



Processing your Patch Test Data in the New MBMAX64

By Joe Burnett

In my previous article, '**Multibeam System Setup and Calibration**', I explained the procedures and orientations of your survey lines, for collecting your patch test data. In this article, I'm going to provide you with the HYPACK® method of processing your patch test data and give a more in-depth look at processing your patch test data in the new MBMAX64 (64-bit HYSWEEP® EDITOR). You may have different steps that you follow, but these are the steps that we recommend that you follow.

Important: The values produced from a patch test are statistical values and should be treated as such. The quality of the data, the area in which it was collected, the overlap of the lines and how the boat was driven for each test can and will significantly affect these statistical values.

PROCESS YOUR DATA

1. **Load all of your patch test data files into the editor and remove the 'spikes' from each file.**

Edit and remove what you consider to be false and erroneous data points ('spikes') from the data that you collected. If you do not remove these data points, they can and will influence the values that are produced from the patch test. Since your patch test files were collected over a short distance (usually 100 to 200 meters in length), removing the 'spikes' should be a relatively quick process.

2. **Save your edited files to the HS2 or HS2x format.**

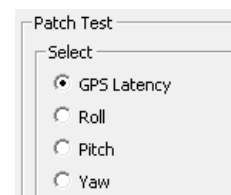
By editing all of the files at one time, you can now load them into MBMAX64 at one time and select them in groups for processing in the patch test. Repeating the loading process for each test within the patch test was a limitation in the 32-bit patch test.

PATCH TEST PROCESSING ORDER

When removing the 'spikes' from your patch test data, there is *no set order* in which you load the files and perform this part of the process; however, the order in which you perform the four (4) tests in the patch test, *does* make a difference. The HYPACK® preferred processing order is this:

1. Latency
2. Roll
3. Pitch
4. Yaw

Latency is done first, because the 'timing' for all of your data must be correct before you can perform any of the 'angular' tests.



Roll is tested second, since it was collected over a flat bottom and any 'positional' errors will not significantly affect the test results.

Pitch is third, mainly because the yaw test has to be last.

Yaw is last, because it 'needs' the initial 'rough' test values from the previous three (3) tests, in order to help it calculate the best yaw test value.

In the MBMAX32 (32-bit HYSWEEP® EDITOR) and MBMAX64 programs, the values calculated from each previous test can be 'applied' to the next group of files, for the next test to be performed. For example:

If your **latency** test produced a value of 0.15 seconds, that value (0.15 seconds) would be applied to the group of files that would be loaded into the roll test.

If the **roll** test produced a value of -2.65 degrees, both the latency value (0.15 seconds) and the roll value (-2.65 degrees) would be applied to the group of files that would be loaded into the pitch test.

If the **pitch** test produced a value of 3.35 degrees, the latency value (0.15 seconds), the roll value (-2.65 degrees), and the pitch value (3.35 degrees) would all be applied to the group of files that would be loaded into the yaw test.

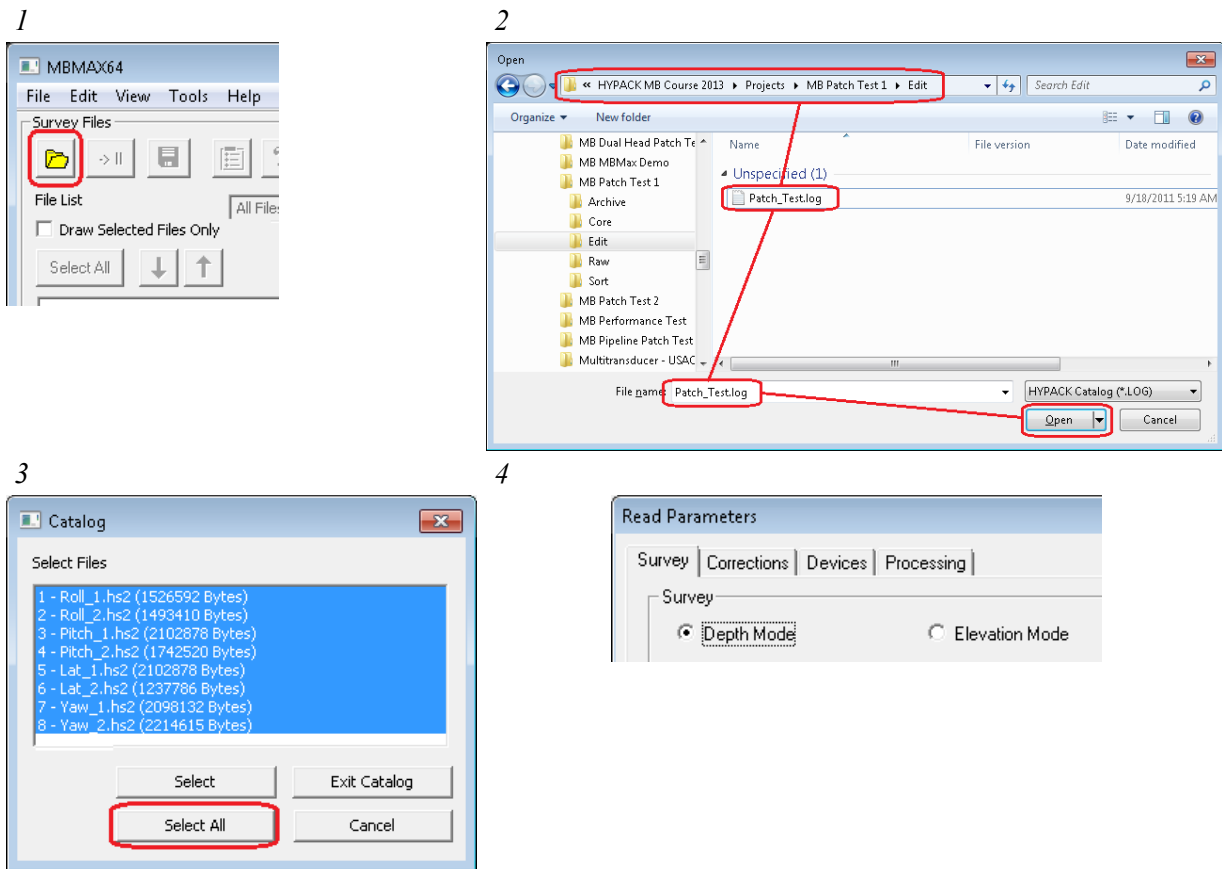
By applying these values to each successive test, better results can be produced for each test. After each test has been performed once, they are again run through the patch test process. This is done to produce a more refined and accurate value for each test, as the first tests did not have the benefit of the values produced in the later tests.

A Third Pass through the tests can be performed, but it is unlikely that you will see any significant change in any of the values, if any change at all.

PERFORMING THE PATCH TEST IN MBMAX64

1. **Load all of the edited HS2 or HS2x patch test files into Stage 1** of MBMAX64.
2. **Check all settings and values in the Read Parameters window.** In the matrix settings, the Cell Size is typically set to 1' x 1' or 0.5m x 0.5m for patch test data.

FIGURE 1. Loading the Files to MBMax64

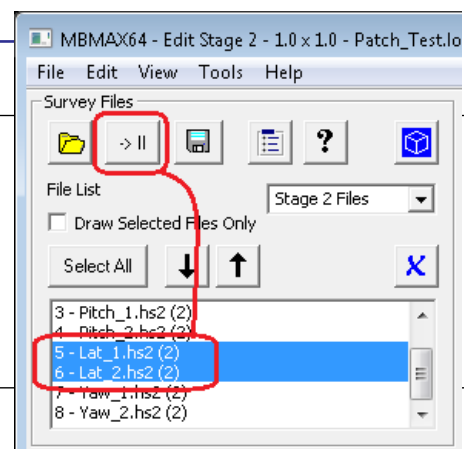


LATENCY TEST

1. **Select the group of files to be processed to measure latency in the PATCH TEST routine.**

FIGURE 2. Loading the Files for the Latency Test to Stage 2

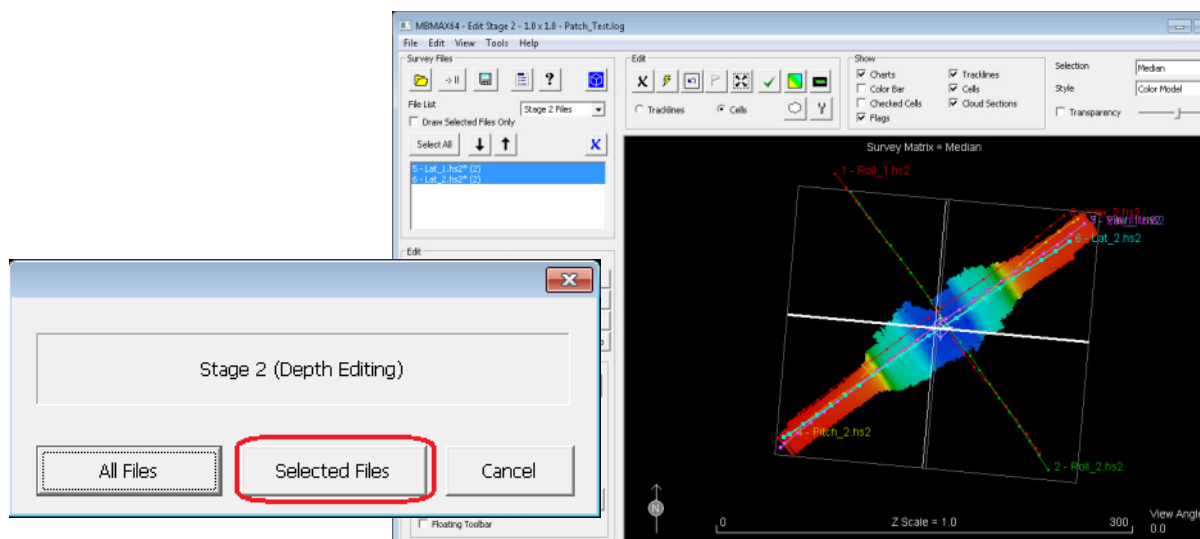
Note: The term 'group' is being used, because a minimum of two files is required for each test, but more than two files can be loaded at a time. Remember, PATCH TEST calculations are 'statistical values' and if you load more data for the PATCH TEST to use, you may get a more definable and supportable 'statistical value'.



2. Click on the Stage 2 button.
3. Click the 'Selected Files' button. The selected group of latency files will be displayed in the main window.



FIGURE 3. Loading Selected Files to the Latency Test



The PATCH TEST is embedded in MBMAX64 and can be accessed in two different ways:

- **Manual Cross Section Tool** which allows you to 'manually cut' the cross section needed for a particular test.

Once the PATCH TEST window appears, you must select the correct test to be performed in the PATCH TEST interface.

OR

- Select TOOLS-PATCH TEST then the test that you want to perform. PATCH TEST will automatically cut the cross section for you and select the correct test to be performed in the PATCH TEST window.

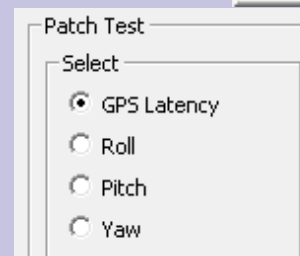


FIGURE A. Starting a Patch Test Through the Menu

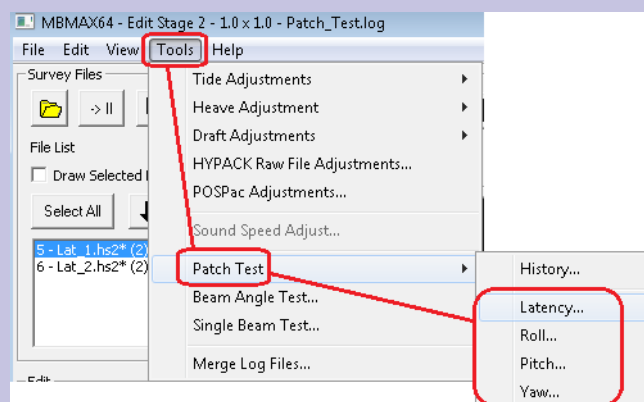
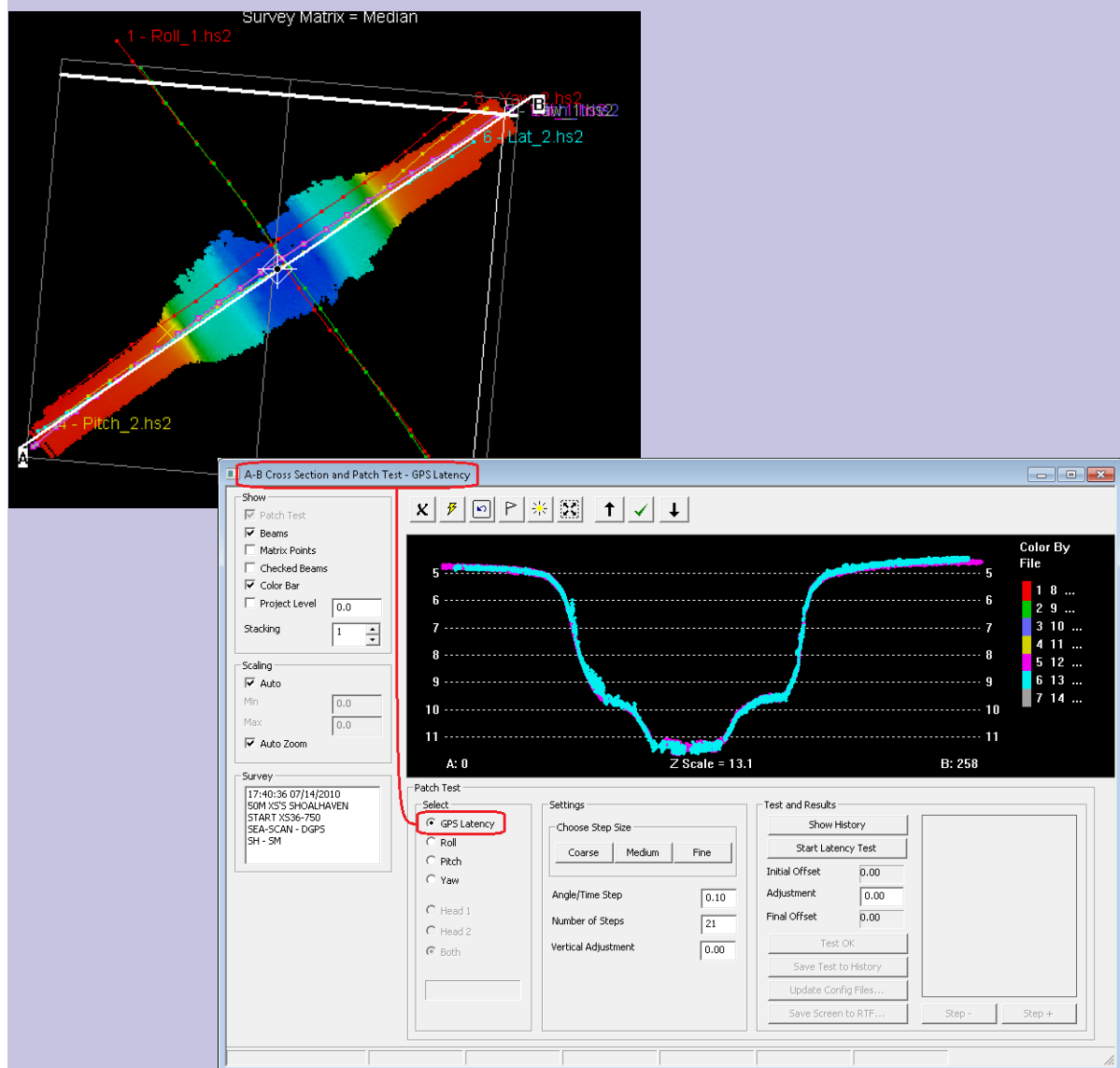


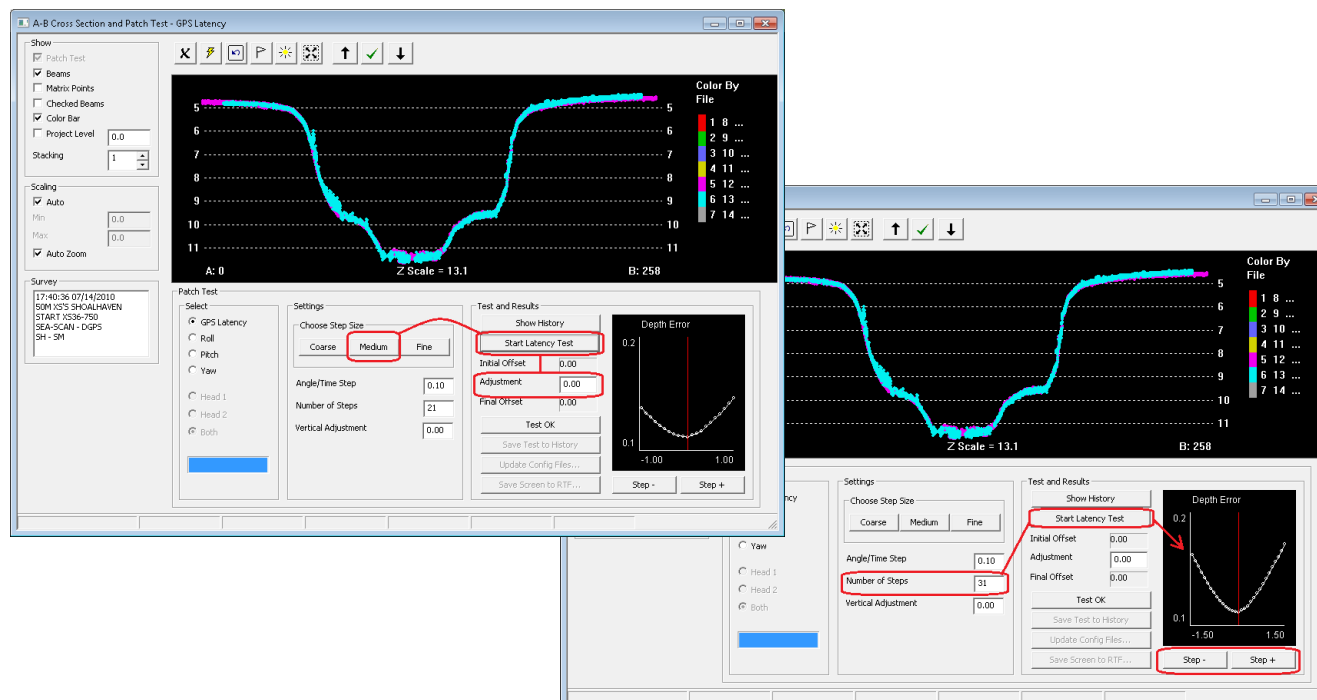
FIGURE B. Cross Section Automatically Cut by the PATCH TEST Routine



Here is where your visual interpretation comes into play. Looking at the two overlapping cross sections, you can determine which Step Size to start with (Coarse, Medium, or Fine). If you see a significant separation, Coarse may be a good selection. If the overlap of the cross sections looks like Figure B (minimal to no separation), I would probably start with the Medium setting.

4. **Cut the cross section.**
5. **Select Step Size, Number of Steps, and click [Start Latency Test].**

FIGURE 4. Medium Step=0.10 sec. Increments, Number of Steps = 21 (left). Increasing the Number of Steps to 31 gives a more pronounced 'V' shape.



6. **Repeat 'Start Latency Test' until a 'V-Shape' is seen in the Depth Error window.**
This is the first pass with the latency data, so there is no real need to do a fine step yet. Remember, these are statistical values and the red line will be at the lowest calculated statistical value found during the test. It is your job to verify its validity and modify it, if necessary. To adjust the position of the vertical red line, click on [Step -] and [Step +] to move it.
7. **Click [Test OK] and save the results as desired.** PATCH TEST automatically updates the offsets for the test that you just performed, in all of the files that are currently loaded and activates the next three buttons to allow you to store your results in other places as follows:
 - **To archive this test**, click [Save Test to History].
 - **To update the Hysweep.ini¹ and BoatConfig.ini² Files**, click [Update Config Files...].
 - **To save the results to a digital document**, click [Save Screen to RTF...], select the folder path and enter a file name.
8. **Close the PATCH TEST window.**

1. HYSWEEP® HARDWARE settings.
2. The Boat Configuration file stores all of the offsets in a central location so you can easily load the correct offsets (in the Read Parameters) when you load each data set for editing. In this case, the program updates the Boat Configuration file with the current offset calculation.

9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

Update Devices

ROLL TEST

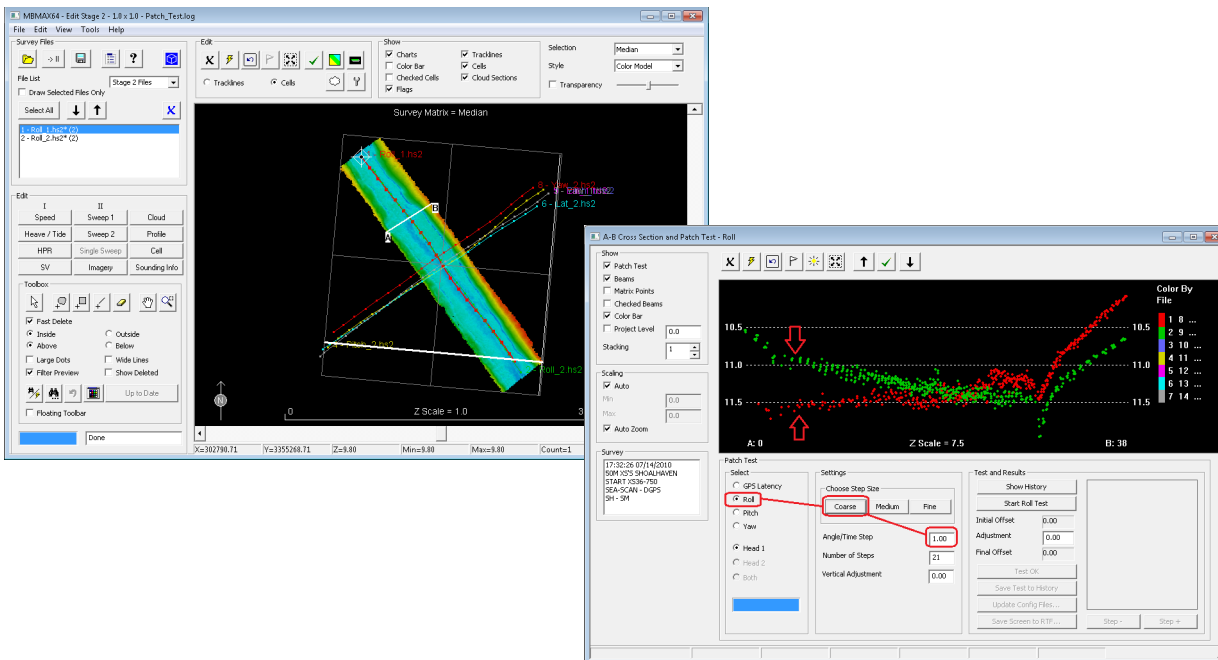
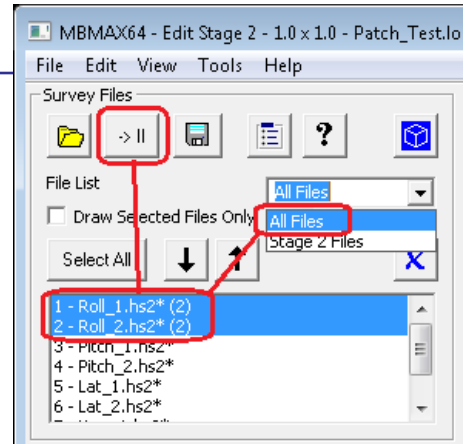
1. Select the group of files to be processed to measure roll offset in the PATCH TEST routine.

FIGURE 5. Loading the Files for the Roll Test to Stage 2

2. Click on the Stage 2 button.
3. Click the 'Selected Files' button.
4. Cut the cross section. Notice the amount of the separation.

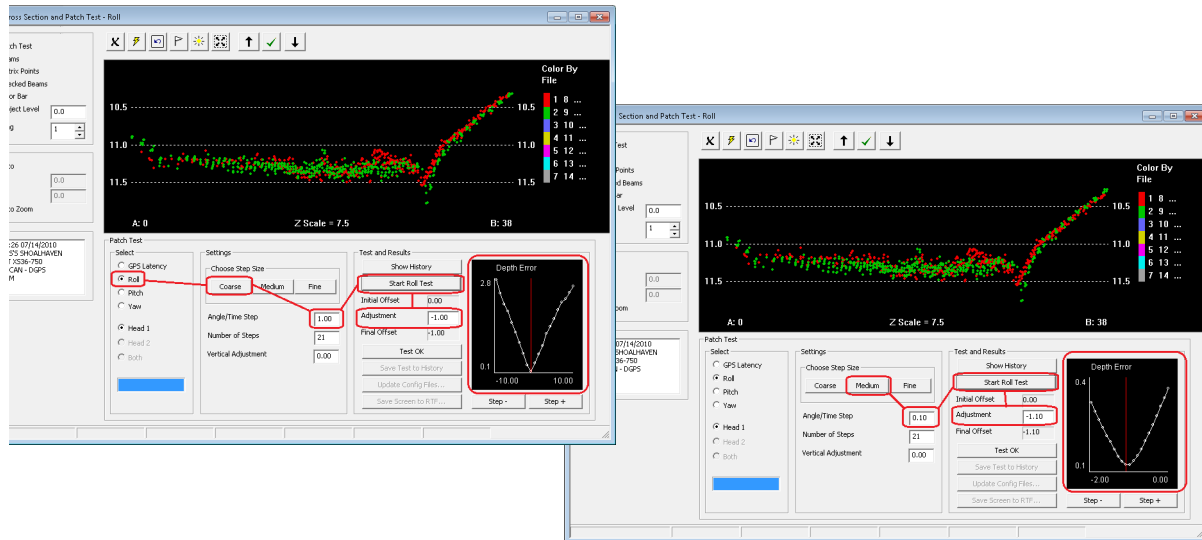


FIGURE 6. Cutting the Cross Section and Checking the Separation



5. Select the Coarse Step Size and click [Start Roll Test].
6. Change the Step Size to Medium and click [Start Roll Test].

FIGURE 7. Coarse Test (left), Medium Test (right)



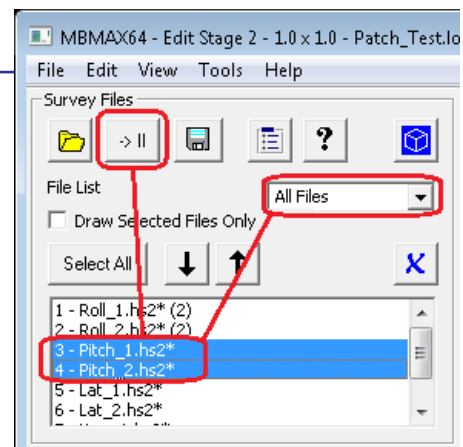
7. Click [Test OK] and store your calculations as desired.
8. Close the PATCH TEST window.
9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

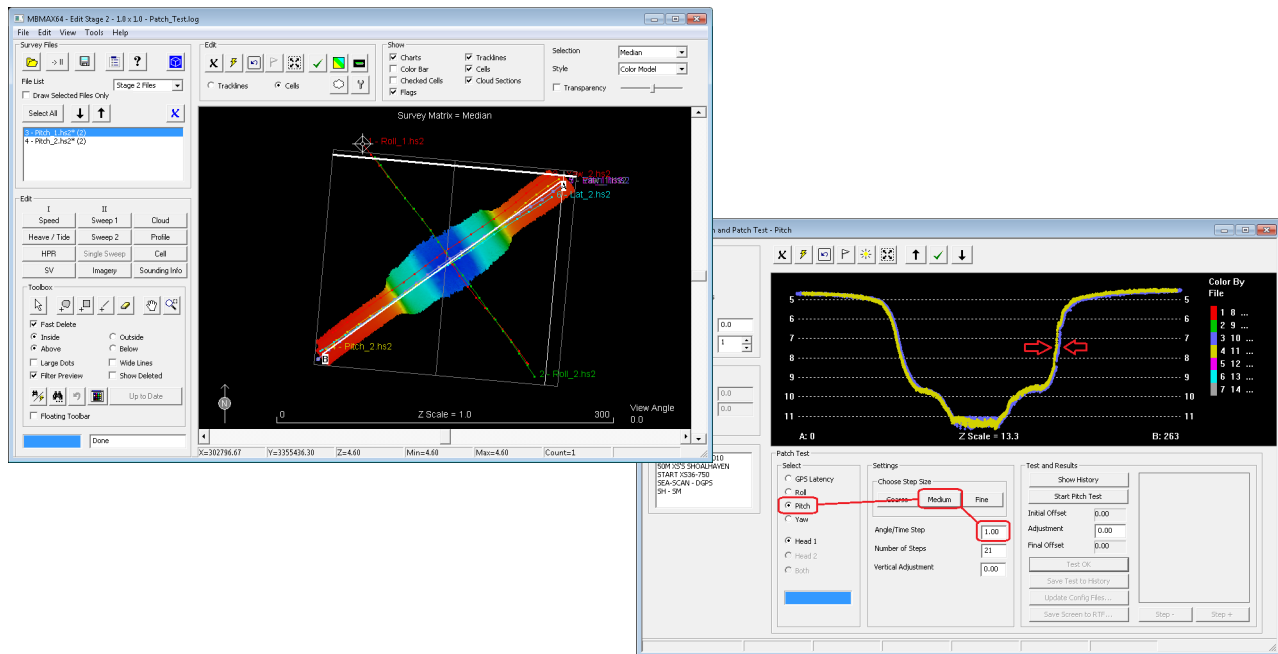
PITCH TEST

1. Select the group of files to test for pitch in the PATCH TEST routine.

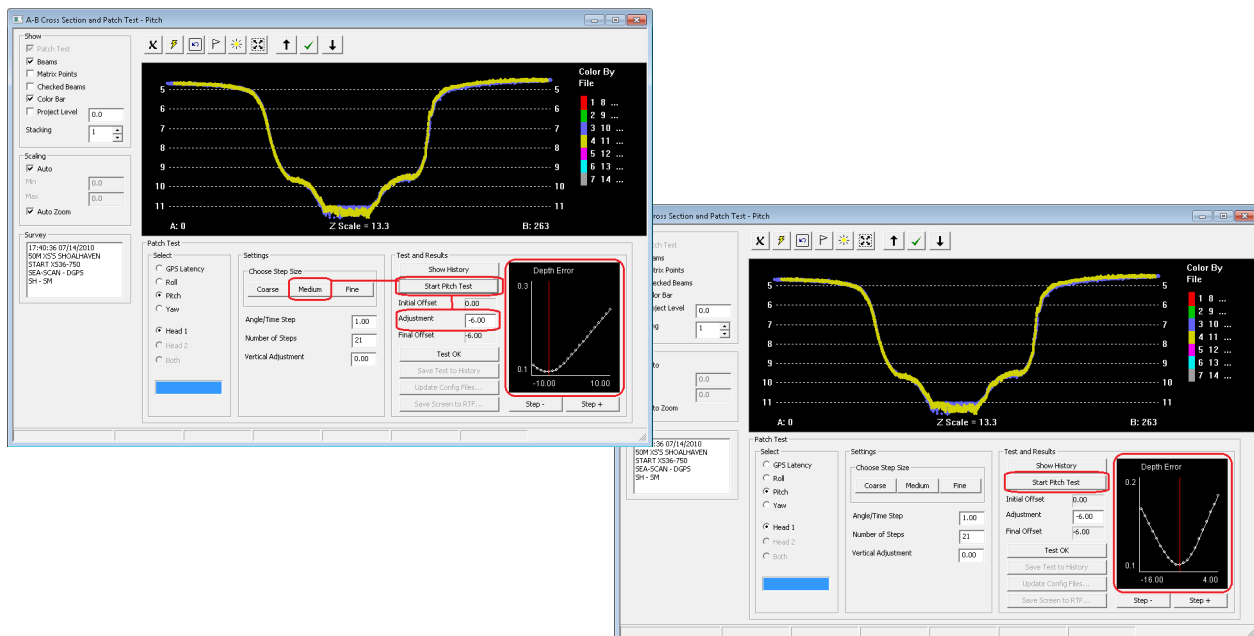
FIGURE 8. Loading the Files for the Pitch Test to Stage 2.

2. Click on the Stage 2 button.
3. Click the 'Selected Files' button.
4. Cut the cross section. Notice the amount of the separation.





5. **Select the Medium Step Size and [Start Pitch Test].**
6. **Repeat [Start Pitch Test] until a V-Shape is seen in the Depth Error Window.**



7. Click [Test OK] and store your calculations as desired.
8. Close the PATCH TEST window.

9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

Update Devices

YAW TEST

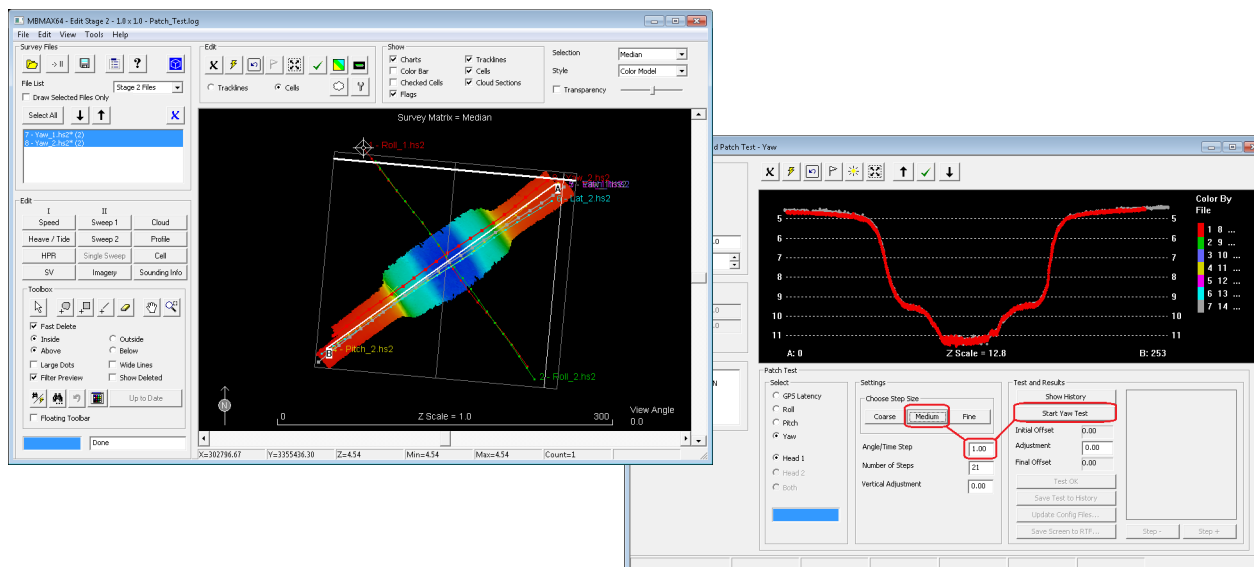
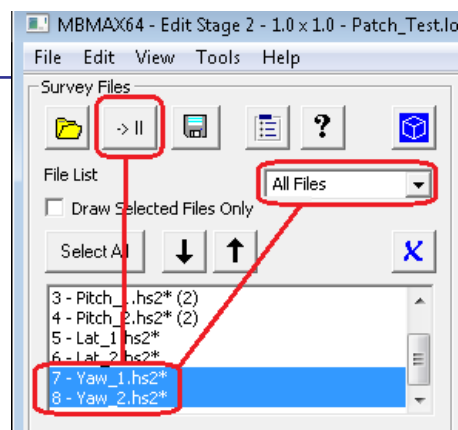
1. Select the group of files to test for yaw in the PATCH TEST routine.

FIGURE 11. Loading the Files for the Yaw Test to Stage 2

2. Click on the Stage 2 button.
3. Click the 'Selected Files' button.
4. Cut the cross section. Notice there is almost no separation.

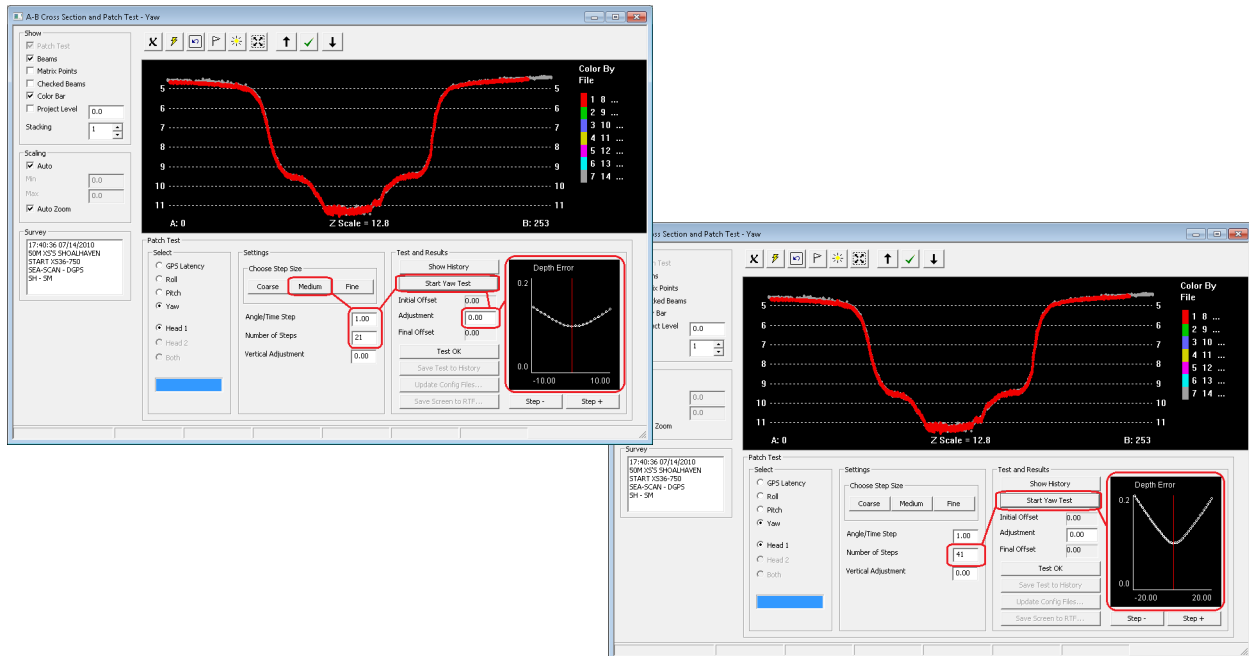


FIGURE 12. Cutting the Cross Section for the Yaw Test



5. Select the Medium Step Size and click [Start Yaw Test].
6. Repeat [Start Yaw Test] until a V-Shape is seen in the Depth Error Window.

FIGURE 13. Medium Step=1.00 Degree Increments, Number of Steps = 21 (left), Medium Step = 1.00 degree increments, Number of Steps increased to 41 (right) This gives a more pronounced 'V' shape).



7. Click [Test OK] and store your calculations as desired.
8. Close the PATCH TEST window.
9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

Update Devices

LATENCY TEST (SECOND PASS)

Repeat the latency test, using *only* the Fine Step Size.

1. Select the group of files to be processed to measure latency in the PATCH TEST for the second time (second pass).

FIGURE 14. Taking your Latency Test Files to Stage 2

2. Click on the Stage 2 button.
3. Click the 'Selected Files' button.
4. Cut the cross section. Notice there is almost no separation.
5. Select Step Size to Fine and enter Number of Steps.

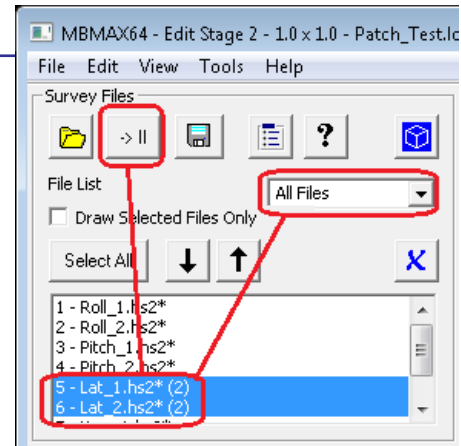
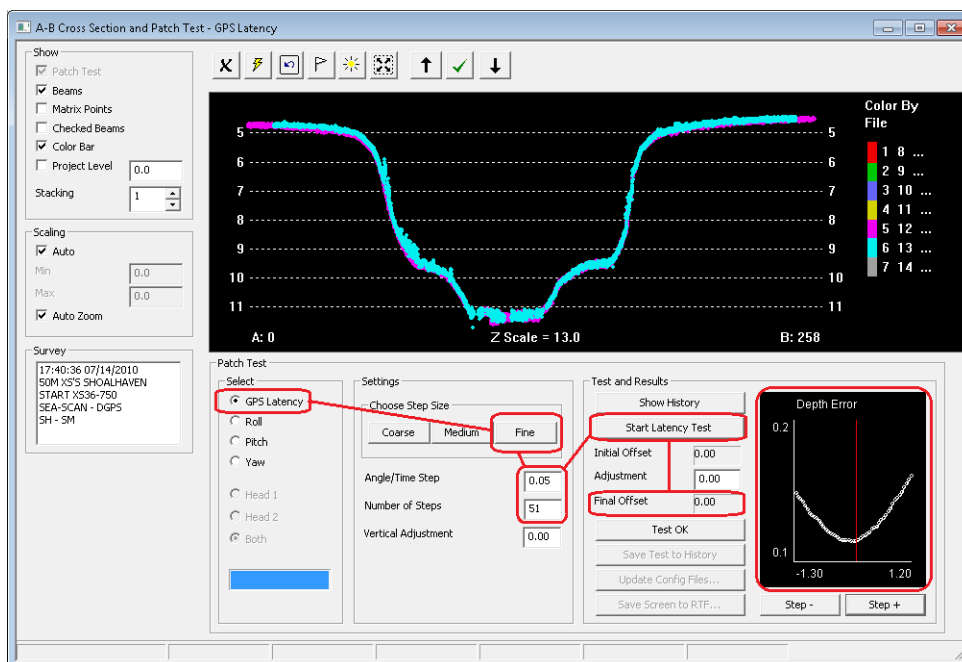


FIGURE 15. Fine Step = 0.05 sec. Increments, Number of Steps Increased to 51. This gives a more pronounced 'V' shape.



6. Click [Start Latency Test].

Important:

- Latency is *a/ways* a positive value for the Final Offset. It can *never* be a negative value.
- Remember, these are statistical values.
- A negative value is often derived when the boat speeds between the two latency files was not significant enough to produce good latency values. If the program produces a negative value (and it might), use [Step +] to bring the Final Offset value to 0.00.
- Almost every 'new' multibeam sonar produced today, time-synchronizes their data with the ZDA message and 1PPS Pulse from the GPS in order to provide zero latency

(0.00). If the proper cabling and time-synchronization has been done between the GPS and Multibeam sensors.

7. Click [Test OK] and store your calculations.

Important: The offsets calculated on the second pass are your final offsets. You must, at minimum, update your configuration files. Using the Update Config Files button is the easiest way to accurately update the offsets in your hardware configuration. You should open the HYSWEEP Hardware to verify that the offsets have been updated.

8. Close the PATCH TEST window.
9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

Update Devices

ROLL TEST (SECOND PASS)

1. Select the group of files to be processed to measure roll in the PATCH TEST for the Second Pass and repeat steps 2 through 10 for the roll test, using only the Fine Step Size.

FIGURE 16. Taking the Files for the Roll Test to Stage 2

2. Click on the Stage 2 button.
3. Click the 'Selected Files' button.
4. Cut the cross section. Notice there is almost no separation.
5. Select Step Size to Fine and set the Number of Steps.

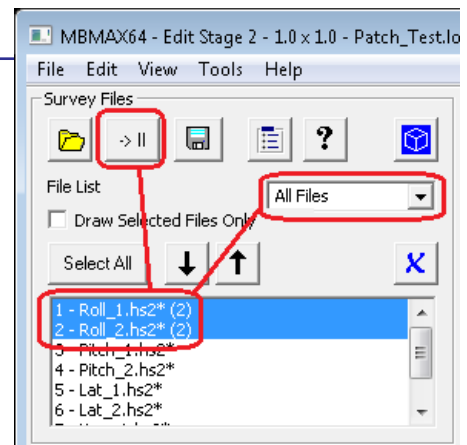
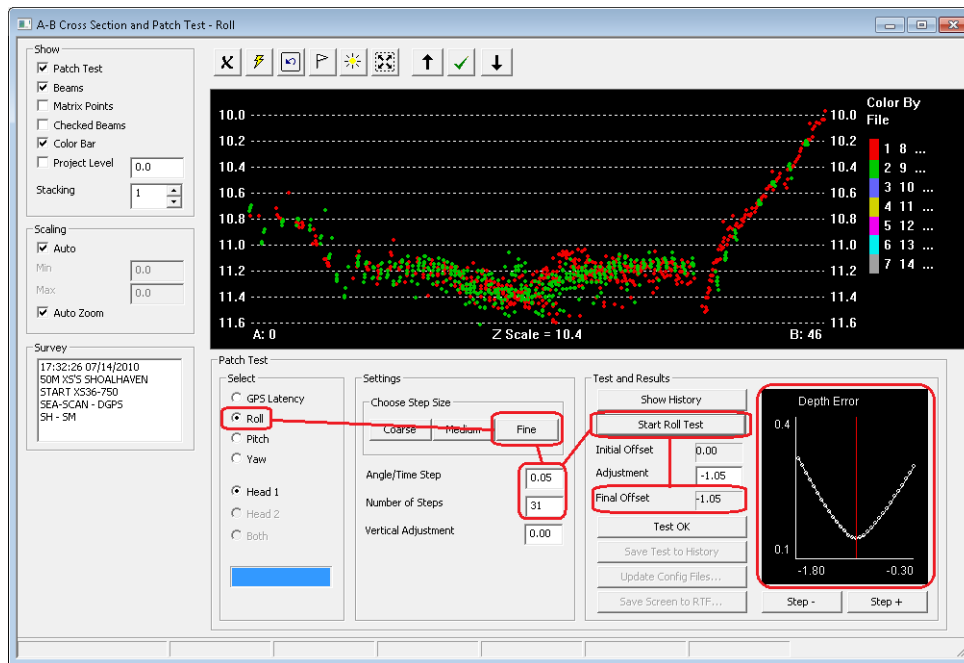


FIGURE 17. Fine Step = 0.05 degree increments. Increasing the Number of Steps to 31 gives a more pronounced 'V' shape.



6. Click [Start Roll Test].
7. Click [Test OK] and store your calculations.
8. Close the PATCH TEST window.
9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.
10. Change the File List to 'All Files' and repeat the same steps for the next test.

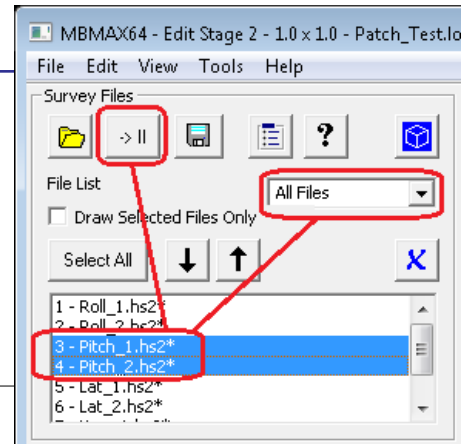
Update Devices

PITCH TEST (SECOND PASS)

1. Select the group of files to be processed to measure Pitch in the PATCH TEST for the 'Second Pass', then repeat the pitch test, using *only* the Fine Step Size.

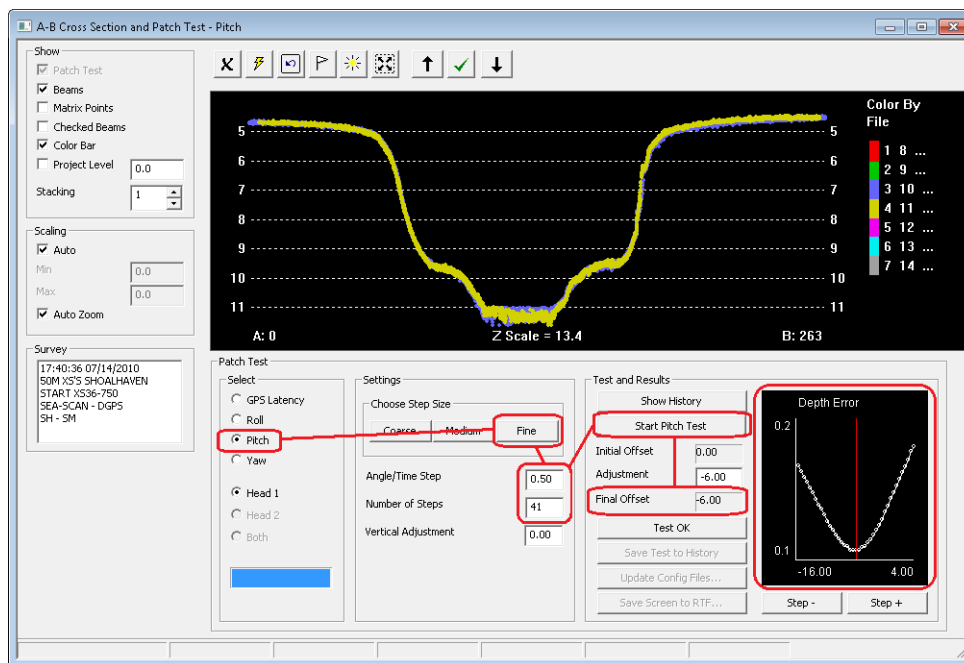
FIGURE 18. Taking your Pitch Test Files to Stage 2

2. **Click on the Stage 2 button.**
3. **Click the 'Selected Files' button.**
4. **Cut the cross section.** Notice there is almost no separation.
5. **Set the Step Size to Fine and set the Number of Steps.**



Note: With DGPS, 0.50 degrees is the best resolution. With RTK GPS, 0.10 degrees is the best resolution. This value can be manually entered in the Angle/Time Step field.

FIGURE 19. Fine Step = 0.50 degree increments, Number of Steps increased to 41. (This gives a more pronounced 'V' shape.)



6. **Click [Start Pitch Test].**
7. **Click [Test OK] and store your calculations.**
8. **Close the PATCH TEST window.**
9. **If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS,**
10. **Change the File List to 'All Files' and repeat the same steps for the next test.**



YAW TEST (SECOND PASS)

1. **Select the group of files to be processed to measure Yaw** in the PATCH TEST for the 'Second Pass', then repeat the yaw test, using *only* the Fine Step Size.

FIGURE 20. Loading the Files for the Yaw Test
Files to Stage 2

2. **Click on the Stage 2 button.**
3. **Click the 'Selected Files' button.**
4. **Cut the cross section.** Notice there is almost no separation.
5. **Set the Step Size to Fine and set the Number of Steps.**

Note: With **DGPS**, 0.50 degrees is the best resolution.

With **RTK GPS**, 0.10 degrees is the best resolution.

This value can be manually entered in the Angle/Time Step field.

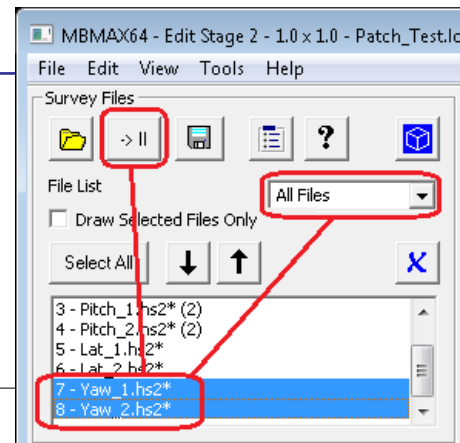
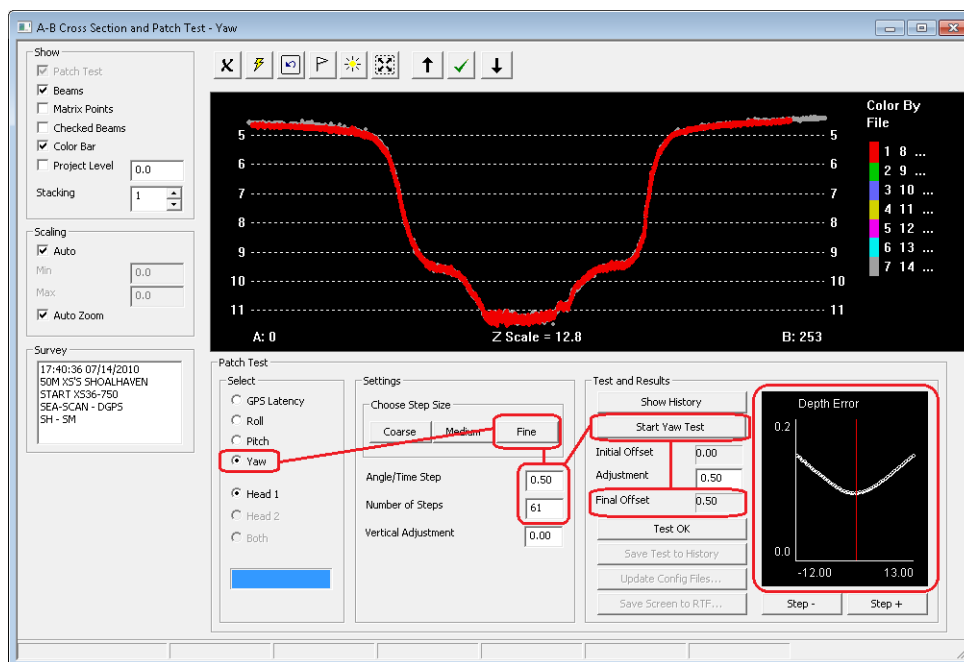


FIGURE 21. Fine Step = 0.50 degree increment. Increasing the Number of Steps to 61 gives a more pronounced V-shape.



6. **Click [Start Yaw Test].**
7. **Click [Test OK] and store your calculations.**
8. **Close the PATCH TEST window.**

-
-
9. If 'Auto Update Mode' is not set in the dialog under EDIT-SETTINGS, click on the red 'Update Devices' button.

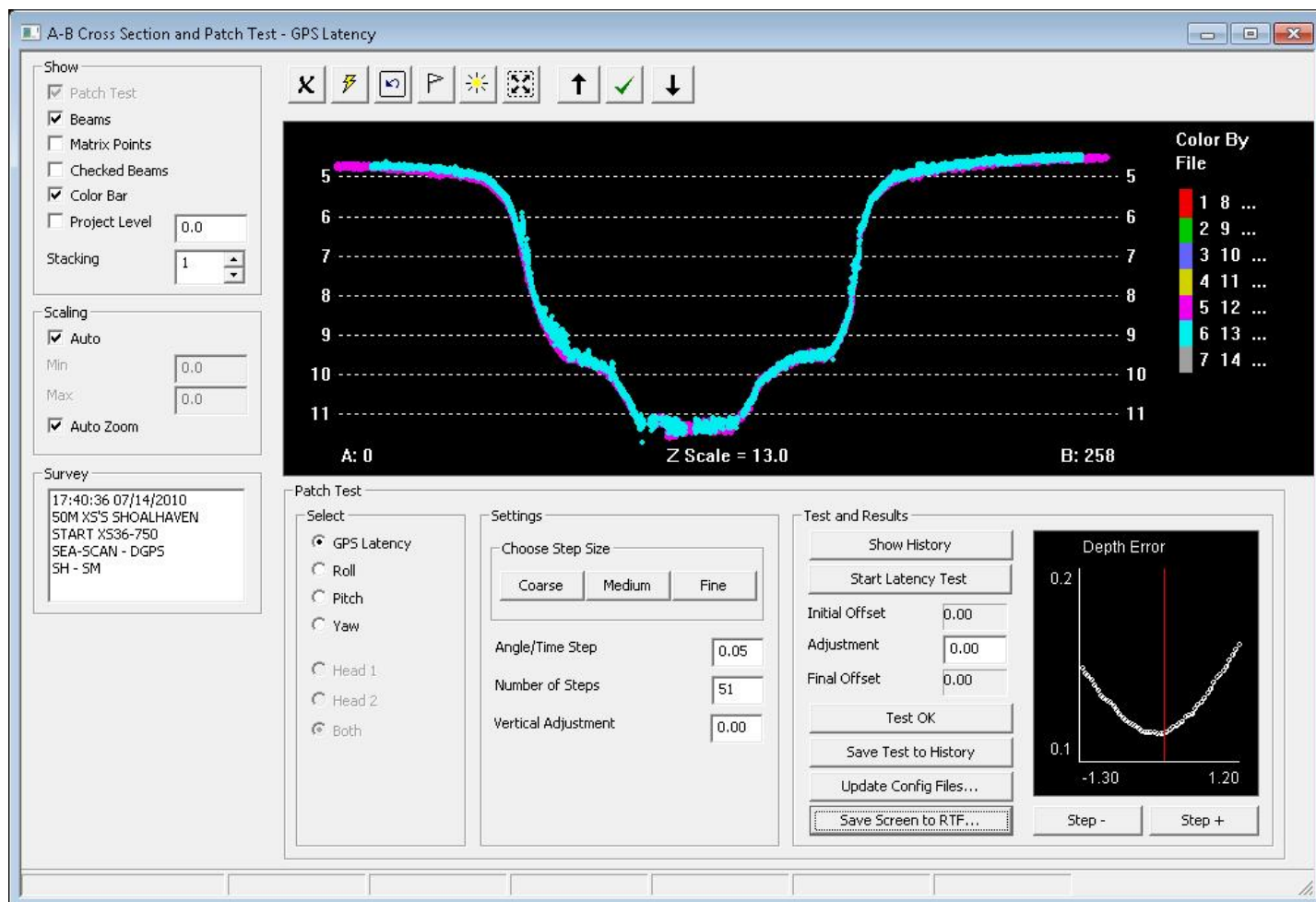
A red rectangular button with the text "Update Devices" in white.

CONGRATULATIONS! You have now completed a patch test in MBMAX64.

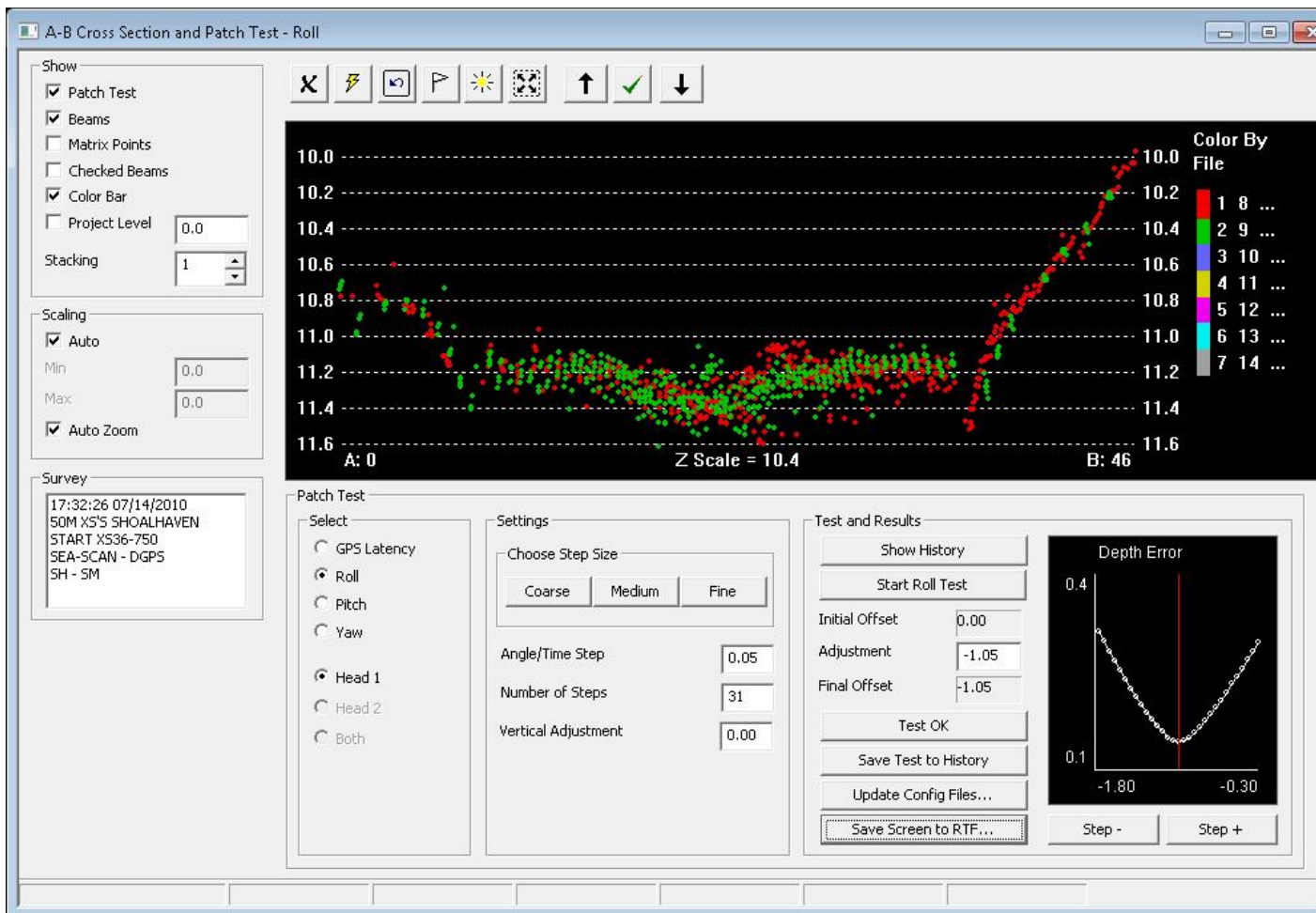
LAST NOTES

- If you updated your configuration files during the second pass for each test, the HYSWEEP® HARDWARE configuration (Hysweep.ini file) and the offsets in the BoatConfig.ini file has been updated with the latest patch test result values.
- If you did NOT update your configuration files after the second pass of each test, you must to open the HYSWEEP® HARDWARE program and manually enter the PATCH TEST values in their correct locations.
 - a. The **latency** value goes in the latency offset for the 'Hypack Navigation' device.
 - b. The **Roll**, **Pitch**, and **Yaw** values go in the offsets for your multibeam device.
 - c. **Save the HYSWEEP® HARDWARE configuration file** (Hysweep.ini).
- Your next survey data collection will now have these offset values applied to the displays during data collection. The offsets are embedded in the header of each HSX file where they are read by the HYSWEEP® Editors when you process your data.
- If you collect data before your system is calibrated, you must correct the data by loading the correct offsets in the Read Parameters dialog of the editing program. The easiest way to load the calibrated offsets is to load the updated boat configuration file after the patch test is complete. MBMAX64 reads the boat configuration file and applies the offsets to HSX, HS2, and HS2x files.
- If you saved your results to the RTF digital document, you will have an RTF document that looks like the next 4 pages. You can print this information for easy reference or copy and paste it into a report document for your survey project.

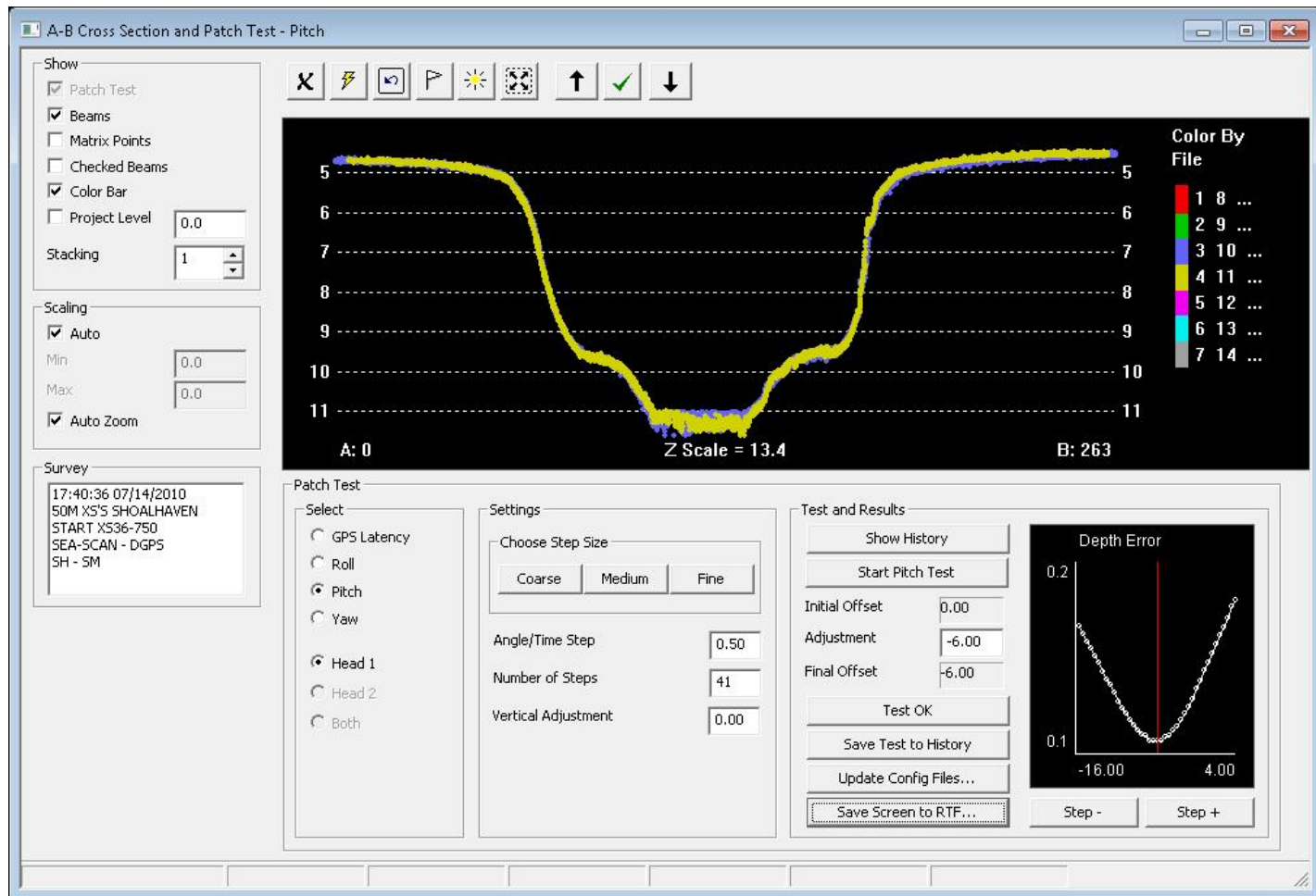
Patch Test = Latency. Sonar Head = Both.



Patch Test = Roll. Sonar Head = Head 1.



Patch Test = Pitch. Sonar Head = Head 1.



Patch Test = Yaw. Sonar Head = Head 1.

