifiable because (1) it occurs below the range that the instrument should normally acquire good data, about 700m in this case, and (2) it is strongly biased. The bias is most obvious when the ship is sailing at 5-8kts.

(B) Laundry room, short RDI cable, UPS

With the short RDI cable and the Rack-mounted UPS, we collected data in the laundry room. This data collection showed no signs of the electrical interference.

(C) Computer lab, UPS, long RDI cable

Collecting data again with the long cable revealed the interference was still present.

Extra bonus: Temperature stability

Plotting the temperature for the whole cruise showed that when we did not see interference, the temperature deviations were very small. But when interference was present, the temperature deviations were larger. This was particularly striking in the last short-cable test. The temperature deviations before and after the short-cable test were high (when the long cable was used and the electrical interference was obvious). But during the short-cable test, when no interference was visible, the temperatures were stable.

Tests: details

Items in blue used the regular long RDI cable
Items in brown used the shorter pigtail, with the deck unit in the laundry room
== overview ==

<table>
<thead>
<tr>
<th>segment name</th>
<th>computer</th>
<th>programs</th>
<th>date range</th>
<th>interference detected?</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN400_part00</td>
<td>currents03tt</td>
<td>stage</td>
<td>2022/03/12 17:30 to 2022/03/14 02:34</td>
<td>NO</td>
</tr>
<tr>
<td>TN400_part01</td>
<td>currents03tt</td>
<td>(stable)</td>
<td>2022/03/12 17:30 to 2022/03/14 02:34</td>
<td>NO</td>
</tr>
</tbody>
</table>

**laundry room tests, no UPS**

| TN400_os75_02 | octopus | (*) stable | 2022/03/12 22:57 to 2022/03/13 01:48 | YES                     |

**computer lab tests with UPS**

| TN400_part02 | currents03tt | (*) stable | 2022/03/14 02:38 to 2022/03/15 21:56 | NO                     |

- Upgrade currents04tt to Ubuntu 20.04
- update software to programs_stage
- development, upgrade currents03tt to ubuntu 20.04

**computer lab tests with UPS**

| TN400_part03 | currents04tt | stage        | 2022/03/15 22:05 to 2022/03/15 23:51 | NO                     |
| TN400_part04 | currents04tt | stage        | 2022/03/16 00:39 to 2022/03/16 02:45 | NO                     |
| TN400_part05 | currents04tt | stage        | 2022/03/16 04:16 to 2022/03/16 17:36 | NO                     |
| TN400_part06 | currents04tt | stage        | 2022/03/16 19:01 to 2022/03/16 19:47 | NO                     |
| TN400_part07 | currents04tt | stage        | 2022/03/16 19:54 to 2022/03/18 02:02 | NO                     |

- interference detected at slow speed (segment 08)

| TN400_part08 | currents04tt | stage        | 2022/03/18 02:13 to 2022/03/19 04:11 | YES                     |
| TN400_part09 | currents04tt | stage        | 2022/03/19 16:28 to 2022/03/19 16:29 | NO                     |

**Computer lab tests with UPS**

| TN400_part10 | currents04tt | (*) stage | 2022/03/19 16:30 to 2022/03/20 04:24 | YES                     |

**laundry room tests, with UPS**

| TN400_part11_os75 | octopus | (*) stable | 2022/03/20 02:56 to 2022/03/20 03:45 | NO                     |

**Computer lab tests with UPS**

| TN400_part12 | currents04tt | (*) stage | 2022/03/20 04:29 to 2022/03/20 17:22 | YES                     |

(*) = testing

== overview ==

Starting out:

2022-03-12 17:28:09,072 INFO StartCruise, new, cruiseid is TN400

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March 12
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currents03tt: logging data under TN400,
- wh300 pinging
- os75 in laundry room

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March 12 (late, into 3/13)
March 13 test (short pigtail, deck unit in laundry room)
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octopus: testing

startdd enddd start date, time end circuit where description cable len speed
70.957 to 70.986 2022/03/12 22:57 to 23:39 L120 laundry dirty power 6’ 12, 8, 5, 3
70.987 to 71.001 2022/03/12 23:40 to 00:01 UPS complab LAB UPS 200’ 8, 3
71.002 to 71.005 2022/03/13 00:02 to 00:07 SP204 complab starboard 200’ 3
71.007 to 71.015 2022/03/13 00:09 to 00:21 SP204 complab port 200’ 3
71.016 to 71.039 2022/03/13 00:22 to 00:56 ?? head unknown 200’ 3, 8
71.042 to 71.047 2022/03/13 01:00 to 01:08 ?? hall unknown 200’ 12
71.048 to 71.075 2022/03/13 01:08 to 01:48 L120 laundry dirty power 6’ 12

see figs march13-pigtail*.png

power sources:
- a 200’ extension cord (or not)
- outlets:
  "clean power" SP204 (no UPS)
  "dirty power" hall, head (no UPS)
UPS Computer lab UPS circuit

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currents03tt: continue running with wh300 only
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reconnect long ADCP cable (replace pigtail)

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March 14
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testing os75 in the computer lab with the long cable.

First tests:
- compare 6' power cable on UPS-circuit and UPS-rack (plugged into SP204, as usual)
- add 30' extension cable: any difference?
- now compare UPS-rack plugged into SP204, hall, head (no difference)
- start speed test, settle on comparing 6'+30' power cable
  - UPS-rack plugged into SP204
  - lab UPS circuit
- move to on comparing 6' (no extension cable)
  - UPS-rack plugged into SP204
  - lab UPS circuit

details:

<table>
<thead>
<tr>
<th>speed</th>
<th>power</th>
<th>ext-cable</th>
<th>duration</th>
<th>start time</th>
</tr>
</thead>
<tbody>
<tr>
<td>12kts</td>
<td>UPS-wall</td>
<td>6'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 22:44:40 +0000</td>
</tr>
<tr>
<td>12kts</td>
<td>UPS-rack-SP204</td>
<td>6'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 22:56:17 +0000</td>
</tr>
<tr>
<td>12kts</td>
<td>UPS-rack-SP204</td>
<td>6'+30'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 23:07:49 +0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UPG-rack to ...</td>
</tr>
<tr>
<td>12kts</td>
<td>hall</td>
<td>6'+30'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 23:19:51 +0000</td>
</tr>
<tr>
<td>12kts</td>
<td>head</td>
<td>6'+30'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 23:32:04 +0000</td>
</tr>
<tr>
<td>12kts</td>
<td>SP204</td>
<td>6'+30'</td>
<td>10'</td>
<td>Sun, 13 Mar 2022 23:43:45 +0000</td>
</tr>
<tr>
<td>0 kts</td>
<td>SP204</td>
<td>6'+30'</td>
<td>10'</td>
<td>oops - wh300 failed to communicate</td>
</tr>
<tr>
<td>0kts</td>
<td>UPS-wall</td>
<td>6'</td>
<td>10'</td>
<td>powered all down; reset USB-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>serial</td>
</tr>
<tr>
<td>0-3kts</td>
<td>UPS-wall</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 00:39:37 +0000</td>
</tr>
<tr>
<td>3kts</td>
<td>SP204-rack</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 00:51:33 +0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UPG-rack to ...</td>
</tr>
<tr>
<td>3-5kts</td>
<td>SP204-rack</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 01:22:03 +0000</td>
</tr>
<tr>
<td>5kts</td>
<td>UPS-wall</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 01:45:19 +0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(continue)</td>
</tr>
<tr>
<td>5kts-8kts</td>
<td>UPS-wall</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 02:12:36 +0000</td>
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<tr>
<td>8kts</td>
<td>SP204-rack</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 02:12:36 +0000</td>
</tr>
<tr>
<td>8-12kts</td>
<td>SP204-rack</td>
<td>6'</td>
<td>10'</td>
<td>Mon, 14 Mar 2022 02:12:36 +0000</td>
</tr>
</tbody>
</table>

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Continuing
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currents03tt: logging data on wh300, os75bb, os75nb
Mon Mar 14 13:20:59 UTC 2022

revert this:
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pycurrents/adcp/adcp_specs.py

orig: 'refavg_valcutoff': 1,
test: 'refavg_valcutoff': 0.5, # Thompson electrical noise #1,

------------
Mark (engineer) is turning on a VM drive
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Mon, 14 Mar 2022 17:57:31 +0000

No change seen.

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more tests at the end, (*)

Now changing computers and trying programs_stage

TN400_part2 currents03tt stable 2022/03/14 02:38 to 2022/03/15 21:56
TN400_part3 currents04tt stage 2022/03/15 22:05 to 2022/03/15 23:51
TN400_part4 currents04tt stage 2022/03/16 00:39 to 2022/03/16 02:45
TN400_part5 currents04tt stage 2022/03/16 04:16 to 2022/03/16 17:36
TN400_part6 currents04tt stage 2022/03/16 19:01 to 2022/03/16 19:47
TN400_part7 currents04tt stage 2022/03/16 19:54 to 2022/03/18 02:02
TN400_part8 currents04tt (*) stage 2022/03/18 02:13 to 2022/03/19 04:11

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Power source tests in the computer lab, with the long cable

cd /Users/jules/data/uhdas_data_archive/evaluate/thompson/TN400_legs/TN400_part8/raw/os75

2022-03-18 02:11 to 2022-03-18 21:15 (76.091 to 76.885) ?? circuit UPS
2022-03-18 21:15 to 2022-03-18 23:48 (76.886 to 76.992) ?? circuit UPS
2022-03-18 23:49 to 2022-03-19 00:35 (76.992 to 77.025) ?? circuit UPS
Mar 18 23:59 tt2022_076_85747.raw
Mar 19 00:35 tt2022_077_00000.raw

2022-03-19 00:36 to 2022-03-19 00:47 (77.025 to 77.033) slow down; circuit UPS
2022-03-19 00:47 to 2022-03-19 00:54 (77.033 to 77.038) circuit UPS
Mar 19 00:47 tt2022_077_02170.raw

2022-03-19 00:56 to 2022-03-19 01:09 (77.040 to 77.048) rack UPS (SP)
Mar 19 00:54 tt2022_077_02874.raw

2022-03-19 01:10 to 2022-03-19 01:20 (77.049 to 77.056) hall, no UPS
Mar 19 01:08 tt2022_077_03415.raw

2022-03-19 01:21 to 2022-03-19 01:28 (77.057 to 77.061) rack UPS: hall power
Mar 19 01:20 tt2022_077_04209.raw

2022-03-19 01:29 to 2022-03-19 02:34 (77.062 to 77.107) speed up; circuit UPS
Mar 19 01:28 tt2022_077_04910.raw

2022-03-19 01:45 slow down; circuit UPS; VF already on (engineering)
2022-03-19 02:06 circuit UPS; VF off(engineering)
2022-03-19 02:17 circuit UPS; VF off(hydrolab)
2022-03-19 02:22 circuit UPS; Knudsen deck unit off
2022-03-19 02:35 to 2022-03-19 04:04 (77.108 to 77.169) speed up
Mar 19 01:59 tt2022_077_05365.raw
Mar 19 02:34 tt2022_077_07200.raw

2022-03-19 04:04 to 2022-03-19 16:26 (77.170 to 77.685)
Mar 19 04:00 tt2022_077_09316.raw
Mar 19 04:03 tt2022_077_14400.raw
"SP power" = SP204 circuit = clean power

gens z-drive comment
---- ------- -------
1,3 whatever 12kts, TN400_part10, circuit UPS Sat, 19 Mar 2022 23:10:53
1,3 whatever 12kts, rack UPS Sat, 19 Mar 2022 23:41:10
1,3 s slow to 5kts Sat, 19 Mar 2022 23:22:49

confusion about settings

autopilot is on starboard, both are engaged
1,3 s port engaged 5kts, rack UPS - main lab SP power Sat, 19 Mar 2022 23:31:40
1,3 s port down 5kts, rack UPS - main lab SP power Sat, 19 Mar 2022 23:41:10

transition: switch (1,3) to (1,4), s auto, port engaged Sat, 19 Mar 2022 23:46:55

now switching to (1,4)
Sat, 19 Mar 2022 23:55:11

1,4 s port engaged 5kts, rack UPS - main lab SP power Sat, 19 Mar 2022 23:55:11
1,4 s port down 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:00:16

transition Sun, 20 Mar 2022 00:05:28 +0000 to Sun, 20 Mar 2022 00:05:28

3,4 s port engaged 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:05:28
3,4 s port down 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:14:10

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switching to port autopilot, Sun, 20 Mar 2022 00:20:17
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Now test 200' extension cable, same settings as before Sun, 20 Mar 2022 00:27:21
back to short AC extension cable Sun, 20 Mar 2022 00:34:47

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3,4 p stbd engaged 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:34:47
3,4 p stbd down 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:40:19
1,4 p stbd engaged 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:46:13
1,4 p stbd down 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:52:36

1,3 p starbd engaged 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 00:57:48
1,3 p starbd down 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 01:04:48
1,3 p starbd engaged 5kts, rack UPS - main lab SP power Sun, 20 Mar 2022 01:12:46

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switching to starboard autopilot, Sun, 20 Mar 2022 01:14:17

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TN400_part10 (os75)

tt2022_077_82974.raw:  77.960 to 77.965 2022/03/19 23:02:59 to 2022/03/19 23:10:16

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TN400_part11_os75 octopus (*) stable 2022/03/20 02:56 to 2022/03/20 03:45
tn2022_078_003376.raw: 78.004 to 78.005 2022/03/20 00:06:21 to 2022/03/20 00:07:31

TN400_part12 (os75) back in the computer lab

programs_stable_forships:

adcp_sphinxdoc 2e631dea77ac 264 default tip
codas3 eacdb5569261 275 default tip
pycurrents 8687ef55268c+ 3231+ default tip
uhdas 77c6f0367395 1464 default tip
onship 2decdb5c3153 1394 default tip
onship_private 1dc773ef2463 465 default tip
pytide 31840bbe046b 68 default tip
scripts 70062441e4e2 191 default tip

program_stage:

adcp_sphinxdoc 2e631dea77ac 264 default tip
codas3 eacdb5569261 275 default tip
pycurrents 8687ef55268c+ 3231+ default tip
uhdas 77c6f0367395 1464 default tip
onship 2decdb5c3153 1394 default tip
onship_private 1dc773ef2463 465 default tip
pytide 31840bbe046b 68 default tip
scripts 70062441e4e2 191 default tip