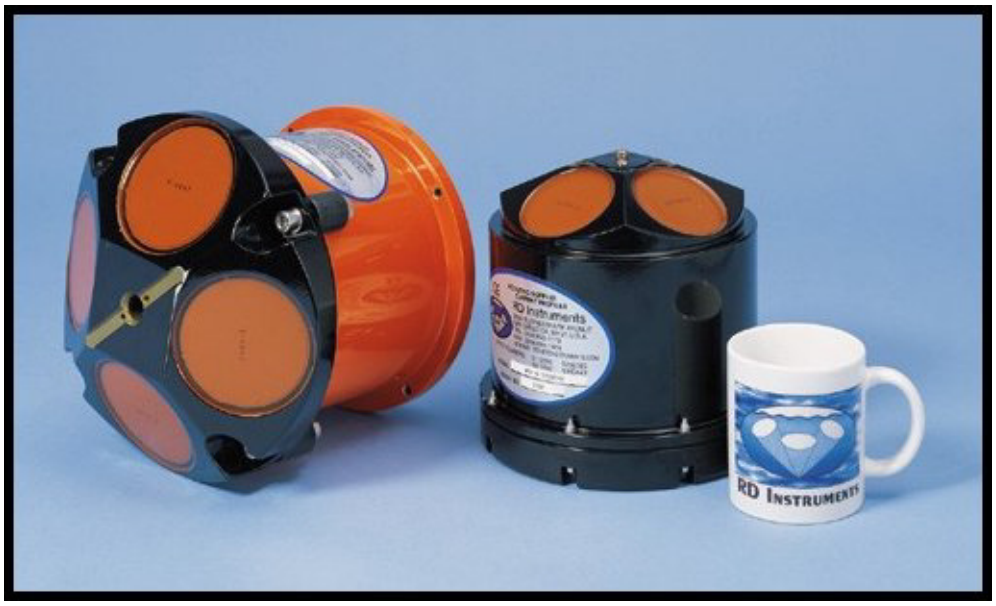
Navigator ADCP/DVL Test Guide



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RD Instruments
Acoustic Doppler Solutions

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Navigator Test Guide

1 Introduction

This guide explains how to test the Navigator using the *BBTalk* program. These tests thoroughly check the Navigator in a laboratory environment, but are no substitute for a practice deployment. You should test the Navigator:

- When you first receive the Navigator.
- Before each deployment or every six months.
- When you suspect instrument problems.
- After each deployment.

These test procedures assume all equipment is working. The tests can help you isolate problems to a major functional area of the Navigator. For troubleshooting information, see the Troubleshooting Guide.

2 Testing the Navigator with *BBTalk*

Use the following steps to test the ADCP/DVL.

a. Interconnect and apply power to the system as described in the Navigator User's Guide.

b. Start the *BBTalk* program (for help on using *BBTalk*, see the RDI Tools User's Guide).

c. Press **<F2>** and run the script file TestWH.txt. The TestWH.txt script file runs PS0, PS3, PA, PC2, and the PC1 tests. The results of the tests will be printed to the screen and saved to the log file WH_RSLTS.txt. The WH_RSLTS.txt file will be created in the same directory that *BBTalk* is running from.

3 Test Results

This section shows an example of the test result printout after running the *BBTalk* script file TestWH.txt.

NOTE. The built-in tests require you to immerse the transducer faces in water. If you do not, some of the tests may fail. Running the tests in air will not harm the ADCP/DVL.

3.1 Display System Parameters

This tells the ADCP/DVL to display specific information about your ADCP/DVL. For example:

```
>ps0
       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:  0.00 degrees C

    CPU Firmware:  8.22g Prototype
   Boot Code Ver:  Required:  1.13   Actual:  1.13
    DEMOD #1 Ver:  ad48, Type:  1f
    DEMOD #2 Ver:  ad48, Type:  1f
    PWRTIMG  Ver:  85d3, Type:   7

Board Serial Number Data:
   0F  00 00 00 98 F0 70  09 CPU727-2000-00G
   35  00 00 00 98 F2 AC  09 REC727-1000-06A
   B3  00 00 00 95 10 ED  09 DSP727-2001-06D
   20  00 00 00 B3 50 7B  09 PIO727-3002-06A
   26  00 00 00 C6 D5 FF  09 CAP727-3003-00A
```

Verify the information is consistent with what you know about the setup of your system. If PS0 does *not* list all your sensors, there is a problem with either the communications to the transducer or a problem with the receiver board.

3.2 Instrument Transformation Matrix

PS3 sends information about the transducer beams. The Navigator uses this information in its coordinate-transformation calculations; for example, the output may look like this:

```
ps3
Beam Width:   3.7 degrees

Beam     Elevation     Azimuth
  1         -70.14      269.72
  2         -70.10       89.72
  3         -69.99        0.28
  4         -70.01      180.28
```

```
Beam Directional Matrix (Down):
  0.3399    0.0017    0.9405    0.2414
 -0.3405   -0.0017    0.9403    0.2410
 -0.0017   -0.3424    0.9396   -0.2411
  0.0017    0.3420    0.9398   -0.2415

Instrument Transformation Matrix (Down):    Q14:
  1.4691   -1.4705    0.0078   -0.0067       24069  -24092     127    -109
 -0.0068    0.0078   -1.4618    1.4606        -111     127  -23950   23930
  0.2663    0.2657    0.2657    0.2661        4363    4354    4353    4359
  1.0367    1.0350   -1.0359   -1.0374       16985   16957  -16972  -16996
Beam Angle Corrections Are Loaded.
>
```

If the Navigator has beam angle errors, they are reflected in the instrument transformation matrix and the Beam Directional matrix. This matrix, when multiplied by the raw beam data gives currents in the *x*, *y*, *z*, and *e* directions.

3.3 Pre-deployment Test

This diagnostic test checks the major Navigator modules and signal paths. For example, the output may look like this:

```
>PA
PRE-DEPLOYMENT TESTS
CPU TESTS:
  RTC.....................................PASS
  RAM.....................................PASS
  ROM.....................................PASS
RECORDER 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
  Receive Loop-Back.......................PASS
  Wide Bandwidth..........................PASS
  Narrow Bandwidth........................PASS
  RSSI Filter.............................PASS
  Transmit................................PASS
SENSOR TESTS:
  H/W Operation...........................PASS
```

3.4 Display Heading, Pitch, Roll, and Orientation

The PC2 test displays heading, pitch angle, roll angle, up/down orientation and attitude temperature in a repeating loop at approximately 0.5-sec update rate. Any key pressed exits this command and returns the user to the command prompt.

```
Press any key to quit sensor display ...
Heading   Pitch    Roll   Up/Down    Attitude Temp   Ambient Temp  Pressure
301.01°  -7.42°  -0.73°     Up          24.35°C        22.97°C        0.0 kPa
300.87°  -7.60°  -0.95°     Up          24.36°C        22.97°C        0.0 kPa
300.69°  -7.61°  -0.96°     Up          24.35°C        22.98°C        0.0 kPa
300.76°  -7.60°  -0.98°     Up          24.38°C        22.97°C        0.0 kPa
```

3.5 Beam Continuity

The PC1 tests the beam continuity by measuring the quiescent Receiver Signal Strength Indicator (RSSI) levels. There must be a change of more than 30 counts when the transducer face is rubbed.

```
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/DVL to automatically select the next beam.

Collecting Statistical Data...
  52  48  50  43

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

4 Sea Acceptance Tests

This procedure is intended to test the Navigator at sea. This procedure assumes that the *BBTalk* tests have been run and that all of the items have passed or been confirmed to be operational. The following tests will not obtain favorable results unless all of this work has been performed.

The reason for Sea Acceptance Testing is that although the *BBTalk* Tests confirm the Navigator is operational, they do not confirm that the system is able to perform to its specifications. The performance of any ADCP/DVL relies greatly upon the installation into any platform. Therefore, the system must be tested at sea to understand the effects of the platform on the ADCP/DVL performance.

Equipment Required

- Navigator 300 kHz, 600 kHz, or 1200 kHz ADCP/DVL with firmware 9.xx or greater
- Computer running RDI's *GO-DVL* and *SHIPTRAK* Program

4.1 Bottom Tracking Test

The bottom tracking capability of the Navigator varies depending on the type of bottom (hard, soft, rock, sand, etc.), the slope of the bottom, and the speed of the vessel (background noise).

4.1.1 Bottom Tracking Platform Test Setup

The key to this test is to operate the system in an area where both the minimum and maximum bottom tracking range can be obtained. The platform will travel over water that is very shallow (<2 meters) to very deep (greater than the maximum bottom track range). It does not matter if the water starts deep and goes shallow or vice-versa.

The platform course for this test is a continuous straight line. The speed of the platform will be varied during this test. The following table lists the recommended speeds.

Table 1: Bottom Track Test Platform Speed

Test #	Speed
Speed 1	Drifting
Speed 2	3 knots
Speed 3	6 knots
Speed 4	9 knots
Speed 5	12 knots
Speed 6	Maximum Speed

4.1.2 Bottom Tracking Computer Screen Display Setup

View the Altitude data on the *SHIPTRAK* display window.

4.1.3 How to Determine Bottom Tracking Reasonableness

Viewing the bottom track Altitude data, record the maximum and minimum bottom track depths in the table below.

Beam #	Minimum Depth (meters)						Maximum Depth (meters)					
Speed	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
Beam 1												
Beam 2												
Beam 3												
Beam 4												

A pass condition is if the maximum depth of the system is equal to the specification for the nominal bottom track range.

Table 2: Navigator Altitude (Uncertainty±1%)

System Frequency	1200kHz	600kHz	300kHz
Maximum Altitude (m)	30	90	200
Minimum Altitude (m)	0.5	0.7	1.0