USER GUIDE

# Autopilot

## TOOLBOX II SOFTWARE

Version 4.01
Revision A
October 2016



Trimble

## LEGAL NOTICES

Agriculture Business Area
Trimble Agriculture Division
10368 Westmoor Drive
Westminster, CO 80021-2712
USA
www.trimble.com

### Copyright and Trademarks



### Release Notice

This is the October 2016 release (Revision A) of the Autopilot Toolbox II documentation. It applies to version 4.0.1 of the Autopilot Toolbox software.

The following limited warranties give you specific legal rights. You may have others, which vary from state/jurisdiction to state/jurisdiction.

### Product Limited Warranty

Trimble warrants that this Trimble product and its internal components (the 'Product") shall be free from defects in materials and workmanship and will substantially conform to Trimble's applicable published specifications for the Product for a period of one (1) year, starting from the earlier of (i) the date of installation, or (ii) six (6) months from the date of original Product shipment from Trimble. This warranty applies only to the Product if installed by Trimble or a dealer authorized by Trimble to perform Product installation services.

### Software Components

All Product software components (sometimes hereinafter also referred to as "Software") are licensed solely for use as an integral part of the Product and are not sold. Any software accompanied by a separate end user license agreement ("EULA") shall be governed by the terms, conditions, restrictions and limited warranty terms of such EULA notwithstanding the preceding paragraph.

During the limited warranty period you will be entitled to receive such Fixes to the Product software that Trimble releases and makes commercially available and for which it does not charge separately, subject to the procedures for delivery to purchasers of Trimble products generally. If you have purchased the Product from an authorized Trimble dealer rather than from Trimble directly, Trimble may, at its option, forward the software Fix to the Trimble dealer for final distribution to you. Minor Updates, Major Upgrades, new products, or substantially new software releases, as identified by Trimble, are expressly excluded from this update process and limited warranty. Receipt of software Fixes or other enhancements shall not serve to extend the limited warranty period.

For purposes of this warranty the following definitions shall apply: (1) "Fix(es)' means an error correction or other update created to fix a previous software version that does not substantially conform to its Trimble specifications; (2) "Minor Update" occurs when enhancements are made to current features in a software program; and (3) "Major Upgrade" occurs when significant new features are added to software, or when a new product containing new features replaces the further development of a current product line. Trimble reserves the right to determine, in its sole discretion, what constitutes a Fix, Minor Update, or Major Upgrade.

Gson components licensed under the Apache 2.0 License. The source is available from http://code.google.com/p/google-gson/. Google MVEL components licensed under the Apache 2.0 Llicense. The source is available from http://code.google.com/p/mvel.codehause.org. Google Guava components listed under the Apache 2.0 License. The source is available from http://code.google.com/p/guava-libraries. MapQuest content licensed under the Open Data Commons Database License (DbCL). The source is available from http://developer.mapquest.com.
APACE LICENSE (Version 2.0, January 2004)
http://www.apache.org/licenses/

### TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

**1. Definitions**

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through Section 9 of this document.
"Licensor " shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.
"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.
"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.
"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.
"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.
"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).
"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.
"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."
"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

**2. Grant of Copyright License.** Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

**3. Grant of Patent License**. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

**4. Redistribution.** You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

You must give any other recipients of the Work or Derivative Works a copy of this License; and

You must cause any modified files to carry prominent notices stating that You changed the files; and

You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third- party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

**5. Submission of Contributions.** Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

**6. Trademarks.** This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

**7. Disclaimer of Warranty.** Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

**8. Limitation of Liability.** In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

### LWGL LICENSE

### ODC DATABASE CONTENTS LICENSE

### SGI FREE SOFTWARE LICENSE B (Version 2.0, Sept. 18, 2008)

Copyright © 2013 Silicon Graphics, Inc. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice including the dates of first publication and either this permission notice or a reference to http://oss.sgi.com/projects/FreeB/ shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL SILICON GRAPHICS, INC. BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Silicon Graphics, Inc. shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from Silicon Graphics, Inc.

### MAPQUEST PLATFORM TERMS OF USE (Last Updated: November 1, 2011)

Community Edition License Agreement

**INTRODUCTION**.

MapQuest has been helping people find places and get maps and directions for over 40 years. We make the MapQuest APIs, our Open Services (as described at http://open.mapquestapi.com/), Community Accounts and other developer services (in short, the "MapQuest Services"), along with the maps, driving directions and other content delivered through the MapQuest Services (the "MapQuest Content"), available without charge to encourage developers to use these services and content in developing their applications and websites. We want you to be creative and build awesome applications and websites that thrill your users. All we ask is that you comply with the terms that are included in these Terms of Use.

We will provide the developer community at-large with support in various forms, such as forums, blog posts or FAQs. Since we're providing the MapQuest Services for free, we don't provide individual technical support or warranties for the Community Services, but if you want to receive technical support and warranties, we have a product for you.

Please check out our MapQuest Platform Services Enterprise Edition and learn more about the services we will provide for reasonable fees. If you choose to use any of the MapQuest Services or if you set up a Community Account, you are agreeing to abide by these Terms of Use and are forming an agreement between yourself and MapQuest, Inc. ("MapQuest"). If you do not want to abide by these Terms of Use, then don't use the MapQuest Services.

**LICENSES FROM MAPQUEST TO YOU.**

2.1. MapQuest Services License. MapQuest grants you a non-exclusive, non-assignable, non-sublicensable, revocable limited license to use the MapQuest Services during the Term of these Terms of Use as provided by MapQuest in the manner permitted in these Terms of Use.

2.2. MapQuest Content License. MapQuest grants you a non-exclusive, non-assignable, non-sublicensable, revocable limited license access, use, publicly perform and publicly display the MapQuest Content as the MapQuest Content is provided through the MapQuest Services and in the manner permitted by these Terms of Use.

**GENERAL RESTRICTIONS, ADDITIONAL LEGAL NOTICE, RESERVATION OF RIGHTS**.

3.1. Restrictions. Except as expressly authorized by MapQuest, You must not:

- decompile, disassemble, reverse engineer, or otherwise attempt to derive any source code from the MapQuest Services or MapQuest Content, other than the Open Services;
- interfere or disrupt MapQuest servers or networks, or disobey any network access or security requirements, policies, procedures or regulations of MapQuest (including the enabling of any viruses, Trojan horses, trap doors, back doors, worms, time bombs, cancelbots, adware, spyware or other computer programming routines designed or intended to damage, detrimentally interfere with, surreptitiously intercept or expropriate any system, data or personal information);
- use the MapQuest Services as a means to engage in conduct that
- reflects poorly upon, disparages or devalues MapQuest's reputation or
- goodwill, as determined in MapQuest's sole discretion;
- use the MapQuest Services, other than the Open Services, in
- conjunction with any commercial application not publicly available
- without charge (other than mobile applications for which users pay a fee
- to download/install the application). If your application does not fit this
- criteria and you would like to discuss additional options for using the
- MapQuest Services please contact info@mapquest.com;
- use the MapQuest Services, other than the Open Services, to process or generate data for any third party (other than for end users as expressly permitted hereunder);
- use the MapQuest Services with any content or product that falsely expresses or implies that such content or product is sponsored or endorsed by MapQuest;
- use the MapQuest Services in conjunction with a site or application which contains or displays adult content or promotes illegal activities, gambling, or the sale of tobacco or alcohol to persons under twenty-one (21) years of age.

3.2. Additional Legal Requirements. In addition to the restrictions set forth in Section 3.1, your use of the MapQuest Services and MapQuest Content is subject to the Additional Legal Requirements which are incorporated and made a part of these Terms of Use. Please read the Additional Legal Requirements carefully as they include usage limits and additional restrictions that may impact your plans for development.

3.3. Reservation of Rights. MapQuest reserves all rights not expressly granted in these Terms of Use and you may not use the MapQuest Services or MapQuest Content in any manner not expressly authorized in these Terms of Use.

**LICENSE FROM YOU TO MAPQUEST**.

If you upload any data, feedback, ideas, suggestions, content, points of interest (including any points of interest that include Trademarks) or other material to MapQuest (collectively "Your Content"), you hereby grant MapQuest a perpetual, worldwide, non-exclusive, royalty-free license to access, archive, reproduce, publicly display, translate, modify the format or the display of, distribute, transmit, stream, cache, overlay, seam, perform, sublicense, and otherwise use Your Content with or without attribution and without financial obligation, in whole or in part, via any method for any purpose. MapQuest makes no assertion of ownership over Your Content, and you retain all intellectual property rights to Your Content, subject to the license you grant to MapQuest above.

**MODIFICATIONS TO THESE TERMS OF USE AND THE SERVICES**.

MapQuest reserves the right to change or modify these Terms of Use, the MapQuest Services and/or the MapQuest Content. Please check these Terms of Use, including the Additional Legal Requirements periodically for changes. Your continued use of the MapQuest Services or MapQuest Content following the posting of any changes to the Terms of Use constitutes acceptance of those changes.

**TERMINATION**.

MapQuest may terminate these Terms of Use and/or the provision of the MapQuest Services or MapQuest Content at any time, for any reason, with or without notice.

**PRIVACY POLICY AND END USER TERMS.**

7.1. Privacy Policy. MapQuest's collection and use of personally identifiable information is governed by the AOL Network Privacy Policy, available at http://about.aol.com/aolnetwork/aol_pp.

7.2. End User Terms. End users shall only be entitled to use the MapQuest Services and MapQuest Content if they accept the then current end user Terms of Use located at http://info.mapquest.com/terms-of-use/. MapQuest reserves the right to amend and/or replace these terms and the form and manner of presentation. You must provide a hypertext link at the bottom of each page in your website or application where the MapQuest Services or MapQuest Content can be viewed or accessed, or within the terms of use of your application or website, to the end user terms of use.

**ACCESS AND USAGE DATA**.

8.1. Credentials. MapQuest, at its discretion, may require you to create an account and obtain an access key and other related credentials (collectively "Credentials") to use the MapQuest Services or certain aspects of the MapQuest Services. You are responsible for maintaining the confidentiality of your Credentials and for any usage or abuse of the MapQuest Services or MapQuest Content by anyone using your Credentials.

8.2. Usage Data. MapQuest's servers record information when you visit MapQuest websites or when applications and/or Credentials call or invoke the MapQuest Services. This information may include, without limitation, the URL, IP address, browser type, Credential and access times and dates. MapQuest may use this information to promote, operate, and improve MapQuest services, products and properties.

**PROPRIETARY RIGHTS**.

You acknowledge and agree the MapQuest Services and MapQuest Content are works for purposes of copyright law, and embody valuable, confidential, trade secret information of MapQuest, the development of which required the expenditure of substantial time and money. As between MapQuest and You, MapQuest retains exclusive ownership of any and all rights, title and interest (including all intellectual property rights) in the MapQuest Services and MapQuest Content, and you shall not acquire any rights, express or implied, in the foregoing by virtue of these Terms of Use other than otherwise expressly set forth. For purposes of these Terms of Use, the term "Trademarks" means all trademarks, trade names, service marks, logos, domain names, along with any other distinctive brand features of MapQuest or its suppliers. All use by You of Trademarks shall inure to the benefit of MapQuest. Further, You shall not (a) display a Trademark as the most prominent element on any page of Your website, application or paper map; (b) display a Trademark in a manner that is misleading, defamatory, infringing, libelous, disparaging, obscene or otherwise objectionable to MapQuest as determined by MapQuest in its sole discretion; or (c) remove, distort or alter any element of a Trademark.

**DISCLAIMER OF WARRANTIES**.

THE MAPQUEST SERVICES AND MAPQUEST CONTENT ARE PROVIDED ON AN "AS IS" AND "AS AVAILABLE" BASIS. MAPQUEST DISCLAIMS ANY AND ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OR NON-INFRINGEMENT. MAPQUEST DOES NOT REPRESENT OR WARRANT THAT THE MAPQUEST SERVICES OR CONTENT, OR ANY PORTION THEREOF, IS OR WILL BE FREE OF DEFECTS OR ERRORS (OR THAT ANY SUCH DEFECTS OR ERRORS WILL BE CORRECTED), VIRUS FREE, ABLE TO OPERATE ON AN UNINTERRUPTED BASIS, MEET YOUR REQUIREMENTS, OR CAPABLE OF BEING INTEGRATED INTO OR WITH YOUR COMPUTER SYSTEM, APPLICATIONS OR NETWORK. FURTHER, MAPQUEST DOES NOT WARRANT OR MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE MAPQUEST SERVICES, OR ANY PORTION THEREOF, IN TERMS OF ITS CORRECTNESS, ACCURACY, QUALITY, RELIABILITY, OR OTHERWISE. THIS DISCLAIMER CONSTITUTES AN ESSENTIAL PART OF THESE TERMS OF USE. IF THIS EXCLUSION IS HELD UNENFORCEABLE, THEN ALL EXPRESS AND IMPLIED WARRANTIES SHALL BE LIMITED IN DURATION TO A PERIOD OF FIFTEEN (15) DAYS AFTER THE EFFECTIVE DATE, AND NO WARRANTIES SHALL APPLY AFTER THAT PERIOD. LIMITATION ON LIABILITY. NEITHER MAPQUEST NOR ITS AFFILIATES NOR ANY OF THEIR SUPPLIERS SHALL BE LIABLE TO YOU OR ANY OTHER THIRD PARTY FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE ARISING OUT OF THE POSSESSION OF, ACCESS TO, USE OF, OR INABILITY TO ACCESS OR USE THE MAPQUEST SERVICES OR MAPQUEST CONTENT, OR ANY PORTION, INCLUDING, WITHOUT LIMITATION, LOST PROFITS, DATA LOSS, COST OF PROCUREMENT FOR SUBSTITUTE GOODS, OR COMPUTER FAILURE OR MALFUNCTION, EVEN IF MAPQUEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND REGARDLESS OF WHETHER THE CLAIM OR LIABILITY IS BASED UPON ANY CONTRACT, TORT, BREACH OF WARRANTY OR OTHER LEGAL OR EQUITABLE THEORY. IN NO EVENT SHALL MAPQUEST'S TOTAL AGGREGATE LIABILITY UNDER THESE TERMS OF USE EXCEED THE LESSER OF (A) THE TOTAL AMOUNT OF FEES PAID BY YOU TO MAPQUEST UNDER THESE TERMS OF USEFOR THE TWELVE (12) MONTHS PRECEDING THE DATE OF THE EVENT GIVING RISE TO SUCH CLAIM; OR (B) FIVE HUNDRED DOLLARS ($500).

YOU EXPRESSLY ACKNOWLEDGE AND AGREE THAT THE PARTICIPATION IN AND USE OF THE MAPQUEST SERVICES AND MAPQUEST CONTENT IS DONE AT YOUR OWN RISK AND THAT YOU ARE SOLELY RESPONSIBLE AND LIABLE FOR ANY DAMAGE SUSTAINED TO YOUR COMPUTER SYSTEM, NETWORK OR DATA RESULTING FROM SUCH PARTICIPATION OR USE.

SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF CERTAIN WARRANTIES OR THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

**INDEMNITY**.

You agree to indemnify, defend and hold MapQuest and its affiliates, and each of their officers, directors, employees, agents, co- branders or other partners (as well as each of their suppliers), successors and permitted assigns ("Indemnified Parties") harmless from and against any third party claim or action, including any liability, cost, losses, damages, expenses, and attorney's fees, arising from or in any way related to Your access, use or participation in the MapQuest Services (including claims related to Your Content and any use of the MapQuest Services with software, data, content, systems, or other technology not provided by MapQuest), any violation of these Terms of Use, or any alleged infringement of a patent, copyright, trademark, trade secret, or other intellectual property right. MapQuest shall use good faith efforts to provide you with prompt notice of any such claim or action; provided however, you agree that, upon MapQuest's written request, MapQuest shall control the defense or settlement of any such claim or action and you shall provide reasonable cooperation to MapQuest. You may not settle an indemnifiable claim without obtain MapQuest's prior written consent.

**EXPORT RESTRICTIONS**.

You agree to comply with all export and import laws and restrictions and regulations of the United States or any foreign agency or authority, and not to export or re-export MapQuest Services or any direct product thereof in violation of any such restrictions, laws or regulations, or without all necessary approvals.

**NOTICES AND TRANSACTING ELECTRONICALLY.**

You understand and agree that MapQuest is an online service and that you are transacting with MapQuest electronically. MapQuest shall provide electronic notices by posting them on this website and/or by sending an email to any account associated with your Credentials.

**GENERAL PROVISIONS.**

15.1. Entire Agreement. These Terms of Use constitute the entire agreement between MapQuest and You with respect to the subject matter of these Terms of Use, and supersedes all prior agreements, understandings and communications between MapQuest and You with respect to such subject matter. No modification or amendment to these Terms of Use shall be effective unless in writing by MapQuest.

15.2. Choice of Law; Jurisdiction. These Terms of Use are made under and shall be governed by and construed in accordance with the laws of the Commonwealth of Virginia (except for its conflicts of laws principles) and specifically excluding f the United Nations Convention on Contracts for the International Sale of Goods. MapQuest and You expressly agree that exclusive jurisdiction for any claim or dispute relating to or arising out of these Terms of Use resides in the state courts in Loudoun County, Virginia and the federal courts of the Eastern District of Virginia (Alexandria Division) and further agree and expressly consent to the exercise of personal jurisdiction in such state and federal courts of Virginia in connection with any such dispute.

15.3. Severability; Waiver. If any provision in these Terms of Use should be held illegal or unenforceable by a court having jurisdiction, such provision shall be modified to the extent necessary to render it enforceable without losing its intent, or severed from these Terms of Use if no such modification is possible, and other provisions of these Terms of Use shall remain in full force and effect. A waiver by either MapQuest or You (as applicable) of any term or condition of these Terms of Use or any breach thereof, in any one instance, shall not waive such term or condition or any subsequent breach thereof.

15.4. Public Statements. You acknowledge and agree that MapQuest may make any public statements regarding the existence of these Terms of Use or the relationship described herein, without Your consent.

15.5. Survival. Any term or condition of these Terms of Use that by its nature would logically survive termination or expiration of these Terms of Use, including but not limited to protections of proprietary rights, indemnifications, and limitations of liability, shall survive such termination or expiration.

15.6. Independent Contractors. The parties to these Terms of Use are independent contractors. Neither party is an agent, representative or partner of the other party. Neither party shall have any right, power or authority to enter into any agreement for or on behalf of, or incur any obligation or liability of, or otherwise to bind, the other party.

15.7. Equitable Remedies. You acknowledge and agree that monetary damages may be insufficient to compensate MapQuest for an actual or anticipated breach of these Terms of Use by you. You agree that in such circumstances MapQuest shall be entitled to seek equitable remedies (including preliminary and permanent injunctions), in addition to any other remedies available to MapQuest at law or hereunder.

15.8. Statute of Limitations. You agree that regardless of any statute or law to the contrary, any claim or cause of action arising out of or related to use of the MapQuest Services or these Terms of Use must be filed by you within one (1) year after such claim or cause of action arose or be forever barred.

15.9. Consent to Further Contacts. You agree that MapQuest may contact You with respect to these Terms of Use, any other MapQuest products and services, and in relation to any marketing related purposes.

ODC Open Database License (ODbL)

The Open Database License (ODbL) is a license agreement intended to allow users to freely share, modify, and use this Database while maintaining this same freedom for others. Many databases are covered by copyright, and therefore this document licenses these rights. Some jurisdictions, mainly in the European Union, have specific rights that cover databases, and so the ODbL addresses these rights, too. Finally, the ODbL is also an agreement in contract for users of this Database to act in certain ways in return for accessing this Database.

Databases can contain a wide variety of types of content (images, audiovisual material, and sounds all in the same database, for example), and so the ODbL only governs the rights over the Database, and not the contents of the Database individually. Licensors should use the ODbL together with another license for the contents, if the contents have a single set of rights that uniformly covers all of the contents. If the contents have multiple sets of different rights, Licensors should describe what rights govern what contents together in the individual record or in some other way that clarifies what rights apply.

Sometimes the contents of a database, or the database itself, can be covered by other rights not addressed here (such as private contracts, trade mark over the name, or privacy rights / data protection rights over information in the contents), and so you are advised that you may have to consult other documents or clear other rights before doing activities not covered by this License.

The Licensor (as defined below) and You (as defined below) agree as follows:

**1.0 Definitions of Capitalised Words**

"Collective Database" - Means this Database in unmodified form as part of a collection of independent databases in themselves that together are assembled into a collective whole. A work that constitutes a Collective Database will not be considered a Derivative Database.

"Convey" - As a verb, means Using the Database, a Derivative Database, or the Database as part of a Collective Database in any way that enables a Person to make or receive copies of the Database or a Derivative Database. Conveying does not include interaction with a user through a computer network, or creating and Using a Produced Work, where no transfer of a copy of the Database or a Derivative Database occurs.

"Contents" - The contents of this Database, which includes the information, independent works, or other material collected into the Database. For example, the contents of the Database could be factual data or works such as images, audiovisual material, text, or sounds.

"Database" - A collection of material (the Contents) arranged in a systematic or methodical way and individually accessible by electronic or other means offered under the terms of this License.

"Database Directive" - Means Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, as amended or succeeded.

"Database Right" - Means rights resulting from the Chapter III ("suigeneris") rights in the Database Directive (as amended and as transposed by member states), which includes the Extraction and Re-utilisation of the whole or a Substantial part of the Contents, as well as any similar rights available in the relevant jurisdiction under Section 10.4.

"Derivative Database" - Means a database based upon the Database, and includes any translation, adaptation, arrangement, modification, or any other alteration of the Database or of a Substantial part of the Contents. This includes, but is not limited to, Extracting or Re-utilising the whole or a Substantial part of the Contents in a new Database.

"Extraction" - Means the permanent or temporary transfer of all or a Substantial part of the Contents to another medium by any means or in any form.

"License" - Means this license agreement and is both a license of rights such as copyright and Database Rights and an agreement in contract.

"Licensor" - Means the Person that offers the Database under the terms of this License.

"Person" - Means a natural or legal person or a body of persons corporate or incorporate.

"Produced Work" - a work (such as an image, audiovisual material, text, or sounds) resulting from using the whole or a Substantial part of the Contents (via a search or other query) from this Database, a Derivative Database, or this Database as part of a Collective Database.

"Publicly" - means to Persons other than You or under Your control by either more than 50% ownership or by the power to direct their activities (such as contracting with an independent consultant).

"Re-utilisation" - means any form of making available to the public all or a Substantial part of the Contents by the distribution of copies, by renting, by online or other forms of transmission.

"Substantial" - Means substantial in terms of quantity or quality or a combination of both. The repeated and systematic Extraction or Re-utilisation of insubstantial parts of the Contents may amount to the Extraction or Re-utilisation of a Substantial part of the Contents.

"Use" - As a verb, means doing any act that is restricted by copyright or Database Rights whether in the original medium or any other; and includes without limitation distributing, copying, publicly performing, publicly displaying, and preparing derivative works of the Database, as well as modifying the Database as may be technically necessary to use it in a different mode or format.

"You" - Means a Person exercising rights under this License who has not previously violated the terms of this License with respect to the Database, or who has received express permission from the Licensor to exercise rights under this License despite a previous violation.

Words in the singular include the plural and vice versa.

**2.0 What this License covers**

2.1. Legal effect of this document. This License is:

a. A license of applicable copyright and neighbouring rights;

b. A license of the Database Right; and

c. An agreement in contract between You and the Licensor.

2.2 Legal rights covered. This License covers the legal rights in the Database, including:

a. Copyright. Any copyright or neighbouring rights in the Database. The copyright licensed includes any individual elements of the Database, but does not cover the copyright over the Contents independent of this Database. See Section 2.4 for details. Copyright law varies between

jurisdictions, but is likely to cover: the Database model or schema, which is the structure, arrangement, and organization of the Database, and can also include the Database tables and table indexes; the data entry and output sheets; and the Field names of Contents stored in the Database;
b. Database Rights. Database Rights only extend to the Extraction and Re-utilisation of the whole or a Substantial part of the Contents.
Database Rights can apply even when there is no copyright over the Database. Database Rights can also apply when the Contents are removed from the Database and are elected and arranged in a way that would not infringe any applicable copyright; and c. Contract. This is an agreement between You and the Licensor for access to the Database. In return you agree to certain conditions of use on this access as outlined in this License.
2.3 Rights not covered.
a. This License does not apply to computer programs used in the making or operation of the Database;
b. This License does not cover any patents over the Contents or the Database; and
c. This License does not cover any trademarks associated with the Database.
2.4 Relationship to Contents in the Database.
The individual items of the Contents contained in this Database may be covered by other rights, including copyright, patent, data protection, privacy, or personality rights, and this License does not cover any rights (other than Database Rights or in contract) in individual Contents contained in the Database. For example, if used on a Database of images (the Contents), this License would not apply to copyright over individual images, which could have their own separate licenses, or one single license covering all of the rights over the images.

**3.0 Rights granted**

3.1 Subject to the terms and conditions of this License, the Licensor grants to You a worldwide, royalty-free, non-exclusive, terminable (but only under Section 9) license to Use the Database for the duration of any applicable copyright and Database Rights. These rights explicitly include commercial use, and do not exclude any field of endeavour. To the extent possible in the relevant jurisdiction, these rights may be exercised in all media and formats whether now known or created in the future.
The rights granted cover, for example:
a. Extraction and Re-utilisation of the whole or a Substantial part of the Contents;
b. Creation of Derivative Databases;
c. Creation of Collective Databases;
d. Creation of temporary or permanent reproductions by any means and in any form, in whole or in part, including of any Derivative Databases or as a part of Collective Databases; and
e. Distribution, communication, display, lending, making available, or performance to the public by any means and in any form, in whole or in part, including of any Derivative Database or as a part of Collective Databases.
3.2 Compulsory license schemes. For the avoidance of doubt:
a. Non-waivable compulsory license schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme cannot be waived, the Licensor reserves the exclusive right to collect such royalties for any exercise by You of the rights granted under this License;
b. Waivable compulsory license schemes. In those jurisdictions in which the right to collect royalties through any statutory or compulsory licensing scheme can be waived, the Licensor waives the exclusive right to collect such royalties for any exercise by You of the rights granted under this License; and,
c. Voluntary license schemes. The Licensor waives the right to collect royalties, whether individually or, in the event that the Licensor is a member of a collecting society that administers voluntary licensing schemes, via that society, from any exercise by You of the rights granted under this License.
3.3 The right to release the Database under different terms, or to stop distributing or making available the Database, is reserved. Note that this Database may be multiple-licensed, and so You may have the choice of using alternative licenses for this Database. Subject to Section 10.4, all other rights not expressly granted by Licensor are reserved.

**4.0 Conditions of Use**

4.1 The rights granted in Section 3 above are expressly made subject to Your complying with the following conditions of use. These are important conditions of this License, and if You fail to follow them, You will be in material breach of its terms.
4.2 Notices. If You Publicly Convey this Database, any Derivative Database, or the Database as part of a Collective Database, then You must:
a. Do so only under the terms of this License or another license permitted under Section 4.4;
b. Include a copy of this License (or, as applicable, a license permitted under Section 4.4) or its Uniform Resource Identifier (URI) with the Database or Derivative Database, including both in the Database or Derivative Database and in any relevant documentation; and
c. Keep intact any copyright or Database Right notices and notices that refer to this License.
d. If it is not possible to put the required notices in a particular file due to its structure, then You must include the notices in a location (such as a relevant directory) where users would be likely to look for it.
4.3 Notice for using output (Contents). Creating and Using a Produced Work does not require the notice in Section 4.2. However, if you Publicly Use a Produced Work, You must include a notice associated with the Produced Work reasonably calculated to make any Person that uses, views, accesses, interacts with, or is otherwise exposed to the Produced Work aware that Content was obtained from the Database, Derivative Database, or the Database as part of a Collective Database, and that it is available under this License.
a. Example notice. The following text will satisfy notice under Section 4.3: Contains information from DATABASE NAME, which is made available here under the Open Database License (ODbL).
DATABASE NAME should be replaced with the name of the Database and a hyperlink to the URI of the Database. "Open Database License" should contain a hyperlink to the URI of the text of this License. If hyperlinks are not possible, You should include the plain text of the required URI's with the above notice.
4.4 Share alike.
a. Any Derivative Database that You Publicly Use must be only under the terms of:
i. This License;
ii. A later version of this License similar in spirit to this License; or
iii. A compatible license.
If You license the Derivative Database under one of the licenses mentioned in (iii), You must comply with the terms of that license.
b. For the avoidance of doubt, Extraction or Re-utilisation of the whole or a Substantial part of the Contents into a new database is a Derivative Database and must comply with Section 4.4.
c. Derivative Databases and Produced Works. A Derivative Database is Publicly Used and so must comply with Section 4.4. if a Produced Work created from the Derivative Database is Publicly Used.
d. Share Alike and additional Contents. For the avoidance of doubt, You must not add Contents to Derivative Databases under Section 4.4 a that are incompatible with the rights granted under this License.
e. Compatible licenses. Licensors may authorise a proxy to determine compatible licenses under Section 4.4 a iii. If they do so, the authorised proxy's public statement of acceptance of a compatible license grants You permission to use the compatible license.
4.5 Limits of Share Alike. The requirements of Section 4.4 do not apply in the following:
a. For the avoidance of doubt, You are not required to license Collective Databases under this License if You incorporate this Database or a Derivative Database in the collection, but this License still applies to this Database or a Derivative Database as a part of the Collective Database;
b. Using this Database, a Derivative Database, or this Database as part of a Collective Database to create a Produced Work does not create a Derivative Database for purposes of Section 4.4; and
c. Use of a Derivative Database internally within an organisation is not to the public and therefore does not fall under the requirements of Section 4.4.
4.6 Access to Derivative Databases. If You Publicly Use a DerivativeDatabase or a Produced Work from a Derivative Database, You must also offer to recipients of the Derivative Database or Produced Work a copy in a machine readable form of:
a. The entire Derivative Database; or
b. A file containing all of the alterations made to the Database or the method of making the alterations to the Database (such as an algorithm), including any additional Contents, that make up all the differences between the Database and the Derivative Database. The Derivative Database (under a.) or alteration file (under b.) must be available at no more than a reasonable production cost for physical distributions and free of charge if distributed over the internet.
4.7 Technological measures and additional terms
a. This License does not allow You to impose (except subject to Section 4.7 b.) any terms or any technological measures on the Database, a Derivative Database, or the whole or a Substantial part of the Contents that alter or

restrict the terms of this License, or any rights granted under it, or have the effect or intent of restricting the ability of any person to exercise those rights.

b. Parallel distribution. You may impose terms or technological measures on the Database, a Derivative Database, or the whole or a Substantial part of the Contents (a "Restricted Database") in contravention of Section 4.74 a. only if You also make a copy of the Database or a Derivative Database available to the recipient of the Restricted Database:

i. That is available without additional fee;

ii. That is available in a medium that does not alter or restrict the terms of this License, or any rights granted under it, or have the effect or intent of restricting the ability of any person to exercise those rights (an "Unrestricted Database"); and

iii. The Unrestricted Database is at least as accessible to the recipient as a practical matter as the Restricted Database.

c. For the avoidance of doubt, You may place this Database or a Derivative Database in an authenticated environment, behind a password, or within a similar access control scheme provided that You do not alter or restrict the terms of this License or any rights granted under it or have the effect or intent of restricting the ability of any person to exercise those rights.

4.8 Licensing of others. You may not sublicense the Database. Each time You communicate the Database, the whole or Substantial part of the Contents, or any Derivative Database to anyone else in any way, the Licensor offers to the recipient a license to the Database on the same terms and conditions as this License. You are not responsible for enforcing compliance by third parties with this License, but You may enforce any rights that You have over a Derivative Database. You are solely responsible for any modifications of a Derivative Database made by You or another Person at Your direction. You may not impose any further restrictions on the exercise of the rights granted or affirmed under this License.

**5.0 Moral rights**

5.1 Moral rights. This section covers moral rights, including any rights to be identified as the author of the Database or to object to treatment that would otherwise prejudice the author's honour and reputation, or any other derogatory treatment:

a. For jurisdictions allowing waiver of moral rights, Licensor waives all moral rights that Licensor may have in the Database to the fullest extent possible by the law of the relevant jurisdiction under Section 10.4;

b. If waiver of moral rights under Section 5.1 a in the relevant jurisdiction is not possible, Licensor agrees not to assert any moral rights over the Database and waives all claims in moral rights to the fullest extent possible by the law of the relevant jurisdiction under Section 10.4; and

c. For jurisdictions not allowing waiver or an agreement not to assert moral rights under Section 5.1 a and b, the author may retain their moral rights over certain aspects of the Database. Please note that some jurisdictions do not allow for the waiver of moral rights, and so moral rights may still subsist over the Database in some jurisdictions.

**6.0 Fair dealing, Database exceptions, and other rights not affected**

6.1 This License does not affect any rights that You or anyone else may independently have under any applicable law to make any use of this Database, including without limitation:

a. Exceptions to the Database Right including: Extraction of Contents from non-electronic Databases for private purposes, Extraction for purposes of illustration for teaching or scientific research, and Extraction or Re-utilisation for public security or an administrative or judicial procedure.

b. Fair dealing, fair use, or any other legally recognised limitation or exception to infringement of copyright or other applicable laws.

6.2 This License does not affect any rights of lawful users to Extract and Re-utilise insubstantial parts of the Contents, evaluated quantitatively or qualitatively, for any purposes whatsoever, including creating a Derivative Database (subject to other rights over the Contents, see Section 2.4). The repeated and systematic Extraction or Re-utilisation of insubstantial parts of the Contents may however amount to the Extraction or Re-utilisation of a Substantial part of the Contents.

**7.0 Warranties and Disclaimer**

7.1 The Database is licensed by the Licensor "as is" and without any warranty of any kind, either express, implied, or arising by statute, custom, course of dealing, or trade usage.

Licensor specifically disclaims any and all implied warranties or conditions of title, non-infringement, accuracy or completeness, the presence or absence of errors, fitness for a particular purpose, merchantability, or otherwise.

Some jurisdictions do not allow the exclusion of implied warranties, so this exclusion may not apply to You.

**8.0 Limitation of liability**

8.1 Subject to any liability that may not be excluded or limited by law, the Licensor is not liable for, and expressly excludes, all liability for loss or damage however and whenever caused to anyone by any use under this License, whether by You or by anyone else, and whether caused by any fault on the part of the Licensor or not. This exclusion of liability includes, but is not limited to, any special, incidental, consequential, punitive, or exemplary damages such as loss of revenue, data, anticipated profits, and lost business. This exclusion applies even if the Licensor has been advised of the possibility of such damages.

8.2 If liability may not be excluded by law, it is limited to actual and direct financial loss to the extent it is caused by proved negligence on the part of the Licensor.

**9.0 Termination of Your rights under this License**

9.1 Any breach by You of the terms and conditions of this License automatically terminates this License with immediate effect and without notice to You. For the avoidance of doubt, Persons who have received the Database, the whole or a Substantial part of the Contents, Derivative Databases, or the Database as part of a Collective Database from You under this License will not have their licenses terminated provided their use is in full compliance with this License or a license granted under Section 4.8 of this License. Sections 1, 2, 7, 8, 9 and 10 will survive any termination of this License.

9.2 If You are not in breach of the terms of this License, the Licensor will not terminate Your rights under it.

9.3 Unless terminated under Section 9.1, this License is granted to You for the duration of applicable rights in the Database.

9.4 Reinstatement of rights. If you cease any breach of the terms and conditions of this License, then your full rights under this License will be reinstated:

a. Provisionally and subject to permanent termination until the 60th day after cessation of breach;

b. Permanently on the 60th day after cessation of breach unless otherwise reasonably notified by the Licensor; or

c. Permanently if reasonably notified by the Licensor of the violation, this is the first time You have received notice of violation of this License from the Licensor, and You cure the violation prior to 30 days after your receipt of the notice.

Persons subject to permanent termination of rights are not eligible to be a recipient and receive a license under Section 4.8.

9.5 Notwithstanding the above, Licensor reserves the right to release the Database under different license terms or to stop distributing or making available the Database. Releasing the Database under different license terms or stopping the distribution of the Database will not withdraw this License (or any other license that has been, or is required to be, granted under the terms of this License), and this License will continue in full force and effect unless terminated as stated above.

**10.0 General**

10.1 If any provision of this License is held to be invalid or unenforceable, that must not affect the validity or enforceability of the remainder of the terms and conditions of this License and each remaining provision of this License shall be valid and enforced to the fullest extent permitted by law.

10.2 This License is the entire agreement between the parties with respect to the rights granted here over the Database. It replaces any earlier understandings, agreements or representations with respect to the Database.

10.3 If You are in breach of the terms of this License, You will not be entitled to rely on the terms of this License or to complain of any breach by the Licensor.

10.4 Choice of law. This License takes effect in and will be governed by the laws of the relevant jurisdiction in which the License terms are sought to be enforced. If the standard suite of rights granted under applicable copyright law and Database Rights in the relevant jurisdiction includes additional rights not granted under this License, these additional rights are granted in this License in order to meet the terms of this License.

### Warranty Remedies

Trimble's sole liability and your exclusive remedy under the warranties set forth above shall be, at Trimble's option, to repair or replace any Product that fails to conform to such warranty ('Nonconforming Product"), and/or issue a cash refund up to the purchase price paid by you for any such Nonconforming Product, excluding costs of installation, upon your return of the Nonconforming Product to Trimble in accordance with Trimble's product return procedures than in effect. Such remedy may include reimbursement of the cost of repairs for damage to third- party equipment onto which the Product is installed, if such damage is found to be directly caused by the Product as reasonably determined by Trimble following a root cause analysis.

### Warranty Exclusions and Disclaimer

These warranties shall be applied only in the event and to the extent that (a) the Products and Software are properly and correctly installed, configured, interfaced, maintained, stored, and operated in accordance with Trimble's relevant operator's manual and specifications, and; (b) the

Products and Software are not modified or misused. The preceding warranties shall not apply to, and Trimble shall not be responsible for defects or performance problems resulting from (i) the combination or utilization of the Product or Software with hardware or software products, information, data, systems, interfaces or devices not made, supplied or specified by Trimble; (ii) the operation of the Product or Software under any specification other than, or in addition to, Trimble's standard specifications for its products; (iii) the unauthorized, installation, modification, or use of the Product or Software; (iv) damage caused by accident, lightning or other electrical discharge, fresh or salt water immersion or spray (outside of Product specifications); or (v) normal wear and tear on consumable parts (e.g., batteries). Trimble does not warrant or guarantee the results obtained through the use of the Product or that software components will operate error free.

THE WARRANTIES ABOVE STATE TRIMBLE'S ENTIRE LIABILITY, AND YOUR EXCLUSIVE REMEDIES, RELATING TO THE PRODUCTS AND SOFTWARE. EXCEPT AS OTHERWISE EXPRESSLY PROVIDED HEREIN, THE PRODUCTS, SOFTWARE, AND ACCOMPANYING DOCUMENTATION AND MATERIALS ARE PROVIDED "AS IS" AND WITHOUT EXPRESS OR IMPLIED WARRANTY OF ANY KIND BY EITHER TRIMBLE NAVIGATION LIMITED OR ANYONE WHO HAS BEEN INVOLVED IN ITS CREATION, PRODUCTION, INSTALLATION, OR DISTRIBUTION INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, TITLE, AND NONINFRINGEMENT. THE STATED EXPRESS WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF TRIMBLE ARISING OUT OF, OR IN CONNECTION WITH, ANY PRODUCTS OR SOFTWARE. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW LIMITATIONS ON DURATION OR THE EXCLUSION OF AN IMPLIED WARRANTY, THE ABOVE LIMITATION MAY NOT APPLY OR FULLY APPLY TO YOU.

NOTICE REGARDING PRODUCTS EQUIPPED WITH TECHNOLOGY CAPABLE OF TRACKING SATELLITE SIGNALS FROM SATELLITE BASED AUGMENTATION SYSTEMS (SBAS) (WAAS/EGNOS, AND MSAS), OMNISTAR, GPS, MODERNIZED GPS OR GLONASS SATELLITES, OR FROM IALA BEACON SOURCES: TRIMBLE IS NOT RESPONSIBLE FOR THE OPERATION OR FAILURE OF OPERATION OF ANY SATELLITE BASED POSITIONING SYSTEM OR THE AVAILABILITY OF ANY SATELLITE BASED POSITIONING SIGNALS.

### Limitation or Liability

TRIMBLE'S ENTIRE LIABILITY UNDER ANY PROVISION HEREIN SHALL BE LIMITED TO THE AMOUNT PAID BY YOU FOR THE PRODUCT OR SOFTWARE LICENSE. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, IN NO EVENT SHALL TRIMBLE OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER UNDER ANY CIRCUMSTANCE OR LEGAL THEORY RELATING IN ANY WAY TO THE PRODUCTS, SOFTWARE AND ACCOMPANYING DOCUMENTATION AND MATERIALS, (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR ANY OTHER PECUNIARY LOSS), REGARDLESS WHETHER TRIMBLE HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH LOSS AND REGARDLESS OF THE COURSE OF DEALING WHICH DEVELOPS OR HAS DEVELOPED BETWEEN YOU AND TRIMBLE. BECAUSE SOME STATES AND JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY OR FULLY APPLY TO YOU. PLEASE NOTE: THE ABOVE TRIMBLE LIMITED WARRANTY PROVISIONS WILL NOT APPLY TO PRODUCTS PURCHASED IN THOSE JURISDICTIONS (E.G., MEMBER STATES OF THE EUROPEAN ECONOMIC AREA) IN WHICH PRODUCT WARRANTIES ARE THE RESPONSIBILITY OF THE LOCAL DEALER FROM WHOM THE PRODUCTS ARE ACQUIRED. IN SUCH A CASE, PLEASE CONTACT YOUR TRIMBLE DEALER FOR APPLICABLE WARRANTY INFORMATION.

### Official Language

THE OFFICIAL LANGUAGE OF THESE TERMS AND CONDITIONS IS ENGLISH. IN THE EVENT OF A CONFLICT BETWEEN ENGLISH AND OTHER LANGUAGE VERSIONS, THE ENGLISH LANGUAGE SHALL CONTROL.

### Registration

To receive information regarding updates and new products, please contact your local dealer or visit the Trimble website at www.trimble.com/register. Upon registration you may select the newsletter, upgrade or new product information you desire.

### Notices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. TRIMBLE is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**Responsible Party**

Trimble Navigation
935 Stewart Drive
Sunnyvale CA 94085
Telephone: 1-408 481 8000

**Canada**

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada. This apparatus complies with Canadian RSS-GEN.

Cet appareil est conforme à la norme CNR-GEN du Canada.

**Europe**

This product has been tested and found to comply with the requirements for a Class A device pursuant to European Council Directive 2006/42/EC and 1999/5/EC, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). Contains a radio module. These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.

**Australia and New Zealand**

This product conforms with the regulatory requirements of the Australian Communications and Media Authority (ACMA) EMC framework, thus satisfying the requirements for C-Tick Marking and sale within Australia and New Zealand.

### Waste Electrical and Electronic Equipment (WEEE)

For product recycling instructions and more information, please go to www.trimble.com/ev.shtml.

**Recycling in Europe**: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:

Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

# Safety Information

Always follow the instructions that accompany a Warning or Caution. The information they provide is intended to minimize the risk of personal injury and/or damage to property. In particular, observe safety instructions that are presented in the following format:

**WARNING –** This alert warns of a potential hazard, which, if not avoided, can cause severe injury.

**CAUTION –** This alert warns of a hazard or unsafe practice which, if not avoided, can cause injury or damage.

**Note –** *An absence of specific alerts does not mean that there are no safety risks involved.*

## Warnings

**WARNING –** During the Deadzone calibration, the system moves the vehicle's steering wheel. To avoid injury, be prepared for sudden vehicle movement.

**WARNING –** Before beginning calibration, ensure that the vehicle is in an open field free of obstacles and objects where you can evaluate the settings. During some calibrations, the system moves the vehicle's steering wheel

## Cautions

**CAUTION –** When laptops are run off a power inverter and connected to the serial port of the NavController, the performance of the NavController is impaired. When you perform critical operations (especially calibration), disconnect laptops from the power inverter and run the laptop on battery power instead. If you do not require communication between the laptop and the controller, disconnect the laptop from the serial port. You can then use the power inverter without affecting the system.

**CAUTION –** Obstacles in the field can cause collisions, which may injure you and damage the vehicle. If an obstacle in the field makes it unsafe to continue any calibration, stop the vehicle and turn the steering wheel to disengage the system.

# Contents


LEGAL NOTICES . . . 2

Safety Information . . . 9
Warnings . . . 9
Cautions . . . 9

1 BASICS OF AUTOPILOT TOOLBOX . . . 13
Features of Autopilot Toolbox . . . 14
Installation requirements . . . 14
Connect and start . . . 14
Close the Autopilot Toolbox II software . . . 15

2 INITIAL CONFIGURATION . . . 16
Configuration tab . . . 17
Calibration tab . . . 17
Diagnostics tab . . . 18
Faults tab . . . 18
Information tab . . . 19

3 AUTOPILOT SETTINGS . . . 20
Autopilot system settings . . . 21
Configuration options . . . 21
Vehicle Model (Vehicle Configuration) . . . 21
Display Units and Language . . . 22
GPS Receiver Configuration . . . 22
Operational Parameters . . . 23
AutoSense (Steering Angle Sensor) . . . 23
Sensors Configuration . . . 23
Steering Control Settings . . . 24

4 CALIBRATING THE AUTOPILOT SYSTEM . . . 25
Calibration by vehicle type . . . 26
Front wheeled / articulated steered tractors, combines, sprayers . . . 26
Calibration sequence . . . 27
Tracked tractors . . . 27
Hydraulically steered tracked tractors (Cat Challenger 35, 45, 55 or E series) . . . 28
John Deere SIU-200 Tracked tractors and Sugar Cane Harvesters . . . 28
Controller orientation . . . 29
Antenna compensation calibration . . . 30
Automated Steering Deadzone (DZ) calibration . . . 31
John Deere SIU-200 Steering Interface calibration . . . 33
Line Acquisition Aggressiveness calibration . . . 33
Classic Mode . . . 34
OnSwath Mode . . . 34

Calibration steps . . . . . 37
OnSwath settings on the TMX-2050 display . . . . . 40
Manual Override Bias calibration . . . . . 42
Manual Override Sensitivity calibration . . . . . 43
Proportional Steering Gain calibration . . . . . 44
Pump Response calibration . . . . . 46
Roll Offset calibration . . . . . 46
Roll correction: Flag offset method . . . . . 48
RPM Sensor calibration . . . . . 49
Steering Center Bias calibration . . . . . 49
Steering Pump Knees calibration . . . . . 50
Steering Sensor calibration . . . . . 51
Track Spacing calibration . . . . . 52
Automatic Calibration and Diagnostics (Auto-calibration) . . . . . 52
Opening the Automatic Calibration and Diagnostics screen . . . . . 52
High-level status and controls . . . . . 54
High-level summary output data and controls (Advanced Mode only) . . . . . 55
Individual procedure data and controls . . . . . 56
Typical workflow . . . . . 57

5 VIEW DIAGNOSTICS . . . . . 58
Diagnostics screens . . . . . 59
CAN diagnostics . . . . . 60
Message categories . . . . . 60
ISO message types . . . . . 61
Manual Override diagnostics . . . . . 62
Remote Engage diagnostics . . . . . 63
Steering Angle diagnostics . . . . . 63
T3 IMU diagnostics . . . . . 64
Vehicle Direction diagnostics . . . . . 64
Wheel Motor diagnostics . . . . . 65

6 SYSTEM FAULTS . . . . . 66
Faults tab . . . . . 67
View faults . . . . . 67
Refresh faults . . . . . 67
Clear a fault . . . . . 68
Save faults to disk . . . . . 68

7 VIEW INFORMATION . . . . . 69
View information . . . . . 70

8 SAVE / RESTORE FILES . . . . . 71
Saving the Autopilot config file . . . . . 72
Restoring the Autopilot config file . . . . . 72
Loading an external VDB file . . . . . 73
Downloading Autopilot external vehicle profiles from Trimble . . . . . 74

9 DATALOGGING . . . . . 76
Overview . . . . . 77
Access . . . . . 77

Load the DLC files . . . . . 77
Select the location for file output . . . . . 78
Start logging . . . . . 78
Stop logging . . . . . 79
Close . . . . . 79
Send log files . . . . . 79

# Chapter 1

# BASICS OF AUTOPILOT TOOLBOX


- Features of Autopilot Toolbox
- Installation requirements
- Connect and start
- Close the Autopilot Toolbox II software


This manual describes the operation of the Trimble® Autopilot™ Toolbox II, software version 4.0.1.

# Features of Autopilot Toolbox

You can use the Autopilot Toolbox II software to:

- Set up or edit an existing Autopilot system (see Autopilot system settings, page 21)
- Save and restore an Autopilot system setup (see Chapter 8, SAVE / RESTORE FILES)
- Display serial number and firmware version information (see Chapter 7, VIEW INFORMATION)
- View basic diagnostics on the main sensor connections (see Chapter 5, VIEW DIAGNOSTICS)
- Load a vehicle database file (see Loading an external VDB file, page 73 )

# Installation requirements

You can install the software on a desktop computer or laptop that is running the Microsoft® Windows® XP, Windows Vista® or Windows 7 operating system.

The Autopilot Toolbox II software is fully compatible with version 4.0 or later of the Autopilot controller firmware.

# Connect and start

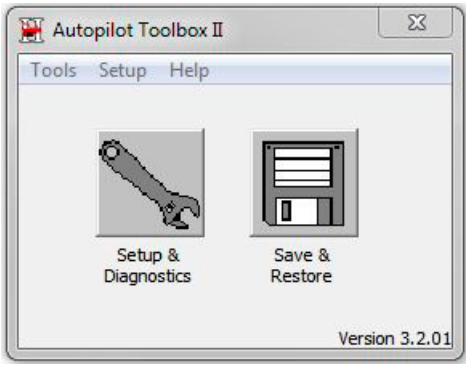
1. Connect the laptop to the diagnostic connector of the NavController. This is a DE9 serial connection. It is recommended that you use a computer with either:
   - An embedded serial connector.
   - A Dell computer (with a legacy adapter).

**Note –** *USB-to-serial adapters can be problematic. If you must use a USB-to-serial connector, Trimble recommends SeaLevel, P/N 2105R (available at* http://www.sealevel.com/store/2105r-usb-to-1-port-rs-232-db9-serial-interface-adapter.html*).*

2. On the laptop or desktop computer, launch the Autopilot Toolbox II software from the desktop icon created during installation.
3. If you are using a power inverter:
   a. Read the warning message that displays and then click **OK**.
   b. Perform the appropriate action.

**CAUTION –** When laptops are run off a power inverter and connected to the serial port of the NavController, the performance of the NavController is impaired. When you perform critical operations (especially calibration), disconnect laptops from the power inverter and run the laptop on battery power instead. If you do not require communication between the laptop and the controller, disconnect the laptop from the serial port. You can then use the power inverter without affecting the system

The main screen appears:




4. Click the appropriate icon for the required action:

| Click | To ... |
|---|---|
|  | Configure Autopilot settings (see Autopilot system settings, page 21) |
| | View Diagnostics (see Chapter 5, VIEW DIAGNOSTICS) |
|  | Save / restore settings (see Chapter 8, SAVE / RESTORE FILES) |

# Close the Autopilot Toolbox II software

In the main screen, do one of the following:

- Select *Tools / Exit*.
- Click the **X** button in the top right-hand corner of the screen.

# Chapter 2

# INITIAL CONFIGURATION

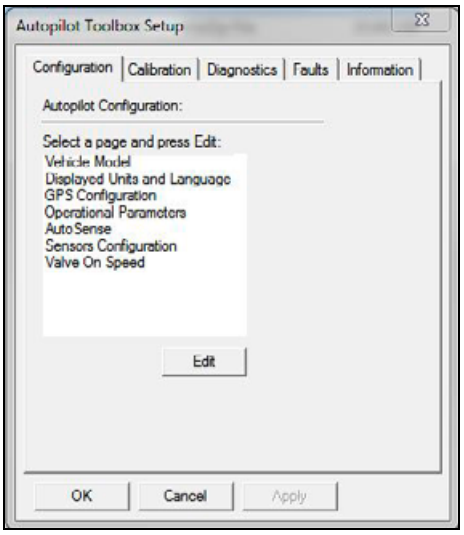

- Configuration tab
- Calibration tab
- Diagnostics tab
- Faults tab
- Information tab


The Autopilot Toolbox II software has five tabs that are used as follows:

- *Configuration* tab: Configure the system initially as well as edit settings later.
- *Calibration* tab: Calibrate the Autopilot items that are specific to the vehicle you have selected.
- *Diagnostics* tab: View diagnostics and troubleshoot issues.
- *Faults* tab: View, refresh, clear and save faults.
- *Information* tab: View information about the Autopilot system.

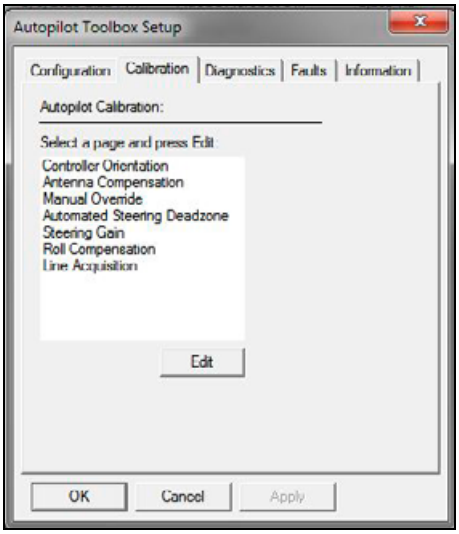
# Configuration tab

This tab shows a list of settings. Select the required setting and then click **Edit**. See Autopilot system settings, page 21).



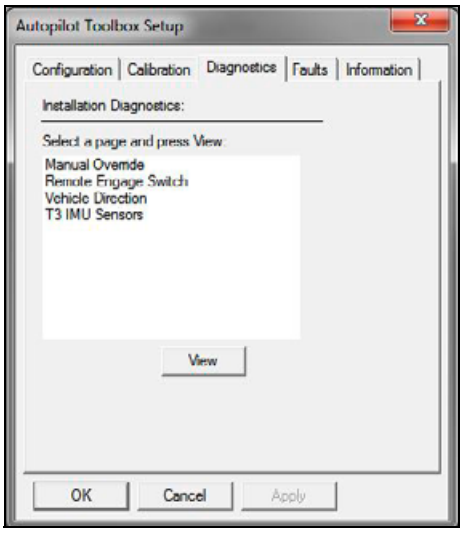

# Calibration tab

This tab shows a list of calibrations display. Select the calibration that you want to carry out and then click **Edit**. For information about each calibration, see Calibration by vehicle type, page 26.



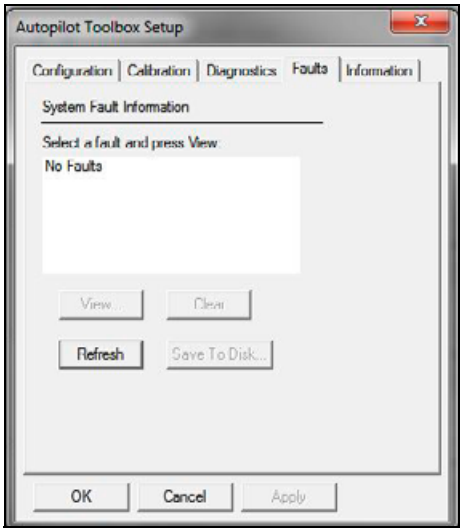
# Diagnostics tab

This tab shows diagnostic and troubleshooting issues. Select the diagnostic option required and then click **View.** See Chapter 5, VIEW DIAGNOSTICS.



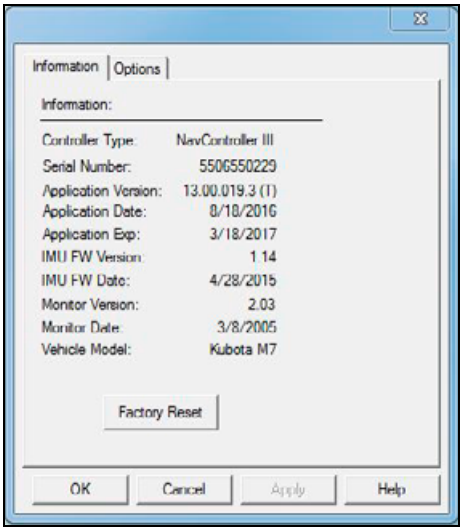

# Faults tab

This tab allows you to view fault messages and save faults. See Chapter 6, SYSTEM FAULTS.



# Information tab

This tab allows you to view information about the Autopilot system. See Chapter 7, VIEW INFORMATION.



# Chapter 3

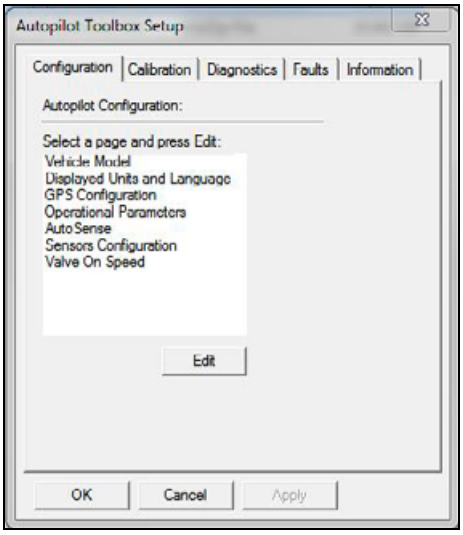
# AUTOPILOT SETTINGS

- Autopilot system settings
- Configuration options

From the Autopilot Toolbox Setup screen, you can set up and / or edit any Autopilot setting.

# Autopilot system settings

1. To initially set up the Autopilot system or edit its settings, at the main screen click  The *Autopilot Toolbox Setup* screen appears:




2. In the *Configuration* tab, select the item to configure and then tap **Edit**.

# Configuration options

## Vehicle Model (Vehicle Configuration)

| | Settings | Explanation |
|---|---|---|
|  | Current Selection | The currently chosen vehicle/ |
| | Change (Select) Vehicle Model | Select one of the following:<br>• Internal Vehicle Database: Not recommended<br>• External Vehicle File. If you select this option:<br>1. Click **Browse**.<br>2. Find the VDB file you want to load. Select it and then click **Open**.<br>3. At the confirmation message, click **Select**.<br>4. At the reset message, click **OK**.<br>The NavController will reset the vehicle profile and the vehicle model you chose now shows as the Current Vehicle Model. |



See also Chapter 8, SAVE / RESTORE FILES.

## Display Units and Language

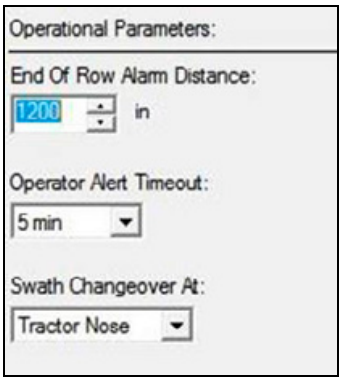

| Settings | Explanation |
|---|---|
| Language | Language for the Autopilot Toolbox and lightbar |
| Units | Unit type for the Autopilot Toolbox and lightbar |

## GPS Receiver Configuration

**Note –** *For the Trimble FmX® integrated display, the CFX-750™ display and the TMX-2050™ display, GPS is set up in the display.*

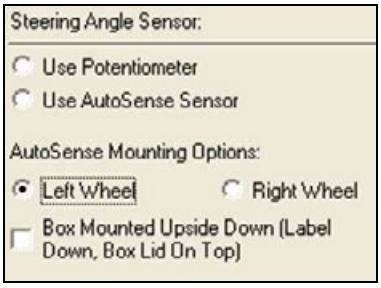

| Settings | Explanation |
|---|---|
| Receiver Type | Shows the receiver type selected by the user or detected by the Autopilot system. |
| GPS Correction Type | If Auto-configure receiver is:<br>• Selected: This list will contain only the valid correction sources for the receiver being used<br>• Not selected: This list will contain all possible choices for correction. |
| Auto-configure receiver on startup | When selected:<br>• The system automatically detects the receiver type<br>• The *Receiver Type* list can not be selected.<br>When not selected: Any changes in the GPS Correction Type list will not be transmitted to the receiver in use, so the receiver will not switch correction modes. |
| Enable HP Autoseeding | |

## Operational Parameters



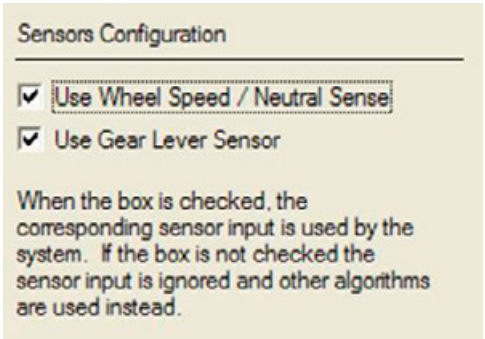

| Settings | Explanation |
|---|---|
| End of Row Alarm Distance | Controls how far from the end of the swath the End of Row warning appears. Increase this value to cause the warning to display earlier. This is useful if the operator is likely to be distracted (for example, by monitoring other equipment during operation). |
| Operator Alert Timeout | How often a warning displays after there is a lack of operator interaction.<br>**Note –** *The Operator Alert Timeout cannot be disabled.* |
| Swath Changeover at<br>**Note –** *For CFX-750, FMX and TMX-2050, swath changeover is determined by the display, not the NavController.* | When turning at the end of a row, the Autopilot system determines the closest swath to the vehicle. This setting selects the point on<br>the vehicle from which the calculation is made. If the GPS antenna is:<br>• Behind you: Select Tractor Nose<br>• At the front of the cab (ahead of you): Select GPS Antenna/ |

## AutoSense (Steering Angle Sensor)




| Settings | Explanation |
|---|---|
| Steering Angle Sensor | Choose which device is used by the angle sensor: Potentiometer or AutoSense sensor. |
| AutoSense Mounting Options | Which wheel the AutoSense device is installed on: Left Wheel or Right Wheel. |
| Box Mounted Upside Down (Label Down, Box Lid on Top) | f the device box is mounted upside down, select the *Box Mounted Upside Down* checkbox. Otherwise, leave the check box clear.<br>**Note –** *If the AutoSense device orientation is not entered correctly, the Autopilot system steering may be affected.* |

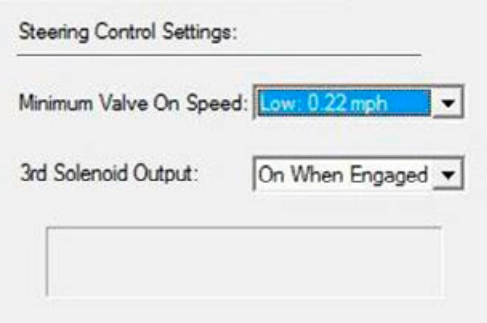
## Sensors Configuration




| Settings | Explanation |
|---|---|
| Use Wheel Speed / Neutral Sense | When not used (not checked), the system enters low speed operation. |
| Use Gear Level Sensor | When not used (not checked), the system uses a vehicle direction estimator. |

## Steering Control Settings

Steering Control controls the minimum velocity at which the Autopilot system will command the hydraulic valve or send curvature commands over CAN.

| | Settings | Explanation |
|---|---|---|
|  | Minimum Valve On Speed | Minimum velocity at which the system will command the hydraulic valve or send curvature commands over CAN.<br>• Normal: .4 m/s - .9 mph - 1.4 km/hr<br>• Low: .1 m/s - .223 mph - .36 km/h<br>• Ultra-Low: .02 m/s - .044 mph - .072 km/hr<br>**Note –** *Speeds below 300 meters/hour may require a steering potentiometer. Some Autopilot interfaces utilizing a CANbus connection may not allow operation down to this speed. Check your vehicle user guide for minimum speed capabilities.* |
| | 3rd Solenoid Output | When a NavController III is being used, the third solenoid output can be configured to output full 12 volt PWM.<br>• On When Engaged: 12 volts will be output when the system is engaged and above the Minimum Valve on Speed.<br>• Off: No electrical signal will be output.<br>**Note –** *This option is not available if you are using NavController II or earlier.* |

# Chapter 4

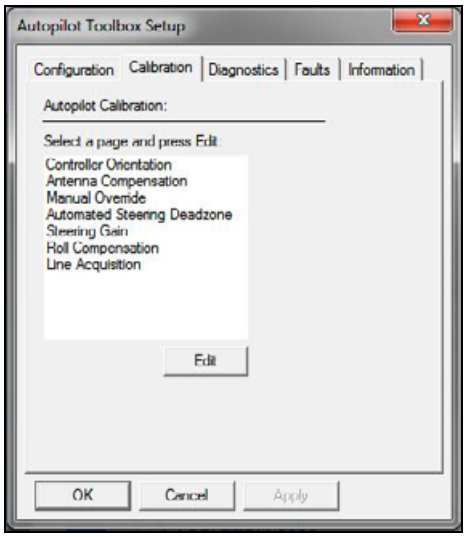
# CALIBRATING THE AUTOPILOT SYSTEM

- Calibration by vehicle type
- Controller orientation
- Antenna compensation calibration
- Automated Steering Deadzone (DZ) calibration
- John Deere SIU-200 Steering Interface calibration
- Line Acquisition Aggressiveness calibration
- OnSwath settings on the TMX-2050 display
- Manual Override Bias calibration
- Manual Override Sensitivity calibration
- Proportional Steering Gain calibration
- Pump Response calibration
- Roll Offset calibration
- RPM Sensor calibration
- Steering Center Bias calibration
- Steering Pump Knees calibration
- Steering Sensor calibration
- Track Spacing calibration
- Automatic Calibration and Diagnostics (Auto-calibration)

Before completing the Autopilot setup, you must perform calibrations specific for each vehicle type.

# Calibration by vehicle type

The types of calibration required will depend on the type of vehicle model you select. The Autopilot Toolbox II software automatically shows the appropriate options for the selected vehicle in the calibration list on the *Calibration* tab.




**WARNING –** Before beginning calibration, ensure that the vehicle is in an open field free of obstacles and objects where you can evaluate the settings. During some calibrations, the system moves the vehicle's steering wheel and sometimes the movement is abrupt. To avoid injury, be prepared for sudden vehicle movement.

**CAUTION –** Obstacles in the field can cause collisions, which may injure you and damage the vehicle. If an obstacle in the field makes it unsafe to continue any calibration, stop the vehicle and turn the steering wheel to disengage the system.

## Front wheeled / articulated steered tractors, combines, sprayers

| Calibration | Explanation |
|---|---|
| Controller orientation calibration | Required to properly associate the outputs of the controller's gyros with the direction of the vehicle. See Controller orientation, page 29. |
| Antenna compensation | Required to compensate for antenna height.<br>See Antenna compensation calibration, page 30. |
| Roll offset correction | Required to compensate for static roll caused by minor variations in controller and GPS receiver mounting.<br>See Roll Offset calibration, page 46. |
| Line acquisition aggressiveness | Adjusts adjust how aggressively the vehicle approaches the line.<br>See Line Acquisition Aggressiveness calibration, page 33. |
| Manual Override Sensitivity | Should only be adjusted from its default value if the operation of the manual function is unacceptable.<br>See Manual Override Sensitivity calibration, page 43.<br>**Note –** *Only for vehicles with a pressure transducer for the manual override function.* |

| Calibration | Explanation |
|---|---|
| Steering Sensor | Required to convert the sensor output into commands for steering full left, full right, and any position in between.<br>See Steering Sensor calibration, page 51. |
| Automated Dead Zone | Required to learn the dead zones where no steering results from system commands to the tractor hydraulics.<br>See Automated Steering Deadzone (DZ) calibration, page 31. |
| Proportional Steering Gain (PGain) | Only required if system steering performance is unsatisfactory.<br>See Proportional Steering Gain calibration, page 44. |

## Calibration sequence

After you calibrate the Manual Override Sensitivity, perform additional calibrations in this sequence:

1. Steering Sensor
2. Automated DeadZone
3. Proportional Steering Gain

## Tracked tractors

**Note –** *No track performance calibration is required if the system is installed on a Cat MT 700/800 series equipped with the ISO option. Required calibration is controller orientation, antenna compensation and roll correction.*

| Calibration | Explanation |
|---|---|
| Controller orientation calibration | Required to properly associate the outputs of the controller's gyros with the direction of the vehicle.<br>See Controller orientation, page 29 |
| Antenna compensation | Required to compensate for antenna height.<br>See Antenna compensation calibration, page 30. |
| Roll offset correction | Required to compensate for static roll caused by minor variations in controller and GPS receiver mounting.<br>See Roll Offset calibration, page 46. |
| Line acquisition aggressiveness | Adjusts adjust how aggressively the vehicle approaches the line.<br>See Line Acquisition Aggressiveness calibration, page 33. |
| Manual Override Sensitivity | Should only be adjusted from its default value if the operation of the manual function is unacceptable.<br>See Manual Override Sensitivity calibration, page 43.<br>**Note –** *Only for vehicles with a pressure transducer for the manual override function.* |
| Track spacing | The distance from the centerline of the left track to the centerline of the right track.<br>See Track Spacing calibration, page 52. |

## Hydraulically steered tracked tractors (Cat Challenger 35, 45, 55 or E series)

| Calibration | Explanation |
|---|---|
| Controller orientation calibration | Required to properly associate the outputs of the controller's gyros with the direction of the vehicle.<br>See Controller orientation, page 29 |
| Antenna compensation | Required to compensate for antenna height.<br>See Antenna compensation calibration, page 30. |
| Roll offset correction | Required to compensate for static roll caused by minor variations in controller and GPS receiver mounting.<br>See Roll Offset calibration, page 46. |
| Line acquisition aggressiveness | Adjusts adjust how aggressively the vehicle approaches the line.<br>See Line Acquisition Aggressiveness calibration, page 33. |
| Manual Override Sensitivity | Should only be adjusted from its default value if the operation of the manual function is unacceptable.<br>See Manual Override Sensitivity calibration, page 43.<br>Only for vehicles with a pressure transducer for the manual override function. |
| Track spacing | The distance from the centerline of the left track to the centerline of the right track.<br>See Track Spacing calibration, page 52. |
| RPM Sensor | Required to verify the RPM sensor output is correct.<br>See RPM Sensor calibration, page 49. |
| Pump Response | Required to verify and optimize the response of the hydraulic steering pumps.<br>See Pump Response calibration, page 46. |
| Steering Pump Knees | Required to determine the compensation for deadband in the steering pumps.<br>See Steering Pump Knees calibration, page 50. |

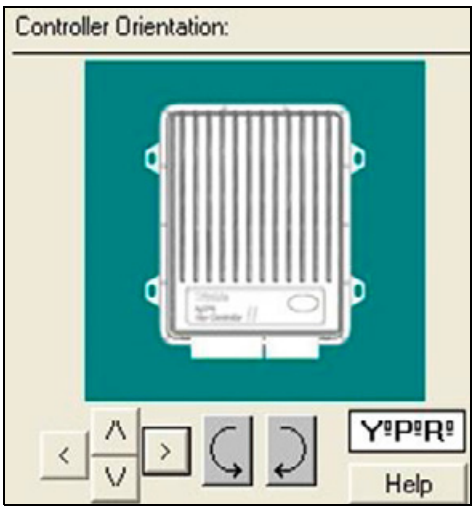
## John Deere SIU-200 Tracked tractors and Sugar Cane Harvesters

**Note –** *John Deere Tracked vehicles that only use the ISO CAN interface use the controller orientation and calibrations for antenna compensation, roll offset calibration, and line acquisition. For the vehicles that use the ISO interface, refer to the Autopilot supported platforms list for vehicle model numbers.*

| Calibration | Explanation |
|---|---|
| Controller orientation calibration | Required to properly associate the outputs of the controller's gyros with the direction of the vehicle.<br>See Controller orientation, page 29 |
| Antenna compensation | Required to compensate for antenna height.<br>See Antenna compensation calibration, page 30. |
| Roll offset correction | Required to compensate for static roll caused by minor variations in controller and GPS receiver mounting.<br>See Roll Offset calibration, page 46. |
| Line acquisition aggressiveness | Adjusts adjust how aggressively the vehicle approaches the line.<br>See Line Acquisition Aggressiveness calibration, page 33. |
| Track spacing | The distance from the centerline of the left track to the centerline of the right track.<br>See Track Spacing calibration, page 52. |

| Calibration | Explanation |
|---|---|
| Manual Override Bias | Sets the biased neutral value for the Steering potentiometer input on John Deere Tracked Machines (both tractors and sugar cane harvesters).<br>See Manual Override Bias calibration, page 42. |
| Steering Center Bias (00, 10, and 20 series machines) | Determines the center voltage that is necessary for controlling the electronic steering interface.<br>See Steering Center Bias calibration, page 49. |
| Steering Interface Calibration | On 00, 10, and 20 series tracked tractors, this flashes the appropriate interface voltage calibration on the SIU-200 box. For 30 and RT series tractors, this calibration maps the steering wheel voltage through the range of motion. |

# Controller orientation

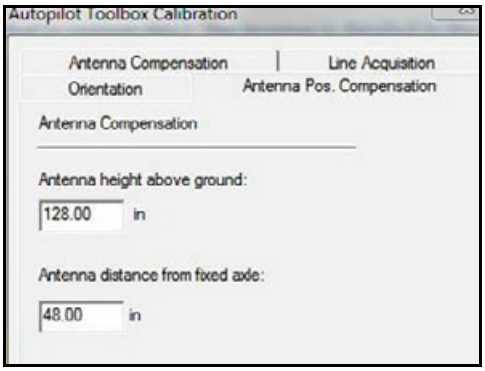



To enter the controller orientation, do one of the following:

- Click the buttons to flip and rotate the image to match the position of the NavController as though you are looking down on the vehicle from above. The top of the screen represents the direction of the nose of the vehicle.
- Click **Y°P°R°** to enter the yaw, pitch, and roll values (for advanced users). When these values are entered, the image of the controller will change to reflect these new values.

**Note –** *If the Y°P°R° values are not in 90° increments, the graphical representation of the controller is not displayed.*

# Antenna compensation calibration

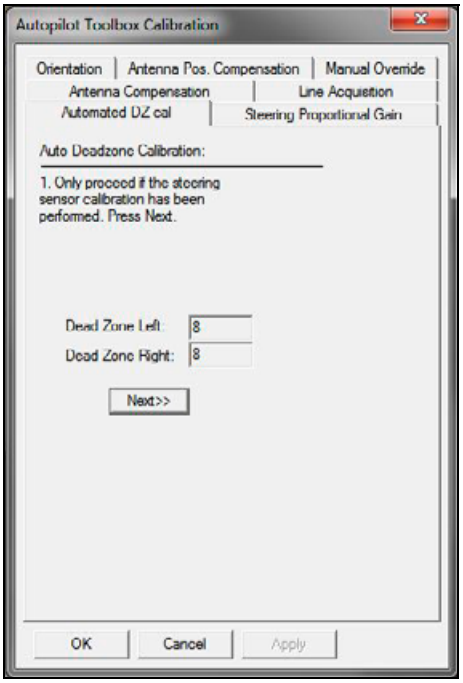



**Note –** *The Autopilot system must be completely set up, the software properly configured, and proper GPS reception enabled before the Antenna Roll Compensation procedure can be performed. Read and understand the complete documentation before attempting this procedure.*

**Note –** *If multiple GPS technologies will be used (for example, RTK and WAAS), use the technology with the highest accuracy when performing roll correction.*

| Settings | Explanation |
|---|---|
| Antenna height above ground | With the tractor on a flat, level surface, measure the distance from the ground to the base of the GPS receiver (or antenna) and enter this value. |
| Antenna distance from fixed axle | With the tractor on a flat, level surface, measure the distance from the fixed axle to the center of the GPS receiver (or antenna) and enter this value.<br>Enter a negative value if the GPS receiver antenna is to the rear of the fixed axle. The nose of the vehicle is considered the forward direction. |

# Automated Steering Deadzone (DZ) calibration




**WARNING –** During the Deadzone calibration, the system moves the vehicle's steering wheel. To avoid injury, be prepared for sudden vehicle movement.

The automated dead-zone calibration procedure runs a series of tests on the valve and steering hydraulics to determine the point at which steering actuation occurs. During each repetition of the test, one side of the steering system is calibrated independently by slowly increasing the command to the valve while looking for wheel actuation.

**Note –** *The steering sensor calibration must be performed before you run this procedure.*

**Note –** *The vehicle will turn to either the right or the left in an uncontrolled manner during the calibration, perform the test in a large field that is free of hazards. To minimize the effect of ground conditions on the results, the field should ideally consist of smooth soil that is loose but firm.*

Obstacles in the field can cause collisions, which may injure your and damage the vehicle. If an obstacle in the field makes it unsafe to continue a particular phase of the automated dead-zone calibration, stop the vehicle to abort the phase and turn the steering wheel to disengage the system. Reposition the vehicle and continue from the current test phase.

1. To ensure good system performance, ensure the hydraulic fluid is at nominal operating temperature when you run this procedure.

   On some vehicles with large reservoirs, it may take several minutes (or longer) for the fluid to reach operating level, especially if the implement circuit is lightly loaded. Review the vehicle documentation to determine if the hydraulic fluid temperature can be displayed on a vehicle console. If the calibration is performed while the system is still cold, re-run both the deadzone and proportional gain calibration procedures again once the system is at operating temperature.
2. Read the instructions for screens 1 through 3 on the screen and select **Next** for each screen.
3. At the screen for step 4, drive slowly in first gear with the engine RPMs at the normal operating level of the vehicle (or maximum).

When an AutoSense device is installed, drive the vehicle in a straight line for at least one minute before you start the automatic dead-zone calibration. This ensures that the gyro meters are able to align to provide the proper steering angle value. If you drive in circles for one minute, the automated deadzone calibration will produce an incorrect result. You can combine driving in a straight line and turning, as long as the accumulated straight line driving time is at least one minute.

4. Select **Test Right.**
5. Continue through each screen, following all instructions.

**Note –** *When you calibrate the deadzone, drive in a straight line for at least five seconds immediately before you select* **Turn Left** *or* **Turn Right**.

Each time you select either **Turn Left** or **Turn Right**, the system engages and slowly increases the steering command to the side of the valve that corresponds to the button label. The wheels will move slowly in the direction that they are commanded and stop. It is not necessary for the wheels to cover a large angle for the calibration to be working.

During the automated deadzone calibration process, the Autopilot system steers the tractor for part of the procedure. While this calibration occurs, the Autopilot Toolbox II software displays a progress indicator. After each left or right phase of the calibration process, the software prompts you before beginning the next phase. The software also indicates whether the next phase will turn the vehicle left or right.

To minimize the total amount of space needed for the complete calibration, you can reposition the tractor between the phases of the test. If the available flat, smooth space is extremely limited, re-align the vehicle after each segment of the calibration.

To reposition the vehicle, wait until the software prompts you that the next phase is ready to begin, and then:

- Look at the screen to determine whether the next phase will require a left or right turn.
- Reposition the vehicle so that the turn will use the space that you have available.
- Acknowledge the prompt to begin the next phase.

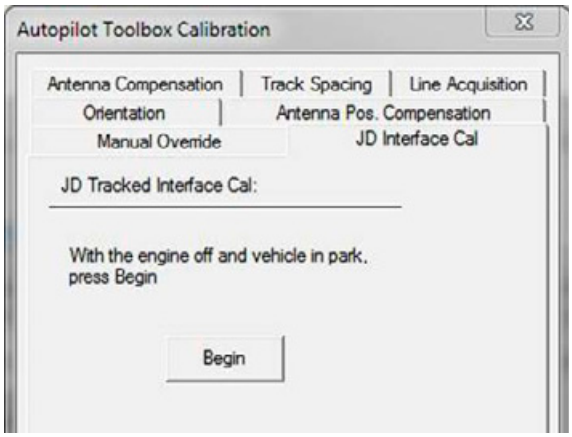
## Error messages

If a calibration cycle is unable to complete successfully, an error message will display.

| Error Message | Explanation |
|---|---|
| Disengage Detected | One of the following happened:<br>• Manual Override was detected<br>• A fault was detected<br>• A system warning that results in in a disengage was not cleared<br>• A liability warning was not cleared |
| Vehicle Moving Too Slow | The vehicle was moving too slowly for the calibration cycle to successfully finish. Make sure the vehicle is moving at least 0.8 kph (0.5 mph) during each calibration cycle. |
| Steering Close To End Stops | Before the calibration cycle could complete, the measured steering angle approached the end stops. Retry, and if the problem persists, instead of centering the steering at the start of each cycle, try turning the steering in the opposite direction to that which is being tested so that the calibration procedure has a greater range to test over. |
| Valve Connectors Could Be Swapped | The calibration test sensed the steering turning in the opposite direction to what was expected. Retry, and if the problem persists either the valve connectors are swapped or the steering sensor calibration was performed incorrectly.<br>If the problem persists, contact Technical Support. |

| Error Message | Explanation |
|---|---|
| No GPS | A GPS receiver must be connected and outputting positions in order to run the calibration procedure. |
| No Steering Response Detected | During the calibration cycle, insufficient movement was sensed in order for the calibration to complete. If the problem persists, the hydraulic installation could be faulty. |
| Unable To Determine DZ: Try Again | A problem occurred when trying to compute dead zone. Retry, and if the problem persists, contact Technical Support. |
| Software Problem Detected | An internal software anomaly occurred. Retry, and if the problem persists, contact Technical Support. |

# John Deere SIU-200 Steering Interface calibration




- For 00, 10, and 20 series tracked tractors: This calibration flashes the appropriate interface voltage calibration on the SIU-200 box. Follow the brief on-screen instructions.
- For 30 and RT series tractors: This calibration maps the steering wheel input voltage through the range of motion. On-screen instructions walk through the steps of moving the steering wheel left and right to determine the voltage range of the steering potentiometers.

# Line Acquisition Aggressiveness calibration

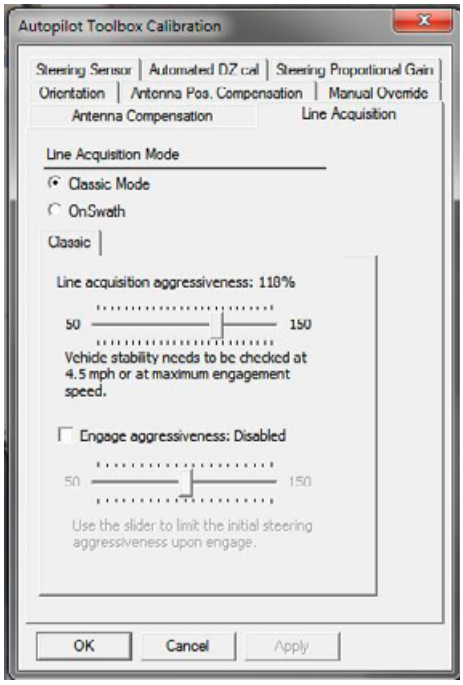
Line acquisition controls how fast the guidance system attempts to steer the vehicle onto the current guidance line. There are two line acquisition modes: Classic and OnSwath. With a:

- High setting: The vehicle approaches the line quickly, but may overshoot the line and drive into instability.
- Low setting: The vehicle steers onto the line more slowly, but is less likely to overshoot the line.

**Note –** *Ensure that you test the line acquisition performance at, below, and above the speed specified at the bottom of the screen. This value changes depending on the Line Acquisition Aggressiveness setting selected.*

## Classic Mode

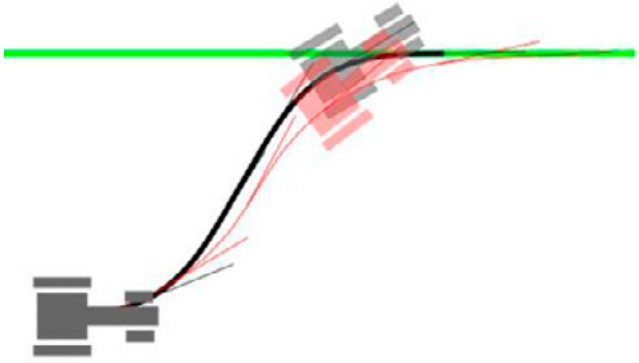
The *Classic Mode* is without the optional  OnSwath feature.




| Classic Mode Settings | Explanation |
|---|---|
| Line acquisition aggressiveness | How fast the guidance system attempts to steer the vehicle onto the current guidance line. |
| Engage aggressiveness: | Disabled: Normal response will occur upon engagement<br>Enabled: The engage response can be adjusted to operator preference |

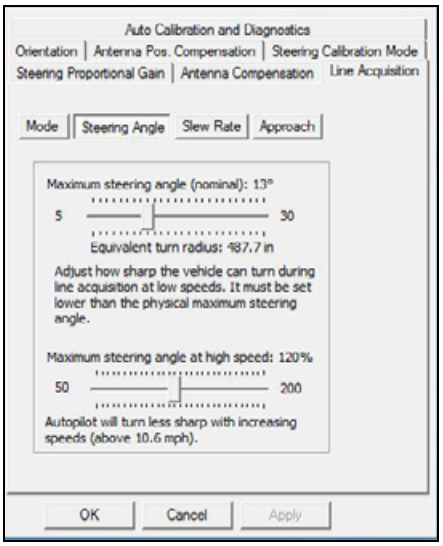
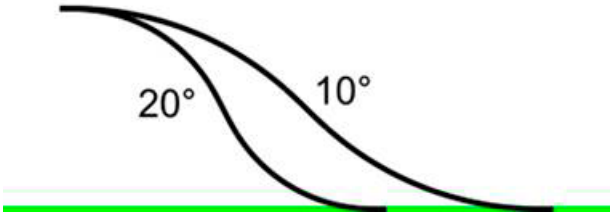
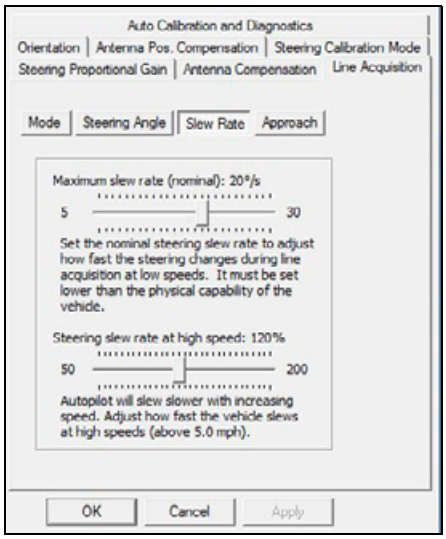
## OnSwath Mode

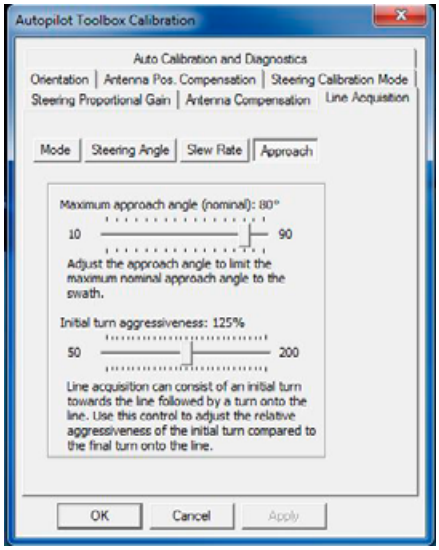
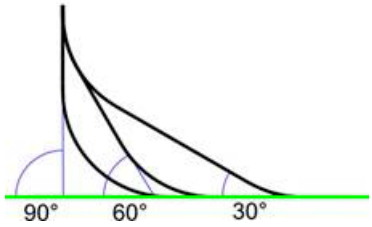
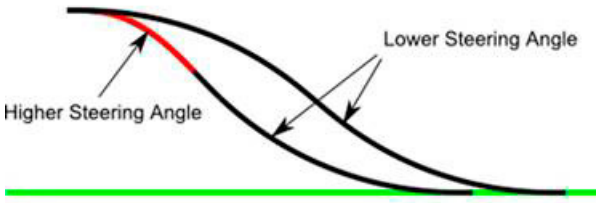
OnSwath Mode is an optional feature that allows you to customize line acquisition to the vehicle, operation and operator preference. Provides more controlled, predictable and repeatable line acquisition. In the following graphic, the bold black line shows acquisition with OnSwath mode. The thin red lines show acquisition with Classic mode.



For instructions on using OnSwath™ advanced line acquisition settingswith the TMX-2050 display, see page 40.

**Note –** *OnSwath requires: NavController II 6.0 or higher and AP Toolbox version 3.02 or higher. For compatible vehicle types, see the latest version of Autopilot supported platforms.*

| OnSwath Mode Settings | Explanation |
|---|---|
| Steering Angle Settings<br>  | The steering angle (or turn radius) used when acquiring a guidance line. A wider angle creates a sharper turn.<br>• Maximum steering angle (nominal): How sharply the vehicle turns during line acquisition at low speeds.<br>Sets the desired steering angle (turn radius) the system will use during line acquisition. This is not a hard limit and may be exceeded. The value must be set to less than the physical maximum steering angle of the vehicle. A good starting point is 50-75% of the physical maximum. The default values for the vehicle profile are in this range.<br>  <br>**Note –** *Do not set this too high. Too high of a value will cause poor performance.*<br>**Note –** *This setting affects the sharpest angle between the vehicle and a towed implement.*<br>• Maximum steering angle at high speed: How much the Autopilot will reduce the steering angle used at higher speeds. The speed noted below the slider indicates when a reduction in steering angle will start to occur.<br>- Lower aggressiveness values: Autopilot will limit the sharpness of high speed turns more, to maintain smoother, more stable operation.<br>- Higher aggressiveness values: Autopilot will use the nominal maximum steering angle until the indicated speed is reached. |
| Slew Rate Settings<br>  | How quickly the vehicle steers. The maximum slew rate (nominal) is the slew rate the Autopilot system will assume the system is capable of and will plan for during line acquisition.<br>• Maximum slew rate (nominal): Adjust how quickly the steering changes during line acquisition at low speeds.<br>**Note –** *This must be set lower than the physical capacity of the vehicle or instability may occur. Lowering this value may help with vehicle jerk and oscillations.*<br>A value that is:<br>- Lower: Better for vehicles with poor hydraulic performance.<br>- Higher: Increases the rate at which the steering angle (turn radius) changes, up to the vehicle's physical capabilities.<br>• Steering slew rate at high speed: The Autopilot system will reduce the slew rate at speeds above the displayed value.<br>**Note –** *Lowering this value may help with vehicle jerk and oscillations.*<br>A value that is:<br>- Lower: Reduces the slew rate at high speeds more. This leads to smoother and more stable operation.<br>- Higher: Reduces the slew rate at high speeds less. The speed noted below the slider indicates where the slew rate reduction will begin. |

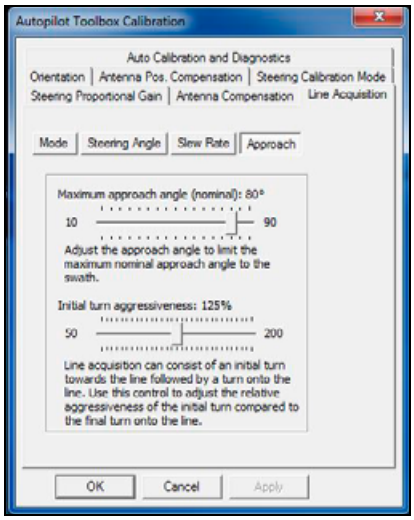
| OnSwath Mode Settings | Explanation |
|---|---|
| Approach Angle Settings<br>  | • Maximum approach angle (nominal): The desired approach angle that the Autopilot system will drive to the line if adequate space is available. If space is not available, the angle may not be achievable.<br>The following graphic shows possible paths to the line based on different approach angles.<br>  <br>• Initial Turn Aggressiveness: Adjusts how sharp or smooth the initial turn toward to the line will be in comparison to the final turn onto the line. This affects only the initial turn towards, while the final turn onto the line is not affected.<br>  <br>If the value is:<br>- Lower: The initial turn will be smoother and more gradual.<br>- Higher: The initial turn will be harder and sharper toward the line. |

## Calibration steps

**WARNING –** Before beginning calibration, ensure that the vehicle is in an open field free of obstacles and objects where you can evaluate the settings. During some calibrations, the system moves the vehicle's steering wheel and sometimes the movement is abrupt. To avoid injury, be prepared for sudden vehicle movement.

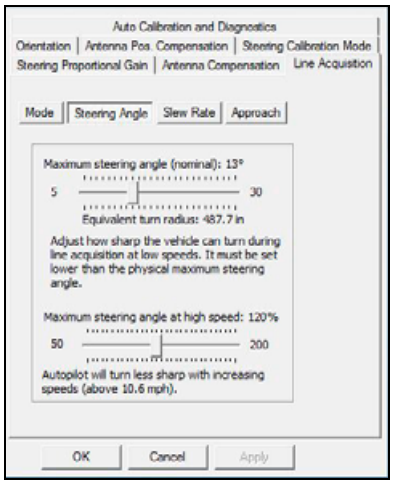
When following the steps below, adjust the settings while evaluating the performance as the vehicle turns onto the line.

1. Set the maximum approach angle.
   a. At the *Line Acquisition* tab, select the *Approach* sub-tab:




   b. Set the Maximum approach angle (nominal) to the swath first. This value can be changed later, with little effect on the other settings.

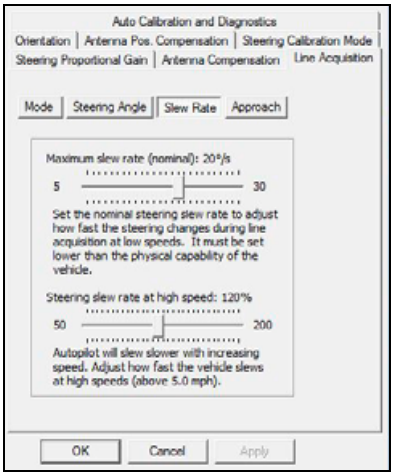
2. Set up the low speed settings.
   a. At the *Line Acquisition* tab, select the *Steering Angle* sub-tab.




   Set the Maximum steering angle (nominal). Evaluate the turn onto the line at low speed. It is recommended to stay below 6.5 km/h (4 mph).

A good starting point for Maximum steering angle (nominal) is approximately 50-75% of the machine's physical capabilities. For example, a typical wheel tractor might have a maximum steering angle of 35 to 40 degrees. Profiles come with default values that are a good starting point for the vehicle.

b. At the *Line Acquisition* tab, select the *Slew Rate* sub-tab:



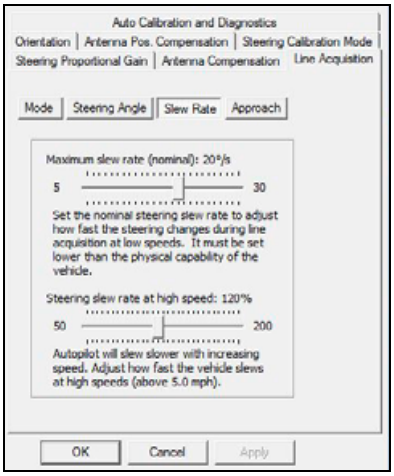

Set the Maximum steering angle (nominal) for the vehicle. A good starting point is around half or below half of the capability of the machine. For example, a typical wheel tractor might have slew rates between 20 and 35 degrees per second. A good starting value would be 10 degrees per second. The vehicle profiles for OnSwath have, by default, suitable starting values for the vehicle.

If the slew test is available (part of the Steering Gain Calibration - see Proportional Steering Gain calibration, page 44), the slew rate can be approximated by measuring the slew time from hard left to hard right while the vehicle is moving slowly forward at operating RPM.

The slew rate is the angle change (full left to full right) divided by the slew time. For example, if the maximum steering angle is 35 degrees and the slew time is 2000 milliseconds, the slew rate is 70 degrees / 2 seconds = 35 degrees per second.

**Note –** *This method is strictly an approximation. It is not the actual steady state slew rate of the vehicle. Actual performance of the vehicle during line acquisition will have many factors including, but not limited to, terrain, hydraulic load, tire size, soil conditions, and engine RPM.*

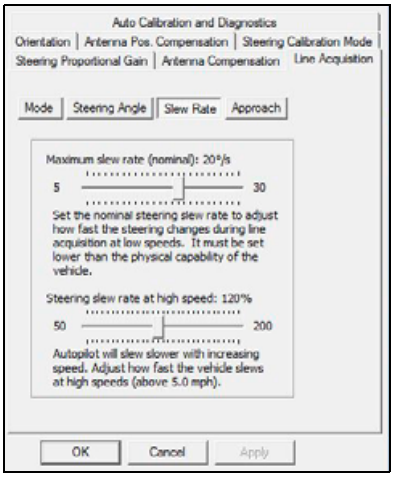
3. Set up the high speed settings.
   a. At the *Line Acquisition* tab, select the *Steering Angle* sub-tab.




   Set the Maximum steering angle at high speed to achieve the desired turn and turn rate at higher speeds. The speed at which these settings start taking effect is indicated. Evaluate line acquisition performance at increasing speeds for the most demanding scenarios (for example, end of row turns). Keep increasing the speed until either:

   – The maximum operating speed is reached. You may choose to increase the aggressiveness values for faster line acquisition. Ensure that operation is stable and safe at any given speed.
   – The system becomes unstable or too aggressive. Reduce the high speed aggressiveness values until the indicated speeds match or are lower than the unstable/too aggressive operating speed. Reevaluate performance. Reduce further if necessary.

   b. At the *Line Acquisition* tab, select the *Slew Rate* sub-tab.

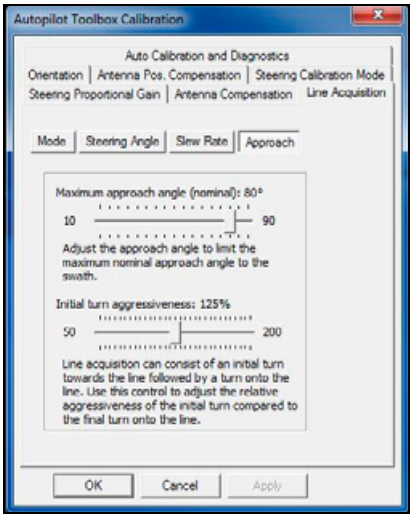



   Set the Steering slew rate at high speed to achieve the desired turn and turn rate at higher speeds. The speed at which these settings start taking effect is indicated. Evaluate line acquisition performance at increasing speeds for the most demanding scenarios (for example, end of row turns). Keep increasing the speed until either:

   The system becomes unstable or too aggressive. Reduce the high speed aggressiveness values until the indicated speeds match or are lower than the unstable/too aggressive operating speed. Reevaluate performance. Reduce further if necessary.

The maximum operating speed is reached. You may choose to increase the aggressiveness values for faster line acquisition. Ensure that operation is stable and safe at any given speed.

4. Set the initial turn aggressiveness.
   a. At the *Line Acquisition* tab, select the *Approach* sub-tab.




   b. Set the Initial turn aggressiveness.
   c. After the desired performance for the turn onto the line has been achieved, this setting can be used to make the initial turn towards the line aggressiveness, while not changing the turn onto the line. If you increase the Initial turn aggressiveness will make the turn toward the line more aggressive, reducing the overall time needed to acquire the line.

# OnSwath settings on the TMX-2050 display

**Note –** *This procedure is recommended only for advanced users. Make sure you read the entire procedure before beginning.*

The TMX-2050 display maintains the master configuration on the NavController. To transfer any changes you make in Autopilot Toolbox II, you must complete the following procedure. If you do not complete this procedure, the display will overwrite any changes in the vehicle selection or the power cycle.

1. Check the list of the VDB supported platforms (version 6.0) to confirm that OnSwath is available for the vehicle. Note which profile is used for your vehicle. (The OnSwath profiles are included in the TMX-2050 display firmware version 1.6 or later. For display firmware prior to version 1.6, you must import the correct profile to the display from a USB drive.)
2. Power up the display and the NavController.
3. For an existing installation, the vehicle must be recalibrated. For this reason, Trimble recommends you make a note of the controller settings, measurements and roll calibration values.
4. Load the OnSwath VDB.
5. For displays with firmware prior to version 1.6:
   a. Create the appropriate file structure. Create a folder on your USB drive named **AgData**. Inside the AgData folder, create a folder named *Vehicle Profiles*.
   b. Copy the VDB version 6.0 or later for your vehicle to the *Vehicle Profiles* folder on the USB drive.
   c. On the TMX-2050 display at the *Controller Setting*s screen, change the vehicle profile origin to Import from USB.

d. Tap **Retrieve Vehicle Profile** and select the profile you copied to the USB drive.
e. Verify the controller orientation and measurements of the profile.
f. Save the vehicle profile. At the *Summary* screen, tap  .

6. For displays with firmware version 1.6 or higher:
   a. On the TMX-2050 display, go to the Vehicle Type list.
   b. Select any vehicle type other than your vehicle.
   c. Select your vehicle type. (You must repeat the whole select and setup, beginning with the Vehicle Type and completing the entire setup.)
   d. Follow the normal process of setting up the vehicle. Make sure to verify the controller orientation and vehicle measurements.
7. Power off the display and NavController.
8. Power on the display and NavController.
9. If the display shows a message that the NavController was configured by another display or device:
   a. Navigate to the *Guidance/ Selection* screen.
   b. Tap **Vehicle Profile Origin** and change the origin to Import from the NavController.
   c. Tap **Retrieve Vehicle Profile**. Wait for the profile to be retrieved.
   d. Tap **Next** until you reach the *Summary* screen.
   e. At the *Summary* screen, tap  .
   f. Power off the system and then power it on.
10. Use the TMX-2050 display to calibrate the vehicle.
11. After the calibration is complete, tap  .
12. Connect the NavController to Autopilot Toolbox II.
13. At the *Autopilot Toolbox Setup* screen, select the *Calibration* tab. The *Autopilot Toolbox Calibration* screen appears.
14. Select the *Line Acquisition* tab.
15. Set up OnSwath as part of the Line Acquisition calibration. See Line Acquisition Aggressiveness calibration, page 33.

**Note –** *Test your OnSwath settings and make any changes while in the Autopilot Toolbox Calibration / Line Acquisition screen. Do not close the this screen if you are adjusting or testing settings.*

16. Once the OnSwath settings meet your requirements, tap **OK** at the *Autopilot Toolbox Calibration* screen. This screen closes and the TMX-2050 display is notified of the changes you made with Autopilot Toolbox II. The display will:
    - Recognize the changes can be imported
    - Apply the display's master configuration to the NavController

**Note –** *Any changes made to the OnSwath settings at the Autopilot Toolbox Calibration screen will not be saved after exiting from either the setup/configuration/calibration pages or the advanced configuration. You must import settings from Autopilot Toolbox II each time you make changes in the Autopilot Toolbox II.*

On the TMX-2050 display, a message notifies you:
- The display is being configured by another device or display
- You must import the configuration from the NavController

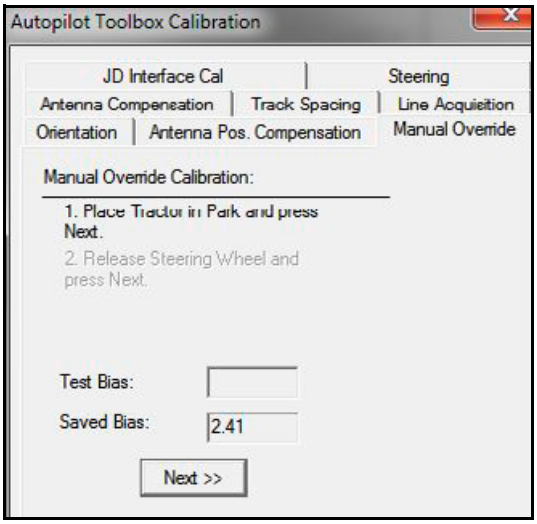
17. Tap **OK** to close the message.
18. Change the master configuration of the TMX-2050 display to include the OnSwath setting in Autopilot Toolbox II:

a. Wait for the TMX-2050 display to re-establish communications with the NavController.
b. Wait for the satellite indicator to turn green in the lower left corner on the screen.
c. At the display, go to the *Vehicle* panel.

d. Make sure the vehicle you are setting up for OnSwath is selected. Tap **Edit**.
e. Navigate to the *Guidance/ Selection* screen.
f. Tap *Vehicle Profile Origin* and change the origin to Import from the NavController.
g. Tap **Retrieve Vehicle Profile**. Wait for the profile to be retrieved.
h. Tap **Next**.
i. Verify the controller settings, vehicle settings and measurements.
j. At the *Summary* page, tap  to save the vehicle configuration.
k. At the *Vehicle* panel, tap **Select** to select the vehicle you just saved. This will send the updated master configuration with all changes to the NavController.
l. Wait for communications to be re-established with the NavController.
m. After communications are re-established, shut down and restart the TMX-2050 display and NavController.

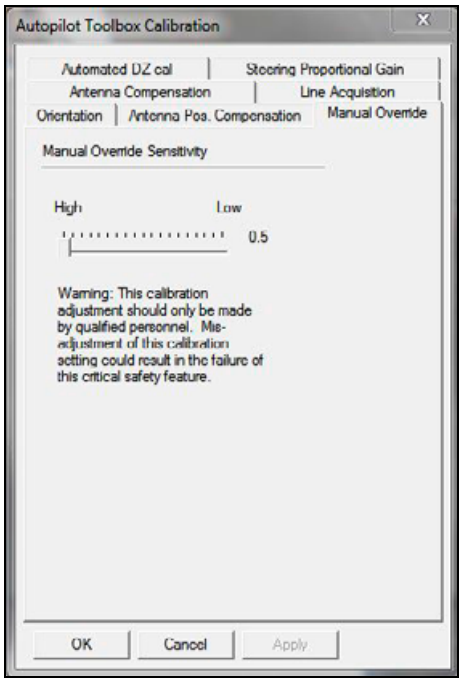
**Note –** *When OnSwath is enabled and saved in the TMX-2050 display, the classic line acquisition adjustments in the display will not function. If you want to use Classic mode, use Autopilot Toolbox II to change back to this mode and re-import the configuration from the NavController again.*

# Manual Override Bias calibration




ManualOverride Bias sets the biased neutral value for the Steering potentiometer input on John Deere Tracked Machines (both tractors and sugar cane harvesters) if the voltage changes from this value,the system manual overrides.

# Manual Override Sensitivity calibration




The Manual Override Sensitivity slider controls how much force is required to override the system by turning the steering wheel. This setting only applies to pressure transducer and encoder based manual override systems. Flow switches are not adjustable as they are either active or not active.

The default sensitivity setting provides a balance between rapid activation of the override function and rejection of steering wheel motion due to incidental contact (for example, due to travel in a rough field).

**WARNING –** Before beginning calibration, ensure that the vehicle is in an open field free of obstacles and objects where you can evaluate the settings. During some calibrations, the system moves the vehicle's steering wheel and sometimes the movement is abrupt. To avoid injury, be prepared for sudden vehicle movement.

**Note –** *The Manual Override Sensitivity calibration is only valid for those platforms employing a pressure transducer or quadrature encoder for the manual override function. The Autopilot Toolbox II software automatically detects whether or not the vehicle configuration includes this type of sensor, and provides this option if required.*

**Note –** *Trimble strongly recommends that this calibration be performed only if it is determined that the default sensitivity is unacceptable under all conditions. Be very careful not to choose a sensitivity setting that is either too sensitive or not sensitive enough. In either case the manual override function may cease to function properly if not correctly adjusted. On some platforms, it may be possible to set the sensitivity so low that the manual override function will not detect any steering wheel motion. Avoiding this case should be a top priority.*

Do the following to re-evaluate each new setting. You can also evaluate the performance of the manual override feature under conditions of loading and/or activities which may affect the pressure of the hydraulic system. For example, you can turn on the auxiliary hydraulics while you evaluate the manual override sensitivity.

1. Set up the Autopilot system with a job loaded and tracking live satellites.
2. With the vehicle not moving, engage the system into automatic mode.

3. Turn the steering wheel and assess whether the manual override feature is at an acceptable level of sensitivity. The criteria generally used includes evaluating how far and how rapidly the steering wheel needs to be turned before the manual override function causes the system to be disengaged.

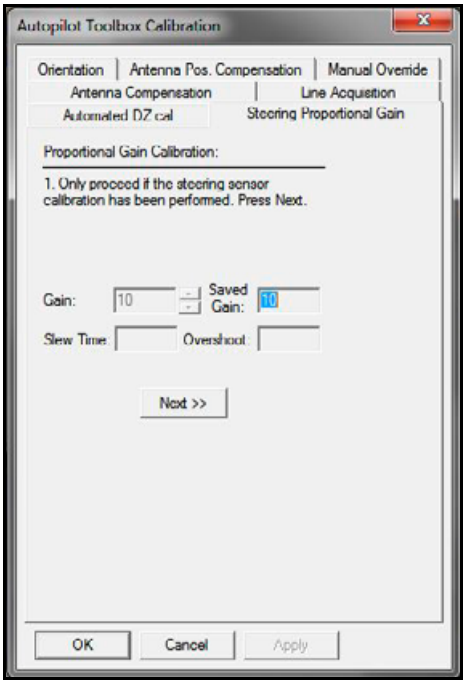
   To adjust the setting, move the slider to the left (increase sensitivity) or right (decrease sensitivity). The value to the right of the slider shows the current setting. The total range is 0.5 to 2.5 (where 0.5 is the most sensitive setting and 2.5 is the least sensitive).

   If you change the slider setting, the new setting is transmitted to the Autopilot controller when you click **OK**.

4. If the steering wheel has to be turned too far or too rapidly, use the calibration slider to increase the sensitivity of the function. If the manual override function is activated even for incidental contact (for example, motion) of the ateering wheel, use the slider to decrease the sensitivity.

Use the above method to re-evaluate each new setting. You can also evaluate the performance of the manual override feature under conditions of loading and/or activities which may affect the pressure of the hydraulic system. For example, you can turn on the auxiliary hydraulics while you evaluate the manual override sensitivity.

# Proportional Steering Gain calibration




**Note –** *If you use the New Installation Wizard to perform this calibration, click the highest Next button to go to the next calibration screen. The Back, Next and Exit set of buttons are for the Installation Wizard and not the steps for each calibration.*

The PGain setting is a compromise between fast steering response and stability. Modifications to PGain affect two steering characteristics:

- Slew Time: The amount of time the front wheels take to move from the far left to the far right position and vice versa.
- Overshoot: The percentage by which the front wheels exceed the commanded angle before they settle on the correct value.

Altering these settings may correct slight variations in your vehicle due to valve current response, friction, and hydraulic fluid viscosity.

High PGain values decrease the slew time and increase the overshoot. This provides rapid responses, but can cause the steering to exhibit signs of instability, like a tendency to excessively overshoot.

Low PGain values increase the slew time and decrease the overshoot. This improve the stability but can introduce significant delays in the steering response and can cause the vehicle to oscillate from side to side.

When you run the calibration, ensure that:

- You perform this procedure on a hard, level surface that is free of obstructions.
- You follow the instructions presented on each page.
- Your vehicle speed is between 1 and 3 mph at an engine RPM sufficient to provide adequate hydraulic flow.

**Note –** *The automated deadzone calibration must be performed immediately before you run the PGain calibration, even if the automatic deadzone calibration has been performed in the past.*

**Note –** *The steering sensor calibration must be completed before you attempt to perform the proportional gain calibration procedure, and ONLY when the Autopilot system performance is less than satisfactory.*

1. You may increase proportional gain to the point just before any one of these occur:
   - Slew times no longer decrease (a low value is desired)
   - Overshoot exceeds 5–8% (depending on vehicle).
   - Wheels noticeably shake near end stops or while engaged driving through the field.
2. Turn the front wheels completely to the right to begin the test. (The test is for the stop-to-stop position).
3. Select **Turn Left**. Both turn buttons will be grayed out while the wheels slew.

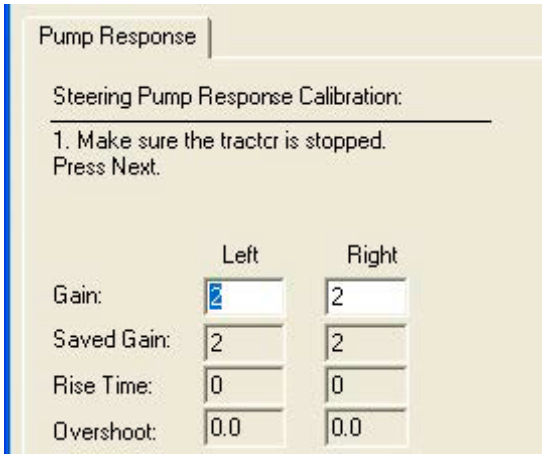
**Note –** *The optimum gain setting has short slew time (short millisecond reading) and low overshoot percentage (less than 10%).*

4. Test various gain settings, while you monitor the vehicle performance and the values for Slew Time and Overshoot for the Turn Left phase.
5. Use the increment/decrement controls to adjust the Gain value (if desired).
6. Turn the front wheels completely to the left.
7. Select **Turn Right**. Both turn buttons will be grayed out while the wheels slew.

**Note –** *The optimum gain setting has short slew time (short millisecond reading) and low overshoot percentage (less than 10%).*

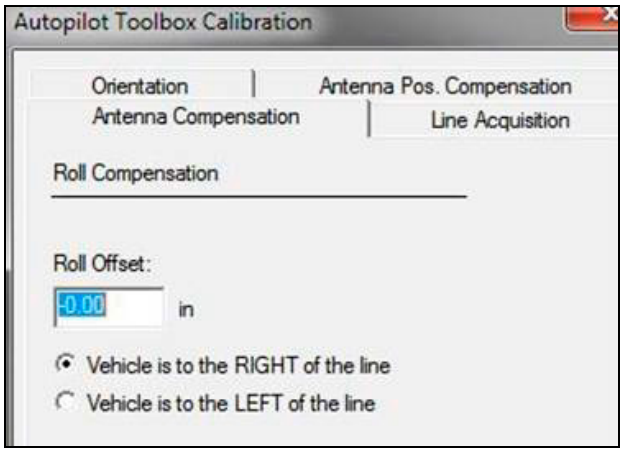
8. When the best gain value is located, select **Next** to save the value in controller memory, or select **Back** to restart the calibration procedure.

# Pump Response calibration




The Pump Response calibration verifies and optimizes the response of the hydraulic steering pumps. Follow the on-screen instructions to perform this procedure.

# Roll Offset calibration




Two different measurement methods are offered for calculating the roll offset:

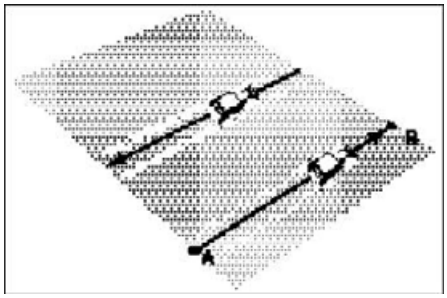
- Tire track offset method
- Flag offset method

Choose the method which best matches your conditions.

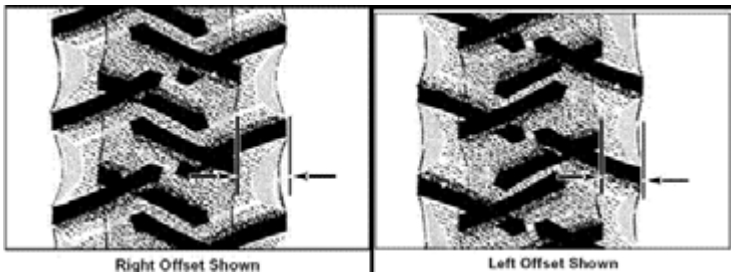
## Roll correction: Tire track offset method

1. Remove any implement from the tractor for this test.
2. Drive the tractor to a relatively flat field where soil conditions will make tire impressions visible and where passes of at least 402 m (1320 ft) in length can be made.
3. Reset the Roll Offset value to 0 (zero) before performing the procedure.
4. Create an AB Line. (The job file does not have to be stored.)

5. To create a clean set of tire tracks in the field, start a new pass away from the area where the AB Line was created. When the system is stable, engage automatic steering mode and allow the Autopilot system to complete the pass.
6. At the end of the pass, turn the tractor around to return along the same pass from the opposite direction.




7. Engage automated steering mode and allow the system to complete the pass.
8. At the end of the return pass, stop the tractor and confirm that its current position is directly on the AB line (there is no cross track error).
9. Park the tractor and exit the cab to evaluate the tire track pattern between the first and return paths.
10. Measure the difference between the track passes and record the distance in inches. Also note whether the return pass is to the left or the right of the original pass.




11. Record the results.

| Test Run | Offset Distance (inches) | Offset Direction |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |

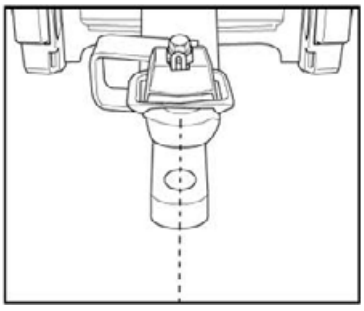
**Note –** *The offset should be consistently to the left or right.*

12. Repeat Steps 5 to 11 two more times for a total of three test runs. Record the offset distance in inches and the left or right direction of offset for each test run.
13. Average the results of the three runs: Total the offset distances from the three passes and divide by 3.
14. Enter the average offset value for the Roll Offset.

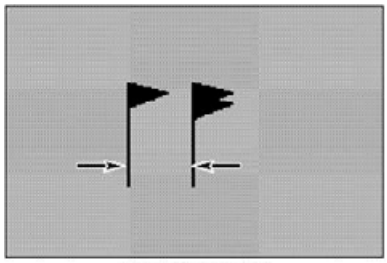
## Roll correction: Flag offset method

1. Remove any implement from the tractor for this test.
2. Drive the tractor to a relatively flat field where passes of at least 402 m (1320 ft) in length can be made.
3. Reset the Roll Offset value to 0 (zero) before performing the procedure.
4. Create an AB Line. (The job file does not have to be stored.)
5. Start a new pass. Engage automatic steering mode when the system is stable. Stop the tractor midway through the pass. Confirm that the current tractor position is directly on the AB Line (there is no cross track error).

   Park the vehicle and exit the cab. Use the hitch pin hole in the drawbar as a guide to insert a flag in the ground to mark the tractor centerline for this pass.



6. Complete the pass with the tractor. Turn the tractor around to return along the same pass from the opposite direction.
7. Engage automatic steering mode. Stop the tractor midway down the pass with the drawbar pin location very close to the marker flag. Confirm that the current tractor position is directly on the AB Line (there is no cross track error).
8. Park the tractor and exit the cab. Use the hitch pin hole in the drawbar as a guide to insert a second flag in the ground to mark the tractor centerline for this pass.
   Note whether the second pass is to the left or the right of the first pass.
9. Measure the difference between the flag markers for the two passes.



Right Offset Shown

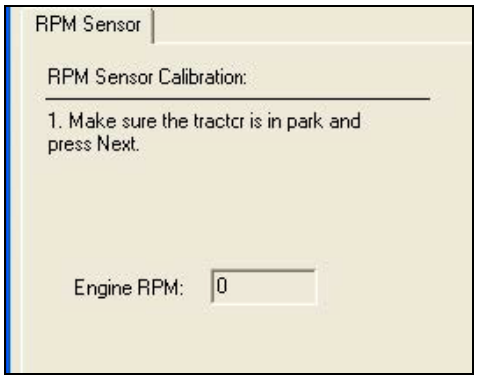
10. Record the distance inches. Also record whether the return pass is to the left or the right of the original pass..

| Test Run | Offset Distance (inches) | Offset Direction |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |

**Note –** *The offset should be consistently to the left or right.*

11. Repeat Steps 5 to 10 two more times for a total of three test runs. Record the offset distance in inches and the left or right direction of offset for each test run.
12. Average the results of the three runs: total the offset distances from the three passes and divide by 3.
13. Enter the average offset value for the Roll Offset.

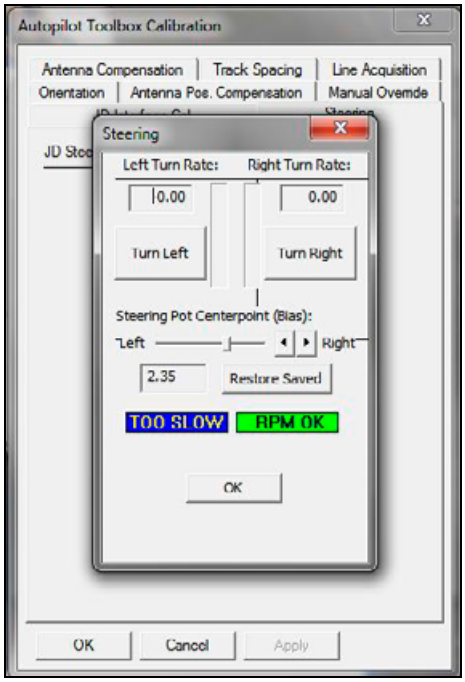
# RPM Sensor calibration




The RPM Sensor calibration verifies that the RPM sensor output is correct.

If the Engine RPM value is not close to the actual engine RPM, follow the on-screen instructions to adjust the sensor output.

# Steering Center Bias calibration




For 00, 10, and 20 series John Deere tractors, the Steering Center Bias calibration determines the center voltage, which is necessary for controlling the electronic steering interface.

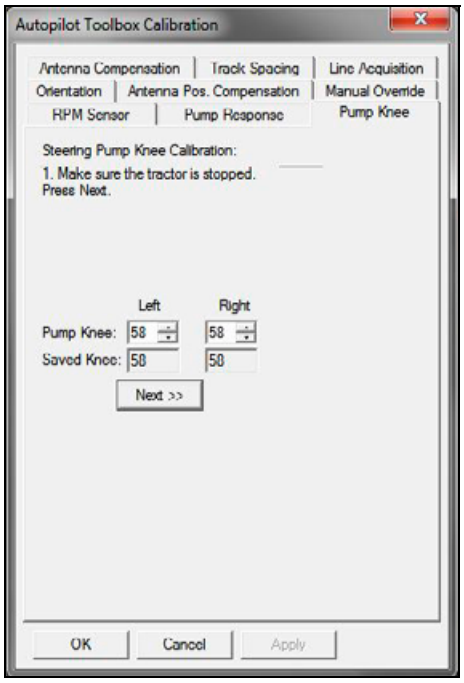
This calibration is not used for 30 and RT series vehicles that use the interface box.

Successfully calibrating the center voltage setting ensures that the Autopilot system steering is balanced for left and right steering commands.

The steering center bias test requires the vehicle to be in motion. To avoid injury, be prepared for vehicle movement.

The instructions for this calibration test span several screens. Follow the on-screen instructions.

# Steering Pump Knees calibration

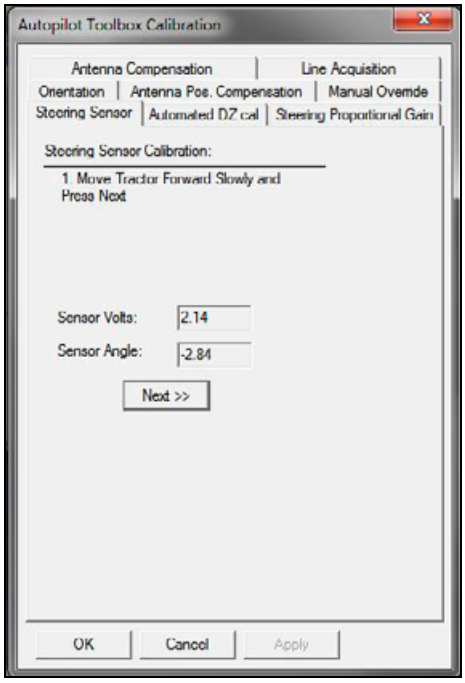



The Steering Pump Knee calibration procedure determines the compensation for deadband in the steering pumps.

This calibration requires the vehicle to be in motion. To avoid injury, be prepared for vehicle movement.

The instructions for this calibration test span several screens. Follow the instructions presented on each screen.

# Steering Sensor calibration




The steering sensor calibration is required to convert the voltage output of the steering sensor into an equivalent steering angle measurement.

**Note –** *Only perform the steering sensor calibration if a rotary potentiometer is installed on the vehicle. If the steering angle sensor is set to Autosense, the Steering Sensor calibration will not display.*

**Note –** *Complete this calibration before attempting to calibrate the steering deadzone or roll correction procedures.*

When you run the calibration, ensure that you:

- Perform this procedure on a hard, level surface that is free of obstructions.
- Follow the instructions presented on each page.
- Drive the tractor at a speed that exceeds 1.6 kph (1 mph).
- Watch the Sensor Angle value to ensure:
  - A symmetrical angle reading at the steering extremes while you manually steer the wheels to the full right and full left.
  - The angle reading is near zero while you manually steer the wheels straight ahead. If the angle is not zero when driving straight ahead, an offset bias will be present when the system is operating.

To run the steering sensor calibration:

1. Start the calibration process by moving the tractor forward slowly. The *Sensor Volts* value updates. Select **Next.**

**Note –** *If you use the New Installation Wizard to perform this calibration, click the highest Next button to go to the next calibration screen. The Back, Next and Exit set of buttons are for the Installation Wizard and not the steps for each calibration.*

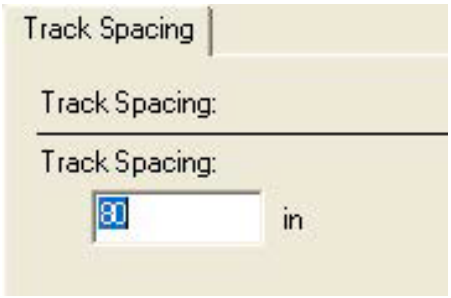
2. Turn the steering wheel to the full left turn position and select **Next**.

   If the steering wheel is not turned to the full left position, or if the steering sensor requires adjustment or replacement, an error message displays.

3. Turn the steering wheel to the full right turn position and select **Next**.

   If the steering wheel is not turned to the full right position, or if the steering sensor requires adjustment or replacement, an error message displays.
4. Steer the vehicle straight and select **Next**.
5. Select **Next** to continue and accept the calibration, or select **Restart** to discard the last calibration and to return to Step 1.

# Track Spacing calibration




Track spacing is the distance from the centerline of the left track to the centerline of the right track.

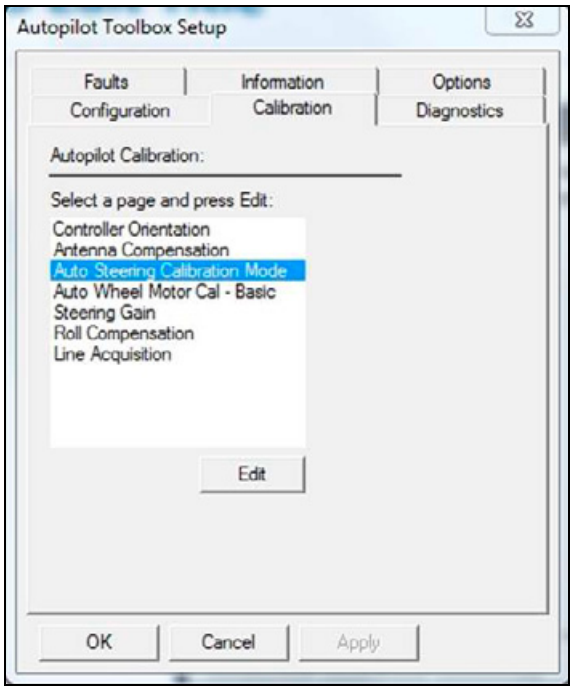
# Automatic Calibration and Diagnostics (Auto-calibration)

Autocalibration mode in the Autopilot Toolbox software is an alternate method to calibrate steering sensors and deadzones on some vehicle types. It is the required method for formally calibrating vehicles using the Danfoss PVED-CLS valve and vehicles using APMD

## Opening the Automatic Calibration and Diagnostics screen

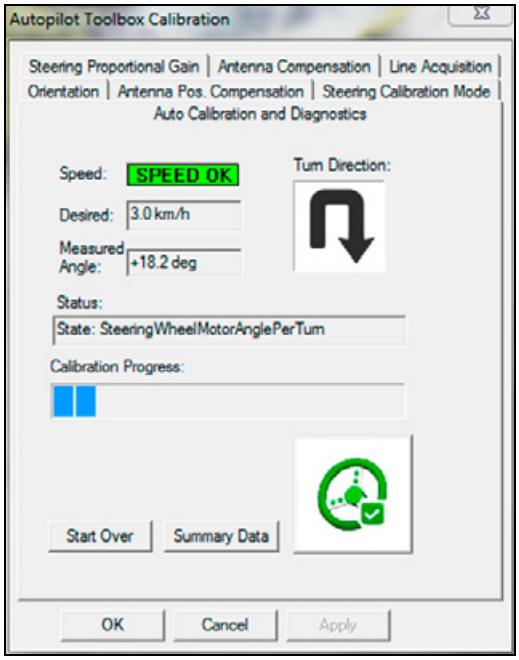
To navigate to the *Automatic Calibration and Diagnostics* interface page:

1. Select *Tools / Setup and Diagnostics* and then click the *Calibration* Tab.
2. Select *Auto Steering Calibration Mode* and then click **Edit**.

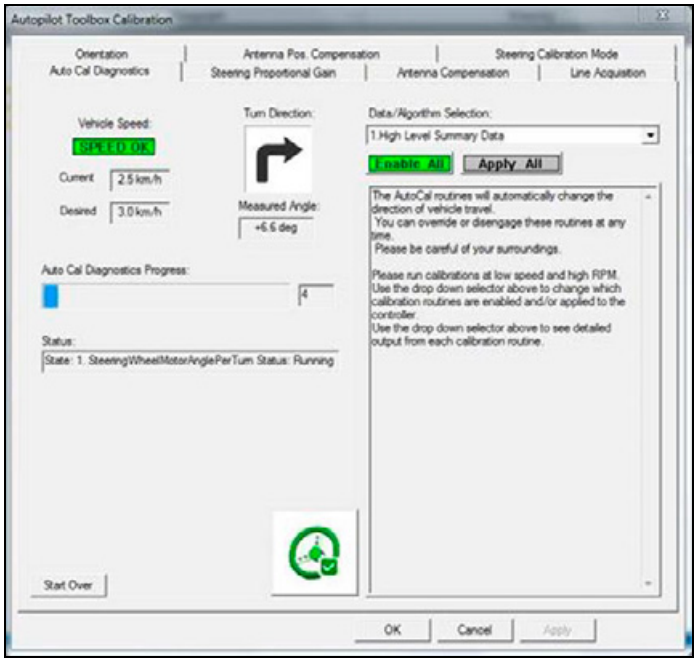



3. Select *AutoCal Basic* or *AutoCal Advanced* instead of *Classic* and then click **OK**.
4. Select *Auto Cal Diagnostics - Basic* or *Auto Cal Diagnostics - Advanced* and then click **Edit**.

The following images show the Autopilot Toolbox interfaces while running:

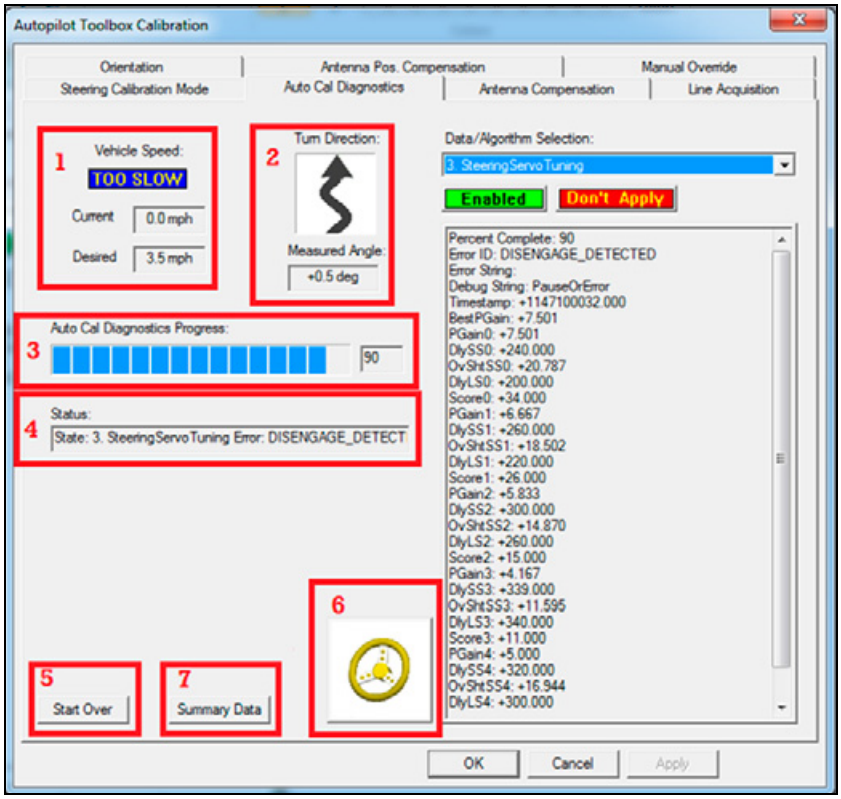



**Autopilot Toolbox Basic Interface**



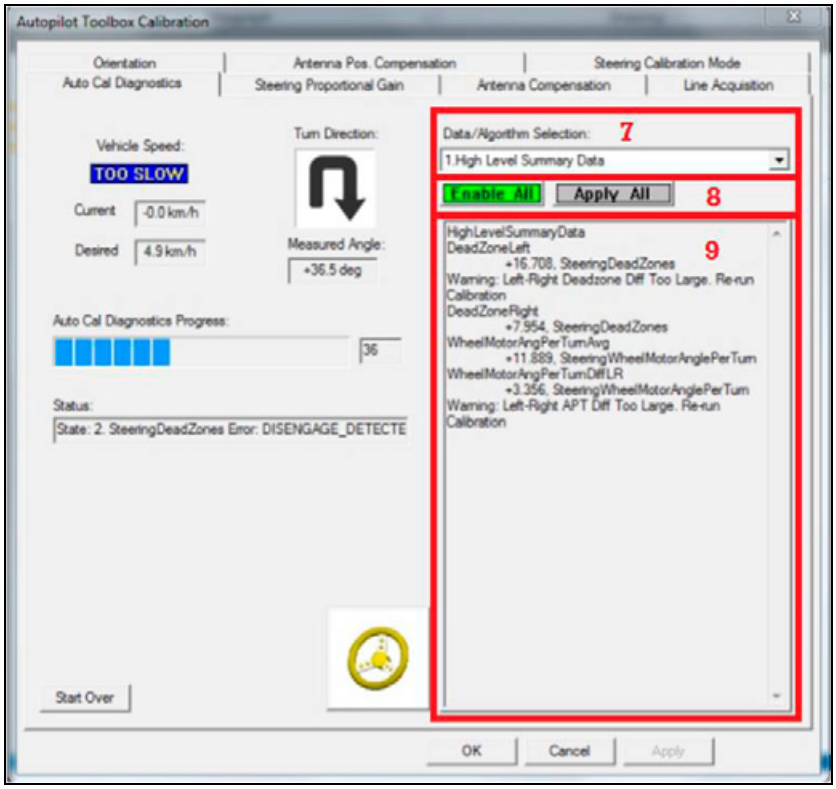

**Autopilot Toolbox Advanced Interface**

## High-level status and controls



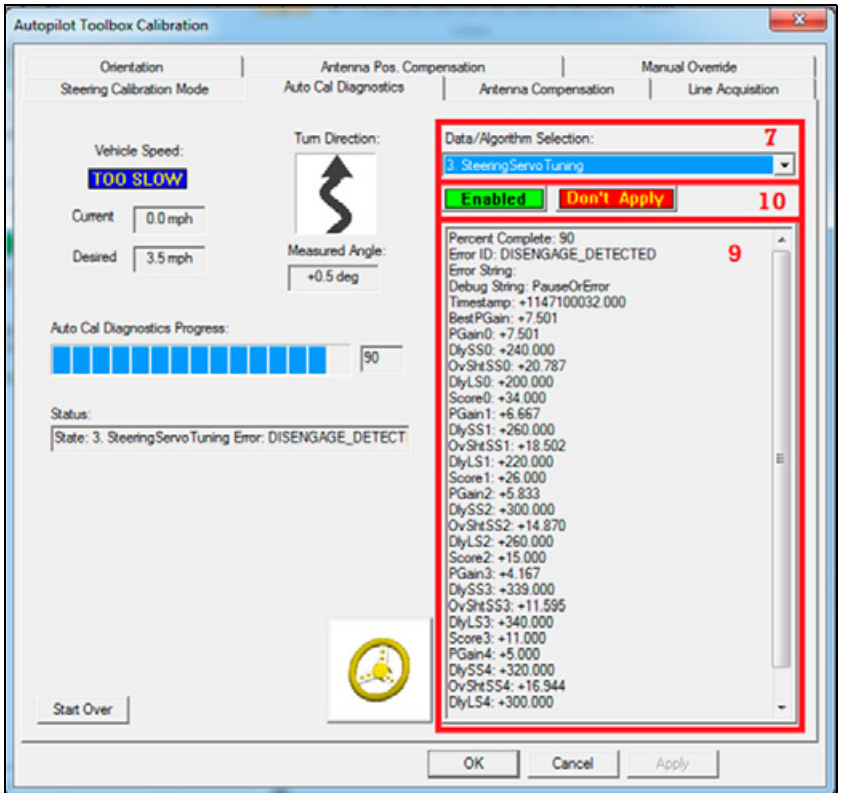

| Number | Name | Description |
|---|---|---|
| 1. | Vehicle Speed Information. | Each calibration routine has an allowed range of vehicles speeds, and a desired vehicle speed. These controls should be used by the operator to adjust the speed to maximize the accuracy of the procedure. |
| 2. | Turn Direction. | Shows the operator the next expected movement of the steered wheels. |
| 3. | Auto Cal Diagnostics Progress. | Graph showing completion percentage of the whole automatic calibration and diagnostics process. |
| 4. | Status. | Indicates the following:<br>• The current calibration routine that is running or paused.<br>• If the running routine is running, paused, or has an error.<br>You can use the drop-down procedure selector to show the error ID and error description. |
| 5 | Start Over Button | Use this button to reset the automatic diagnostics calibration process to the beginning.<br>• One click restarts the current running procedure.<br>• Two clicks restarts the whole process. |
| 6 | Run/Pause Calibration Button. | If this button is yellow, the calibration process is not running, and pressing it will command the system to start or continue the calibration process. If this button is green, the calibration process is running, and pressing it will pause it. The user can also disengage the calibration process by overriding with the steering wheel. |
| 7 | High Level Summary Data Button (Only Available in Basic Mode). | Retrieves and displays the high level summary output data from all procedures in a pop-up window. See High-level summary output data and controls (Advanced Mode only), page 55. |

## High-level summary output data and controls (Advanced Mode only)




| Number | Name | Description |
|---|---|---|
| 7 | Output Data Selector - High Level Performance Data. | Use the drop-down menu is used to select which data you want to see.<br>The default selection is to show the high level performance data, which is a summary of the individual procedure results. |
| 8 | Control buttons | • **Enable All** button. If this button is clicked, it will select or deselect all compatible calibration procedures to be run on the next pass through the calibration process.<br>**Note –** *When power is removed and then applied to the guidance controller (that is, key cycle the machine), all procedures default to enabled.*<br>**Note –** *When all compatible algorithms are enabled, this button is green. Otherwise, this button is grey, even though some of the procedures may be enabled.*<br>• **Apply All** button. If this button is clicked, and it is green, the results of all completed procedures will be applied either immediately (if they've already completed), or after the next time they complete. If the button is grey, then some of the procedure results may still be applied when they complete.<br>**Note –** *When power is removed and then applied to the guidance controller (i.e. key cycle the machine), all procedures default to "Apply Results".*<br>**Note –** *Once the results have been applied to the controller, the procedure cannot be reversed.* |
| 9 | Output data window | Displays the selected output data. High level summary data includes the parameter name, value, name of the procedure that estimated it, estimated performance grade (if available), and any warnings associated with the value (if applicable). |

## Individual procedure data and controls




| Number | Name | Description |
|---|---|---|
| 7 | Output Data Selector - Specific Procedure | Use the drop-down menu is used to select which data you want to see.<br>It can be used to select the output from a specific procedure. When a specific procedure's data is chosen, it shows more detailed information than the High Level Performance Data. |
| 9 | Output data window | Displays the selected procedure's output data. |
| 10 | Control Buttons. | • **Enabled/Disabled** button. Click this button to set it to either **Enabled** or **Disabled**. If the selected calibration procedure is **Enabled**, it will be run on the next pass through the calibration process; otherwise, it will be skipped.<br>**Note –** *When power is removed and then applied to the guidance controller (that is, key cycle the machine), all procedures default to Enabled.*<br>• **Apply Results/Don't Apply** button. Click this button to set it to either **Apply Results** or **Don't Apply**. If the selected calibration procedure is set to **Apply Results**, the results of the procedure will be applied either immediately (if the procedure has already completed), or after the next time it completes. Otherwise, the results will not be applied.<br>**Note –** *When power is removed and then applied to the guidance controller (i.e. key cycle the machine), all procedures default to Apply Results.*<br>**Note –** *Once the results have been applied to the controller, the procedure cannot be reversed. However, future results will not be applied if* **Don't Apply** *is selected.* |

## Typical workflow

1. Open the *Auto Cal Diagnostics* interface page. It will default to show the *High Level Summary Data* output.
2. By default, all compatible procedures are enabled and set to apply their results as soon as the procedure completes.
3. You can enable/disable the desired procedures by selecting them from the drop-down list, and then click the **Enabled/Disabled** button to highlight the appropriate option.

To run all available procedures, in the *High Level Summary Data* page click the **Enable All** button until it turns green.

1. Make sure you are in an open, flat area, and moving at an acceptable speed.
2. To start the Automatic Calibration and Diagnostics process, click the Run/Pause Calibration button (this looks like a steering wheel and is in the bottom right corner of the screen) until it turns green.
3. When the calibration process is running, be aware of your surroundings, and disengage the guidance system at any time necessary to maintain safety.
4. You can shuttle the vehicle forward/reverse, as necessary, and the procedure should continue running.
5. When the Automatic Calibration and Diagnostics process is complete, do the following:
   - Review the output data. You can either do this at the high level, or select an individual procedure's output to review more detailed results.
   - Apply the results from all, or only from specific, procedures, if they have not already been applied.

# Chapter 5

# VIEW DIAGNOSTICS


- Diagnostics screens
- CAN diagnostics
- Manual Override diagnostics
- Remote Engage diagnostics
- Steering Angle diagnostics
- T3 IMU diagnostics
- Vehicle Direction diagnostics
- Wheel Motor diagnostics


This chapter describes the Diagnostics functionality, which allows you to view the state of the Autopilot system by vehicle type.

# Diagnostics screens

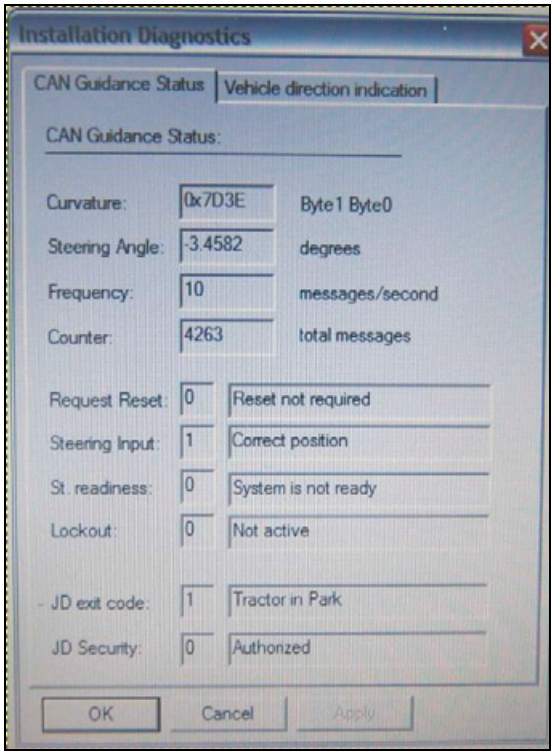
At the *Diagnostics* screens, you can view data from the main sensor inputs for the selected vehicle type. The raw and scaled sensor data is continuously updated to allow real-time evaluation of the connection.

The selected vehicle type determines which diagnostics screens are available. To view diagnostics on an item, select an item from the list and click **Edit**.

The following table shows which calibrations are required for which types of vehicles.

| Calibration | Front Wheel Steered | Hydraulic Tracked | John Deere SIU-200 Tracked | Articulated Steered | Sprayer |
|---|---|---|---|---|---|
| Steering Sensor | x | | | x | x |
| Manual Override | x | x | x | x | x |
| Gear Lever | x | x | x | x | x |
| Wheel/ Transmission Speed | x | x | x | x | |
| Left Pump Pressure | x | | | | |
| Right Pump Pressure | x | | | | |
| Engine Speed | x | | | | |
| Steering Module Status | | x | | | |
| Output Balance Voltage | | x | | | |
| Neutral Sense or Wheel Speed | | | | | x |
| Vehicle Direction | Available when either the Wheel Speed / Neutral Sense sensor or the Gear Lever sensor (or both) are disabled. | | | | |

# CAN diagnostics




Use the CAN diagnostics to help troubleshoot connection or state errors. These diagnostics are for vehicles that allow the NavController to send curvature commands to a closed loop controller on the machine.

## Message categories

Categories of CAN messages used depend on the type of vehicle implementation.

| CAN message category | Explanation | Example of vehicles affected |
|---|---|---|
| ISO | Follows the communication protocol outlined by ISO 11783 | • Krone<br>• CLAAS<br>• AGCO MT 900 C |
| ISO "Plus | Follows the communication protocol outlined by ISO 11783 with more verification required | • AGCO DT/RT (additional Sauer Danfoss status items)<br>• AGCO Challenger MT wheeled/Massey Ferguson<br>• John Deere (must pass security and curvature matching)<br>• Valtra |
| Proprietary | Unique messages (not standard)<br>**Note –** *For proprietary message type vehicles, not all CAN message diagnostics is available.* | • AGCO MT tracked vehicles<br>• Fendt 700/800 (entirely proprietary)<br>• Case IH and New Holland tractors and combines<br>• Austoft 8800 sugarcane harvester |

# ISO message types

The types of CAN messages that can be sent and received are:

- Guidance status message
- Guidance command message

## Guidance status message

The guidance status message is sent from the machine to the NavController to provide status on the following items.

| CAN Message | Explanation |
|---|---|
| Curvature (steering angle) | Units of X km-1 (positive figure is turning right) |
| Steering input status | 00: Not the correction position<br>01: Correct position<br>10: Error<br>11: Status not available |
| Reset required | 00: Reset not required<br>01: Reset required<br>10: Error<br>11: Status not available |
| Steering system readiness | 00: System is not ready<br>01: System is ready<br>10: Error<br>11: Status not available |
| Valve lockout/roading switch | 00: Not active<br>01: Active<br>10: Error<br>11: Status not available |

## Guidance command message

The NavController sends the guidance command message to the machine, providing the desired curvature:

- 00: Not intended to steer
- 01: Intended to steer
- 10: Reserved
- 11: Information not available

## Messages occur at 10 Hz

If no messages are sent for a set period of time, the NavController, the machine or both throw a fault (for example, 118s, 177s and so on). These faults are indicators that the NavController is not receiving the guidance status messages.

## Troubleshooting lack of messages

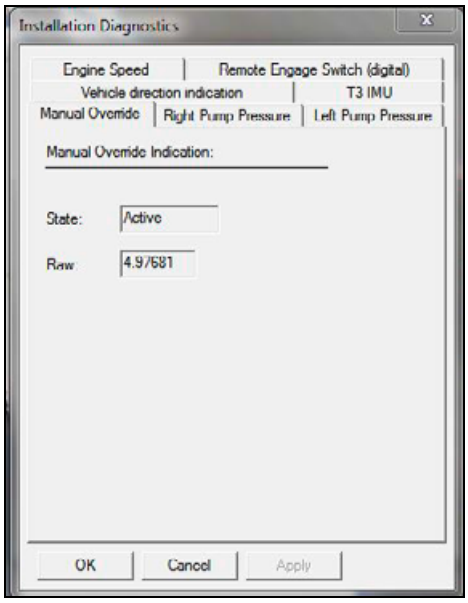
When no messages are sent, the most common cause is electrical problems of the CAN bus, such as:

- Faulty wiring.
- Termination issues.

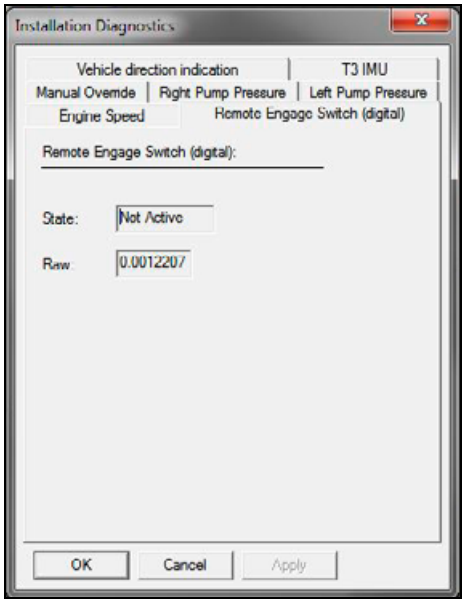
- Disconnected cables.
- Improperly configured vehicle ECUs.
- Vehicle is not guidance ready.

For some proprietary communication protocols, system errors can be transmitted and cause faults.

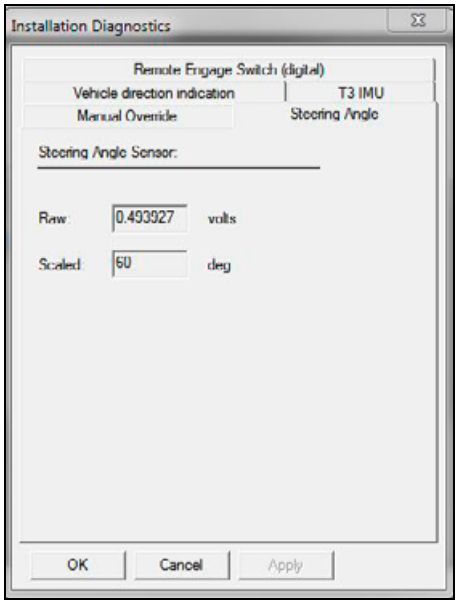
# Manual Override diagnostics



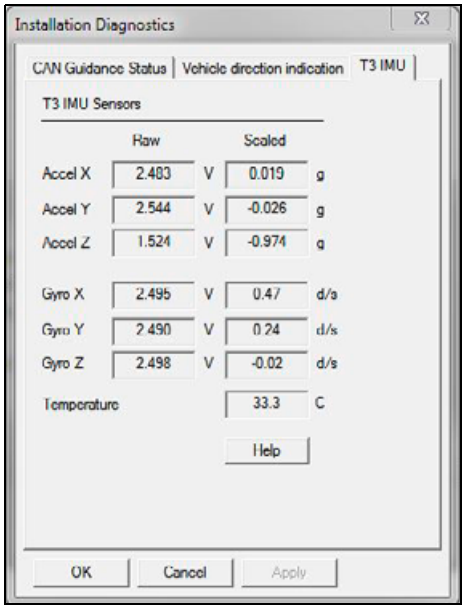
# Remote Engage diagnostics




# Steering Angle diagnostics



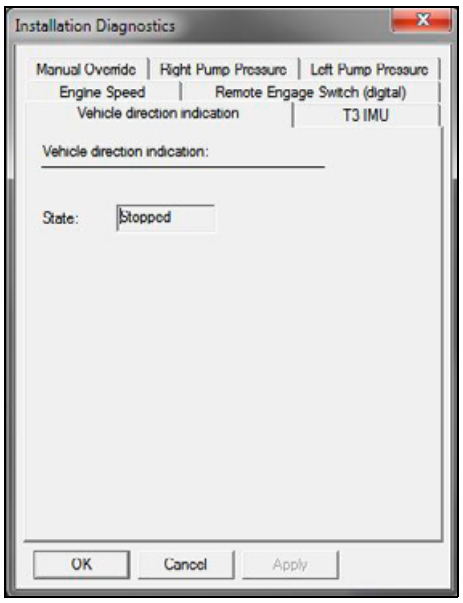
# T3 IMU diagnostics




The T3 IMU sensors diagnostics show the raw and scaled readings from the gyro meters, accelerometers and temperature in the NavController. If the controller's orientation is set correctly and the vehicle is stationary on level ground:

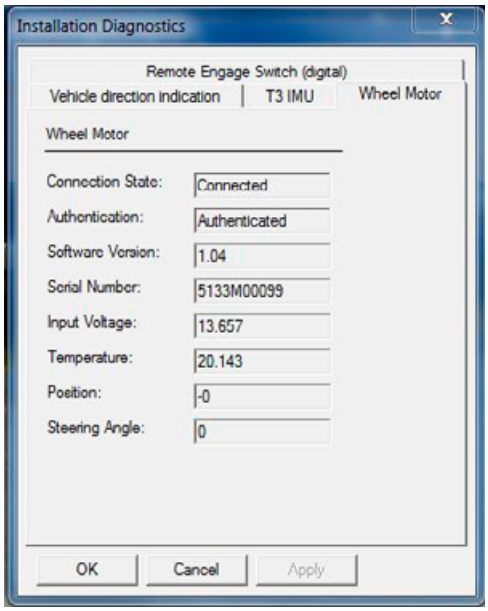
- Both scaled X and Y accelerometers should read between -.2 g and +.2 g.
- The scaled Z accelerometer should read between -0.8 g and -1.2 g.
- All three scaled gyros should read between -3.0 and +3.0 d/s.

# Vehicle Direction diagnostics




The vehicle direction diagnostics indicates the forward, reverse, or stopped direction.

# Wheel Motor diagnostics




| Field | Description |
|---|---|
| Connection State | Indicates if the SAM-200 motor and the NavController have established CAN communications. |
| Authentication | The state of the authentication between the NavController and the SAM-200 |
| Software Version | Version of SAM-200 firmware on the motor |
| Serial Number | The Serial Number of the SAM-200 unit. |
| Input Voltage | The input voltage the SAM-200 unit is reporting that it is being supplied with. |
| Temperature | Current temperature of the SAM-200 unit |
| Position | The offset of the SAM-200 unit in rotations from the position it was located at when communication with the NavController was first established.<br>Positive values denote the number of full turns in the clockwise direction while negative numbers denote counterclockwise rotation |
| Steering Angle | Appears when the system is moving and functioning as the estimate of the steering angle of the machine. |

# Chapter 6

# SYSTEM FAULTS

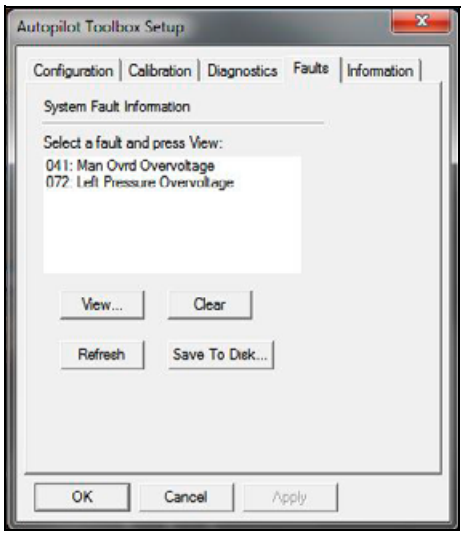

- Faults tab
- View faults
- Refresh faults
- Clear a fault
- Save faults to disk


Autopilot system faults occur:

- When part of the system is malfunctioning or communication with a required interface for operation is not available, causing unsafe or nonfunctional conditions.
- For various reasons and vary based on installation type. Some faults have more detailed information that can be used to help support personal determine the cause of the fault and provide help dealing with it.

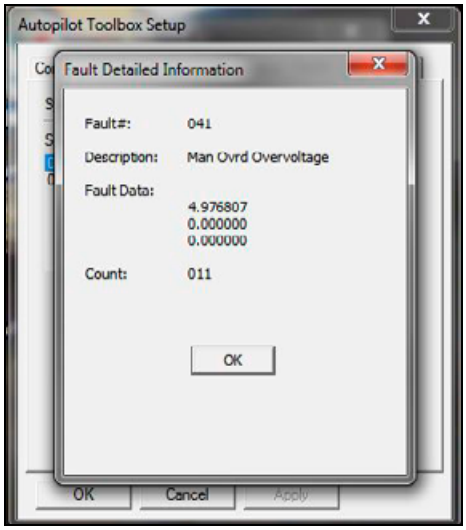
# Faults tab

The *Faults* tab lists the current system faults.




# View faults

To view the details of a specific system fault, select the fault from the list and then select **View**. This action shows specific data including the fault data values. These values can be essential for determining the cause of the fault. When reporting a fault, make sure to note these data values.




# Refresh faults

If it is believed that the cause of a fault has been resolved, select **Refresh** to re-evaluate the input causing the fault. The system will indicate if the fault is still active.

# Clear a fault

To clear a specific fault, select the fault and then select **Clear**.

# Save faults to disk

To store the entire fault list and the detailed information of each entry to a file, select **Save To Disk**. Select the file location for the desired save location and select **Save**. This records the fault details to a file in the selected location that can be reviewed or sent to support.

**Note –** *For information on the faults with troubleshooting steps, refer to the Autopilot System Troubleshooting Guide.*

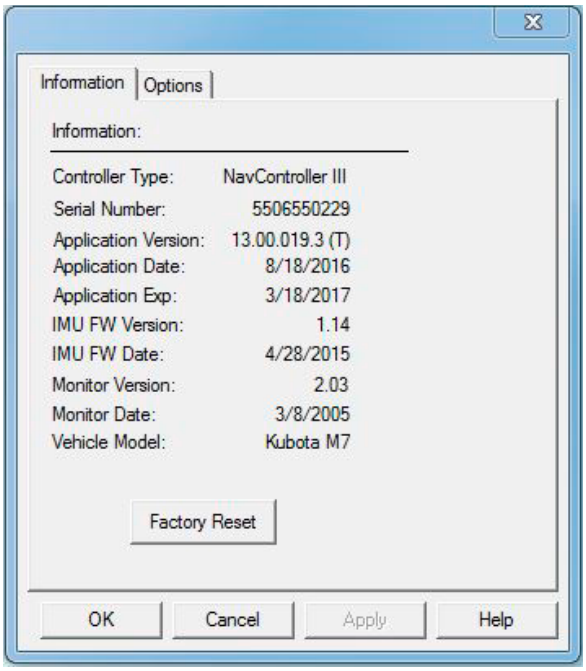
# Chapter 7

# VIEW INFORMATION

▶ View information

View information provides a summary of the Autopilot installation to which the computer is attached.

# View information




At the *Information* tab, you can view the following about the Autopilot controller:

- Controller type
- Serial number
- Application (firmware) version
- Application (firmware) date
- Application (firmware) expiration date
- Monitor version
- Monitor date
- Vehicle model: Selected vehicle model
- Options installed

You can access this information from the main screen by either:

- Clicking the wrench icon and then selecting the Information tab.
- Going to the Tools menu and selecting Information.

# Chapter 8

# SAVE / RESTORE FILES


- Saving the Autopilot config file
- Restoring the Autopilot config file
- Loading an external VDB file
- Downloading Autopilot external vehicle profiles from Trimble


You can save customized vehicle files, and restore and download files vehicle database files.

# Saving the Autopilot config file

**Note –** *Note - Trimble recommends that you use this screen to make an external backup every time that you change the system setup.*

This file can be used to later restore the system set up on the vehicle if the memory ever becomes corrupted or if a different controller is used on the vehicle.

To save an Autopilot configuration file:

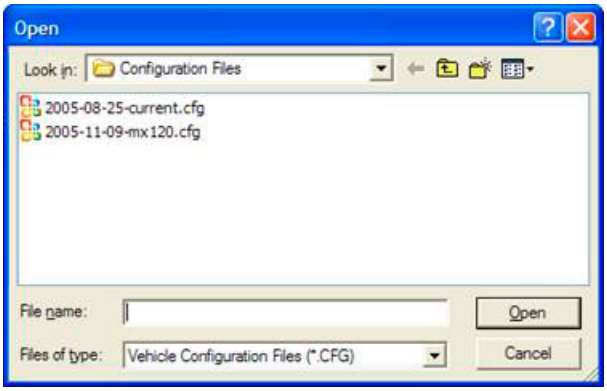
1. At the main screen, click  . The *Save / Restore Setup* screen appears.
2. Select  and then click **OK**.
3. Enter a path and filename for the file.
4. If you have selected the correct file, click **OK**.

The system creates a configuration file from the current Autopilot system settings and stores them on the device you have connected (pocket computer or laptop).

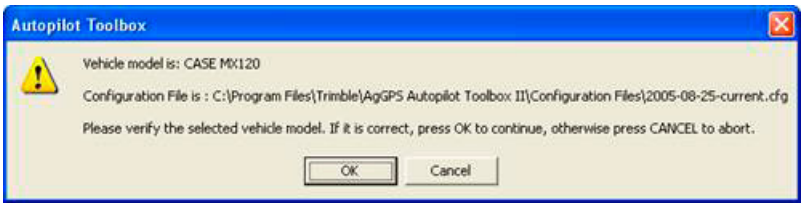
# Restoring the Autopilot config file

To restore an Autopilot configuration file that has been saved:

1. At the main screen, click  . The *Save / Restore Setup* screen appears.
2. Select  and then click **OK**. The *Open* screen appears.

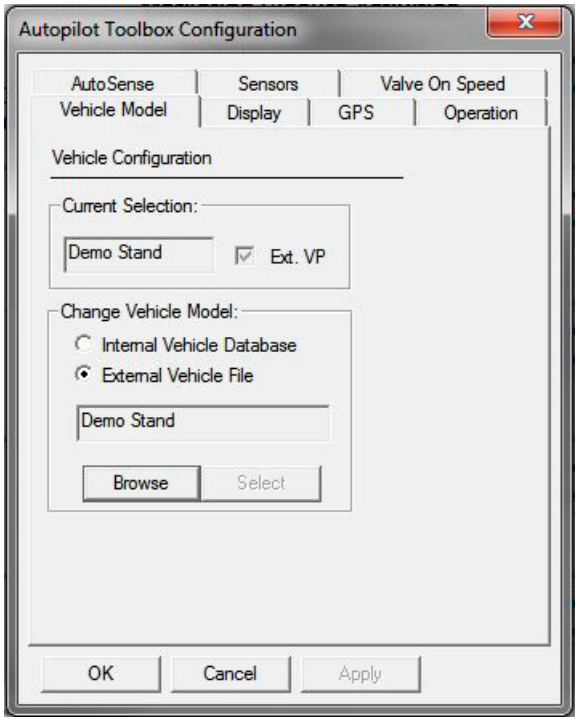



3. Find the configuration file you want to restore and click **Open**. A confirmation screen appears.




4. If you have selected the correct file, click **OK**.

# Loading an external VDB file




To load an external vehicle profile (.vdb) file:

1. Select the *External Vehicle File* radio button and then click **Browse**,
2. Select the file and then click **Open**.

To load a custom vehicle profile (.vdb) file:

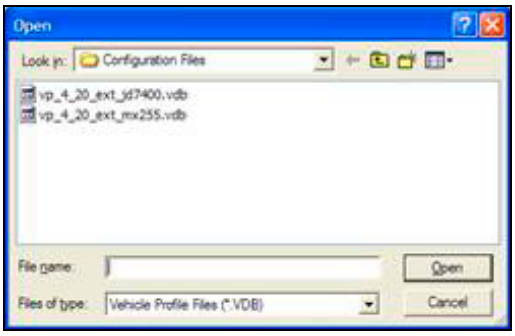
1. Download the latest VDB files from Trimble Agriculture Partners (http://agpartners.trimble.com).
2. Navigate t:o *Ag Partners / Products A-Z / Autopilot / Technical Support / Autopilot System Software Downloads / Nav Controller II Software Downloads*.
3. Save the vX.x Autopilot External Vehicles Profiles.zip file to your computer.

**Note –** *If Autopilot Toolbox II software is installed on the computer you are sending the .zip file to, Trimble recommends you save the file to C:\Program Files\Trimble\Autopilot II\Vehicle Database Files.*

4. Double click the vX.x Autopilot External Vehicles Profiles.zip file to launch the WinZip program.
5. Click the **Unzip** icon to unzip the file. The WinZip window displays.

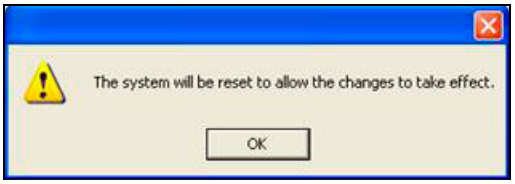

6. Click **Unzip** to download the file to a folder—follow the system prompts.

7. Once you have done this, from the Autopilot Toolbox software, in the Autopilot Toolbox Setup screen's *Vehicle Model* tab, select the *External Vehicle File* option and then click **Browse**.
8. In the *Open* screen, navigate to the directory that contains the .vdb custom vehicle profile file.




9. Select the required profile and then click **Open**.
10. Click **Select**. A confirmation message appears.


11. Click **Yes** to continue. A message displays to alert you that the system will reset.




12. Click **OK**. The profile loads and the vehicle name displays in the *Current Vehicle Model* field.

# Downloading Autopilot external vehicle profiles from Trimble

To download external vehicle profiles:

1. Navigate to Ag Partners / Products A-Z / Autopilot / Technical Support / Autopilot System Software Downloads / Nav Controller II Software Downloads.
2. Save the vX.x Autopilot External Vehicles Profiles.zip file to a location on the computer.

**Note –** *If Autopilot Toolbox II software is installed on the computer you are sending the .zip file to, Trimble recommends you save the file to C:\Program Files\Trimble\Autopilot II\Vehicle Database Files.*

3. Double click the vX.x Autopilot External Vehicles Profiles.zip file to launch the WinZip program.

4. Click the **1-Click Unzip** icon to unzip the file . The WinZip window appears.


5. Click the **Unzip** icon and then follow the system prompts to unzip the file to a folder on the computer.
6. Navigate to the folder you want the unzipped file to be saved to and click **Unzip**.

# Chapter 9

# DATALOGGING


- Overview
- Access
- Load the DLC files
- Select the location for file output
- Start logging
- Stop logging
- Close
- Send log files


For some faults or performance issues, it may be required to log internal data. This enables technical support to analyze and make proper changes to the vehicle configuration.

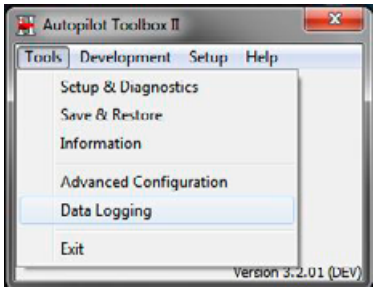
# Overview

To log data, you must do the following:

1. Access the data logging function.
2. Load the DLC files.
3. Select the location for file output.
4. Begin logging.
5. Stop logging.
6. Exit the logging controls.
7. Send the files to support.

# Access

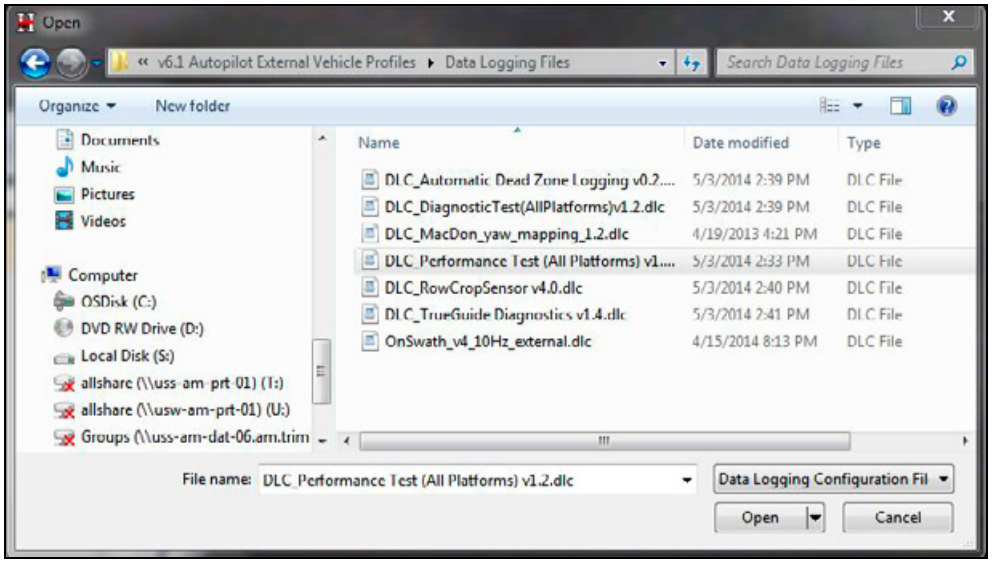
Select *Tools / Data logging*.




# Load the DLC files

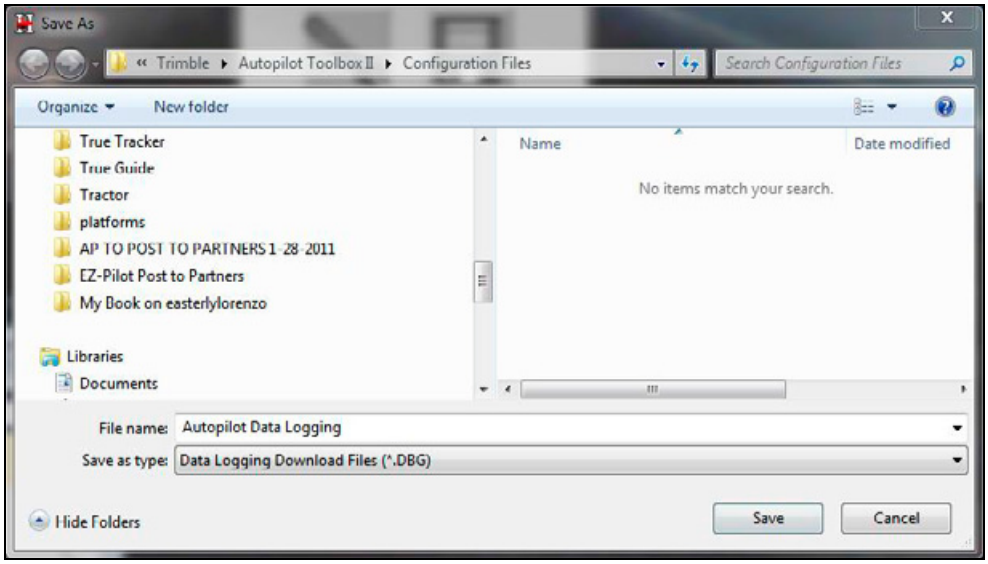
Each release of external vehicle profiles contains a base set of DLC (data logging configuration) files.

DLC files are used to determine what parameters will be recorded. When you are instructed to perform data logging, load the specified DLC file by finding where it is stored on the computer used for logging and select it.



# Select the location for file output

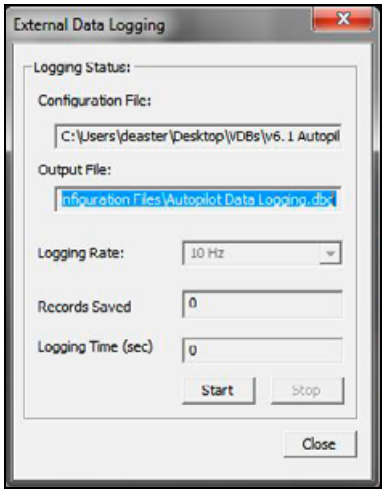
Autopilot Toolbox II version 4.01 uses external storage on the laptop to record the data. You must indicate the location of this file before data logging can begin.




1. Create a folder and name it appropriately for the logging being done.
2. Give the data file (.dbg) a descriptive name of what the log is a recording of.
3. Click **Save**.

# Start logging

After you have determined the destination for the output file, the logging control panel displays. To start logging, click **Start**. After logging begins, the records and time counter will start to accumulate. Log the requested sequence or event.



# Stop logging

When the event or sequence is done, click **Stop**.

# Close

Click **Close** to exit the logging controls.

# Send log files

1. Place the files into a file folder with the appropriate name.

**Note –** *Make sure to include both .dbg" and .dbg.cfg files.*

2. Zip the files.
3. Email the zipped files to Trimble Support or other specified recipient.