NDI Accuracy Assessment Kit User Guide

Revision 6
November 2016

Revision Status

Revision Number	Date	Description
3	September 2005	Polaris Vicra functionality; application improvements
4	June 2006	Polaris Spectra functionality
5	March 2008	Added line separation adjustment procedures
6	November 2016	Added Vega functionality

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Read Me First!

Read this section before continuing with the rest of the guide.

Defining Roles

Application Expert The application expert is the person responsible for having a sufficient understanding of the accuracy assessment (including protocol, implementation and external factors) to interpret the results for their particular application.

Operator The operator is the person actually performing the accuracy assessment procedure. This will typically be done in the field, or as part of an incoming inspection.

User The user is defined as either the application expert or the operator, as defined by context.

Warnings

In all NDI documentation, warnings are marked by this symbol. Follow the information in the accompanying paragraph to avoid personal injury.

1. Do not trim buckets unless absolutely necessary. Trimming buckets may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.
2. Do not use the AAK tool if it has been dropped or damaged in any way. Return the damaged AAK tool to NDI for recalibration immediately. Failure to do so may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in

your application. If this application involves personal safety, this may increase the risk of personal injury.

3. The AAK tool is a highly precise, calibrated instrument that you must enter into a calibration program. Failure to do so increases the risk of using a damaged AAK tool to perform accuracy assessment tests. A damaged AAK tool may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.
4. Do not use the AAK Tool in a sterile area. The AAK tool is not designed to be a medical device, and to use it in such an environment may increase the possibility of personal injury.
5. Do not shield or protect the AAK Tool (for example, bagging the AAK tool). Shielding or protecting the AAK tool may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.
6. Do not rename the AAK tool definition file (.ATF), and ensure that your selected .ATF file name matches your AAK tool's serial number. The AAK application and the AAK tool are directly associated using this file name. Changing it may provide results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.
7. Do not perform an accuracy assessment test until the Position Sensor has had a sufficient thermal stabilization period. Failure to do so may provide results that are not representative of the Position Sensor's stable accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions

being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

Note **Testing should be conducted to determine the thermal stabilization time necessary specific to your application requirements. NDI recommends that a reference tool be used with its systems whenever possible to account for drift in the measurement caused by time, settling and/or temperature.**

Disclaimers

1. Although NDI provides an AAK threshold value for Position Sensor warranty/factory specifications, the application expert is responsible for determining its suitability for specific applications. In addition, the application expert is responsible for training the operator, who will be applying this threshold to accuracy assessment tests.

Note **If you have any questions regarding the "NDI Accuracy Assessment Kit Guidelines - Polaris Position Sensors" white paper, contact NDI Technical Support for assistance.**

2. NDI recommends that all multi-volume Position Sensors be assessed with the largest characterized measurement volume available, or alternatively, all the measurement volumes used in your application. Although a particular application may only use a small portion or subset of the available measurement volume, the more measurement volume assessed, the better chance of a more accurate/complete assessment.
3. NDI products are designed and manufactured to be used with NDI components only. NDI does not warrant the performance or accuracy of the NDI Accuracy Assessment Kit when performed with non-NDI components.
4. NDI does not warrant the performance or accuracy of the NDI Accuracy Assessment Kit when repaired by non-NDI personnel.
5. Although the Polaris Position Sensor operates throughout the temperature ranges stated in its accompanying documentation, all of

NDI's performance specifications for accuracy are based on Position Sensor characterization and Position Sensor calibration conducted at 20ºC.

Note **Under warranty/factory specifications, the temperature of the room in which the accuracy assessment test will be performed must be between +18ºC and +23ºC for Polaris Systems, between +10ºC and +30ºC for Polaris Vicra Systems and between +10ºC and +40ºC for Polaris Spectra Systems and between +10ºC and +35ºC for Polaris Vega Systems.**

6. The AAK result and the line separation adjustments are valid only at the time of the accuracy assessment test, and only for the environment in which the accuracy assessment test was performed. NDI does not warrant that the Position Sensor will continue to operate as reported; handling, operating conditions (e.g. temperature), and use may affect actual performance.
7. The NDI Accuracy Assessment Kit is designed to be an in-field, interim calibration assessment tool only, and may not expose all failures of the Position Sensor (for example, dirt or scratches on the lenses). The NDI Accuracy Assessment Kit is not a replacement for a complete calibration program, but can be a part of one.

Questions?

If you have any questions regarding the content of this guide or the operation of this product, please contact us:

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About This Guide

Organization of Content

Overview Information

The following sections help you better understand the NDI Accuracy Assessment Kit:

- "About the NDI Accuracy Assessment Kit" on page 1 describes the NDI Accuracy Assessment Kit components and terminology.
- "Unpacking the Accuracy Assessment Kit" on page 7 explains how to unpack and assemble the NDI Accuracy Assessment Kit components.
- "Care, Cleaning and Maintenance" on page 14 describes how to handle, clean, and maintain the NDI Accuracy Assessment Kit components.
- "Exploring the AAK Application" on page 17 walks you through each element the AAK application interface.

How to Perform an Accuracy Assessment Procedure

Performing an accuracy assessment procedure involves the following steps:

1. "Preparing for an Accuracy Assessment Procedure" on page 24
2. "Performing an Accuracy Assessment Setup" on page 36
3. "Performing an Accuracy Assessment Test" on page 46
4. "The AAK Report" on page 54
5. "Line Separation Adjustment" on page 60 (The line separation adjustment is an optional upgrade and is not applicable to Polaris Vicra, Polaris Spectra or Polaris Vega Position Sensors.)

Additional Information

Additional information is included at the end of the guide, to help with any additional questions or issues that may arise:

- "Troubleshooting" on page 63 assists the user in understanding what may have gone wrong when something does not seem to be working.
- "Frequently Asked Questions" on page 69 answers commonly asked questions about the NDI Accuracy Assessment Kit and the accuracy assessment procedure.
- "Glossary" on page 74 defines terminology used throughout this guide.

Related Documentation

White paper: *"NDI Accuracy Assessment Kit Guidelines - Polaris Position Sensors"*

This white paper describes essential features of the accuracy assessment protocol, verifies its suitability for in-field accuracy assessment, and provides some general guidelines to assist users on how to interpret the results within the framework of their own calibration programs.

You can obtain this white paper from the NDI support site:

https://support.ndigital.com

Note If you have any questions regarding the white paper, contact NDI Technical Support for assistance.

1 About the NDI Accuracy Assessment Kit

The NDI Accuracy Assessment Kit (AAK) is designed to assess the accuracy of a Position Sensor as it operates in a specific application environment. (It does not assess the accuracy of tools or applications.)

The NDI AAK consists of a tool and an accompanying software application package. Use the application to track the tool through predefined positions in the measurement volume. The application then calculates a result that represents the accuracy of the Position Sensor in that specific environment.

An optional upgrade to the AAK provides for line separation adjustment. This feature allows the line separation parameters to be adjusted in the field. If you wish to upgrade with this feature, contact NDI. (Line separation adjustment is not available for Polaris Vicra, Polaris Spectra or Polaris Vega Position Sensors.)

Note The NDI AAK is designed to be an in-field, interim calibration assessment tool only, and may not expose all failures of the Position Sensor (for example, dirt or scratches on the lenses). The NDI AAK is not a replacement for a complete calibration program, but can be a part of one.

1.1 What is the AAK Tool?

The AAK tool consists of two rigid bodies, each equipped with five passive disc markers. These rigid bodies are affixed at either end of a bar, and engraved on their respective surfaces are identifying numbers to differentiate between them.

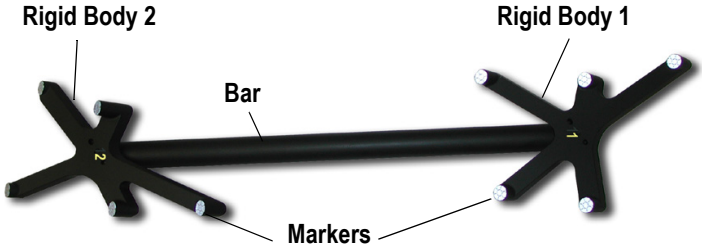

Figure 1-1 AAK Tool

A removable handle is supplied with the AAK tool, to help you hold the tool correctly when performing an accuracy assessment test:

Figure 1-2 Removable AAK Tool Handle

AAK Tool Serial Number

A serial number in the format `AAK-XXXXX` is engraved on the side of each AAK tool, near Rigid Body 1:

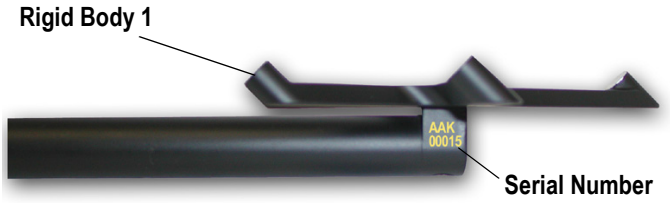

Figure 1-3 AAK Tool Serial Number

AAK Tool Identification Label

Each AAK tool has an identification label mounted on the back. The identification label shows the item ID, model, serial number, and characterization date of the AAK tool.

Figure 1-4 Sample Identification Label

The serial number on this label corresponds with the serial number engraved on Rigid Body 1.

AAK Tool Definition File (.ATF)

Each AAK tool has a unique AAK tool definition file (.ATF) associated with it, containing information about its dimensions. The .ATF file is supplied on the USB flash drive included in the NDI Accuracy Assessment Kit.

Note **Whenever the AAK tool is calibrated, a new .ATF is created and supplied on a new AAK USB flash drive. Be sure to use this new file, as the old one is obsolete. For more information about calibration, see "AAK Tool Calibration" on page 15.**

The .ATF file is named with the format `AAK-XXXXX-YYYYMMDD`, where:

- `AAK-XXXXX` is the AAK tool serial number
- `YYYYMMDD` is the characterization date

The .ATF file name should correspond with the label on the front of the AAK application USB flash drive. If it does not, contact NDI.

Do not rename the AAK tool definition file (.ATF), and ensure that your selected .ATF file name matches your AAK tool's serial number. The AAK application and the AAK tool are directly associated using this file name. Changing it may provide results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

1.2 What is the AAK Application?

The AAK application guides you through the accuracy assessment procedure, collects data about the AAK tool, and produces an AAK report for each test you perform.

For more information about the AAK application user interface, see “Exploring the AAK Application” on page 17.

Understanding the File Extensions

There are several file extensions used by the AAK application. The following table provides a listing of the file extensions, their corresponding file type and description:

Table 1-1: File Extensions

File Extension	Description
AAK tool definition file (.ATF)	Each AAK tool is associated with a specific tool definition file (.ATF). This file contains information about the tool’s design (such as its dimensions and marker locations).
bucket file (.BIN)	Each bucket’s path made during an accuracy assessment
assessment report (.TXT)	The AAK report produced during an accuracy assessment
online help file (.CHM)	The AAK online help file

1.3 What is the Accuracy Assessment Procedure?

The accuracy assessment procedure consists of three steps:

Step One: Perform a Setup

Use the AAK application to select which AAK tool you are using and what kind of measurement volume you are using. The application will then guide you through a brief collection at the back of the measurement volume to determine:

- the orientation of the Position Sensor
- if there are any issues with the Position Sensor that could be attributed to line separation. If you have purchased the line separation adjustment upgrade (available for Polaris only), you may be able to adjust the line separation. Refer to “The Line Separation Result” on page 59.

Step Two: Perform the Test

Once you have performed a setup, you can begin collecting data from various parts (or buckets) of the measurement volume. The AAK application uses both visual aids and messages to help you position the AAK tool correctly.

Step Three: Produce the AAK Report

Once you have finished the test collections, the AAK application calculates the accuracy of the Position Sensor and produces an AAK report. This report includes the final AAK result and any errors that may have occurred during the test.

Note The AAK result and the line separation adjustments are valid only at the time of the accuracy assessment test, and only for the environment in which the accuracy assessment test was performed. NDI does not warrant that the Position Sensor will continue to operate as reported; handling, operating conditions (e.g. temperature), and use may affect actual performance.

1.4 What is a Bucket?

A bucket is a region of the characterized measurement volume in which data is collected to produce an AAK result. Although these buckets do not encompass the entire measurement volume, they do cover specific areas chosen because of their relevance in assessing a Position Sensor's accuracy.

1.5 What is the AAK Threshold?

Set by NDI according to the system and type of measurement you are using, the AAK threshold is the pass/fail value that the AAK application applies to the final result of the accuracy assessment test, once it is complete.

Although NDI provides an AAK threshold value for Position Sensor warranty/factory specifications, the application expert is responsible for determining its suitability for specific applications. In addition, the

application expert is responsible for training the operator, who will be applying this threshold to accuracy assessment tests.

1.6 What is Line Separation?

To determine the position of an IR source, the Position Sensor calculates a line between the source of IR and each sensor (displayed as dotted lines in Figure 1-5). Where the lines cross each other, the system calculates the line separation. (The vertical distance between the lines.) In a theoretical case the lines will intersect exactly, but in the modelled “real world” case they will be apart. If the line separation at this point is less than a predefined limit, the system considers the point to be a possible marker position. Otherwise, the point is discarded.

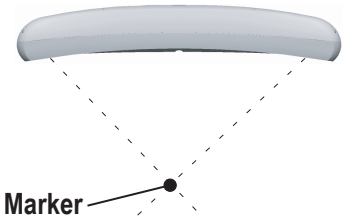

Figure 1-5 Line Separation

2 Unpacking the Accuracy Assessment Kit

2.1 Important! Be Careful

You must unpack the AAK with care. The AAK tool is a precise measurement instrument. Be gentle when removing it from its packaging. When not in use, store the AAK tool in the customized storage case in which it was shipped.

When handling the AAK tool, be very careful not to drop it or otherwise damage it. In addition, transport and store it at a temperature between -10ºC and +40ºC.

2.2 Step One: Check For Required Parts

Check that you have received all of the required parts:

- ❒ NDI Accuracy Assessment (AAK) tool
- ❒ NDI Accuracy Assessment (AAK) tool handle
- ❒ NDI Accuracy Assessment USB flash drive
- ❒ customized storage case with foam padding inserts

If any of these parts are missing, contact NDI.

Important! Each AAK tool has an identification label mounted on the back. Check that the label on the USB flash drive and envelope matches the serial number and characterization date of the identification label on the AAK tool.

Note Keep the storage case and its foam padding inserts as they are customized specifically for the AAK tool. If you ever need to store, carry or ship the system, re-using the inserts will help prevent damage to it.

2.3 Step Two: Inspect the AAK Tool

After unpacking the kit, inspect the AAK tool. Check for visible signs of damage, such as damaged or missing markers, or chips in the finish. If the AAK tool appears to have been dropped or damaged during shipment, contact NDI for a Returned Materials Authorization (RMA).

2.4 Step Three: Install the AAK Tool Handle

1. Position the handle so that the number engraved in the handle is oriented towards the corresponding number on the face of each rigid body.
2. Hold the AAK tool so that the markers are facing up (making sure not to touch them).
3. Midway on the AAK tool, between the two rigid bodies, there is a slightly flattened area on the top and bottom of the bar. Slip the handle onto the AAK tool between the flattened areas.

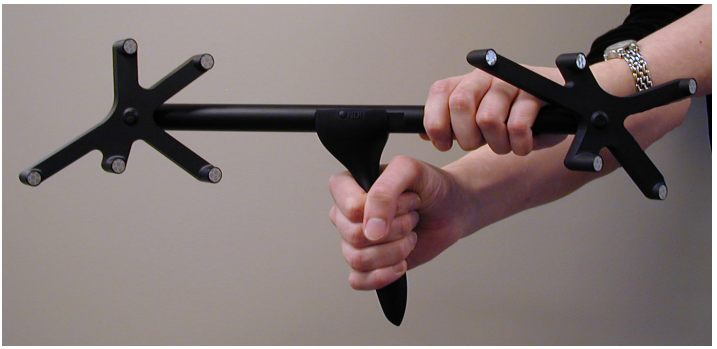

Figure 2-1 Installing the Handle

4. Lock the handle into place by grasping the bar and twisting the handle 90º towards you.

Removing the Tool Handle

1. Hold the AAK tool, making sure not to touch any of the markers.
2. Twist the handle 90º away from you and then pull it gently off the AAK tool's bar.

Storing the Tool Handle

When not in use, store the handle in the AAK storage case in which it was shipped. When handling, be careful not to drop or otherwise damage the handle; damage will affect its fit and increase the risk of the handle coming loose while in operation.

3 Setting Up and Running the AAK Application

3.1 Firmware Requirements

To run the AAK application, your system must meet the following firmware requirements:

Polaris:

- combined firmware revision 017 or higher

Polaris Vicra:

- Polaris Vicra combined firmware revision 001 or higher

Polaris Spectra

- Polaris Spectra combined firmware revision 002 or higher

Polaris Vega

- Polaris Vega firmware revision 002 or higher

3.2 Host Computer Specifications

The host computer must meet or exceed the following requirements:

- Operating system:
  - Windows 7
  - Windows 8.1
  - Windows 10

The following requirements are the minimum requirements for Windows 10. See the Microsoft website for Windows 8.1 and Windows 7 minimum requirements.

- 1 gigahertz or faster processor
- 2 gigabyte RAM for 32-bit or 64-bit
- 16 GB disk space for 32-bit OS, 20 GB for 64-bit OS
- DirectX 9 or later graphics card with WDDM 1.0 driver
- Serial communication port (Polaris only)

- USB port (Polaris Vicra, Polaris Spectra)
- Ethernet port (Polaris Vega only)

Note **For best performance, NDI recommends screen resolution of 1024x768 pixels and 16-bit colour or higher.**

3.3 Running the AAK Application

To set up and run the AAK application, proceed as follows:

1. Insert the USB flash drive into the host computer's USB port.
2. If the setup program does not start automatically, navigate to the AAK USB flash drive and double-click **Setup.exe**.
3. Read and accept the licence agreement. A wizard opens automatically. Follow the on-screen instructions to continue through the setup procedure.

Note **The licence acceptance only appears the first time you set up the application.**

4. During the setup procedure the Line Separation Activation dialog appears (Figure 3-1). Choose from the following options:
   - Continue with software in current activation state (enter code later).
   - Using Polaris Vicra, Polaris Vicra or Polaris Vega System (no adjustment supported) the dialog will not be shown again, but can be accessed by selecting Help > Licencing Information.
   - Never activate this feature. Dialog will not be shown again, but can be accessed by selecting Help > Licencing Information.
   - Activate with code.

If you did not select **Activate with code**, continue with the on-screen instructions to complete the setup and run the application.

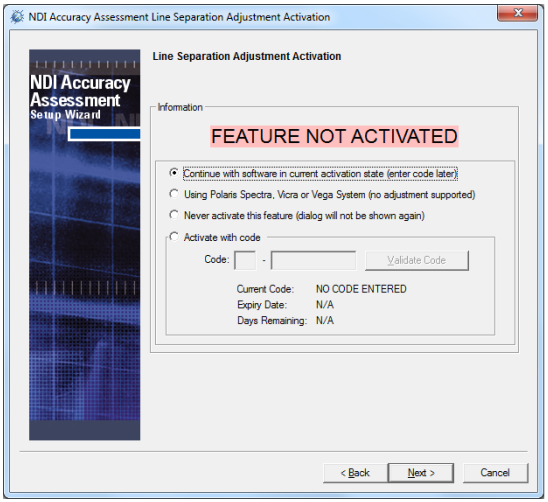

Figure 3-1 Line Separation Activation Dialog

5. If you select **Activate with code**, enter the code supplied with your AAK and select Validate Code. (The validation code is case sensitive.)
6. If you enter a valid code, the dialog updates and displays the line separation feature expiry date.

If the validation fails, check the following:

- Did you enter a valid code? (The code is case sensitive.)
- Has the code expired?
- Is the system date older than the last time you ran the application?

Retry the validation and if it fails again, contact NDI for assistance.

7. Click **Next** to complete the setup and run the AAK application.

Each time you run the AAK application, the line separation feature code is validated and the expiry date is updated. When the expiry date is within 60 days of the current date, the message CODE EXPIRES IN XX DAYS will appear in the information pane. The message will change to CODE HAS EXPIRED at the end of the validation period and line separation

adjustment will no longer be available. Contact NDI to purchase a new line separation activation code

Note To ensure the AAK Online Help runs properly, you need to copy the contents of the AAK USB flash drive to a local drive and run the application and help locally.

Note If you upgrade the AAK application, the communications settings will require resetting. After you upgrade the application, check the communications settings and reset them to the fastest possible setting. Refer to "Performing an Accuracy Assessment Setup" on page 36.

3.4 Installing the USB Drivers

Note You do not need to install these drivers if you are using AAK with a Polaris Vega System.

The USB drivers are part of the AAK setup. The drivers are located in the **Drivers** folder on the USB flash drive that accompanied your AAK.

There are two sets of drivers:

- the first set of drivers enables the NDI Host USB Converter to work with the host computer;
- the second set of drivers sets up the conversion settings for the USB port to emulate a serial port.

To Install the USB Drivers, proceed as follows:

1. When you first connect the Host USB Converter to the host computer, the Found New Hardware Wizard will begin automatically.
2. When prompted, select the option that allows you to specify the driver location.
3. Browse to the folder containing the drivers. Windows will automatically select the correct drivers from the folder.
4. Click **Next**, then **Finish**, as required to complete the installation.

5. Once the first set of drivers is installed, the **Found New Hardware Wizard** will begin a second time. Follow steps 2 to 4 above to install the second set of drivers.

4 Care, Cleaning and Maintenance

4.1 Important! Before You Start

As part of regular system use, remember the following:

- NDI measurement systems are highly specialized instruments. They should be inspected for cleanliness and damage before and during use.
- Switch off all equipment before cleaning or inspecting the system.
- The AAK Tool is a precise measurement instrument. You must ***handle with it care*** when unpacking, packing, inspecting, using, and cleaning it.
- NDI products are designed and manufactured to be used with NDI components only. NDI does not warrant the performance or accuracy of the NDI Accuracy Assessment Kit when performed with non-NDI components.
- NDI does not warrant the performance or accuracy of the NDI Accuracy Assessment Kit when repaired by non-NDI personnel.

4.2 Cleaning

Note If you need to clean the Position Sensor, refer to the guide that came with your system.

AAK Tool and Handle

- Wipe off dust with a dry, soft cloth.
- Remove dirt or finger marks using a cloth moistened with water and then dry immediately with a clean cloth.

Markers

- Wipe markers clean with a gentle patting motion, using a clean, lint free cloth moistened with water.

- Wipe from the centre of the marker out, to avoid damaging the edge of the markers.

Do not use the AAK Tool in a sterile area. The AAK tool is not designed to be a medical device, and to use it in such an environment may increase the possibility of personal injury.

4.3 AAK Tool Calibration

The AAK tool is a highly precise, calibrated instrument that you must enter into a calibration program. Failure to do so increases the risk of using a damaged AAK tool to perform accuracy assessment tests. A damaged AAK tool may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

How often the tool should be calibrated depends on the following:

- If the tool is dropped or damaged, its markers could be shifted and it could provide misleading results. It should be immediately recalibrated.
- How often and how you use the AAK tool affects how often it should be calibrated. If it is used frequently or is subject to external environmental influences on a regular basis, it should also be recalibrated frequently.
- The quality of the markers on the AAK tool is crucial to assuring a proper test; marker quality should be included in your calibration program.

Like any precision calibrated artifact, the AAK tool should be calibrated regularly. An industry standard practise is to start by calibrating frequently. If there is little change between calibrations, the period can be extended. NDI recommends a maximum of one year between

calibrations, and shorter calibration intervals of three to six months if handling is more than typical lab use.

Note **If the tool is damaged (or suspected to be damaged) in any way, return it to NDI immediately for recharacterization.**

4.4 About the NDI Calibration Procedure

Once NDI receives a returned AAK tool for recalibration, the following procedure is implemented:

Step 1: Calibration Testing The AAK tool and its accompanying .ATF file are tested and a calibration value is produced. The calibration value is calculated by comparing the AAK tool to a known standard.

Step 2: Calibration Report NDI produces a calibration report, recording the change in calibration values since the last time the AAK tool was calibrated.

Step 2: Marker Replacement All markers on the AAK tool are replaced.

Step 3: Re-characterization NDI creates a new AAK tool definition file (.ATF) to provide an updated description of the tool's specific parameters. This re-characterization is based on a minimum of 8000 measurements at nominally 20ºC. At this point, it is a new AAK tool.

Step 4: More Calibration Testing The newly characterized AAK tool and .ATF file are tested, producing an updated calibration value. A new identification label is attached to the tool and a new application USB flash drive is produced that contains the new .ATF file. Because it is a new tool, it is possible that this new calibration value may be different than the calibration value of the tool upon first arrival to NDI.

5 Exploring the AAK Application

The AAK application is designed to guide you through the accuracy assessment procedure. This section describes the main elements of its interface:

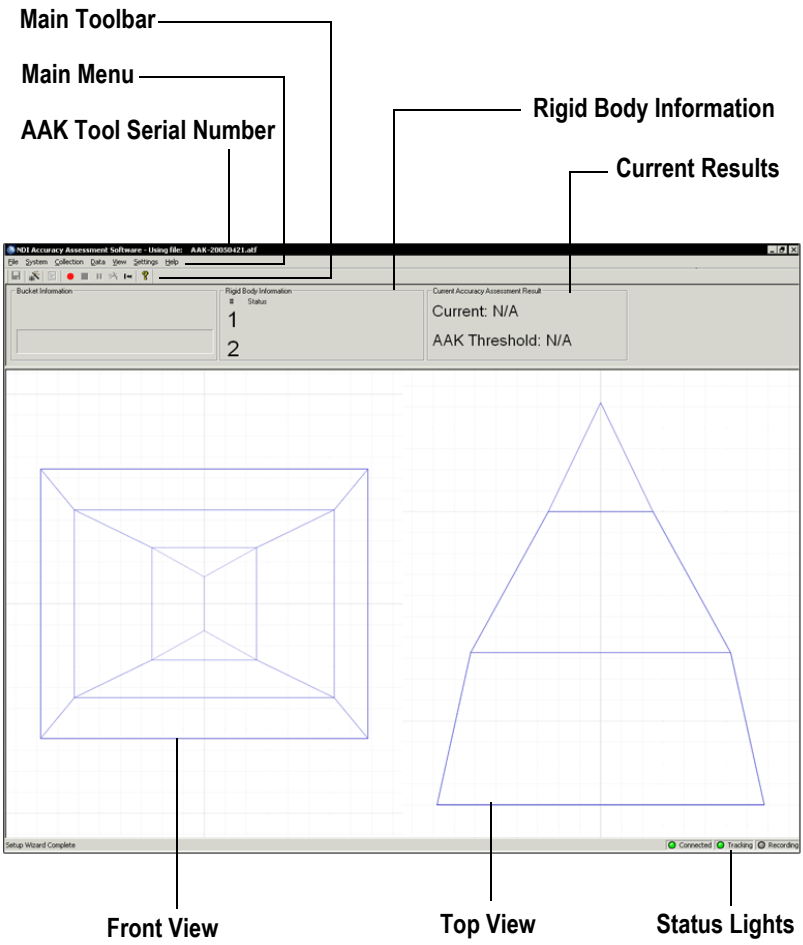

Figure 5-1 AAK Application Main Window

5.1 About the Main Menu

Table 5-1: Main Menu

Menu Item	Sub-Item	Functionality
File	Exit (Alt-F4)	Exits the AAK application
System	Setup Wizard (F8)	Restarts the Setup Wizard; all unsaved collected data is lost
	Adjustment Options	Opens the adjustment options dialog
Collection	Record (F4)	Starts the accuracy assessment test
	Stop (F5)	Stops the accuracy assessment test
	Pause (F6)	Pauses data recording
	Trim (F7)	Truncates the current bucket in which the assessment data will be collected
	Start Over (F11)	Discards all the collected assessment data for all buckets, and restarts the collection. Deletes all unsaved data.
	Loop (F12)	Allows the application to load each bucket automatically, once the previous bucket has been collected. This is enabled by default.
Data	Report (Ctrl-R)	Displays AAK report
View	Toolbar	Shows/hides Main Toolbar
	Status Bar	Shows/hides Status Bar
	Direction Hints	Shows/Hides visual hints for helping you move the AAK tool to the required location
Settings	Colour Scheme	Allows you to change the colours used in the AAK application interface
Help	Contents (F1)	Opens the NDI AAK online help
	Licensing Information	Opens the line separation activation dialog
	About...	Displays details about the NDI Accuracy Assessment application

5.2 About the Main Toolbar

Use the main toolbar to perform the following:

Table 5-2: Main Toolbar

Toolbar Item	Functionality
	Restarts the Setup Wizard. All unsaved collected data is lost.
	Displays the AAK report
	Opens the NDI AAK online help
	Starts the accuracy assessment test
	Stops the accuracy assessment test
	Pauses collection data recording
	Truncates the current bucket in which the assessment data will be collected
	Discards all collected assessment data for all buckets and restarts the collection.

5.3 About Rigid Body Information

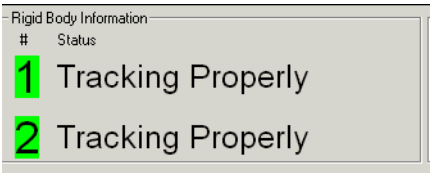

Figure 5-2 Rigid Body Information

The Rigid Body Information area displays the tracking status of each rigid body affixed to the AAK tool:

Table 5-3: Rigid Body Status Messages

Rigid Body Status Message	Default Status Colour
Out of Volume	Red
Partially Out of Volume	Yellow
Max. 3D Error Exceeded	Red
IR Interference	Red
Markers Are Off Angle	Red
Too Few Markers in View	Red
Tool is Missing	Red
Tracking Properly	Green
System Level Error	Red

Note For instructions on how to change these default colour settings, see "Changing the Colour Displays" on page 22.

Note If you receive a "System Level Error" status message, contact NDI for assistance.

5.4 About Current Accuracy Assessment Results

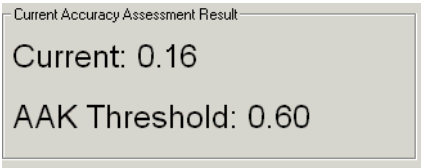

Figure 5-3 Current Accuracy Assessment Results

This area of the main window displays two values:

Current This value is calculated every 25% of each bucket as the bucket is being collected.

AAK Threshold This value is the pass/fail criterion that will be applied to the final AAK result, once the test is complete. These values are:

- 0.60 mm for Polaris Systems
- 0.35 mm for Polaris Vicra and Polaris Spectra Systems. (For Polaris Spectra Systems, this value is applicable to both the pyramid and extended pyramid volumes.)
- 0.25 mm for Polaris Vega Systems (This value is applicable to both the pyramid and extended pyramid volumes.)

5.5 About Views

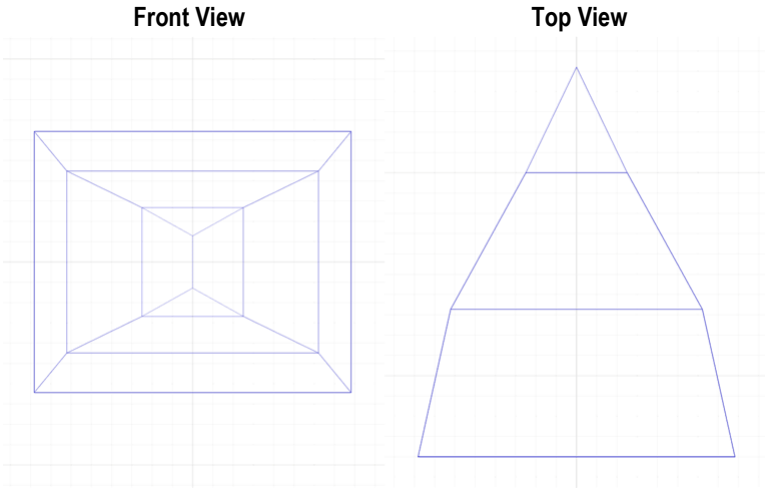

Figure 5-4 Views

Two different views of the characterized measurement volume are displayed in the main window:

Front View The view on the left is the *front view*, as if you were looking directly at the Position Sensor. This view always represents the X,Y axis coordinate system, but will automatically rotate depending on the orientation of the Position Sensor.

Top View The view on the right is the *top view*, as if you were looking directly down on the detection region of the Position Sensor. This view

represents the X,Z or Y,Z axis, depending on the orientation of the Position Sensor.

5.6 About the Status Bar Lights

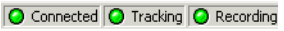

Figure 5-5 Status Bar Lights

Three status lights sit in the bottom right-hand corner of the main window:

Table 5-4: Status Lights

Status Light	Description	Status
Connected	Indicates status of connection to system.	Green if connected. Red if connection lost or connection not made.
Tracking	Indicates if the AAK application is in tracking mode.	Green if tracking assessment data. Grey if not tracking assessment data.
Recording	Indicates if the AAK application is in recording mode.	Green if recording assessment data. Grey if not recording assessment data.

5.7 Changing the Colour Displays

You can customize how the AAK application displays information by changing the colour scheme:

1. From the main menu, select **Settings** > **Colour Scheme**.
2. Use the following table to choose which items to change:

Table 5-5: Items Available for Colour Scheme Adjustments

Item	Description
Volume Outline	The outline of the measurement volume
Tool Centroid	The tool centroid when both tools are tracking

Table 5-5: Items Available for Colour Scheme Adjustments

Item	Description
Tool Centroid when off-angle	The tool centroid when the orientation angle is off
Bucket Paths	The path of collection
Target Aligned in both Views	The tool centroid has been aligned with the target in both the front and top views.
Target Aligned in one View	The tool centroid has been aligned with the target in one of the two views
Target Aligned in no Views	The tool centroid is not aligned with the target in either view
Tool Status: Tracking	Background colour behind tool number, when tool is tracking properly
Tool Status: Partially Out of Volume	Background colour behind tool number, when tool is partially out of volume
Tool Status: Not Tracking	Background colour behind tool number, when tool is missing

3. Select the item that you wish to change, and click **Change Colour**. A dialog displaying a colour palette appears.
4. Select the new colour, and click **OK** to apply it.
5. Click **OK** once you are finished the colour adjustments.

6 Preparing for an Accuracy Assessment Procedure

6.1 Important! Temperature

Do not perform an accuracy assessment test until the Position Sensor has had a sufficient thermal stabilization period. Failure to do so may provide results that are not representative of the Position Sensor's stable accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

Testing should be conducted to determine the thermal stabilization time necessary specific to your application requirements.

Polaris System

- ❒ Under warranty, the temperature of the room in which the accuracy assessment test will be performed must be between 18ºC and 23ºC.
- ❒ The AAK tool must be at the room temperature of the accuracy assessment test (between 18ºC and 23ºC).
- ❒ The system must have a warm up of ***at least one hour***.

Outside the conditions listed above, but still within the operating specifications stated in the documentation that accompanied the Polaris System, the test is still indicative of the Position Sensor accuracy at that time and in that environment. Outside the stated operating specifications, you may cause damage to the Position Sensor.

Although the Polaris Position Sensor operates throughout the temperature ranges stated in its accompanying documentation, all of NDI's performance specifications for accuracy are based on Position Sensor characterization and Position Sensor calibration conducted at 20ºC. This does not apply to Polaris Vicra Systems or Polaris Spectra Systems.

Polaris Vicra System

- ❒ The temperature of the room in which the accuracy assessment test will be performed must be between 10ºC and 30ºC. You can perform tests outside this temperature range, but you may cause damage to the Position Sensor. Refer to the "*Polaris Vicra User Guide*" for more information about safe temperature ranges.
- ❒ The AAK tool must be at the room temperature of the accuracy assessment test (between 10ºC and 30ºC).
- ❒ The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

If the system is outside the recommended temperature range when you *begin* an accuracy assessment procedure, the AAK application will warn you and provide you with the opportunity to cancel the procedure.

If the system's temperature falls outside of the recommended temperature range *during* an accuracy assessment procedure, the AAK application will take note and append a warning to the AAK report.

Polaris Spectra System

- ❒ The temperature of the room in which the accuracy assessment test will be performed must be between 10ºC and 40ºC. You can perform tests outside this temperature range, but you may cause damage to the Position Sensor. Refer to the "*Polaris Spectra User Guide*" for more information about safe temperature ranges.
- ❒ The AAK tool must be at the room temperature of the accuracy assessment test (between 10ºC and 40ºC).
- ❒ The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

If the system is outside the recommended temperature range when you *begin* an accuracy assessment procedure, the AAK application will warn you and provide you with the opportunity to cancel the procedure.

If the system's temperature falls outside of the recommended temperature range *during* an accuracy assessment procedure, the AAK application will take note and append a warning to the AAK report.

Polaris Vega System

- ❒ The temperature of the room in which the accuracy assessment test will be performed must be between 10ºC and 35ºC. You can perform tests outside this temperature range, but you may cause damage to the Position Sensor. Refer to the "*Polaris Vega User Guide*" for more information about safe temperature ranges.
- ❒ The AAK tool must be at the room temperature of the accuracy assessment test (between 10ºC and 35ºC).
- ❒ The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

If the system is outside the recommended temperature range when you *begin* an accuracy assessment procedure, the AAK application will warn you and provide you with the opportunity to cancel the procedure.

If the system's temperature falls outside of the recommended temperature range *during* an accuracy assessment procedure, the AAK application will take note and append a warning to the AAK report.

6.2 Inspection and Cleaning

You must inspect and clean the AAK tool before starting an accuracy assessment procedure. Refer to "Care, Cleaning and Maintenance" on page 14 for cleaning instructions.

You must also inspect and clean the Position Sensor. Ensure that it is free from noticeable optical defects such as scratched lenses, and that the lenses/illuminator filters are clean. Refer to the documentation that accompanied the system for the correct cleaning procedure.

Do not use the AAK tool if it has been dropped or damaged in any way. Return the damaged AAK tool to NDI for recalibration immediately. Failure to do so may cause the accuracy assessment test to produce results that are not representative of the Position

Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

Do not shield or protect the AAK Tool (for example, bagging the AAK tool). Shielding or protecting the AAK tool may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

6.3 Determine Position and Orientation

Before you can collect data from areas of the characterized measurement volume, you need to understand exactly where your particular characterized measurement volume is located.

All dimensions in the following diagrams are approximate.

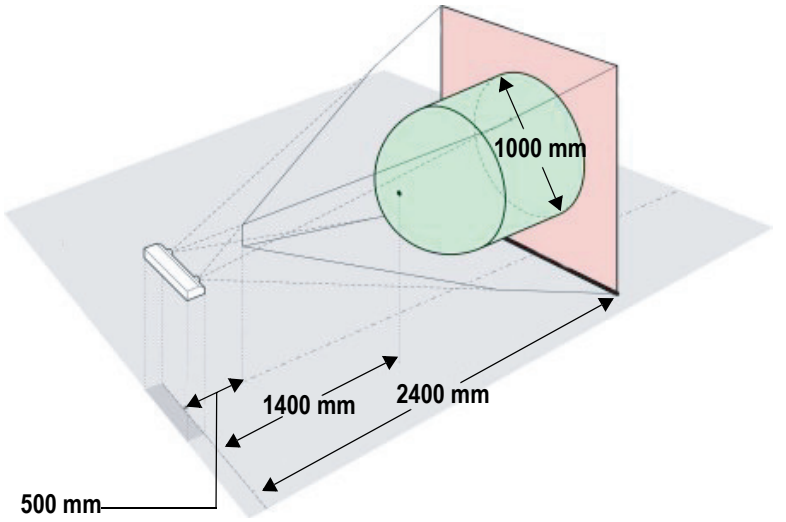

Figure 6-1 Polaris Standard Volume

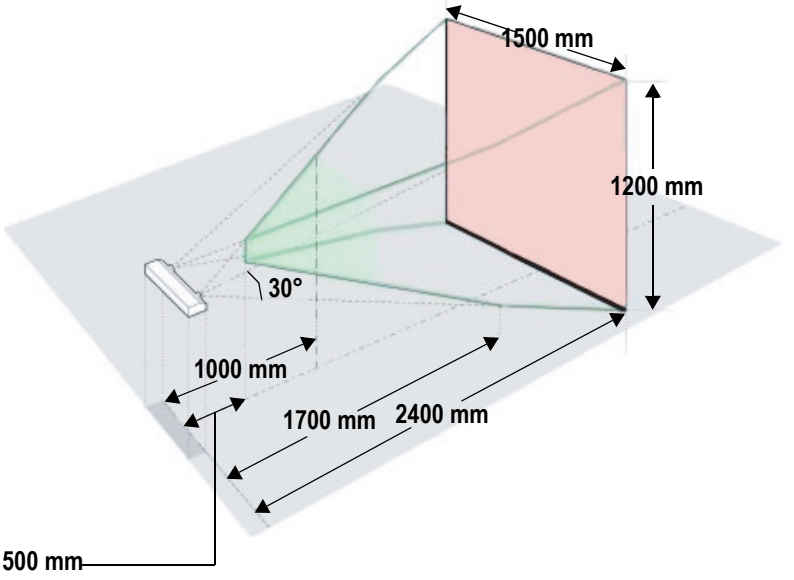

Figure 6-2 Polaris Pyramid Volume

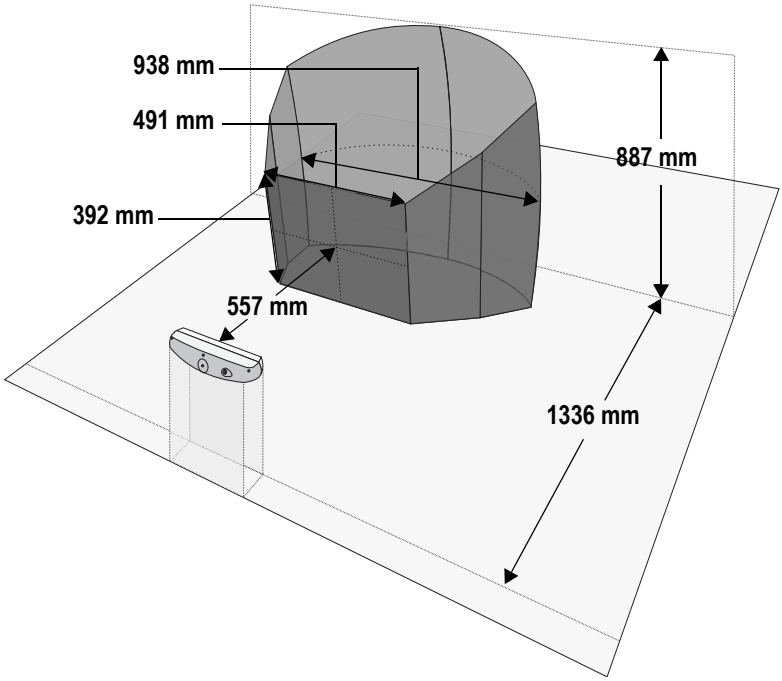

Figure 6-3 Vicra Volume

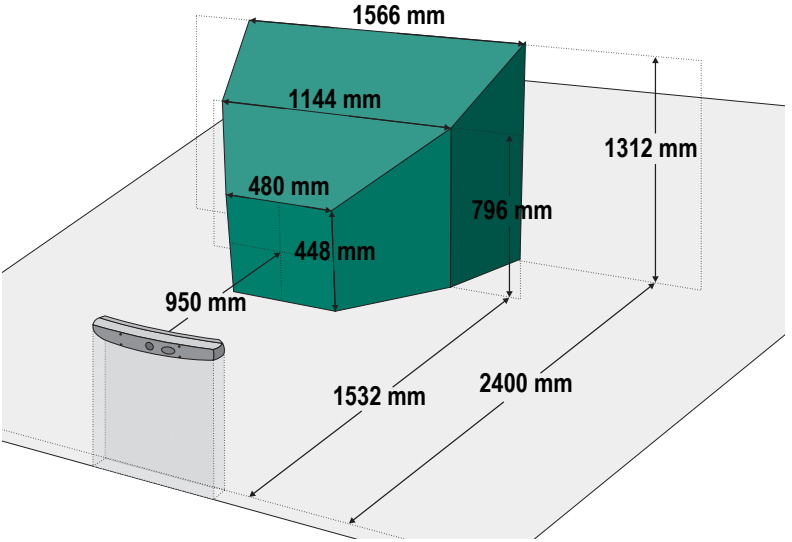

Figure 6-4 Spectra Pyramid Volume

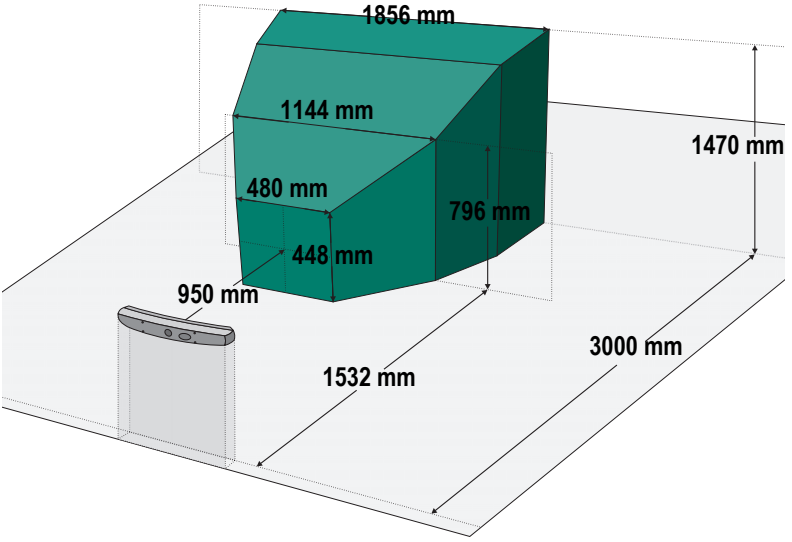

Figure 6-5 Spectra Extended Pyramid Volume

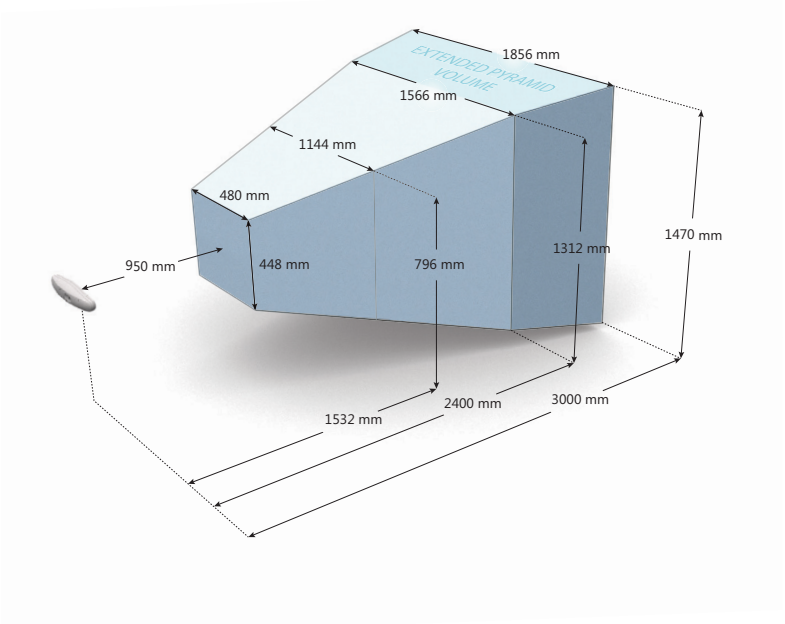

Figure 6-6 Polaris Vega Volumes

Once you understand the location of the characterized measurement volume, remember to do the following:

- ❒ Check that the area in which you will perform the accuracy assessment procedure is large enough to accommodate the characterized measurement volume you are evaluating.
- ❒ Ensure that the area is free of obstructions, and that you can move comfortably and easily while collecting assessment data for each bucket.
- ❒ If possible, NDI also recommends that you orient the Position Sensor parallel to the floor in a horizontal position, before starting the accuracy assessment test. This position will make it easier to collect the assessment data.

6.4 How to Hold the AAK Tool Correctly

When holding the AAK tool for a collection, remember the following:

1. Make sure that the markers are directly facing the centre of the Position Sensor.

Note **Polaris Vicra Systems are particularly sensitive to marker angle. Make sure that the markers point directly at the Position Sensor regardless of the AAK tool's position in the measurement volume.**

2. Check that there is a clear line-of-sight between the markers and the Position Sensor.
3. You can hold the AAK tool with either one or both hands, but holding the AAK tool with two hands may be easier as it helps you keep it steady while performing the test.

Figure 6-7 Holding the AAK Tool Incorrectly - Marker Normals Not Pointing at Position Sensor

6.5 How to Position the AAK Tool Correctly

The following diagram shows the different Position Sensor orientations that are possible for your system setup:

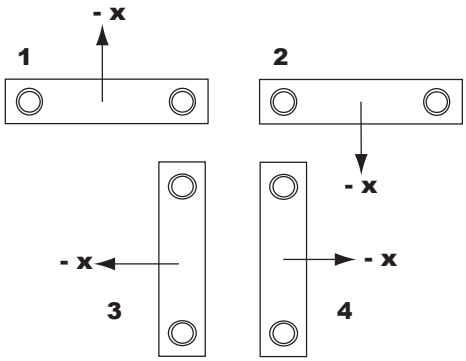

Figure 6-8 Possible Position Sensor Orientations

Depending on which orientation your system setup uses, you will have to hold the AAK tool a certain way.

Note Always hold the AAK tool so that it is angled from the front face of the Position Sensor as shown in the following figures.

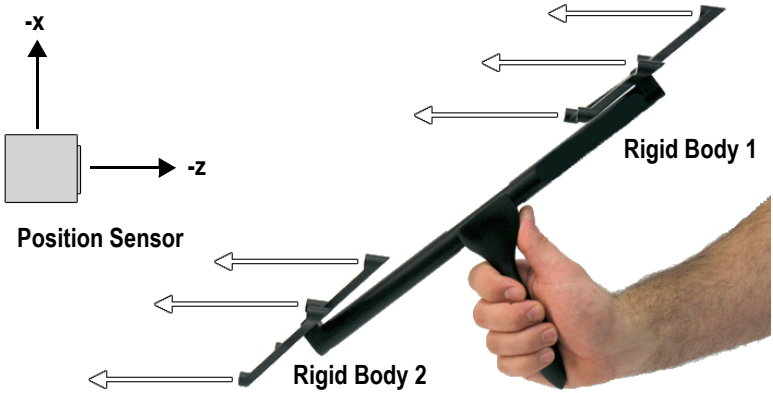

Figure 6-9 Holding the AAK Tool for Position Sensor Orientation 1

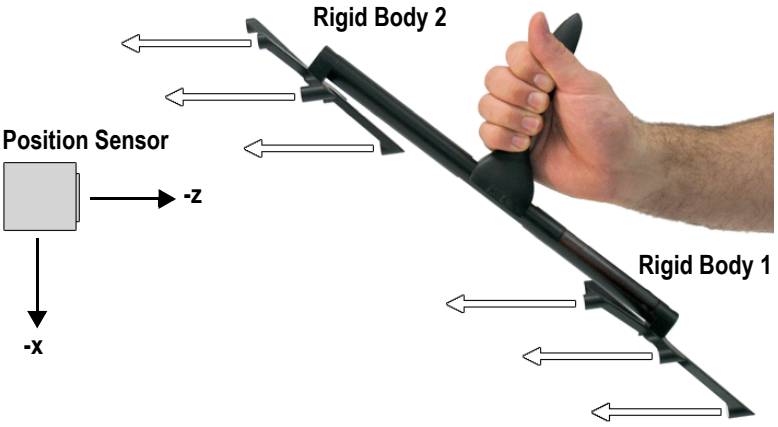

Figure 6-10 Holding the AAK Tool for Position Sensor Orientation 2

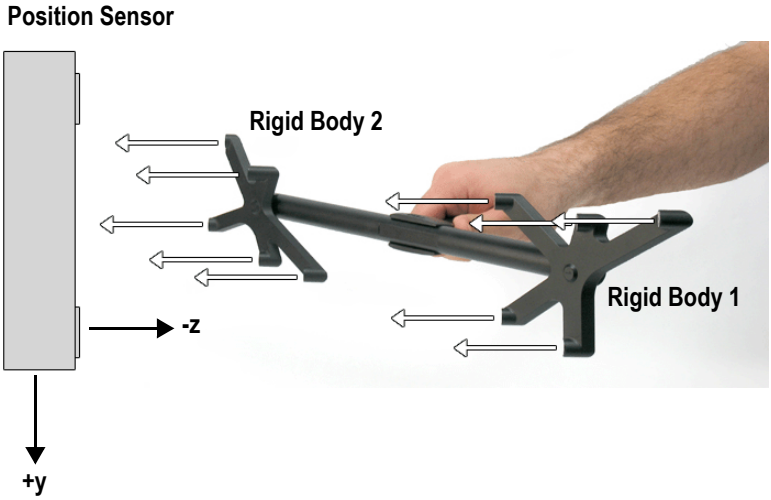

Figure 6-11 Holding the AAK Tool for Position Sensor Orientation 3

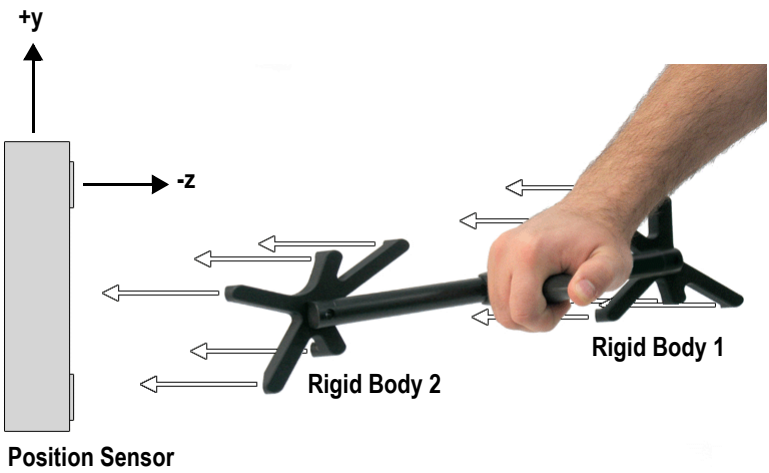

Figure 6-12 Holding the AAK Tool for Position Sensor Orientation

7 Performing an Accuracy Assessment Setup

Note Do not move the Position Sensor during any part of the accuracy assessment procedure.

Once you start the AAK application, the NDI Accuracy Assessment Setup Wizard opens automatically. The application will then guide you through a brief collection at the back of the measurement volume to determine:

- the orientation of the Position Sensor
- if there are any issues with the Position Sensor that could be attributed to line separation problems

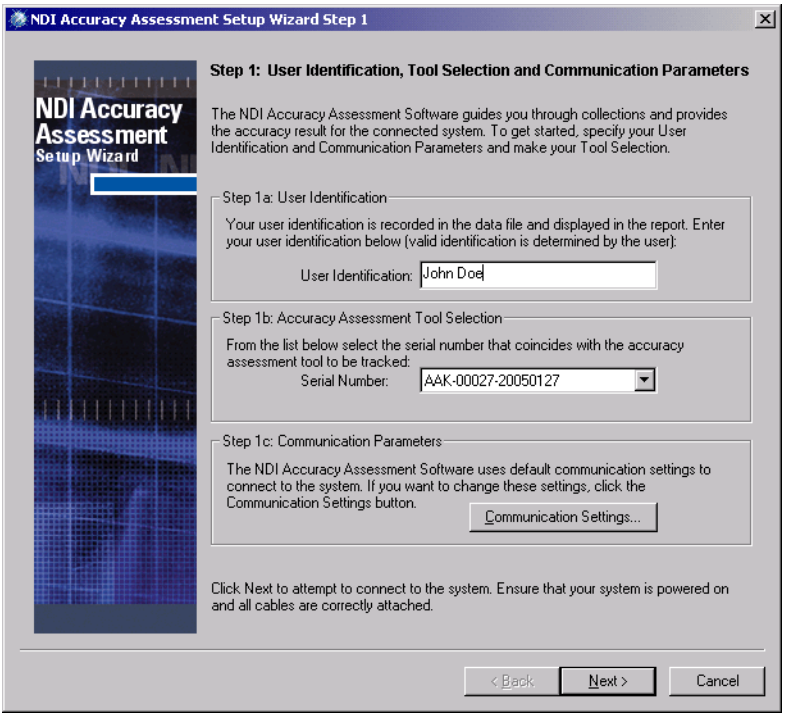

Figure 7-1 Setup Wizard

Note **For more information about line separation, refer to the documentation that accompanied the system.**

If communications to the Position Sensor have already been established and you have already completed the Setup Wizard and accuracy assessment procedure, you can perform another accuracy assessment procedure on the same Position Sensor without completing the Setup Wizard again. From the main toolbar, click **Start Over** to start a new collection with the same setup.

7.1 Step 1: Enter Basic Information

The first step of the Setup Wizard requires that you enter basic information about the accuracy assessment test. For example, which AAK tool you are using, the communication method you are using, and what type of measurement volume you are working with.

1. Enter a **User Identification**, such as your name. This identification will be displayed in the final AAK report.

Note **Complete the User Identification field carefully. Application experts use this information to track repeatability and reproducibility among users.**

2. Select the AAK tool's **Serial Number** from the drop-down list provided, where:
   - `AAK` is a common identifier
   - `XXXXX` is the serial number found on the tool
   - `YYYYMMMDD` is the date the tool was characterized

   This format is also used to name the tool definition file (.ATF).

   If "No Tool Files found" is displayed in the Tool Selection drop down list, contact NDI Technical Support for assistance.
3. (Optional) Click **Communication Settings** if you want to change the default communication settings assigned by the AAK application. The following dialog appears:

Note **If you upgrade the AAK application, your communications settings will require resetting, as detailed below.**

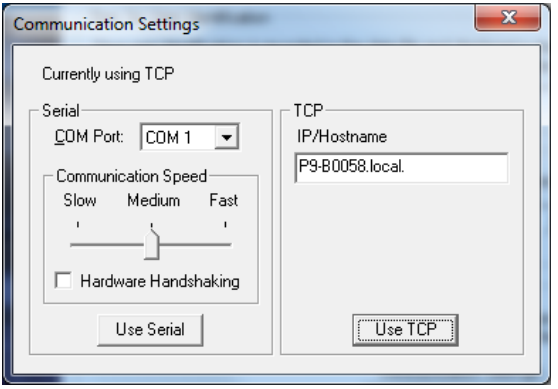

Figure 7-2 Communications Settings dialog

If you are connecting via serial connection proceed as follows:

a) Select the new **COM Port** from the drop-down list provided.

b) Select the **Communication Speed** using the slider bar.

NDI recommends that you first select **Fast**. If the AAK application is unable to connect to the system, select the next lowest speed (**Medium**). Continue to select **Slow** if communication has still not been established.

Note **Lower communication speeds will decrease the speed at which assessment data is collected and lengthen the duration of the assessment data collection process.**

c) (Optional) Enable **Hardware Handshaking** to improve the reliability of successful data communication and protects against potential data loss. NDI recommends that you enable **Hardware Handshaking** if the Polaris System hardware and cable combination support it.

d) Click **Use Serial**, then **Next**.

Note TCP communications are only available on Polaris Vega Systems.

If you are connecting via TCP connection, enter the **IP/Hostname** and click **Use TCP**, then click **Next**.

To determine the IP address of the Vega Position Sensor you wish to connect to, use ToolBox.

a) In the ToolBox Configure Utility, select **File> Connect to**.

b) Hover over the Position Sensor you wish to connect to; its IP address will be displayed.

Multiple Measurement Volumes

NDI recommends that all multi-volume Position Sensors be assessed with the largest characterized measurement volume available, or alternatively, all the measurement volumes used in your application. Although a particular application may only use a small portion or subset of the available measurement volume, the more measurement volume assessed, the better chance of a more accurate/complete assessment.

If the Polaris Position Sensor contains multiple characterized measurement volumes, the following appears:

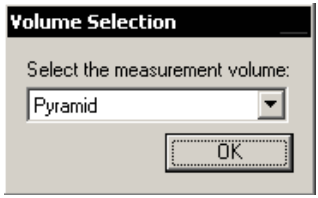

Figure 7-3 Volume Selection dialog

The default selection is the largest volume. Change this selection if required, then click **OK**.

Note If the Position Sensor's largest characterized measurement volume exceeds the physical space available, pick the next largest available.

7.2 Step 2: Determine Position Sensor Orientation

Before you can perform an accuracy assessment test, the AAK application requires collections from two locations at the back of the measurement volume, to determine the Position Sensor's orientation.

This procedure also checks to see if there are any issues with the Position Sensor that could be attributed to line separation problems. If such a potential problem is detected, the application will provide you with the option of cancelling the setup before going further.

Remember the following:

- The distance between the first and second collections must be a minimum of 100 mm.
- You must hold the AAK tool stationary at each location during the orientation collection. For instructions on the correct way to orient the AAK tool, see "How to Hold the AAK Tool Correctly" on page 31.

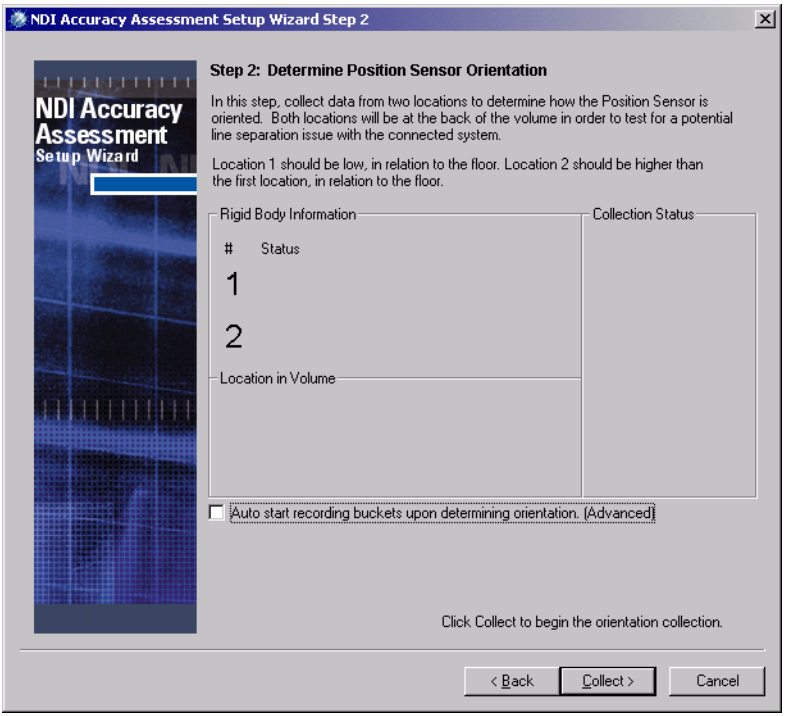

Figure 7-4 Determine Position Sensor Orientation Window

1. (Optional - selected by default) **Auto-start** is selected so that, upon successful determination of the Position Sensor orientation, the AAK application will finish and close the Setup Wizard and launch directly into the accuracy assessment test.
2. Click **Collect**.
3. ***For the first location, position the AAK tool LOW, in relation to the floor and at the back of the measurement volume***.

Note It is very important that the first location is LOW so that there is enough room for the second location to be at least 100 mm higher than the first.

In the Rigid Body Information area, rigid body status messages and associated status colours are displayed for each rigid body. Use this

information to ensure that the AAK tool is positioned correctly, and that the Position Sensor can see all of its markers.

Note To better understand status messages and colours, see "About Rigid Body Information" on page 19.

Once the AAK application determines that the AAK tool is in an appropriate position for the first location, it starts the collection countdown:

Figure 7-5 Collection Countdown

The collection countdown is set to 5 seconds, to give you time to position and steady the AAK tool. The countdown will stop if one of the rigid bodies suddenly cannot be tracked, and restart once the problem is solved.

4. Once the countdown is complete, the collection begins, stopping only if one of the rigid bodies suddenly cannot be tracked. ***Hold the AAK tool stationary while the orientation collection is in progress***.

   A collection progress bar shows how much of the first location's data has been collected.

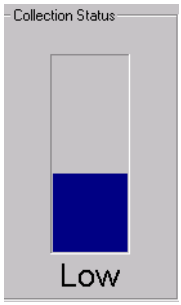

Figure 7-6 Collection Progress Bar

After the AAK application successfully completes the first orientation collection, it will start the countdown delay for the second location.

5. ***For the second location, position the AAK tool HIGHER (minimum of 100 mm) than the previous collection, in relation to the floor and at the back of the volume.***

   As with the first location, the AAK application will begin a collection countdown once you have positioned the AAK tool in the required location.

   After the AAK application successfully completes the second orientation collection, it determines the orientation of the Position Sensor to the nearest 90-degree orientation angle.

   Once an orientation has been determined successfully, the wizard is complete.

6. Click **Finish** to close the Setup Wizard.

About Potential Line Separation Issues

Note This section is only applicable to Polaris Vicra, Polaris Spectra and Polaris Vega.

If the application detects a potential line separation issue with the Position Sensor, a warning will appear and the application will provide you with the opportunity to cancel the accuracy assessment procedure at

this point. Although Position Sensors identified with a potential line separation issue may still perform accurately, line separation issues may cause tools to go missing at the back of the volume.

A note will be added to the final AAK report to remind you that a potential problem was initially detected.

Note On Polaris systems (model P2 and P4 Position Sensors) the AAK application is able to track when other applications may not be able to track. This is because the AAK application uses a different tracking threshold in the software to enable it to calculate the line separation.

About Bump Detection

Note This section is only applicable to Polaris Vicra, Polaris Spectra and Polaris Vega.

If the Position Sensor has a bump registered prior to the collections, the AAK application will warn you of this bump before you start the setup, and offer you a chance to cancel the procedure. If you choose to continue, you are also offered a chance to clear the bump sensor if the AAK test “passed”.

If the Position Sensor registers a bump *during* either the setup procedure or actual AAK testing, the AAK application will stop the current collection with a warning, and cancel the procedure for you.

For more information about the bump sensor, refer to the system user guide.

About Storage Temperature Detection

Note This section is only applicable to the Polaris Vega System

If the Polaris Vega Position Sensor has registered an out of range storage temperature, the AAK application will warn you before you start the setup, and offer you a chance to cancel the procedure. If you choose to continue, you are also offered a chance to clear the alert if the AAK test "passed".

For more information about the storage temperature sensor, refer to the guide that came with your system.

8 Performing an Accuracy Assessment Test

Note **Do not move the Position Sensor during any part of the accuracy assessment procedure.**

Now that you have completed the setup, you are ready to perform an accuracy assessment test. The accuracy assessment test is a set of data collections from specific areas (buckets) of the characterized measurement volume.

Note **You can perform multiple accuracy assessment tests with the same setup, as long as communications with the Position Sensor have been established, the assessment tests are being performed with the same AAK tool, and the Position Sensor has not moved.**

8.1 About Buckets

The number of buckets the accuracy assessment test collects depends on the type of characterized measurement volume you are assessing. For example, the accuracy assessment procedure collects sixteen buckets for the Polaris Pyramid Volume, but only eight buckets each for the Polaris Standard Volume.

You have the option of skipping or truncating (“trimming”) a bucket during a test, but be careful - the more buckets you trim, the less representative the final AAK result will be.

Do not trim buckets unless absolutely necessary. Trimming buckets may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

8.2 About Targets

Once you start an accuracy assessment test, a target appears in each view. This target is attached to a bucket progress bar that visually tracks each bucket collection as you move through the test.

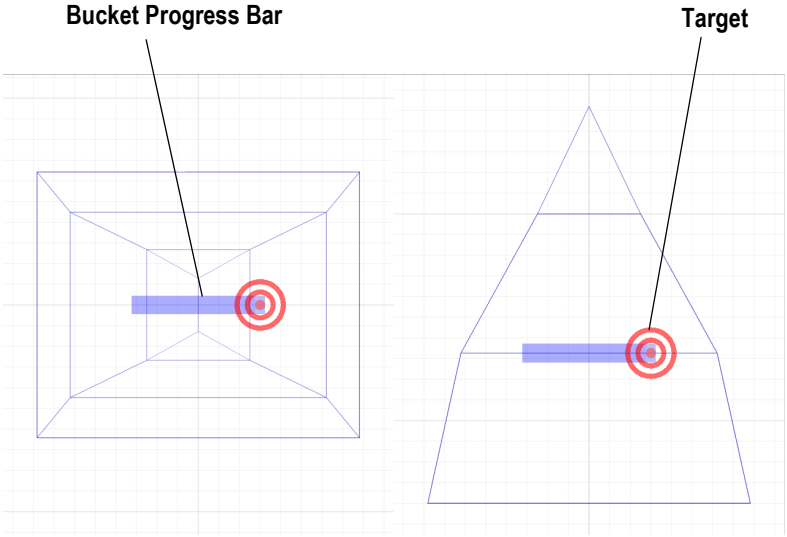

Figure 8-1 Target and Bucket Progress Bar

You must orient and position the AAK tool with the target before the bucket progress bar can be activated and the application collects data from that bucket:

The AAK tool's origin is represented by a black circle in both views:

- When this circle is aligned with the target in both views and is correctly oriented, the target turns green.
- When this circle is only aligned with the target in one view, the target in that view turns yellow.
- When this circle is not aligned with the target in either view, the target is red.

Note These are the default target colours. To change them, see "About Direction Hints" on page 49.

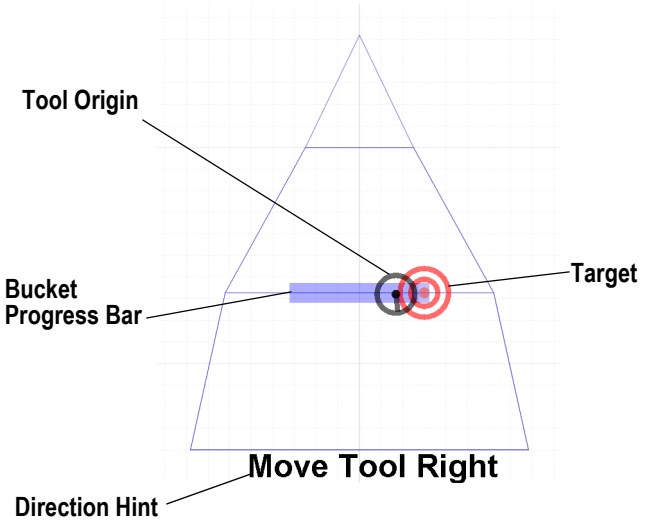

Figure 8-2 Positioning the AAK Tool

The actual orientation of the AAK tool is represented by a black line. This line moves as you turn the AAK tool and change its orientation. The *required* orientation is represented by a green "zone". Slowly rotate the tool so that the black line falls within the green zone:

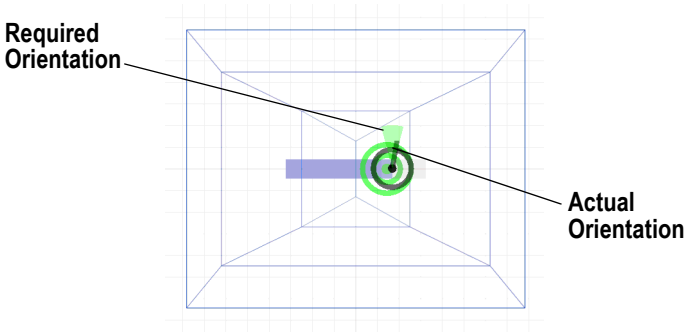

Figure 8-3 Orienting the AAK Tool

Note You can enable visual instructions to help you correctly position and orient the AAK tool in each bucket: Select View > Direction Hints to turn

them on or off. For more information, see "About Direction Hints" on page 49.

8.3 About Direction Hints

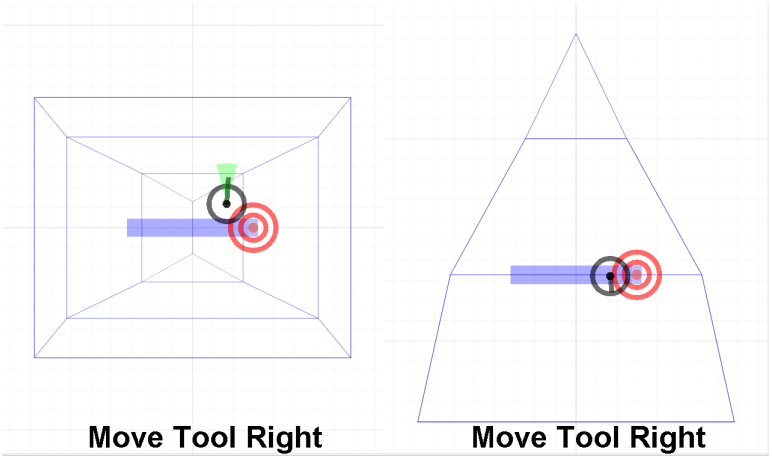

Figure 8-4 Direction Hints

For every collection made, you must position and then move the AAK tool in a specific manner. The AAK application helps you perform this task by providing visual hints for every movement required:

Table 8-1: Direction Hints

Hint	Description
Move Tool Left	Move the AKK tool slightly to the left while keeping markers pointing at the Position Sensor and maintaining the same tool orientation.
Move Tool Right	Move the AKK tool slightly to the right while keeping markers pointing at the Position Sensor and maintaining the same tool orientation.
Move Tool Forward	Move the AKK tool slightly towards the Position Sensor, but maintain the same tool orientation.
Move Tool Back	Move the AKK tool slightly away from the Position Sensor, but maintain the same tool orientation.

Table 8-1: Direction Hints

Hint	Description
Rotate Tool	Rotate the AAK tool slightly either clockwise or counter-clockwise, to better align the tool's rigid bodies with each other and to make sure that marker normals are pointing at the Position Sensor.

8.4 Angle Constraints

Note Applicable only on Polaris, Polaris Spectra and Polaris Vega systems.

An angle constraint indicator and **Tool Off Angle** message is implemented. This visual aid provides an indication whether or not the AAK tool is at the correct angle in relation to the Position Sensor. Refer to Figure 8-5 on page 51 for an example with the AAK tool within constraints and Figure 8-6 on page 51 for an example with the AAK tool out of constraints. Refer to Figure 8-7 on page 52 for a graphic showing the constrained angle.

If the AAK tool angle is within constraints, the angle constraint bar is green and touches the orientation bar.

If the AAK tool is out of constraints, the following visual indications occur:

- bucket progress is stopped
- the target background and angle constraint bar changes colour. (This colour is set in colour settings under **Tool Centroid when off-angle**. Refer to Table 5-5 on page 22 for further details.)
- the angle constraint bar does not touch the orientation bar
- the **Tool Off Angle** message appears

In this case, adjust the angle of the AAK tool, in relation to the Position Sensor, whilst observing the display, until the error indications cease.

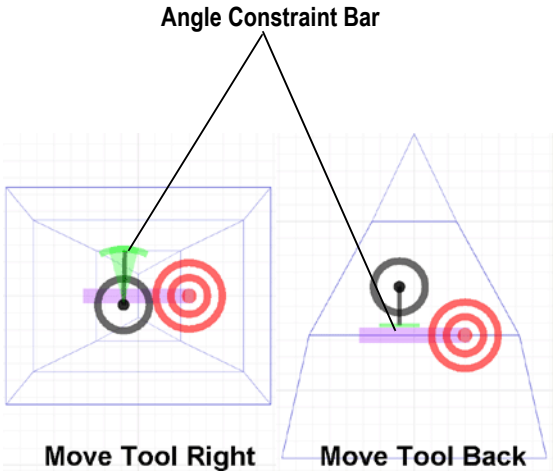

Figure 8-5 Angle Constraint Indication - Tool Within Constraints

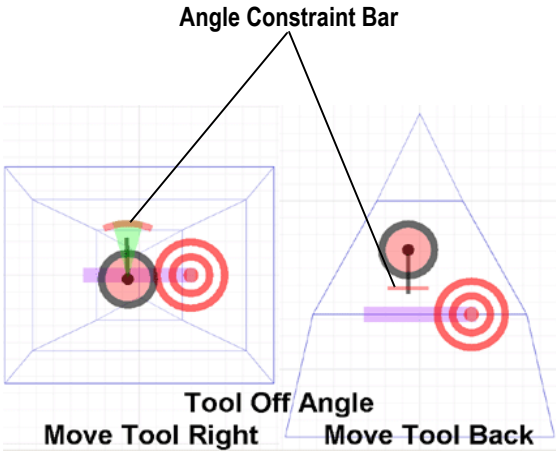

Figure 8-6 Angle Constraint Indicator - Tool Out Of Constraints

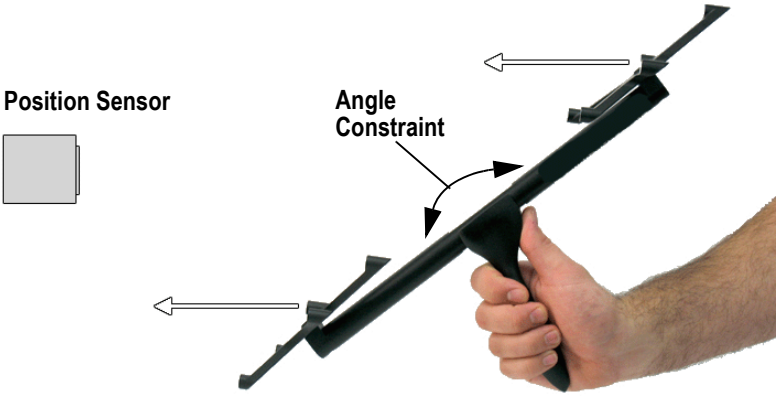

Figure 8-7 Angle Constraints

8.5 Performing the Test

1. From the main toolbar, click **Record**.
2. Once the AAK tool is positioned and oriented correctly in the characterized measurement volume, ***the target begins to move along the length of the bucket progress bar***. Move the AAK tool along with the target, using the status colours, message cues, and the position of the progress bar for guidance.

   As you move the AAK tool and the bucket data is collected, notice that the bucket progress bar also tracks the collection for that bucket.

Note For the most accurate results, you must move the AAK tool slowly and steadily.

3. Once the first bucket collection is completed, the target moves to the next location in preparation for the next bucket. Repeat the positioning procedure.
4. Once the accuracy assessment test is complete and all buckets have been collected, the Bucket Information area label changes to "Collection Complete" and the AAK application produces the AAK report.

8.6 What is Trimming?

The AAK application provides you with the ability to skip or truncate a portion of a bucket from the accuracy assessment test that you are performing. Trimming can be helpful if you find that, due to environmental constraints, you may not be able to physically position the AAK tool in the required location for a particular bucket. You can simply trim that bucket and move on to the next location.

Be aware that trimming buckets reduces the number of areas in the measurement volume being measured. This reduces the amount of useful data collected, which in turn decreases the chance that the AAK result is representative of the Position Sensor's actual accuracy.

To trim a bucket, click the **Trim** button on the main toolbar.

When the accuracy assessment test is completed, the application produces the AAK report. This report will list the buckets trimmed, so that you have a record of what data was not collected.

Note **If you trim buckets you will not be able to apply a line separation adjustment. (The adjustment feature is not applicable to Polaris Vicra, Polaris Spectra or Polaris Vega systems.)**

Do not trim buckets unless absolutely necessary. Trimming buckets may cause the accuracy assessment test to produce results that are not representative of the Position Sensor's accuracy. Working with a Position Sensor of unknown accuracy may increase the possibility of inaccurate conclusions being applied in your application. If this application involves personal safety, this may increase the risk of personal injury.

9 The AAK Report

Note The application expert is responsible for understanding how the AAK result relates to their own application requirements.

When the accuracy assessment procedure is complete, the AAK application produces an AAK report. The report contains details of the collections and the final AAK result.

If you purchased the optional line separation adjustment upgrade, that pane will be active in the AAK report. To interpret and apply line separation adjustment, refer to “The Line Separation Result” on page 59.

Note Line separation adjustment is not available for Polaris Vicra, Polaris Spectra or Polaris Vega Position Sensors.

An example of an AAK report is shown in Figure 9-1 on page 55.

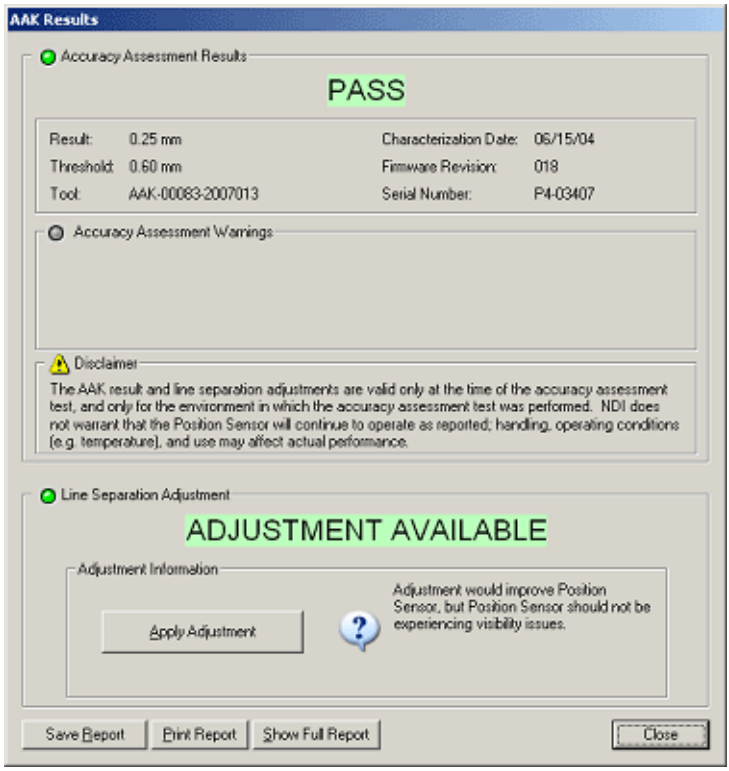

Figure 9-1 Sample AAK Results

If you trimmed any buckets during the accuracy assessment procedure, the AAK report will display “Incomplete Collection”. To view the full bucket details, click **Show Full Report** to open a text file of the entire AAK report.

9.1 The AAK Result

Note The AAK result and line separation adjustments are valid only at the time of the accuracy assessment test, and only for the environment in which the accuracy assessment test was performed. NDI does not warrant that the Position Sensor will continue to operate as reported; handling, operating conditions (e.g. temperature), and use may affect actual performance.

1. The AAK application calculates the length of the AAK tool using the collected positions of the rigid bodies affixed to each end of it. The application performs this calculation for each position collected during the test.
2. The application then compares the calculated length to that of the known length of the bar, as stored in the AAK tool definition file (.ATF). This comparison is done for each location collected throughout the measurement volume.
3. Finally, the application calculates the root mean square (RMS) value of all comparisons made, producing the final AAK result.

Following the instructions and protocol described above will help ensure accurate results.

The uncertainty for a given AAK result is ± 0.1 mm. Tests may be repeated to increase confidence in the result. If you suspect the AAK tool is providing results which are not representative of the Position Sensor's accuracy, stop using the AAK tool, save the Data file and forward it to NDI Technical Support.

Note The accuracy assessment protocol is significantly different from the internal Coordinate Measurement Machine (CMM) protocol used by NDI. As such, the results obtained cannot be directly correlated to individual CMM results.

Interpret the AAK result as follows:

Polaris System

Table 9-1: NDI AAK Result Thresholds - Polaris System

Accuracy Value	Meaning
Value ≤ 0.60 mm	Represents a typical range for a correctly functioning Position Sensor.
Value > 0.60 mm	Represents a less than optimal result. Depending on specific customer application, it is recommended that the Position Sensor be returned to NDI for evaluation.

These values are only warranted under the following conditions:

- The ambient temperature of the room in which the accuracy assessment test will be performed must be between 18°C and 23°C.
- The temperature of the AAK tool must also be between 18°C and 23°C.
- Starting from room temperature (between 18°C and 23°C), the system must have a warm up time of at least one hour.

Polaris Vicra System

Table 9-2: NDI AAK Result Thresholds - Polaris Vicra System

Accuracy Value	Meaning
Value ≤ 0.35 mm	Represents a typical range for a correctly functioning Position Sensor.
Value > 0.35 mm	Represents a less than optimal result. Depending on specific customer application, it is recommended that the Position Sensor be returned to NDI for evaluation.

These values are only warranted under the following conditions:

- The ambient temperature of the room in which the accuracy assessment test will be performed must be between 10°C and 30°C.

- The temperature of the AAK tool must also be between 10°C and 30°C.
- The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

Polaris Spectra System

Table 9-3: NDI AAK Result Thresholds - Polaris Spectra System

Accuracy Value	Meaning
Value ≤ 0.35 mm	Represents a typical range for a correctly functioning Position Sensor.
Value > 0.35 mm	Represents a less than optimal result. Depending on specific customer application, it is recommended that the Position Sensor be returned to NDI for evaluation.

Note These values are applicable to both the pyramid and extended pyramid volumes.

These values are only warranted under the following conditions:

- The ambient temperature of the room in which the accuracy assessment test will be performed must be between 10°C and 40°C.
- The temperature of the AAK tool must also be between 10°C and 40°C.
- The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

Polaris Vega System

Table 9-4: NDI AAK Result Thresholds - Polaris Vega System

Accuracy Value	Meaning
Value ≤ 0.25 mm	Represents a typical range for a correctly functioning Position Sensor.
Value > 0.25 mm	Represents a less than optimal result. Depending on specific customer application, it is recommended that the Position Sensor be returned to NDI for evaluation.

Note These values are applicable to both the pyramid and extended pyramid volumes.

These values are only warranted under the following conditions:

- The ambient temperature of the room in which the accuracy assessment test will be performed must be between 10°C and 35°C.
- The temperature of the AAK tool must also be between 10°C and 35°C.
- The power LED on the front of the Position Sensor must be on solid. (A flashing power LED indicates that the system is still warming up.)

9.2 The Line Separation Result

The line separation result is displayed in the lower half of the AAK report. An example of an AAK report is shown in Figure 9.1 on page 56. Line separation adjustment is an optional upgrade that allows you to (conditionally) adjust the line separation of the Position Sensor in the field. (The adjustment is not applicable for Polaris Vicra, Polaris Spectra or Polaris Vega Position Sensors.) For details on activating the line separation adjustment feature, refer to "Running the AAK Application" on page 10.

What is Line Separation?

To determine the position of an IR source, the Position Sensor calculates a line between the source of IR and each sensor. The line separation is the vertical distance between these two lines where they cross.

Line Separation Adjustment

If required, line separation adjustment is applied after the successful completion of an accuracy assessment procedure. Depending on a number of factors, the line separation adjustment is either:

- not required
- not required, but may improve line separation
- recommended
- not possible

The various messages, their interpretation and recommended or required action are detailed below:

Table 9-5: LIne Separation Adjustment

Message		Action
Accuracy Assessment Results	**Line Separation Adjustment**	
Pass (green)	No Adjustment Required (green)	No action required. The Position Sensor is within specification.
Pass (green)	Adjustment Available (green)	Adjustment is not necessary, but would improve line separation.
See Adjustment Information (yellow)	Adjustment Recommended (yellow)	Adjustment is recommended. Without adjustment, the Position Sensor may not track (passive) throughout the entire volume.
Fail (red)	Adjustment Cannot be Applied (red)	The accuracy assessment procedure failed. Review the documentation and re-run the procedure. If the condition continues, return the Position Sensor for servicing.

Message		Action
Accuracy Assessment Results	**Line Separation Adjustment**	
Incomplete Collection (yellow)	Adjustment Cannot be Applied (red)	Complete the collection.
See Adjustment Information (red)	Adjustment Cannot be Applied (red)	The Position Sensor is either out of original specification or accuracy would be significantly affected. Return the Position Sensor for servicing.
Pass (green)	Adjustment Cannot be Applied (red)	No action required. Applying adjustment would improve line separation, but would significantly affect the accuracy
Pass (green)	Adjustment Aborted Due to Problem (red)	Retry the adjustment. If that fails, contact NDI Technical Support

Read the messages in both the Accuracy Assessment Results and the Line Separation Adjustment panes of the AAK Results window. Choose the most appropriate action from Table 9-5. If applicable, apply line separation adjustment as follows:

1. Click on the **Apply Adjustment** button. Select **Yes** in the resulting dialog. The line separation adjustment procedure starts.
2. A progress bar displays the progress of the update procedure. Leave the system turned on and the AAK application running during the update procedure. (This may take several minutes.)
3. When the adjustment is complete the Accuracy Assessment Results message will show:
   PASS

   The Line Separation Adjustment message will show:
   ADJUSTMENT SUCCESSFULLY COMPLETED.
4. Click `Close` and in the resulting dialog, click `OK`. This action will initiate an AAK procedure.
5. Perform an AAK procedure. At the completion of the procedure the Accuracy Assessment Results message will show:
   PASS

The Line Separation Adjustment message will show:
NO ADJUSTMENT REQUIRED.

Note **If a problem occurs during the line separation adjustment procedure a "Programming Error" dialog will appear. Select "Yes" to retry the procedure or "No" to abort the procedure. If a second attempt fails, contact NDI Technical Support for assistance.**

9.3 Saving AAK Reports

You can store AAK reports for future reference. Click **Save Report** to save the AAK report to the directory location you specify, using the following default file naming conventions:

`AAK-XXXX_YYYY-MM-DD-HHMM_USERNAME.TXT`

where:

- `AAK-XXXXX` is the AAK tool serial number
- `YYYY-MM-DD-HHMM` the date the report was created
- `USERNAME` is the user name recorded using the Setup wizard
- `.TXT` is the text file created for the AAK report

9.4 Printing Reports

Click **Print Report** to send the AAK report to the printer location you specify.

10 Troubleshooting

This section provides explanations of potential problems encountered during the use of the AAK application.

Note If you do not find the problem you are encountering addressed here, contact NDI Technical Support for assistance.

Communications Timeout Errors

A communications system timeout error occurs when the AAK application attempts to connect to a system but does not make a connection. A “System Error” message box is displayed and you must click **OK** to continue.

This error may also occur if communications are lost once the connection has been established. If this error occurs, check that:

- the system is turned on
- all power and communication cables are properly connected
- the proper settings are selected in the Communication Settings dialog
- no other application is using the same COM port (not applicable to Polaris Vega)
- (for Polaris Vega) the correct IP address for the Position Sensor is used

Clicking **Retry** will attempt communications. This process may take several seconds. If, after clicking **Retry**, communications are still not enabled, restart the Setup Wizard. If that fails, reboot the computer and the Position Sensor, wait the appropriate warm-up time, then restart the Setup Wizard.

Clicking **Cancel** ends the attempt at communications and restarts the application. You will have to run the Setup Wizard to establish communications.

If the error persists, contact NDI Technical Support.

Incorrect Position Sensor Orientation

If possible, NDI recommends that you move the Position Sensor parallel to the floor, in a horizontal position, before starting the accuracy assessment procedure. This positioning will make it easier to collect the assessment data.

For correct Position Sensor orientation, position the AAK tool so that it tracks both the rigid bodies. Be sure to take the first reading at a lower level, with respect to the floor and the second reading at a higher level, with respect to the floor. The distance between the two locations must be a minimum of 100 mm. If you take the first reading at a higher level and the second reading at a lower level, the directions, such as up and down, will be reversed. The effect of an incorrectly determined orientation would be that you would have to move the AAK tool in the reverse direction in which you want to move it. For example, if you wanted to move the AAK tool to the left, you would have to actually move it to the right. Incorrect Position Sensor orientation does not affect the AAK result.

Rigid Body Missing Overview

A rigid body may be missing and the AAK application is unable to track it for a variety of reasons.

Rigid Body Missing Due to Interference from Intense Background IR

This error occurs when you are performing the accuracy assessment procedure correctly, but the rigid body status message is "IR Interference" for one or both of the rigid bodies. To troubleshoot, check the environment and remove the cause of the intense background infrared interference. For example, a light or reflections of infrared light from the illuminators could cause background infrared light. Turn off operating room lights and remove any surfaces that give reflections.

If the error persists, contact NDI Technical Support.

Rigid Body Missing Due to Marker, Rigid Body or AAK Tool Damaged

Note **NDI products are designed and manufactured to be used with NDI components. NDI cannot guarantee or warranty the performance or**

accuracy when non-NDI components are used with NDI products or when NDI components are not repaired by NDI personnel.

If the rigid body status message "Max. 3D Error Exceeded" or “Too few Markers in View” is displayed, despite the markers pointing directly at the Position Sensor, one of the markers may either need cleaning or be damaged. To troubleshoot, first try cleaning the markers. Refer to “Care, Cleaning and Maintenance” on page 14 for marker cleaning instructions. Then, rerun the accuracy assessment procedure.

If the error persists, one of the markers may be damaged or one of the rigid bodies may be bent. Contact NDI Technical Support for assistance.

If the AAK tool is not tracking and one of the markers, rigid bodies or the AAK tool itself appears to be damaged, contact NDI Technical Support. You may have to obtain a Returned Materials Authorization (RMA) from NDI and return the AAK tool for repair. Refer to “Questions?” on page viii for contact information.

Note **The “Max. 3D Error Exceeded” status message may be displayed if the Position Sensor is facing a source of non-intense IR light. In this situation, reposition the Position Sensor such that it is not facing the IR source.**

System Will Not Track Tool at Back of Characterized Measurement Volume

If the system will track the AAK tool at the front of the characterized measurement volume, but not at the back of the characterized measurement volume, it may be due to one of the following reasons:

Rigid Body Missing Due to System Not Warmed Up

Note **The Polaris Position Sensor requires a thermal stabilization period in order to provide accurate measurements. It is the responsibility of the user to conduct testing to determine the required accuracy and corresponding stabilization time for the intended use.**

Follow the instructions for warming up the system and then rerun the accuracy assessment procedure. If the error persists, contact NDI Technical Support.

Rigid Body Missing Due to Position Sensor Damaged

If the Position Sensor exhibits any of the following behaviours, contact NDI Technical Support. You may have to obtain a Returned Materials Authorization (RMA) from NDI and return the Position Sensor for repair. Refer to “Questions?” on page viii for contact information.

- after warming up the system, unable to track at the back of the volume
- unable to track a passive tool anywhere within the volume
- unable to track passive tools within a region of the characterized measurement volume

These are indicators that the Position Sensor is out of calibration.

Rigid Body Missing Due to Being Unable to Collect Orientation Information

In tracking mode, each rigid body on the AAK tool is represented in the Rigid Body Information area by a status colour and status message (see “About the Status Bar Lights” on page 22). If one of the rigid bodies is completely out of the characterized measurement volume during the orientation collection, it will be missing. The rigid body's status colour will be red and the status message "Out of Volume" is displayed. If the rigid body is partially out of the characterized measurement volume during the orientation collection, the rigid body's default status colour will be yellow and the message "Partially Out of Volume" or “Too Few Markers” is displayed.

Move the AAK tool so that each rigid body’s status colour is green and the status message is “Tracking Properly”, indicating they are within the characterized measurement volume. Then rerun the accuracy assessment procedure. If the error persists, contact NDI Technical Support.

If the rigid body status message "Markers Are Off Angle" is displayed, rotate the AAK tool until the markers point directly at the Position Sensor and each rigid body's status colour is green and “Tracking Properly”. Then rerun the accuracy assessment procedure. If the error persists, contact NDI Technical Support.

Rigid Body Missing Due to Wrong AAK Tool Used

Note **If you have copied the AAK files to your PC hard drive and need to return the AAK tool to NDI, you should also delete the original .ATF file. If you run the AAK application from the USB flash drive and need to return the AAK tool to NDI, you should discard the old AAK USB flash drive.**

Each AAK tool has an identification label mounted on the back. Check that the label on the USB flash drive and envelope matches the serial number and characterization date of the identification label on the AAK tool.

Each Tool has a specific AAK tool information file (.ATF file) associated with it and is supplied on the USB flash drive. The file name is an amalgamation of the AAK tool serial number and the characterization date. The file name is in the format “AAK-XXXXX-YYYYMMDD”. If you do not use this .ATF file, the accuracy assessment procedure may provide results which are not representative of the Position Sensor’s accuracy.

Application Does Not Display Properly

The application may not display properly as a result of out-of-date video card drivers. If you are not sure if the display is correct, refer to “About Views” on page 21 for an illustration of how a Pyramid Volume is typically displayed. If you encounter this problem, install the latest drivers available for your video card.

Incorrect colour settings and screen resolution may affect the application display.

Note **For best performance, NDI recommends screen resolution of 1024x768 pixels and 16-bit colour or higher.**

If the problem remains, contact NDI Technical Support.

AAK Online Help Does Not Display Properly

The Online Help will not display properly if you are using the AAK application from the USB flash drive that was provided with the system. To ensure the Online Help displays properly, copy the AAK folder from the USB flash drive to a local drive on your computer and run the AAK program from the local directory.

If the problem remains, contact NDI Technical Support.

11 Frequently Asked Questions

What can a CMM do that the NDI Accuracy Assessment Kit cannot?

The CMM measures the entire measurement volume, whereas the AAK provides a quick field test of specific areas of the measurement volume, to determine if the system needs to be returned to NDI for re-characterization. Because of this difference in focus, the CMM can take into account issues such as dirt, scratches on lenses, and other local distortions. The AAK does not always detect such disturbances.

The CMM can provide absolute values for any point in the measurement volume. The AAK can only report the relative position and orientation of two locations: those fixed to either end of the AAK tool. This difference means that the CMM can recognize certain types of defects that the AAK cannot see.

How does the AAK result relate to CMM accuracy?

The CMM and the AAK each use different protocols. They assess and emphasize different areas and aspects of the measurement volume using different methods; as such, they will not correlate consistently.

Therefore, there is a weak correlation between AAK and CMM test results, especially for good cameras where noise dominates the AAK results.

The AAK is more application relevant than CMM tests as it takes place in the application environment, using a standard collection procedure that does not remove the Position Sensor from its intended location. Beyond environment, the accuracy assessment test measures rigid bodies instead of single markers. This also increases application relevancy.

For more information, see the "NDI Accuracy Assessment Kit Guidelines - Polaris Position Sensors" white paper posted on the NDI support site.

What is the meaning of the AAK result?

It is the difference in distance between the measured locations of two rigid bodies on the AAK tool, and a known calibrated value of the same distance. This difference, calculated as an RMS value, is indicative of the performance of the Position Sensor.

How does NDI recommend the AAK result be interpreted?

For Polaris Systems:

Value ≤ 0.60 mm represents a typical range for a correctly functioning Position Sensor.

Value > 0.60 mm represents a less than optimal result, depending on specific customer application. Return the Position Sensor to NDI for evaluation.

For Polaris Vicra Systems:

Value ≤ 0.35 mm represents a typical range for a correctly functioning Position Sensor.

Value > 0.35 mm represents a less than optimal result, depending on specific customer application. Return the Position Sensor to NDI for evaluation

For Polaris Spectra Systems:

Value ≤ 0.35 mm represents a typical range for a correctly functioning Position Sensor.

Value > 0.35 mm represents a less than optimal result, depending on specific customer application. Return the Position Sensor to NDI for evaluation

For Polaris Vega Systems:

Value ≤ 0.25 mm represents a typical range for a correctly functioning Position Sensor.

Value > 0.25 mm represents a less than optimal result, depending on specific customer application. Return the Position Sensor to NDI for evaluation

Note For Polaris Spectra and Polaris Vega Systems, these values are applicable to both the pyramid and extended pyramid volumes.

How did NDI produce the AAK result thresholds?

NDI established the AAK threshold for each system type (Polaris Vega, Polaris Spectra, Polaris Vicra and Polaris) by performing a repeatability

and reproducibility study involving at least 10 position sensor systems, 3 operators and 3 repetitions.

Why is it that, after my Position Sensor produced a failing AAK result (and returned the system to NDI), NDI's CMM calibration produced a passing result?

Because the CMM protocol is different than the AAK protocol, their results do not correlate perfectly. They emphasize different areas and aspects of the measurement volume and error distribution. Although similar on a broad level, they are different protocols with different results.

How often should the tool be recalibrated?

NDI recommends, under normal lab conditions, a maximum of one year before recalibrating the AAK tool. However, if you are using the tool in the field, NDI recommends that you develop a calibration schedule based on intervals of three to six months.

If the AAK tool has been dropped or if its discs are damaged, return it to NDI immediately, to be recalibrated before performing any more tests. Even small changes to the AAK tool can offset the results produced by the Position Sensor.

Like any precision calibrated artifact, the AAK tool should be calibrated regularly. An industry standard practise is to start by calibrating frequently. If there is little change between calibrations, the period can be extended.

Why should I implement the AAK process into my regular maintenance program of Position Sensors?

The AAK test allows you to assess a Position Sensor while it is still in service. This can help you avoid the possibility of removing a "good" Position Sensor from the field for repair.

The AAK test is a cost-effective calibration program that takes very little time to perform.

The AAK protocol is more comparable to a real application than a normal CMM protocol.

What happens if my incoming inspection does not pass an AAK test?

If the incoming inspection does not pass an AAK test, return the Position Sensor to NDI for evaluation. Should the Position Sensor fail our own AAK tests, under our environmental criteria set in this document, NDI will replace/repair the system under its existing warranty.

How often should I do an AAK test in the field?

The frequency of field tests depend on usage and environment, and must be decided by the customer. As with any calibration check, good practice says a calibration check should start by being performed frequently; the period can be extended once it is proven that there is little change between checks.

Can I set my own value criteria?

You can set your own value criteria to match your specific application needs; however, any system returned to NDI under warranty will be evaluated using the value criteria set by NDI.

Why do I have to wait a specific length of time to warm up the Position Sensor when my system can track tools after a shorter warm-up time?

Although the Position Sensor can track tools at a temperature reached in a shorter time, warming up the system for the length of time specified in this document ensures that *all* Position Sensor components have settled to the same temperature. Because the AAK test is so sensitive to test conditions, ensuring that every component of the Position Sensor has reached the same temperature is very important.

12 Abbreviations and Acronyms

The following table provides a listing of the abbreviations and acronyms used in this guide.

Table 12-1: Abbreviations and Acronyms

Abbreviation or Acronym	Meaning
AAK	Accuracy Assessment Kit
CMM	Coordinate Measurement Machine
IR	Infrared Light
RMA	Returned Materials Authorization
RMS	Root Mean Square
USB	Universal Serial Bus

Glossary

.ATF

see *AAK tool definition file (.ATF)*

.BIN

see *bucket file*

AAK handle

A removable handle that is supplied with the AAK tool

AAK report

Once you have finished the accuracy assessment test, the AAK application calculates the accuracy of the Position Sensor and produces an AAK report. This report includes the final AAK result, any errors that may have occurred during the test, and any additional bucket information.

AAK tool

The hardware used by the AAK application to determine the accuracy assessment result. The AAK tool consists of two rigid bodies, each equipped with five passive disc markers. These rigid bodies are affixed on either end of a metal bar, and engraved on their respective surfaces are identifying numbers, to differentiate between them

AAK tool definition file (.ATF)

Each AAK tool is associated with a specific tool definition file (.ATF). This file contains information about the tool's design (such as its dimensions and marker locations).

see also *tool definition file*

accuracy assessment procedure

The accuracy assessment procedure consists of three steps: create an accuracy assessment setup, perform an accuracy assessment test, and produce an accuracy assessment report.

accuracy assessment setup

The accuracy assessment setup involves selecting the appropriate AAK tool definition file (.ATF), setting the communication parameters, and performing two brief collections at the back of the characterized measurement volume in order to determine the Position Sensor's orientation.

accuracy assessment test

The accuracy assessment test involves collecting data from various buckets of the measurement volume. The AAK application uses both visual aids and messages to help you position the AAK tool correctly.

application expert

The application expert is defined as the person who is responsible to have a sufficient understanding of the accuracy assessment (including protocol, implementation and external factors) to interpret the results for their particular application. Once they fully understand the AAK result, the application expert is responsible for determining a pass/fail criterion suitable to their particular application.

bucket

A bucket is a region of the characterized measurement volume in which accuracy assessment data is collected.

bucket file

The file containing bucket collections made during an accuracy assessment.

calibration

Calibration is the process of establishing, under specified conditions, the relationship between values produced by an NDI measurement system and corresponding known values established with universal standards.

characterized measurement volume

The characterized measurement volume is the volume within the detection region where accuracy is within specified limits. NDI does not know the accuracy of measurements performed outside this region.

disc marker

see *marker*

line separation

To determine the position of an IR source, the Position Sensor calculates a line between the source of IR and each sensor. The line separation is the vertical distance between these two lines where they cross.

line separation adjustment

Line separation adjustment is an (optional) in-field procedure applied to Polaris P2 and P4 Position Sensors, to return the line separation to within original specifications. (Line separation adjustment is not available for Polaris Vicra or Polaris Spectra or Polaris Vega systems.)

marker

A marker is a retro-reflective passive disc that reflects infrared light emitted by the Position Sensor.

measurement volume

see *characterized measurement volume*

missing

If the system cannot determine the transformation of a marker, that marker is considered missing.

NDI Accuracy Assessment Kit

The NDI Accuracy Assessment Kit consists of an Accuracy Assessment (AAK) tool and an accompanying application package. To assess the accuracy of a Position Sensor operating in your specific application environment, use the AAK application to track the AAK tool through

predefined, guided positions throughout the characterized measurement volume. The AAK application then calculates an accuracy assessment (AAK) result. This result represents the accuracy of the Position Sensor in that specific environment.

normal

A normal is a vector defining the direction in which an object is facing.

operator

The operator is defined as the person actually performing the accuracy assessment procedure. This will typically be done in the field, or as part of an incoming inspection.

Position Sensor

The Position Sensor is the component of the Polaris measurement system that provides a source of infrared light for passive markers, collects marker position data, calculates tool transformations, and sends the results to the host computer.

raw data file

Raw data collected during an accuracy assessment, in binary format.

rigid body

A rigid body is an object on which three or more markers are fixed relative to one another.

tool definition file (.ATF)

A tool definition file (.ATF) stores information about the AAK tool. This includes information such as the placement of the tool's rigid bodies, markers, and its manufacturing data.

transformation

A transformation is a combination of translation and rotation values that describe a change of the tool or rigid body's position and orientation.

trimming

Trimming is the practice of skipping a particular bucket collection during an accuracy assessment test.

User

The User is defined as either the application expert or the operator.

views

A view is a graphic representation of the characterized measurement volume displayed in the AAK application main window.

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