T3RRA Cutta™

T3RRA Ditch™

T3RRA Plane™

T3RRA Apply™

T3RRA Levee™

T3RRA Survey™

Operators Manual

T3RRA v2 Manual

Notice of Rights

Trademark Notice

Notice of Liability

The information in this document is distributed on an 'as is' basis, without warranty. While every precaution has been taken in the preparation of this course, neither the authors nor T3RRA shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the instructions contained in this book or by the computer software and hardware products described in it.

Disclaimer

We make a sincere effort to ensure the accuracy of the material described herein; however, T3RRA makes no warranty, expressed or implied, with respect to the quality, correctness, reliability, accuracy, or freedom from error of this document or the products it describes. Data used in examples and sample data files are intended to be fictional. Any resemblance to real persons or companies is entirely coincidental.

All information in this manual was correct at the time of writing. T3RRA reserves the right to make corrections to the courseware at any time and without notification.

Manual version changes

version	Release date	T3RRA version	Changes
1.0	2 August 2019	Pre 2.71	Initial release of T3RRA Manual
1.1	26 August 2019	2.71	Added information on survey guidelines, inline offset and drain Multi fit
1.2	17 October 2019	2.88	Added information on Boundaries and made corrections
1.3	20 January 2020	2.101	Added new functions and corrections ● Lock backslope ● Screenshot ● Image overlay ● Changes to auto drains
1.4	1 March 2020	2.109	Added information on implement profiles
1.5	26 June 2020	2.120	Added links to video tutorials. Added new functions ● Collection beep setting
1.6	5 November 2020	2.146	Updated functions: ● Battery level ● Improved design surfaces ● Improved drain design ● Settings page improvements and additions
1.7	2 June 2021	2.181	Updated screenshots and various sections to match the current UI. Added/improved: ● Added extra cross-slope algorithms ● Importing reference images (KMLs) ● Levees ● Exporting curves
1.8	20 July 2021	2.184	Updated vertical blade shift Added how often we drop survey points
1.9	16 August 2021	2.190	Added custom currency
	31 August 2021 23 Sept 2021		TSG Entry added for SF3000 GPS zero crossover bug Added image of grid heights shown on report pdf.
	21 December 2021	2.200	Added T3RRA Levee

			Added T3RRA Desktop
1.10	27 April 2023	2.242	Updated information for new import/export UI Updated documentation to match the new Zeroing page. Removed details on the implement profile
1.11	28 August 2023	2.258	Added details on surveying with various sensors.

Table of Contents

Introduction

Hi! Welcome to our manual. We're kind of excited to have a manual, because for the longest time we haven't. There have been ~~excuses~~ reasons for this.

- We'd rather put effort into writing software than books.
- We update functionality so quickly that a manual is almost always out of date
- Our service and support network has always been really good at educating users
- Our software is kind of simple and intuitive anyway

Maybe there is some merit in the above. Maybe there isn't. In any case, our latest iteration of software has significantly raised the bar vis-a-vis functionality and capability. That's brilliant, but it also means that the complexity has also increased significantly. Regretfully, we've realized that there is no way around just sucking it up and getting a bit serious about documentation.

So there you go.

And here it is.

Enjoy!

Stu Pocknee

Special Counsel to The Royal Commission Into Making Our Software More Awesome[1]

PS. If you find any errors or omissions in this manual please blame Gwen, Travis, David, Sunkyu, Johnathan, or Nathan. It's hard to get good help these days.

[1] This commission is possibly not officially sanctioned by any particular Royalness and may, or may not bear resemblance to any commision living or deceased.

Disclaimer

Important: Please read this before using any of our software products.

We at T3RRA are software developers. We are not irrigation engineers or designers.

We build tools. We do **NOT** create designs for customers, or provide advice on any aspect of agronomy, irrigation, drainage, landforming, or earthworks design. **We cannot (and do not) warrant or guarantee the appropriateness of any design created with our software *for any purpose*.**

It is your responsibility to evaluate the fitness and correctness of the designs created in our software for your purposes. This includes meeting all local rules, regulations, requirements, and laws.

Do NOT blindly follow the output of this software. Monitor work progress and evaluate the correctness of implementation continuously. Independently verify that the evolving job is meeting your exact requirements. Any perceived deviation, real or imagined, must be taken seriously and work must cease until you are satisfied that results are within your tolerable margins of error. Seek professional advice from qualified and certified engineering personnel if you have *any* doubts about the correctness or suitability of your design.

Use of our software constitutes an implicit and explicit agreement that we and our partners (dealers, distributors, representatives, business associates etc) will not be held responsible for any damages resulting from the use of our software.

Our software

Both Mark Twain and Will Rogers shared a wise sentiment: “Buy land, they’re not making it anymore”. We can’t help you buy land, and we definitely can’t help you make more of it. What we can do is help you make your current land *better.*

This manual describes the operation of the software solutions we offer specifically for in-cab design and implementation of landforms to improve field terrain. There are many reasons to change the surface contours of a field. Most relate to facilitating efficient irrigation, or improving drainage. Further benefits relating to trafficability and enhanced management opportunities nearly always accrue.

In order to address diverse market requirements we offer several different software packages. Our most fully featured product is **T3RRA Cutta**. This application includes all the functionality we offer for full field landforming, ditch creation, and levee delineation. **T3RRA Ditch** offers all the ditch and levee creation capabilities of **T3RRA Cutta** but is not appropriate for users who intend to do full field earthworks. **T3RRA Plane** is for Best-fit full field design projects. **T3RRA Apply** is used to survey and apply dirt moving projects without the design step. **T3RRA Levee** is for operators who only want to survey and get levee/contour lines. **T3RRA Survey** is used solely for gathering elevation data.

Note that we also offer a related desktop design product - **T3RRA Design**. This product is a more traditional “keyboard and mouse” application for use in an office environment. The advanced nature of **T3RRA Design** requires a wholly separate manual and users should refer to it for more information.

It’s important to understand that **T3RRA Cutta**, **T3RRA Ditch**, **T3RRA Plane, T3RRA Apply, T3RRA Levee** and **T3RRA Survey** are all built using the same basic building blocks. They share many of the same user interface screens and functionalities. In this manual we will use the generic term “**T3RRA software**” when the topic or concept we are referring to is common to all five applications. When the information is specific to one or two of the applications this will be noted and the software will be referred to by its actual name. Cutta Desktop Ditch Plane Levee Survey

CUTTA

The John Deere connection

We often hear ourselves being referred to as the "John Deere leveling software" people. In actuality we are a completely independent company. Many years ago we formed a strategic alliance with John Deere in order to fill a niche that we jointly recognized was best served by a small, innovative, agile software developer with a focus on the unique requirements of earth moving and terrain design.

T3RRA Cutta, Ditch, Plane, and Apply both act as extensions of the John Deere iGrade™ technology platform. As such, in order to run these software packages it is a requirement to first have John Deere StarFire RTK receivers, a John Deere display capable of running iGrade™, an Application Controller, and an iGrade™ activation. By extending a customer's existing technology stack we allow that customer to leverage their existing investment, without having to re-buy and re-learn new technology. Cutta Ditch

T3RRA Levee and T3RRA Survey have no control function and are not limited to systems running iGrade™.

If you're judged by the quality of the company you keep, we're happy to be associated with both John Deere corporate, and the wider network of John Deere dealerships who sell, service, and support our product. Without them we would not be in business, and our customers would not experience the benefits our products can bring to their operation. We wholeheartedly recommend this network of agricultural machinery and technology professionals to you, and we hope they will, in turn, recommend us to you!

T3RRA Cutta

T3RRA Cutta is designed to enhance the capability and efficiency of John Deere's iGrade™. T3RRA Cutta enables the user to collect and process terrain (elevation) data, then design appropriate landforming solutions. The program creates output maps and connects to John Deere iGrade™ for machine control, streamlining and modernizing agricultural land forming operations.

T3RRA Cutta v1 was created in 2011. It has been used on 5 different continents and has undergone countless upgrades and improvements. We've had the pleasure of hearing from many, many operators in the ensuing time period. Almost all of the features and improvements in T3RRA Cutta have been prompted by user requests.

T3RRA Cutta v2 came about after collecting ideas and input over about a 2 year period. We know our users love power. Power to do more in-cab, power to design smarter, power to move dirt more efficiently, power to make what they visualize in their mind's eye a reality in the real world. It's easy to make software simple if you are prepared to limit what it does. It's easy to make software powerful if you don't mind requiring extensive training and a PhD to run it. The trick is to combine power with simplicity.

T3RRA Cutta 2 has been developed to improve the efficiency, accuracy, and compliance of landforming operations by providing operators with access to the "as-built" results of their job. The elevation surface changes from original to design as work progresses, with progress being displayed. In and of itself this is a huge step forward. But there are many, many improvements in version 2. For further accounting please see "Notes for those upgrading from v1 to v2 of T3RRA Cutta" in a few pages.

NOTE: Sections of this manual that refer only to T3RRA Cutta are denoted using the tag Cutta.

T3RRA Cutta Desktop

T3RRA Cutta Desktop is designed to enhance the capability and efficiency of T3RRA Cutta. T3RRA Cutta Desktop enables the user to process terrain (elevation) data and design landforming solutions with the same familiar interface as T3RRA Cutta. The program has more powerful design, import and export capabilities, making it easier to support and streamline modern agricultural land forming operators.

T3RRA Cutta Desktop was created in 2022. Being so similar to T3RRA Cutta, it provides a seamless path for farmers to transition from one-man shops to a team with multiple operators. T3RRA Cutta Desktop is intended to be paired with our in-cab products with surveying and implementation capabilities for maximum efficiency.

NOTE: Sections of this manual that refer only to T3RRA Cutta Desktop are denoted with Desktop.

T3RRA Ditch

Cutting a ditch seems like a fairly simple operation. It's surprising to learn how many different ways there actually are of doing it, and how many factors need to be considered. In T3RRA Ditch we have attempted to create a package that covers as broad a range of scenarios as possible. Consider the two following cases:

1. Customer A directly drives the path of a drain - surveying the elevations along the way. Then he/she designs a profile and a cross section to make the water flow while moving as little dirt as possible. Finally the implement is height controlled to cut exactly to the desired depths along the drain.
2. Customer B surveys the whole field and creates a digital terrain map. He/she performs water flow simulations and finds out where water lies in depressions. An automatic drain path discovery is performed to plot the best ways of draining the depressions. Drain profiles and cross sections are then created. These paths are exported to the tractor guidance system to allow for automatic steering. Finally, the drains are cut with automatic blade control and "as-applied" tracking.

T3RRA Ditch is a power tool for ditching. As well as being able to survey a field directly, you can also bring in elevations from a variety of other data sources.

T3RRA Ditch is not just about creating drains. It is also a fully fledged levee delineator with many simple yet powerful design options.

If you reach a stage where you want to do full field landforming T3RRA Ditch can be upgraded to the full featured T3RRA Cutta package. See your dealer for details.

NOTE: Sections of this manual that refer only to T3RRA Ditch are denoted using the tag Ditch.

T3RRA Plane

NOTE: Sections of this manual that refer only to T3RRA Plane are denoted using the tag Plane.

T3RRA Plane is for Best-fit full field designs & Linear drain designs with automated control operation providing surveying, designing, and on-screen cut/fill maps.

Features

- Full field and drain surveying capabilities
- Automated control
- Edit points in the field
- Drop markers at points of interest
- Create Best-fit full field designs
- Create Linear drain designs
- Separate fields into Regions
- Full field leveling
- Drain project implementation

Benefits

- Works with many data formats and 3rd party systems
- Fully integrated with John Deere iGrade and John Deere collected data
- Easy to use wizard operation
- Continuously updating progress maps
- 2D and 3D data views
- Blade height limits

T3RRA Levee

You don't always want to do full field or ditching designs. Sometimes you just want to recreate the levees before planting the crop. There are good reasons to have multiple versions of T3RRA software in order to streamline your operation.

Farmers build levees to hold water at a consistent depth throughout the field. Our Levee tool will place levees following the field contours, enabling growers to maintain water levels and keep roots submerged. Fields are irrigated using gravity flow. The water enters at the top of the field and moves down through each paddy via spills or levee gates.

Most important to rice is accurate and easy management of water application, depth, and drainage so that crop growth is improved and weeds controlled. Also important is conservation of water by efficient use and minimizing the likelihood of accidental drainage.

We hope to provide solutions for more efficient use of the land and your 'tillage and harvest' equipment by minimizing the number of levees, straightening them, and making them smaller.

Straight levees can have their benefits. T3RRA Levee has a 'Best-fit' design for full fields which creates a plane of best fit for the field. Levee lines are straight when placed on this type of design surface. Use CAUTION when creating full field designs without implementing them before placing levees.

Before T3RRA Levee, we had operators buying additional units of T3RRA software just for levees. That works great but it seems a waste to buy all the earthworks capability if you are not going to use it. It made sense to us to have a package directed solely at surveying full fields and designing levees to fill this niche.

NOTE: Sections of this manual that refer only to T3RRA Levee are denoted using the tag Levee.

T3RRA Survey

You don't always want to tie up your earthmoving equipment doing surveys. Sometimes you want to get ahead of the game by doing the next survey while you have an operator moving dirt on the last survey. There are good reasons to have multiple versions of T3RRA software in order to streamline your operation. Before T3RRA Survey, we had operators buying additional units of T3RRA software just so that they could survey separately. That works great but it seems a waste to buy all the earthworks capability if you are not going to use it. It made sense to us to have a lower cost package directed solely at surveying to fill this niche.

T3RRA Survey is a stand-alone package for performing elevation surveys, but it also has the unique ability to read data from other sources, such as DualEM data, Geonics EM data, Depth sounder data. It dovetails nicely with our other products using the same familiar interface and workflow. Surveys can be opened directly in other T3RRA software products because it uses the same file format.

- Precise self-survey capability
- Full field survey
- Ditch line survey
- Marker dropping
- Full field and ditch survey editing tools
- Surface interpolation
- Generic survey import and export

T3RRA Survey can be used to survey existing field elevations (RTK GPS recommended but not required), or to import surveys from other operations and then add to them. Like all other T3RRA software packages, T3RRA Survey can receive GPS messages from either John Deere iGrade™ or any GPS receiver that outputs NMEA messages.

T3RRA Survey does not create designs or perform machine control.

NOTE: Sections of this manual that refer only to T3RRA Survey are denoted using the tag Survey.

T3RRA Apply

T3RRA Apply allows surveying and implementation of landforming operations. Create the project designs in the office and transfer them to T3RRA Apply for application only. There are good reasons to have multiple versions of T3RRA software in order to streamline your operation.

T3RRA Survey is a stand-alone package for implementing designs created in other packages. It dovetails nicely with our other products using the same familiar interface and workflow.

- Full field and drain surveying capabilities
- Edit points in the field
- Drop markers at points of interest
- Full field leveling
- Drain project implementation

T3RRA Apply can be used to survey existing field elevations (RTK GPS recommended but not required), or to import surveys from other operations and then add to them. Like all other T3RRA software packages, T3RRA Apply can receive GPS messages from either John Deere iGrade™ or any GPS receiver that outputs NMEA messages.

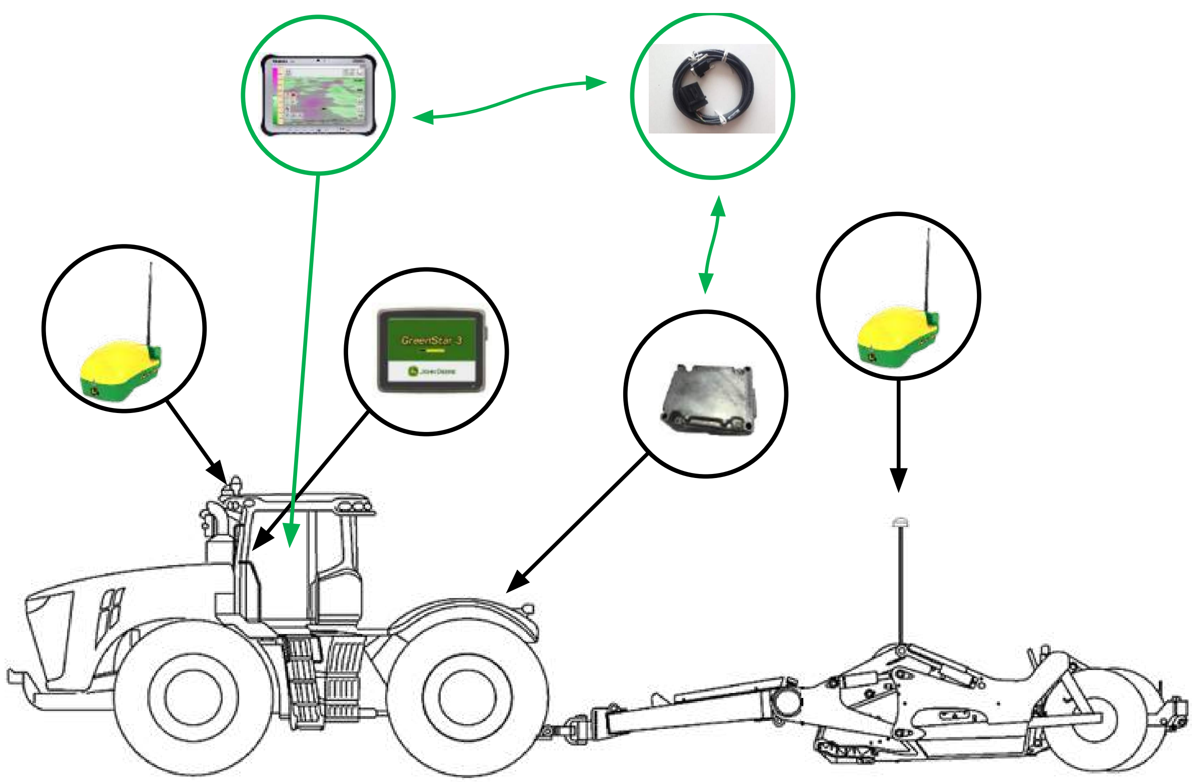
NOTE: Sections of this manual that refer only to T3RRA Apply are denoted using the tag Apply.

How we work with iGrade™

Cutta Ditch

Important: John Deere iGrade™ has a comprehensive manual. We do not try to replicate it here. We strongly recommend reading the iGrade™ manual prior to reading this one. This chapter only seeks to inform you of how we interact with iGrade™ If you have any questions regarding the operation of iGrade™ please refer to the iGrade™ Manual.

T3RRA software operates in conjunction with John Deere's iGrade™ system. Because T3RRA relies on iGrade™ performing accurately it is important that iGrade™ is installed and configured correctly. If iGrade™ is not working properly, then neither will T3RRA software.



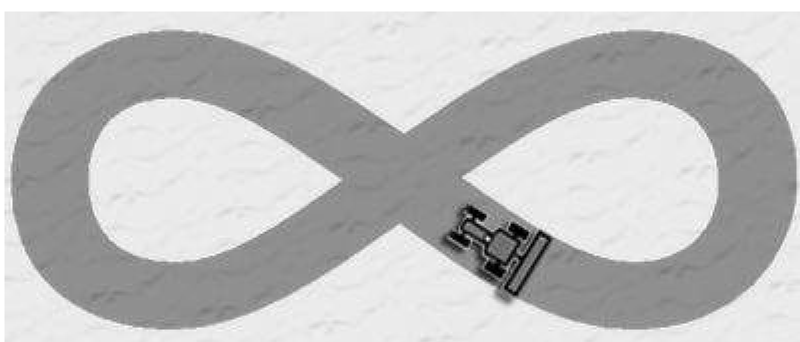
Important Concept!

It might seem obvious, but it is important to note that iGrade™ will work without T3RRA software. Before setting up T3RRA, best practice is to first test iGrade^{tm} in isolation. Only once you have confirmed that iGrade™ is working properly should you start to troubleshoot the T3RRA software.

For all information on how to correctly make adjustments to iGrade™ please refer to your iGrade™ user manual or contact your local John Deere representative.

T3RRA software “talks” to iGrade™ over the “iGrade™ Remote Control Harness”. For iGrade™ and T3RRA software to communicate, the serial port settings of each must match. If an iGrade™ UCC1 unit is being used we recommend setting the baud rate to 38400 and NMEA - GGA & GSA and a rate of 5Hz. If an iGrade™ UCC2 unit is being used we recommend setting the baud rate to 115200 with NMEA set to ALL at a rate of 5Hz.

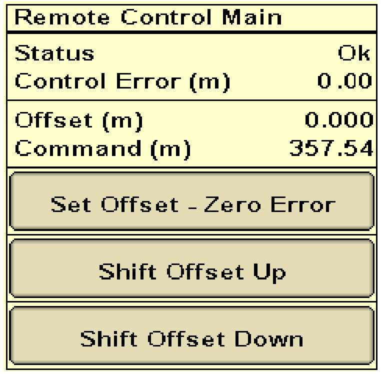
Important: Ensure that the hydraulic threshold setup, and TCM calibrations on iGrade™ have been completed correctly. If not done this will directly impact the performance of the system and the implementation of your field designs. Make sure to carefully follow the instructions in the iGrade™ user's manual. Perform the figure 8 calibration to make sure that everything is running smoothly. If in doubt, consult your dealer.



iGrade™ controls implement activity using hydraulic plugins SCV1 and SCV3. In order to allow T3RRA software to take control it is important to tell iGrade™ to accept remote commands for SCV1 and SCV3. To control an implement with a single control surface (such as a scraper with only up/down control) ensure that iGrade™ has SCV1 control type set to

'**Remote Control**'. If using dual scrapers make sure to set both SCV1 and SCV3 control type to '**Remote Control**'. If you are using a single scraper with cross-slope capability then set SCV1 control type to '**Remote Control**' and SCV3 control type to '**Cross Slope Control**'. Additionally, in Cross Slope Setup make sure that the setpoint source is set to '**Remote Control**'.
To make sure that the SCVs will receive the commands correctly also ensure that their switches in the cab are set to 'Detent'.

NOTE: iGrade™ will "time out" approximately 5 seconds after the tractor stops receiving remote commands. It will then display 'No Remote Commands'. If this happens it will need to be re-engaged. T3RRA software attempts to keep the connection alive by continuously sending data and you should not normally see the time out message.



NOTE: T3RRA software is not limited to receiving GPS messages solely from iGrade™. Although only T3RRA Cutta and T3RRA Ditch send control messages to iGrade™, all T3RRA software (including T3RRA Plane, Levee and Survey) can connect to both iGrade™ and any other GPS to receive GPS messages.

NOTE: Before implementing make sure to use Zero Error to set Zero to current blade height in iGrade™. You should zero iGrade™ Offsets whenever you set Zero in your T3RRA™ software.

Notes for those upgrading from v1 to v2 of T3RRA Cutta

Cutta

Users moving from v1 to v2 should find the experience fairly painless. The popular wizard based workflow remains the same, as do most of the visual elements, albeit with updated iconography.

While there are more design capabilities present, the basic usage remains the same. Perhaps the greatest conceptual change is the new ability to mix and match design types within separate regions of a field, and to perform designs on top of existing designs. This will take some adjusting to. The best advice when beginning is to take careful note of the surface you are applying any design to: *elevation* or *design*.

Another large adjustment is the addition of the '**As-applied**' functionality. Please carefully read the Understanding "As-applied" section in this manual. If not understood fully this capability could confuse and frustrate. Remember that you can always turn off this capability to return to the traditional mode of use.

We recommend that all users moving from v1 to v2 download and peruse the *T3C v1 to v2 Migration Document* before first use of the new system.

Backwards compatibility

We have worked to ensure that v2 is as compatible as possible with v1. This is not 100% possible as v2 has layers that are not present in v1 and hence cannot be loaded by v1. However, in the main, files created in v1 will be able to be opened in v2 and vice versa. This should ensure that machines running v1 will be able to work alongside machines running v2 in the same field using the same control file.

Installing T3RRA Software

- Make sure you have a good internet connection and your computer has the latest Windows updates installed.
- T3RRA software is normally installed by your dealer[2].

Windows & OS maintenance

Requirements:
Windows 10 or 11 (64 bit)

Recommended:
Intel i5 or better processor (manufactured 2021 or newer)
>= 8GB RAM (more RAM facilitates larger fields)
>= 256GB HDD
Integrated or better graphics card
Serial port (preferred) or USB port

Windows updates should be performed whenever an error is encountered or a new version of T3RRA software is downloaded. We suggest doing updates and testing software prior to the earthmoving season each year.

Optimizing a tablet for in-cab use (can do during installation utilizing last tab on installer):

- Adjust Power & Sleep to 'Never' so the tablet will not automatically sleep.
- Turn off ‘Connect automatically’ when in range for saved networks.
- Adjust ‘Display Brightness’ level to the highest setting.
- Turn on ‘Automatically Hide Taskbar’ in tablet and desktop mode.

REMEMBER to update T3RRA software after installation. Best practice is to regularly connect your tablet to the internet at home or in the office to provide adequate time for software updates to occur and successfully install. T3RRA software is updated manually by opening the '**Settings**' window, choosing the '**Applications**' tab, and then clicking on '**Download Updates**'.

[2] Refer to Dealer T3RRA Install Manual

If you are using antivirus software, help T3RRA Cutta run without interference by adding an exclusion for the T3RRA Cutta folder for your username. For more information, see T3RRA software will not install in Troubleshooting.

Updating T3RRA Software

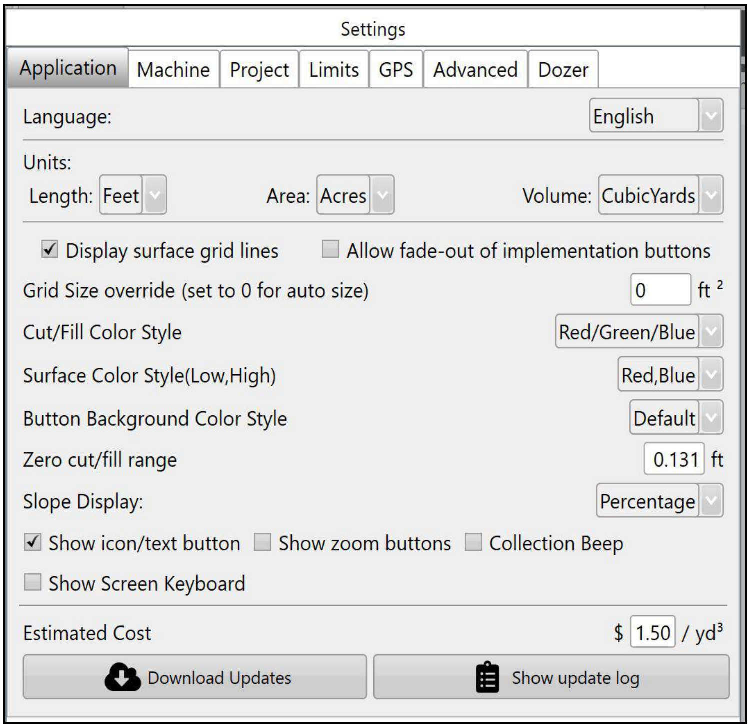
The software developers at T3RRA have many faults. One of them is that we love tinkering with our software in an effort to make it better. In order to allow our users to benefit from our latest efforts we've built-in a system to allow users to update the software whenever a new fix or feature is available.

How do you know an update is available?

The software will check on startup to see if an updated version is available. This only happens if the tablet on which it is running has an active internet connection. If so, one of two messages will be displayed briefly in the bottom left corner of the main window. One will note that the software is up to date and no update is available. However if an update is available the message will indicate the version number of this update.

How do you update?

Navigate to the '**Settings**' window and tap the '**Download updates**' button on the '**Application**' tab. If you are online and an update exists, downloading of the update will begin immediately.



A window will appear showing the progress of the download. When complete you will be prompted to close the software and re-open it. At this time the upgrade process will be complete. A strong internet connection is recommended for updating.

When should you update?

Don't fix what isn't broken! If the software is doing everything you want then don't tempt fate by changing anything. In particular don't update the software while in the middle of an operation. Only update if there is a clear problem apparent, or if you have been advised to do so by your dealer.

What should you do if updating causes more problems than it fixes?

There is a provision to revert updates if needed. This is not a process that should normally be necessary, or that is recommended to be performed by customers. Please contact T3RRA or your dealer for information about this.

Hardware

12V Vehicle charger **Windows tablet with serial interface**

Ram Mount

AE3166: Harness to connect T3RRA software to iGrade™.
AE3070: Optional harness used to T into StarFire receiver harness to connect GPS to T3RRA software for field survey (iGrade™ not required).

The part numbers associated with these harnesses are from AgExpress in North America.

Choosing a tablet to run T3RRA software in-cab

Our in-cab software will run on any 64bit Windows 10 PC. It will run on a desktop, a laptop, or a tablet. It will work with a regular mouse and keyboard, but it is designed to be used with a touch screen.

In most instances we would expect the software to be loaded onto a tablet. The screen is expected to be oriented in landscape format (wider than taller). Any screen size will work but in most cases we expect users to prefer 10inch (or greater) screen sizes.

There is a wide range of Windows 10 tablets on the market. These vary in computational performance, ruggedness, and price. The best choice for a given user will depend on the specific needs of that user.
In general, we divide tablets as follows:

Category	Consumer	Ruggedized
Example	• Microsoft Surface Pro	• Panasonic FZ-G1 or RuggON
Performance	• High (if correctly specified)	• High
Pros	• Relatively inexpensive • Easy to acquire • Quickly replaced	• Very reliable • Long warranty • Designed for vehicle use • Can be sourced with dedicated serial port
Cons	• Require careful handling • Short warranty • Not designed for outdoor use or high vibration • Unlikely to have dedicated serial connection	• Relatively expensive • Available from limited sources
Suitability	• Owner-operators with pedantic care & maintenance tendencies	• Contractors • Hired operators • Time critical operations

At T3RRA we only sell and supply high-end ruggedized tablets (like the Panasonic FZ-G1 or RuggON). In our opinion raising the price of a consumer grade tablet to the level that would adequately cover the increased support and warranty claims that are likely when these tablets are used in a field scenario negates the benefits of selling them.

Just because we do not sell consumer tablets does not mean we will not support our software if it is run on them. As long as the tablet meets our minimum feature specification and is not damaged or poorly maintained we expect our software to work normally on it.

In many cases we have had users running consumer grade tablets like the Microsoft Surface Pro for years on end without issue. However, the nature of consumer tablets is that they are not designed to operate in dusty environments which are potentially high vibration, have large temperature extremes, and are subject to rough handling. They are not weatherproof and don't have screens designed for outdoor viewing.

We expect all users to carefully consider the impact of a hardware failure, and the time lost due to waiting on a replacement, on their operation. If the potential losses from tablet failure are high they should not consider the consumer grade tablet option, or at the very least should have a backup option that can be quickly implemented.

The modern tablet PC is a highly capable machine with the ability to run many different software applications and to be used in many different roles. We ask customers to consider the impact of using their in-cab PC for other activities. There are software programs and usage activities that can use up disk and processor resources. This may result in sluggish performance when running T3RRA software in the field, and should be avoided.

NOTE: Maintaining your tablet PC is extremely important. Take your tablet PC to your home/office at regular intervals to perform both Windows updates and T3RRA updates.

Consider the system as a whole

Modern dirt moving is a complicated operation. It involves a mix of mechanical, hydraulic, electronic, and software technologies. To perform with the high accuracy most users expect it is *critical* that *all* the involved technologies are performing at maximum potential. Your T3RRA software application is an important part of your landforming system. But, it is one of the smaller and least expensive parts of the operation. The performance of T3RRA software is *heavily* reliant on all other parts of the system being properly maintained and tuned.

Before putting T3RRA software into action ensure that:

- Your tractor is in good condition with all mechanical, hydraulic, and electronic systems in proper working order.
- Your implement is in good condition with all mechanical and hydraulic systems in proper working order.
- Your RTK GPS (including base station) is properly configured for best possible vertical accuracy.
- You have carefully studied your iGrade™ manual.
- Your iGrade™ is properly configured with all appropriate settings, and thresholds calibrated.
- Your tablet PC is current with operating systems updates, is not laden with 3rd party software, and has adequate disk and RAM space available.
- Your T3RRA software is properly updated and configured.

NOTE: Do not disengage your brain when engaging T3RRA software. Failure to continuously observe, monitor, measure, and critically evaluate the performance of the system **WILL** result in suboptimal results.

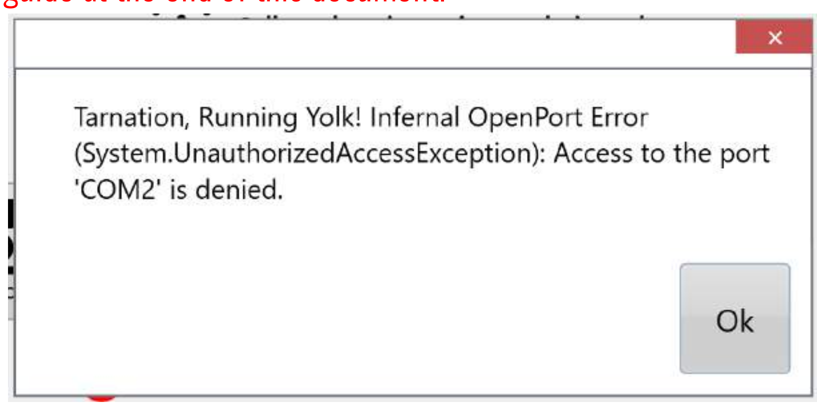
System Startup

Normally the T3RRA software will start automatically when the tablet boots. If this does not occur and you wish it to then check the accompanying troubleshooting guide for instructions.

If the T3RRA software does not start on tablet boot (after a reasonable period has elapsed) then it can be started manually by tapping twice on the appropriate desktop icon.

The initial screen will then open.

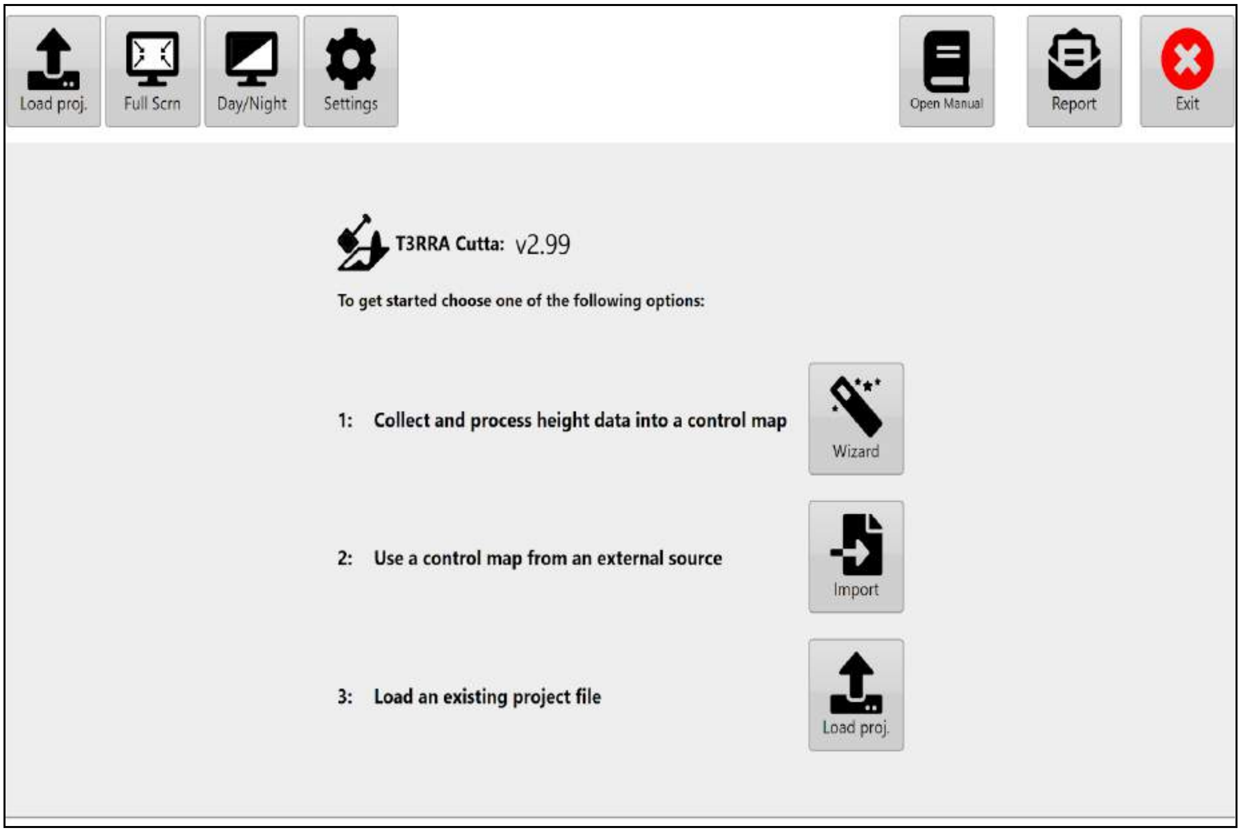
NOTE: Due to prior issues regarding the GPS data stream being recognized as a serial mouse we formerly recommended the Tablet and T3RRA Software be started before starting the tractor. These issues should no longer occur. If you see a similar issue refer to the troubleshooting guide at the end of this document.



Main Page/New Project Page

Cutta Ditch Plane Levee Survey

When T3RRA software is first opened this will be the first screen you see, this screen is also what you will be directed to when you press the '**New Project**' button on a Wizard page (discussed in the Wizard section).



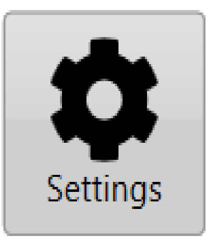
Points to note

- The file name currently loaded will be displayed at the top of the screen if you are not using 'Full Screen' mode.
- The name of the software (T3RRA Cutta, T3RRA Ditch, T3RRA Plane, or T3RRA Survey) will be displayed.
- The version (v2.99 above) will be displayed.

Full Scrn - this option allows you to switch T3RRA software between full screen mode or windowed mode. This is helpful if you need to be looking at other pages on the tablet at the same time as using the T3RRA software. If a keyboard is attached you can use the shortcut of F11.

Day, Night, & High Contrast modes - These are different variations of displaying the screen.
Day mode (1): classic white (the mode used in the manual).
High Contrast (2): inverts the colours of classic white.
Night mode (3): Has a black background and a green foreground.

For a youtube video tutorial on contrast adjustment visit https://youtu.be/b-YLq5bELTk or use your phone to scan this barcode



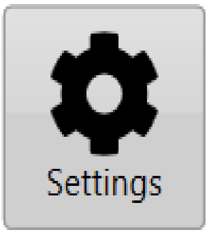
Settings - After the T3RRA software has started the first step is to confirm the correctness of your software configuration. The different settings and how they operate will be covered in the next section.

Open Manual - The ‘Open Manual’ button will download a digital copy of the manual and install it on your device. After the manual has been downloaded, pressing the same button will open the manual.

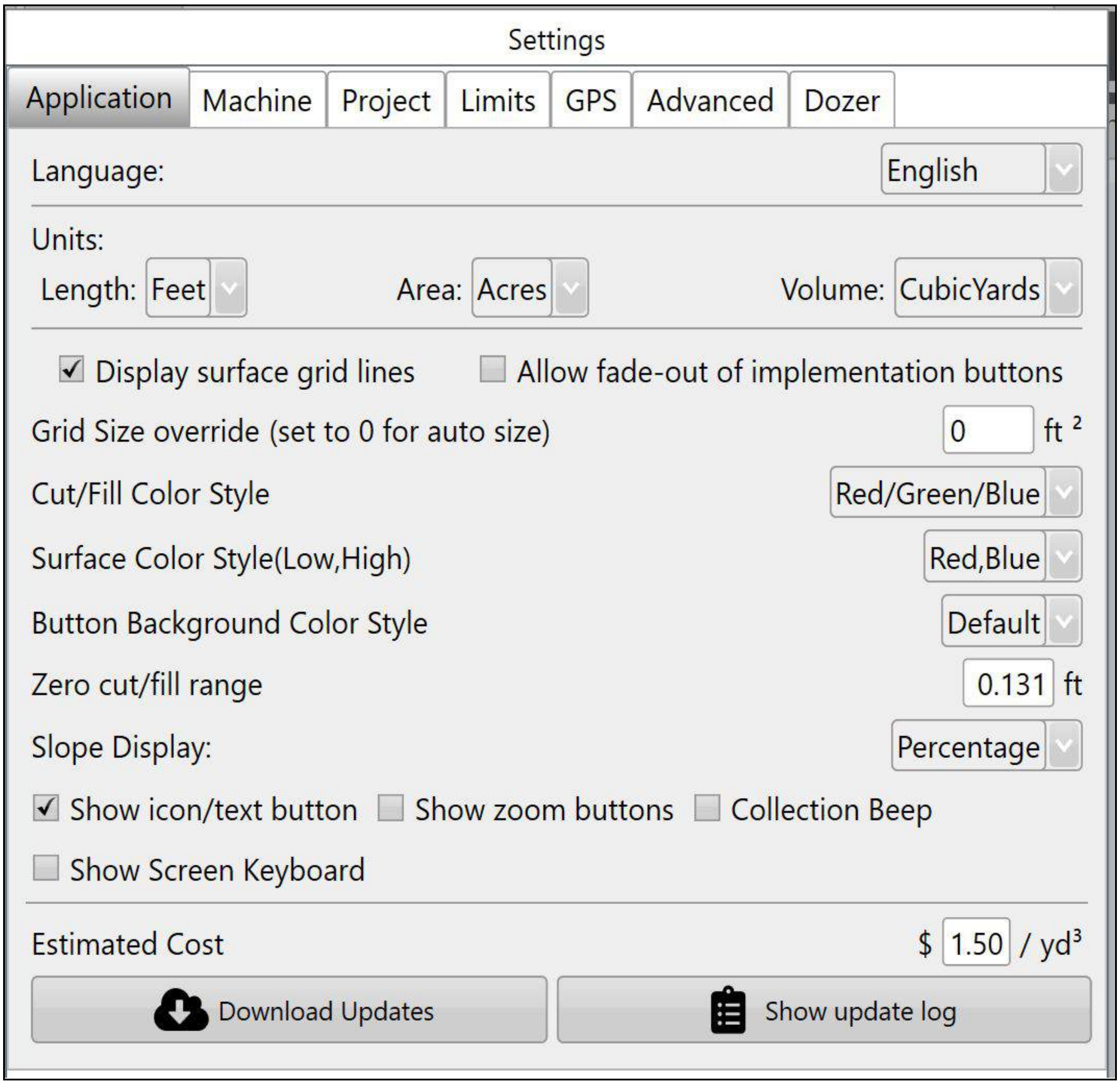
Report - The report button opens up a bug report/feature request window (shown below) allowing you to report issues to T3RRA. The name and email address fields of this window are automatically filled using the details linked to the software licence. You must be connected to the internet for this to work.

For a youtube video tutorial on sending reports visit https://youtu.be/YzdzwxzxydU or use your phone to scan this barcode

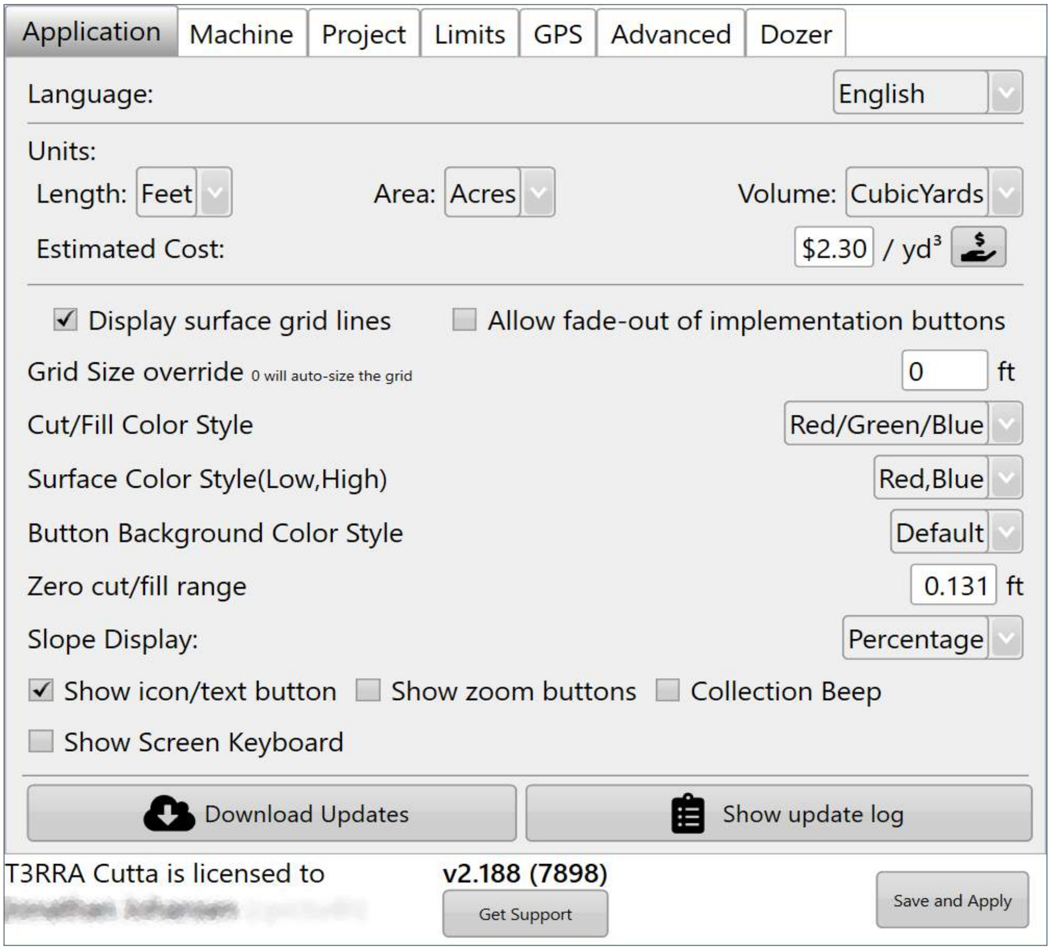
Settings



Settings can always be found at the top of the screen

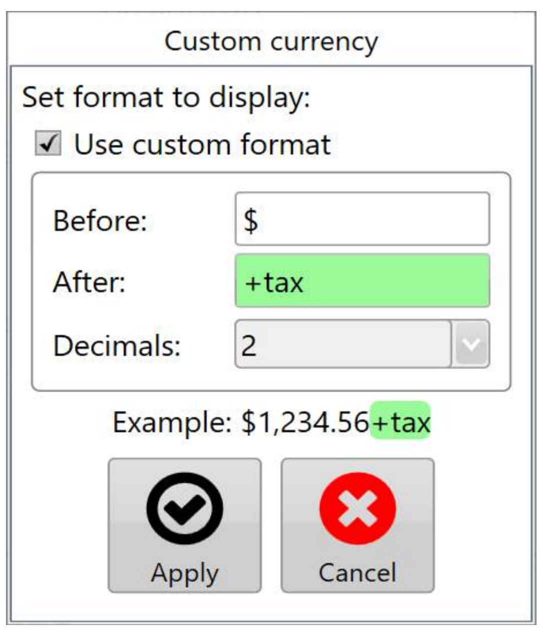


Application Tab

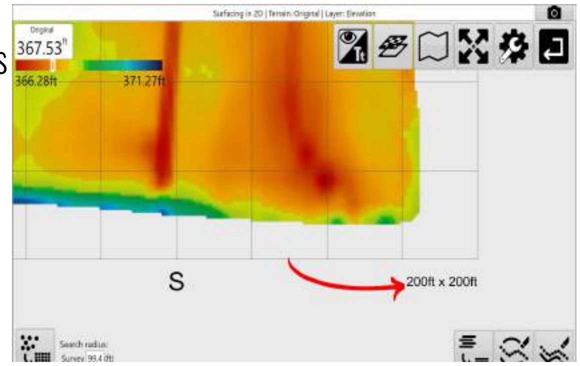


'Language' – Changes the language
'Length' - Changes unit of distance measurement.
'Area' - Changes unit of area measurement.
'Volume' - Changes unit of volume measurement.

'Estimated Cost' - Set an estimated cost per volume of dirt moved. To customize the currency format, click the button to the right. You can enter custom text before and after the amount. An example is shown on the right. This allows you to put your currency code and other information before and/or after the value.



'Display surface grid lines' -Determines whether or not to show the grid lines on the map. By default the grid changes size to best fit the size of the field. Dimensions for the grid size are displayed in the lower right corner of the scanned area.



'Allow fade-out of implementation buttons' – If checked buttons will fade after 15 seconds on the implementation screen. Touch screen to retrieve.

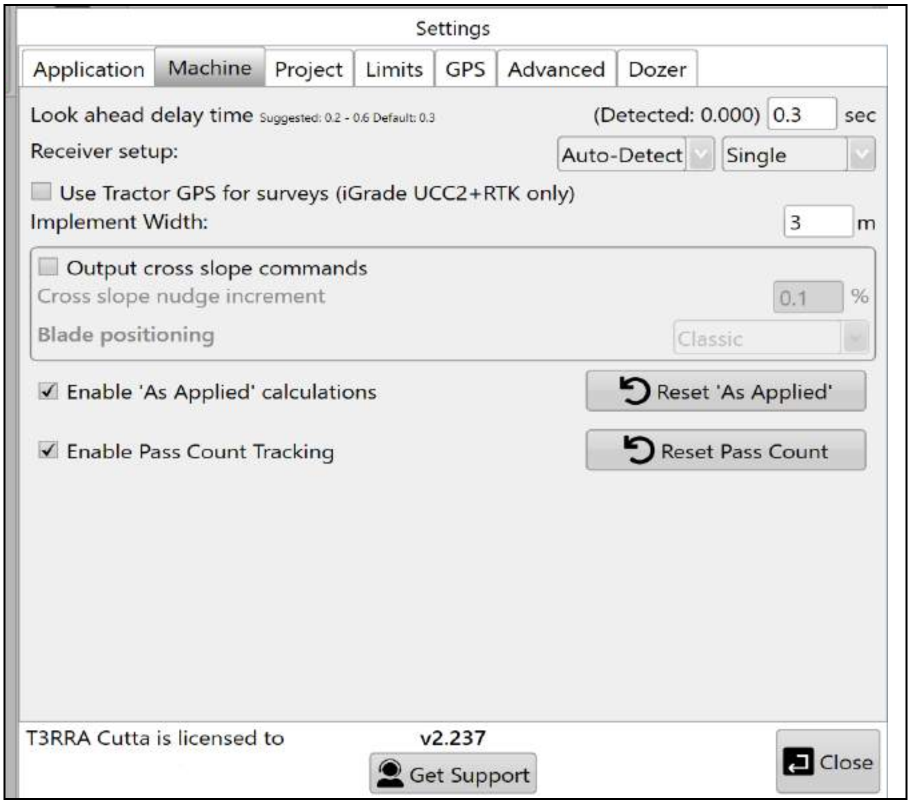
For a youtube video tutorial on button fade out visit https://youtu.be/9fSbZdnzvh0 or use your phone to scan this barcode

'Grid Size override' – Users can adjust grid size manually. Leave empty to auto-size.
'Cut/Fill Color Style' – Set colors used for Cut/Fill to Magenta/Green or Red/Green/Blue. (Magenta as cuts/Green as fills, or Red as cuts/Green as neutral/Blue as fills)
'Surface Color Style (Low,High)' - The surface color style allows you to change which colors represent your highs and lows. (this is limited to selecting from a drop down menu)
'Button Background Color Style' - This setting will change the button backgrounds between gray and transparent when in design or implementation screens.
'Zero Cut/Fill Range' – Adjusting this number allows you to set a vertical range that will be considered as "on-grade". This is a great tool for quickly identifying parts of a field with heavy earth moving. This option will not change the design height or the height of the scraper blade.
'Slope Display' – Show slope as a *Percentage* or as a *Ratio*. (0.1% or 1/1000)
'Show icon/text button' - Choose to have this button present.
'Show zoom buttons' - Choose to use zoom buttons for zooming in and out instead of 'two-finger touch zoom'.
'Collection Beep' - Choose to enable audible notifications of collection of elevation points.
'Show screen keyboard' - choose to have the keyboard automatically open when needed.
'Estimated Cost' – Cost per cubic meter, or cubic yard (this is calculated for cuts only). Currency is based on the current language
Download Updates– Choose to update to the latest version when connected to the internet.
Show update log – lists software update details.

Save and Apply – choose to save settings and exit this settings dialog.

For a youtube video tutorial on grid size override visit https://youtu.be/9rlCn1VuGlo or use your phone to scan this barcode

Machine Tab



Look ahead delay time - In order to control blade height the software must receive an elevation from iGrade™, process that elevation, and then return a control signal to iGrade™. This control loop is quick but the time delay can cause inaccurate implementation in certain situations.

A normal "Look ahead" time is 0.3 to 0.5 seconds. The exact time is machine specific and can be determined through experimentation (see Bi-Directional error in T3RRA in the troubleshooting section). The look ahead time helps to account for the delay in the control loop.

If the look ahead time is not set the delay can cause a "bi-directional error". This is where the blade offsets incorrectly, moving up when going down a slope and down when going up a slope. This error occurs consistently. If the look ahead time is set too LOW the implement will always grade high when going down-slope and low when going up-slope, the opposite effect will occur if the look ahead time is set too HIGH. Bi-directional error is most noticeable when working steep slopes at higher speeds.

Receiver setup - The 2 drop down menus set which sort of receiver connection is being used(left) and the number of receivers that are connected (right).
The receiver connection type in the left drop down menu has 4 options:

- Auto-detect (default)
- Non-IGrade
- IGrade 1
- IGrade 2

The number of receivers (Implements) can be adjusted using the right drop down menu:

- Single
- Dual implements
- Two receivers on one implement
- Triple implements.

T3RRA will use the front GPS receiver for any multi-bucket configuration, but both GPS receivers when it's two receivers on the one implement.

When using multiple receivers, iGrade™ has the ability to control SCV1 *and* SCV3. Ensure SCV1 and SCV3 are configured correctly for remote control commands by placing them in detent, for information on how to do this refer to the "How we work with iGrade™" section.

Important Concept!

When utilizing dual or triple scrapers on UCC2 you may need to adjust the receiver height settings in the receiver settings in the individual receiver menu in ISO Page. Refer to your iGrade Manual for instructions on adjusting individual receiver height offsets. When using multiple scrapers with UCC1, the receivers must be mounted the same height above the blade. Also with UCC1, implement offsets cannot be entered in the display to account for mounting error.

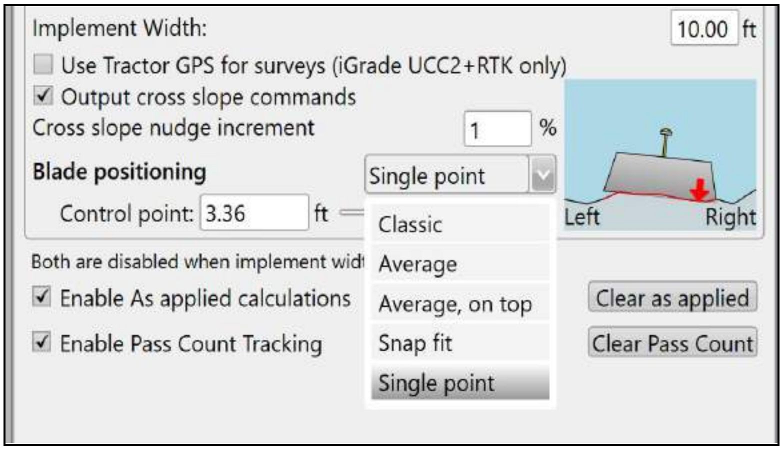
NOTE: to lower the blade enter a higher receiver height. To raise the blade position lower the height set in the receiver setup.

Implement width - this value reflects how wide the implement in use is and needs to be entered manually. This value is needed for 'Cross slope', 'As applied' and 'Pass count'.

Output cross slope commands - The amount each tap of the manual left/right cross slope adjustment buttons causes the cross slope to change by during implementation. Uses percentages (not degrees).

Cross slope nudge increment - This specifies the incremental amount each press of the left and right tilt buttons will add to the cross slope.

Blade positioning - Allows the operator to specify which part of the soil profile under the blade has priority in determining blade position. This option is only available when you have entered an 'Implement width' and enabled to 'Output cross slope commands'.



Classic - This position uses the design elevation as the target elevation under the center of the blade, and the cross-slope is determined by the design elevations under the left and right points of the blade. With Classic, it is easy to over-dig when driving down the midline of ditches, or to clip the top off a bank when straddling the ridge.
Average - This position looks at the design surface under the blade and goes for the overall trend. This is great for taking any full-field design and giving you basically that. It's not so good for abruptly changing slopes, however.
Average, on top - This position is one step up from the trend method, literally. It determines the slope in the same way as the 'Average' method, but it always avoids overcutting.
Snap fit - This position attempts to find the best blade position, without overcutting. If you are going over a break line, you will see the blade snap from one position to the other as you traverse the break line. What it means, though, is that you will be cutting and filling most efficiently, minimizing the number of passes and risk of rework. This option has been tailored for abruptly changing slopes.
Single point - This position is what everyone seems to want – Control-by-point. In this configuration, you pick a position on the blade represented by the red arrow. That point on the blade will be at the design elevation and cross slope even if it cuts below the design elsewhere. This is envisioned to be great for digging features like V-ditches.

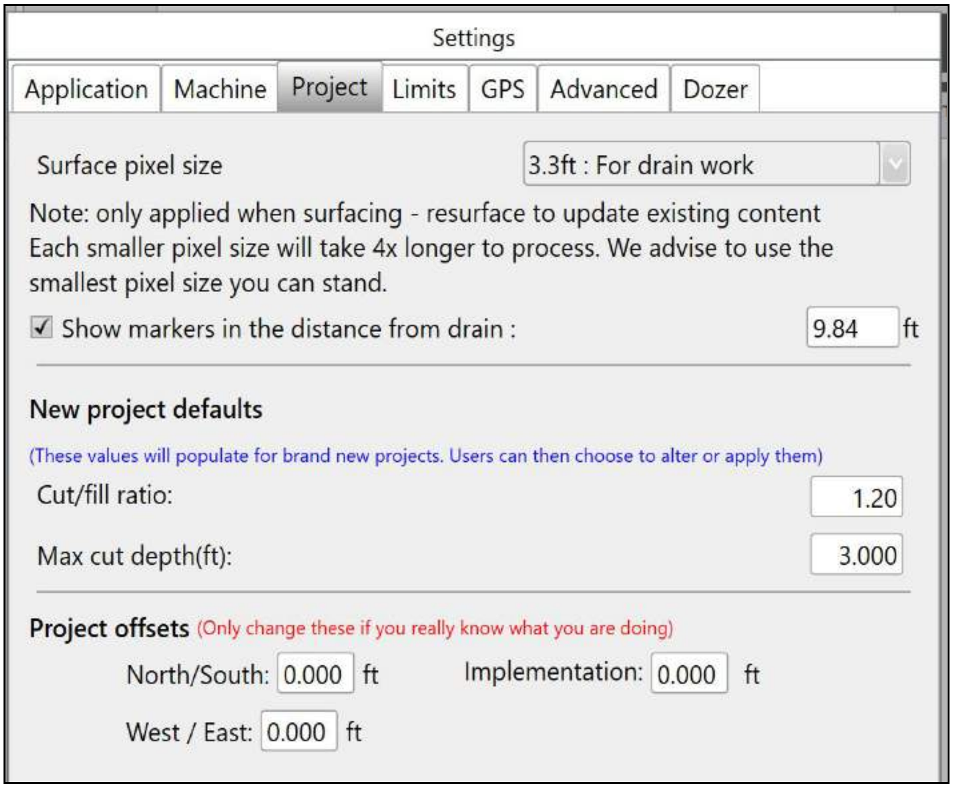
Enable As-applied calculations - As-applied calculations show a graphic representation of the surface's current state as work progresses. For more see [Understanding how "As-applied" works]
NOTE: 'Implement width' is required to enable the As-applied feature.
Enable Pass Count Tracking - Pass count tracking shows how many times you have gone over a particular spot, an indication of the amount of work that has been done in an area. For more see

Understanding how “Pass Count” works

NOTE: ‘Implement width’ is required to enable the Pass Count Tracking feature.

Note: ‘Enable As-applied calculations’ and ‘Enable Pass Count Tracking’ are set to for each system, if a different Cutta system is used your setting won’t be remembered.

Project Tab



Settings made in the project tab will not be represented in a project that is open when the settings are changed.

Surface Pixel Size - The default pixel size of 2 meters (~6 feet) should be adequate for most purposes. In some situations, it may make sense to decrease pixel size to 1 meter or even 0.5 meters (primarily to facilitate small interval contour creation, or to get good definition on drain batters/backslopes).

A field surface is represented using a “raster”. This is a grid of elevation heights. The individual cells in this grid are referred to as “pixels” and have a uniform edge size. The smaller the pixel size, the more pixels needed to cover a given area, and the more precise the elevation surface is.

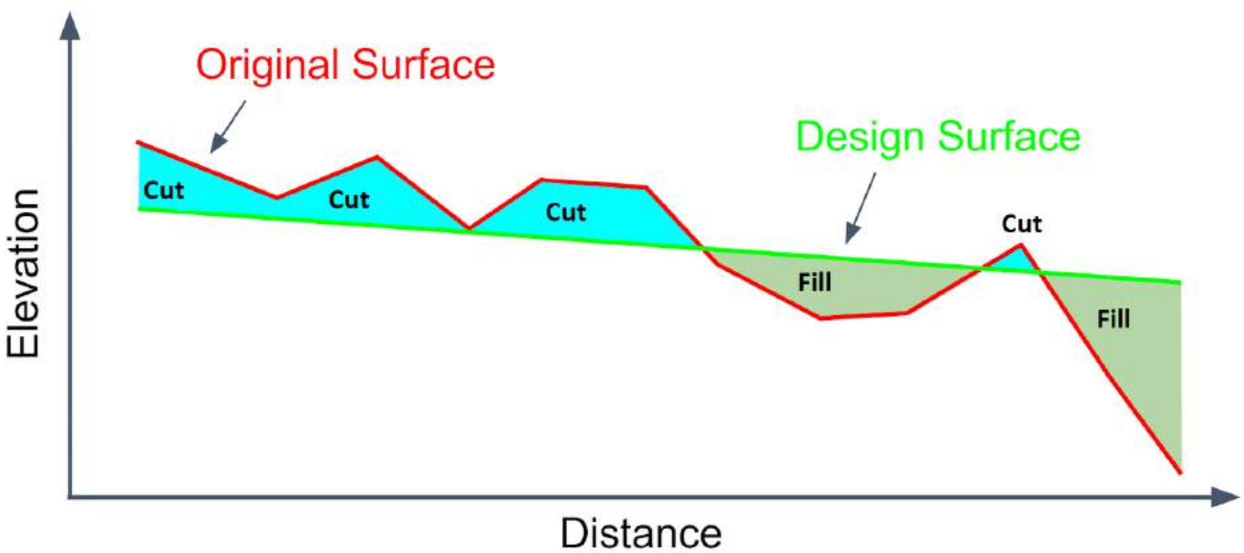
<u>Points of interest</u>

- If pixel size is too large then the field surface will not appear smooth, and short range changes in elevation may not be adequately represented.
- If the pixel size is too small, then the computer will have to work harder to process the data. Dividing the pixel size by two increases the amount of pixels by four.

New Project Defaults will populate for brand new projects. Users can then choose to alter or apply them:

'Cut/Fill ratio' - The cut/fill ratio is determined by the type of material being moved and what percentage of it will "settle" or "shrink" once compacted.

Example: Using a cut/fill ratio at 1.2 means that you are moving at the rate of 1.2 cubic yards of cut to get 1.0 cubic yards of compacted fill.



'Max cut depth' - When using design options (e.g. multi fit or best fit) if the design parameters exceed the value set here the following window will appear as a notification.

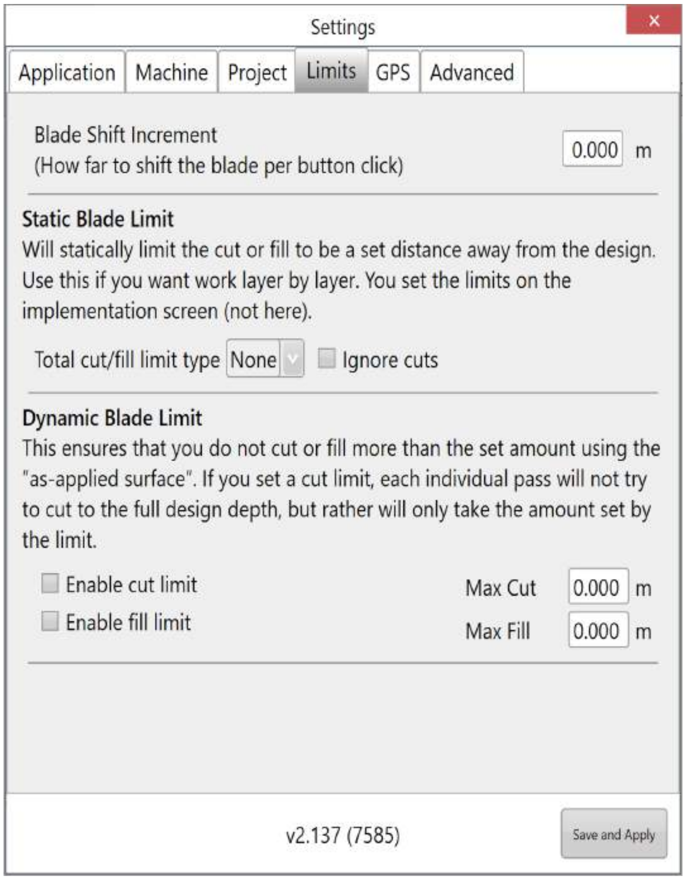
Project offsets

These settings allow for any GPS discrepancies to be accounted for during implementation.
The 'North/South' and 'West/East' directions to move the map (+ is North, - is South) (+ is West, - is East).
'Implementation' is a vertical offset used during implementation only. When you set zero, it is saved as this value. We recommend that you do not modify this directly - Use the zeroing tools in the implementation screen.

Limits Tab

Cutta Ditch

Blade Shift Increment -Used to set the height adjustment value of the up/down elevation adjustments buttons in the implementation wizard step.
NOTE: Recommended distance for the blade shift increment would be 0.03 - 0.06 feet (0.4 - 0.8 inches, or 0.01m - 0.02m).



Static Blade Limit - This feature allows you to temporarily alter your target design heights by a certain amount. For instance, by setting the Static Blade Limit to 50% you will effectively be setting your target cut and fill heights to be 50% of what the actual design calls for. This setting can also be used to overfill a design by a percentage to allow for soil to "sink " by a percentage over time. Having a setting of 110% will fill a 100mm fill to 110mm to allow for future compaction.

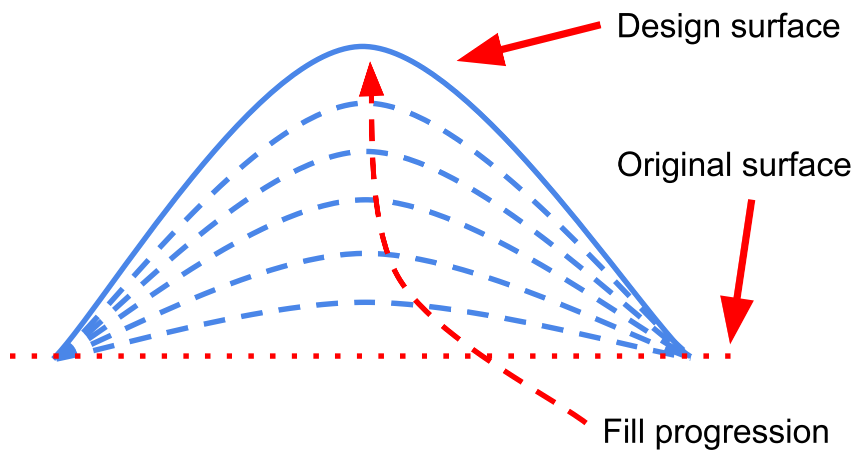
This is useful for building up banks, roads, or mounds in gradual steps and allows for even compaction of dirt.

The checkbox '**Ignore cuts**' is useful if you want to gradually build up a mound of dirt by using the vertical nudge to lower a design surface below the current surface and then slowly nudge it upwards so that the fill pattern starts with the apex of the mound and proceeds outwards. In this case you do not want to cut in the regions where the mound design surface is currently nudged below the original surface.
NOTE: 'Ignore cuts' can be activated even if the Static Blade Limit is set to "None".

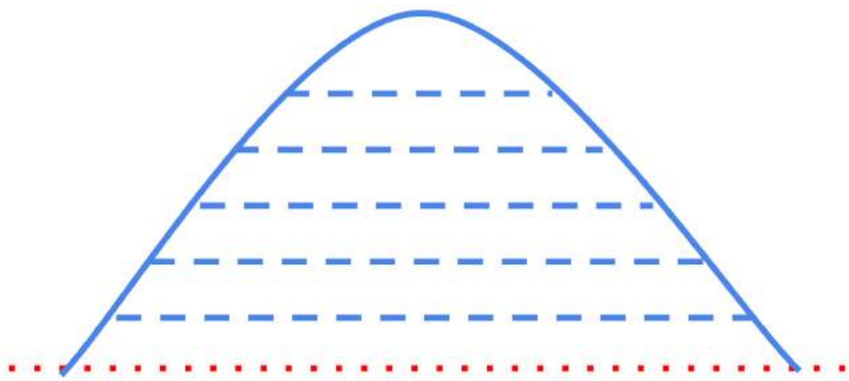
The static blade limit amount is set on the implementation screen.

Methods to progressively add layers of dirt to a fill area.

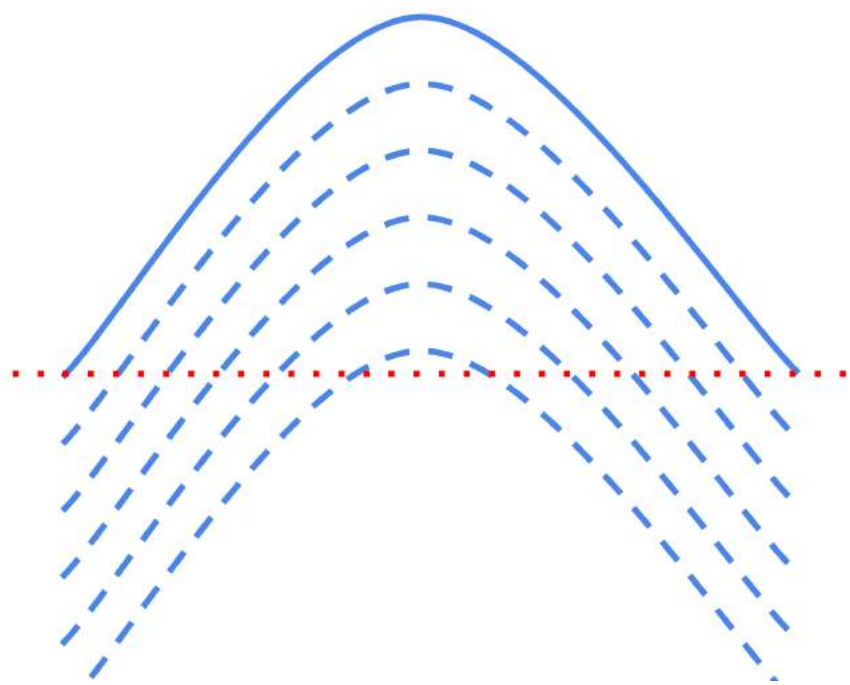
Static Blade Limit
by Percent



Static Blade Limit
By Absolute Value



Combination of vertical
blade offset
+ Ignore cuts

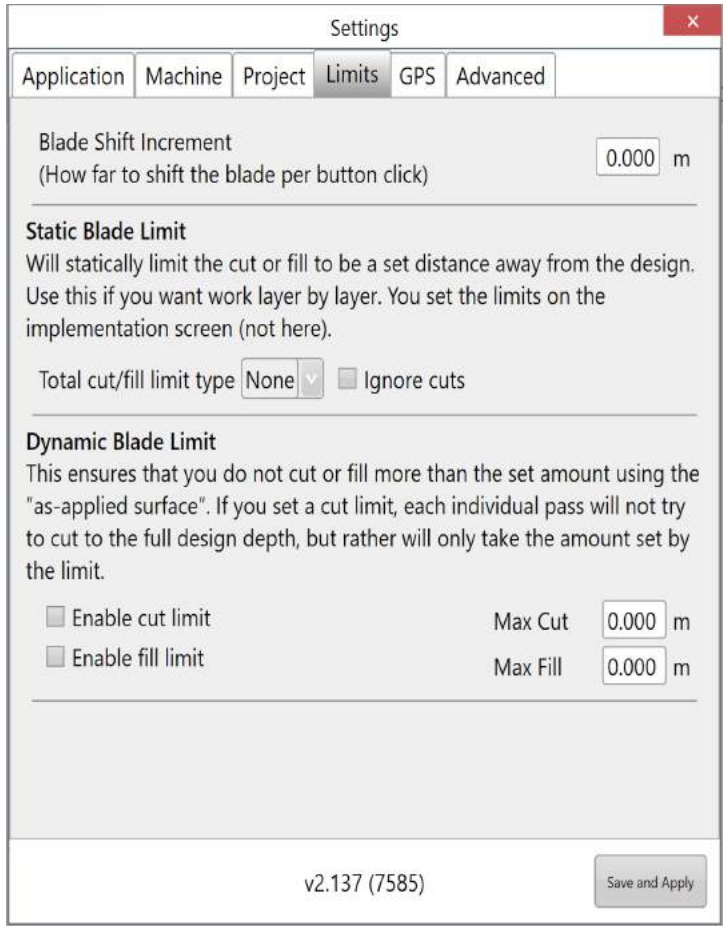


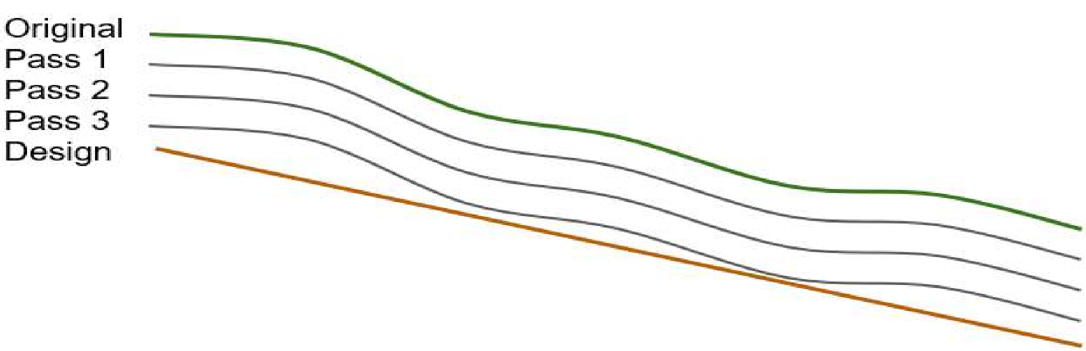
Dynamic Blade Limit - The increment which the blade will move per pass of cut or fill. It allows progressively cutting to a total depth without over cutting on an individual pass.

This feature is designed to allow cuts to be taken in “bite size“ chunks without causing the machine to be overloaded.

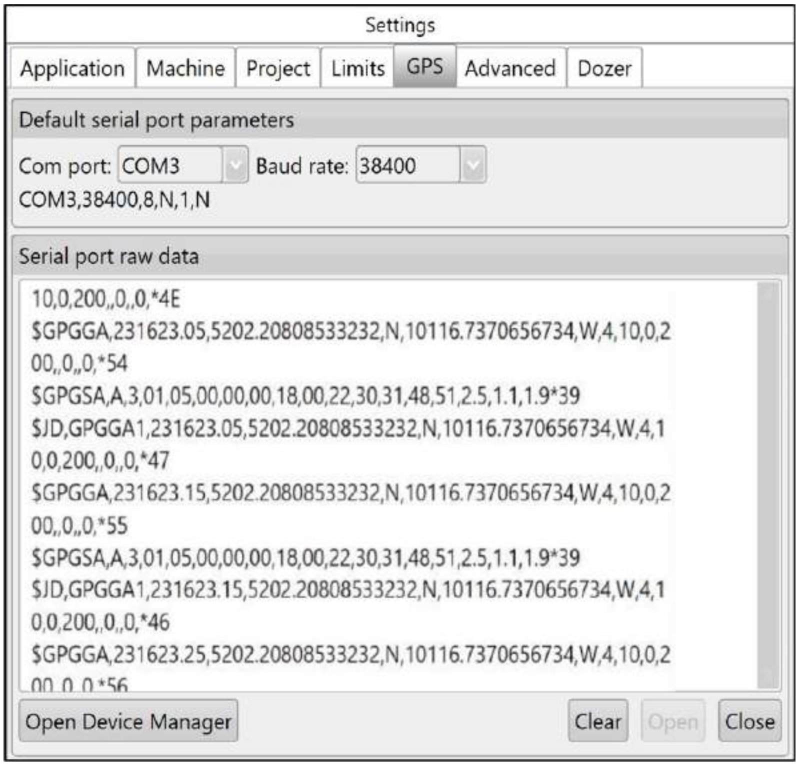
It can optionally be applied only to cuts, only to fills, or both.

It uses the as-applied functionality to track blade heights on previous passes in order to set the current blade height. Dynamic Blade Limit does not operate unless as-applied functionality is activated. For more see [Understanding the relationship between the “As-applied” surface and the Dynamic Blade Limit.]





GPS Port Settings Tab



Com port - The channel that is used to communicate with the GPS. Use the drop down menu to ensure you have selected the correct port.

Baud Rate - The communication speed between software and GPS (it should match the baud rate of the GPS)

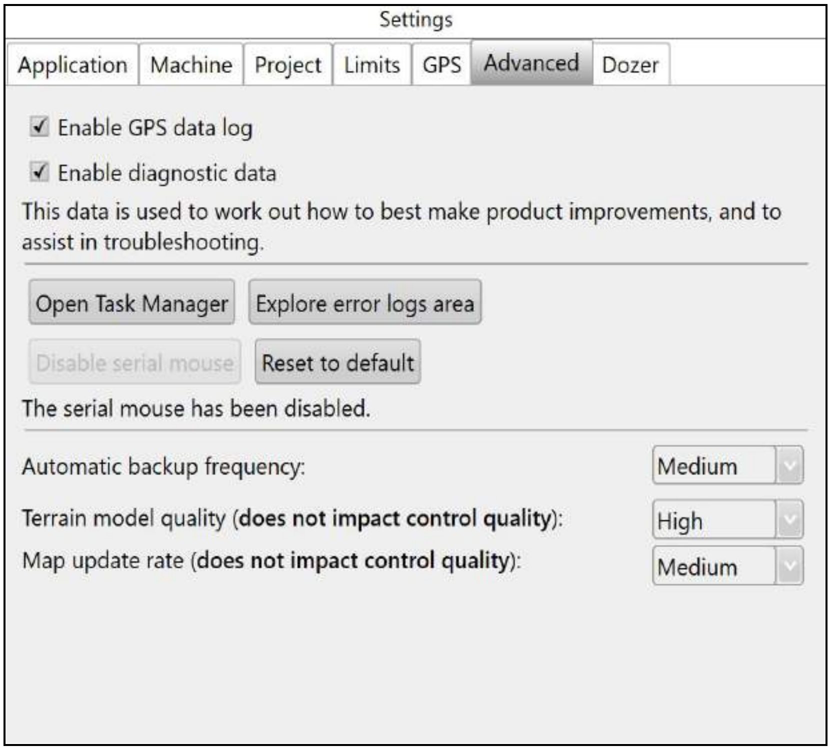
NOTE - settings changed on this page will stay even after the system is turned off.

Serial port raw data - Is primarily used for diagnostics, should support be required.

Open Device Manager - used to investigate Com port issues if required.

NOTE: T3RRA software and iGrade™ must have identical Com port and Baud Rate settings in order to communicate.

Advanced Settings Tab



'**Enable GPS data log**'
It is highly recommended to keep this enabled. The GPS data log is sent along with error reports to assist in finding a solution.

'**Enable diagnostic data**'
It is highly recommended to keep this enabled because the data collected is valuable for us in assisting you if any issues should occur.

'**Open Task Manager**' will open the computer's task manager tool. This will display all current systems running on the computer.

'**Explore error logs area**' will open the folder on the tablet that contains all error log files. If you encounter an issue we recommend you send us the latest file so we can find the cause and correct it quickly.

'**Disable serial mouse**'
If your cursor is jumping around the screen or you are getting "COM in use" errors it can be corrected by disabling the serial mouse.

'Reset to Default' This will reset all settings to Default.

'**Automatic backup frequency**' This drop down menu allows you to change the frequency at which the T3RRA Software backs up your work. The different timing options are:
Never = never backup save
Low = backup save every 20 min
Medium = backup save every 5 min
High = backup save every 2 min.

'**Terrain model Quality**' This setting is set to High by default most visible when looking at surfaces in 3D. When lowering the setting some details may appear to smooth out, the details and depressions are still there but are not represented in the 3d display.

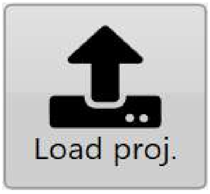
'Map update rate' This will alter the rate of the map updates during Surveying and Implementation.

New Project Options

Collect and process elevation data into a control map. When starting a new job this is the usual place to start.

Use an elevation data file from an external source. Various file formats are supported.

Load an existing T3RRA control file from disk.



Importing

Because T3RRA software normally reads .tci "project" files, external files need to be imported using the '**Import**' button on the initial screen.

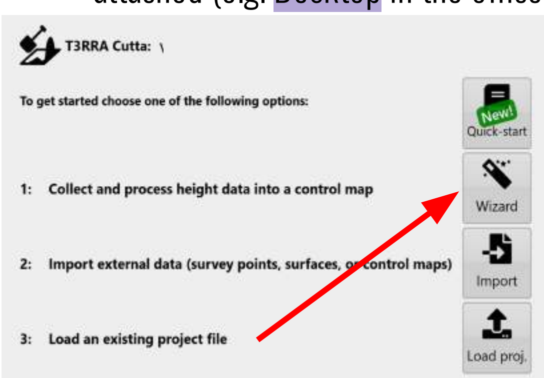
NOTE: T3RRA Design can be used to convert many other file types for use in T3RRA software.

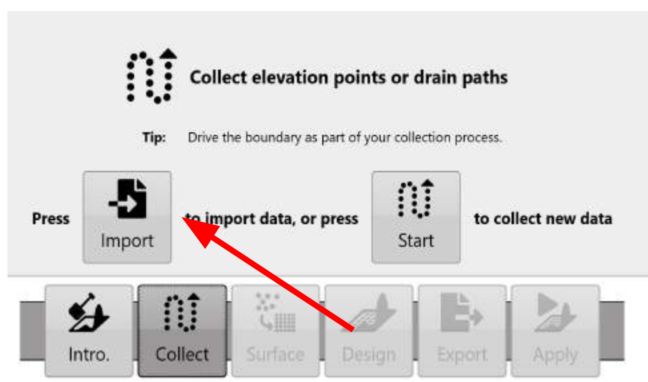
NOTE: T3RRA Apply is unable to import data, and can only work with designs from other T3RRA products.

In T3RRA software we make a distinction between *loading* a project, and *importing* data. When we refer to "loading" it concerns the opening of a native T3RRA .tci project file. When we refer to "importing" it refers to a 3rd party data file. Whereas a .tci file will *load* in a single step there are sometimes multiple steps to *importing* data as the data may need to be changed or altered during the import process, or there may need to be decisions made during the import in order to get the correct data.

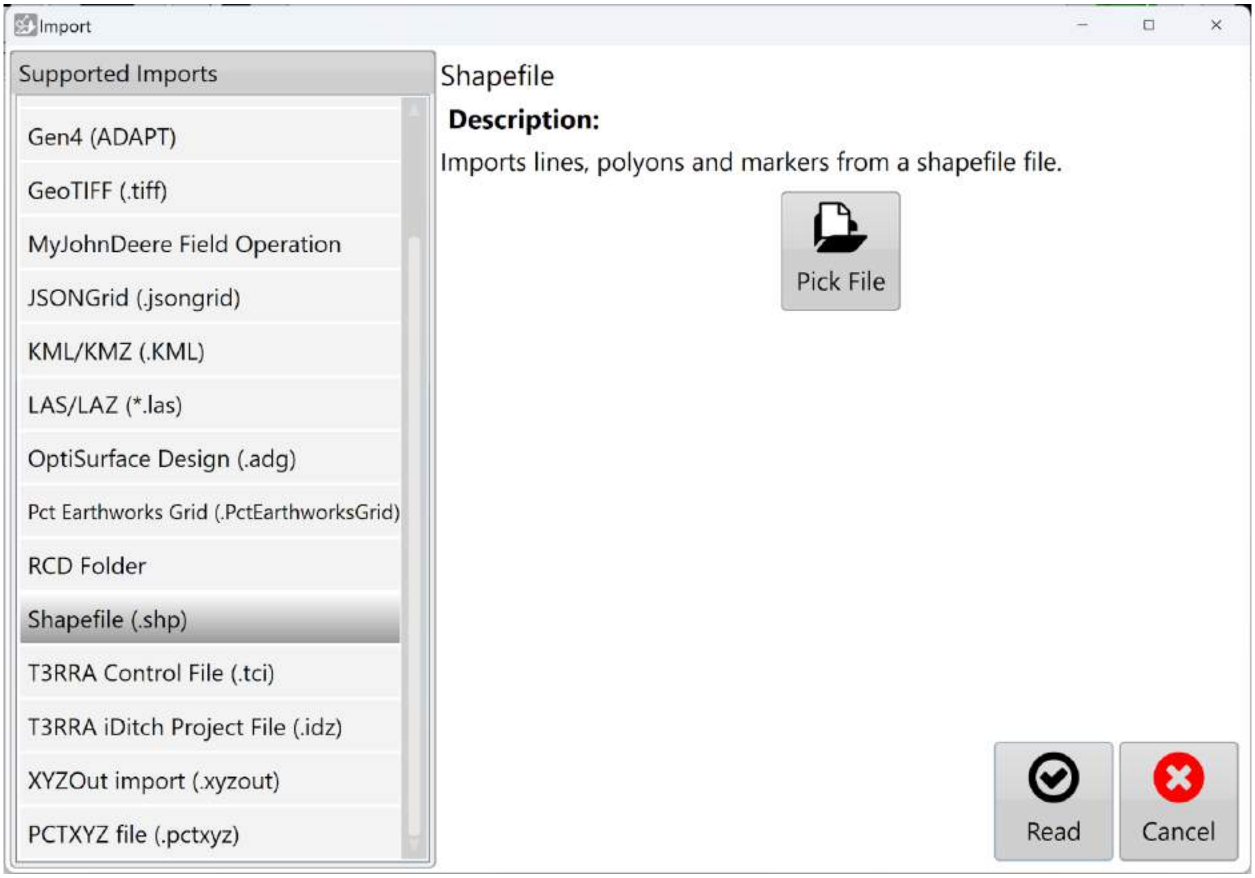
The following guide shows the steps required to successfully import a file.

1) To import a file from an external source first press the Import button on the **Main Page** or from the "Collect" step. You can import more data at any time. If you have a keyboard attached (e.g. Desktop in the office), press Ctrl+I.

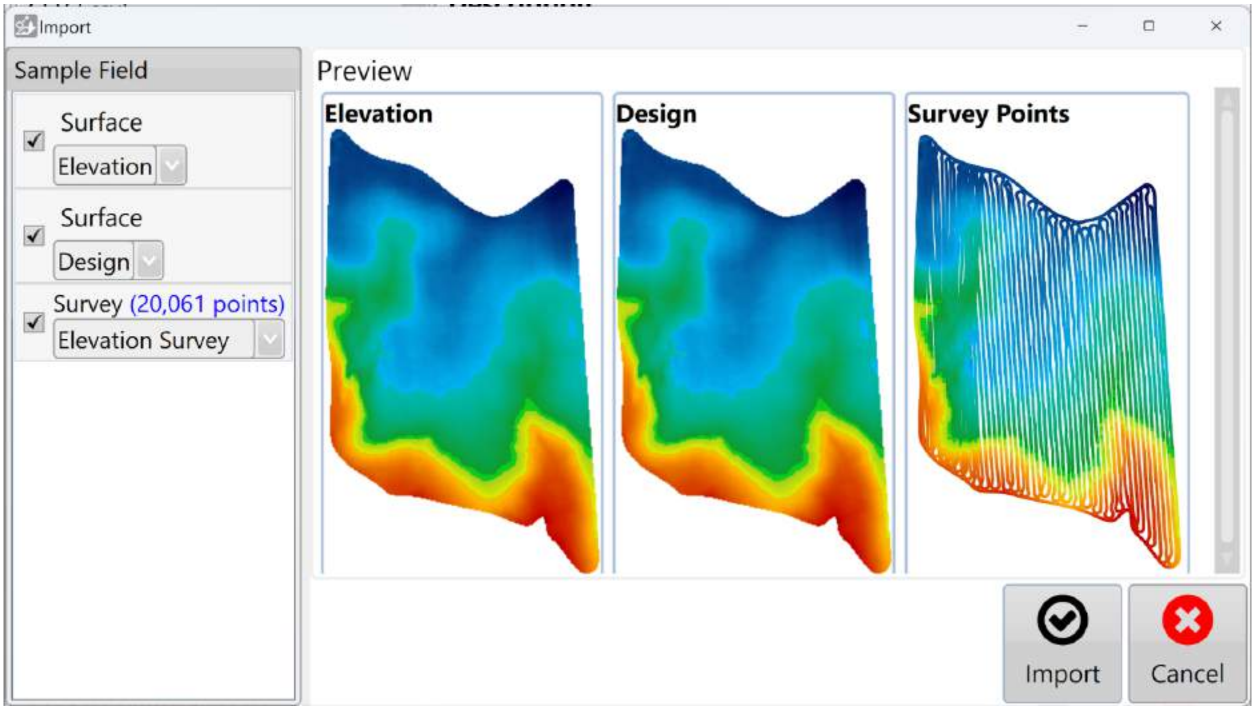




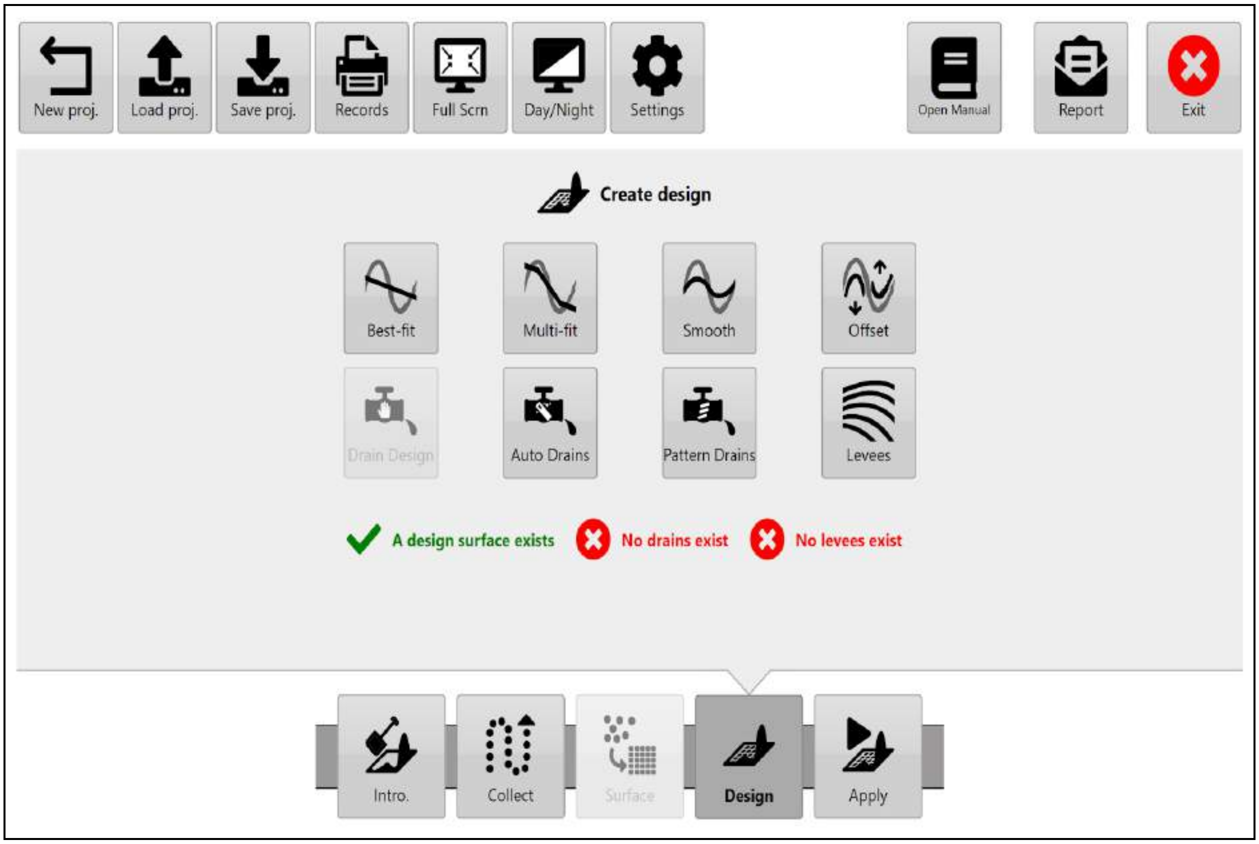
2) Next press the button for the type of file you are trying to import on the left hand side, then click “Pick File” and select the file you wish to import.



3) For some imports you might need to specify extra information, such as projection information. Once you’ve provided the required information, click “Read” in the bottom right corner.
4) You will now be able to select which data you wish to import. On the right is a preview of all the data to be imported.
NOTE: If the auto-detected data type is incorrect, you can change it using the drop downs.
Click “Import” to start working with the imported data.

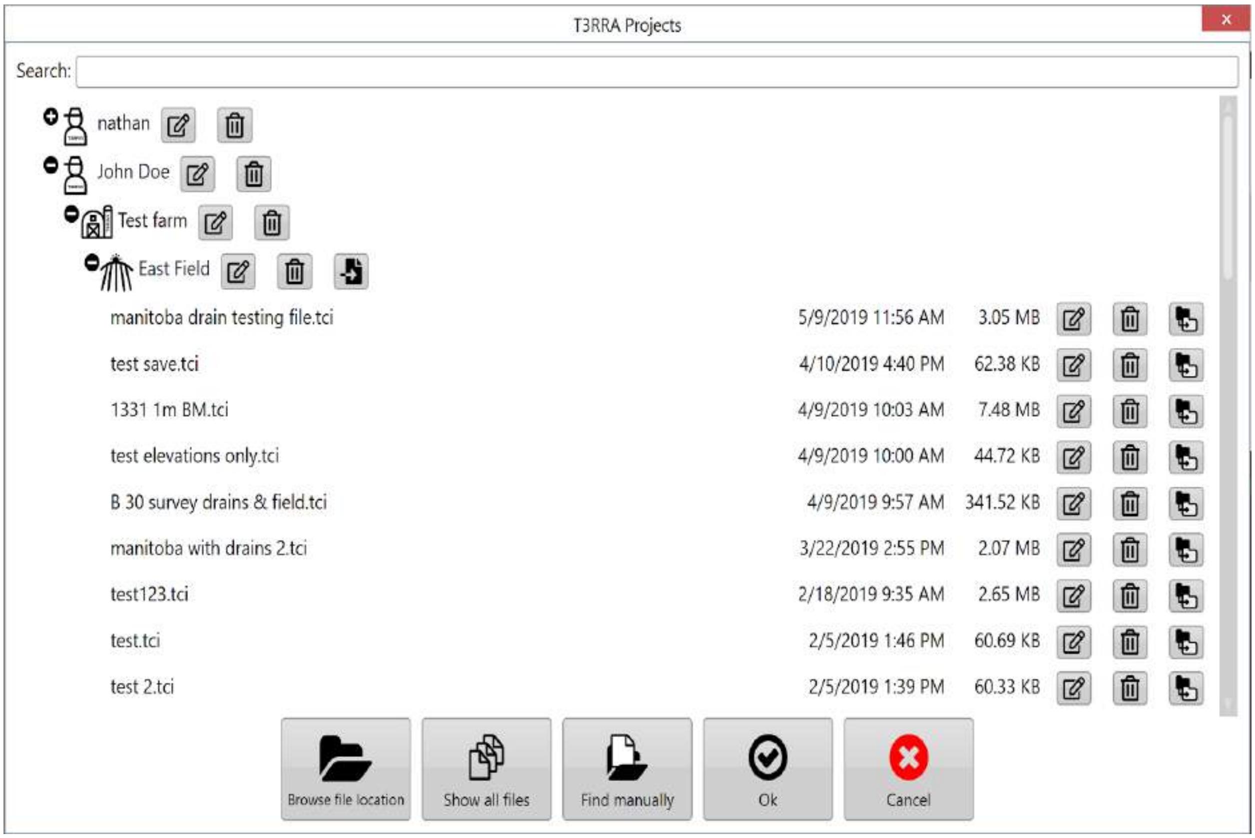


5) After data has been imported, surfacing and design options can be applied.

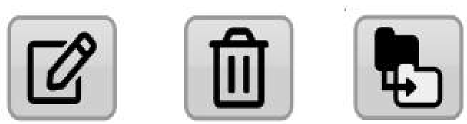


Load project

The ‘**Load proj.**’ button is used to load any saved T3RRA projects. T3RRA projects can be loaded in several different ways, allowing you to load files saved directly to your tablet or from external sources such as USB thumb drives. To load a project press the ‘**Load proj.**’ button in the top left corner or bottom center of the main/new project screen.

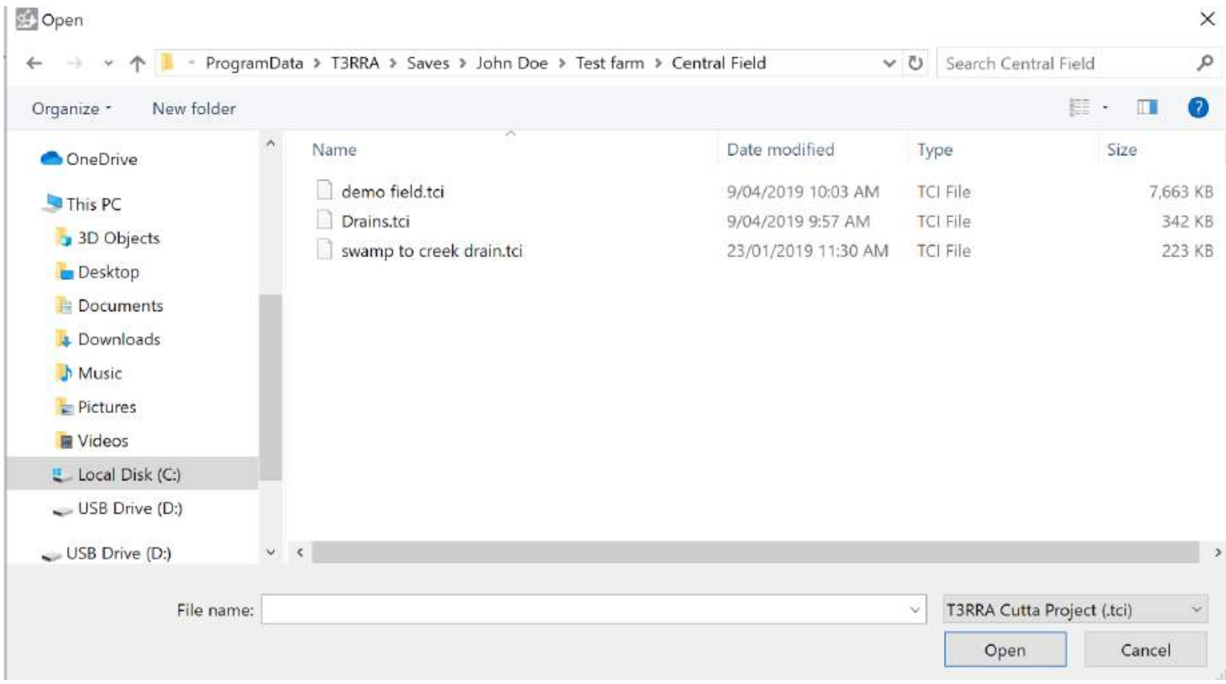


Select the project that you wish to load from the desired field and press '**OK**'
The ‘Grower/Farm/Field’ file structure allows for projects to be easily organized. For more information on these profiles and how they are set up see later in this section.
Next to each file there are 3 buttons:



- The left button with an image of a pencil and paper is used to rename the file.
- The center button with a trash can is used to delete the file. Deleted files are moved to the Windows Recycle Bin.
- The right button with the image of 2 folders is used to move the file. It brings up the same file save window, but it moves the project to a new location instead.

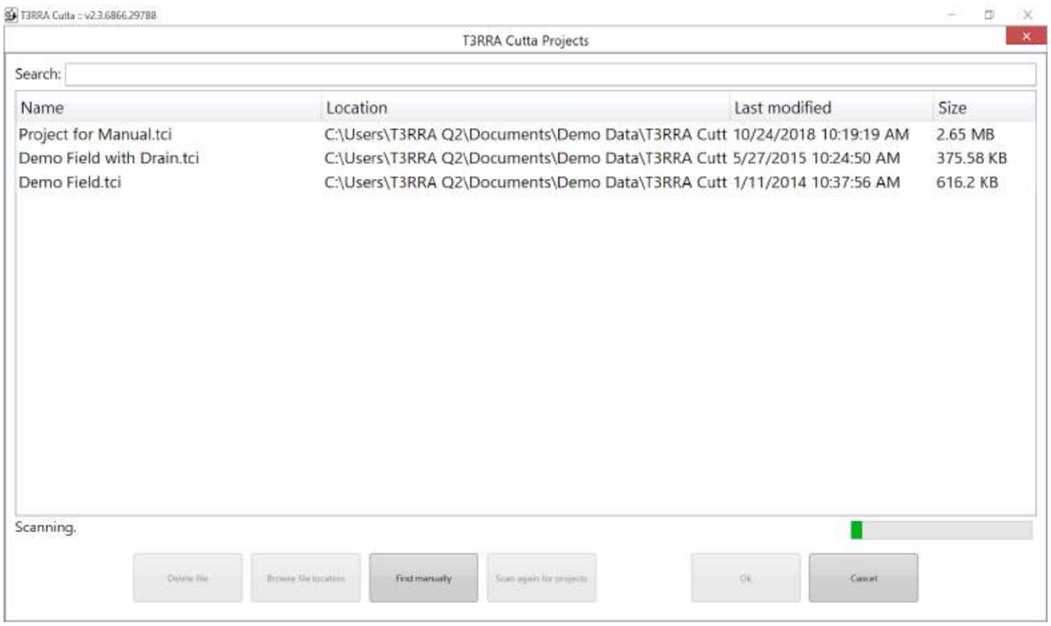
'**Find manually**' can be used when files are not saved in the default T3RRA folder structure. Project files are normal Windows files and can be stored anywhere on the computer.



Use the file explorer to find the project file, select the file, then press the '**Open**' button.

Choosing '**Show all files**' will start a scan of your computer's C: drive. A list of the T3RRA Cutta project files will be populated once the scan has been finished.

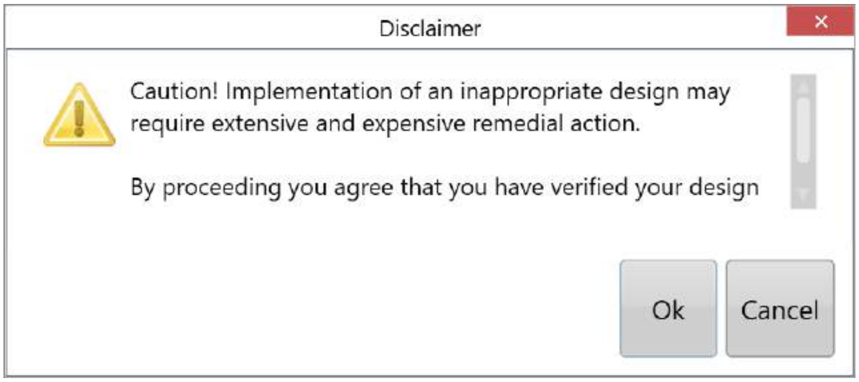
Entering text in '**Search**' will limit the displayed projects to only with matching file names.



Progress bar in the lower right indicates scanning in progress
Once the desired file has been found in the list, select the file and press '**Ok**'.

Once a file has been selected and loaded, the wizard page should appear and show the stage that the project is up to. If applicable, you can proceed directly to implementation.

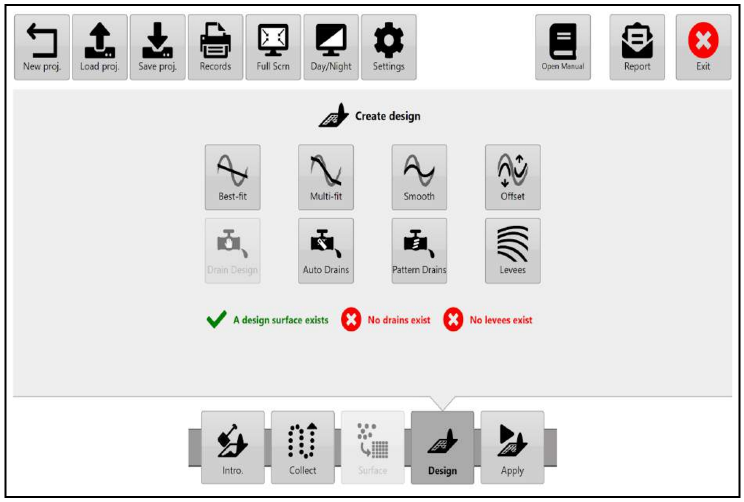
When ready you should press '**Start**' to implement your design. You will need to accept the Disclaimer to begin machine control.



Save project

Saving a project allows you to return to it at a later time and ensures that you have a copy of the data in case of accidents. We **STRONGLY** recommend periodic saving of your projects in order to guard against data loss.

The '**Save project**' button can be found in the top left corner on any of the main wizard pages.



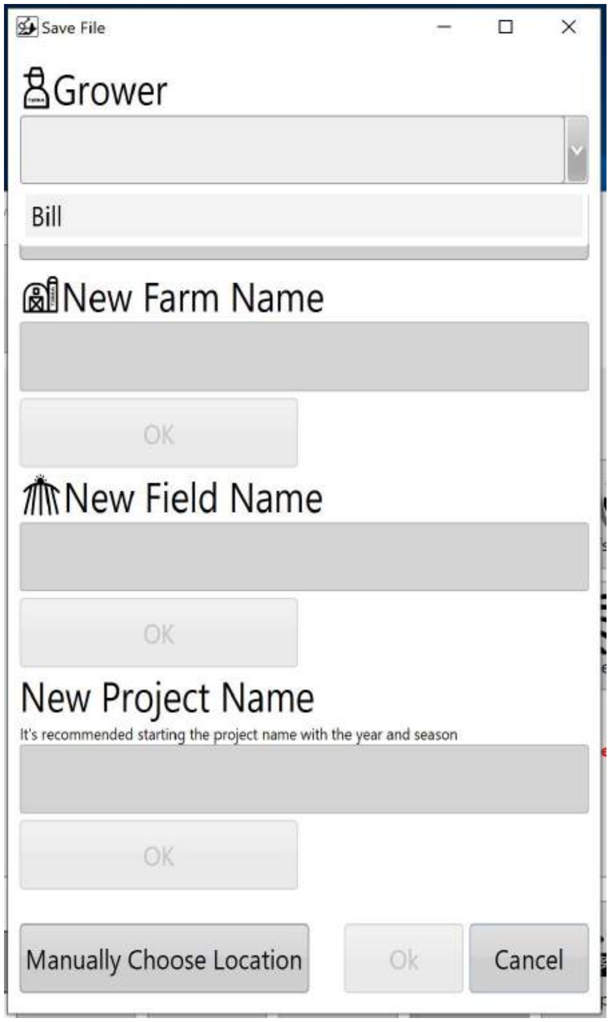
The '**Save proj.**' button presents you with a screen that allows you to save using the following structure.

You can enter:

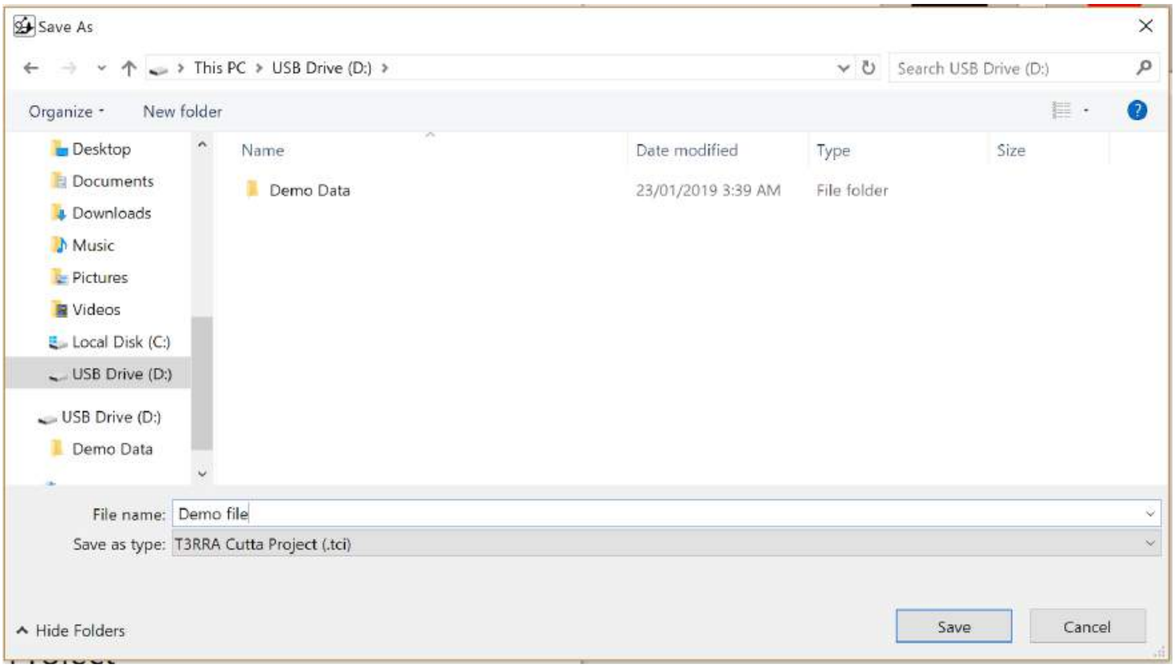
- Grower
- Farm Name
- Field Name
- Project Name

Or you can choose a previously saved value in any of the fields from the drop down list.

Pressing the final '**Ok**' will save the project and add the file T3RRA's structured file saving area.



'**Manually Choose Location**' allows you to select an alternate location to save to.



When manually choosing the save location there are two ways of navigating to where you would like to save the file.

1. You can use the left portion of the window to navigate through folders to find the desired save location.

2. Using the main section in the center of the window you can navigate to the desired file save location.

Once you have navigated to the location where you would like to save the file, enter a name for the file and press the save button.

NOTE: Project files are normal Windows files and can be stored anywhere on the computer. We recommend that you regularly copy your files to a location off the in-cab tablet in order to have them stored safely in case anything happens to your tablet.

Autosaving

T3RRA software autosaves project data at approximately 5 minute intervals. This is to assist in case of accidentally closing the software, or software or hardware failure.

Autosave files have the same name and location as the open project, with the additional suffix '.backup'.

manitoba.pctgdp	13/06/2018 10:40 ...	PCTGDP File	648 KB
manitoba.tci	8/09/2018 5:36 AM	TCI File	1,479 KB
manitoba.tci.backup	12/06/2019 11:12 ...	BACKUP File	3,703 KB
second download.pctgdp	30/04/2017 5:15 PM	PCTGDP File	3,142 KB

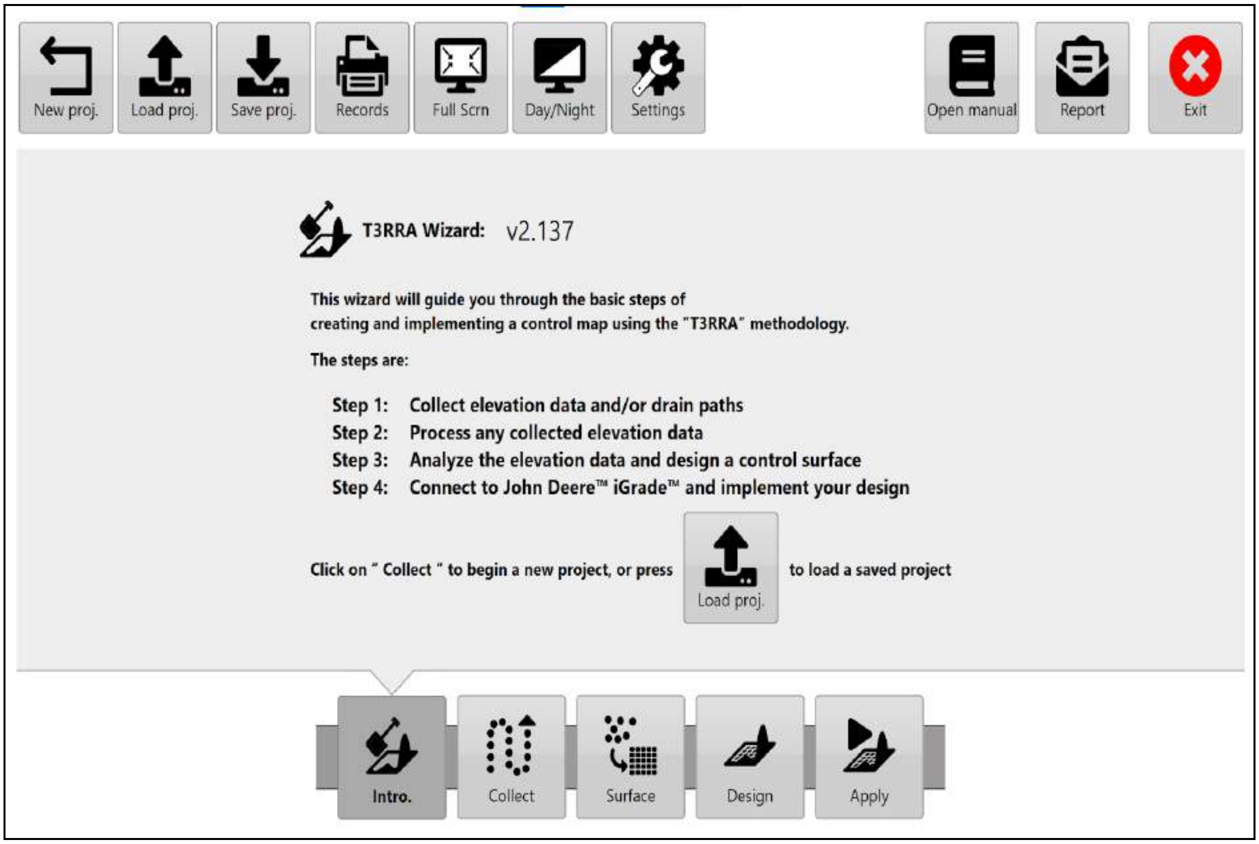
When a project is loaded a check is made to see if a backup exists for that project. If it does and the backup has a newer date/time stamp associated with it, you will be given the option of loading it.

An autosave file has the same format as a regular project. From within Windows Explorer you can rename the autosave file and remove the .backup extension in order to keep both the original file and the autosaved version.

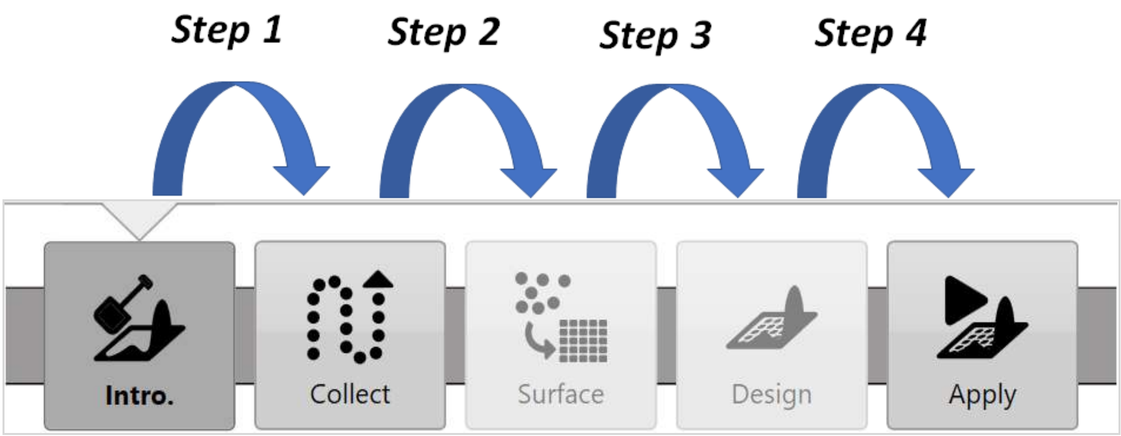
Wizard

Cutta Ditch Plane Levee Survey

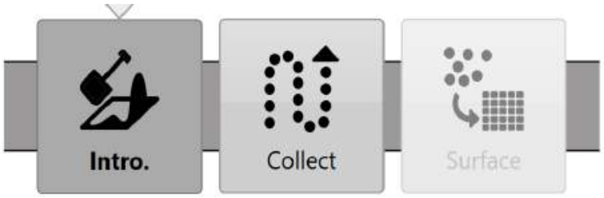
The '**Wizard**' is home to the primary functions of T3RRA software and the place where you will find the tools used to survey, design, and implement.



The wizard will guide you through the 4 logical steps involved in the T3RRA software process.



If you need to start a new project you are able to return to the '**Main Page/New Project Page**' by pressing the '**New proj.**' button found in the top left corner of all wizard pages.



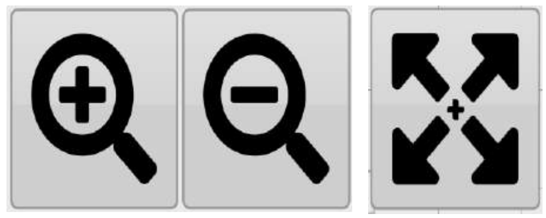
T3RRA Survey does not have '**Design**' or '**Apply**' (Implementation) wizard steps. Sections in this manual relating to these are not relevant to **T3RRA Survey**. Survey

Common tools found in the Wizard

There are several buttons that can be found on many wizard pages.

Show button text

Zoom Controls



Choose Model/Layer

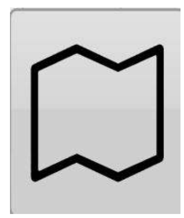
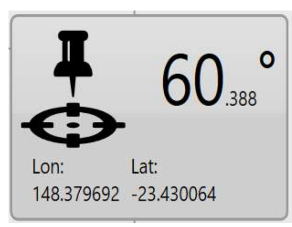


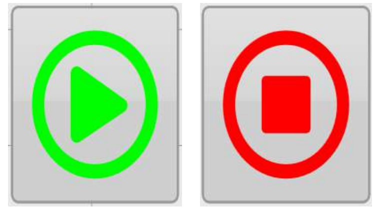
Image Overlay

GPS Controls (limited to surveying and implementation)



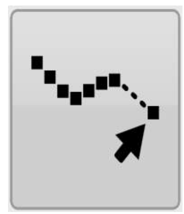
Markers (limited to surveying and implementation)

Start and Stop commands
(limited to surveying and implementation)



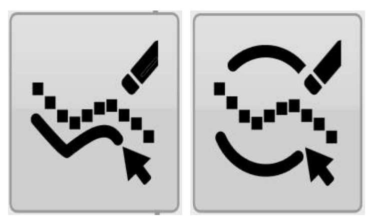
Delete Drain (limited to surveying and surfacing)

Extend Drain (limited to surveying and surfacing)

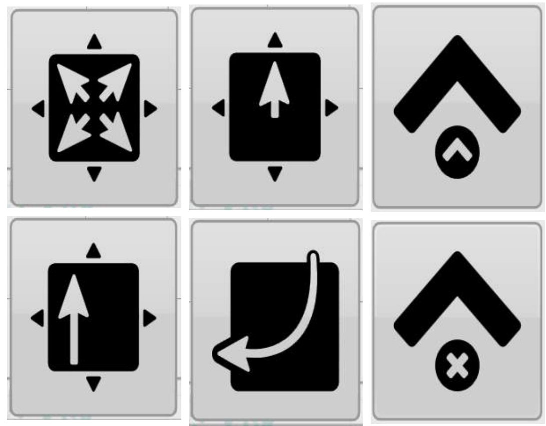


Split Drain (limited to surveying and surfacing)

Delete Points (limited to surveying and surfacing)

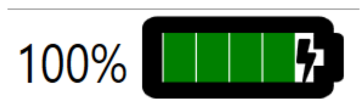


Tracking Options (limited to surveying and implementation)



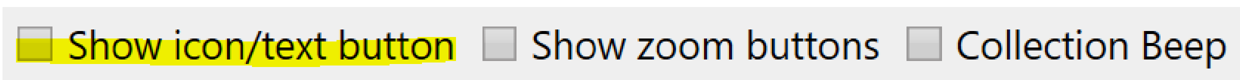
Screenshots

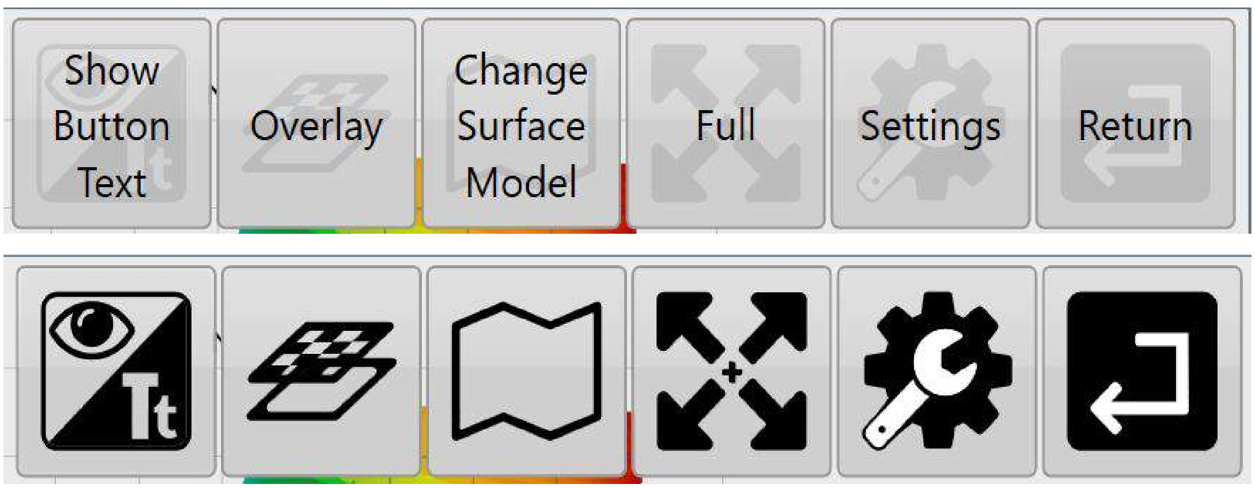
Battery power indicator



Show Text Button

This button can be found in all the map pages. It allows the user to switch the buttons from showing icons to showing text. This button can be enabled or disabled using the checkbox '**Settings > Application > Show icon/Text button**'.





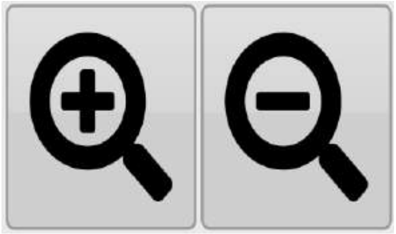
For a youtube video tutorial on showing button text and zoom controls visit https://youtu.be/LJbVzyvFydI or use your phone to scan this barcode

Zoom Controls

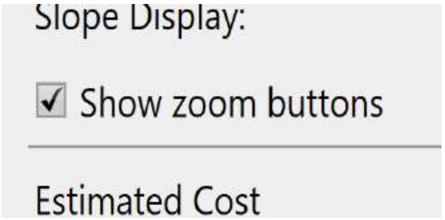
There are multiple methods available for zooming your map.

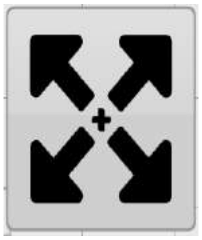
The first method that can be used is the 2-finger pinch controls. By pinching your fingers together on the screen you can zoom out and by moving your fingers apart you can zoom in.

The alternate method is the use of zoom in and zoom out buttons that can be added to the bar along the top right.



The zoom buttons are not shown by default. To enable these buttons check the '**Show zoom buttons**' box under '**Settings > Application**'.

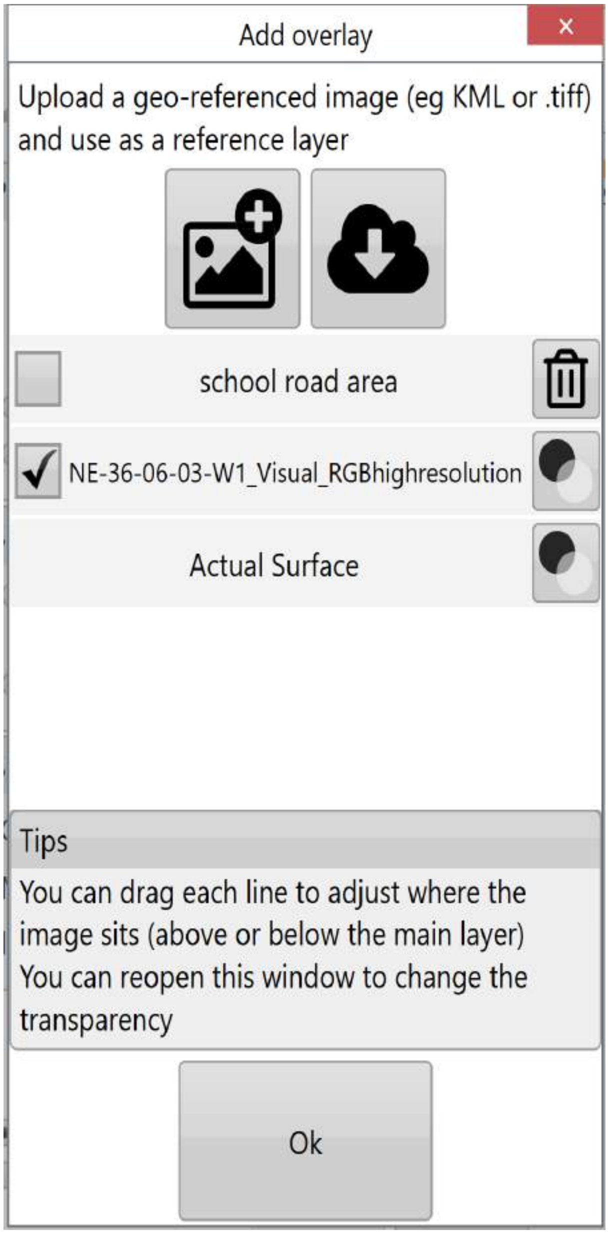




Independent of these zoom controls is the '**Zoom to full**' button, this button does NOT need to be enabled. When pressed the button zooms the map in or out to the maximum size that shows the entire surface grid of the map.

Image Overlays

‘Image overlays’ allows geo-referenced image data to be imported into a field.
The image overlay is accessed by pressing the button at the top of the screen (Shown right).



Add image
This is the primary method for adding overlay images to the field. When the button is pressed a file window will open to select the desired file. The file types that are currently supported as overlay images are **.KML** and **.TIFF**.

Load image from JDOC
Images from the *John Deere Operations Center* can be downloaded into the image overlay. This is useful for comparing previous data (such as yields) with current survey data.

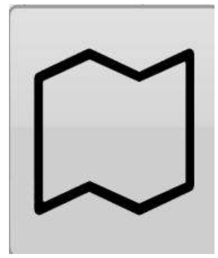
Delete images
Overlay images can be deleted by unchecking the box next to them and pressing the ‘delete images’ button. This will delete the layer from the available list.

Transparency
Overlay images can be set to be transparent so that layers below them can be seen. Check the box to the left of the layer and then press the transparency button on the right side.

Layers

Pressing on any of the layers will cause it to be displayed over the others.

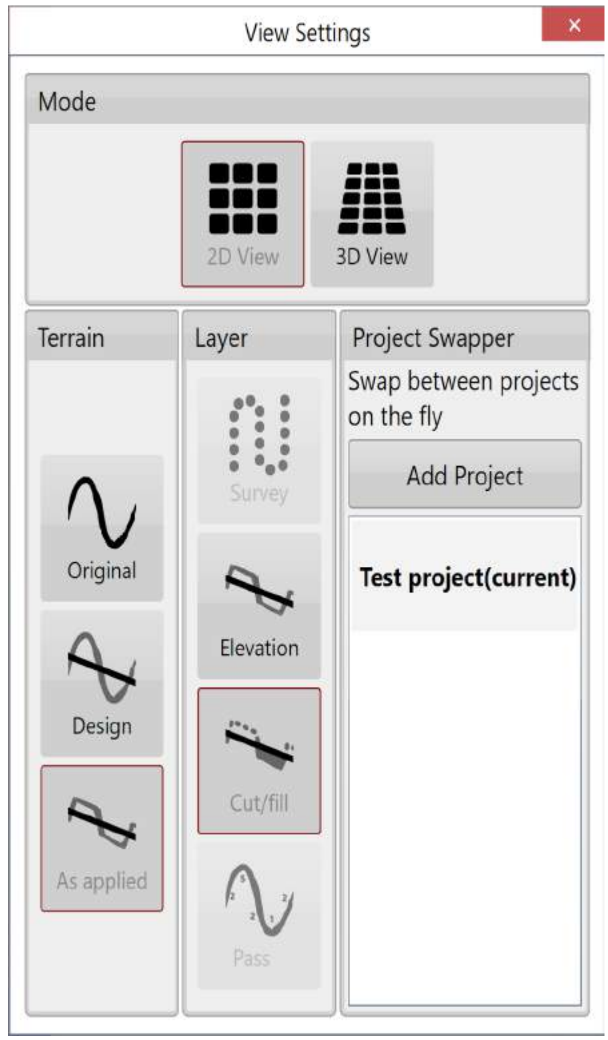
Choose Mode/Terrain/Layer



When viewing a map you have a variety of display options.

Mode

2D View - By default the map will be displayed in a 2D aerial view.



3D View - When switching to 3D view the map will show all the terrain as small hills and valleys. In this viewing mode if you press the vertical scale magnifier (shown here) it will increase the exaggeration of these hills and valleys so that they can be more easily identified.

The focal point when viewing in 3D can be changed by quickly double tapping on a position.

Terrain

This refers to the source for the 3D topography of the map. There are 3 options:

Original - this terrain viewing mode shows the map as the original surface prior to any dirt being moved.

Design - This viewing mode shows the design that has been applied. This is the surface that you are attempting to reach at the end of the dirt moving process.

As applied - Displaying the map using this method shows changes as they occur. It shows a real-time representation of progress as work progresses (this terrain is only available if '**As applied**' mapping has been enabled in the machine tab of '**Settings**') Cutta Ditch

Layer

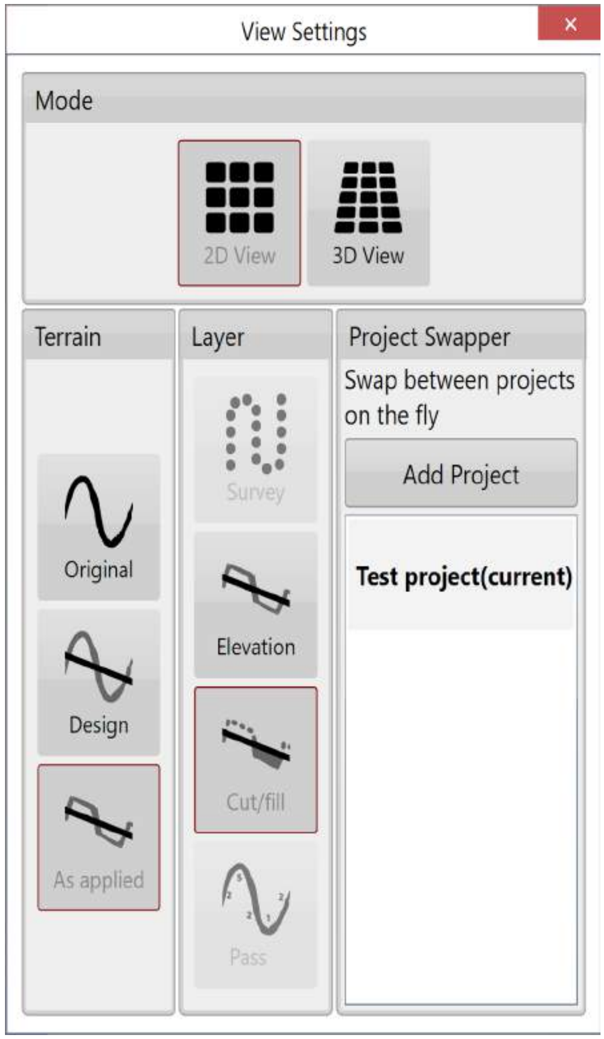
These are images that are displayed over the terrain. Options are:

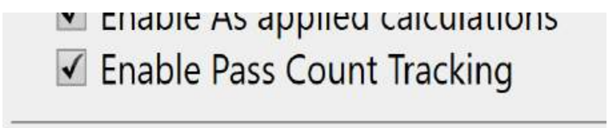
Survey - This layer shows all the points that were collected during surveying. It allows you to easily see whether points that were collected are for drain or field. (only available when surfacing)

Elevation - Displays the map in a Red to Blue gradient scale with Red being low areas and Blue being high areas.

Cut/Fill - Shows where the design will be taking dirt from and where it will be putting it. Coloring of this layer depends on the Cut/Fill color scheme in effect (Settings > Application).

Pass - This layer displays how many passes you have done over an area. (this layer is only available once pass count tracking has been enabled in Settings > Machine as shown below)





For a youtube video tutorial on modes and layers visit https://youtu.be/x5FrylWjpfk or use your phone to scan this barcode

Choose Model/Layer Cont.

Project Swapper:

Project swapping is a unique function for T3RRA software. It allows you to load multiple projects and switch between them easily without needing to constantly save, close, and load files.

When swapping between projects, it is important to set zero. Then before implementing, make sure you save each project. By setting zero and saving you will not have to re-zero your system when swapping between projects.

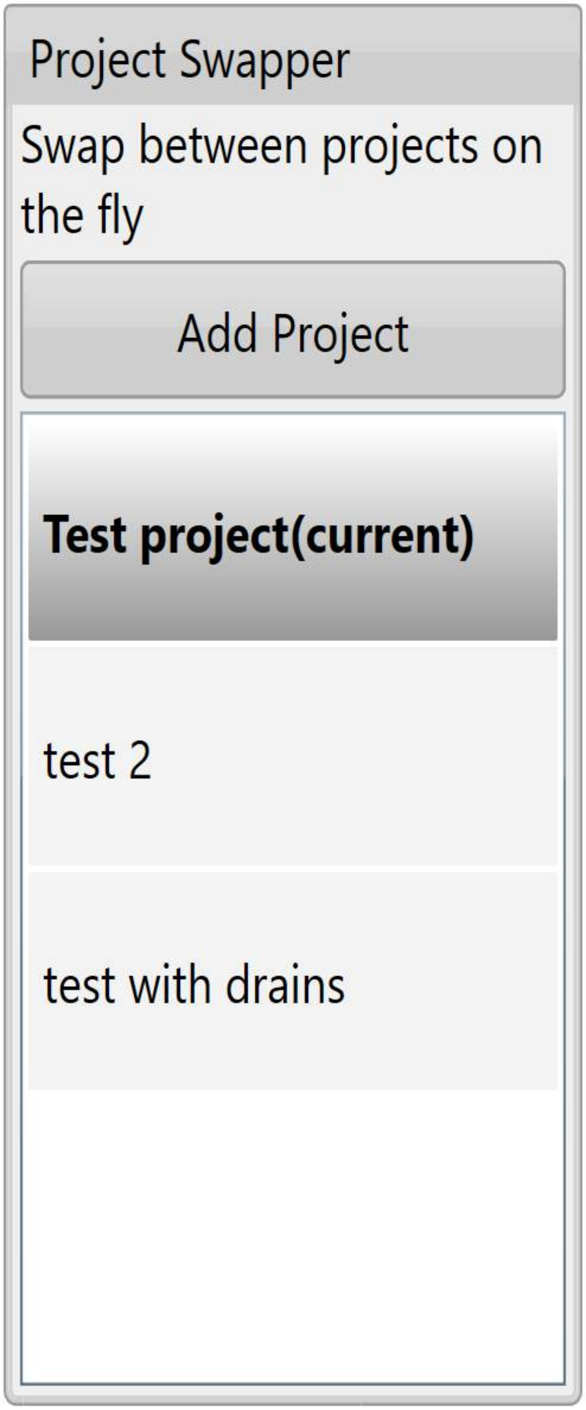
'**Add Project**' will open the same window used for loading a file.

Once you have loaded a file, it will be added to the list in the bottom portion of the window.

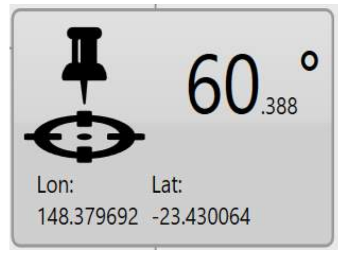
Pressing any of these files will swap you to that project.

All files that are loaded are subject to normal autosave backups.

NOTE: Projects are stored in memory. Loading too many projects may cause performance issues. We recommend not loading more projects into the '**Project Swapper**' than are needed for the current job.



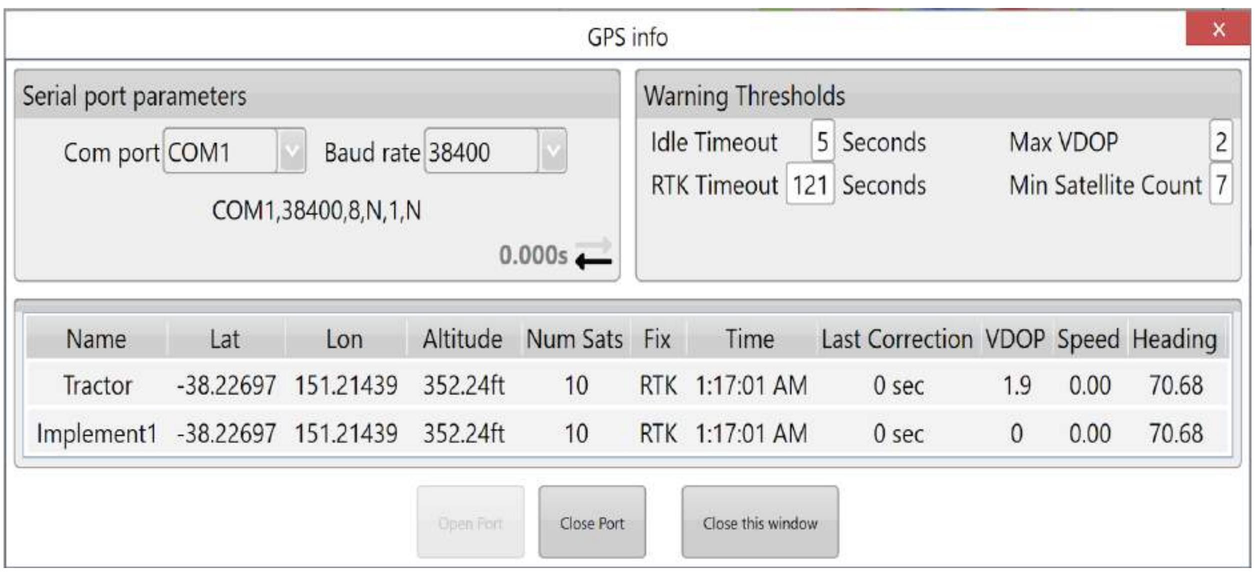
GPS Data



In the lower right corner of the screen is the GPS information button. It displays the latitude and longitude of your current position as well as your current heading.

NOTE: Right-clicking (press and hold) on this button will reveal a context menu with the option to display coordinates in UTM format.

When you press this button the '**GPS Info**' window will open with more detailed GPS information.

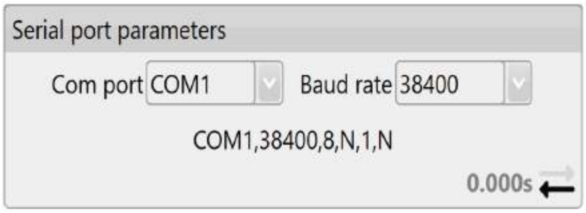


This window provides the following information:

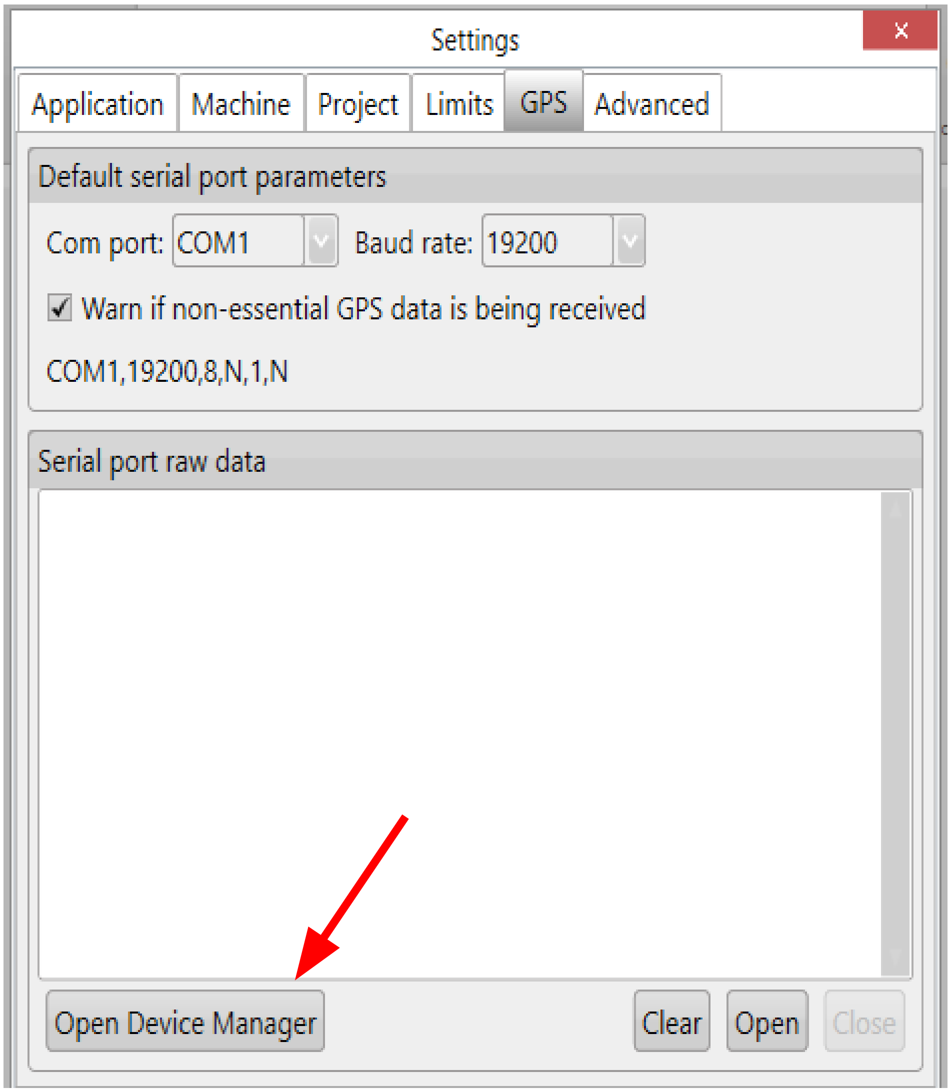
- **Serial port parameters:** displays the current settings for the com port and baud rate that is being used. There are flashing arrows which indicate that the software is sending and receiving information.
- **Warning Thresholds:** used to set limits for certain parameters. When these thresholds are being approached the borders of the screen will flash orange, once any of the thresholds have been exceeded or connection to GPS is cut the borders of the screen will flash red.
- **Output:** shows all the GPS information currently being received.

Serial port parameters

Com port: The Com port # is assigned by the adapter. In the drop down box you can find all available com ports. It is important that this is set to the serial port that is physically attached via cable to the iGrade™ Application Controller.



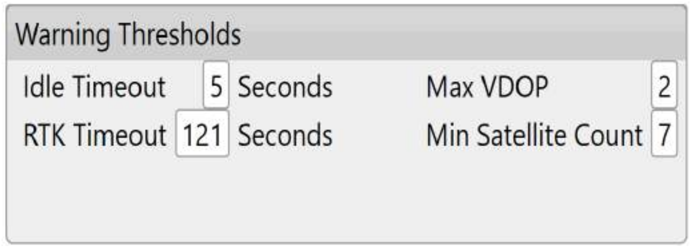
Diagnostic information about current serial ports can be found in the Windows Device Manager. One way of accessing this Windows tool is via the button in 'Settings > GPS'.



Baud rate: The speed at which the system talks to iGrade™. It is important that this matches the iGrade™ settings or the T3RRA software will not be able to talk to iGrade™. When connected to iGrade™ v1, set the baud rate to 38400 in iGrade and T3RRA settings. When connected to iGrade™ v2, set the baud rate to 115200 with **NMEA Message Type** set to "All". Ensure the baud rate in iGrade™ and T3RRA settings match.

Warning Thresholds

Idle timeout: If no GPS messages have been received in this time period an error warning will show.



RTK Timeout: This monitors the time since the last good RTK correction packet was received. It should not normally be set above 10-20 sec.

Max VDOP: Vertical Dilution of Precision is a measure of the altitude accuracy. For the most accurate implementation you will want this value as low as possible. Setting lower than 2 may cause interruptions in the use of T3RRA software as satellites change position throughout the day.

Min Satellite Count: Sets how few satellites the GPS needs to see before a warning is shown.

Output

Name	Lat	Lon	Altitude	Num Sats	Fix	Time	Last Correction	VDOP	Speed	Heading
Tractor	-38.22697	151.21439	352.24ft	10	RTK	1:17:01 AM	0 sec	1.9	0.00	70.68
Implement1	-38.22697	151.21439	352.24ft	10	RTK	1:17:01 AM	0 sec	0	0.00	70.68

Lat & Lon: Your current location coordinates (latitude and longitude).

Altitude: Your current height (Displayed in chosen measurement format) above sea level.

Num Sats: The number of satellites that your GPS is currently tracking. This is linked to the Min Satellite Count in Warning thresholds and provides an error if this number drops below what is set there.

Fix: The type of position solution calculated.

Time: The current GPS time.

Last Correction: Time since receiving the last differential correction message from the base station. Should be as low as possible for the most accurate readings. It is linked to the RTK Timeout in Warning thresholds and will provide an error if it exceeds that time limit.

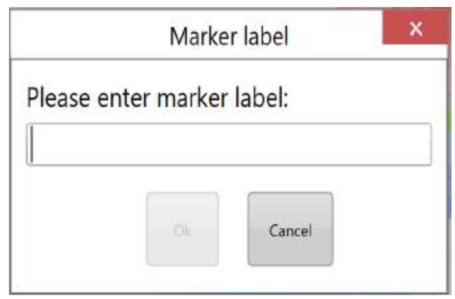
VDOP: Vertical Dilution of Precision. If this number exceeds the value in the Max VDOP in warning thresholds it will show an error.

Markers

Markers on designs allow for setting points of interest at user-selected locations. This includes using a marker as a benchmark "control point" location in the design. To use a marker as a Benchmark Location, refer to **'Set Zero using a marker'** in the Implementation section of this manual.

Set marker - use this tool to set a marker on the map. Markers are always placed at the current location.

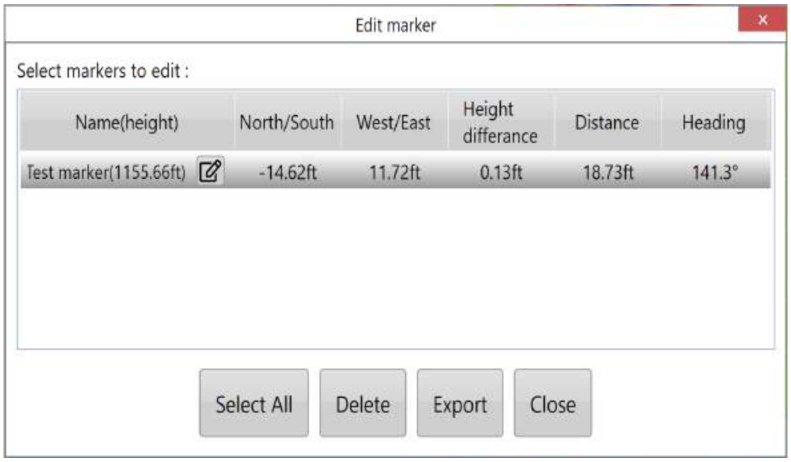
When a new marker is created a window will appear allowing a name for the marker to be entered.



For a youtube video tutorial on setting markers visit https://youtu.be/sk7BdYk62K8 or use your phone to scan this barcode

Edit Marker - this opens a window that allows you to select any marker on the map and edit it.

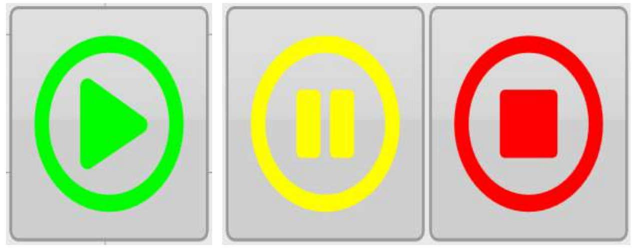
The 'Edit Marker' button will open the below window allowing you to see the information of each marker that has been placed including heading, distance and height of the marker relative to your current position.



Pressing the button next to the marker name will let you change the name of the marker.

The buttons at the bottom of the window allow you to select all the markers, delete the currently selected markers, export the currently selected markers and close the window.

Start, Pause and Stop controls



In the Surveying and Implementation screens the '**Start**', **'Pause**', and '**Stop**' buttons are used to control the beginning and ending of the relevant activities.
These buttons do have slightly different functions depending on when they are used.

Normal function:
During normal function these buttons will act in the following way.
'**Start**' will begin the system either surveying data or implementing a design. It will also start logging path counts (if enabled).

'**Pause**' is only applicable to Surveying. The use of the pause button in surveying is to allow you to continue a path after moving around obstacles. For example surveying a drain, pressing the pause button and moving then the start button will tell the system that the same drain continues where you are.

'**Stop**' will stop the surveying of the area or the implementation of a design. Using the stop button in surveying tells the system that when you press start next it is a separate area. Using the same example as pausing, if surveying a drain pressing the stop button moving and then the start button will tell the system that this is a new separate drain.

Drain Surveying function:
The '**Start**' '**Pause**', and '**Stop**' buttons will change function slightly when the software is set to survey drains.
'**Start**' will start the system surveying a drain.

'**Stop**' will end the current drain survey. Pressing '**Start**' after this will start a new drain.

Pausing collection is designed to allow for situations where the collecting vehicle cannot physically traverse a section of drain line.

Survey point edit controls

When modifying survey collected data there are a couple of tools that share function between drain and field survey data.

Common tools in drains and field survey

During surveying and surfacing, there are '**Delete points within a circle**' and '**Delete points along a line**'. Two tools that are available to edit both drains and fields survey points. Telling them apart at a glance, the field tools will have the circles in the icon while the drain tools will have squares in the icons (as shown below).

Drain

Field

Drain

Field

These two functions operate in very similar ways. Press down on the screen at a starting position and then drag away from that position to define the extent of the deleted area.

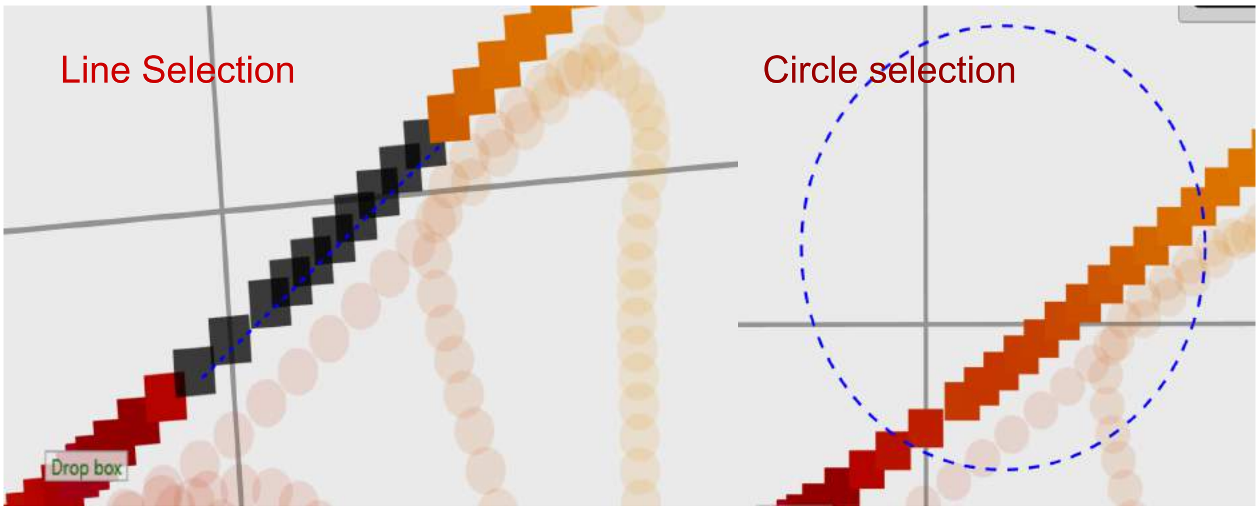
'**Delete points within a circle**' will delete everything within the circumference of the drawn circle. Press down at the center of the circle and then drag outwards.

'**Delete points along a line**' will delete all consecutive points between point A and point B. Press down on the point where you would like to start, drag the point to an end point. All points that had been collected on that path between these 2 points will be selected to be deleted.

While these functions are in use their buttons will display large red circles on them. This indicates that deleting is active. This is to help make sure you do not accidentally delete things while trying to perform other tasks such as moving the screen or zooming. Pressing the buttons will cancel selection.

When one of these tools has been activated you can begin selecting points to delete.

To select an area, press and hold where you would like to start and move to the end point of what you want to delete. Or in the case of the circle press and hold, dragging until the circle has everything you want deleted inside it. A blue dotted line will show what you are about to select.



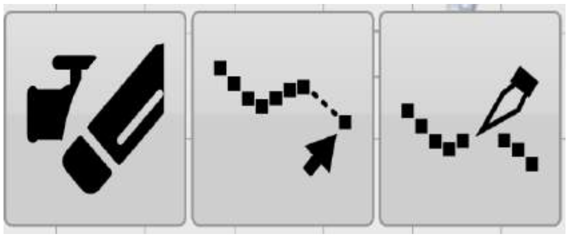
Once selections have been made press the delete button to confirm that you want to delete that area.

For a youtube video tutorial on deleting points visit https://youtu.be/Q0581DSU7j4 or use your phone to scan this barcode

Drain specific edit controls

The following tools become available in the '**Collection**' and '**Surfacing**' stages if drain survey points exist.

- Delete drain
- Extend drain
- Split drain

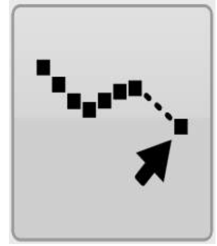


Delete drain

This button allows you to delete complete drain paths from the project.

After pressing the '**Delete drain**' button a window will appear with a list of available drain paths. Select a drain from the list, and then delete it.

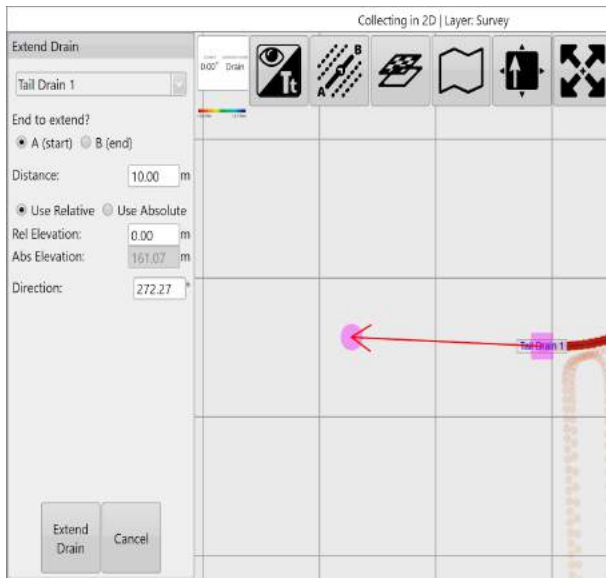
Extend drain



This tool allows you to arbitrarily extend a drain from either end of the surveyed path. This can be useful if the drain needs to extend to a location that was not directly accessible by the surveying vehicle.

Pressing the '**Extend Drain**' button will bring up the below screen. This screen allows you to extend the drain in whatever direction you wish.

The red arrow shows the direction in which the drain will be extended, as well as which end of the drain will be extended.



Use the controls on the left hand side to select a drain. Then choose the length, elevation, and direction of the extension.

'Relative elevation' is a value relative to the last elevation point collected. It places a point relative to the last elevation either +/-.
'Absolute elevation' allows you to extend the drain line to a known elevation. It provides the last elevation collected for reference.

For example, to extend the drain 1ft below an ending elevation height of 100ft:
Relative -1ft
Absolute 99ft

Once you have finished making these adjustments press the '**Extend Drain**' button.

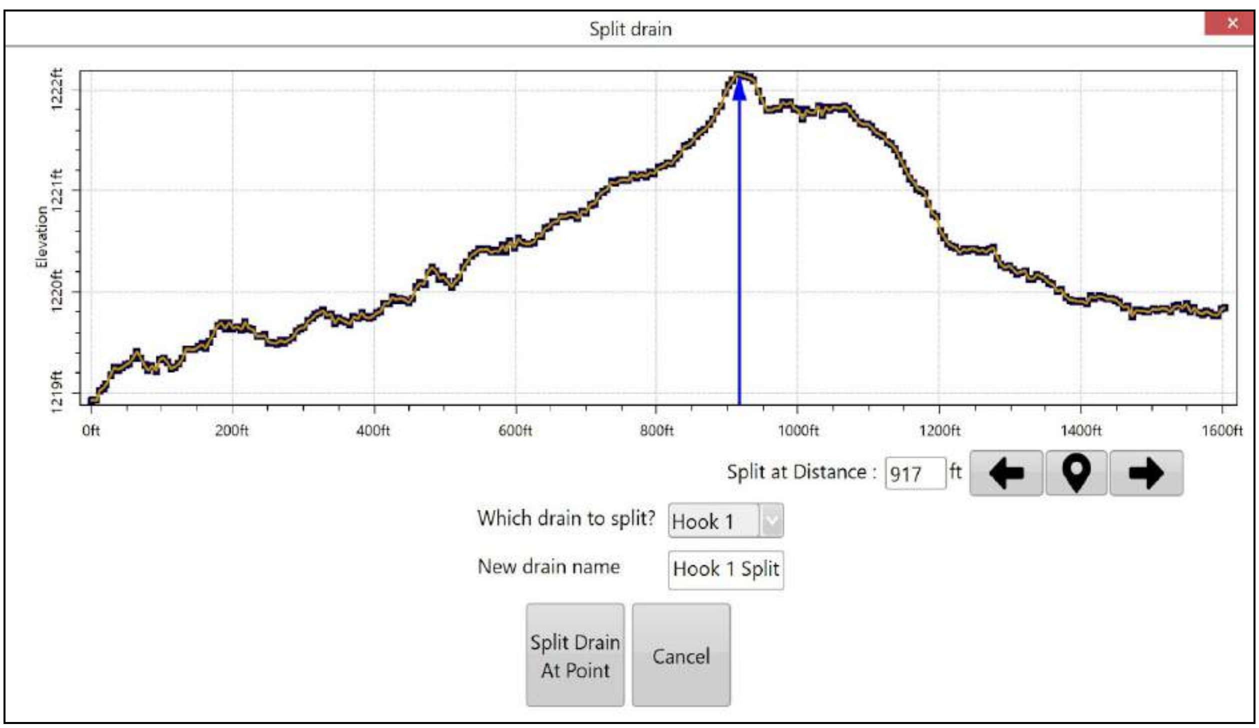
For a youtube video tutorial on extending drains visit https://youtu.be/G3HQhuOQewQ or use your phone to scan this barcode

Split drain

Split drain allows you to split a drain into two separate drains.

For a youtube video tutorial on splitting drains visit
https://youtu.be/slorWX6Yhds or use your phone to scan this barcode

First select which drain it is you wish to edit from the '**Which drain to split?**' drop down menu in the bottom center.



Once a drain has been selected you can press anywhere along the drain profile. A blue arrow will appear to show where the split will occur. The arrow can also be moved using the left and right arrows found to the right of the '**Split at Distance**' option.

Create a Marker for referencing by choosing the Marker button.

Name the new drain using the '**New drain name**' text box. Once you are happy with all of these settings press the '**Split Drain At Point**' button to apply the split.

NOTE: The new drain name cannot be the same as an existing drain. The '**Split Drain At Point**' button will become disabled in this case.

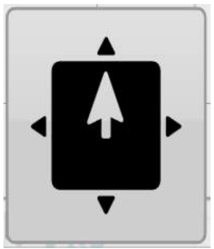
2D Current Position Tracking Options

When surveying or implementing there are 4 options that control how vehicle location is tracked on the screen in 2D. The options for 2D tracking are '**Scroll**', '**Center**', '**Dir. up**', and '**Manual**'.

Scroll

This option will show the GPS position indicator moving freely on the screen and will move the screen as the indicator approaches the edge to ensure that the indicator is always present on the screen.

Dir. Up



When the '**Direction Up**' option is active the map will rotate to make sure that the direction of travel is always to the top of the screen.

Center

The Center option has 2 parts, first it locks the indicator to the center of the screen so as it moves the map moves to make sure it stays in the center. The second part is that the map is locked to always have north at the top of the screen.

Manual

This option makes it so that the system does not lock the direction of the map or fixate on the location of the indicator so that even while surveying or implementing you can inspect other sections of the map. Caution: in this mode the vehicle icon can move off the edge of the map.

3D Current Position Tracking Options

When surveying or implementing in 3D there are 2 options available. The first option is '**Follow Tractor**' and the second option is '**Stop Following**'.

Follow Tractor

This option keeps the tractor at the center of the screen at all times, the camera will be placed behind the tractor when pressed.. While in 3D viewing the camera can only be moved to view the tractor from various angles and will rotate with the tractor as the primary focus.

Stop Following

This option stops the camera from following the tractor. While using this option the tractor is able to drive off the edge of the screen and the camera will not follow it, however whenever a change is made to the camera angle it will snap back to the tractor's current position and use the tractor as the focal point.

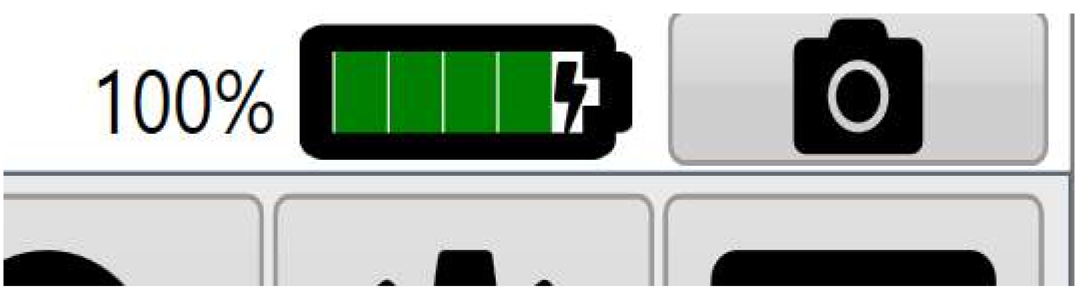
Screenshot

In the top right of any mapping window is a small button with a camera. Pressing the camera button will take a screenshot of what  is currently on the screen.

After taking a screenshot a pop-up window will appear (shown below). Pressing 'Yes' will open the folder where the screenshot is saved.

Battery Level

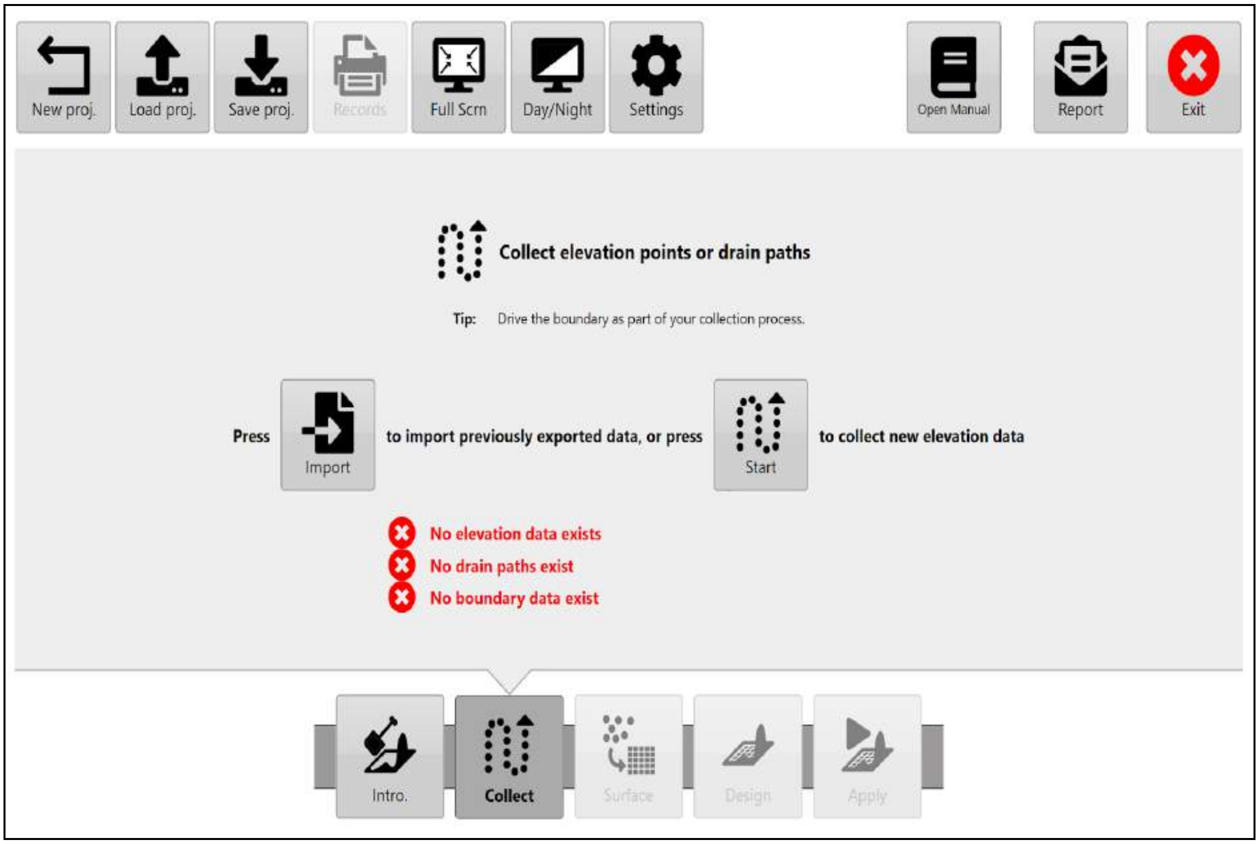
In the top right of the screen next to the screenshot button you will find the Battery level indicator.
This indicator displays the tablet/computer's battery level and whether it is plugged into power or not.



Data Collection/Surveying

Cutta Ditch Plane Levee Survey

NOTE: See the previous section 'Common tools' for in depth information about certain of the controls within the Data Collection/Surveying section.



Surveying Overview

The '**Collection**' wizard step allows you to collect elevation heights from your field. This is done to create a topographic representation of the field surface.

In T3RRA software collection is normally accomplished by driving over the surface of a field while logging GPS elevations. Once sufficient points have been collected (surveyed) they are then processed in order to create a Digital Elevation Model (see definitions). In T3RRA software we refer to this process as '**Surfacing**' and this is performed in the next wizard step.

The key concept with surveying is: "*Collect enough points to create a good surface, but no more*".

If you do not collect enough points from the field you will end up with a poor representation of the field. If you collect too many points you will have wasted time and fuel in order to create a surface that is not markedly better than one created from fewer points. As well as the number of points collected, the accuracy of the final surface depends on *where* the points are collected.

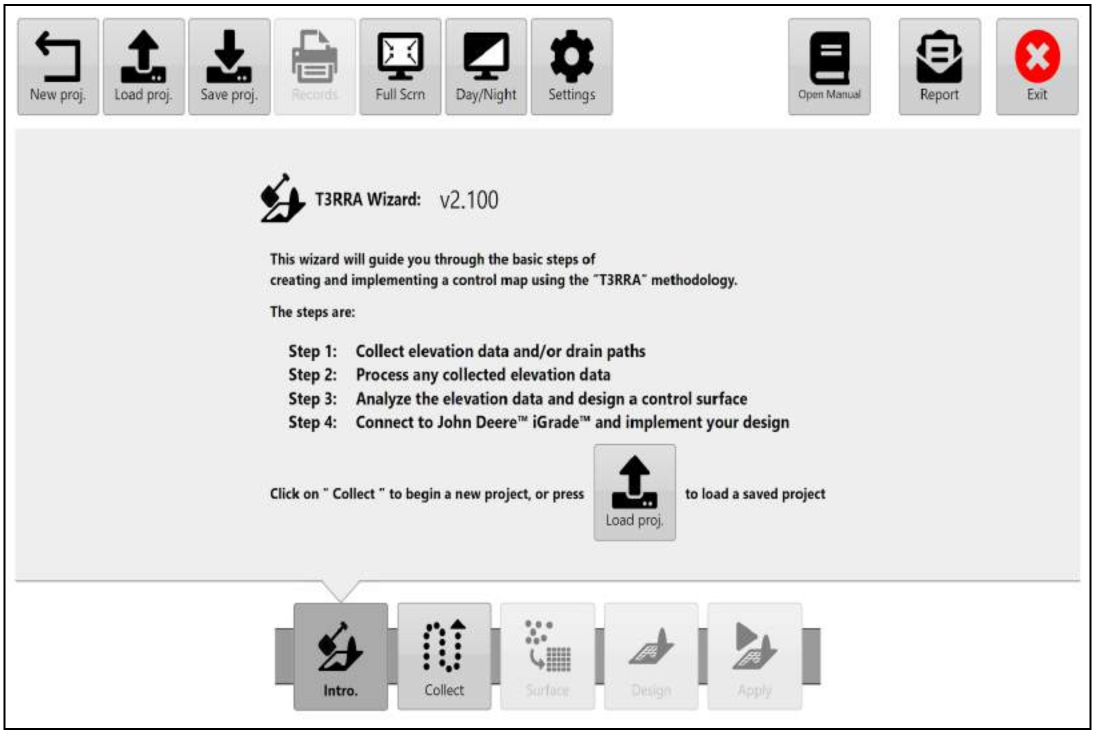
Getting a good representation of the field surface is not a difficult task. Getting a good surface representation while minimizing time spent doing it requires more effort and experience. Figuring out the total number of points to collect, and the best pattern to collect them in, is an art that requires experience. If you do a lot of it you will soon start to understand how to improve and optimize your surveying technique.

However, new and casual users need not despair. In general, we would advise users not to attempt to optimize this activity too much. Extra time spent getting a good survey is usually insignificant relative to the time spent moving dirt. A thorough survey and an appropriate design will save far more dirt moving time than any time added while over-surveying.

Also, be sure to read the section 'Surveying tips' later in this document.

The ‘Collect’ wizard page

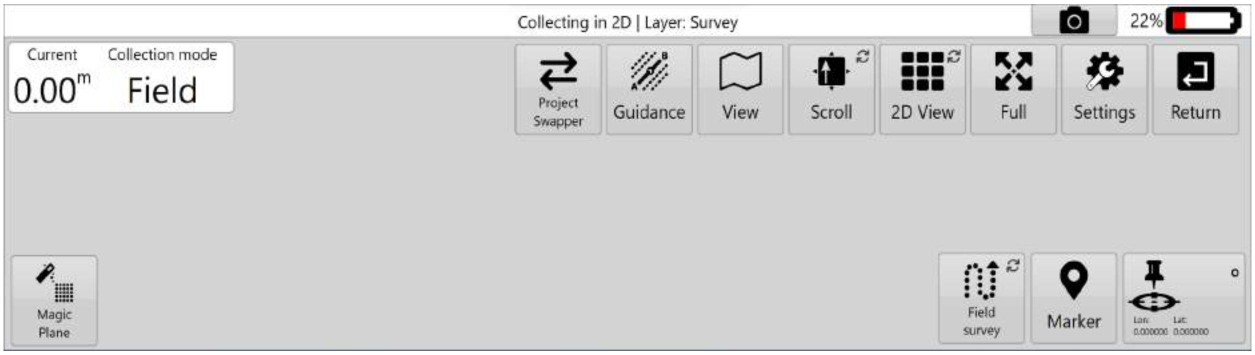
If you are at the Main Page and want to begin surveying first press the '**Wizard**' button.



Then choose the second wizard step ‘**Collect**’ at the bottom of the page. This will take you to the ‘**Collect**’ wizard page.

You are able to import existing data from other sources (such as CSV for Field and Drain surveys). Press the '**Import**' button to import existing data.

To begin collecting elevation points use the '**Start**' button (in the center section of the screen). If data has previously been collected this will still be present when you enter the mapping screen.

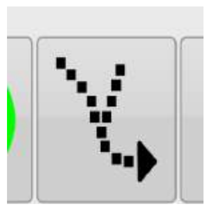


We consider it best practice to *drop a marker for reference* prior to beginning any survey. Do this at a location you know you can return to reliably. This will assist you in shifting the survey points in the future should it become necessary to do so.

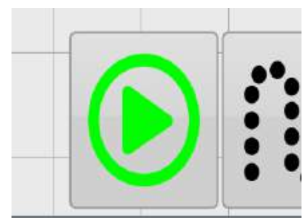
Before collecting elevation points you must decide whether you are collecting data for a full field, for a drain or a boundary. We distinguish between these three

collections because the way the data is processed in subsequent steps is quite different. You can however collect drains, full field and boundary surface points at the same time by swapping between them as required. Survey modes are swapped between by pressing the survey button in the bottom right of the screen until the icon for the type of surveying you wish to do is displayed or until the text in the top left corner of the screen reads as the type of surveying you would like to do.
NOTE: Best practice is to not overlap different survey types. Instead, press Pause when traveling over different survey points then Resume once clear.

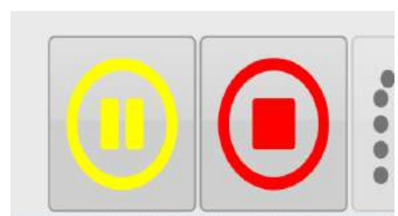
(the icons below: Field survey on left, Drain survey in center, Boundary survey on right)

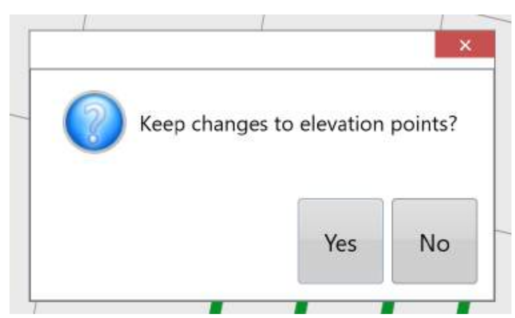

To begin collection select the ‘**Start**’ button.



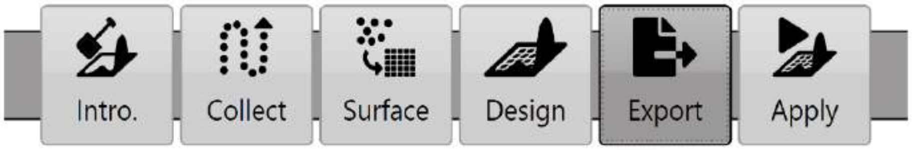
The ‘Pause’ button is used to finish data collection while moving around obstacles or avoiding replication of survey points, while the ‘**Stop**‘ button is used when data collection is finished.



When all collection and editing of data points is complete use the '**Return**' button to return to the main ‘**Collect**’ wizard page. You will be asked to confirm keeping changes to the elevation data.



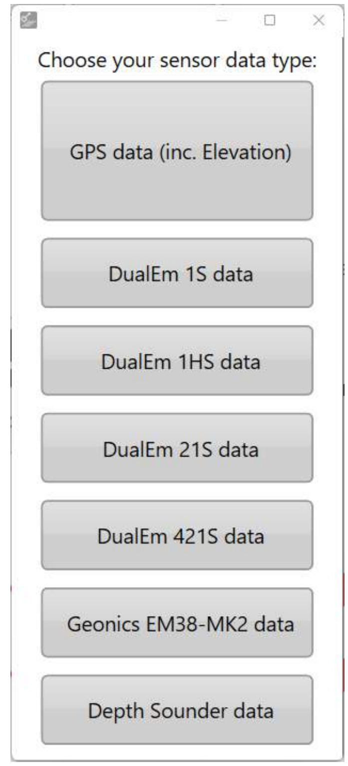
At this point it is recommended that you save your project. If you wish to save the file externally use '**Export**' wizard step



NOTE: You should always use '**Save proj.**' to save your T3RRA project. This saves in the native file format and is the easiest file type to reopen in T3RRA software. Exporting is optional, and depending on the type of export you perform you may not always be saving all the information that exists with your T3RRA software project.

For a youtube video tutorial on exporting survey data visit https://youtu.be/ikGuhZYBri8 or use your phone to scan this barcode

Surveying with extra sensors (T3RRA Survey only)

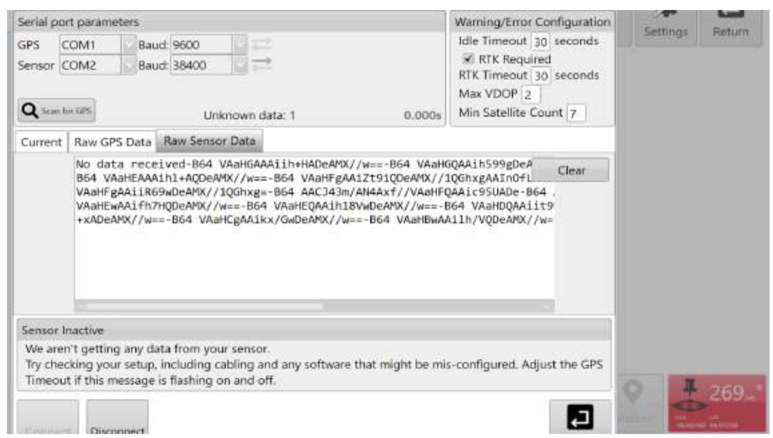


T3RRA Survey allows you to bring data in from additional survey types. When you hit the “start” button to begin surveying, you will be presented with various options.

Choose the first option (GPS data) if you don’t have anything additional to collect with.

After choosing your sensor, the collected elevation points will be based on the sensor, so you get a color gradient showing the collected sensor data. The “Current” in the top left of the screen will also show your current sensor value.

The GPS screen will allow you to debug the sensor data

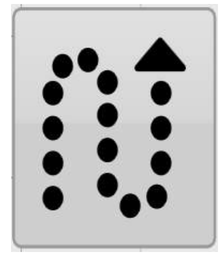


After you’ve selected your sensor, surveying works the same as for the other tools, so read on to learn more about the available options to you.

How to export/view surveyed data

To export all the data gathered in the survey, go out to the wizard step and go to the final step “Export”. Currently, “CSV” and “PCT AgCloud” exports will allow the sensor data to be retrieved.

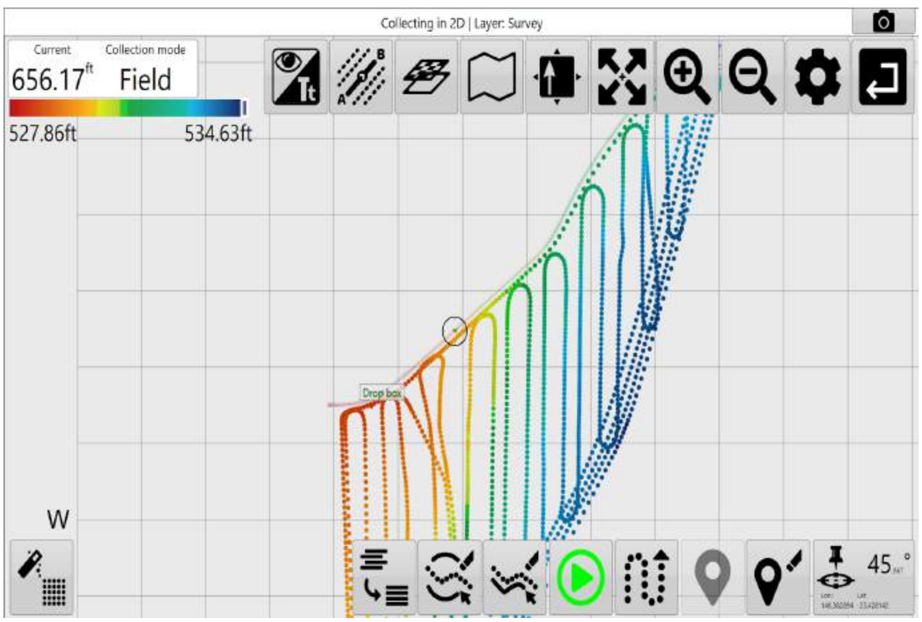
Field Surveying



When you enter surveying you will be in Field surveying mode (except in T3RRA Ditch where Drain survey mode is the default). Points that are collected in field survey mode are shown on the map as circles.

We do not require you to collect a field boundary when surveying. Some do consider it best practice to drive the perimeter of a field regardless, collecting elevation points as they go.

When surveying fields travel slowly across the field to ensure that plenty of data is recorded for an accurate representation in later stages.



We recommend between 30-50 feet (9-15 meters) between survey passes to ensure that enough information is gathered. The “best” spacing is dependent on the specifics of the work being done. The wider the swath that is taken the less information that is gathered.
Collected points can be deleted using the two available methods:

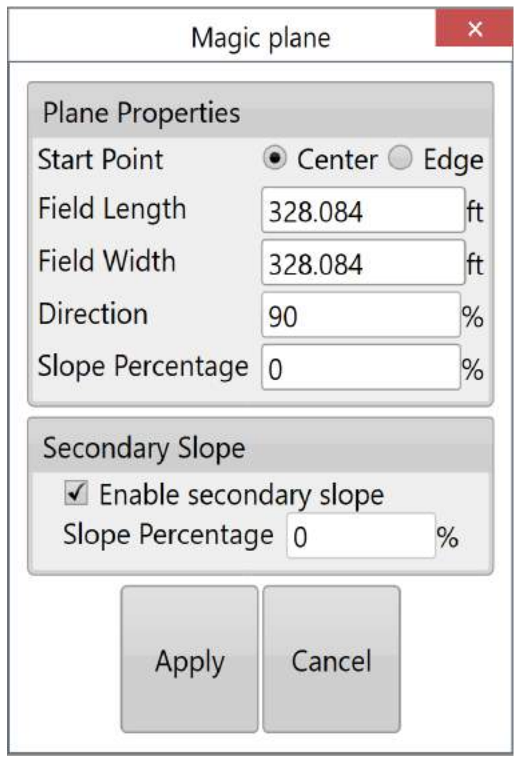
- Delete in a circle.
- Delete points in line.

Markers can also be placed and deleted.

Magic plane

The Magic plane is a shortcut method for creating a plane of survey points without actually having to collect them. This can be used when the grade and direction of the desired plane is known and getting accurate cut/fill volumes is not required. An example would be a building pad.

NOTE: If you use '**Magic plane**' as your original surface you are unlikely to be able to create an accurate cut/fill map. This is because the newly created plane is unlikely to match the actual real world surface. Any cut/fill map created from a design you place on a 'Magic plane' will be relative to it, and not the real world surface.



Start Point - The 2 options available are center or edge, this will generate the magic plane with your current location (or the location of some pre-existing surveyed points) at the center, or at the center of an edge.

Field Length - This is the length of the magic plane and can be adjusted as needed.

Field Width - This is the width of the magic plane and can also be adjusted as needed.

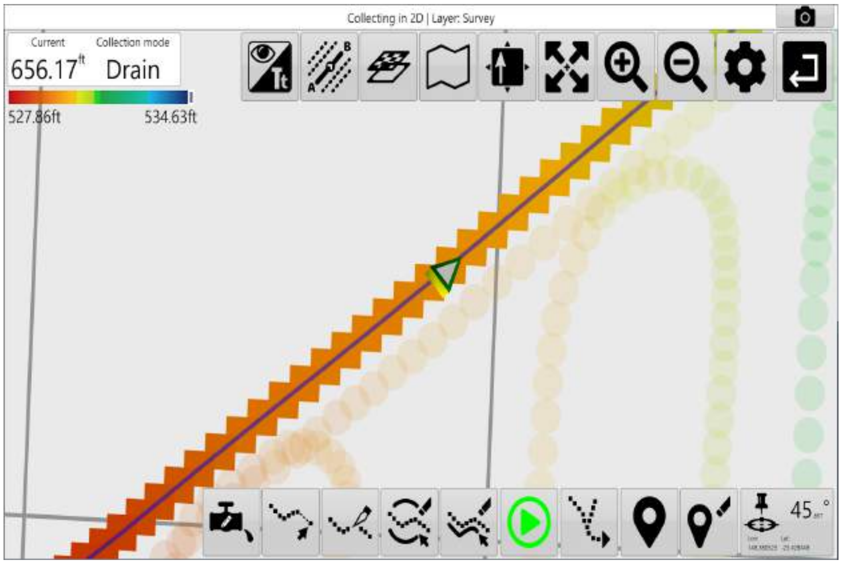
Direction - This sets which direction the magic plane is oriented.

Slope - This sets the degree of the slope (as a percentage).

Secondary slope - This is enabled by selecting the "**Enable secondary slope**" check box. (the secondary slope runs at 90° to the primary)

Drain Surveying

T3RRA has a drain collection mode that you must use when surveying drain lines. The button is at the bottom right of the survey collection map window.



When in '**Drain survey**' mode you must drive the length of the drain in order to collect the data. It doesn't matter whether you drive from source to outlet or vice versa. When points are collected in '**Drain survey**' mode the data points are displayed as squares.

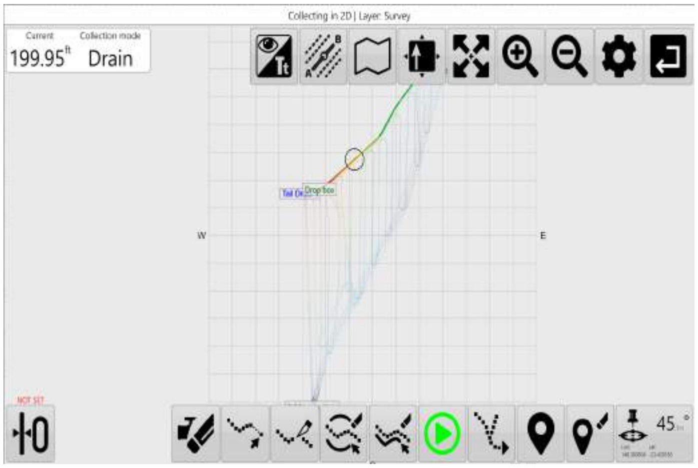
Available features:

- Delete all or portion of drain line.
- Extend drain's length.
- Split drains.

(see Drain specific edit controls)

After you have finished surveying:

- Design drains from either direction.
- Choose Best-Fit, Multi-Fit, or Linear-Fit drain design.
- Add batters/backslopes to drains.
- Export drains as guidance curves.

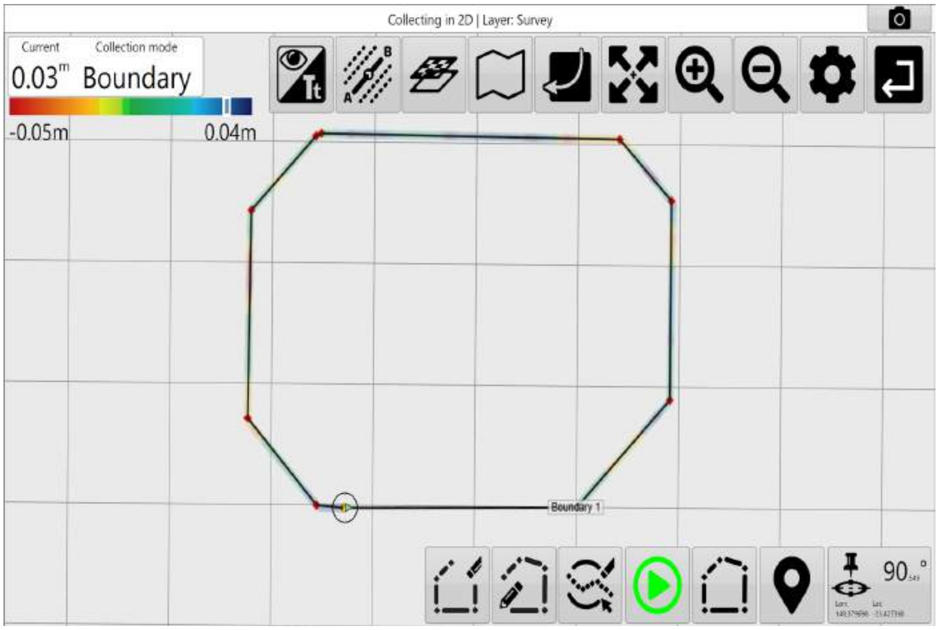


Boundary Survey

Boundary surveying allows you to survey the outer perimeter of a field which can be used for Design purposes.

In T3RRA software the boundary survey mode is located in the bottom right corner of the survey screen and is accessed by pressing the survey mode button until the boundary survey mode icon is displayed and 'Boundary' is displayed in the top left corner of the screen.

When using Boundary survey it is not required to survey the entire perimeter of the field. If you start your system in one corner of your field but you know the position you want to start from is directly across from you, you can survey the rest of the sides of the field and the Boundary survey tools will automatically close the boundary line once you press the stop collection button.



To make a boundary with few points (as shown above), simply start collecting a boundary while stationary, then pause collection while traveling to the next corner. Once at the next corner, resume collection for a few seconds, then pause to go to the next corner. In this way you can collect a boundary with only the points you want, but you can use the delete points tools to thin out extraneous points as necessary afterwards.

There are 2 tools specific to only Boundaries: Delete boundary, and Scale the boundary.

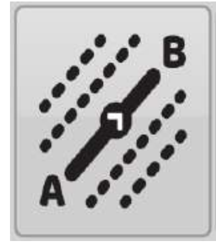
Delete boundary: allows you to delete a specific boundary if multiple have been recorded or if you wish to start the surveying over again. Elevation points that are collected while recording the boundary will remain even after the boundary has been deleted.

Scale the Boundary: this tool allows you to expand or retract the size of the boundary lines by moving each boundary line a set distance away from the original position to a maximum of 98ft (30m) and a minimum of -98ft (-30m).

Exporting boundary information: Boundary survey information can be exported as Shapefiles or as KML files

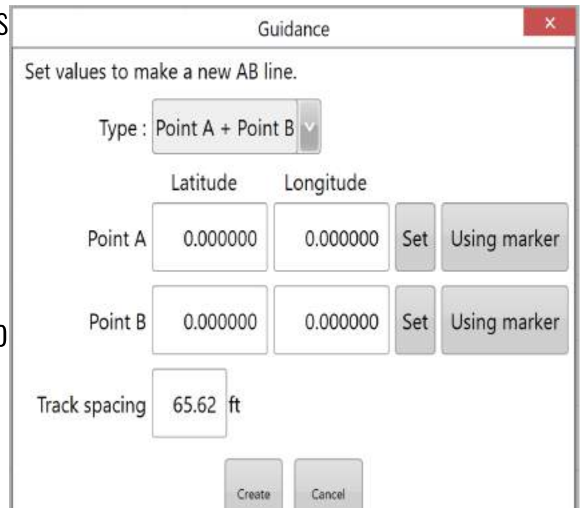
For a youtube video tutorial on Switching between survey modes visit https://youtu.be/CFoOmHY6tG8 or use your phone to scan this barcode

Survey Guidelines



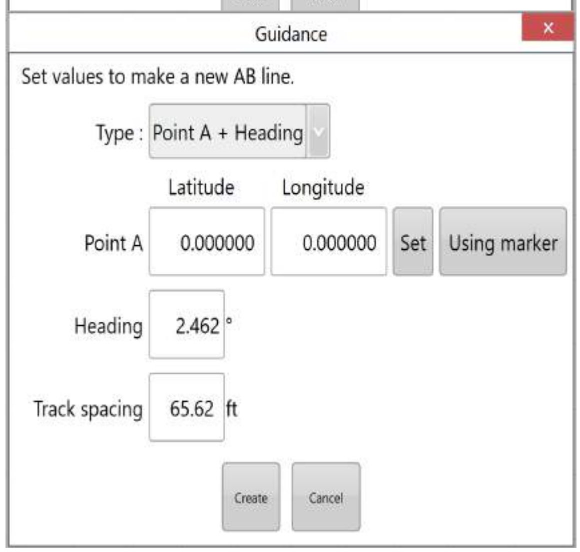
No matter what type of surveying you are doing you are able to implement guidance lines on the survey surface by pressing the guideline button at the top of the screen.

The guidelines button will cause a pop-up window to appear on the screen offering you several options in regards to how the guidelines will be placed. The default inputs for the pop-up window is through point A and Point B. These points can be set in 3 different ways



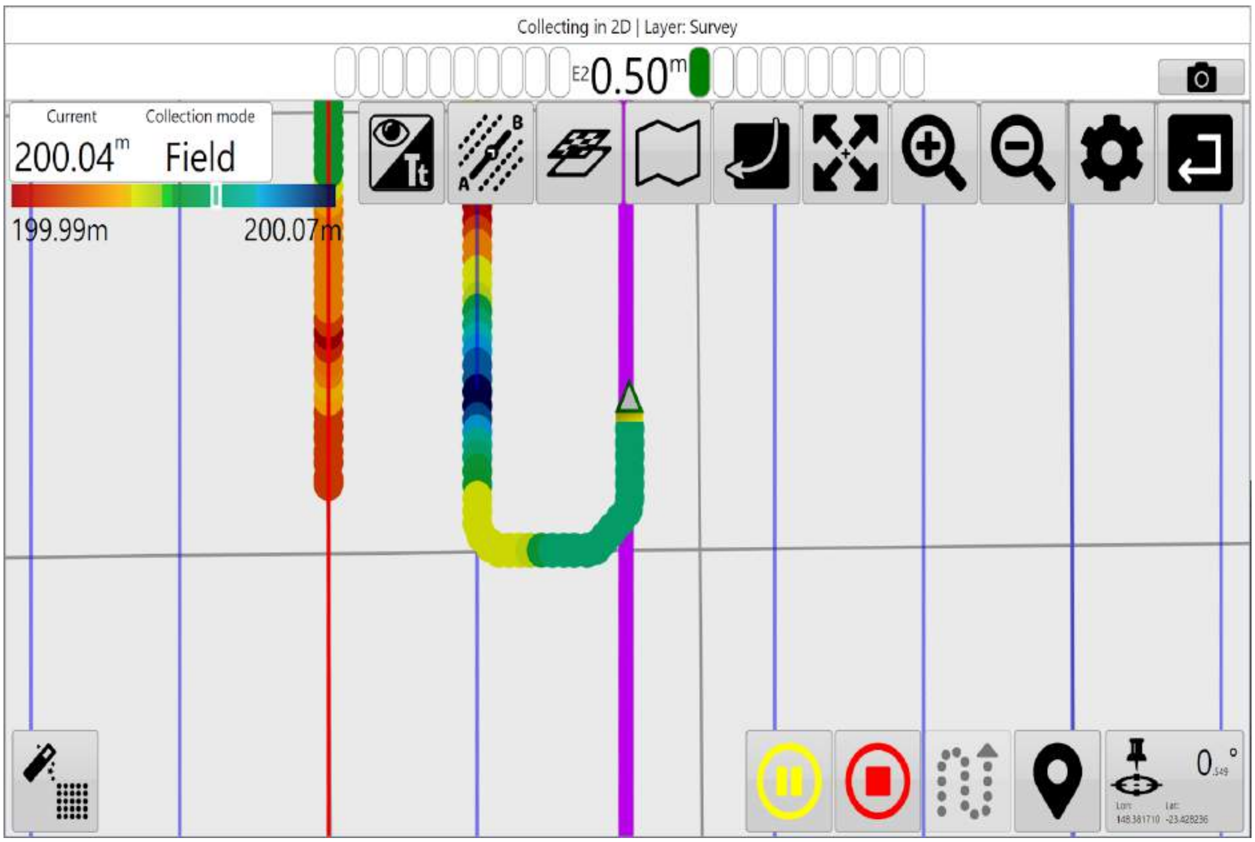
1. If you know the latitude and longitude for the points they can be input manually.
2. Drive to Point A and click “Set” then drive to Point B and click “Set”.
3. If you have recorded markers you are able to use their GPS locations for either or both of the points.

If you do not wish to use multiple points there is an alternative of using a single point (Point A) and your current heading. Like with using 2 set points Point A can be set using known latitude and longitude, current position or a set marker. The 2nd point in this option is then replaced with your current heading which can be manually adjusted to a heading of your choice.



Once the line creation method is selected the guidelines will then create a central line from the information provided and radiate lines moving out from it at spacing equal to what you have set in the ‘Track spacing’ section at the bottom of the pop-up window.
The lines made with the Guidelines tool will appear blue on the screen with the center line appearing red and the nearest one to your current location being highlighted bright purple.

In addition to the highlighted line, a light bar at the top of the screen will display a visual representation of how far you are from the nearest line, a measurement from the nearest line and an indication of which line it is displaying.
The line indicator is written in a method that represents the direction you are moving away from the center line and which number line it is from the center line. In the below image that shows the lightbar with measurement and line indicator, the line indicator reads E2 meaning it is the 2nd line heading east from the center line.



Surveying tips

Tips for Collecting Elevation Data

- Use a vehicle where the GPS-to-ground offset will remain constant (such as a tractor, truck, or ATV – not a harvester or self-propelled sprayer that will shift vertically depending on load).

- If the field you are surveying has wheel ruts, either stay in them or stay out of them. Do not alternate between them.

- Do not survey in fields where there will be variable wheel sinkage – ie., if part of the field is wet and part is dry.

- Trace the course of any waterways and banks you want to include in the elevation model. Drive the centerlines of such features, and also drive the shoulders.

- Ensure that your base station is within 1.5 miles (2.4 km) of the area you are surveying.

- Areas that exhibit a rapid change in slope will need to be surveyed more intensely (closer swath widths)

- Survey at a slow enough speed so the vehicle does not rock or bounce measurably.

- If you are using an implement based receiver to survey with, **DO NOT** alter the elevation of the implement while surveying. If using a scraper mounted receiver, raise the blade to full height before starting the survey and leave it at this position for the duration of the survey.

- Save your data as often as necessary. Consider how long it would take to re-do the work you would lose if your computer crashed at any point in the survey.

- Use markers to set benchmark height/control points.

- Collect elevation data on 30-50ft (9-15m) passes (no more than 80ft/24m). Complete more passes in areas of the field with detailed terrain.

- Try not to double survey areas. Use the *pause* button to skip over the already surveyed area before recommencing.

- Drop markers as required.

- Points are logged once every 2 meters (6.6 feet). The data received between these points will be averaged. This reduces the effect of noisy GPS (bumpy ground or bouncy implements).

- Preferably use 5Hz, as it will allow us to better compensate for noisy data.

Surveying FAQ

Q: Why are there gaps in the GPS surveyed data?

A: This can be caused because the GPS has stopped transmitting (check the connection) or it can be that the user has hit "Pause" or "Stop" on the T3RRA Display. Pausing can be used when one needs to stop surveying for a time and then resume from the same point. (ie, for a lunch break)

Q: Are there any limits on logged data?

A: We will only record a data point once every 2 meters (6.6 feet). Any data received that's less than 2m from the last logged point will be averaged into one record.

Q: What do we mean when we say we "average" the collected data into one record?

A: If we receive a GPS read every 50cm, we get 4 GPS reads every 2 meters. We take all of those data points and average their position (latitude and longitude) and their elevation to produce the dropped point. This allows us to compensate for the fact that the surface can be quite rough when surveying.

Q: Why does the logged point always appear about 1m behind the tractor?

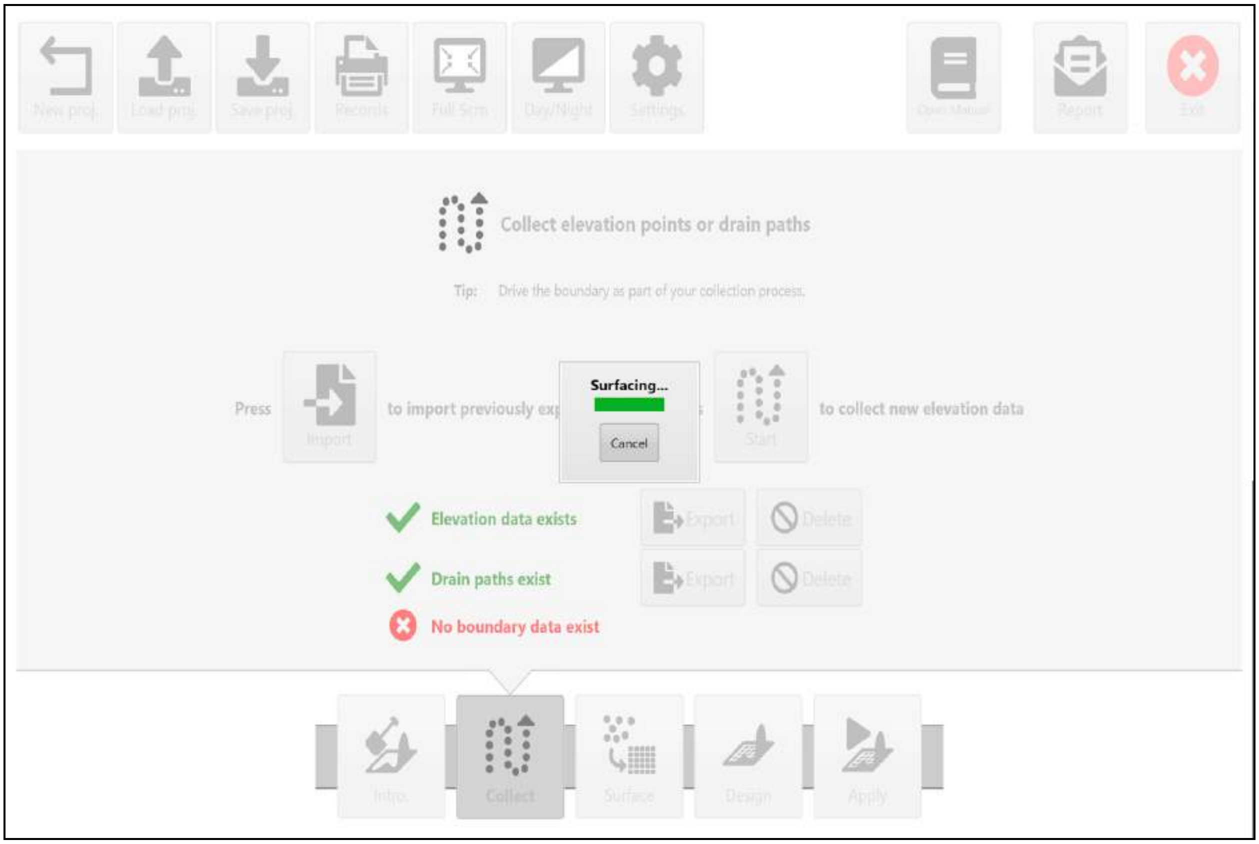
A: This is because of the averaging. As we average the position as well as the elevation it will drop ½ the collection distance behind the tractor.

Surfacing

Cutta Ditch Plane Levee Survey

"Surfacing" is a term used to describe the process of creating a continuous map (ie., a "surface") from all the discrete elevation data points collected in the '**Collect**' wizard step. This is done so that every location in the field (or work area) has an elevation point associated with it, not just the places where GPS data was physically collected. The software estimates values in all the blank areas between the survey dots. For every blank position on the map it looks a certain distance in every direction to find actual surveyed points. This distance is called the '**Search radius**'. Once it finds enough points it will estimate the blank location based on these points.

Upon exiting the '**Collect**' step, T3RRA will attempt to automatically calculate the best search radius and create a surface from the collected data. If you wish to view the surfaced data before going to the '**Design**' wizard step, pressing the '**Surface**' wizard button (at screen bottom) will allow you to both view it and make manual changes (if it does not match your expectations). NOTE: if you make a change to the collected elevation points (for example: by deleting a drain) you should re-run the surfacing step.



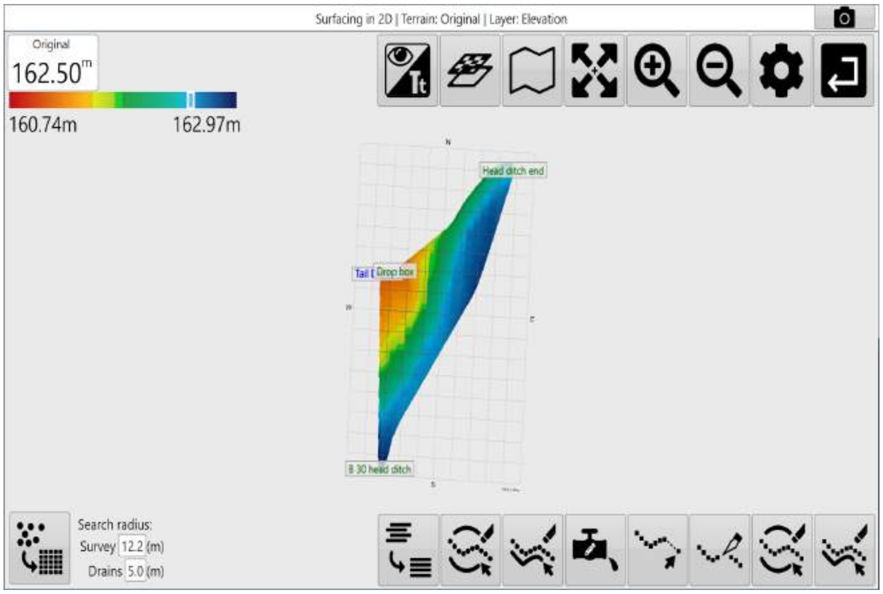
New proj.
Load proj.
Save proj.
Records
Full Scrn
Day/Night
Settings
Report
Exit
Collect elevation points or drain paths
Tip: Drive the boundary as part of your collection process.
Press
Import
to import previously exp
Surfacing...
Cancel
Start
to collect new elevation data
Elevation data exists
Export
Delete
Drain paths exist
Export
Delete
No boundary data exist
Intro
Collect
Surface
Design
Apply

Setting the Search Radius manually

If the automatically generated search radius does not achieve what you expect it is possible to manually adjust the search radius in the bottom left corner of the surfacing page. There are a few things to take into account when manually adjusting the search radius.

When converting discrete elevation points into a continuous surface, a '**Search radius**' is required. To estimate the elevation at any point on the surface which was not directly measured, we look at the surrounding measured points. The distance the surfacing algorithm will look for surrounding points is determined by the search radius.

Gaps will appear on the surface if the search radius is smaller than required. There is normally no visible effect on the resultant surface if the search radius is larger than required (although the surfacing will take longer to complete). In some instances surface artifacts will occur where the surface bridges across sections of the field where you would not expect it to. Examples might be a pond in a field, or the inside corner of an "L" shaped field. You can sometimes remove these areas by choosing a smaller search radius. Normally the effect of these artifacts is not great, although they can have impacts on your area and dirt volume records.



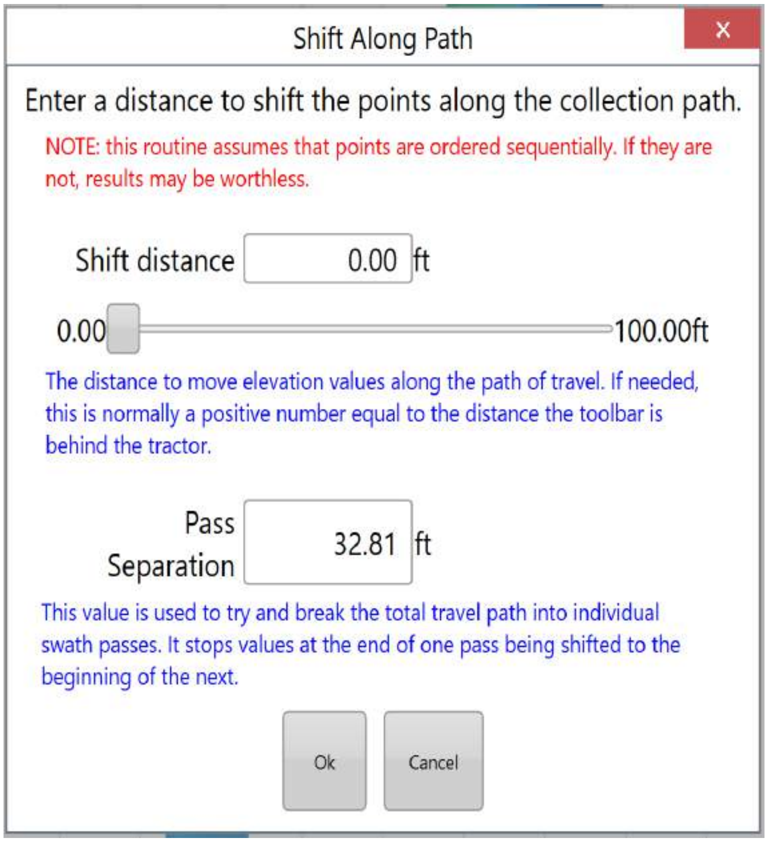
In general, a search radius should be about 2 times the swath width at which the data was collected. This sizing should ensure that the time it takes to apply the surface is still short but that as much data as possible is used to generate a representative map.

Inline Offset

Inline Offset is a surfacing tool that assists in making corrections to elevation data that is imported from other sources.
To access this tool press the 'Fix Lag' button located at the left end of the tools at the bottom of the screen. Pressing this button will open a pop-up window that will provide you with the options to correct elevation alignment.

For a youtube video tutorial on Inline offset visit https://youtu.be/O9Sgkx-DffM or use your phone to scan this barcode

When correcting elevation data In the pop-up window it will be shown on the data behind the window. There are 2 separate sections that control the correction of elevation data in the pop-up window.



To control how far the data is shifted there are 2 options. You can either use the slider or manually set distance. The slider has a maximum shift distance of 100ft or 30m depending on the measurement unit used. In the 'Shift distance' window you are able to manually set the distance that the data will be shifted, like the slider the maximum value that can be set in the shift distance window is 100ft or 30m.

The lower portion of the pop-up

window controls the pass separation. The pass separation is how far must be between a point and any other point moving forward before it is considered to be a new segment.

When making changes to the data in the inline offset window they will be reflected on the surface in the background, this will help to make sure that the changes you are making are correct before accepting them.
NOTE: the surface must be set to survey in the models/layer to correctly display changes.

Important Concept!

Surfacing a survey *also* creates a design

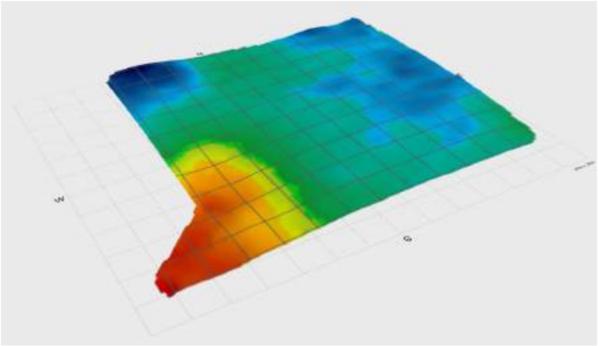
This is a concept that can be confusing at first. When you surface a set of collected survey points you create a terrain model of the original elevation in the field. This is expected. But T3RRA software also automatically creates a design surface for you as well. This design surface is an exact duplicate of the original elevation surface.

Because T3RRA software allows you to create design surfaces in separate regions of a field, and also create design surfaces based on existing design surfaces, it makes sense to always have a base layer to work off. And this base layer is an exact duplicate of the original surface.

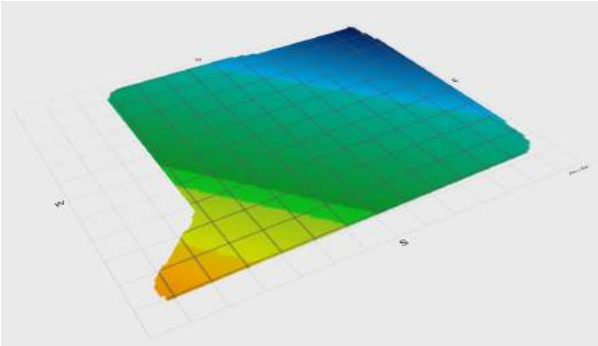
A side effect of this automatic creation of design layers is that you can go straight to implementation after surfacing even if you have not specifically created a design (surfacing is normally automatic, so really you can usually skip directly to implementing directly after collecting!). A design surface does exist, it's just that the cut/fill map is made up of 0 values for the whole field.

Design

Cutta Ditch Plane



Original elevation surface



Design surface

Measure twice, cut once.

It's an old maxim but a good one. You can do as many designs as you want in T3RRA software before you ever put your tractor into gear. Use our 3D visualization and rainfall simulation tools to carefully examine the effect of any design. Evaluate the volumes of dirt being predicted and ensure that they are within expectations. Catching a design error in the software is much less painful than having to redo many hours of dirt moving.

Remember that computers are fallible. Never blindly follow a design you are given. Critically assess whether the computer output matches what is happening in the real world. It is not a given that it will!

Try to start small with simple designs and little fields. Mistakes, and the lessons learned from them, build your experience and capability - but it is far better to do your learning on small jobs!

If you are in doubt, please seek the advice of a professional irrigation designer or engineer.

The design step is not compulsory and can be skipped if desired. HOWEVER this is not recommended unless you have a specific task where only a copy of the surveyed data is required.

Design capabilities present in different T3RRA software packages

The '**Create design**' page is presented to you when you advance to the '**Design**' wizard step. The tools you will see differ based on the specific T3RRA software you are using. This is because each package is aimed at a certain user type and market segment.

A surfaced elevation map is the starting point for creating a new field design. Determining an optimal terrain design is very specific to the conditions that exist on an individual farm. Cropping practices, existing topography, soil types, costs, available machinery, and many other factors apply. Even if you are not intending to do full field land forming (such as when only creating ditches) we still see great value in fully surveying a field. All of our packages allow you the capability of doing this. All of our design tools show you the surface in 3D and can run a rainfall simulation on it.

In general, the design aims of each package are explained over the next few pages.

T3RRA Cutta provides tools for GPS based landforming, ditching, and levee creation

In order to provide solutions that are as broadly applicable as possible, T3RRA Cutta includes a variety of design methods:

- Single or dual best-fit planes
- Multi-fit optimization
- Smoothing
- Offsetting
- Drain profile and cross section design
- Automated drain path creation
- Pattern drain design
- Levees

NOTE: A powerful capability of T3RRA Cutta is the ability to “chain” designs together. As well as performing designs on the original field surface, you can also perform designs on an existing design. For instance, after performing a multi-fit design, you can then go and use the '**Smoothing**' tool to smooth the multi-fit design. Use this capability methodically and with care - it is easy to get confused!

T3RRA Ditch provides tools for ditching and levee work

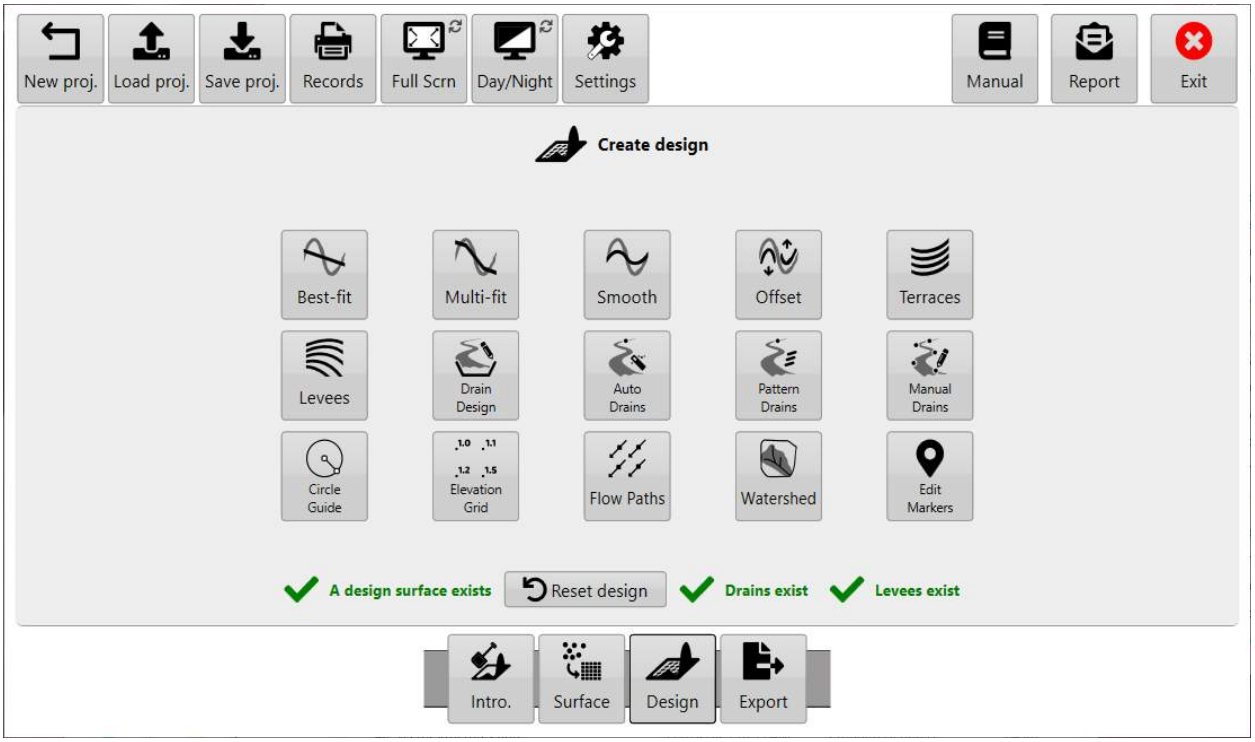
- Drain profile and cross section design
- Automated drain path creation
- Pattern drain design
- Levees (including regions)

T3RRA Plane provides tools for laser based leveling and ditches

T3RRA Plane can't do non-linear surface designs. But we wanted to make sure that it can do anything you can do with a laser level.

- Single or dual best-fit planes
- Linear Drain profile and cross section design
- Automated drain path creation
- Pattern drain design

T3RRA Cutta Desktop provides a wide variety of tools suitable for desktop use.



T3RRA Cutta Desktop can do all the designs of our other tools combined. Like T3RRA Cutta, it is meant to be as broadly applicable as possible. As it is meant to be used in the office, it also has some analysis tools that aren't available in our in-cab offerings.

Design icons.

T3RRA software attempts to divide design functionality into discrete tools.

- Select Best-fit, Multi-fit, Smooth & Offset to design a field surface area.
- Select Auto-Drains or Pattern Drains to place drain paths on the surface.
- Select Drain design to design the profile and cross section of drains
- Select Levees to add levees to the surface.

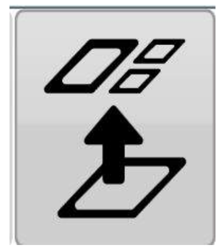
NOTE: If you have a drain/field combination to design, always design the field first and the drain second.

Common Design tools

There are some tools that can be found in most design functions.

Rainfall Simulator

Region Tools



Earthwork Details

Calculator

Rainfall Simulator

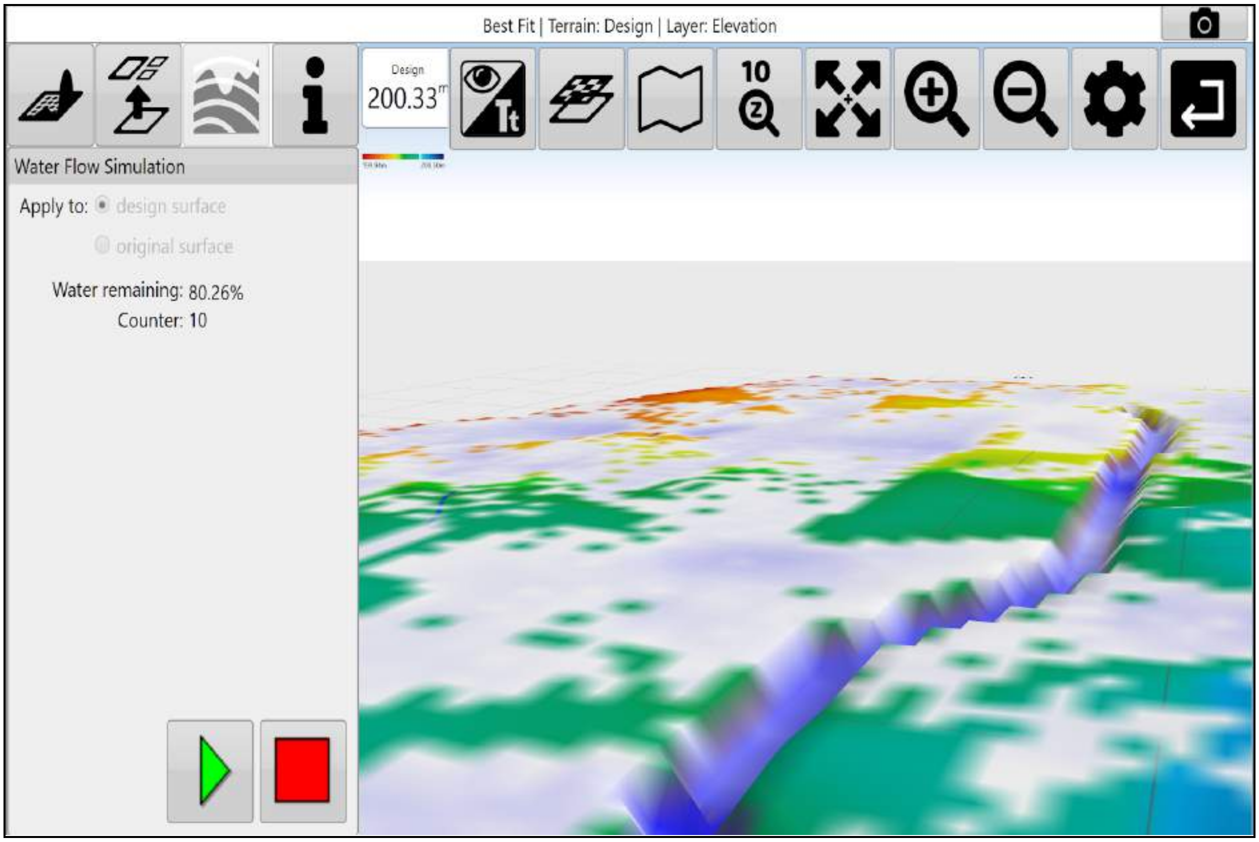
One of the many unique features of the T3RRA product suite is our inclusion of a rainfall simulation tool. This allows a very visual and easily relatable analysis of how a field surface affects water runoff and ponding.

It should first be used after a survey and prior to any design being placed on the field. The intent of this is twofold:

1. *To verify that the created surface does in fact truly represent the field*. By looking at the water flow, a person familiar with the field will usually be able to say "Yes, that is the normal pattern of water runoff I would see". In this case the operator can be confident that the survey has created an accurate model of the field. On the other hand, if the simulation produces results that are not expected it may be wise to critically revisit the survey and perhaps collect more data.
2. *To compare the design with the original surface*. It is expected that the design will result in a pattern of drainage different to the original. Analyzing the design will quickly tell you if the new surface is going to have the effect on drainage that you expect.

The rainfall simulator **cannot** tell you *how long* a field will take to drain. There are simply too many variables, such as the soil type, the soil moisture level and the soil depth before reaching hardpan. Such a calculation is beyond the scope of this software. It can however provide you with an indication of how much faster one design will be over another. You can do this by comparing the iteration counter value of two different designs at a given drainage % value. Even so, be aware that the timing information of the simulation is qualitative in nature, not quantitative.

For a youtube video tutorial on the rainfall simulator visit https://youtu.be/LJ5Vw9Q7tqA or use your phone to scan this barcode



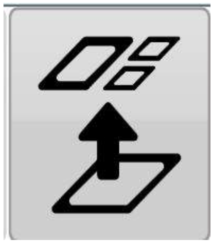
Alternate between design surface and original surface to view changes in water flow.

Counter is used for comparing drainage time differences between design and original surfaces.

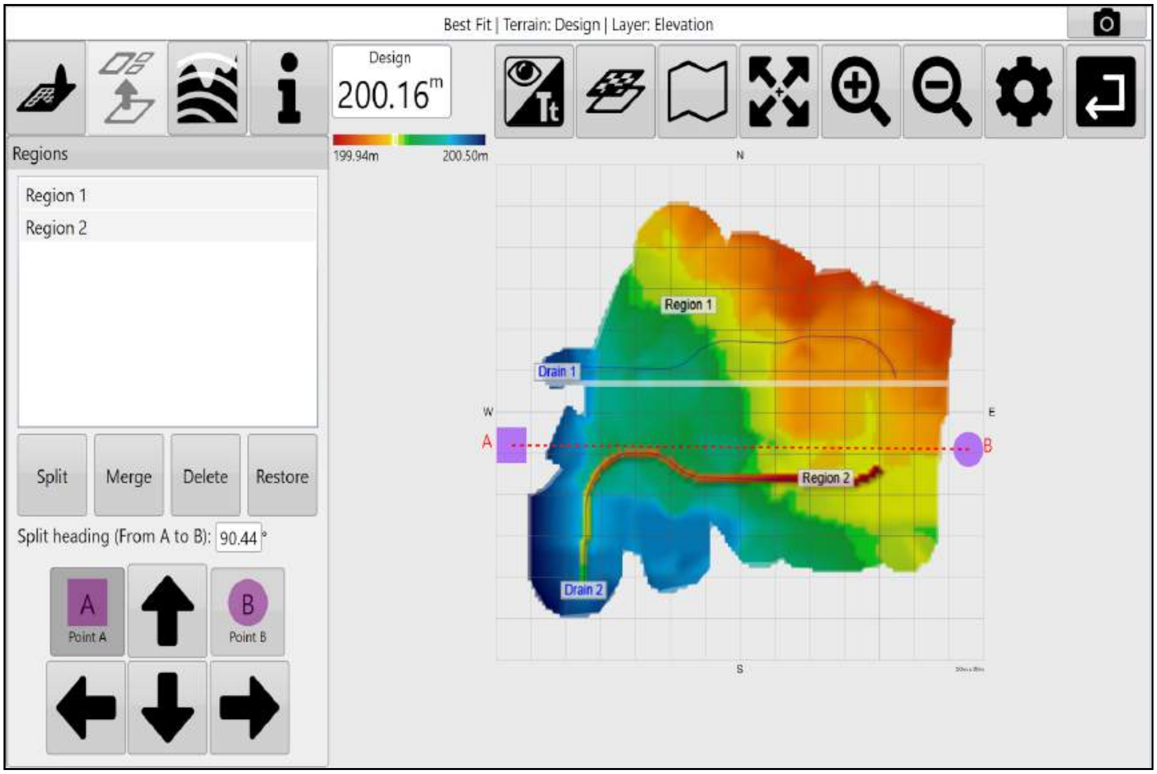
View simulation in 2D or 3D.

Regions

Cutta Ditch Plane



To create regions, select the '**Regions**' button (regions are not available in drain related functions).



The '**Regions**' tool allows the user to split the field into many working regions.

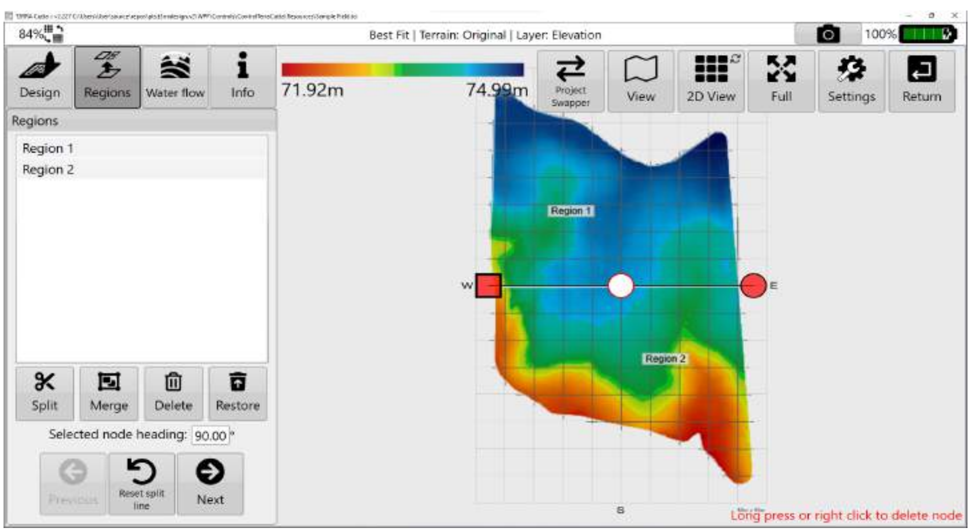
Users are able to implement different design options in each region that they make. For example, you can apply different primary and secondary slopes, or different levee designs in each region.

NOTE: It is perfectly possible to create different design types in different regions. You can have a best-fit plane in one region, and a multi-fit surface in another, for instance.

For a youtube video tutorial on Regions visit
https://youtu.be/NQn9PJkU6Y4 or use your phone to scan this barcode

Regions are created by slicing a line between two edges of an existing region, or the whole field if no regions exist. The split location is defined by moving **Point A** and **Point B** of the "split" line. Pressing the **up, down, left,** or **right** arrow buttons will orientate **Point A** or **Point B** to the desired location. (Points A and B can also be moved by pressing and dragging them on the touch screen). The split lines must be straight, but by merging regions it is possible to achieve region boundaries that are not straight.

Press the '**Split**' button to confirm the "split" on the selected region.

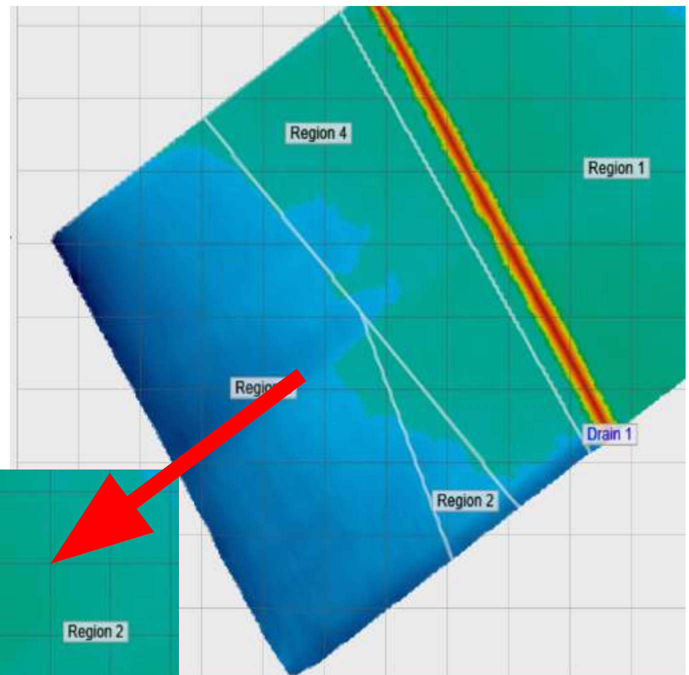


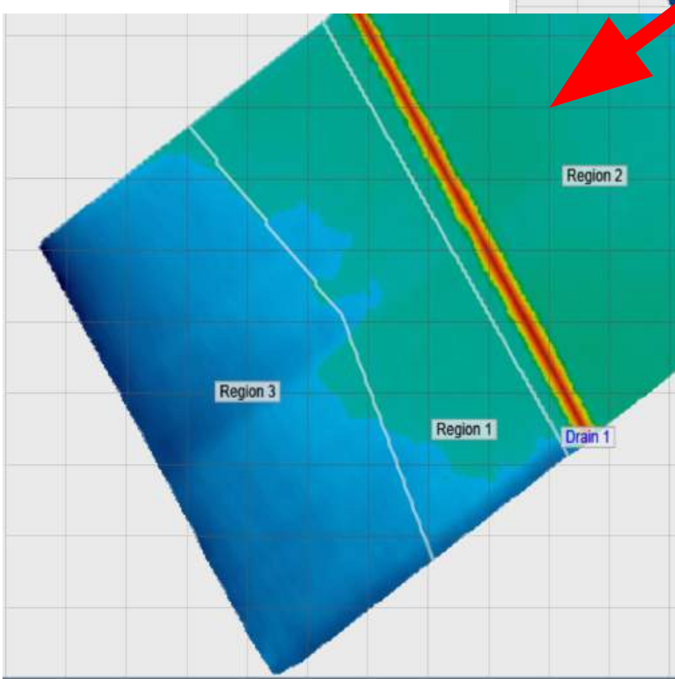
The '**Merge**' button will merge selected regions into one region.

The '**Delete**' button will delete whatever design exists with the selected region(s). At this point the region will not exist as a separate area that can accept designs. It can still have full-field designs applied to it.

The ‘**Restore**’ button will restore all deleted regions.

To create non-linear split lines first create multiple splits that intersect, and then merge the regions that are not wanted. See below for an example.

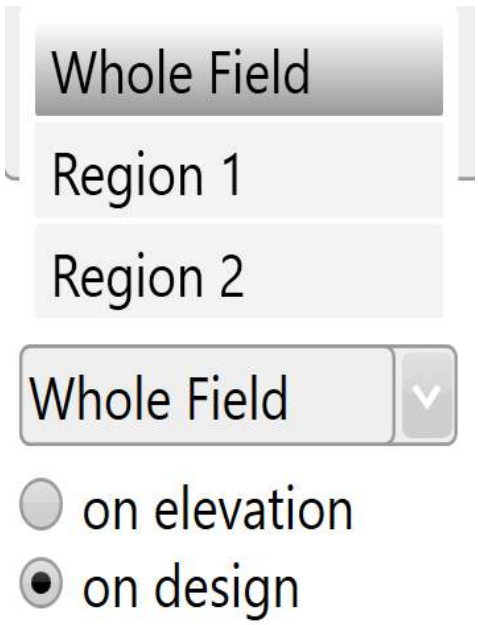




Examples illustrate merging regions 2 and 4 to create non-linear line.

Press the '**Back to Design**' button when you have finished adding your regions.

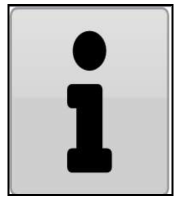
In certain design functions (multi-fit, best-fit, smoothing, and levees) different regions can be selected from a drop down menu allowing you to make design changes to only the selected region.

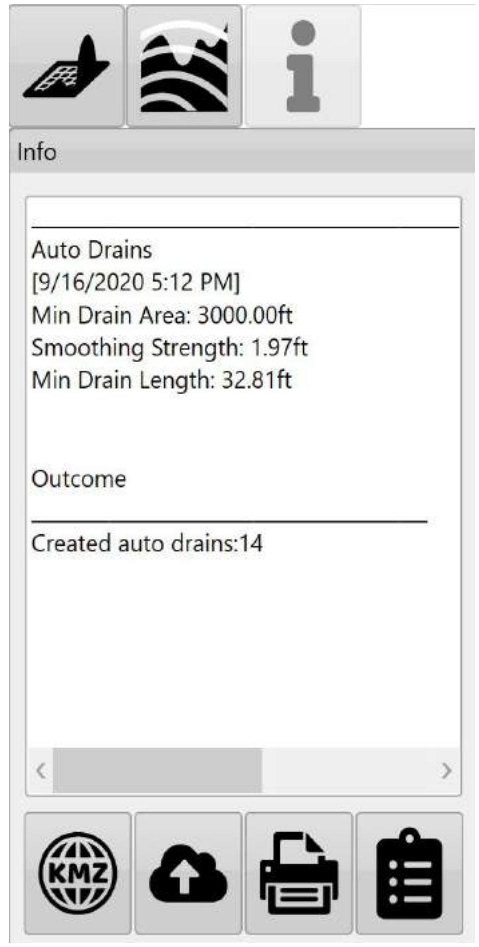


Choose to apply your design to the original elevation surface or to the design surface.

Earthworks Information

Press the 'i' button to view earthwork details.





Note: pressing within the '**Info**' text box will expand the view to full screen.

Each region will have its own set of earthworks details and cut/fill summary.

Press the '**Records**' button (shown as a printer) to save design details (in PDF format) to a folder for record keeping and documentation purposes.

Press the '**Activity Log**' button (shown as a clipboard) to view the activity that a file has undergone. This includes things like file save times and when/what design functions have been applied to a file.

Press the '**KMZ'** button to save all layers present as a georeferenced image.

Press the '**Upload**' button to send a map layer to John Deere Operation Center.

For a youtube video tutorial on Earthwork information visit https://youtu.be/UORB2av-vow or use your phone to scan this barcode

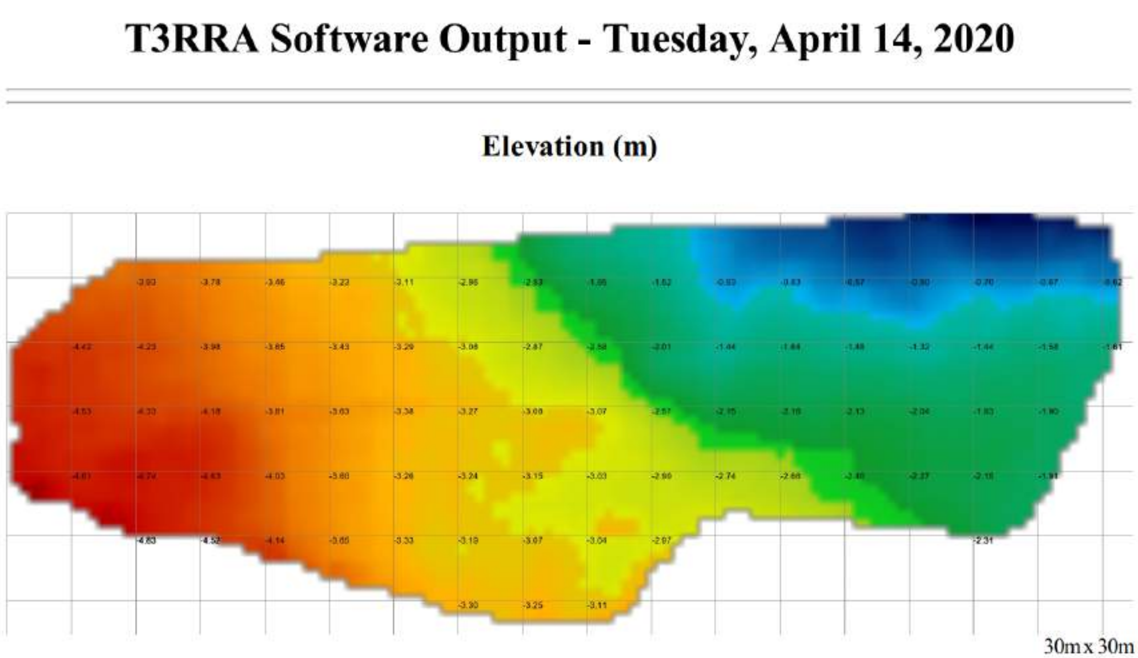
Notes on printing records

The '**Records**' feature in T3RRA software creates a PDF document and saves it to the hard drive. This document is meant to give an overview of the operation being performed by the software. It is suitable for record keeping purposes, or for supplying to field managers or clients.

It includes the following:

- Map of the original surface
- Map of the design surface
- Map of Cut and Fill areas
- Statistics relating to the earthworks

The maps created in the report will include a grid overlay showing data values.



Notes on the Activity Log

The '**Activity Log**' is designed to provide a history of the user actions that were performed in a project. It keeps a sequential history of the design actions that have been performed. This is helpful in understanding what methods were used in order to go from the original design surface to the final design surface. Where possible a record of slopes, directions, and design tools utilized are kept. As we allow designs to be performed on existing designs and differently in different regions, the steps and actions taken to go from the original surface to the final design surface can be quite complicated.

The '**Activity Log**' also keeps a record of the results of a design action (in the form of the resulting dirt balance statistics).

If the user is in doubt about steps taken or parameters used, they can refer back to this log. The log entries include a date and time in order to remove confusion about when the actions were performed.

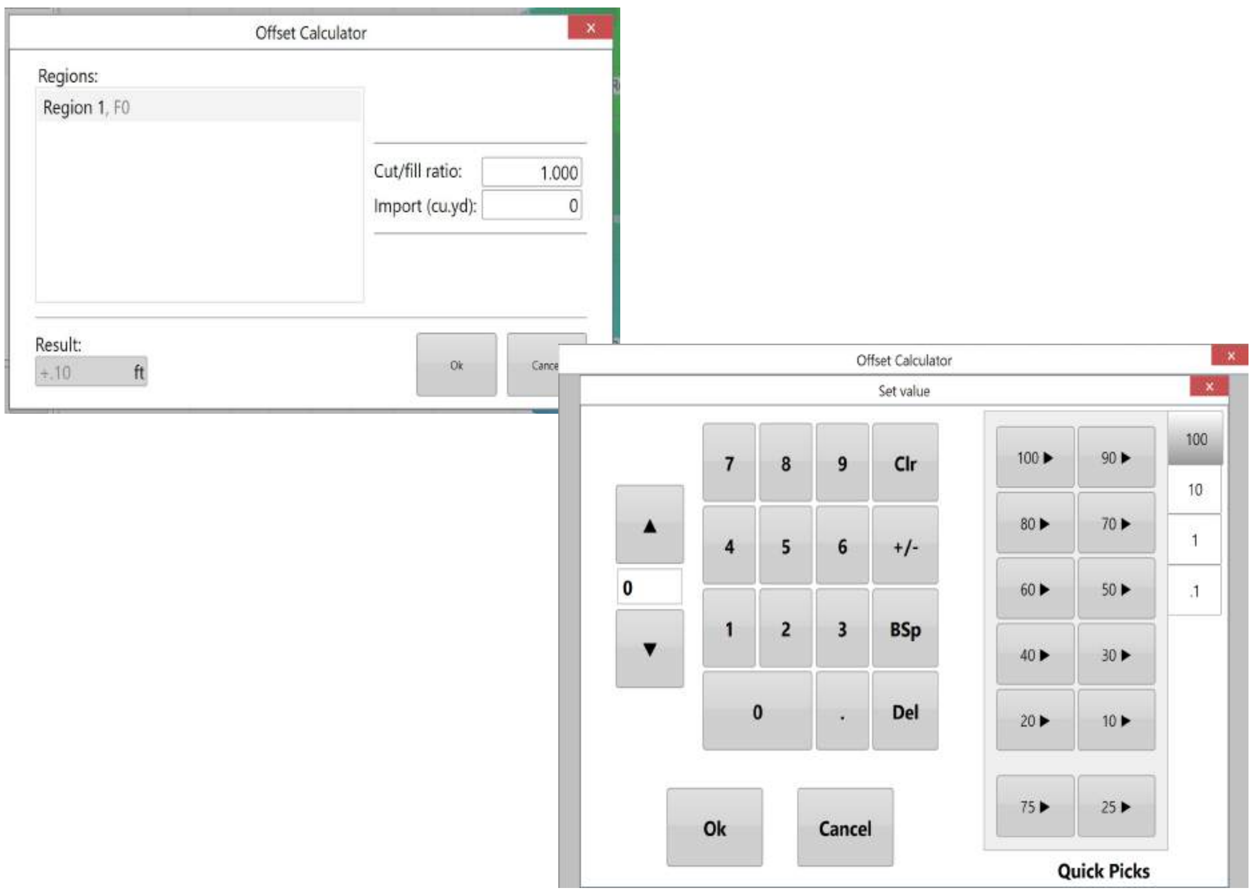
The log can also be used to compare two or more design options. Because the results of each design operation are kept in the log it can be easier to simply compare them there rather than trying to remember them, or write down the results.

If you want to save or email the log you can copy it into the clipboard using the '**Copy**' button. Then paste it into any other application.

Calculator

In some tools that require a value to be input a calculator will be available. The purpose of the calculator is to take some of the stress away from creating field and drain designs.

In addition to being able to calculate, the calculator comes with a function to add quick values.
These are helpful if you are not wanting to find the exact value and just want to get moving as quickly as possible.



Design functions

Best-fit Cutta Plane Levee

'**Best-fit**' creates a plane of best fit for the field or region. The best-fit calculation produces the slope and direction required to achieve a single plane, while minimizing the amount of dirt moved.

Multi-fit Cutta

'**Multi-fit**' builds multiple smaller planes that follow the contours of the ground to drain water in a single direction, usually in the direction of irrigation and/or wheel tracks. The minimum and maximum slopes influence the individual plane design which will improve the drainage on a field while moving as little soil as possible by staying truer to the existing elevation gradients

Smooth Cutta

'**Smooth**' is used to smooth out gradients on a surface. The strength of smoothing is adjustable to influence the smoothing effect. The option of region blending allows you to set a slope between regions on your field to allow for smooth transition between regions.

Offset Cutta

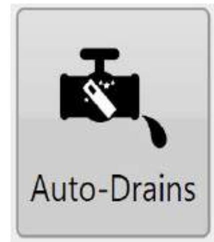
This tool alters a surface's elevation by adjusting it up or down. This relates to the importing and exporting of dirt volumes. A use case might be the importing of an inch of topsoil which you want to spread evenly over an entire region or field.

Drain Design Cutta Ditch Plane

Enables the design of drain profiles and cross sections. Used to make sure that ditch grades are optimized.

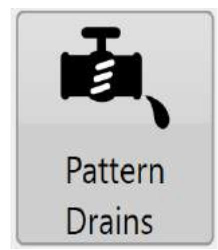
Auto-Drains Cutta Ditch Plane

Automatically locates wet areas (depressions) in your field and calculates optimal ditch lines to drain those areas. You can export ditch track guidance lines that will steer your tractor along calculated paths (John Deere AutoTrac™ required).



Pattern Drains Cutta Ditch Plane

Design repeating parallel drain patterns at constant spacings for quick implementation.



Terraces Desktop

Design terrace paths to redirect overland water flows and reduce erosion and/or create specific levees.

Levees Cutta Ditch Levee

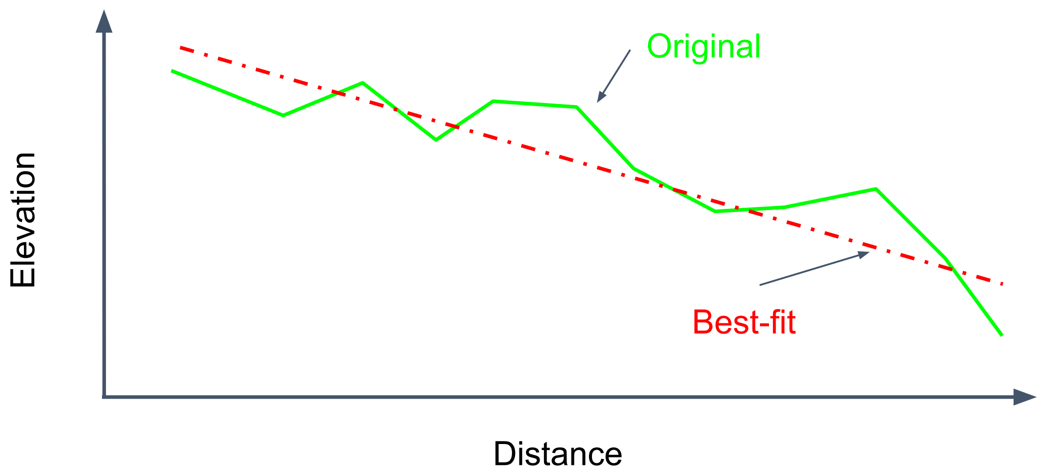
The levee mode can be used to create a single levee or a series of levees at specific elevations. Designs can be made on either the original elevation surface or design surface.

Best-fit Design

Cutta Plane Levee

Select the '**Best-fit**' button to create a plane of best fit for a field.

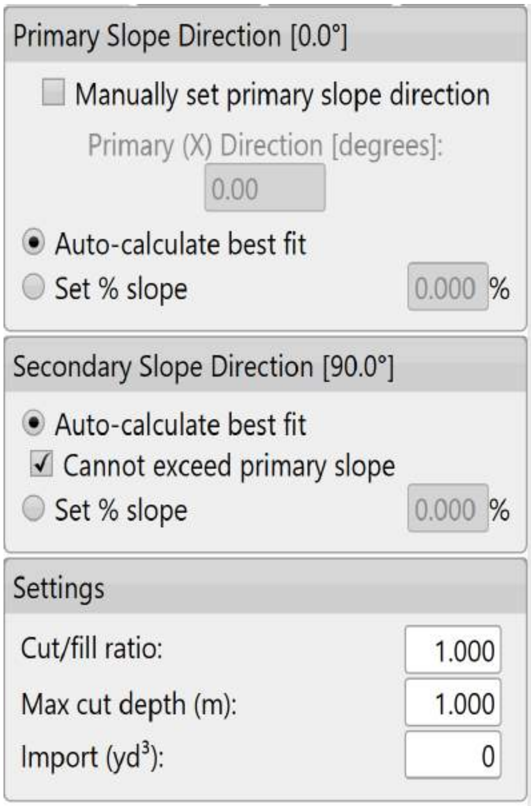
For a youtube video tutorial on Best-fit design visit
https://youtu.be/hmSVJCpsIns or use your phone to scan this barcode



- A Best-fit design provides a single plane that most accurately fits the existing topography. Using a Best-fit plane ensures that you move the least amount of dirt possible to create a single plane for a field. Note that this can still result in large amounts of dirt being moved.

- Tip: Dividing the field into regions, then fitting single planes to each region can help to decrease dirt volumes.

Enter design details to create a plane, or instruct the T3RRA software to auto-calculate your design details.



Setting slope parameters

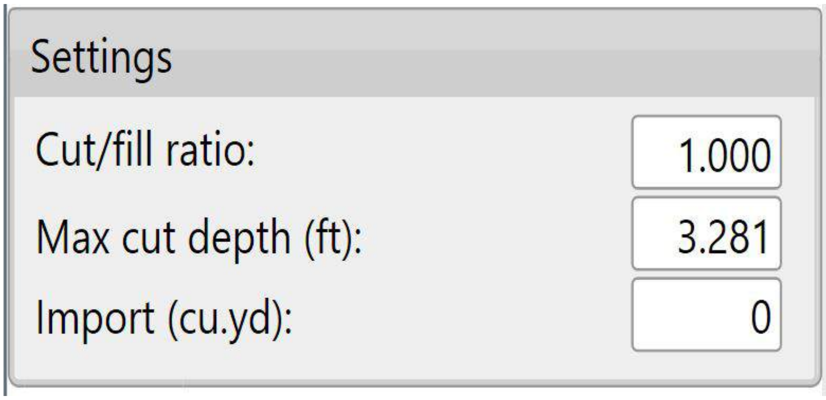
The software will try to find the most appropriate line of best fit, however the primary and secondary slopes can also be manually set.

(It is recommended that only users with a good understanding of Laser Plane systems use manual settings)

To manually set the primary slope direction check the box labeled '**Manually set primary slope direction**'.

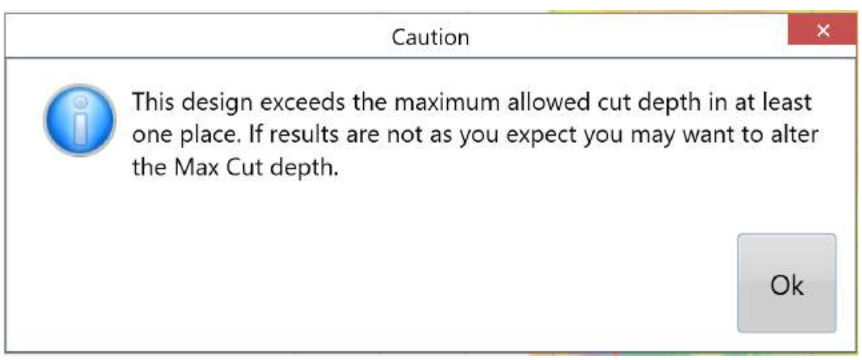
When in doubt, consult an irrigation engineer.

Cut/fill ratio, Max cut depth, & Import can be set in 2 locations. The defaults that will be applied to new projects can be set in the Project tab of settings (see section B) or in the lower left corner of the Best-Fit (and Multi-Fit) page.



The '**Cut/fill ratio**' is determined by the type of material being moved and how much of it will "settle" or "shrink" once compacted. This value depends on soil characteristics.

Enter a '**Max cut**' for the maximum allowed cut depth. The following warning will appear to notify you if any points on the map exceed the max cut depth. adjustments may be required.



The '**Import**' section is used when you need to bring in dirt from a stockpile or export dirt from the field to another area. Change the amount to a negative value for exporting.

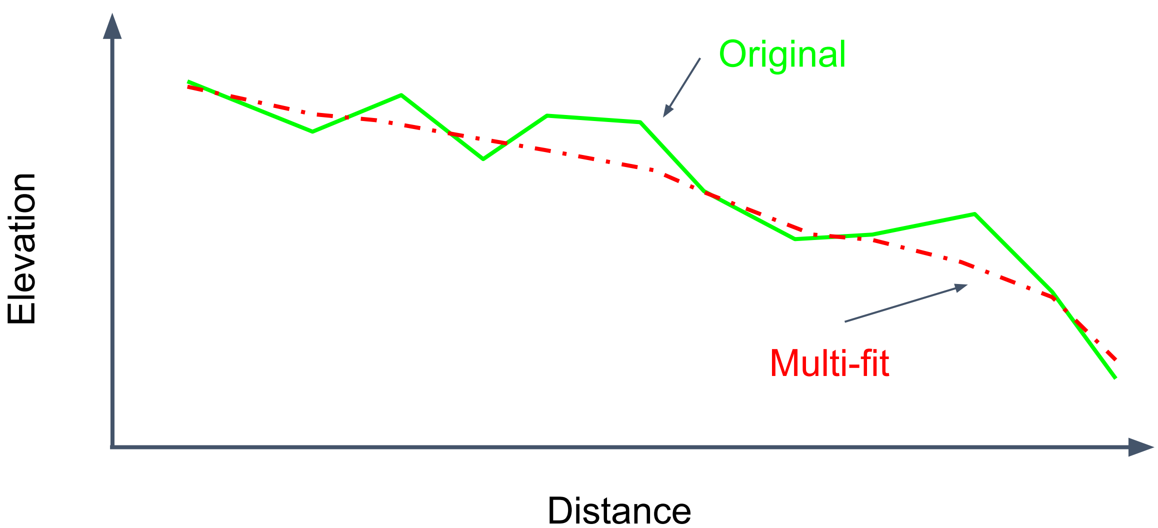
Once you are happy with the design follow the steps in the '[completing your design]' section.

Multi-fit Design

Cutta

Select the '**Multi-fit**' button to create an optimized non-linear surface with slopes between the entered minimum and maximum. Multi-fit balances the dirt down the field in the direction you specify. The balancing occurs within strips, and is great for working within rows and moving minimal dirt.

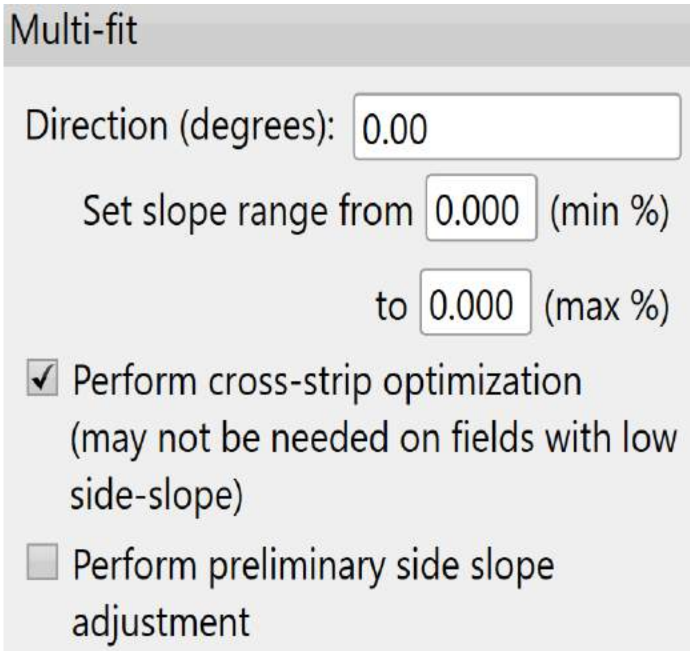
For a youtube video tutorial on Multi-fit design visit
https://youtu.be/SYG32-HJQEY or use your phone to scan this barcode



• A Multi-Fit design allows the slopes to vary within set tolerances and can greatly reduce the amount of dirt moved.

• Dividing the field into regions can further decrease the dirt movement required.

Enter details in the below panel and into all fields to generate a Multi-fit plane.
NOTE: If ‘min%’ or ‘max%’ are left blank the design results will not be desirable.

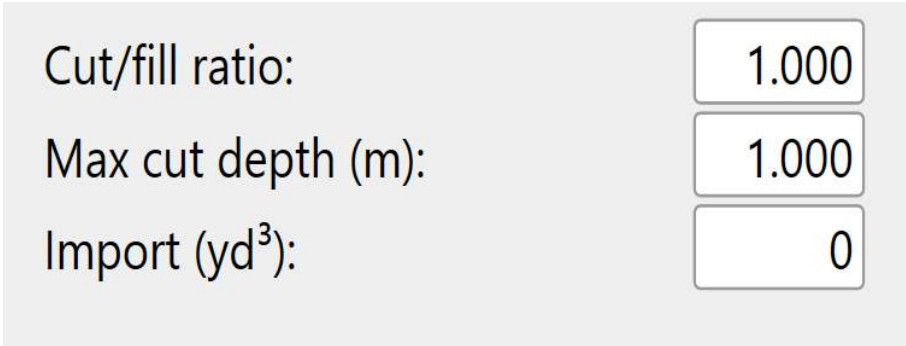


'**Set slope range**'
You can use the iGrade™ Plane Calculator to find out the average slope percentage. Alternatively you can find this in T3RRA Cutta by doing a plane of best fit in a direction and then looking at the primary and cross slopes in the plane statistics window. If in doubt, consult an irrigation engineer.

'**Perform cross-strip optimization**'
This will attempt to tilt the strip sections to match the actual side slope present. Use in fields that have high side slopes (>2% slope). It is unlikely to provide any benefit in relatively flat fields. (this is enabled by default)

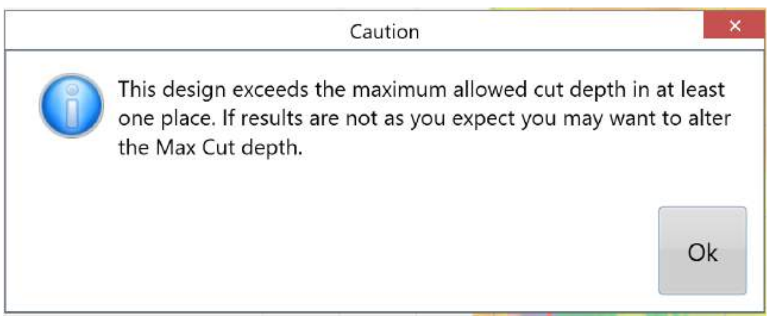
'**Perform preliminary side slope adjustment**'
This will cause an initial side slope adjustment to occur. It will attempt to ensure that the side slope is no greater than the minimum row slope (use if water might have a tendency to run across rows rather than down the rows).

Cut/fill ratio, **Max cut depth**, & **Import** can be set in 2 locations. The defaults that will be applied to new projects can be set in the Project tab of settings (see section B) or in the lower left corner of the Multi-Fit (and Best-Fit) page.



The '**Cut/fill ratio**' is determined by the type of material being moved and what percentage of it will “settle” or “shrink” once compacted.

Enter a '**Max cut depth**' for the maximum allowed cut depth. The following warning will appear to notify you if any points on the map exceed the max cut depth. adjustments may be required.

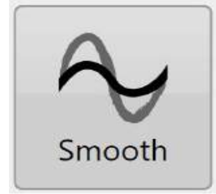


The '**Import**' section is used when you need to bring in dirt from a stockpile or export dirt from the field to another area. Change the amount to a negative value for exporting.

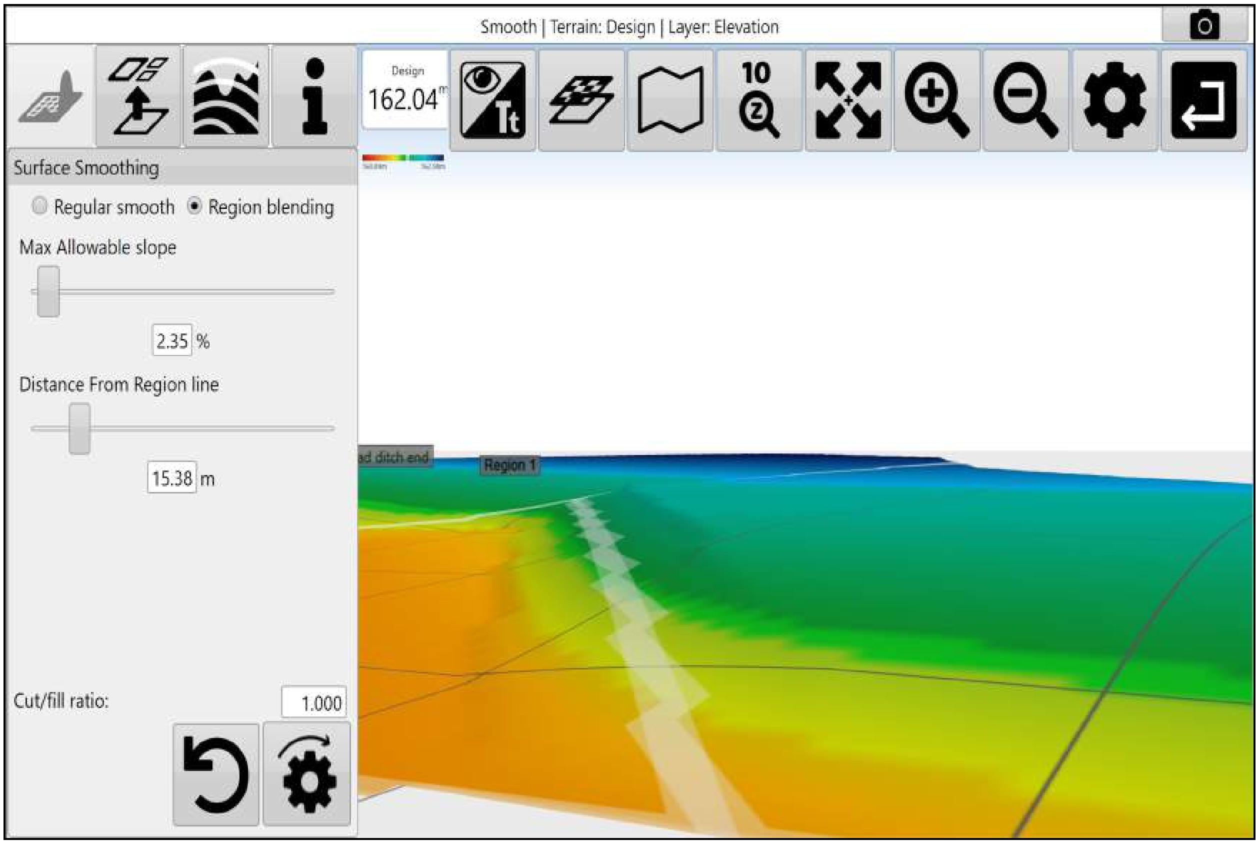
Once you are happy with the design follow the steps in the 'completing your design' section.

Smooth Design

Cutta



Select the '**Smooth**' button to create a more regular surface with fewer and more gradual hummocks and dips. The smoothing strength can be adjusted to produce a stronger or lesser effect as needed.



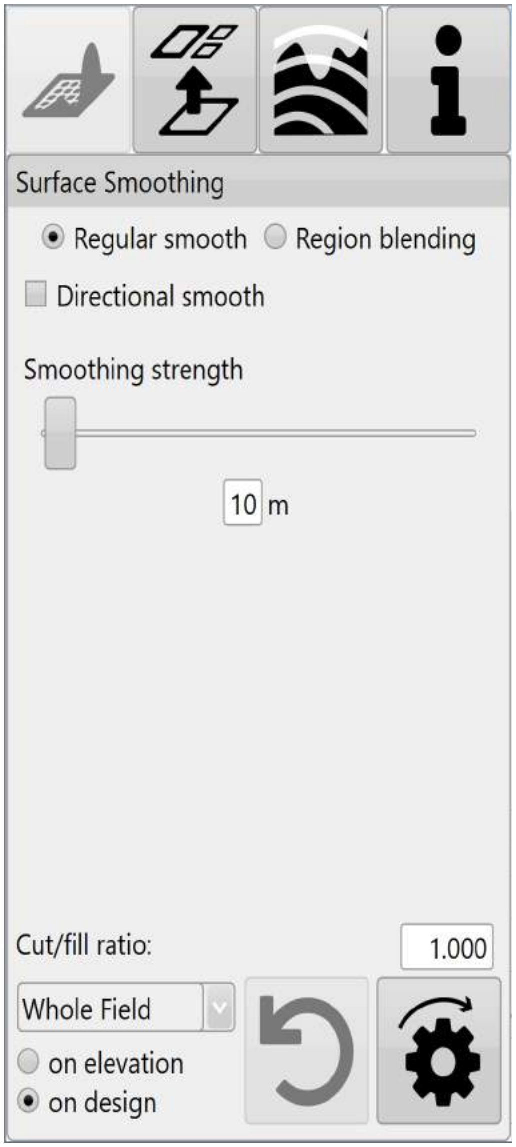
For a youtube video tutorial on regular and directional smoothing visit https://youtu.be/kwWrap5bqNY or use your phone to scan this barcode

Regular Smoothing

Regular smoothing applies an averaging filter to the surface of the field to remove bumps and dips.

The '**Smoothing strength**' slide bar controls how smooth it is by increasing the radius that is used in calculations. The smaller the slider value, the less of an effect the smoothing will have.

Smoothing can be applied to the whole field, or to individual regions. It can be applied to the original surface, or to an existing design.



Directional Smoothing

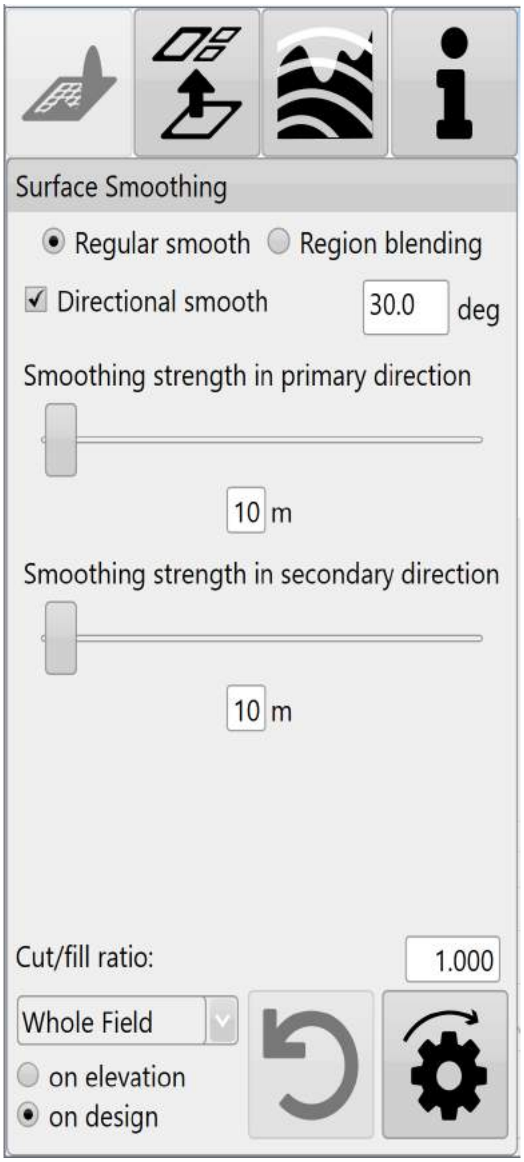
'**Directional smooth**' is a check box just below regular smoothing.

Directional smoothing causes the smoothing effect to be stronger in a particular direction and weaker in the perpendicular direction.

Enter the primary smoothing direction in the provided text box.

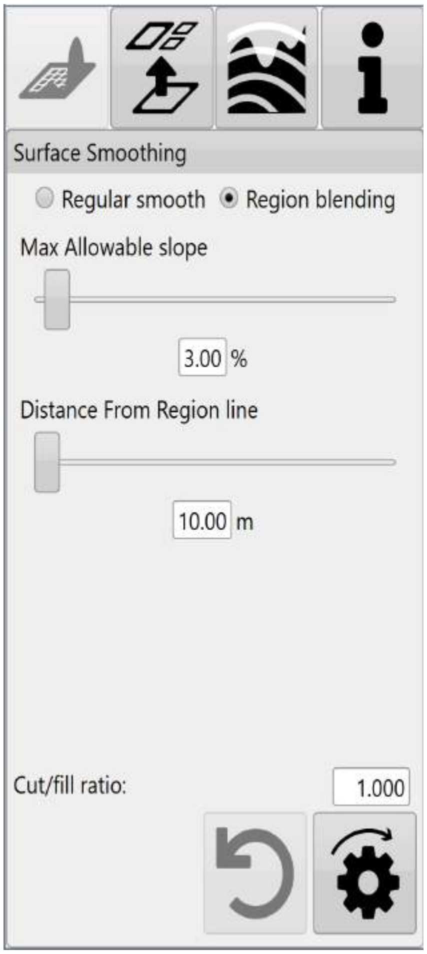
'**Smoothing strength in the primary direction**' allows you to set the influence radius in that direction.

'**Smoothing strength in the secondary direction**' controls the influence radius at a 90 degree angle to the primary direction.



Region Blending

Region blending allows you to “feather” the edges of regions to allow for smooth transitions between regions.



'**Max Allowable slope**' lets you set the maximum steepness that can be used to achieve a region blend.

'**Distance from Region line**' limits how far into each region the blend can go, in order to help make sure that other design elements are not affected.

NOTE: changes made with region blending may not be obvious in 2D view but can be much more prominent in 3D view, or in the cut/fill map.

Press '**Apply**' after parameters are entered in order to see effects.

Once you are happy with the design follow the steps in the '[completing your design](#)' section.

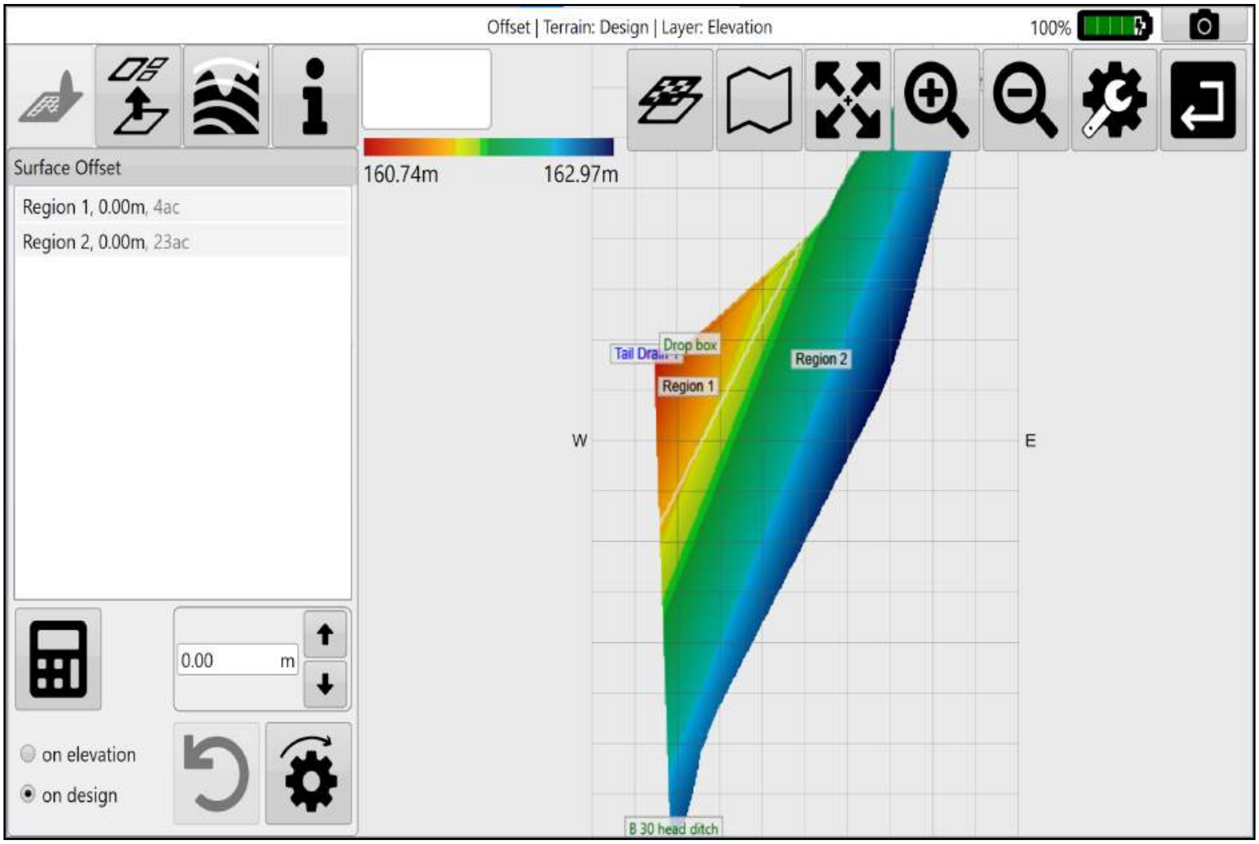
For a youtube video tutorial on region blending visit https://youtu.be/4Ww5kLBfN2U or use your phone to scan this barcode

Offset Design

Cutta

Select the '**Offset**' button to raise or lower the surface height of a field or region. This can help with:

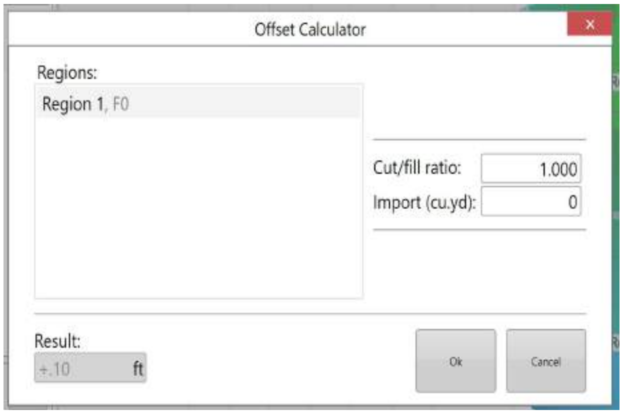
- Importing and exporting dirt
- Addition or removal of topsoil
- Raising pads



For a youtube video tutorial on offsetting designs visit
https://youtu.be/RDORZxdaVwA or use your phone to scan this barcode

You can either:

- manually enter the desired offset amount (this can also be adjusted in set increments using the up and down arrows)
- use the calculator to help set the offset amount. The calculator is useful if you want to offset the surface by a certain volume of imported or exported dirt.



Negative import values are considered exports.

Press '**Apply**' (shown as the offset design icon) after parameters are entered.

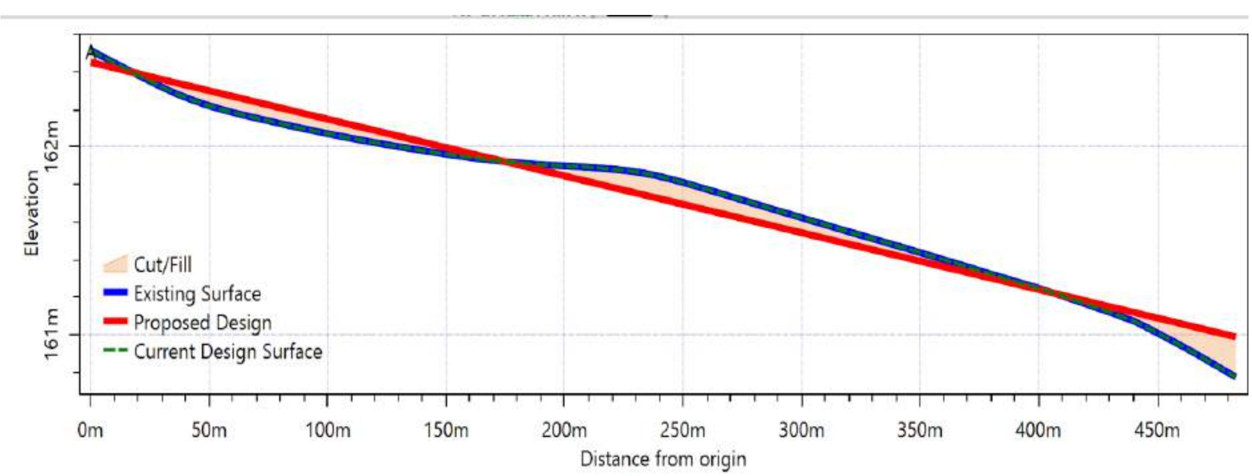
Once you are happy with the design follow the steps in the 'completing your design' section.

Drain Design Tools

When designing drains, there are several aspects that you will find that are across all the different Drain Design tools.

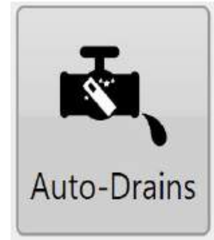
The most important feature of the drain design tools that you will find will be the cross section found at the bottom of the screen. The cross section displays all the ups and downs along the drain surface.

The cross section is made up of three different lines. The **Red** line is the proposed design that you are currently working on. The **Blue** line is the existing surface that has been surveyed. The Yellow dotted line is the current design surface, when starting a new design this will be overlapped with the Blue line and when a design is applied it will overlap with the Red line UNLESS a second design is being made on top of that.



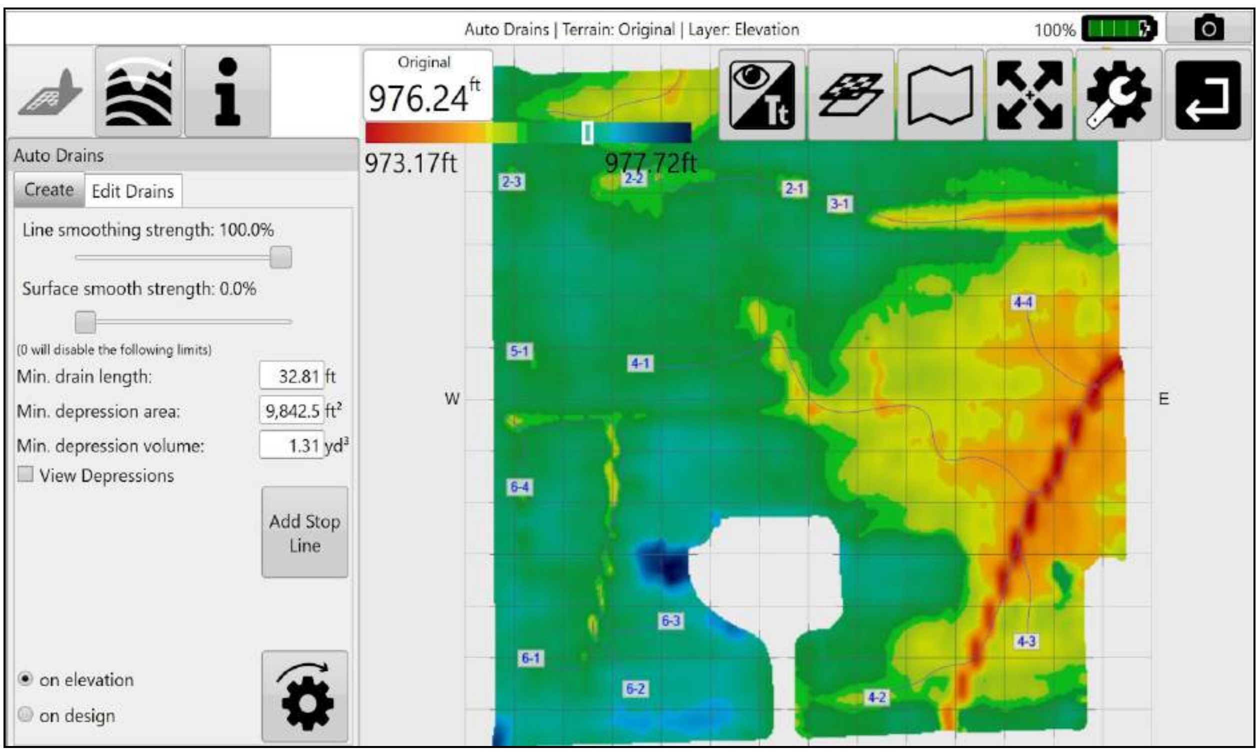
Auto-Drains Design

Cutta Ditch Plane



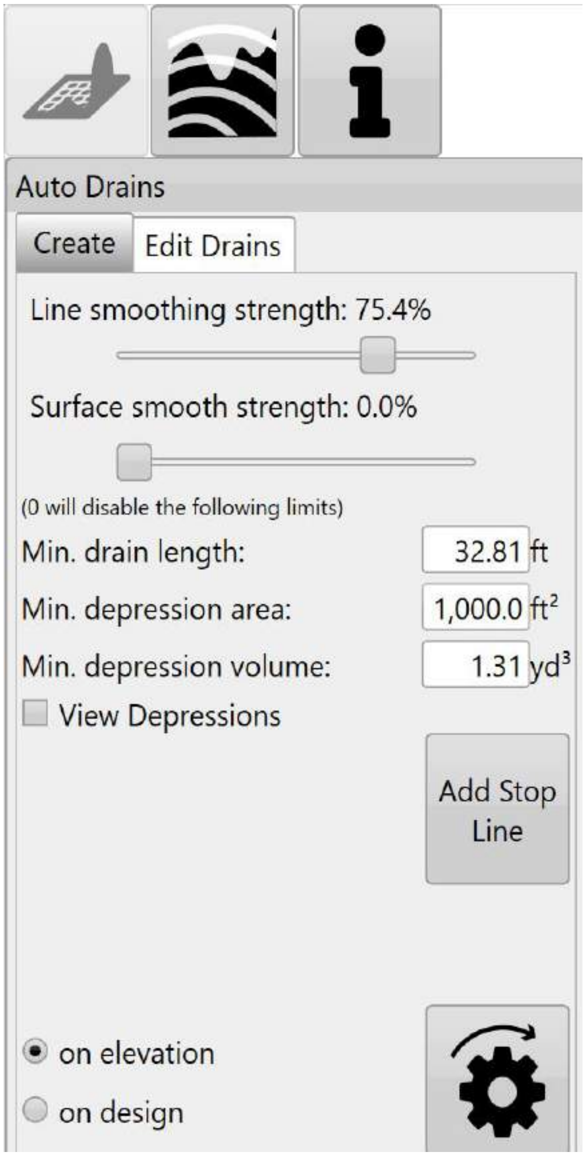
You can use Auto-Drains to automatically generate drain paths for wet areas in your field. It will calculate optimal ditch lines to drain depressions. There are two tab pages present in Auto-Drains:

1. '**Create**' controls the parameters that must be met before drains are applied to the surface.
2. '**Edit Drains**' allows for editing of the drain paths.



Create Drains

For a youtube video tutorial on creating auto drains visit https://youtu.be/i-e5TWS83ds or use your phone to scan this barcode



'Line smoothing strength' adjusts how many sharp turns and how smoothly the drain lines flow. The further to the right the slider is the more round the lines will be (with decreased sharp turns).

'Surface smooth strength' adjusts the surface by applying an averaging filter to the surface of the field to remove bumps and dips without creating a full field earthwork design.

'**Min. drain length**' will set the minimum length a drain must be to be displayed on the surface.

'**Min. depression area**' will set the minimum surface area a depression must cover before T3RRA software will consider draining it.

'**Min. depression volume**' allows you to also set a minimum volume for a depression before a drain will be implemented.[3]

'**View Depressions**' will make all depressions visible (including those that did not meet above

[3] A depression will *only* be drained if it meets *all* of the minimum length, area, and volume criteria.

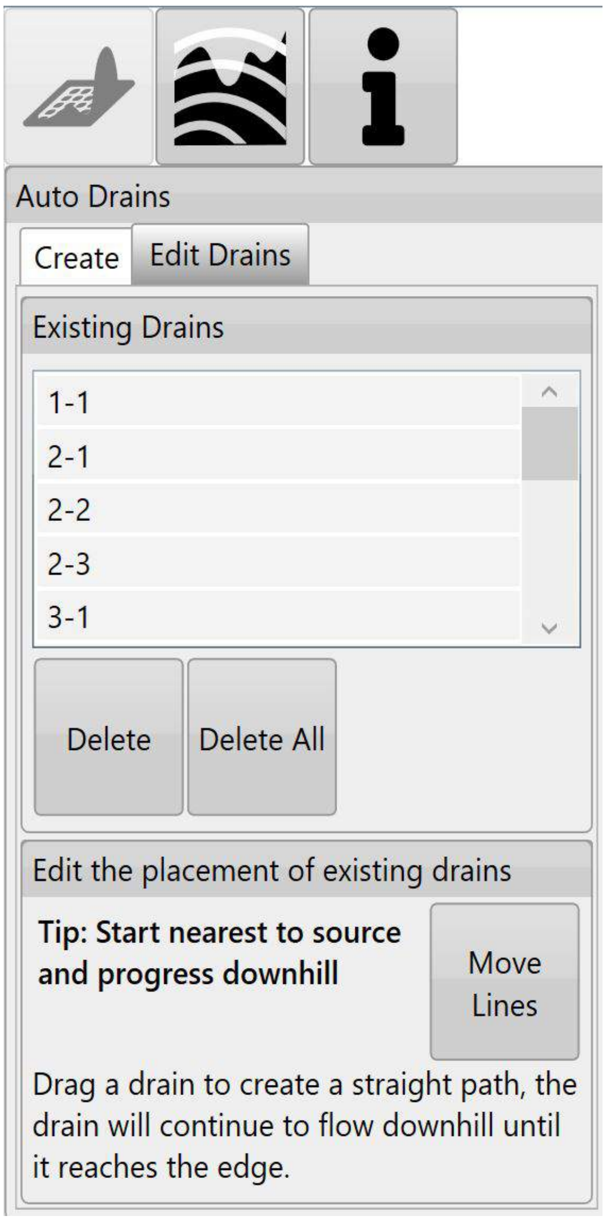
requirements).

‘**Add Stop Line**’ will create a black line on the screen with large red anchors at each end. Drain lines will not cross this line. To confirm the placement, press the ‘**Lock Stop Lines**’ button that will appear next to the ‘**Add Stop Line**’ button. Pressing the white anchor in the center of the lines will create another red anchor so that lines can be adjusted. Additional stop lines can be added by pressing the ‘**Add Stop Line**’ button again.

Edit Drains

The ‘**Existing Drains**’ list will show all drains in the current project.

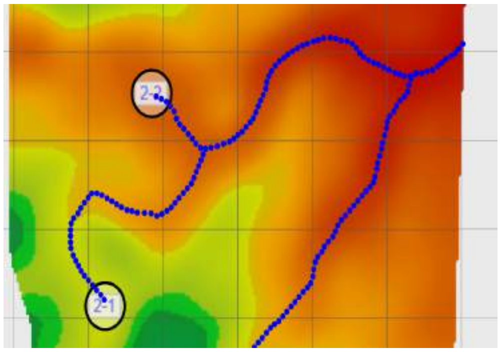
- Tapping on any of the drains in the list will select or unselect it. Multiple drains can be selected.
- Pressing the ‘**Delete**’ button while drains are selected will delete all of the selected drains.
- The ‘**Delete All**’ button will delete all drains in the list (even if they have not been selected).
- The ‘**Move Lines**’ button will change all the drain lines on the surface (shown in bottom image).
- Drain lines will have blue dots along them to indicate they can be moved to adjust the drain path.
- When moving drain lines always start at the origin point (which can also be moved) and move downhill.
- The drain lines will automatically adjust their paths according to your changes to ensure they flow off the edge of the



surface.

- Press '**Save Changes**' to keep changes or '**Discard Changes**' to revert to the original paths.

NOTE: If you make an adjustment on a drain line and make a second adjustment closer to the origin point the first adjustment will revert to the line's original state. Auto-drains ALWAYS flow downhill from the point of the last change.

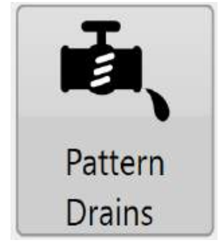


Once you are happy with the drains go back to the wizard page and use the '**Drain Design**' function to set their profiles and cross sections.

For a youtube video tutorial on editing drains visit https://youtu.be/2bidhKMix7s or use your phone to scan this barcode

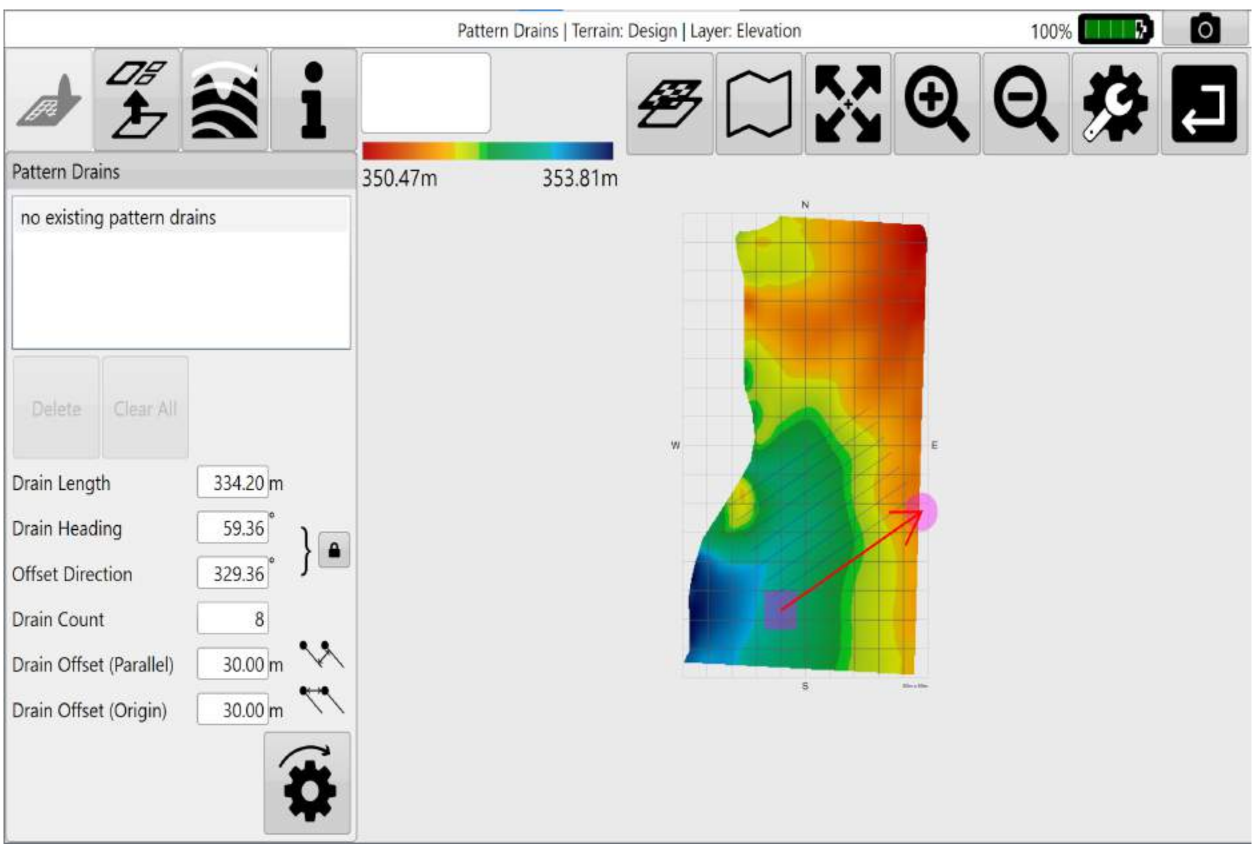
Pattern Drain Design

Cutta Ditch Plane



This design tool allows for simple design of many parallel drains at once.

For a youtube video tutorial on Pattern drain design visit https://youtu.be/5OO7xLIOeSI or use your phone to scan this barcode



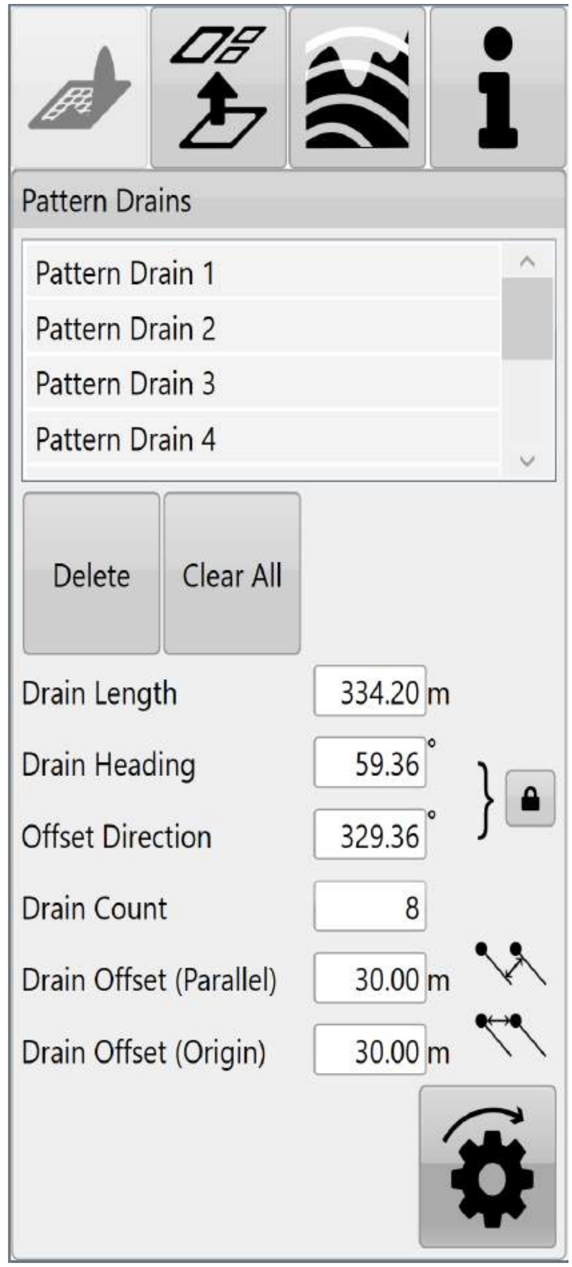
The pattern drain window allows you to select specific drains to delete.

The '**Delete**' and '**Clear All**' buttons allow you to either delete selected drains or all pattern drains.

'**Drain length**' can either be set here or by moving the red circle on the design map.

'**Drain Heading**' is the direction that the drains run (represented as degrees).

'**Padlock**' button changes the behaviour of the copied drains in relation to the original.
locked - This locks 'Drain Heading' to 'Offset Direction' so if either are adjusted the other will change to match.
Unlocked - 'Drain Heading' and 'Offset Direction' can be set independently of each other.



'**Offset Direction**' sets the direction in which copy drains will be created from the original.

'**Drain Count**' is the number of drain copies you want to add (not including the original drain).

'**Drain Offset (Parallel)**' is the distance between each line of the copies. (if the padlock is unlocked this will not show in the example until it is manually updated.)

'**Drain Offset (Origin)**' is the set distance between the origin point of each copy.

Press '**Apply**' (shown as the pattern drain icon) after parameters are entered.

Once you are happy with the drain paths use the '**Drain Design**' function to design the profile and cross section of the drains.

Drain Design

Cutta Ditch Plane

Drain *paths* can be created by:

- Surveying them in the '**Collection**' wizard step
- Importing them
- Using the Auto drains tool
- Using thePattern drains tool

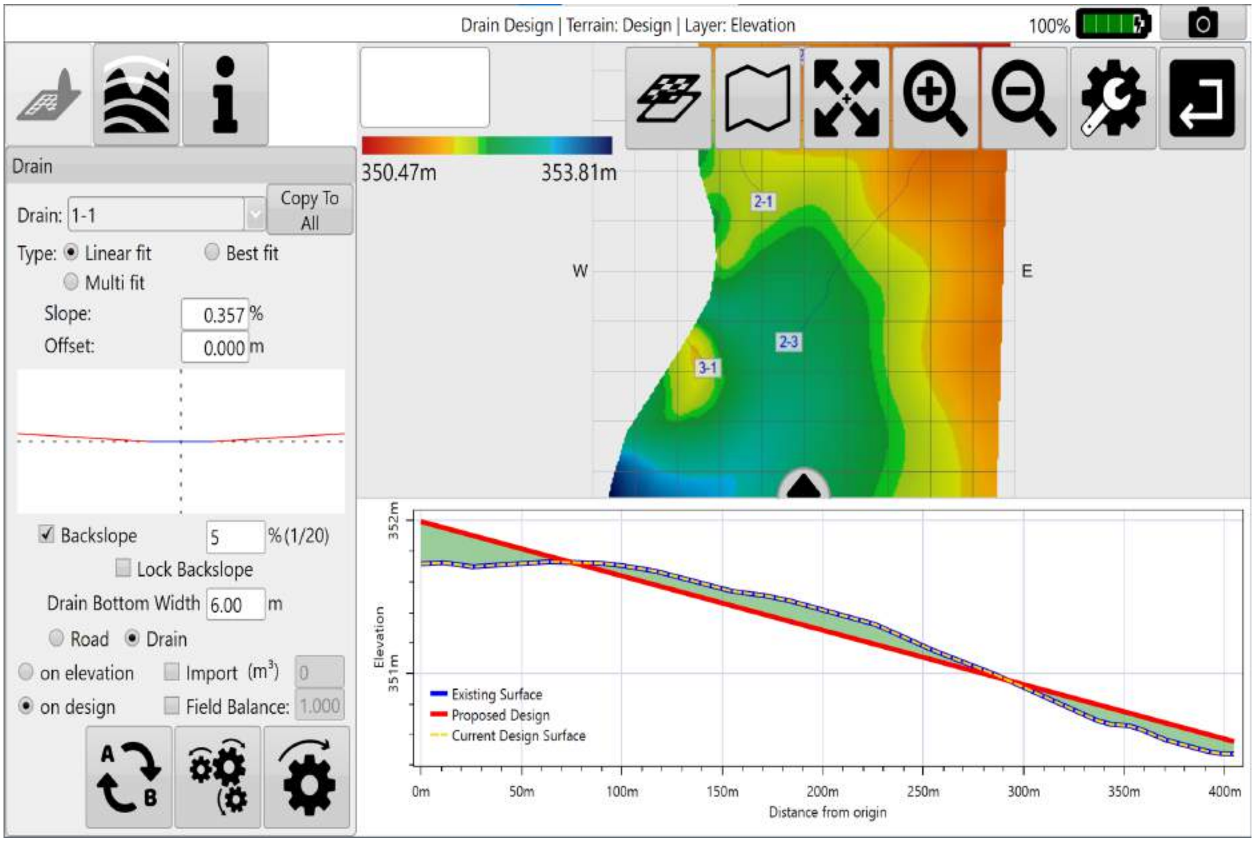
Drain Design allows slope profile and cross section design choices before “burning” (embedding) drains into the map for implementation.

Important Concept!

NOTE: If a surface & drain exist, the surface should be designed first & the drain second. If you need to edit drain elevation data you can return to the '**Collect**' wizard step to edit the drain line. However you will lose current project designs.

Select a drain and the depth/elevation profile of the drain will show in the plot at bottom right (this chart may need to be dragged up into view). Use the '**AB Reverse**' button to make sure your drain is falling from left to right in the profile chart, this will make sure that slope values are all positive and make adjustments a lot easier.

Drain paths can be changed into roads by selecting the checkbox. By selecting '**Road**' the drain design will be inverted.



NOTE: The positioning/layout of drain paths is not considered part of '**Drain Design**'. They can be adjusted in the surfacing step for driven drains or in auto drains/pattern drains.

When applying drain designs there are 3 different modes that adjust the path of the drain which are Linear fit, Best fit and Multi fit.

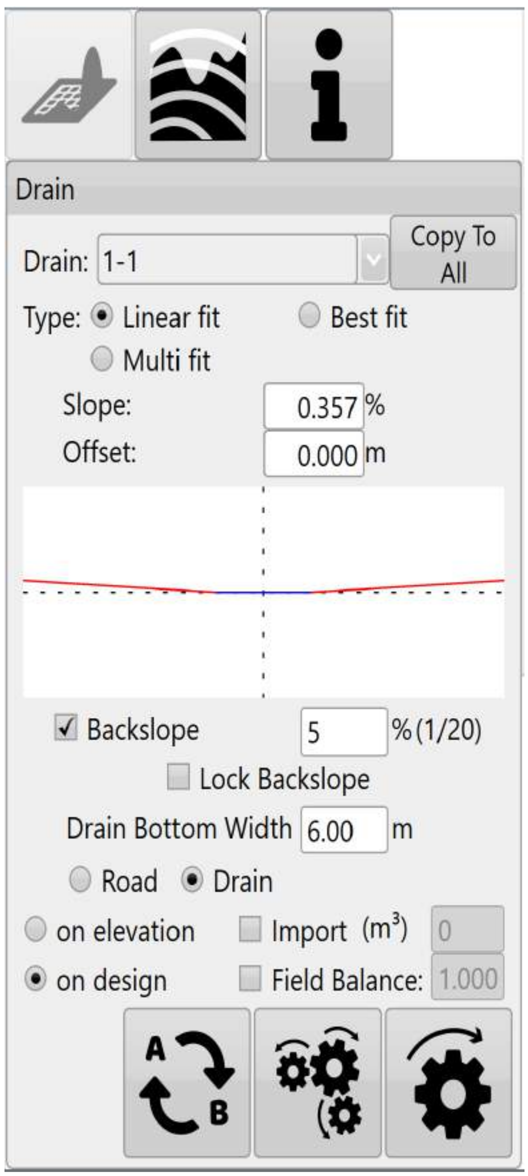
For a youtube video tutorial on Linear and Best fit drain design visit https://youtu.be/tea6Xk7NmyQ or use your phone to scan this barcode

Linear fit

Creates a single straight plane along the drain path.

'**Slope**'- is the gradient at which the drain is installed to ensure that water flows in the direction you want.

'**Offset**'- allows for vertical offsetting of the drain. Setting a positive value will lift the offset creating a fill effect along the entire drain, while a negative value in the offset will lower the design height creating a deeper cut drain.



Best fit

Adjusts the slope to try and follow the natural curve of the field. Similar to multi-fit field design. Cutta Ditch

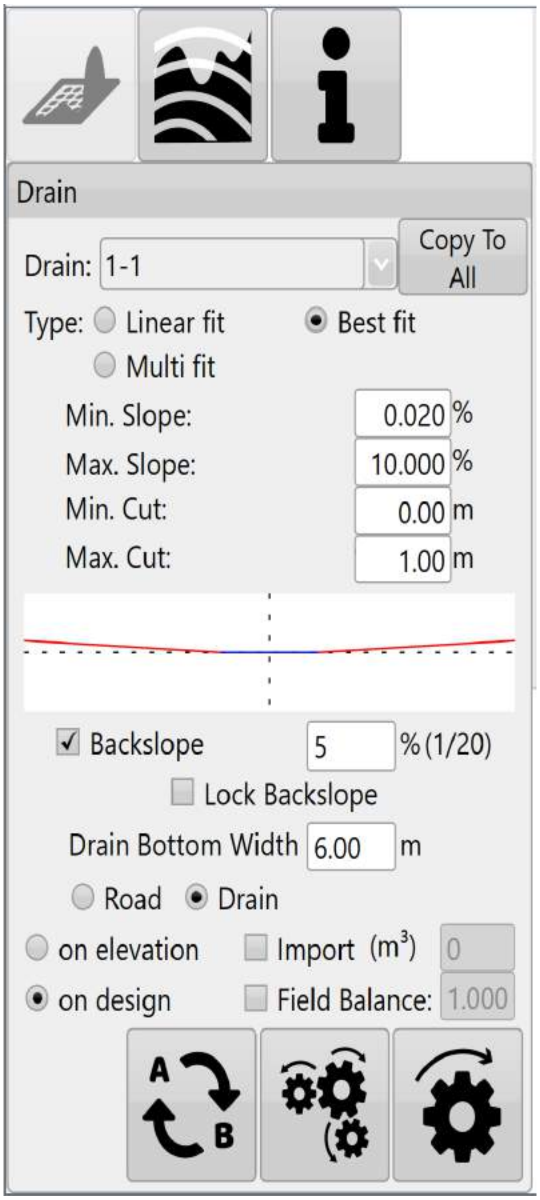
NOTE: Best-fit in drains is equivalent to Multi-fit in full field design. This incongruity comes from a desire to try and match the naming conventions of the John Deere SWP+ product (which is superseded by T3RRA Cutta and T3RRA Ditch).

'**Min. Slope**'- The lowest gradient of slope you will accept in the drain.

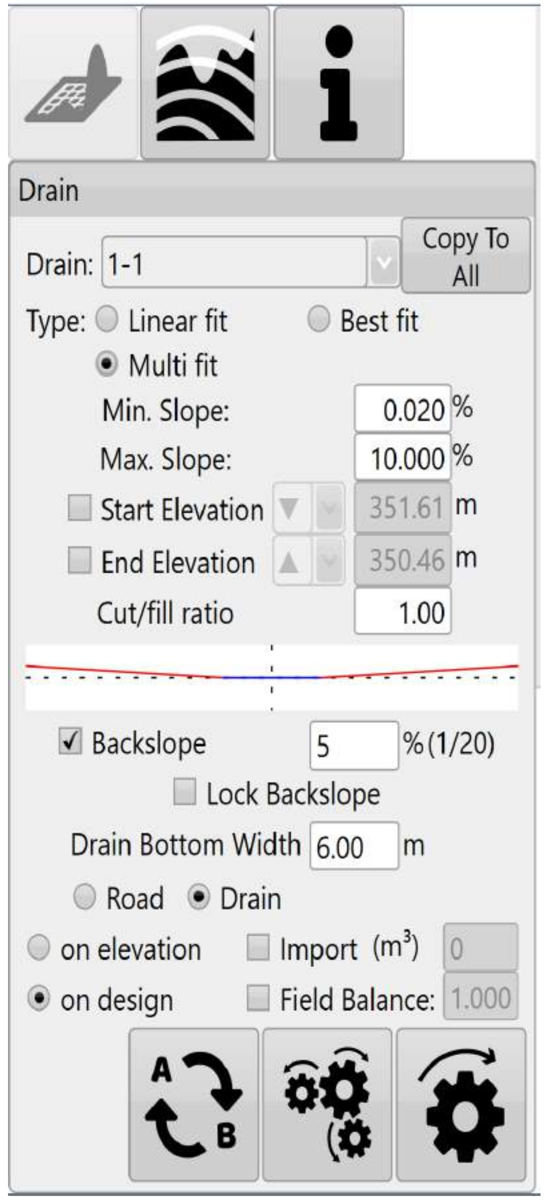
'**Max. Slope**'- The highest gradient slope you will accept in the drain

'**Min. Cut**'- ensures the design will consistently cut at least this amount.

'**Max. Cut**' sets the maximum depth that the design will cut to and ensures that it never exceeds this point.



Multi fit



Applies both cut and fill, and can be used to remove points of erosion and build up that would cause issues. Best used when maintaining existing drains.

'**Min. Slope**'- The minimum allowable gradient of the slope.

'**Max. Slope**'- The maximum allowable gradient of the slope.

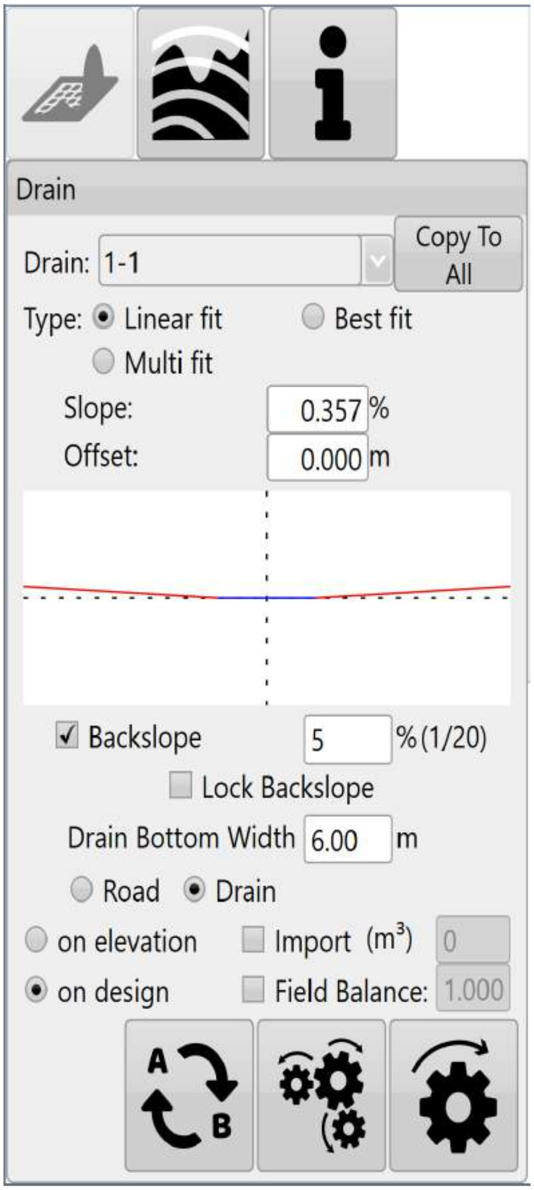
'**Start Elevation**'- The desired elevation point at which the design will begin (at point A). Set to be greater than, equal to, or less than the set value adjusting the start elevation value of the design to be no higher or lower than the set value

'**End Elevation**'- The desired elevation of the final point on the design also referred to as (point B). Set to be greater than, equal to, or less than the set value to ensure that the final elevation of the design is not higher or lower than the set value.
NOTE: Multi fit tries to balance the cuts and fills using the start and end elevations. If the design parameters won't work you will see the message: "Model is too constrained" .

For a youtube video tutorial on multi fit drain design visit https://youtu.be/W3L1hksgH14 or use your phone to scan this barcode

General settings

These settings are present in all drain design modes.



'**Cut/Fill ratio**' - please refer to definitions in appendix. The following settings and buttons are all constant between all three modes in Drain Design. '**Copy Settings To All**' - copy the settings of the currently selected drain to all other drains present in the project. If all drains are likely to require similar parameters this can be a big time saver.

'**Backslope**' (batter) is the gradient of the drain walls. A higher backslope value means a sharper drop into the drain. (If no backslope is desired enter 0 as the value.) If you wish to make a road switch the selected Road/Drain option (below Drain Bottom Width). =

'**Lock Backslope**' is mainly intended to be used when working with drain lines - not full surfaces. Will cause the surface to be ignored and the backslopes will be created to their maximum extent. Note: that the drain bottom will always be burnt in, regardless of the surface elevation. I.e., if you offset a drain up 5m, you would always have a drain bottom burnt in, regardless of if lock backslope is on or off

'**Drain Bottom Width**' allows you to control how wide the bottom of the drain is. The drain bottom is always horizontal. If you want a drain bottom with a defined non-zero cross slope you should manually set the cross slope control on your implement in the 'Implementation' stage of operation.

'**Cut/fill ratio**' allows you to compensate for soil compaction characteristics.

'**Apply All**' allows you to apply all the drains in the field, not just the drain that is currently selected.

The '**AB**' button reverses the drain direction. It effectively reverses the direction calculations are performed on the drain.

Choosing to apply '**on elevation**' or '**on design**' chooses the elevation profile that is used to calculate the designed surface. For example, one drain requires a different design than the others present, you will apply the design 'on elevation' to All then select the drain from the drop down and apply a different design 'on design' to that drain alone.
NOTE: choosing to design on a design will continue to lower the surface of the drain.

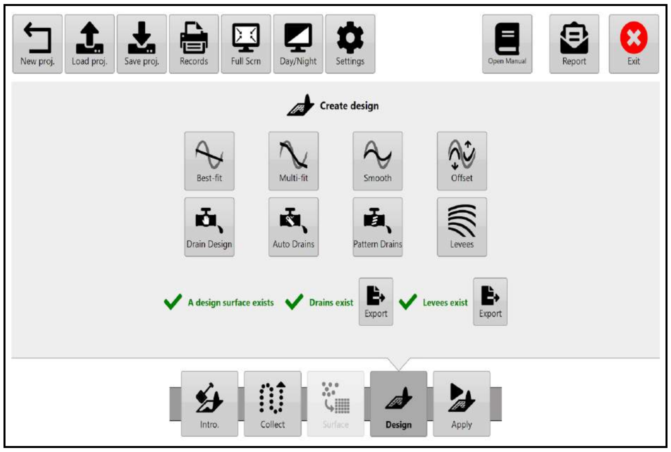
The swap '**A-B**' button reverses the profile as it is displayed in the profile view. This also affects how the software designs the profile as the software will always try to slope the design from left to right.

Press '**Apply All**' (the image of 3 cogs) to apply all drains at once

Press '**Apply**' (the image of 1 cog) to apply only the currently selected drain.
After editing your drains in the surveying step, return to create a new drain design in the '**Design**' wizard step. If a surface and drain exist, the surface should be designed first and the drain second.

For a youtube video tutorial on general drain design options visit https://youtu.be/5FbgzyWI7PQ or use your phone to scan this barcode

After designing the drain and applying it, it is “burned” (embedded) into the field surface model. At this point you can begin implementing in the same way you would a normal field design. If you are using a constant depth drain cutting implement you may not be interested in the depth profile. You may want to only rely on the paths for guidance and not elevation control. In this case there is no need to create the drain profile (unless you want to look at the effects of the drains in the rainfall simulation).



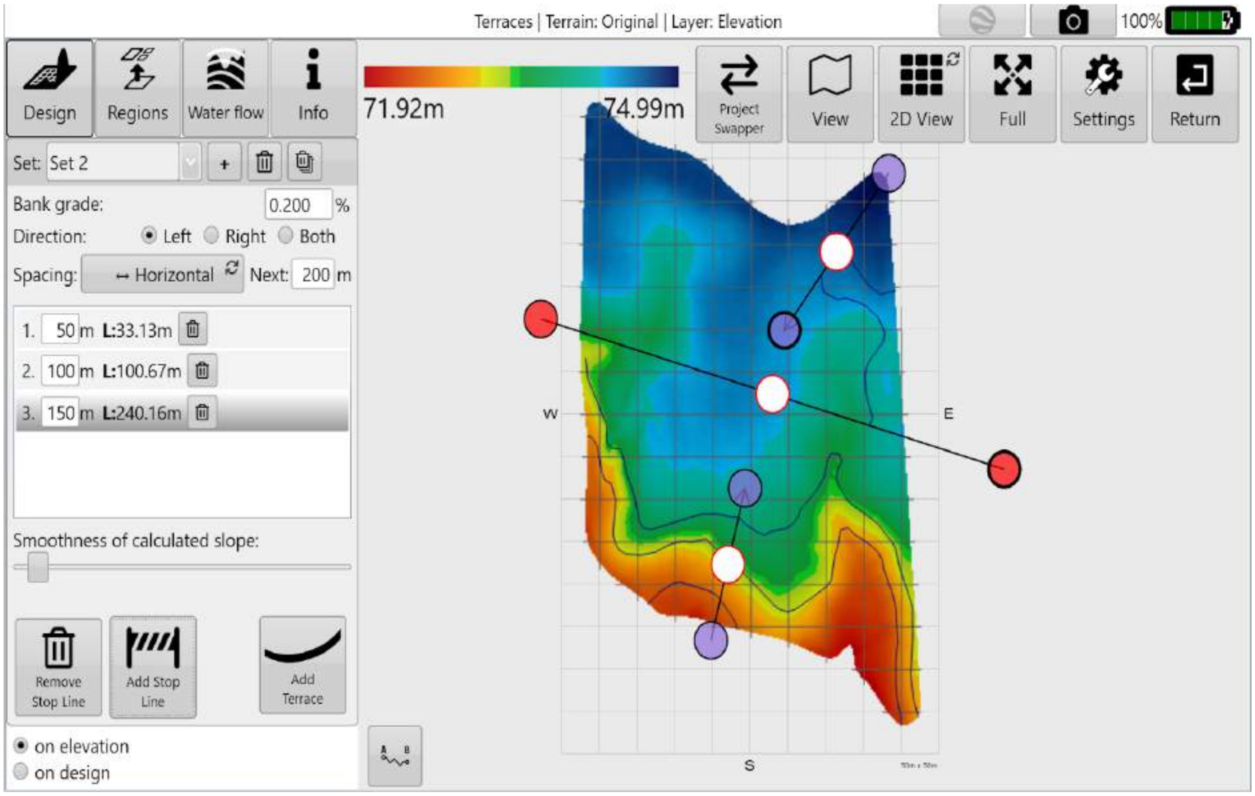
Option: Use the '**Export**' button on the wizard screen to export the drain paths to an RCD folder structure (JD Guidance lines). You can export ditch track guidance lines that will steer your tractor on exactly the right path to accurately and efficiently remove your wet areas (John Deere AutoTrac™ required).

Once you are happy with the design follow the steps in the 'completing your design' section.

Terrace Design

Desktop

'**Terraces**' allows you to create Guidance curves to mark terraces for erosion control.



When you first enter the terraces tool, a start line is displayed on the map. This is where your terraces will start from. There are a few parameters for terraces:

- '**Bank grade**' allows you to control the slope of the terraces. This will affect how quickly water flows down each terrace.
- '**Direction**' controls how terraces flow from the start line. To the left, right or to the left and right (both) of the start line. If you want the terraces to flow towards the start line, make the bank grade negative (e.g. 0.2% to -0.2%).
- '**Spacing**' controls whether the starting positions of the terraces are controlled by Vertical distance (elevation drop) or Horizontal distance (distance traveled along the start line). Each time a terrace is added (with the [Add Terrace] button in the lower right of the design pane), it updates the 'Next' distance on the right.

- Each terrace added is listed in the center. In the list, you can change each terrace's start distance, or delete it. It also shows you how far the terrace extends.
- The '**Smoothness**' slider controls how much the surface irregularities are smoothed out. If your terrace lines are too jagged, you may increase this slider. Note, however, that high smoothing will lead the terraces to not follow the 'Bank grade' as closely. This may lead to wet spots and/or require earth moving to ensure drainage.
- '**Add Stop Line**' adds a new black line to the map with large red circles at each end. Position one or more stop lines using the red circles to terminate terrace lines at the right location (e.g. a waterway).

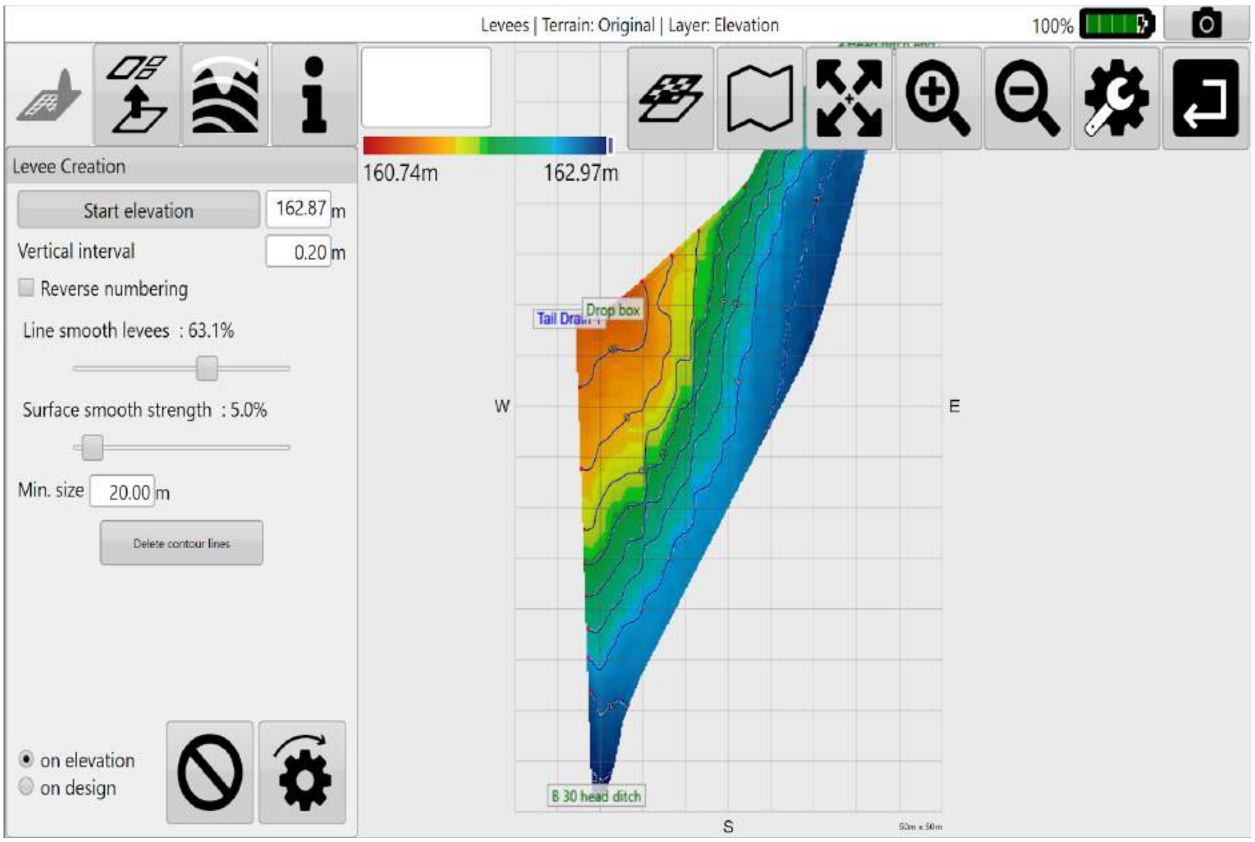
Once you've created terraces with one start line (also called a 'set'), you may use the smaller Plus button at the top to add a new start line. You can add as many start lines as desired. To switch between start lines, use the '**Set**' drop down, or simply tap on one of its purple circles on the map. If you want to remove a start line (including the full terrace set), select it and click the delete button at the top.

Once you're done creating and laying out the terraces, you may export them as guidance lines, etc.

Levee Design

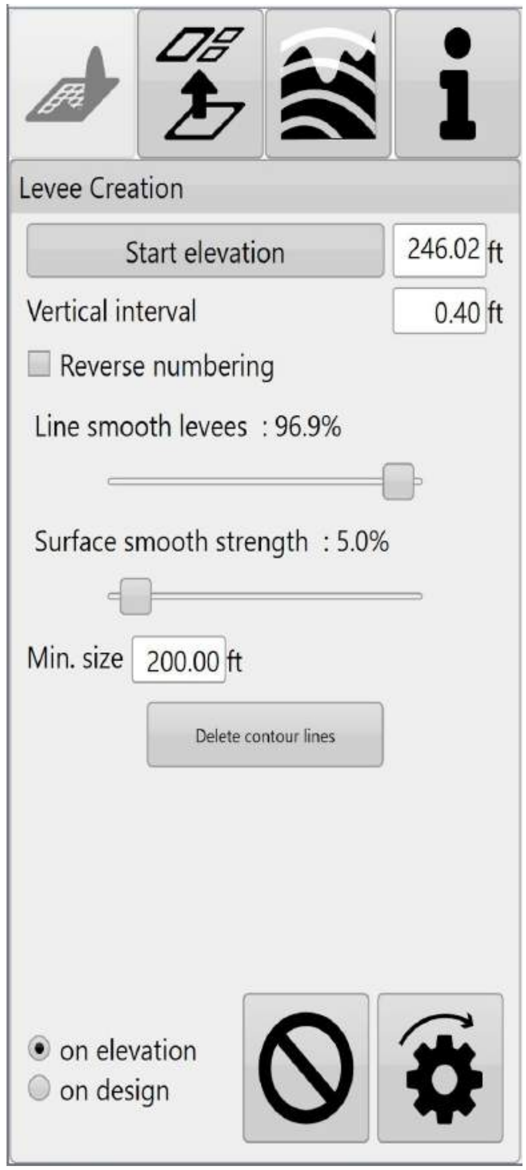
Cutta Ditch Levee

'**Levees**' allows you to create repeating or singular levees at set elevations.



- Levees can be added at set intervals.
- Levees can be smoothed.
- Levees can be selectively deleted.
- Levees can be applied selectively to field regions.
- Levees can be exported as guidance curves for use with John Deere AutoTrac™.

Levee Creation Parameters



'**Start Elevation**' will be populated automatically. You can also choose the 'Start Elevation' by manually pressing on the 'Start Elevation' button and then touching the design map at the location you would like to start the levees from. Press Finish selecting to apply.

'**Vertical interval**' tells T3RRA Cutta and T3RRA Ditch how much elevation change from the previous levee is needed before adding another levee.

'**Reverse numbering**' – By default levees are numbered from highest elevation to lowest, reverse numbering switches it to count up from the lowest elevation.

'Line smooth levees' adjusts how many sharp turns and how smoothly the levee lines will be created. The further to the right the slider is the more round the lines will be (with decreased sharp turns).

'**Surface smooth strength**' adjusts the surface by applying an averaging filter to the surface of the field to remove bumps and dips without creating a full field earthwork design.

'**Min. size**' determines the minimum length a levee must be before it is included as a drivable path. Levees that are shorter than this will appear grayed out and not be available as paths.

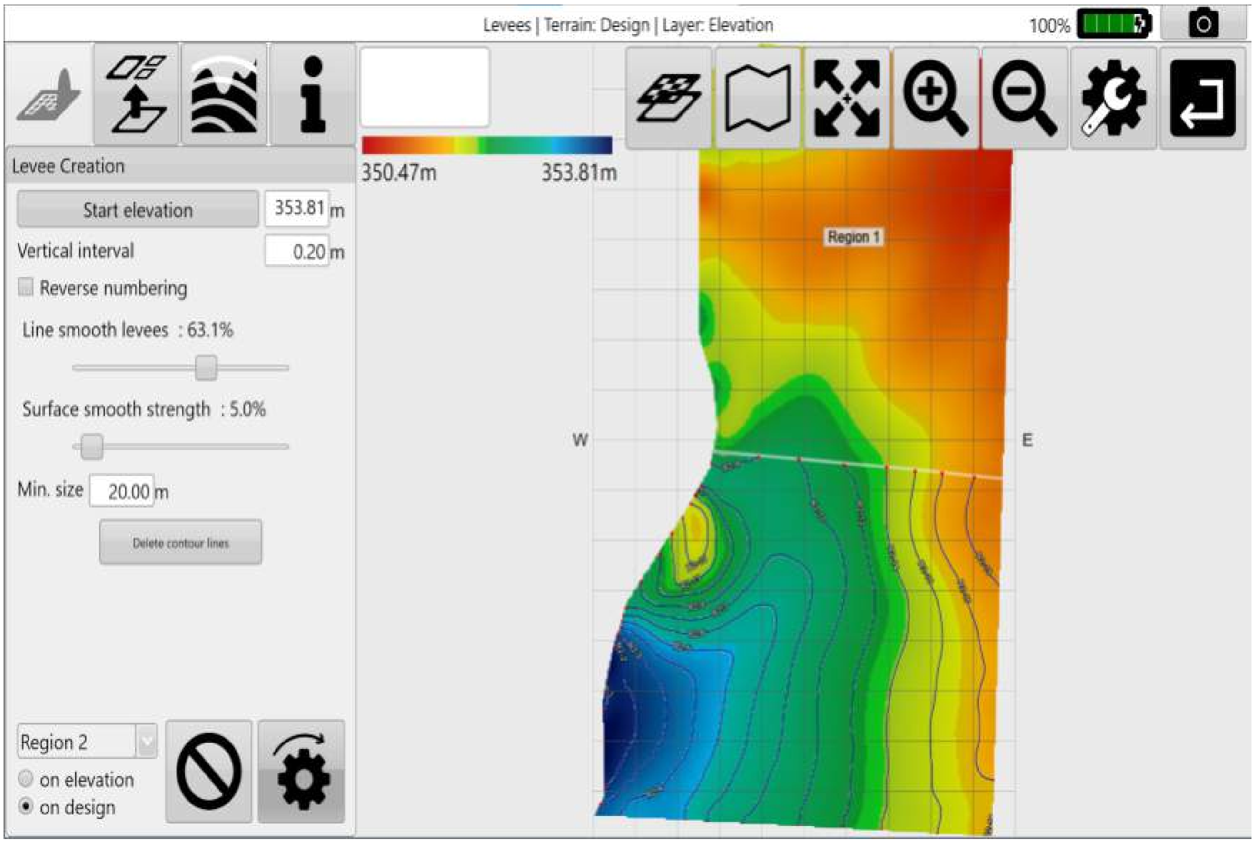
'**Delete contour lines**' will bring up a window allowing you to enter the number associated with the levees you want to remove.

Like other design tools, Levees allows you to use either the original elevation surface, or a design surface as the basis for the calculations. It may be beneficial to perform a landforming operation on this field prior to putting in levees and then base the levees off the design surface.

Cutta Even if you are not performing a landforming operation it can sometimes be useful to perform a smoothing design on the surface first before attempting to lay out levees (ie, to work around poor data).

Press '**Apply**' (shown as the levees icon) after parameters are entered.

Levees can be applied separately to individual regions. It may be advantageous to do this if you have differently spaced levees in different sections of a field.



NOTE: Levees can be added to each region individually.

Once you have finished designing your levees and are happy with them there are two options available:

- export levee paths as guidance lines.
- begin implementation.

Exporting will allow the lines to be saved as guidance curves that can be loaded to John Deere's guidance system.

Select the Export button on the main design page to save as guidance curves (John Deere AutoTrac™ required).

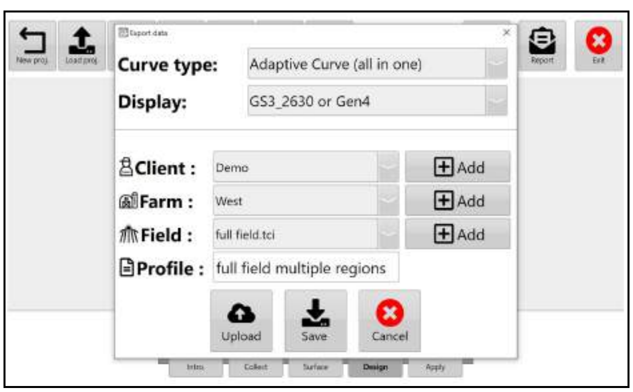
If you want to continue and manually implement the levee paths or just display current position on the map while pulling levees, you can follow the instructions to begin implementation on the following page.

For a youtube video tutorial on Levees visit https://youtu.be/V8NLmRCQEx0 or use your phone to scan this barcode

Exporting Guidance lines from T3RRA™ and importing into AutoTrac™.

Remember that guidance lines are only available for Drains and Levees.
Should you wish to export guidance lines from T3RRA software for use with AutoTrac™ be sure to follow the following steps to be sure that the process is successful.

Exporting begins by pressing the export button next to the information that you want to export that appears once that data is present at the bottom on the 'Design" home screen.

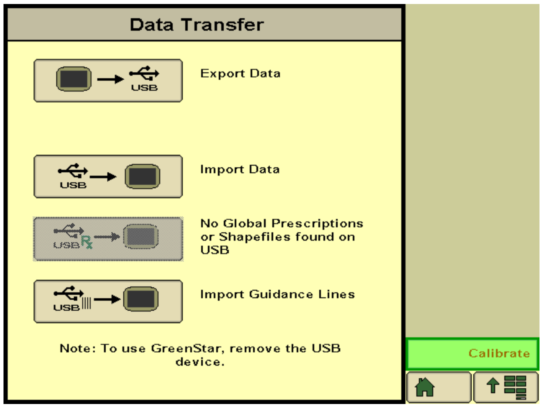


How to export guidance lines from T3RRA

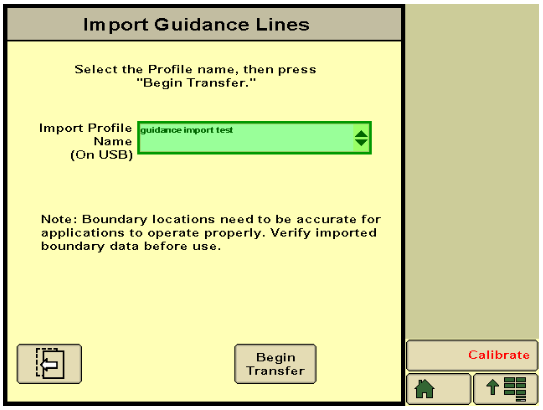
1. A window should appear similar to the image to the right when you select 'Export'.
2. Select curve type.
3. Set the display to the model number of the John Deere display you will be using.
4. Input project information into client, farm, field and profile.
5. Press "Save" and a file with your guidance lines will be saved in the set location.
6. Press "Upload" and a file will be uploaded to JDOC where it can be assigned to equipment.

How to transfer guidance lines to a John Deere display
(Instructions given are for the GS3 2630 Display, steps for other displays may vary: refer to the appropriate display manual)

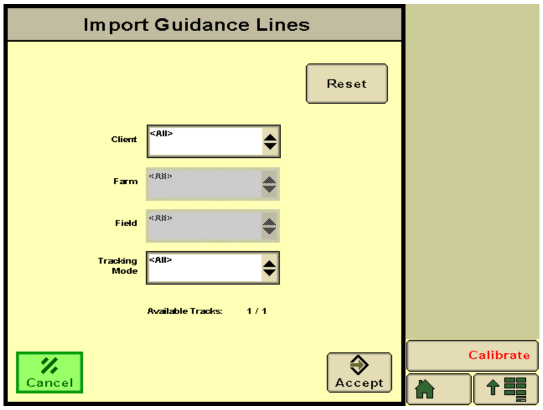
1. Insert USB with guidance lines saved on it into John Deere Greenstar display. (The display will automatically detect the USB and display the available options.)
2. Select "Import Guidance Lines" which should be the bottom option.



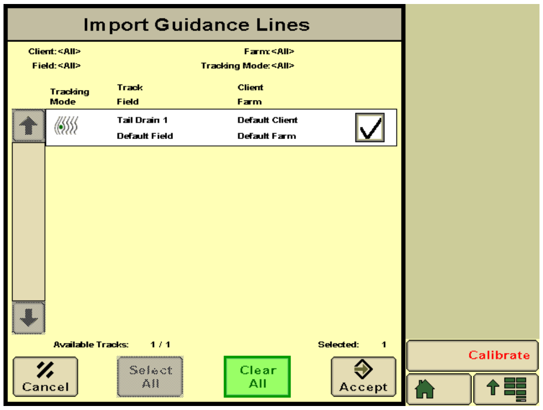
3. Select the desired profile and press "Begin Transfer".



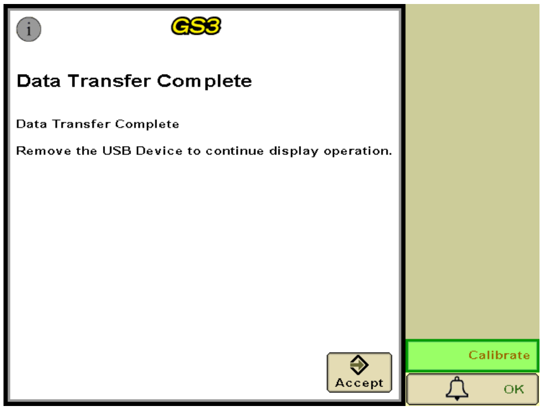
4. On this screen select which client, farm, field and tracking option of the file you want to import and press "Accept". (The tracking option should be set to adaptive curves.)



5. Make sure the correct line/s you want to import are ticked and press “Accept”.



6. A loading bar should appear, if everything has been successful the Data Transfer Complete screen should appear and you will be able to press “Accept”.

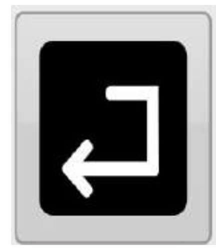


7. Your guidance lines have been imported to your John Deere Greenstar display and are now ready to be used with Autotrac™.

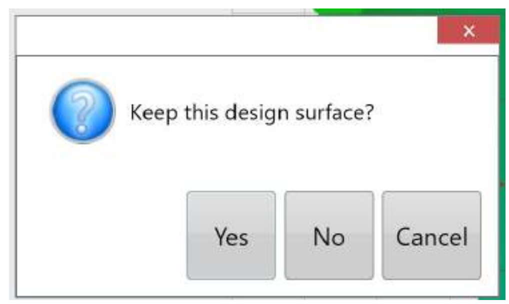
Completing your design

Once satisfied with your design surface and/or drain.

1. Select the '**Return**' button. (Top right corner)



2. Select '**Yes**' to keep the design surface.



3. Select the '**Save proj.**' button to save the T3RRA project.

Once you have finished making all your design changes, move onto step 4.

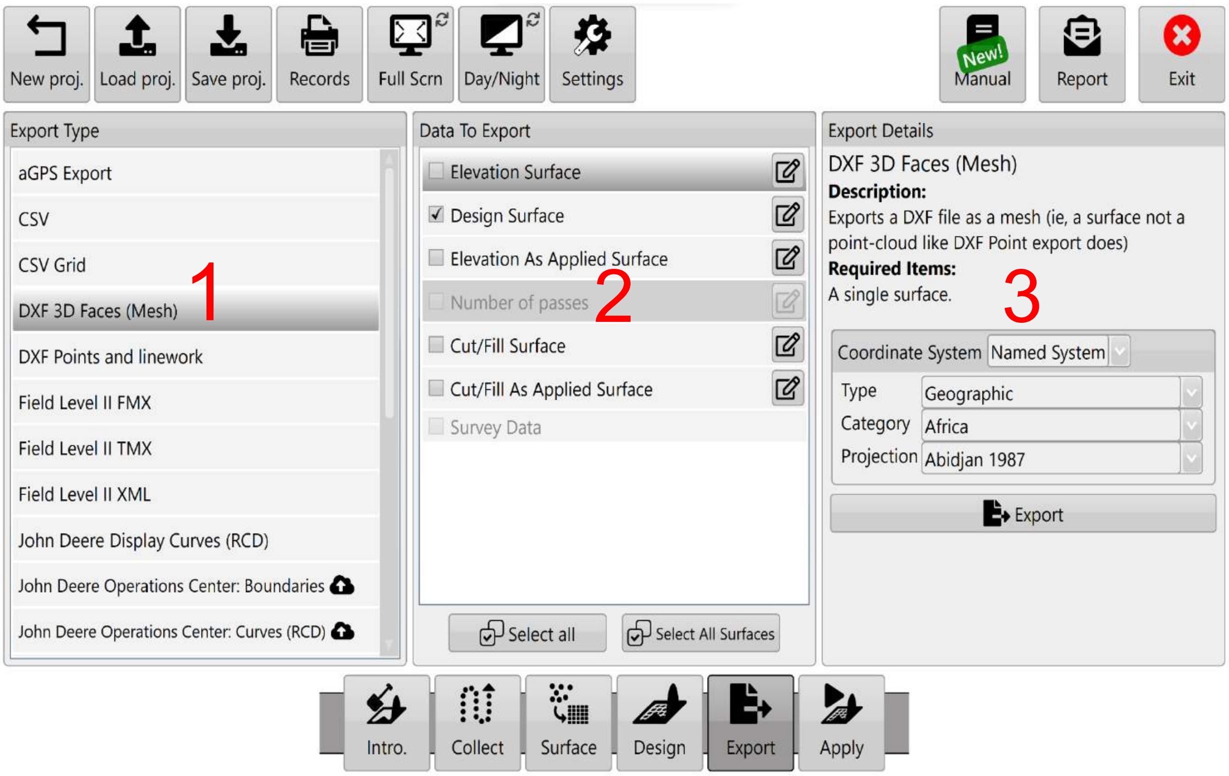
4. Select the '**Apply**' button and follow on screen steps to begin implementing your design.

Exporting Data

Cutta Ditch Plane Levee

Exporting allows data to be transferred to other programs. If you're wanting to work within T3RRA, click the "Save Proj" button at the top of the screen - it is far easier to work with this format than exporting and then re-importing the data.

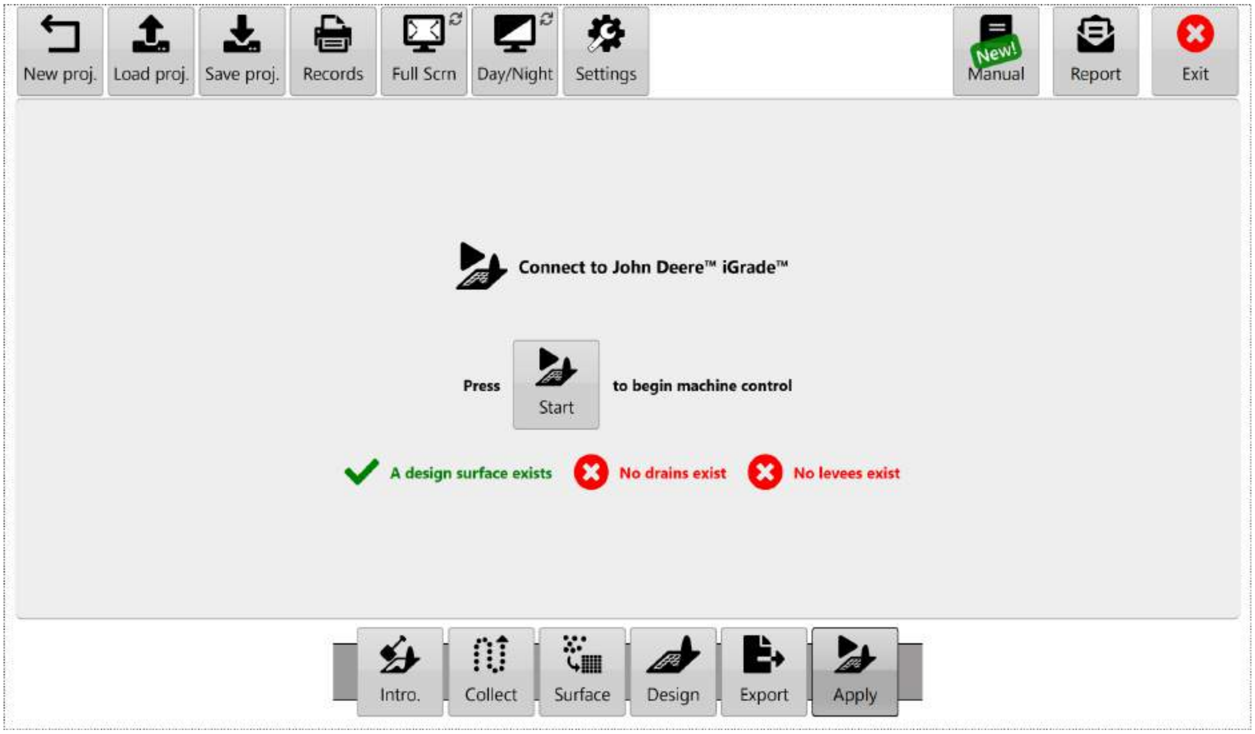
Steps to export data



1) Select the export format you want on the left.
2) Choose the data you wish to export. Clicking the  button will allow you to change how the layer is exported (say if you wished to export a design surface as an elevation).
3) Provide any additional information required (such as which projection you need) and click “Export”.

Implementing

Cutta Ditch Plane Levee



The implementation screen

When you begin implementation of your design, the display will show a cut/fill map as well as tools to assist in the implementation of the design.

Screen features of interest include include:

1. Setting Zero button.
2. Cross-slope nudge control buttons.
3. Vertical blade shift control buttons.
4. Cut/Fill Information & horizontal colour bar.
5. Progress Indicator.
6. On-Grade Indicator.
7. Blade and Tractor Indicators.
8. Map display.
9. Drain profile and cross section.

1. Setting Zero

Cutta Ditch

Important: Before work can begin, the system must be “zeroed”. Both the T3RRA software and iGrade™ must be zeroed.

Important concepts:

1. **Benchmarks.**
   Benchmarks are “control points”. These are known locations in or out of the field that can be returned to as required. They have a known location in the real world (hopefully marked by a peg, or some easily identifiable marker) and also have known locations on your digital map (marked by a digital marker). They are used to tie the real world and the digital world together. Whenever you are located at the benchmark in the real world, you should also be located at the same place on your digital map. If there is a discrepancy (either horizontally or vertically) then a correction factor can be applied to the digital map to correct it. We call this process “zeroing”.
2. **Zero Cut/Fill Area.**
   A “zero cut/fill area” is a location in a field where neither cuts nor fills are expected. That is, part of the field where the design calls for the original elevation to remain untouched. The important thing about these areas is that they can be relied upon to always have the same elevation and thus can be useful to check against.

Important Concept!

“Zeroing” is a generic term for making sure that the digital map, the actual field surface, and the GPS measured blade height are all aligned. In practice this means combining a number of factors to calculate offsets in the horizontal (X,Y) and vertical (Z) directions.

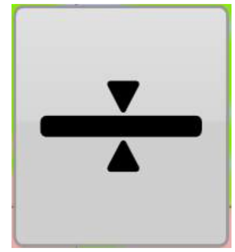
There are multiple ways to do this. The appropriate method depends on the circumstances of the survey, the design, and the implementation. We will explore the available methods and some example operational scenarios below.

After zeroing you should save the project. The zero offset is stored in the project and this will avoid needing to set zero again. If any of the GPS Receivers are adjusted, moved or replaced you will need to zero your system again.

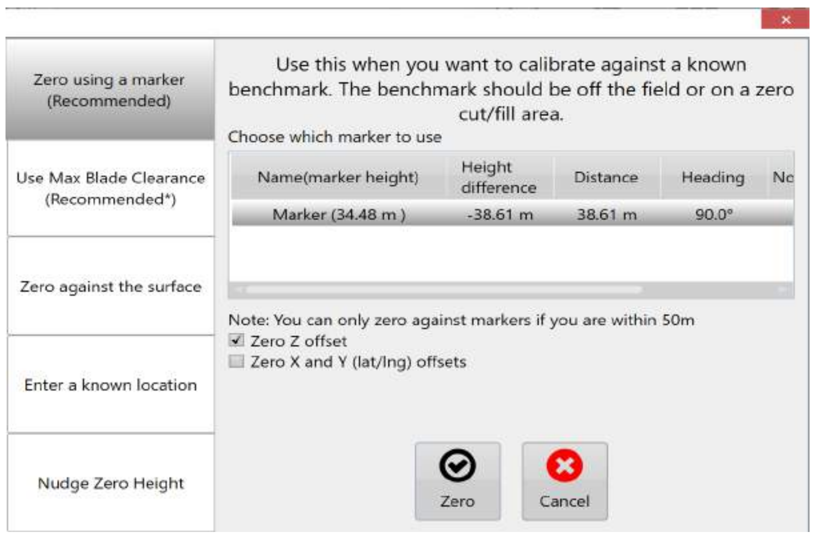
Setting the Zero Offset

Cutta Ditch

When you press the button to set zero during implementation you are presented with 5 methods of doing so.

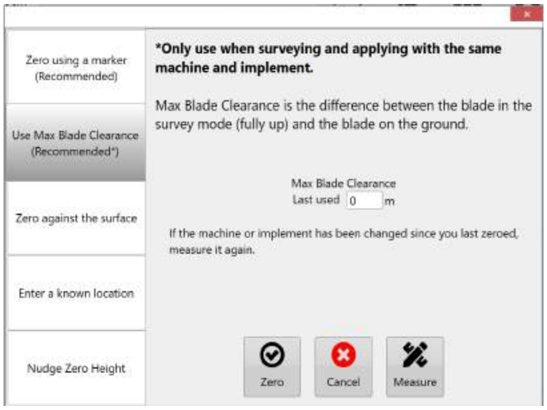


1. Zero against a marker



This method is best used when you have a digital marker that you know has the correct position and height associated with it. Potentially this marker may have been created in another software package (like T3RRA Design) or may have been placed by you. You also must be at the exact location in (or out of) the field that the digital marker represents. Ideally this will be marked by a peg, or other permanent object. **This method has the benefit of being able to optionally zero the control map in the horizontal direction as well.**

One point to note here relates to dropping markers while surveying with a scraper. Normally you will survey with the scraper at full elevation. This means that markers dropped will be at the same height as the rest of the survey. This is good. You may be tempted to lower the cutting blade to the ground when placing a marker on the map while surveying. Do NOT do this. Do not alter the scraper elevation when surveying just to drop a marker. If you come back to the same location as the marker when zeroing DO place the blade on the ground prior to setting the zero. The difference in the scraper blade height when surveying (verse implementing) will be accounted for.



2. Use Max Blade Clearance

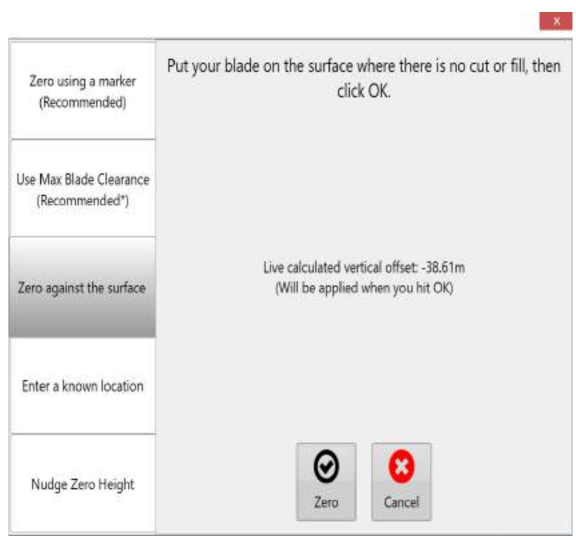
Max blade clearance allows you to quickly reuse a previous zero you have performed. Ideal for when you're applying and implementing with the same tractor/implement every time.

Maximum blade clearance is the difference in the blade/bucket height between it being fully raised and on the ground.

Click the measure button  to automatically calculate clearance or you can enter it manually - just measure the distance the blade is above the ground when fully raised (in survey mode).

3. Zero against the surface

This method is most useful if you have done your own survey using your own base station. Effectively all you need to do is to tell the system when the cutting edge of the implement is resting directly on the ground in an area of the field where no dirt has been moved.

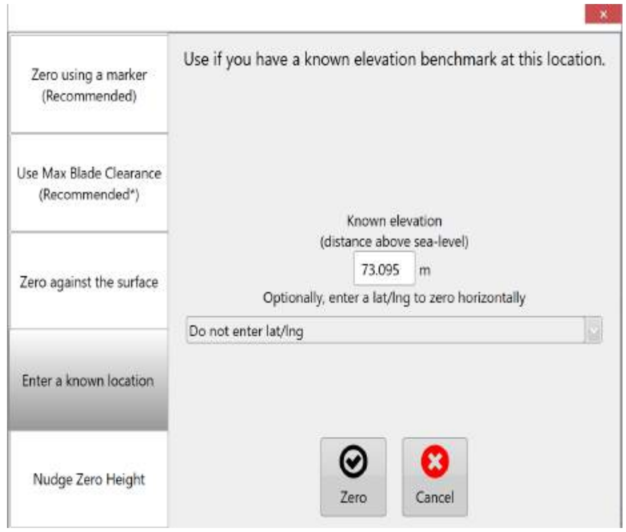


Our recommendation is that you do this in a zero cut/fill area. On a cut/fill map this is a gray or green (depending on color-scheme selected) area. We also recommend that you zero in a location where you are over the wheel tracks of the path that was taken while surveying. Mark your zeroing point (benchmark) with a peg or a flag and drop a digital marker in the T3RRA software. You should then be able to return to this benchmark if you suspect that your GPS has drifted or developed an inaccuracy.

T3RRA

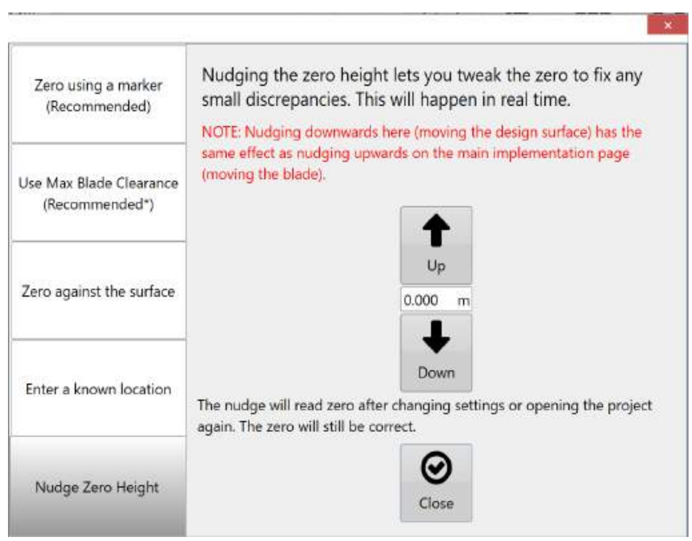
4. Zero against a known location

Sometimes you will have a location in the field where the height (and possibly horizontal location) is known. An example of this would be where a surveyor has surveyed the field and has left a survey peg to benchmark off. As long as you have imported the surveyors terrain file that peg can be used to zero the system. Drive to the peg, place your cutting edge on top of the peg (assuming the known height is at the top of the peg) and zero. You can optionally add in the latitude and longitude to adjust the map horizontally if this information has also been supplied.



5. Zero by nudging

Even after zeroing you may need to alter the vertical offset slightly. Compensating for GPS drift may be a reason to do this. Or you may want to alter the design surface height slightly to improve your cut and fill balance.



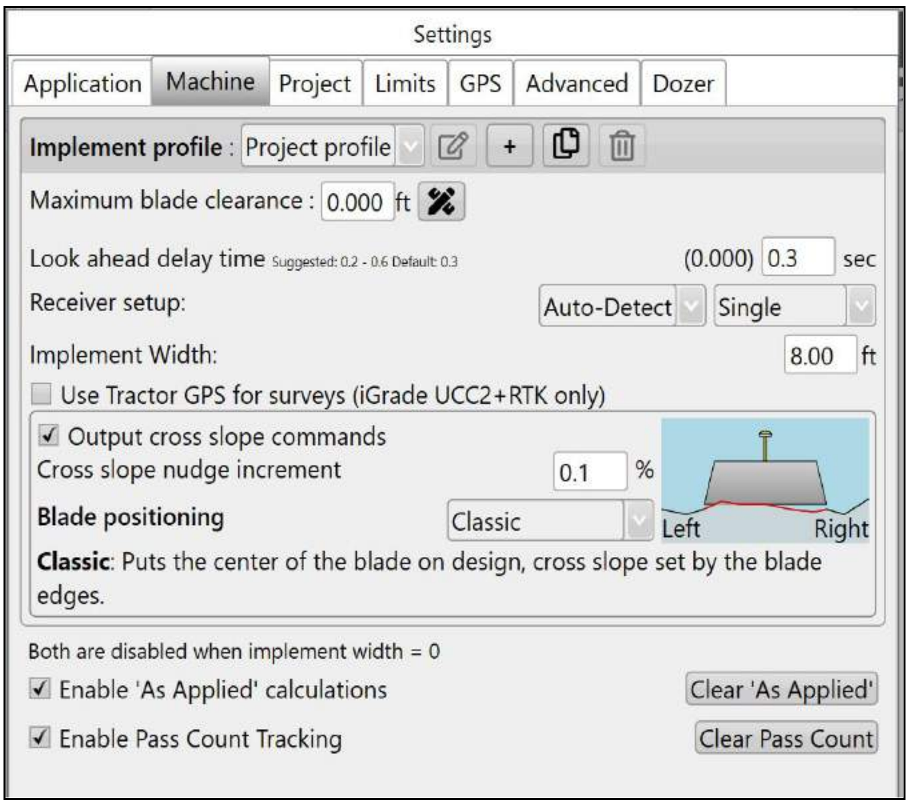
For a youtube video tutorial on Setting Zero visit
https://youtu.be/DZSitcrYMWs or use your phone to scan this barcode

2. Cross-slope adjustment

Cutta Ditch

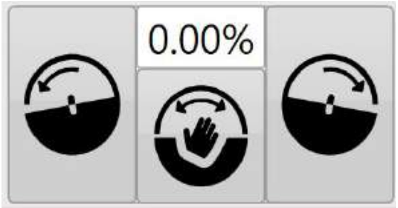
T3RRA software is capable of sending cross slope commands to iGrade™. It can operate automatically based on the cross slope observed on the map at the current location. It can also be switched to manual and a cross slope value entered.

To enable control (manual or automatic) you first must check the '**Output cross slope commands**' box in the '**Settings > Machine**' window.



Once you have checked this box, you will be able to set the cross slope nudge increment. This specifies the incremental amount each press of the left and right tilt buttons will add to the cross slope. Being able to set the nudge increment allows you to decide the size of each adjustment.

The cross slope controls are in the lower left section of the map screen. The left and right button rotate the blade to the left and right respectively (relative to the direction of travel). As the left and right buttons are pressed the current tilt value is displayed in the text box between the two buttons. The center button of these controls will turn automatic machine control on and off.



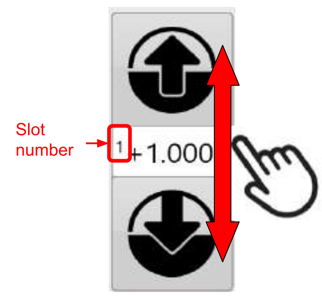
When automatic control is engaged, the nudge buttons will change to display the icon to the right.

3. Vertical blade shift

Cutta Ditch

The blade shift buttons in T3RRA Cutta and T3RRA Ditch serve to manually shift the height of the blade, either up or down. The distance a single press will shift the blade vertically (called the '**Blade shift increment**') is set in the '**Settings**' window. As the up and down buttons are pressed the current shift value is displayed in the text box between the two buttons. This value can also be set directly by touching the text box with a finger.

Each project now has three blade shift slots (1, 2 and 3). Drag or swipe the blade shift up or down to switch between slots.



Blade Shift is generally used in one of two ways:

1) It can be used to limit the cut depth which T3RRA will try to reach in a heavy cut area. For instance, if you have a six inch cut to make but you can only realistically cut in 2 inch increments, then you can "shift up" four inches for the first pass, two for the second, and then zero for the third. In this way, you can shave down to grade without over-taxing your equipment. Remember to set it back to zero for areas of the field that have smaller cuts!

2) It can be used to offset transient GPS variations. If an operator feels like the GPS has drifted upward, then they can adjust for this using the blade shift.

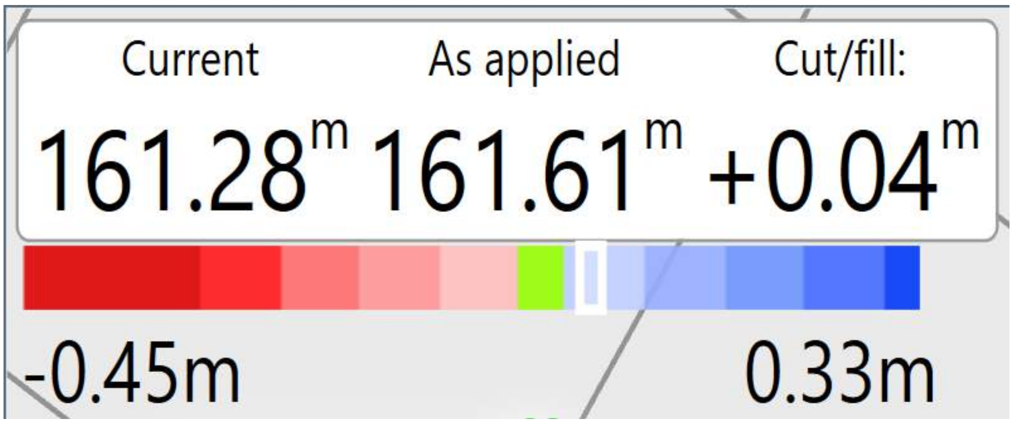
NOTE: The '**On-Grade indicator**' does not account for the blade shift. So if you shift the blade up two inches from grade, and the blade then adjusts to that height, the on-grade chevrons will show the blade as being two inches above grade, not on-grade.

NOTE: Blade Shift should be used for temporary manual vertical adjustments. If the vertical adjustment is intended to be permanent then it is more appropriate to adjust the Zero Offset value.

4. Cut/Fill information display

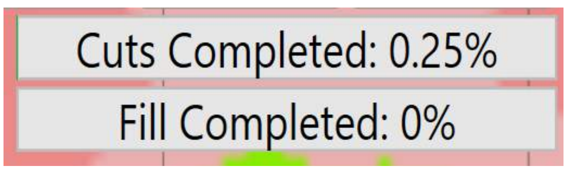
In the upper left corner of the screen more information is shown about current ground height, design ground height and the amount needing to be added/removed.

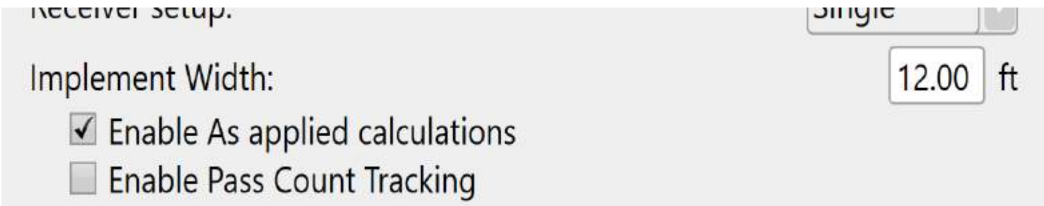
The Horizontal color bar will display a color graded scale of cut and fill amounts and the white marker will show the height of the current location.



5. Progress bars

In the upper right of the screen are 2 percentage counters that show the amount completed. These are only shown when '**Enable as-applied calculations**' is turned on. Cutta Ditch



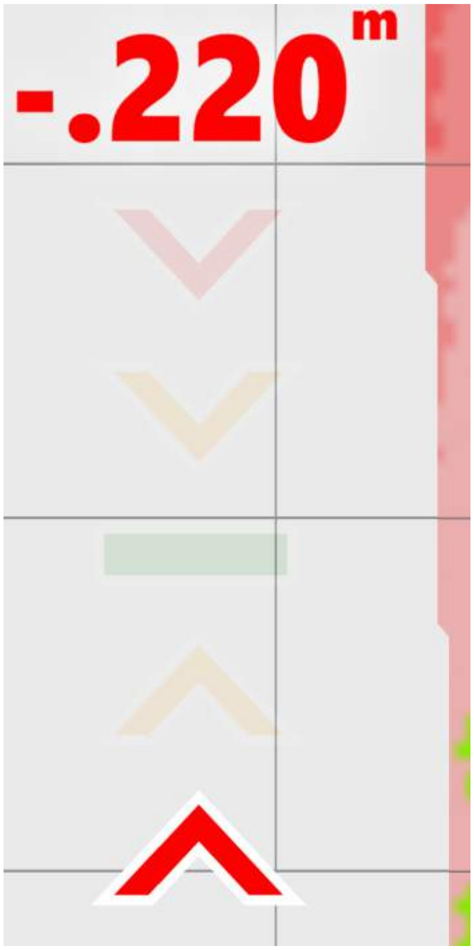


NOTE: the percentages count up what has been implemented so far, not what is left to do. When pausing work part way through a job save the project in order to retain completion percentages.

6. On-grade indicator

Cutta Ditch

At the left side of the map screen there is a grouping of up/down chevrons that show the current blade height relative to the target design height. They show how far the blade needs to move, and in what direction, in order to be “on grade”.



If two GPS units are connected to the system two sets of on-grade indicators can be shown. This is configured in the ‘**Settings**’ window.

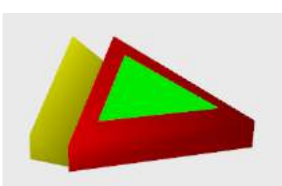
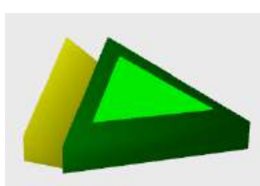
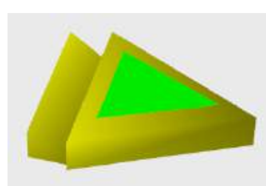
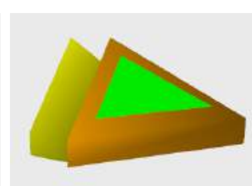
If the screen is displaying 2 sets of chevrons the left set will display data for the left/front GPS.

7. Blade and Tractor Indicators

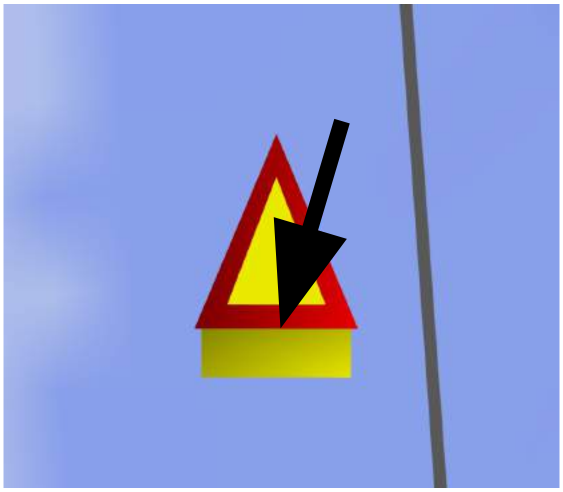
When you are implementing a design the tractor will appear as a triangle pointing towards your current heading much like it did in surveying.
This Triangle indicator shows various statuses of GPS settings with different colors. The inner triangle of the indicator will show the current VDOP status while the outer edge will show the Fix Quality status.
The current VDOP status will show on the inner portion of the triangle.
Grey - VDOP reading of 0
Green - VDOP reading between 0 and 1.5
Yellow - VDOP reading between 1.5 and 2
Red - VDOP reading is higher than 2
These readings are independent from the VDOP threshold set in the GPS info screen.

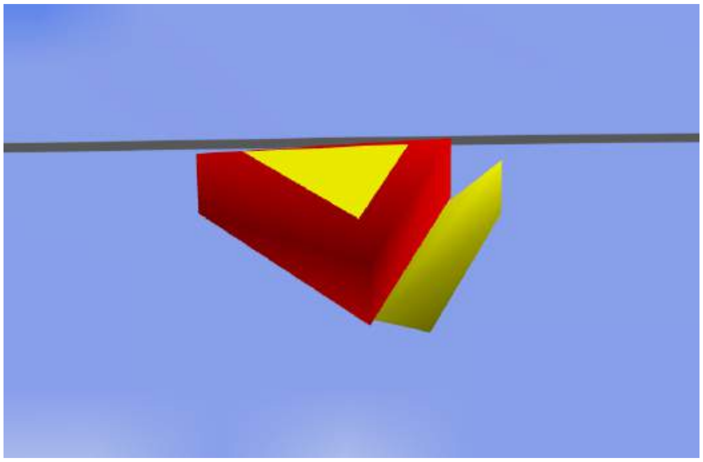
The outside edge of the triangle indicator shows the status of Fix Quality (normally only applicable to Plane and Survey).
In T3RRA Plane the Fix Quality may change depending on what is available. Depending on the type of fix quality the outside triangle will change to one of four colors.
Red - No fix is being made. (T3RRA Cutta and Ditch will only display this if something is wrong.)
Green - Fixed RTK (T3RRA Cutta and Ditch should only display this.)
Yellow - Float RTK
Orange - Differential GPS

Behind the triangle is a “blade bar” that shows the location of the blade. The width of this bar corresponds to the width of the cutting edge as entered in the ‘**Settings**’ window. The exact position of the GPS is at the center of the rear edge of the triangle (or the center of the front edge of the blade bar).

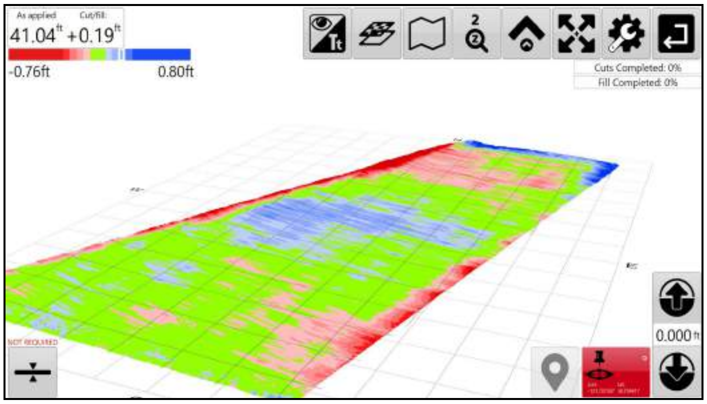


In 3D the T3RRA software will show the GPS position of the blade as the center of the front edge of the blade bar.

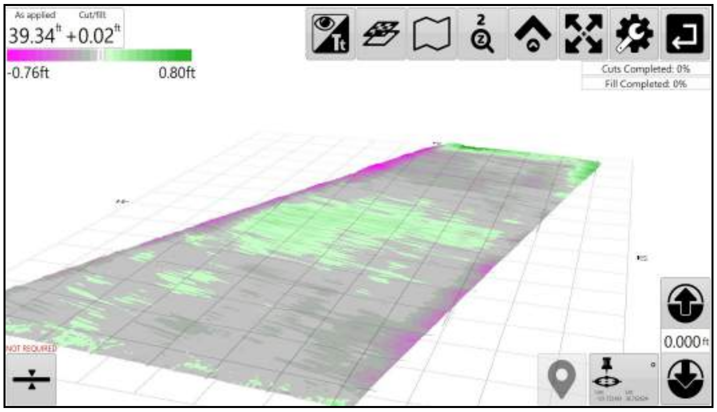


8. Map display

When implementing the display will show a cut/fill map by default. The Cut/fill map will be displayed using the color settings you have set in the '**Settings > Application**' window.



Red/Green/Blue



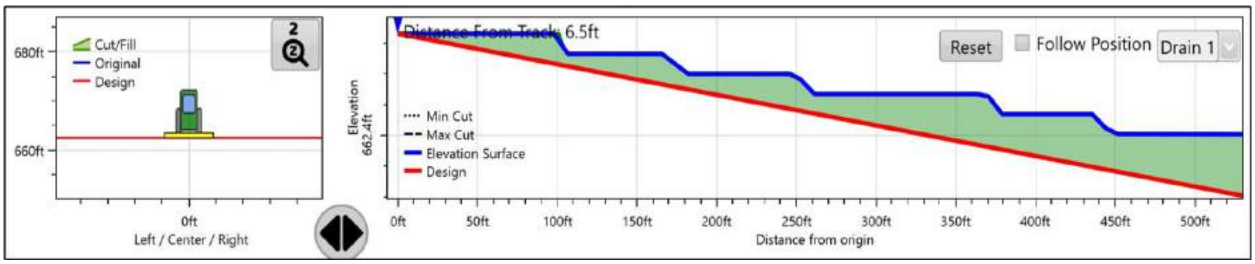
Magenta/Green (default color setting)

The Magenta/Green color scheme may be easier to view for those users with red/green color blindness. The Red/Green/Blue color scheme may be preferred by users wanting a clearer delineation of “on grade” areas.

9. Drain Profile

When implementing a drain you are able to bring up a display on the screen that shows the profile and cross section of the drain. A small circular drag handle can be found at the bottom of the screen. Double tapping, or dragging this handle will display this screen. It shows both a cross section of the drain (window on the left) as well as a profile of the drain (window on the right).

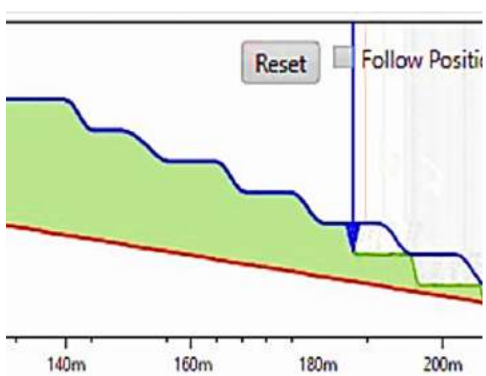
The window on the left displays your current position relative to the drain centerline. It will indicate whether you are currently on the shoulder or in the bottom of the drain.



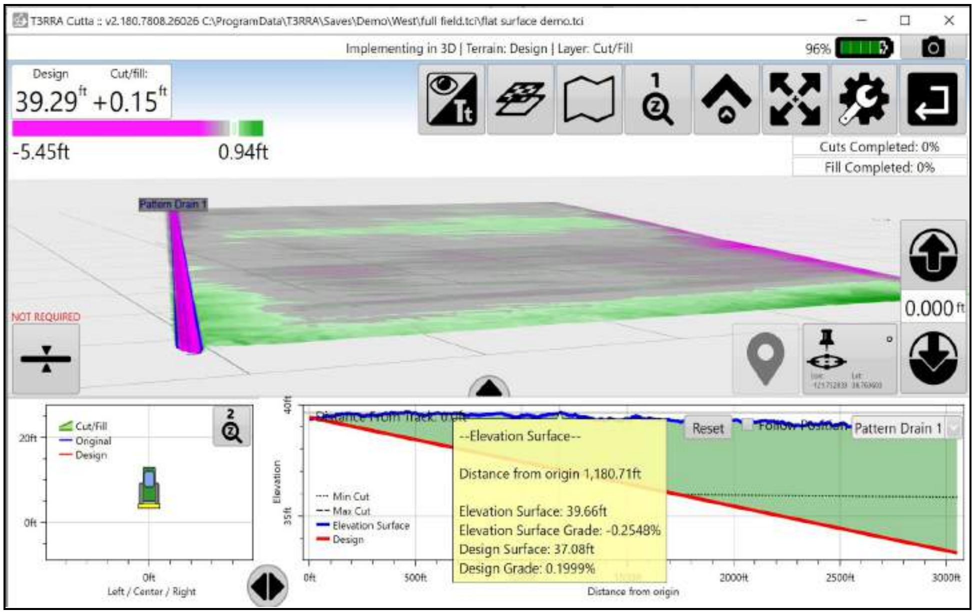
The right section of the screen shows design heights and original heights for the drain's full length.

The red line in the diagram is the designed drain, the blue line shows the pre-implementation level of the ground and the green shading area is what will either be cut or filled.

With this diagram you will be able to see cut depths along the length of the drain and estimate the number of passes required.



The blue arrow points to your current location and indicates the height of the blade. The blue arrow travels along the drain bottom and not on the backslope if one has been designed.



You can touch along the drain line to see the information at that location.

In the top right corner of the drain profile window there are 3 tools:

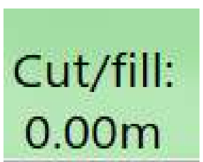
- **Reset**.
  Like the map above the graph you are able to zoom in to specific sections. '**Reset**' allows you to reset the view of the graph.
- **Follow Position**.
  Zooms into the blue arrow and follows it along the graph as it implements the drain
design.
- **Drain selector**.
  Used to select the drain to be displayed. The closest drain is not automatically selected, this needs to be selected manually.

Starting implementation

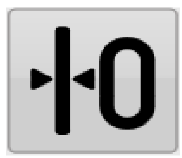
Cutta Ditch

T3RRA Software implementation startup instructions for UCC1

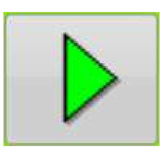
1. Drive to a zero cut/fill area and place the scraper cutting edge on the ground. Drop a marker for future reference. (when zeroing on drains ensure that the position indicator is on the drain surface)

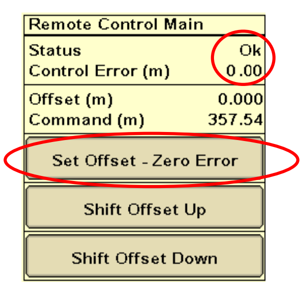


2. Select the '**Set Zero**' button to zero the T3RRA Cutta then choose '**Zero against the surface**'.Select the Set Zero button to zero the T3RRA then choose "Zero against the surface" then OK.........



3. Select the '**Start**' button in your T3RRA software, to begin implementation then press the Set Offset – Zero Error on the iGrade*.....



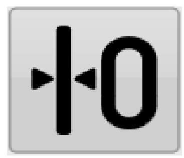


4. Place the applicable SCV's in the "Detent" position, **not float**, to set iGrade™ to automatic control.

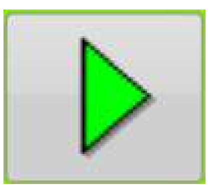
T3RRA Software implementation startup instructions for UCC2

1. Drive to a zero cut/fill area and place the scraper cutting edge on the ground. Drop a marker for future reference. (when zeroing on drains ensure that the position indicator is on the drain surface)

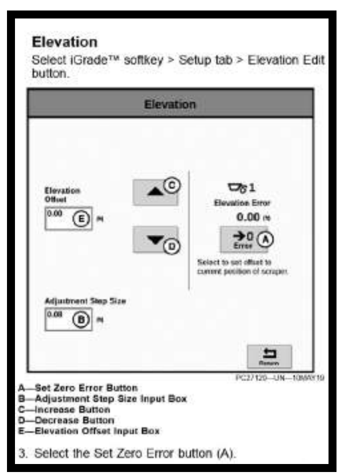
2. Select the Set Zero button to zero the T3RRA then choose “Zero against the surface” then OK.



3. Select the Start button, to start sending commands to iGrade.



4. Verify Elevation Error remains 0.00. If not, then press the Set Zero Error Button on the iGrade*



NOTES:

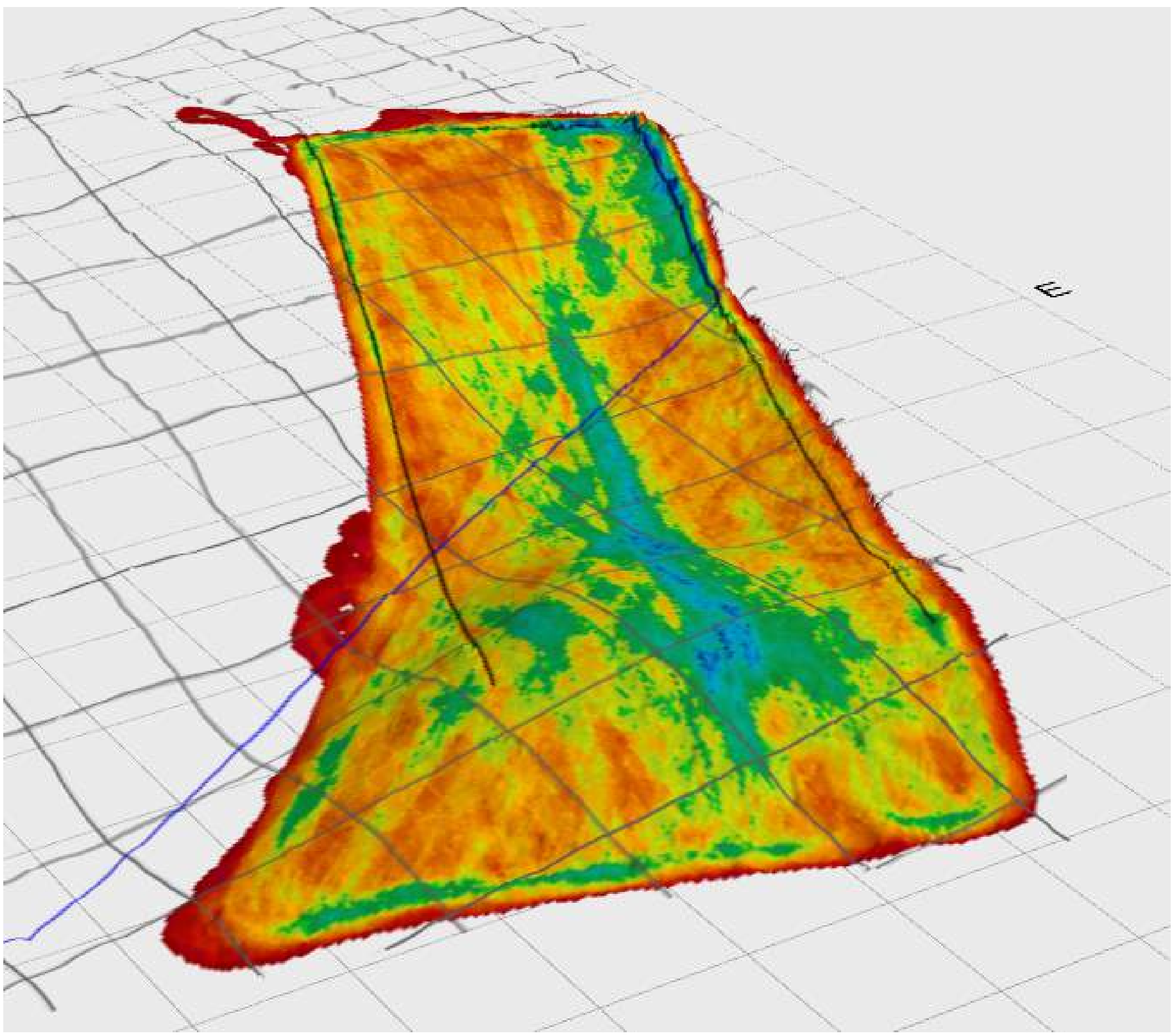
- After placing the scraper cutting edge on the ground, verify the selected SCV(s) (1 and/or 3) is/are in <u>Auto</u>.
- Manually adjusting blade height with SCV disables Automatic Control. Returning SCV to detent automates control.

Understanding how "Pass Count" works

Cutta Ditch Plane Levee

The '**Pass Count**' map is a representation of where activity has occurred in the field. It is similar to a normal coverage map seen in agricultural applications such as spraying. In a regular coverage map the tractor and implement normally only pass over a location in the field one time. When moving dirt it is common to revisit the same location many times, and equally there may be areas that are never visited.

Each time the implement passes over a point in the field the mapped value in that location increments by one. The end result is a map that shows the intensity of activity in different parts of the field.



Understanding how “As-applied” works

Cutta Ditch

When moving earth there are three states:

1. What you started with.
2. What you intended to do.
3. What you actually did.

You start with the original field surface. You intend to end up with the field surface matching your design. An “As-applied” (or “As-built”) map is a record of what you actually did.

More than that, the “As applied” map is a constantly updating record of what you have done, and what still remains to be done. At the start of a job no work has been done. Therefore the “As-applied” map will be exactly the same as the original surface. At the end of a job the field surface will match the design surface. At this point the “As-applied” map should match the design map. Between starting and ending the job the “As-applied” map will be somewhere between the original and the design surfaces (as will the actual real world field surface).

The “As-applied” map is constantly updated by keeping track of cuts and fills as they occur. The software tracks the blade constantly. At the beginning of a job all it knows is that the field matches the original surface map. Any time the blade goes below this surface it knows that a cut has taken place. It tracks this cut and updates the “As-applied” map accordingly. At this point the “As-applied” map is no longer the same as the original surface map. As the blade continues to cut lower and lower the map will continue to be updated.

The nice thing about cuts is that there is no way for the blade to go lower than a previous cut without the new cut level being the new true earth surface. So our cut measurements will tend to be quite accurate. But what about fills? Just because the blade is above the surface does not mean any dirt is actually coming out of the scraper pan. The implement could be simply moving from one location in the field to another location. So measuring the fills using blade height is a bit problematic. We deal with this in a number of clever ways, taking into account whether or not the design calls for a cut (or a fill) and where the blade is relative to the design height. But fill measurements *will not be perfect*.

It is important to understand that the T3RRA software tracks activity over time. It is constantly surveying the current status of the job surface.

Important: T3RRA software has no way of knowing what other equipment is doing. If another machine is operating in the same work area as you, your "As-applied" map will not be accurate. You can only track your own activities.

Important: T3RRA software has no way of knowing what work has been done in a field prior to your arrival. If the original surface map is not representative of the true state of the terrain when you arrive (because another operator has already done part of the job) then the "As-applied" map will not be accurate. If you want to make it accurate you will need to drive over the entire surface again to calibrate the as-applied map. **It only knows what it has surveyed**.

Important Concept!

Understanding the relationship between the "As-applied" surface and the Dynamic Blade Limit.

Cutta Ditch

The Dynamic Blade Limit (See the section of "Static Blade Limit" in the Limits Tab for disambiguation) relies totally on "As-applied" functionality to work properly. If this is not activated, or is not working properly, the blade limit will not work.

T3RRA software knows where the cutting edge currently is (courtesy of GPS). It also knows where the original surface is. When "As-applied" functionality is turned on the T3RRA software keeps track of changes to the current ("As-applied") surface. So anywhere you are in the field it will know what the actual surface height is. Using this information it is easy for the T3RRA software to limit the target elevation of the cutting edge to be a certain amount below (or above) the "As-applied" surface.

If the T3RRA software loses track of the current surface then the Blade Limit will no longer work. For instance, if you have not done any work on part of a field that is calling for 6 inches of cut, and you have a 2 inch blade limit set you would expect that it will take 3 passes to cut down to the final grade. However, if another operator has already removed the top 4 inches you may expect that it will only take one pass for you to complete the work. The problem in this scenario is that the T3RRA software has no way of knowing that the top 4 inches are no longer present. When you go to cut, the blade limit will keep the edge two inches off the current surface on the first pass, and on the second pass it will only skim the surface. It will only be on the 3rd pass that the blade will enter the ground.

It is critical to understand that the T3RRA software surveys as it goes, and keeps track of blade heights to understand where the surface is. Anything that alters the surface since the last time it was surveyed by the T3RRA software will cause the Blade Limit to have errors. Blade Limit guides the blade relative to where it *thinks* the dirt surface is, not where it *actually* is. As long as you alone are making changes to the field then the place it *thinks* the dirt surface is and where it *actually* is will be the same thing. If someone else is making changes then all bets are off!

Important Concept!

Do NOT expect Dynamic Blade Limit to work properly if anyone other than you is working in a field OR if the job has been worked on by anyone else since the original surface was surveyed.

Definitions

As-Applied: This refers to the state of the map as it reflects current reality. The As-Applied surface should normally progress from being equal to the original surface to being equal to the design surface as a job proceeds. Synonymous with 'As-Built'.

Baud Rate: This is a number representing the speed at which messages are sent over a serial connection. A bigger number corresponds to a faster data rate. Both the sending and receiving systems must have the same baud rate in order to communicate.

Backslope/Batter: This is the cross sectional slope that leads into a drain from the field surface. The "sides" of a drain.

Bi-directional error: A term for the consistent (equal and opposite) vertical error of the cutting edge that is sometimes seen when going in opposite directions. This error can be solved by applying an appropriate look-ahead time setting.

Benchmark: Synonymous with "control point". This is a known location (and height) in or out of the field that can be returned to as required.

Blade Shift: Blade shifting is used to describe how the blade of the implement moves either automatically or manually.

Borrow pit: A pit or depression that is created when dirt is removed from a location for use elsewhere. Is often a channel beside a bank, where the channel was dug in order to provide dirt for the bank.

Bulking: The act of making all the largest cuts and fills first before approaching the final stages of the implementation. Generally thought of as being a low accuracy activity.

Burning: The act of embedding a certain design element into an existing surface.

Button push: Touching/tapping an on-screen button with your finger. Synonymous with button click.

Com port: Also known as a 'serial port'. This is a hardware connection used to connect a cable to another device so that data can be transferred. A computer may have 0, 1, or several of these. Sometimes a com port may represent a connection to an internal device (modem or GPS) so may be present even if there is no external connector present. Sometimes a com port will not exist until a device is connected to a USB port.

CSV: Comma Separated Values. This is a generic text file format often used to store columns of numeric data. To view the contents of a CSV file, open the file in a text editor such as "Notepad" or "Excel". Users in countries where a comma is used as a decimal place separator should be particularly careful when using this format.

Cut area: A cut area is a zone where soil needs to be removed.

Cut/fill map: A map using different coloring to show the difference between an original and a design surface.

Cut/Fill Ratio: A ratio that is determined by the type of material being moved. It relates to what percentage of it will "settle" or "shrink" once compacted. Example: Using a cut/fill ratio of 1.2 means that you require 1.2 cubic yards of cut soil to create 1.0 cubic yards of compacted fill.

Design surface: A surface that has been designed, this model represents the finished/target surface after all earthworks have been completed.

DEM: see Digital Elevation Model.

Detent: is a term used by John Deere that means to place the iGrade™ system into automatic and allow another system to send control commands.

Digital Elevation Model: A digital representation of the topography of an area of land. Allows a user to view the surface of the land in three dimensions with software. Can be manipulated and changed in software and the result can be fed into a machine control system.

Feather: To feather something is to soften it or soften the transition between regions so that the interface is gradual.

Fill area: A region where dirt must be added in order to meet a target surface design.

Finishing: Final passes to achieve design height.

Geo-referenced: Data or images that have geographic coordinates (latitudes and longitudes) associated with them can be described as being 'geo-reference'. Normally, data must be geo-referenced in order to be used with a GPS based guidance or mapping system.

GPS: Global Positioning System.

Haul: The activity of picking up dirt in the bowl of a scraper pan and moving it some distance to a new location.

Heading: the heading is the direction a tractor is moving or facing.

Importing/Exporting dirt: Importing refers to the action of bringing dirt into a region from outside the field. It may come from a stockpile of dirt, or from some other place where it is not needed, or where removal of dirt is called for. Exporting is the opposite action.

Land forming: The process of altering the land surface using non-linear curves and slopes.

Land leveling: The process of altering the land surface using large flat planes. These planes are normally graded to drain water in one or more directions.

NMEA: National Marine Electronics Association. NMEA messages are data strings that conform to a particular standard established by the National Marine Electronics Association. These are commonly used with GPS data communications.

Original surface: A surveyed or imported set of data that forms the shape of an area of land before it is leveled or formed.

On-grade: The position of an implement cutting edge when it is considered to be at the correct elevation in order to achieve the desired target design.

Pixels: Pixels are the individual cells of a raster structure that makes up an elevation surface. The width and height of a pixel determines the precision of the surface.

Primary and secondary slope: The primary slope (sometimes called "row slope") is the main direction a field or area falls in, the secondary slope (synonymous with cross slope) is 90°

(perpendicular) to the primary slope.

Project file: This is a proprietary binary file used to store data for T3RRA Cutta, T3RRA Ditch, and T3RRA Plane. It will always end in the '.tci' extension. (You may have to enable 'Show file extensions' in Windows to see this extension).

Raster: This is a term for a data structure consisting of a grid of elevation values. It has a set number of rows and columns of grid points. Each grid point is called a 'cell', or a 'pixel'.

RTK: Real Time Kinematic. This is a term for a type of GPS position solution that has very high accuracy.

Settle/Shrink: Settle or shrink is used when discussing the compaction of soil after it has been moved.

Slope: A measure of the steepness, incline, grade/gradient, or constant rate of elevation change, of a surface. A higher slope value indicates a steeper incline. In T3RRA software positive slopes always refer to "downhill" slopes.

Stockpile: A pile of dirt/soil/material that has been exported from some other area.

Surface: A two- or three-dimensional representation of the topographic form of a field. Is often a systematic grid of elevation points that describe the location and elevation of every point within a field.

Survey point: A point measured with a location (x,y) and an elevation (z). Collections of survey points are used to create the surface of the field. The more points the more accurate the surface.

TCM: Terrain Compensation Module. A sensor that is part of the John Deere StarFire receivers. Used to measure and control cross slope in iGrade™.

Time-out: When an application "times out" it means that whatever it is talking to has taken too long to respond and it does not know what to do.

Topography: The physical features of an area of land, especially the shape of its surface.

Topsoiling: The action of adding a layer of new soil over the top of an existing surface. Often done in heavy cut areas to ensure there is a layer of more organic, fertile soil above the subsoil that has been exposed by the removal of dirt during the leveling process.

Washboarding: A term used to describe undesirable systematic up and down movement of a scraper blade. The bumpy resulting nature of the soil surface resembles an old fashioned washboard, hence the name.

Zeroing: The process by which the elevations in a control map are calibrated against the elevations being measured by the GPS. By 'zeroing' we are able to compensate for:

- the offset from the GPS to the cutting edge,
- differences in a surveyors GPS to the implement GPS,
- differences in implement height when surveying verse implementing, and
- other factors.

Troubleshooting guide

General notes on troubleshooting

Isolate the problem

This is a key technique. To solve a problem you first must understand it. A given set of symptoms can arise from multiple unrelated issues. Simplify your system by decreasing the number of possible sources of problems. Turn off features and functionality until the issue no longer occurs. Then gradually turn features back on until the problem occurs again.

Act methodically

Only make one change or adjustment at a time. Then check to see if the problem is fixed. If you change multiple things you will be unable to definitively know which change solved the issue. In the worst case, one change may have solved the problem, and another change may have re-ignited it.

Do not rush

The tortoise almost always wins the troubleshooting race. Logical thought and considered action are the natural allies of problem solving.

Read the manual

Yup. It can actually help sometimes.

TABLET

Tablet screen freezes.

Symptoms:
The screen of the tablet PC has frozen and is not responding to inputs such as pressing on the screen or the mouse (if one is attached).
Your tablet becomes slow and sluggish.

Cause:
The Tablet may not have enough available memory.
Windows or the T3RRA software needs updating.
If you have connected your tablet to the Wi-Fi hotspot previously, the tablet will retain internet access credentials and connect to the internet. Automatic updates of the operating system, or software can start without your knowledge.These can slow operations.
If you have surveyed the field in 'drain mode' rather than 'field survey mode' the tablet can become sluggish when implementing (due to continual calculations positioning the displayed position relative to the large drain line created).

Solutions:

1) Confirm tablet running T3RRA meets minimum requirements:
   - ✓ Windows 10
   - ✓ CPU: Intel i5
   - ✓ RAM: 8GB, HDD
   - ✓ HDD 128GB (minimum)
2) Perform updates for T3RRA and Windows:
   T3RRA needs to be updated regularly in order to perform at its best. When connected to a good internet connection, click on 'Check online for updates' in T3RRA Settings Application tab and the newest version will install. (T3RRA alerts when a new version is available if connected to the internet). Windows & .NET need to be regularly updated. Windows 10 is best updated using the Windows 10 Update Assistant downloadable from the Microsoft website. Perform a hard restart after updates are completed.
3) Create manageable projects:
   Break large projects into smaller projects that are less taxing on the computer.
4) Check for applications running in the background:
   Make sure there is nothing else running on the computer and bogging it down (you can go into Task Manager and look at the performance charts).
5) Report detailed information to T3RRA if the problem persists.

- Does the tablet freeze?
- Does the software freeze?
- Does the freeze 'unfreeze' at some time?
- Can the software be killed manually or does the machine have to be re-started?

Please provide this information when reporting an issue.

Surface Pro tablet not updating or freezing

Symptoms:
Surface Pro tablet does not update T3RRA software completely and/or freezes.

Cause:
Windows updates require hard restart to take effect.
High speed internet connection required.

Solution:
Microsoft suggests executing the “Two Button Shutdown” after restart and before signing in. This is only to be used on Surface Pros. Do not use this process on Surface RT, Surface 2, or Surface 3. Using this two-button shutdown process ensures that your Surface is turned off completely. Here’s how:

Step 1: Press and hold the power button on your Surface for 45 seconds and then release it.
Step 2: Press and hold the volume-up button and the power button at the same time for at least 20 seconds and then release both. (the screen may flash the Surface logo or something else, but continue holding the buttons down)
Step 3: After you release the buttons, wait 10 seconds.
Step 4: Press and release the power button to turn your Surface back on.

<u>Things we have also found useful:</u>
Connect to the hotspot on your cell phone for a possible higher speed internet connection.
Make sure there is nothing else running on the computer and bogging it down (you can go into the task manager and look at the performance charts).
Break large projects into smaller projects that are less taxing on the computer.

Mouse pointer flickers across the screen randomly.

Symptoms:

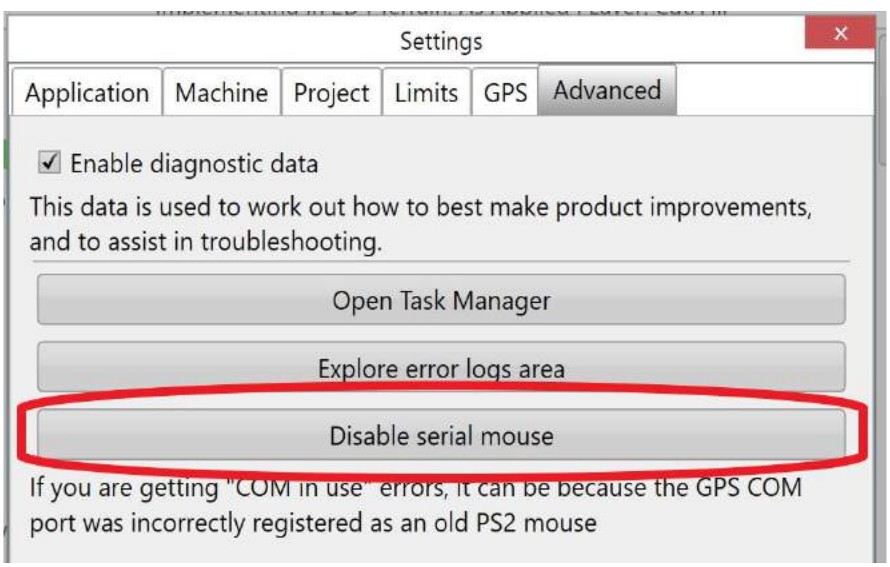
When the tablet starts the on-screen mouse jumps randomly about the screen. Windows may open and close as the mouse clicks on desktop or program icons. Input is difficult due to competition from the 'crazed and possessed' mouse arrow. You will likely receive a pop-up error about your desired com port being taken already when you try to open your T3RRA software.

Cause:

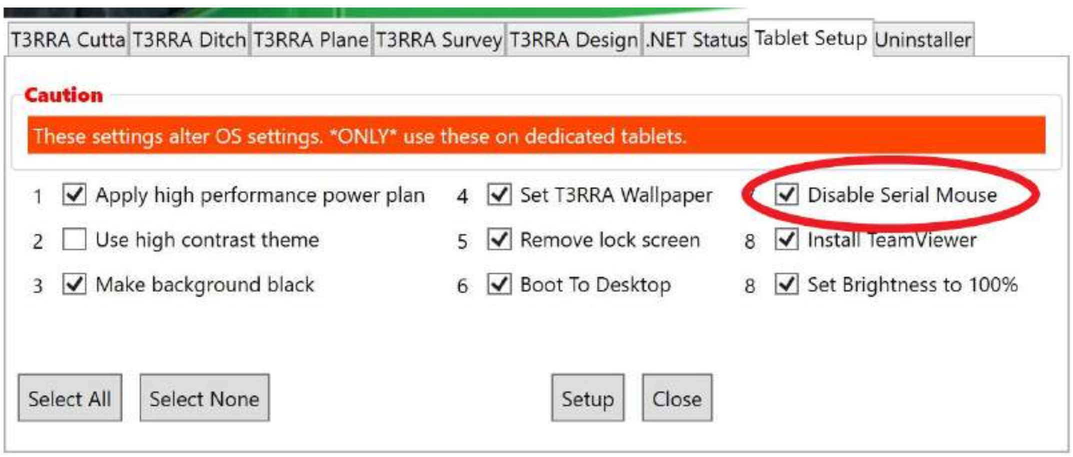
When booting, some tablets check the serial port for the presence of a serial mouse (a common type of mouse prior to PS1 and bluetooth mice). If a stream of GPS data is present the operating system can mistake it for mouse data and direct the data to the onscreen pointing device. As the data is not mouse data it simply results in random movement and clicking. This also monopolizes the serial port, which then cannot be used by T3RRA software. **Note**: Even after implementing the registry fix below a 'Windows Update' can sometimes cause this fix to be reverted and the problem will re-appear.

Solutions:

1. Go to 'Settings > Advanced' and disable the serial mouse (Version 2 software).



2. Always start the tablet before the tractor is turned on. If the tablet starts prior to any incoming GPS data the problem will not occur.
3. Search for the serial mouse with the Windows 'Device Manager' and disable it.
4. Permanently disable serial mice using the Windows Registry. Instructions for doing this can be found online at pages like:
   http://www.taltech.com/support/entry/windows_2000_nt_serial_mice_and_missing_com_port
   NOTE: Do not alter the Windows Registry unless you are competent to do so and understand the possible issues of doing so. If in doubt contact your dealer or T3RRA.
5. Request that your dealer uses their T3RRA Installer software to correct the issue. This software will perform the Registry fix action. The relevant tab in the software is the "Tablet Setup" tab.

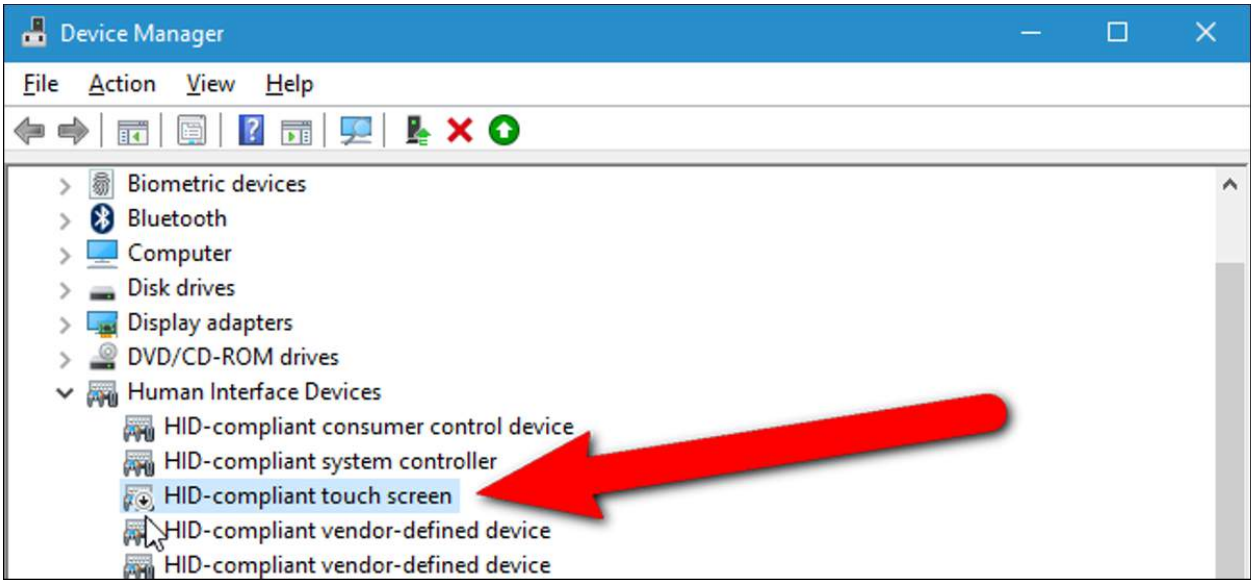


Windows are opening and closing on the tablet randomly.

Symptoms:
Windows are opening and closing randomly as if someone was tapping on desktop or program icons.

Cause:
It is possible that the touch screen is malfunctioning. A crack in the screen may be a good indicator. This happens whether or not GPS data is streaming into the tablet COM port (see Mouse pointer flickers across the screen randomly.)

Solutions:
Tablet repair may be required. Alternatively, disable touch input (via the Human Interface Devices section of the *Windows Device Manager*) and use a computer mouse for input.



T3RRA software does not automatically start when the tablet boots.

Symptoms:
When the tablet starts it is normal for T3RRA software to automatically load. However if you wait a reasonable period (sometimes up to several minutes, if updates or other activities are occurring) the T3RRA software still may not load,

Cause:
The tablet has not been properly configured to load the T3RRA software on startup, or the load routine has been disabled.

Solutions:
Configure your system to start T3RRA software on startup. There are several ways to do this. Google will provide many answers. See below for answers from Microsoft at
https://support.microsoft.com/en-au/help/4026268/windows-10-change-startup-apps

Note: If you are asked to copy the T3RRA software program file to a startup location DO NOT copy an actual executable file from any of the T3RRA software program directories. Copy the *shortcut* that is on the Windows desktop instead. Alternatively, create a shortcut pointing to the executable file and copy it. Note that the executable file that the shortcut must point to will normally be in a folder with two subfolders named ‘d’ and ‘v’ (see below for T3RRA Cutta’s program file, other software will be named similarly, according to the application name).

Name	Date modified	Type	Size
d	18/06/2019 7:56 AM	File folder	
v	18/06/2019 7:56 AM	File folder	
T3RRA Cutta.exe	16/04/2019 8:20 AM	Application	40 KB

Important: you should be familiar with working with files in Windows in order to apply this fix. Mistakes while performing these types of activities can cause serious system problems. If you are not confident of your abilities please contact T3RRA or your dealer.

Change which apps run automatically at startup in Windows 10

Applies to: Windows 10

Change apps

Here are two ways you can change which apps will automatically run at startup in Windows 10:

- Select the **Start** button, then select **Settings** > **Apps** > **Startup**. Make sure any app you want to run at startup is turned **On**.
- If you don't see the **Startup** option in **Settings**, right-click the **Start** button, select **Task Manager**, then select the **Startup** tab. (If you don't see the **Startup** tab, select **More details.**) Select the app you want to change, then select **Enable** to run it at startup or **Disable** so it doesn't run. Watch the video to see how to do it.

Add apps

To add an app to **Startup:**

1. Select the **Start** button and scroll to find the app you want to run at startup.
2. Right-click the app, select **More**, and then select **Open file location**. This opens the location where the shortcut to the app is saved. If there isn't an option for **Open file location**, it means the app can't run at startup.
3. With the file location open, press the Windows logo key + **R**, type **shell:startup**, then select **OK**. This opens the **Startup** folder.
4. Copy and paste the shortcut to the app from the file location to the **Startup** folder.

Last Updated: 29 Mar 2019

Can’t find an onscreen keyboard.

Symptoms:
You need to enter text (like a filename) while running T3RRA software but you can’t figure out how to.

Cause:
Microsoft Windows has at least one onscreen keyboard available to use for text input on tablets. However it can sometimes be challenging to find it.

Windows may be set to desktop mode and the Keyboard won't automatically open when a text box is selected,

Solutions:
There are 2 current solutions to this problem.

1. Plug a physical keyboard into your tablet

2. Swipe in from the “right” side of the screen and check if tablet mode is on/off, the icon should be highlighted blue if tablet mode is on.
   If tablet mode is on press the small image of a keyboard on the task bar in the lower right corner of the screen (in case you have moved the taskbar the keyboard icon should be next to the clock)

T3RRA software will not install

Symptoms:
Installation proceeds smoothly. However, when attempting to run the software it will not start. The program shortcut icon may disappear. Subsequent attempts to re-install may throw errors indicating the user does not have sufficient permissions to perform file writing or folder accessing tasks.

Cause:
It is likely that you are running some type of anti-virus or malware protection software. This software may be seeing T3RRA software as a potential threat and refusing to run it. Alternatively, your administrative settings may be such that software cannot be installed without help from your system administrator.

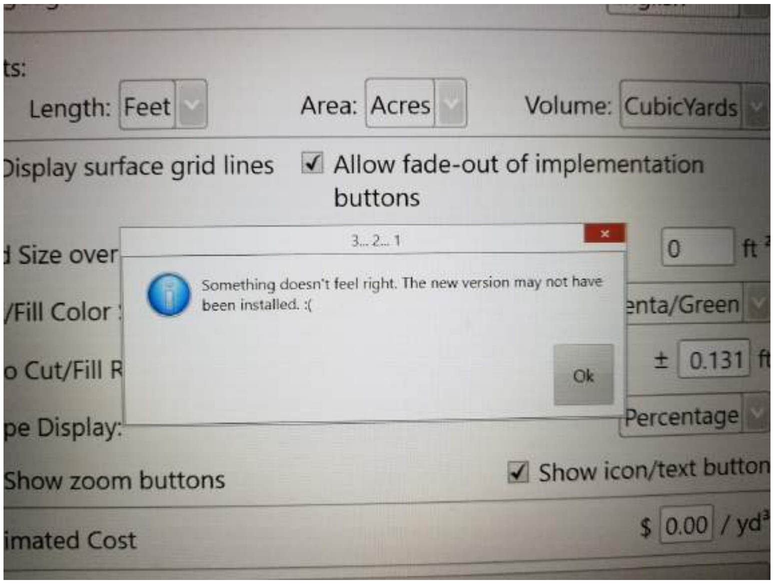
Solutions:

1. Read the documentation provided with your malware protection software. Follow directions to allow the T3RRA software to run as a whitelisted application. The path to add as an exclusion is:
   `C:\Users\YourUserName\AppData\Local\T3RRA\T3RRA Cutta 2`
2. Alternatively, uninstall your malware product and install the T3RRA software while it is uninstalled. Then re-install your malware software.
3. Seek advice from your system administrator.

T3RRA software is not updating

Symptoms:

When attempting to update T3RRA software using the normal method in the Settings area an error message like the following appears. You appear to have a good Internet connection.



Cause:

If you are on a corporate network it might be configured not to allow access to certain websites. Our download server may not be on an approved whitelist.

Solution:

Request help from the company network administrators. Alternatively switch to another network (such as by tethering the tablet to your phone's internet signal).

In-cab tablet is too small to design on effectively

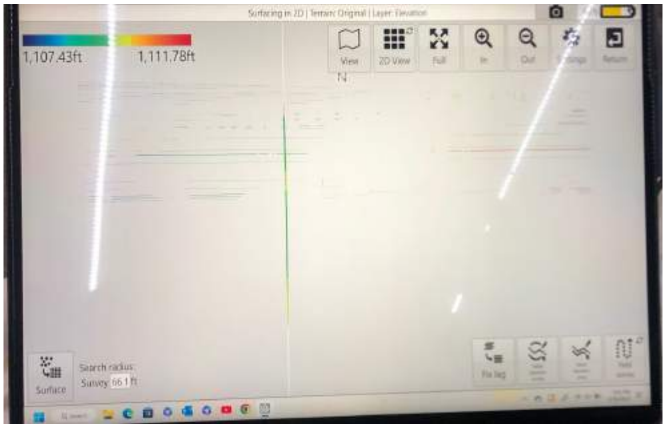
Symptoms:
You are having difficulty performing designs on a tablet screen that is 10 or 12 inches in size.

Cause:
Small screens can be difficult to work with, particularly for anyone with impaired vision.

Solution:
Take the tablet back to your office. Plug the tablet into a large PC monitor or TV. Most tablets will have an HDMI connector for this purpose. Consult your local IT retail firm regarding cables or adapters required. Duplicate your tablet screen on the external monitor.

Surface and elevation data not displaying properly

Symptoms:
When viewing a map (2D/3D), the surface doesn't display - there are only some streaks showing.



Cause:
Some Intel graphics cards do not display 3D properly with the original drivers. The manufacturers release updates, but they don't always get installed before being sold, or picked up by Windows Update.

Solution:
First connect the device to a good Internet connection. Open System Information on the device and look for the type of Processor installed. Open intel.com website and search for driver updates for your processor. Download and install.

Tablet is in 'Tablet Mode' and you can't find the desktop icon for your T3RRA Software

Symptoms:

The screen on your tablet when T3RRA Cutta is not running appears different from what you expect. It does not display the regular Windows desktop. You are unable to find the T3RRA software icon to activate your T3RRA software/

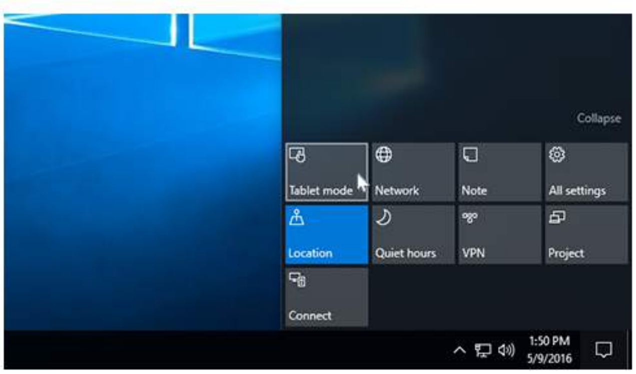
Cause:

Your tablet has been somehow placed in 'Tablet' mode.

Solution:

Turn off tablet mode.

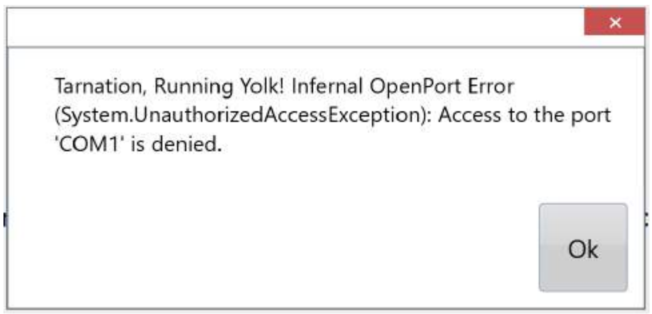
Tablet mode makes Windows 10 more touch-friendly when using your device as a tablet. Select **action center** on the taskbar (next to the date and time), and then select **Tablet mode** to turn it on or off.



Access to the port ‘COM X’ is denied.

See also: “Mouse Pointer flickers across screen Randomly”.

Symptoms:
The following message appears.



Cause:
This message generally occurs when an attempt is made to open a serial connection to iGrade or directly to a GPS, but the serial port in question is already being used by another piece of software.

Solutions:

1) Check that no other software is running on the tablet and already using the port.
2) Check the connection of the cable to the tablet.
3) Power down the tablet running T3RRA and the tractor. Next, remove the serial cable or USB-Serial cable from the tablet. Turn on the tablet and start T3RRA. Once you are looking at the GPS screen, plug in the cable. Now, start up the tractor.

Plug all cables for iGrade in before starting the tractor. In other words, the tractor needs to be OFF until iGrade is plugged in and the T3RRA tablet is powered on.

The tablets that do not have true dedicated serial ports require USB-to-serial cables which create 'virtual' COM ports. Best practice is to update the USB-to-serial cable driver before initial use of T3RRA in-field.

Steps:

1. Turn on the tablet that has T3RRA installed.
2. Connect to the internet.

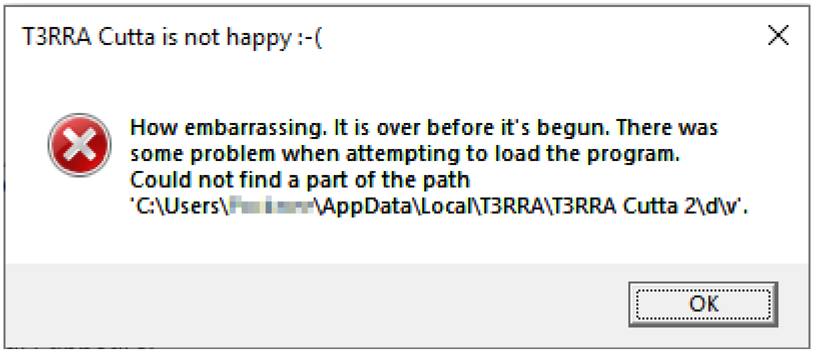
3. Insert your USB to Serial cable.
4. Select Settings, then GPS Port settings, click on 'Device Manager'.
5. When the Device Manager window opens, locate 'Ports (COM & LPT)'.*
6. Click on 'Ports (COM & LPT)' to show which COM port has been assigned.
7. Right click on 'COM Port'.
8. Select 'Update Driver'. You will be notified once the software has been updated or if it has the current driver.
9. Set the COM port in T3RRA GPS Port Settings to correct port from the drop down.

*NOTE: If ‘Port” is not in the list, you may need to download the driver from the product website and install manually. We ONLY recommend FTDI USB to Serial Port adapters. This is the URL to download the FTDI Setup executable file:
https://ftdichip.com/wp-content/uploads/2021/08/CDM212364_Setup.zip

T3RRA Xxxxx is not happy :-(error.

Symptoms:

The following error (or similar) appears.



Cause:

There is a problem with T3RRAs program file structure. The program cannot find the correct path to the latest program files when it is started up.

Solution:

Contact T3RRA or your dealer. Please provide context about when this error started happening and whether or not any changes were recently made to the tablet.

Out of memory errors.

Symptoms:
T3RRA software crashes with an "Out of Memory" error.

Cause:
If the software is running on a 32bit version of Windows 10 and is working with large data sets it is possible to get this error.

Solution:
Upgrade your Windows 10 operating system to the 64bit version.

T3RRA software crashes without an error message.

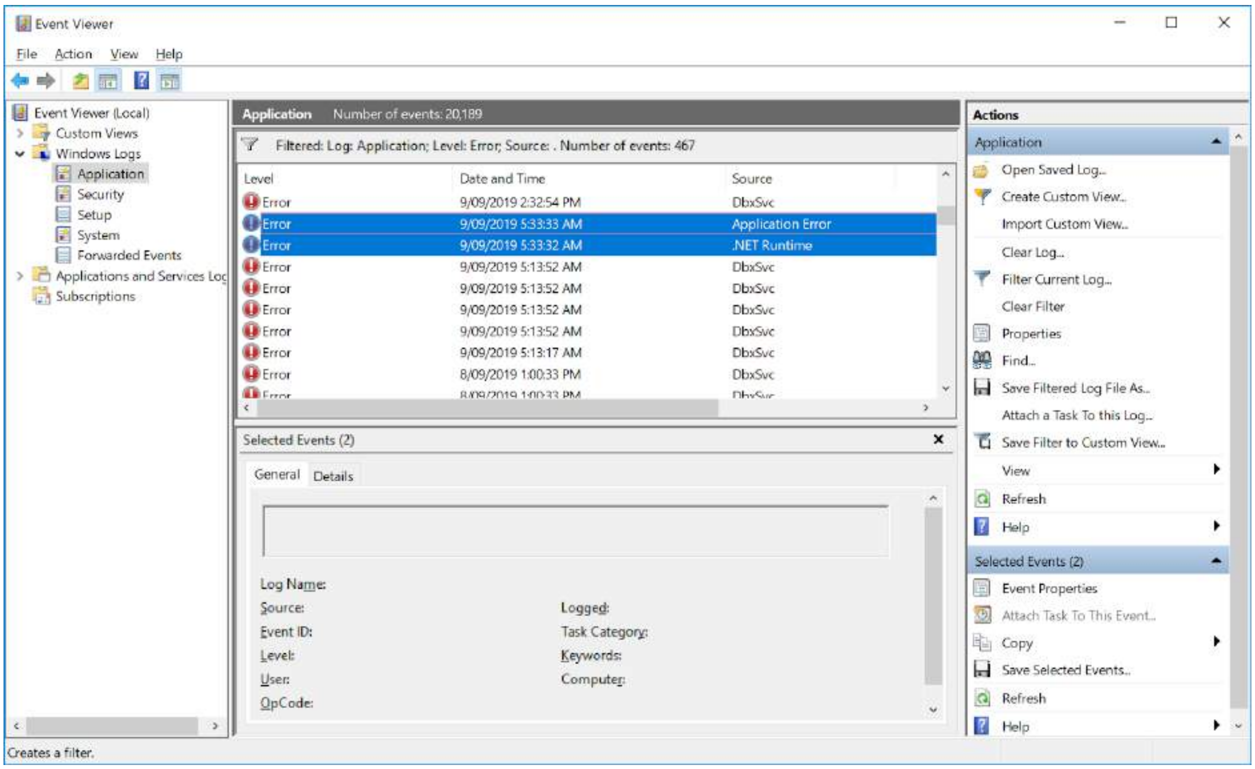
Symptoms:
The T3RRA software will suddenly close with no warning or error message. It is not clear what has caused the program to do this.

Cause:
Some unhandled error is causing the program to suddenly halt.

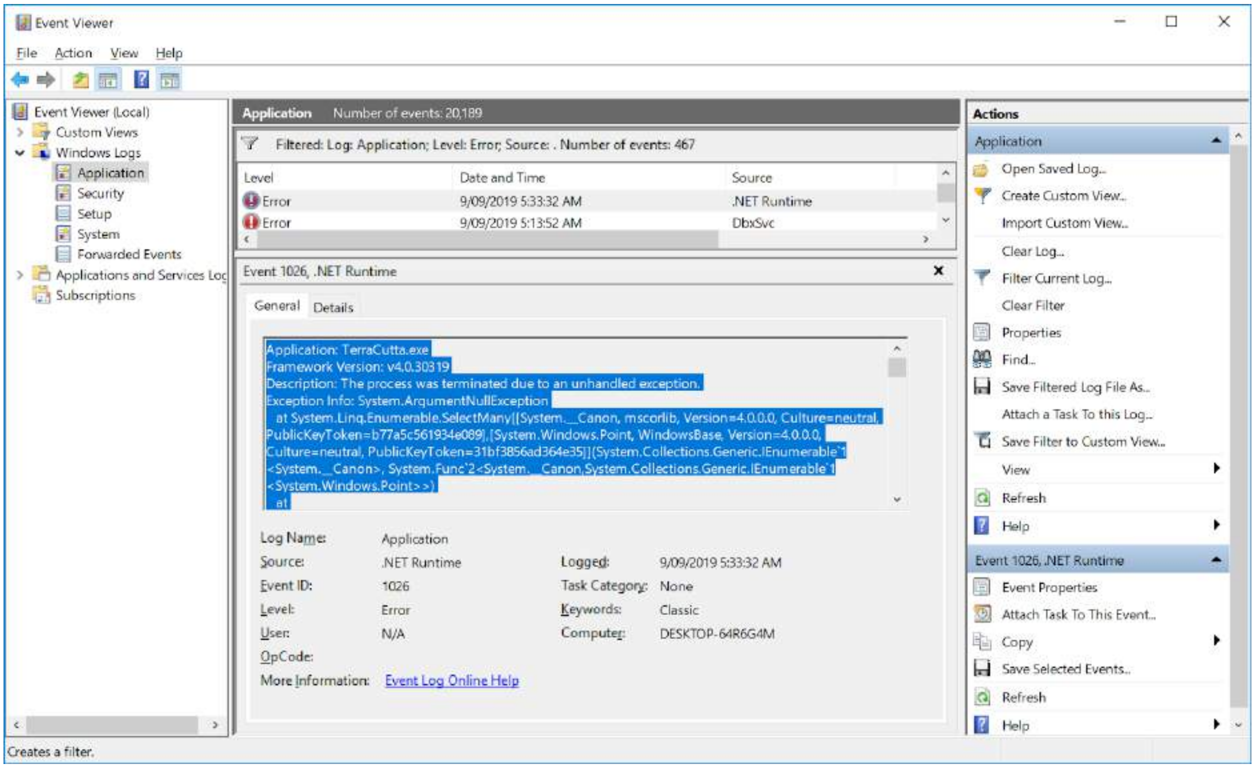
Solution:
If a certain action by you causes the crash, try to avoid that action. Normally this type of error requires our software developers to develop a fix and release an updated version of the software. However, this type of error is difficult to reproduce and hence difficult to fix. Follow the following steps to send the information the developers will need.

1. Open the Windows 'Event Viewer' program
2. In the left pane navigate to "Windows Logs > Application"

3. Find the most recent errors in the right pane that are related to the crash
    a. Normally these errors will occur in pairs with the first one having the source "Application Error" and the second having the source ".NET Runtime". It is the second one that is of interest normally.
    b. Copy the contents to the ".NET Runtime" error into an email and send it to support@t3rra.com



(image above: finding the errors in windows logs.)

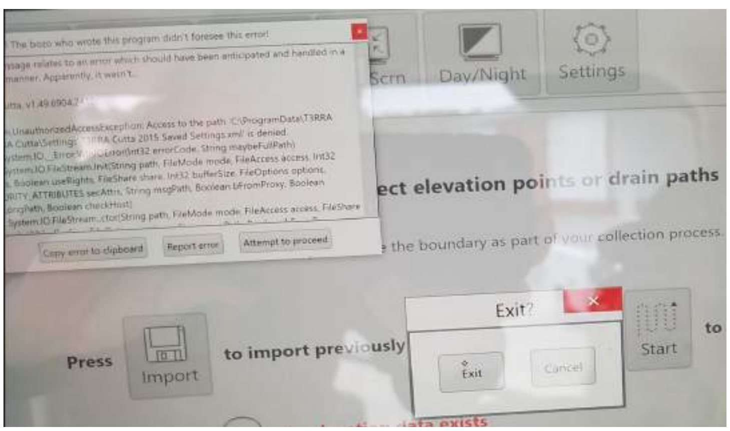


(Image above: highlighted contents that should be sent to T3RRA.)

Unauthorized Access Exception on program exit

Symptoms:

Bozo Error message occurs upon Exit prohibiting close of T3RRA software.



This message relates to an error which should have been anticipated and handled in a logical manner. Apparently, it wasn't...

TerraCutta, v1.49.6904.24186

System.UnauthorizedAccessException: Access to the path 'C:\ProgramData\T3RRA\T3RRA Cutta\Settings\T3RRA Cutta 2015 Saved Settings.xml' is denied.

Cause:

Current “User” of tablet does not have access to T3RRA Program Data in folder.

Solution:

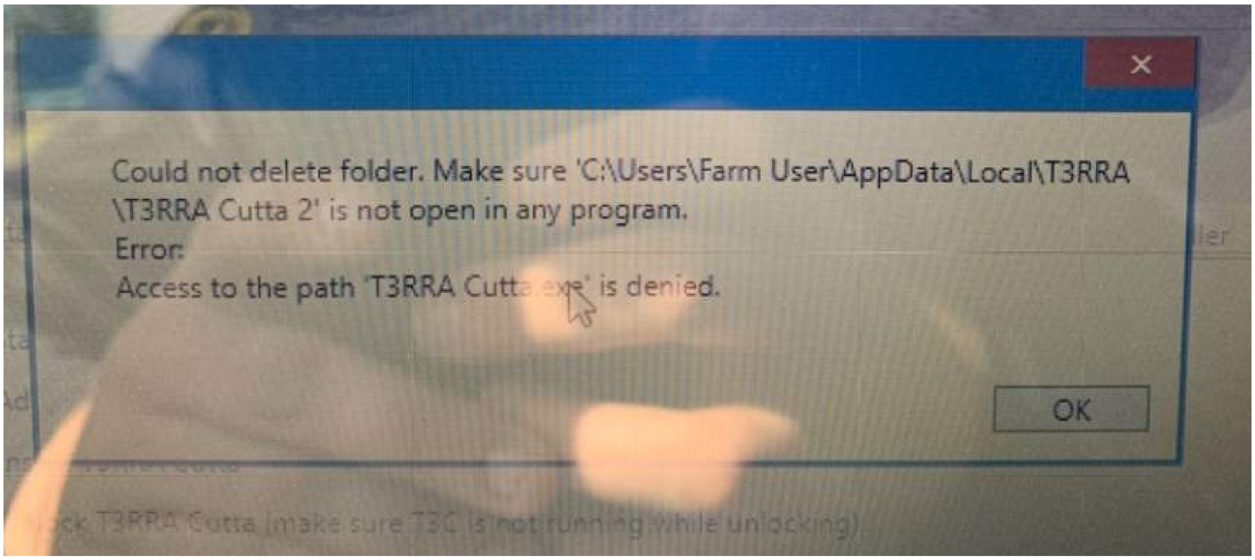
1. Maneuver to the location - C:\ProgramData\T3RRA\T3RRA Cutta\Settings\T3RRA Cutta Saved Settings.xml
2. Right click on T3RRA Cutta saved settings file.
3. Choose Properties
4. Choose Security tab
5. Choose Advanced
6. In Permissions tab Click Add
7. Choose select a principle
8. Type in name of User to add
9. Select Ok
10. Check Full control permissions
11. Select Ok
12. Select Apply

SET UP & INSTALLATION

Unable to install T3RRA software.

Symptoms:

"Access denied" type errors occur when attempting to install T3RRA software. The installation fails, or the software disappears from the computer shortly after installation.



Causes:

1) Antivirus software on the tablet prevents installation, or quarantines the installed files shortly after installation.
2) Company IT staff have locked down the tablet such that software cannot be installed.

Solutions:

1) Disable your antivirus software or 'whitelist' T3RRA files with an exclusion. Consult your antivirus software documentation for information on how to do this. In some situations you may have to uninstall the antivirus software. It can normally be reinstalled afterwards.
2) Consult your company IT staff.

Unable to import RCD or ADAPT files directly from flash drive.

Symptoms:
Choosing to Import Survey Data then picking RCD or ADAPT files on flash drive plugged in tablet and the files are not loading or 'grayed out' so you cannot choose them in the import list.

Causes:
Flash drive is not transferring files correctly.

Solutions:
Copy files from the flash drive to the tablet's hard drive then import from that location.
Use a new flash drive or reformat the old one

Notes for Dual or Triple Receiver systems.

Symptoms:

There are many strange errors that can result from incorrectly configured dual or triple receiver systems when running iGrade, these can vary from no control outputs to machines behaving erratically, so we have compiled a few things to check if you are having trouble,

Solutions:

Ensure both SCV1 and SCV3 are configured to "Remote Control"

In the more common machine configurations where SCV1 is used for elevation control and SCV3 is used for "Slope" control these would be the correct settings, but for situations where a user has 2 receivers setup on one implement the SCV's should both be configured to "Remote Control"

Power Cycle the Machine after making iGrade setting Change

After making any settings changes on iGrade it is important to power cycle the machine, power down the machine, Wait for all displays to save configs and completely shut down, wait 10 seconds, then start the machine, before then going through the settings to confirm all settings have stored correctly,

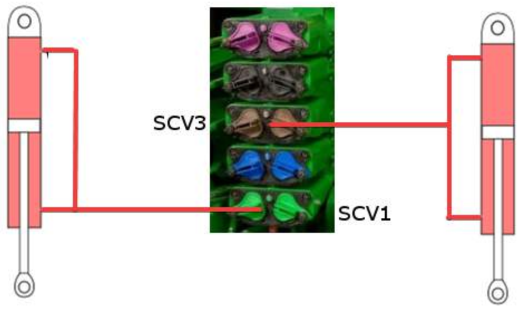
Confirm SCV's are connected correctly

SCV1=Left control cyl

SCV3=Right control cyl

Check hoses for Extend and Retract aren't connected in reverse! It may seem silly but we have seen it stump the most experienced users before, Check and double-check those hoses!

It is also important to note that when using 2 receivers on one implement that both SCV's operate independently based on their respective receiver, and both SCV's must be on their own Hydraulic circuits,



Check Receiver Serial Numbers

Check the serial numbers of the receivers, the receivers should be placed in order of their serial number, from lowest to highest.
Ensure the lowest serial number is on the Tractor, the next serial number is on the left side of the implement and first on the loom coming from the tractor, then the receiver with the highest serial number is on the right side and last on the Loom.

The same applies for dual and triple scraper systems where the lowest serial number should be on the tractor. The next goes on on scraper 1 and so on for scraper 2 and 3. With each additional receiver being placed along the harness in order of serial number.

Receiver heights for UCC1 or UCC2 on implements

- When utilizing dual scrapers on **UCC2** you may need to adjust the receiver height setting in the individual receivers settings through the ISO menus to ensure implements level at the same elevation. NOTE: To lower the blade enter a higher receiver height. To raise the blade position, lower the height set in the receiver setup.
- When utilizing dual scrapers with **UCC1**, both receivers must be mounted the same height above the blade. Implement GPS offsets cannot be entered in the display to account for mounting error. If a constant offset is noticed during operation between scrapers, corrections must be made to the implement mast using shims.

Diagnosing guidance line location issues

Symptoms:

Imported guidance lines into display are not in the correct location:

- Tractor is manually steered down lines displayed on T3RRA.

- Tractor is auto steered down lines.

- Auto and manual steering result in significantly different paths.

Possible causes with solutions:

Cause: For 2630 only - Repeat box was not checked.

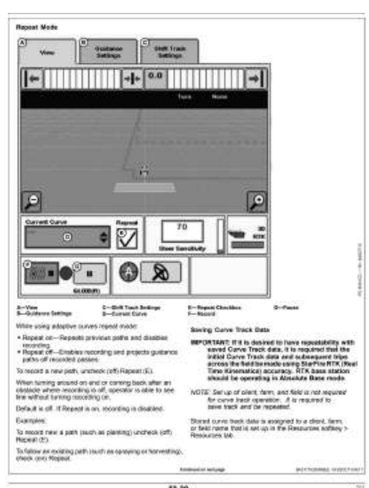
Solution: For 2630 only - check Repeat box then cycle.

Cause: Survey data used to Generate paths captured on a different correction source (SF3, Dealer base, SF1 and others).

Solution: Due to the in-ability to complete North-South, East-West shift for Guidance lines in a JD display, we cannot correct or guarantee the accuracy of lines created from another correction then the correction used to survey them. It is best practice and highly recommended that users survey, design, and implement from a single GPS source.

Cause: Survey completed from Dealer base and implementing from a Quick survey base

Solution: It is always good practice to implement with an absolute base. If there is a dealer network base coverage available at the location of the base used for implementation, we highly recommend connecting that base to the dealer network as a vehicle. Take note of the lat/long and elevation values then enter those details into the base location after configuring the base to absolute base. (refer to JD technical documentation for more information on editing base parameters).



Error “Incorrect MD5 Hash” occurs when loading project

Symptoms:
When loading a project an error similar to “Incorrect MD5 Hash” occurs. The project fails to load.

Cause:
The file has become corrupted somehow. This file will no longer work. It may have happened if Windows shut down unexpectedly while a project was saving, or if a USB drive was removed prematurely while copying a file.

Solution:
There is no solution to this problem. The file is likely unrecoverable. Make sure you have sufficient backups available in case this error occurs. Switch to a backed up version of the project file and delete this one. If this problem continues to occur be aware that it may be a sign that your hard drive is failing. It may be time to replace it.

Dual GPS scraper is not level.

Symptoms:
When using two GPS receivers in a side-by-side configuration on a single scraper, one side of the scraper is consistently lower than the other side.

Cause:
One GPS is mounted lower than the other, or Implement GPS Receiver Offsets are incorrectly entered.

Solution:
Select Controller Setup softkey > Profile tab > GPS Offsets Edit button. Enter the correct GPS height offsets.

SETTINGS

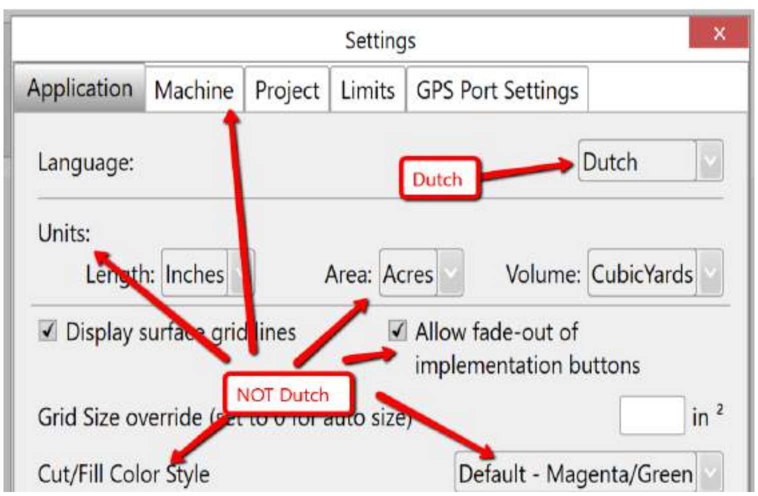
Changing language has no effect.

Symptoms:
In settings, when you use the pulldown picklist to select a language other than English, the UI does not update to reflect the new language. The selection indicates that you have successfully chosen a new language but nothing else changes.

Causes:

- The language translation files are missing.
- There was an issue with an earlier version of the installer software that placed the translation files in the incorrect location

Solution:
Contact your dealer. The latest version of the installation software needs to be run to correct the issue.



Unable to change language.

Symptoms:
Even in settings you are unable to change the language. There may also be a red warning message indicating a problem with translations.

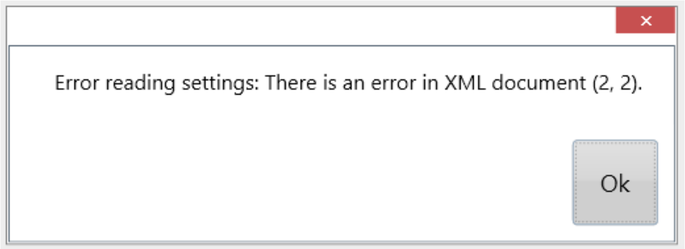
Causes:
- The language translation files are missing.
- There was an issue with an earlier version of the installer software that placed the translation files in the incorrect location

Solution:
Contact your dealer. The latest version of the installation software needs to be run to correct the issue.

Error reading settings.

Symptoms:

When starting T3RRA software an error message appears referencing a problem reading settings.



There is an error in XML Document

Normally the program will continue to load, but in severe circumstances the settings file error may cause the software to crash.

Cause:

There is some problem with the file that T3RRA software uses to store settings on the disk. It may have been corrupted in some fashion.

Solutions:

Normally you can continue running the software. You will likely have to re-enter any settings that you previously had. When you exit the settings dialog these settings will be saved to disk and the bad settings file will be overwritten. If you are unable to continue loading after encountering this error you will need to manually delete the settings file. This file can be found at:

C:\ProgramData\T3RRA\T3RRA *<Ditch/Cutta/Plane/Levee/Survey>*\Settings\T3RRA *<Ditch/Cutta/Plane/Levee/Survey>* Saved Settings.xml (or similar).

Note that the 'ProgramData' folder is often a hidden folder. It can be viewed by making hidden folders visible within the Windows Explorer settings, or by manually typing '**C:\ProgramData**' into the Explorer navigation area.

Navigate to the settings folder in Windows File Explorer and rename the existing file by changing the extension to '.bad' (or similar). Then restart the software. A new settings file will be generated.

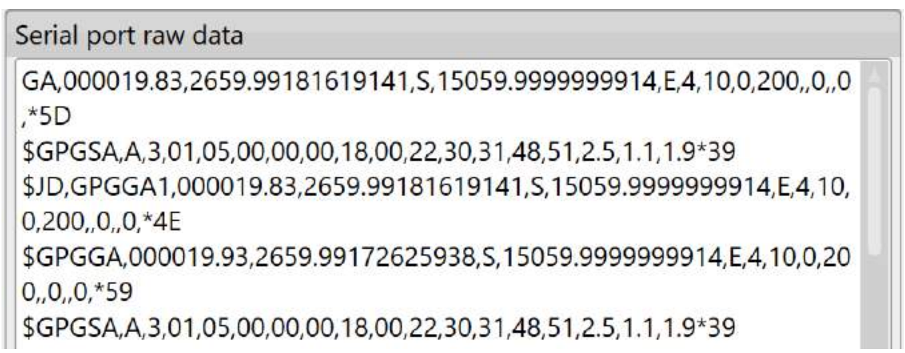
GPS

No GPS signal is being received from iGrade.

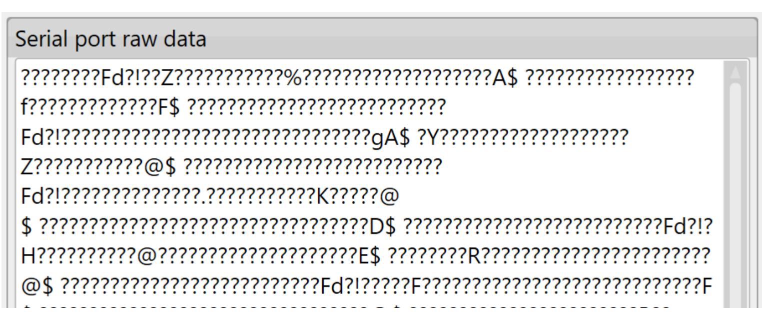
Symptoms:
Tractor position icon not appearing on map-screens.
'GPS info' button in the bottom right of map-screens is red.
In the 'Settings' window there are no characters streaming into the 'Serial port raw data' window in the 'GPS Port Settings' tab.

Symptoms of incorrect baud:
Incorrect baud rate settings are identifiable by viewing the incoming data in the window provided in the GPS setting tab.

Good data looks like normal text, as below.



Incorrect baud looks like:

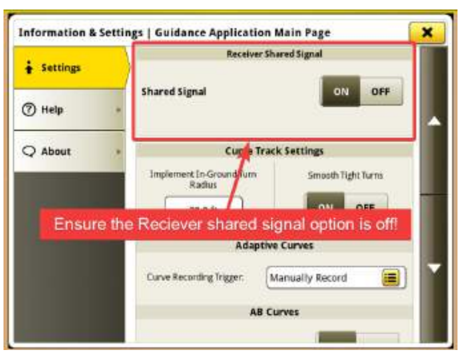


Causes:

The port for the GPS to T3RRA software may be closed.
Signal sharing is causing iGrade to lose Gps
Drivers for tablets serial port or USB-to-serial port may not be up-to-date.
Cables may not be seated correctly.

Solutions:

1) Ensure all Windows updates are performed.
2) Open the GPS info screen by pressing on the GPS button in the bottom right of the Collect or Apply step. Confirm that you have an RTK GPS signal and that the Open Port button is grayed out.
3) Ensure Signal Sharing is disabled in Autotrac settings



4) Confirm USB-to-serial cable's driver is up-to-date if applicable (refer to 'Access to the port 'COM X' is denied'. for instructions on how to update driver)
5) Confirm harnessing is correctly installed using AE3166 to connect T3RRA to iGrade app controller or AE3070 to T into receiver for surveying without iGrade.
6) Perform a continuity check on the iGrade harness to make sure the pin configuration is correct and the cable is not damaged.
7) Check settings in both iGrade and T3RRA (iGrade and T3C need identical Baud Rate):

IMPORTANT: When using T3RRA Products with iGrade you must configure the serial settings in "**iGrade Settings**". You only need to configure the serial port in "**Receiver Settings**" if you are connecting directly to the StarFire (as you might do when you are surveying in a Gator for instance).

In iGrade UCC1:

- Select Main Menu
- Select Control Selection
- Select Serial Port Setup
- Baud Rate – 38400
- NMEA – GGA, GSA
- NMEA Rate – 5 Hz
- Set Last Altitude - Off

In T3RRA (using iGrade UCC1):

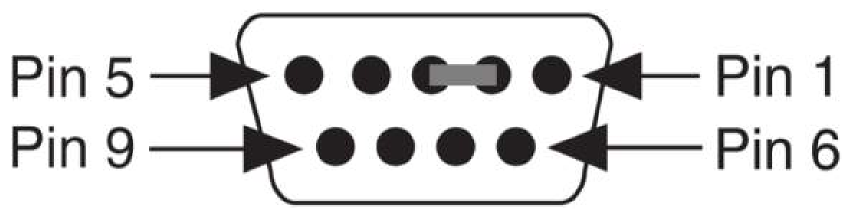
- Open T3RRA program and go to Settings > GPS Port Settings
- Set 'COM Port' to the correct port
- Set Baud rate to 38400
- Select Ok button

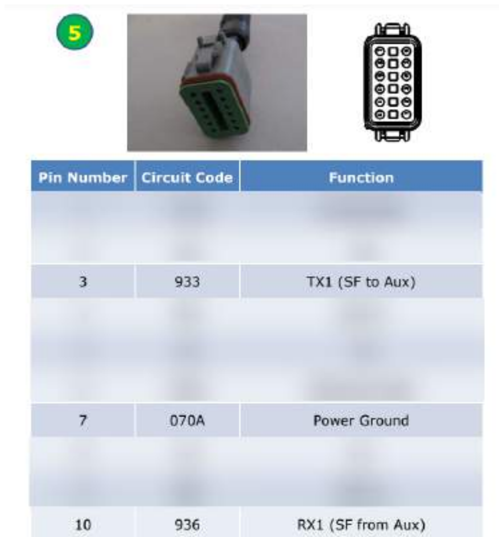
Testing Serial harnessing.

The most reliable way to confirm correct serial port harnesses operation when using T3RRA Products is to utilise the Port data window and use a testing method called Serial Loopback.

A loopback test can verify the operation of serial communication by sending and receiving data from the same serial port. It can show problems in the serial port, the cable, or the software generating the messages without having to connect to third party hardware.

VERY CAREFULLY! connect the transmit (TXD) signal to the receive (RXD) signal pins 2&3 on the serial port connector. Or pins 10&3 on the JD SF Receiver connector. Or Pins 5&6 on the iGrade connector.

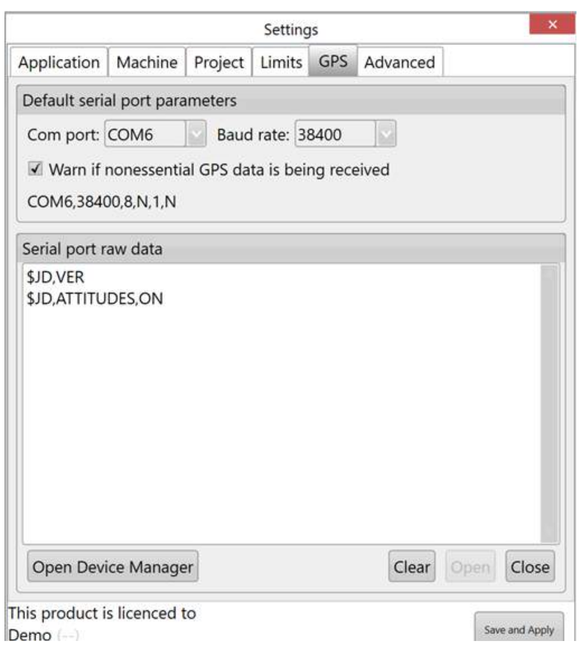




Pin Number	Circuit Code	Function
3	933	TX1 (SF to Aux)
7	070A	Power Ground
10	936	RX1 (SF from Aux)

While these pins are connected, press the **Open Port** button.

The serial port raw data should populate the messages as indicated below, this would indicate both the send and receive pins are working correctly and the harnessing is connected correctly.



No GPS signal is being received when connected directly to a GPS receiver.

Symptom:
The Tablet PC running T3RRA Software is connected directly to GPS but it is not receiving a GPS data stream.

Cause:
There are two potential causes of this problem.

1. The GPS receiver is not properly configured to output data via serial.
2. The cable between GPS and tablet is not connected or defective.

Solutions:

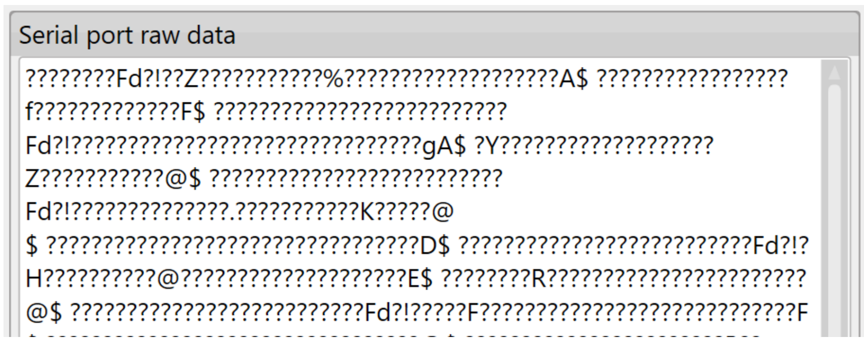
1. Check your receiver settings to ensure the correct data strings are being sent to the appropriate port.
    a. NMEA GPGGA @ 5 Hz
    b. NMEA GPGSA @ 5Hz
2. Check your receiver settings to ensure that the baud rate in use matches that expected by your T3RRA software. The rates configured in each must match.
3. Check your cabling.
4. Perform Windows updates.

If connecting to a StarFire receiver directly with a T harness (AE3070 from AgExpress), confirm harnessing is correctly installed for surveying without iGrade.

To test if T3RRA software is at fault when no serial data is being received from iGrade it can be helpful to close the T3RRA software and use another independent program to read and display the serial data. One such program is 'RealTerm' https://realterm.sourceforge.io/ . If you can successfully display incoming iGrade data in a serial terminal program it rules out a bad serial cable or incorrect settings on iGrade. If you are receiving valid text strings in such a program take special note of the port settings (Baud rate, and COM port number). These will be the same ones needed in T3RRA software.

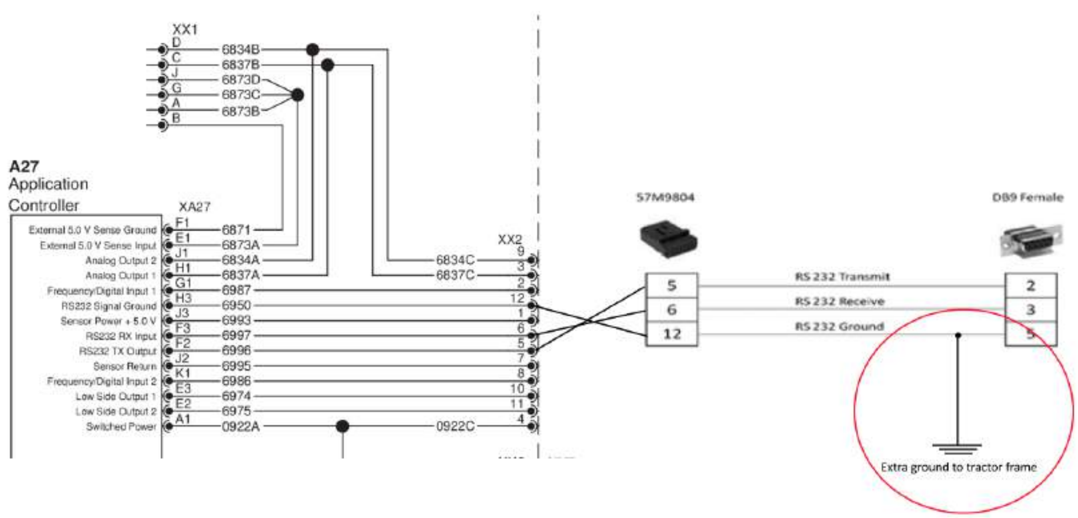
Baud rate is set correctly but messages from iGrade are still garbled.

Symptoms:
Baud rates are set correctly on both T3RRA software and in iGrade. The T3RRA software is not receiving GPS and the GPS diagnostics window is showing an unintelligible data stream



Causes:
The serial connection is not properly grounded. Pin 5 is disconnected or connected to the wrong pin at the other end of the cable.

Solutions:
Carefully check the remote control cable and the iGrade harness. Ensure that the ground wire is properly grounded. In at least one case we have had a user report that an additional grounding wire was required as shown below.



Vertical Performance Issues (GPS drift).

Symptoms:

Blade seems to drift throughout the day. When grading over an area of the field that is thought to be 'finished' the blade consistently begins to either cut or fill.

Possible Cause:

- Using SF6000 and SF3000 receivers together as a base and rover, or as tractor and implement.
- Base is configured as a Quick Survey base when using iGrade.
- Poor GPS availability throughout the day.
- Base station in a non-ideal location.
- Base station being interfered with by passing vehicles.
- High VDOP values are shown by T3RRA Software

Solutions:

- ALWAYS look for correlations with something that is happening in your vicinity when the issue is occurring. If the issue always happens at a certain time, or in proximity to buildings, trees, powerlines or other features then troubleshooting options can be narrowed.
- If using a 3000 receiver on the implement, John Deere recommends using an external antenna.
- John Deere recommends not mixing Receiver generations, as Base-Rover or as Machine-Implement configurations.
- Ensure the base is always configured as an absolute base when using iGrade.
- You must ensure Signal sharing is turned off in AutoTrac settings when using iGrade.
- Check GPS conditions at http://satpredictor2.deere.com/address. GPS conditions may be non-ideal, shift activities to bulking work until the GPS constellation improves.
- Use a mobile base and place it as close to the working area as practically possible.
- Move the base away from obstructions (building, vehicles, trees) and higher off the ground.

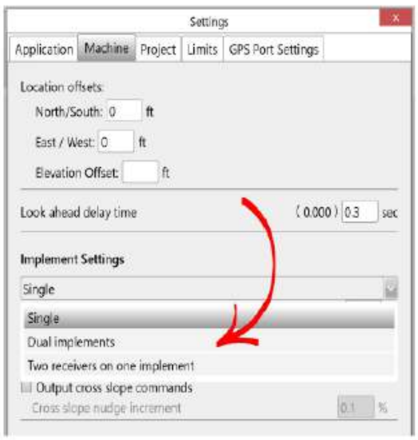
- Tune iGrade hydraulic thresholds.
- If you notice that degraded accuracy consistently occurs at certain times of the day there may be unavoidable satellite/atmosphere conditions. Try and schedule bulking work for this period, leaving high accuracy finishing grading for other periods in the day.

Dealers are encouraged to file a John Deere DTAC case if vertical accuracy issues are not solved using other recommendations in this guide.

No GPS in T3RRA Cutta v1 when using dual scrapers in iGrade v1.

Symptoms:

Customer is running dual scrapers on iGrade v1. GPS appears to be present in T3RRA Cutta if only one scraper is configured. Changing to dual scrapers in T3RRA Cutta causes GPS to be lost.



Implement Settings Options:

- Single - one implement (default)
- Dual - two implements connected as front and rear
- Two receivers on one implement - receivers mounted on left and right side of implement with split hydraulics controlling blade heights independently

Cause:

iGrade had been set up in "Plane Control" for SCV1 & SCV3 under the control selection .

Solution:

Change the control selection to "Remote Control" for SCV1 & SCV3 and cycle power.

You are getting GPS data but the fixed quality is not RTK.

Symptoms:

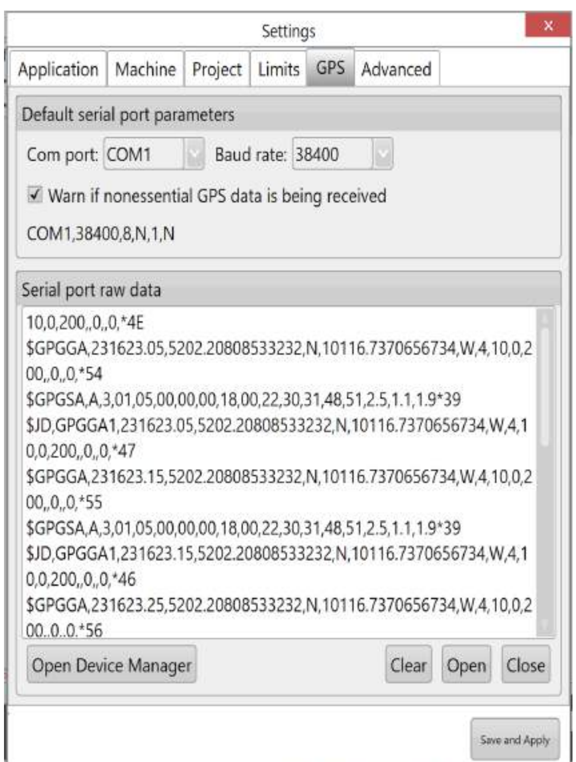
When you open a com port you clearly see that positional data is being received. However the GPS Info window is displaying a fix other than *FixedRealTimeKinematic*.

Cause:

1. You are connected to the wrong com port. This is possible if your tablet has an internal GPS and you are connecting to it's port.
2. Your GPS is not receiving RTK correction packets from it's base station.

Solutions:

1. Check to see that you are connected to the correct serial port.
2. There are many reasons a GPS may not be receiving correction packets from it's base station. Check your GPS documentation for solutions.



GPS data stops and COM port number has changed.

Symptoms:

The position stops updating and it is apparent that position data is no longer being received. When you open the 'GPS Info' window it is apparent that the COM port has changed to a different port from normal. The regular port may or may not be there. If it is there and you change back to it everything is ok, but the problem may intermittently continue to occur.

Cause:

You are using a USB-to-Serial adapter. It is loose and the connection is randomly lost when the machine vibrates or travels over bumps.

Solutions:

1. Check connector ends for obvious damage.
2. Secure the adapter more securely using cable ties or other restraints.
3. Clean the USB metal contacts using contact cleaner and a cotton swab (or similar).
4. If the tablet has more than one USB port try the USB-to-Serial adapter in an alternative USB port.
5. Replace the USB-to-Serial adapter (please only use an approved FTDI adapter).

SURVEYING

Collected survey data is blue and red only.

Symptoms:

Normally collected survey data is colored with a spectrum of red (low) through green through blue (high). In this instance there appears to only be two colors: red and blue.

Causes:

T3RRA software fits a red-green-blue spectrum of color to the survey points. It "stretches" these colors across the range of data points. If the data is "clumped" in groups that are well apart numerically then the majority of the spectrum of color will not be seen.

1. One or more points has received a corrupted elevation value, placing it well above or below the bulk of the points
2. The base station has changed it's elevation part way through the survey. Points collected before will be offset by this change.

Solutions:

1. If there are only a few corrupted data points, simply delete them using the tools available in surveying or surfacing.
2. If this problem is caught while surveying, stop the survey immediately. Check to see if the base station has been altered and fix it. Then delete the points that were too high or low and begin surveying at the location where the problem began.
3. If it is not possible to resurvey the affected part of the field you have several (bad) options
    a. Export the elevation points as a CSV file. Open the CSV points in a spreadsheet. Add the appropriate offset to all bad points. Save the file as a CSV. Import this CSV file in the T3RRA software.
    OR
    b. Surface the collected data. Create a region around the section of the field that is too high or too low. Use the 'Offset Surface' design tool to change the height of the problem region. Some smoothing across regions may also be required. From

this point onwards, use the resultant design surface as the basis for further designs.

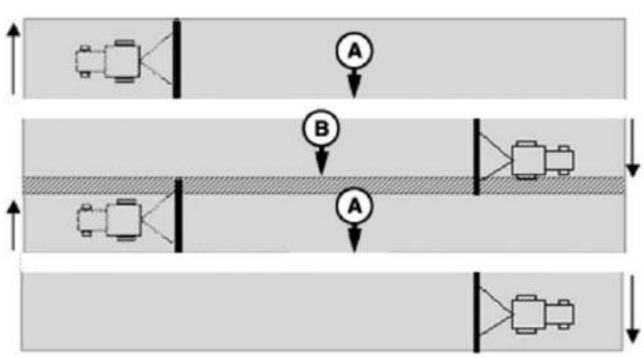
Elevation Offset during surveying.

Symptoms:
Recorded elevation data collected while surveying is offset and not in the correct location.

Possible Cause:
- StarFire Receiver needs calibrated

Solutions:
- Calibrate receiver's TCM (refer to John Deere SF OM)
- Re-Survey

IMPORTANT: Vehicle must be on a hard, flat level surface for calibration. If TCM is not calibrated on a level surface or TCM mounting angle is not level in relation to vehicle angle (StarFire mounting bracket or vehicle cab being slightly offset, uneven tire pressures from one side to other, etc.) operator may see offset during operation. This offset could look like a consistent skip (A) or overlap (B) in passtopass operation. To eliminate offset, recalibrate on a level surface, drive down a pass, turn around and drive down the same pass in the opposite direction. If the vehicle does not follow the same pass, measure offset distance and enter in implement offset. After initial calibration of TCM, it is not necessary to calibrate again unless TCM angle in relation to the vehicle has changed. For example, tire pressure has been lowered on one side of vehicle.



A—Skip B—Overlap

Drain Survey mode performed in error.

Symptoms:
Drain line is present in the elevation data path.

Possible cause:
T3C user has recorded in Drain survey mode instead of Field survey mode as intended. Drain lines are in a swath pattern across the field.

Solutions:
If a user does not wish to resurvey in Field survey mode, they can:

1) Delete drain line T3RRA Design (T3RRA Cutta owners only).

    1. Load the project into T3RRA Design
    2. Delete the drain line on the Guide tab
    3. Export a control file for T3C

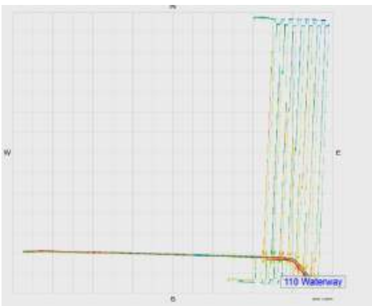
2) In Collect step of Wizard:

    1. Export data as CSV file
    2. Import CSV file into T3RRA Cutta v2.

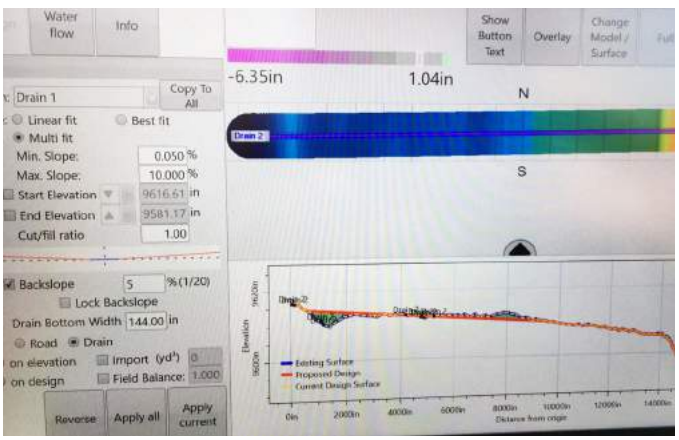
Elevation points not appearing correctly or with voids.

Symptoms:

1) When you survey a field or drain and the elevation points are faint with black lines through them causing the survey to appear incorrect or with void like spaces.



2) Your drain profile view shows incorrect names associated with the drain selected.



Cause:

1) The elevation points have been recorded using the Boundary mode instead of the field or drain survey modes
2) Drain was resurveyed without starting a new project or deleting previous surveys.

Solution:

1) Delete the black boundary line using the delete boundary option in the boundary survey mode in the collection screen. After this the elevation points can be used as they normally would.
2) Delete the unwanted drain survey elevation data in the collection screen.

Surveying at heights close to sea level results in an incorrect field surface.

Symptoms:

The collected field elevation map (in T3RRA software) appears vastly different from your expectation of what the actual field looks like. You are surveying a field where elevations can be both negative and positive (i.e., partially above and partially below sea level). When you examine your field map you see that all elevation values are either negative or positive (not both). You are using a StarFire 3000 receiver and receiving serial data directly from the receiver (not via iGrade).

Cause:

The StarFire 3000 has a bug that causes problems with output elevations when it crosses between positive and negative elevation values.

Solution:

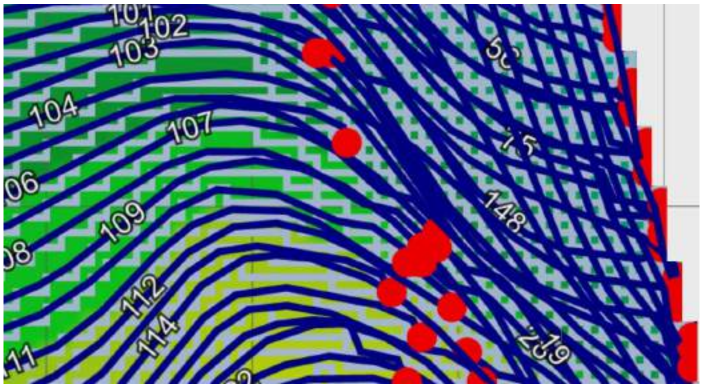
1. Alter your base station height so that the whole field can be surveyed using elevations that are either all positive or all negative.
2. Use iGrade and an implement receiver to survey the field.

DESIGNING

Levees are jumbled and crossing over.

Symptoms:

When you create levees in T3RRA Cutta, Ditch or Levee, the levee lines seem very 'messy'. There are frequent line endings and levee paths sometimes appear to cross over each other

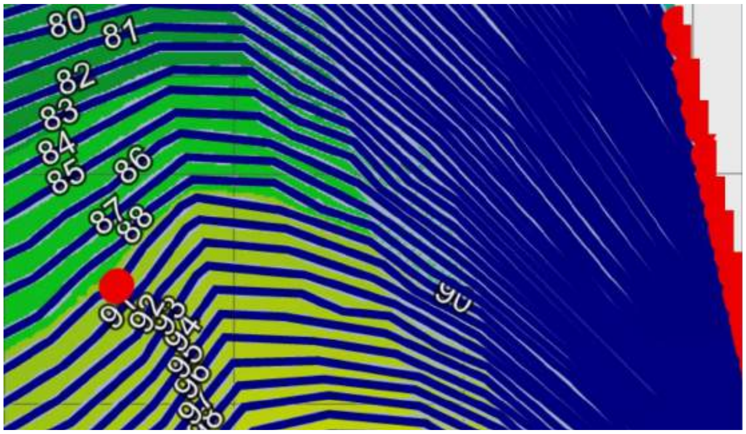


Cause:

The levees are spaced very closely. T3RRA software uses an algorithm that looks at the edges of individual raster pixels and problems can occur if the levee lines are spaced at a width of equal to, or less than, the pixel size.

Solution:

Resurface the survey data at a smaller pixel size. Then re-do the levees. The correct pixel size will depend on the slope of the land, and the required vertical distance between levees.



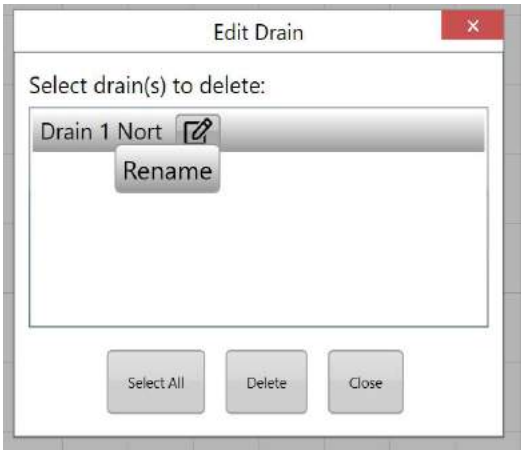
Imported SWP+ ditch track names are too long.

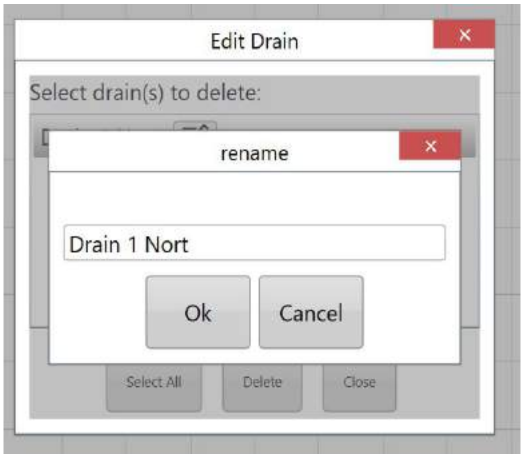
Symptoms:
After importing SWP+ ditch tracks, you see that their assigned names are too long and cover most of the surface.

Cause:
Previously assigned names are imported along with ditch tracks.

Solutions:
Return to the Surface step and use the Edit Drains button to rename.

Click on the pencil and paper icon, rename drain, choose Ok, then Close.





Drain Design freezing and/or producing jagged profile view OR Small Field design has jagged edge and difficult to see changes in elevation.

Symptoms:

After Applying drain design, the tablet freezes.

Profile view of drain is jagged.

Small field design has jagged edges.

Small field not defined enough.

When I am in the Drains Design step, the profile view of my surveyed drain appears 'jagged' and 'corrupt'. I know what I am viewing in the drain profile window is not an accurate representation of the original surface.

Possible causes:

Pixel size is too large for thin drain.

Drain is long and the drain width is thin.

A drain survey was collected OVER a field survey (or visa versa).

Solutions:

Change Pixel size.

Change width of drain (only if the change will not affect implementation).

Image of profile view of drain with jagged drain line:

Image of small field with large pixel size:

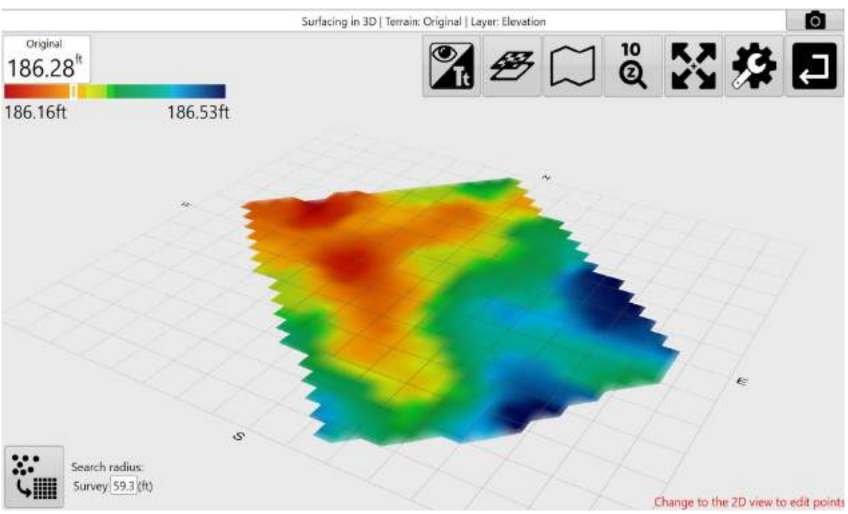
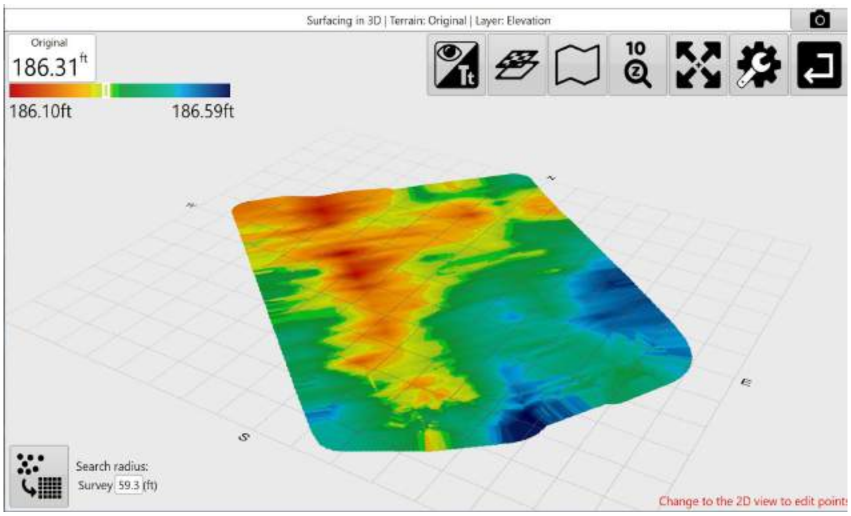


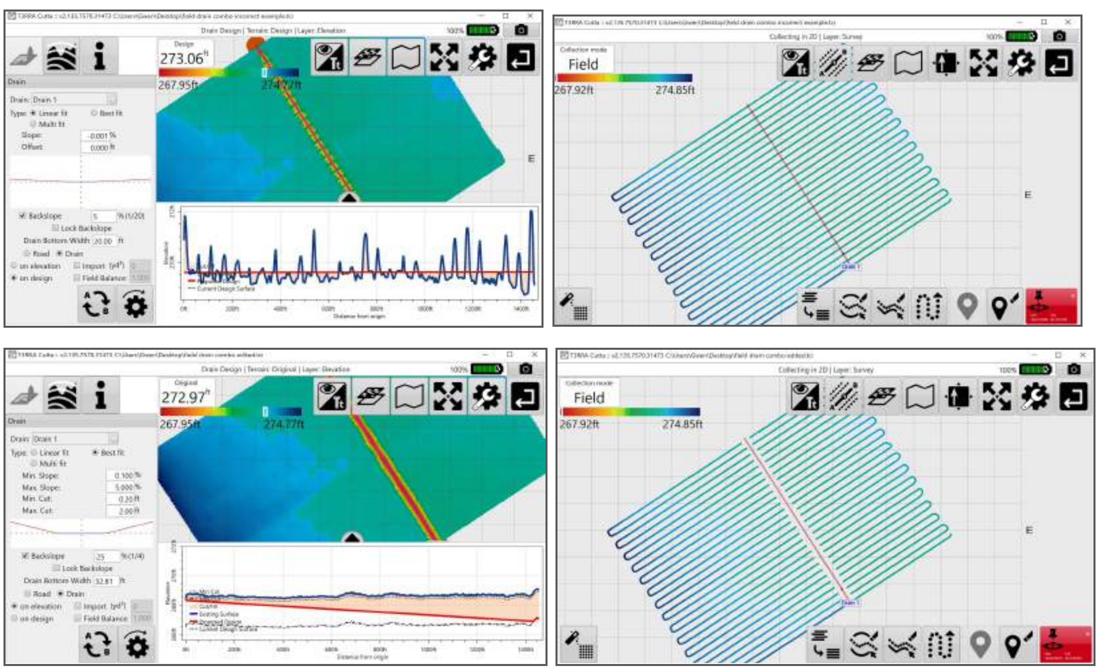
Image of small field with small pixel size:



Solutions if drain and field surveys overlap:

Delete the field elevation points directly under the drain path of drain surveyed points.

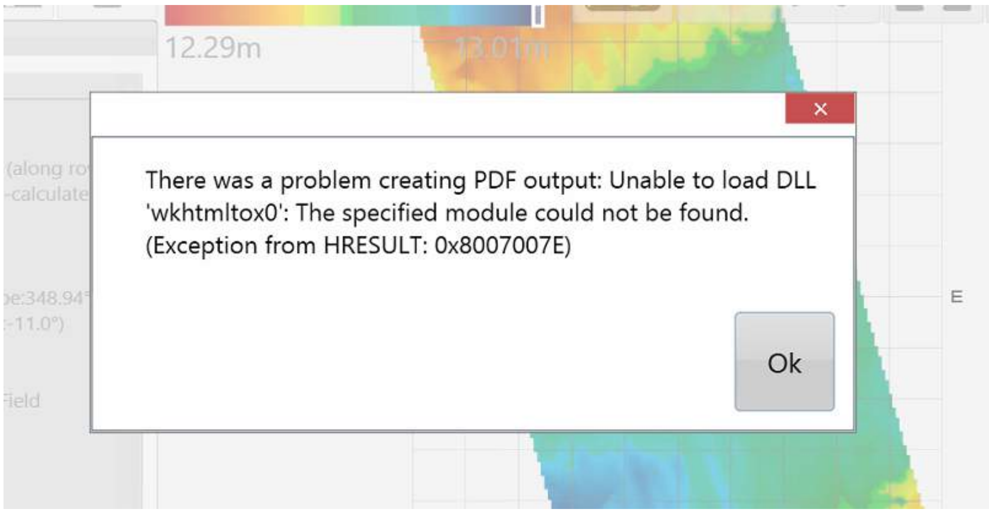
Resurvey in Field survey mode pausing field collection of points when traveling over the drain path then change to Drain survey mode to collect the drain path that is clear of field elevation points.



Attempting to save a PDF report throws an error.

Symptoms:

When attempting to create a PDF report on a tablet running Windows 8.1 an error message appears and no report is created.

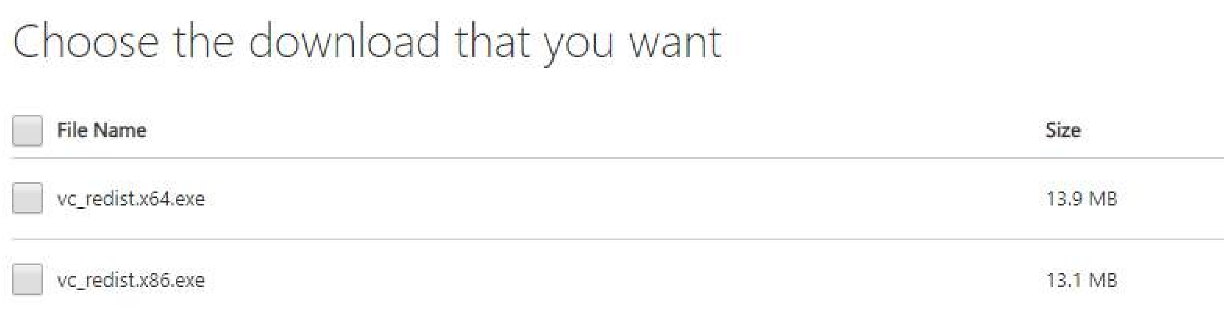


Cause:

Windows 8.1 is missing some critical files the PDF creator relies on.

Solution:

Install the VC++ 2015 Redistributable files. These are available at www.microsoft.com. Use a search engine to find them. Choose the version that matches your tablet (32 or 64bit). Install on the tablet. The PDF creation process should then work.



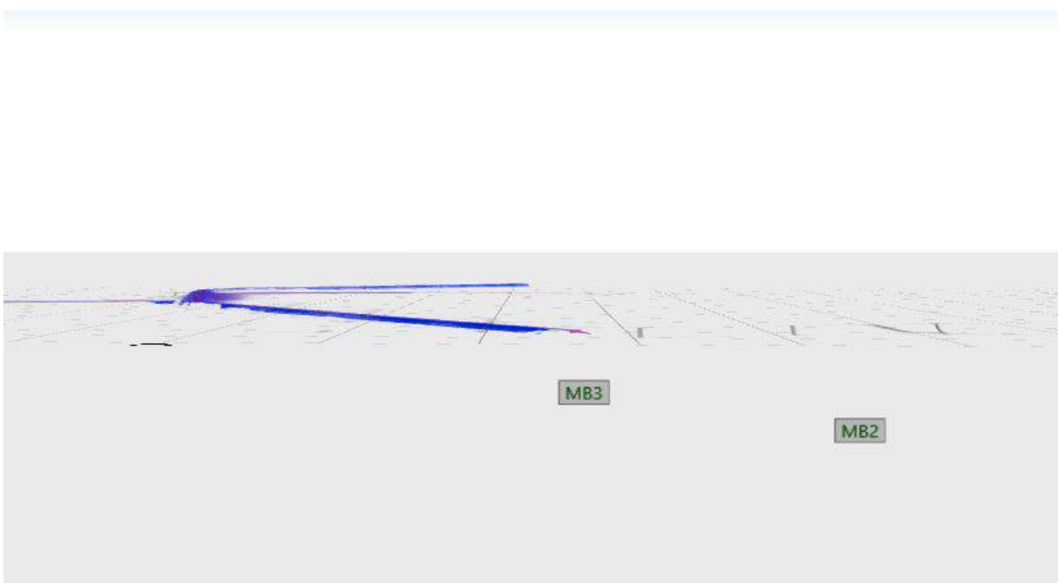
Markers not visible.

Symptoms:

Markers are not visible on the map surface, and you believe they should be present.
When you have created markers (Bench Marks) in T3RRA Design and have exported your control file for T3RRA Cutta or T3RRA Ditch.

Cause:

A marker may have been given an incorrect elevation value, causing it to be well above or below the surface. This can happen for instance if the design was made in T3RRA Design and the marker was given an elevation of zero.
The markers have been exported without a height set, therefore will only show up in 3D underneath the surface.

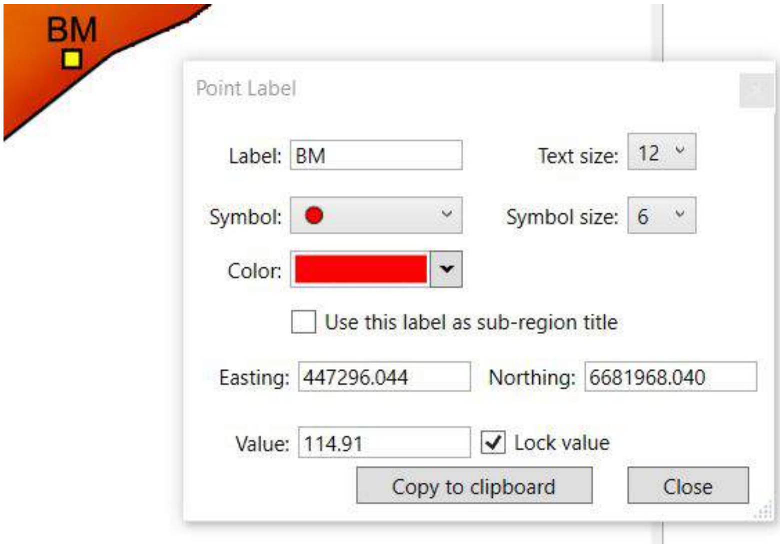


Solutions:

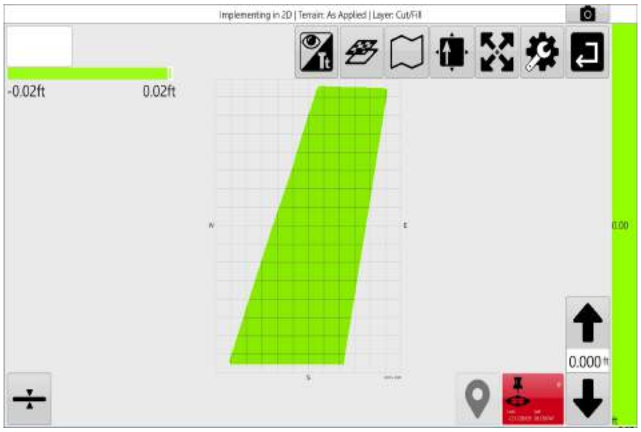
1. Check to see that the marker is actually present. This can be done by tapping the ‘Delete marker’ button in the bottom right of any map-screen and seeing if the marker of interest is in the list to be deleted. If it is then close that dialog and then zoom as far out as you can. You will likely see the marker a long way above or below the surface. If the

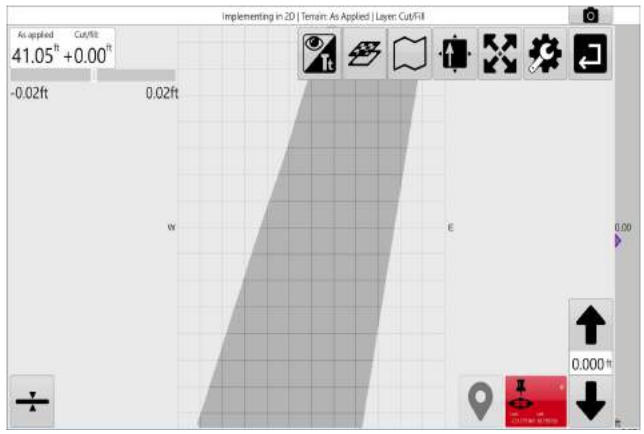
‘Delete marker’ button is not present it means there are no markers available on the map.

2. There is currently no way of changing the elevation associated with a marker. Go back to the original source software and fix the issue there. If this is not a satisfactory solution please contact T3RRA to explain the use case and we will examine ways to achieve your goals.
3. When creating markers in T3RRA Design always make sure that you enter the value and tick the “Lock value” before exporting your control file.



My cut/fill map is totally a single color representing no cut and no fill.



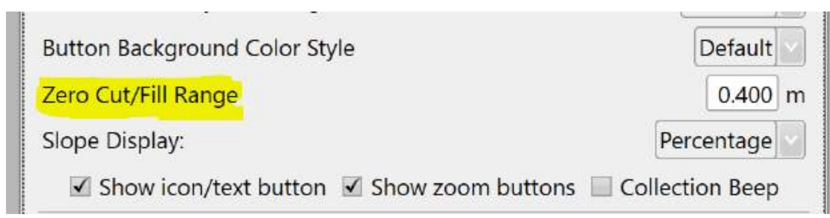


Symptoms:

In the implementation or design phase of T3RRA software, you view a cut/fill map and it is a uniform green or gray color representing no cut and no fill (depending on your cut/fill color schematic selected in Settings). When you touch part of the map it shows the Cut/Fill value as being 0.

Cause:

1) Your original surface and your design surface are exactly the same. This happens if no design has been created. When surfacing first completes a “blank” design is created that matches the original surface exactly. As a cut/fill map is the difference between the original surface and the design surface it will necessarily be a map of zero values.
2) Your ‘Zero Cut/Fill Range’ is too large.

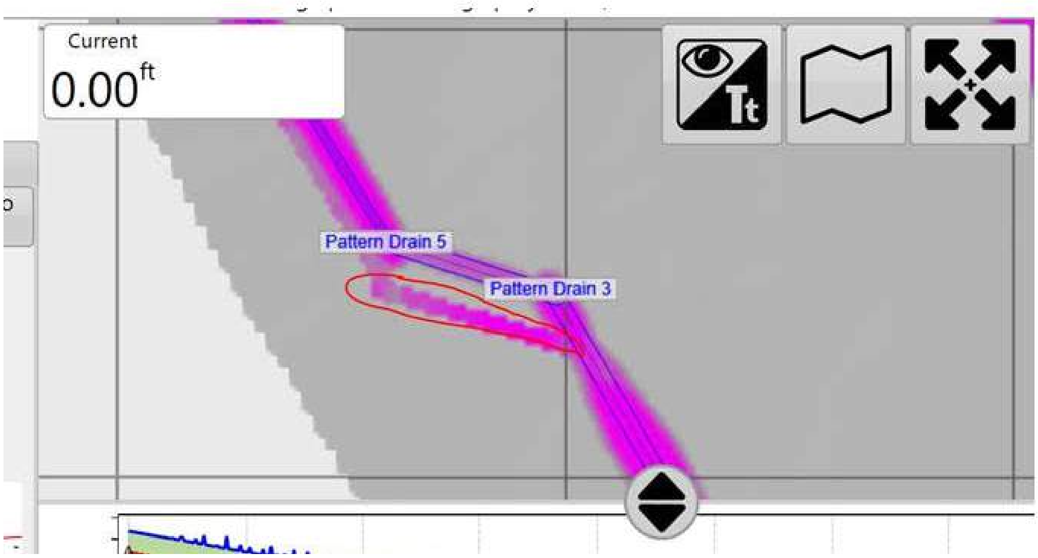


Solution:

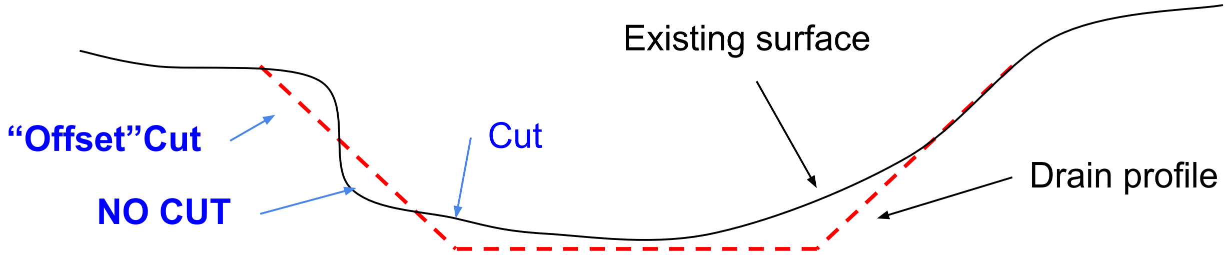
1) Go to the design step of the wizard and create a new design.
2) Open **Settings > Application** and lower your ‘Zero Cut/Fill Range’

There is an 'offset' cut area beside my drain.

Symptoms:
When burning a drain profile into a surface, one or more side cut areas appear that seem disconnected with the actual drain path.



Cause:
The side batter from the drain rises up through an existing surface that undulates in such a way that both cut and no-cut areas result.

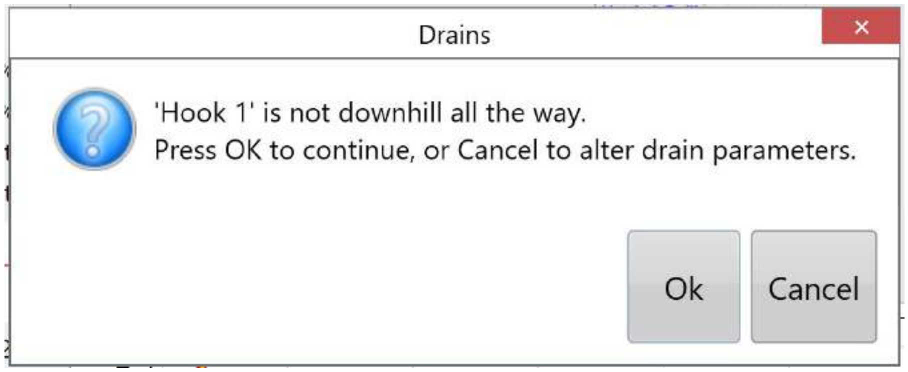


Solution:
Increase the batter angle, or smooth the field surface before creating the drains (and create the drains based on the DESIGN, not the ORIGINAL surface). Alternatively, simply ignore the offset cut area.

Drain Design error message ‘not downhill all the way’

Symptoms:

When designing a drain, you receive an error message:



Cause:

Parameters entered do not allow drain to flow downhill all the way.

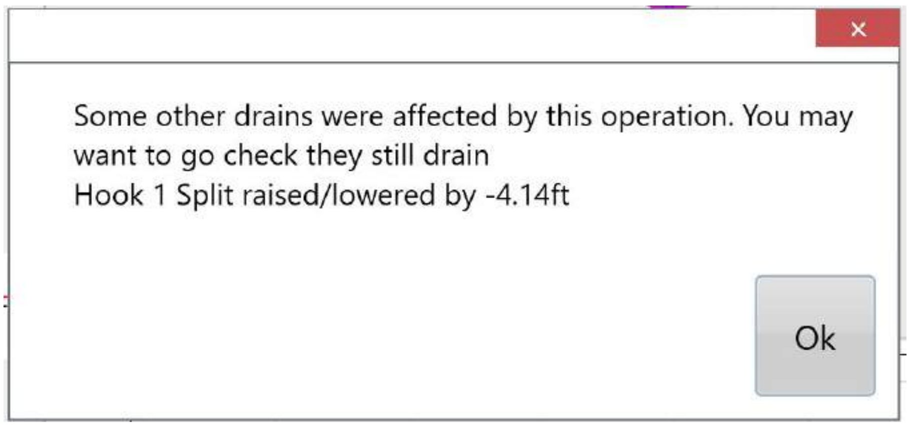
Solutions:

Change parameters until they produce a drain that will flow downhill all the way. i.e. increase Max Cut.

Drain Design error message ‘drains were affected by this operation’

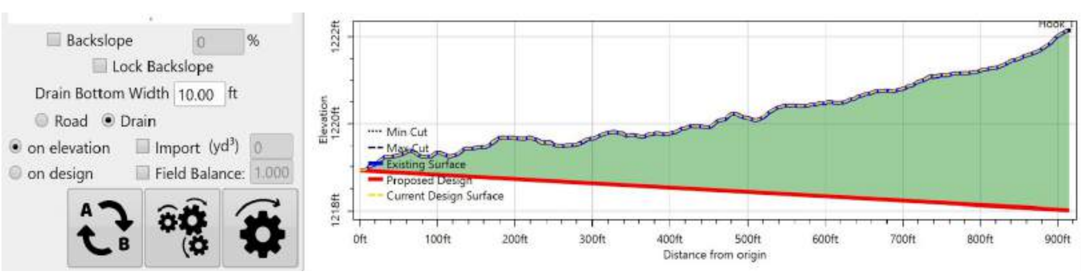
Symptoms:

When designing a drain, you receive an error message:



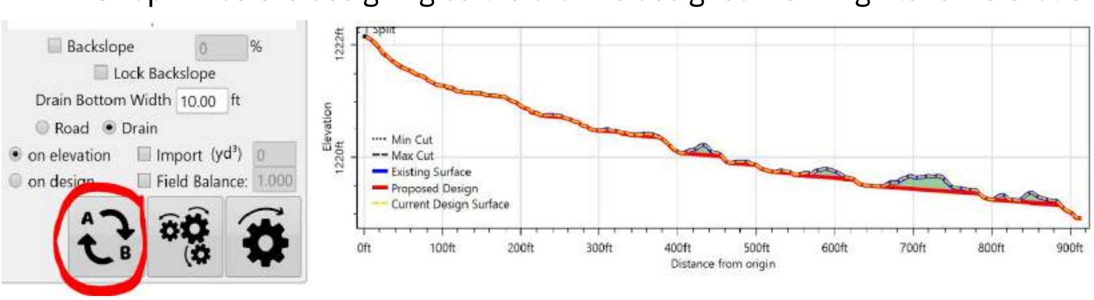
Cause:

1. Elevation data was collected from low to high elevation where another drain connects.
2. Drain was split with the Split Drain tool.



Solutions:

1. Swap AB before designing so the drain is designed from high to low elevation.



CROSS SLOPE

Cross slope control is not working.

NOTE: This guide is NOT applicable for systems using two GPS units on a single implement for cross slope control.

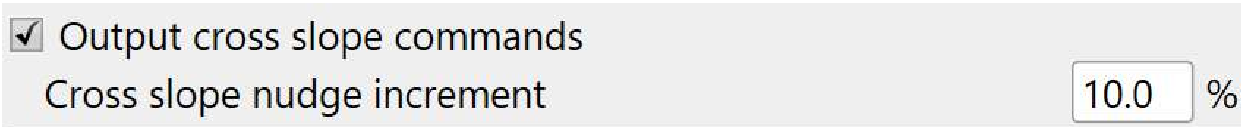
Symptoms:
You want the T3RRA software to control the cross slope of the cutting edge but it does not seem to be working.

Cause:
Improper physical setup, iGrade configuration, or T3RRA software settings.

Solutions:

1. Make sure that SCV3 is set up for cross slope control (check your iGrade Operators Manual). IMPORTANT. Choose 'Cross Slope Control' from the SCV3 drop down menu in UCC1. Check the 'Enable Cross Slope' box in UCC2.
2. Make sure that you have properly calibrated your TCM.
3. Ensure the SCV has had the thresholds calibrated as per the iGrade manual
4. Check the control sensitivity is not set too low causing cross slope to be "lazy". Increase the value for a more aggressive control.
5. Check that the correct hoses from your implement's cross slope controlling hydraulic ram(s) are plugged in to SCV3
6. Reverse the hoses plugged in to SCV3 if needed.
    a. Reversed hoses will normally cause the blade to rotate completely to either the left or right as soon as you begin working.
    b. iGrade 2 has a checkbox option to reverse the blade tilt without reversing the hoses, iGrade 1 does not. If you have iGrade 2 check your iGrade manual for more information.

7. Make sure that the '**Output cross slope commands**' box is checked under '**Settings > Machine**' in the T3RRA software.



8. Make sure that an accurate '**Implement Width**' is entered under '**Settings > Machine**' in the T3RRA software.
9. Make sure that cross slope control is set to Auto on the implementation screen.
10. Ensure that the design is actually calling for the expected cross slope.

Cross Slope not working and Front and Rear Error displays are visible.

Symptoms:

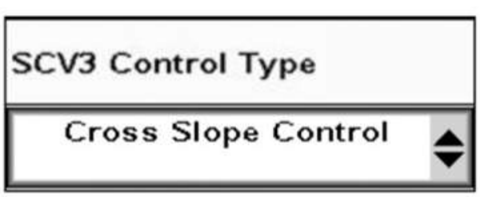
If you are seeing Front Error and Rear Error and you are not using dual scrapers, you may have set up the SCV 1 and SCV 3 incorrectly.

Cause:

You have not set Cross Slope up correctly on the Application controller.

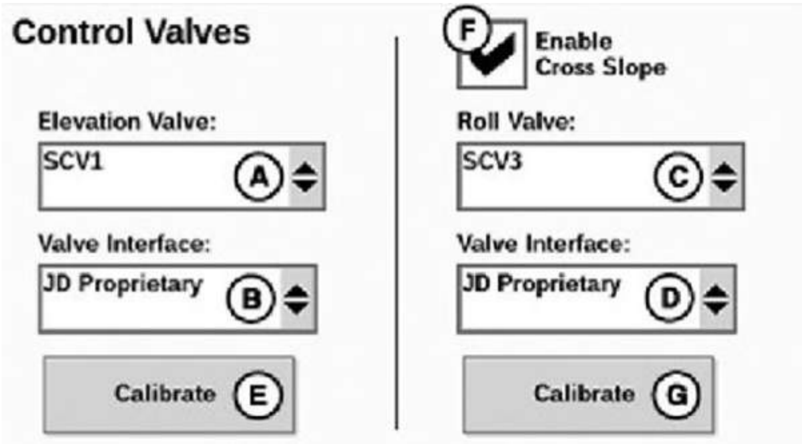
Solutions:

Choose 'Cross Slope Control' for SCV3' from the drop down menu in UCC1.



SCV Control Type Drop-down Menu

Check the 'Enable Cross Slope' box in UCC2.



Paddle pots are backwards for manual control of cross slope.

Symptoms:

The operator is accustomed to moving the controls in one direction to achieve left tilt and in the other for right tilt. iGrade v1 wants the cross slope ram hoses in a certain way and this forces manual control to be backwards from how the operator expects.

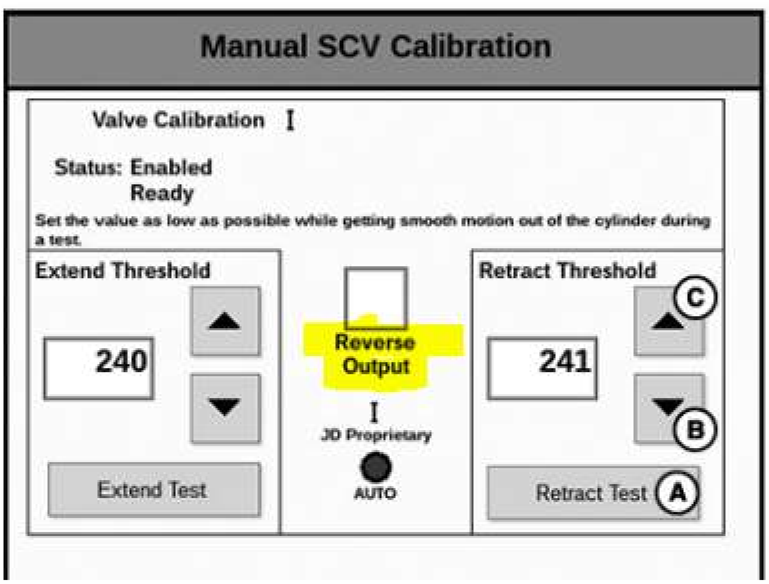
Cause:

iGrade v1 only allows the hoses to be plugged in one configuration.

Solutions:

Short of altering the hydraulic hose configuration on the implement rams, there is no known solution for iGrade v1.

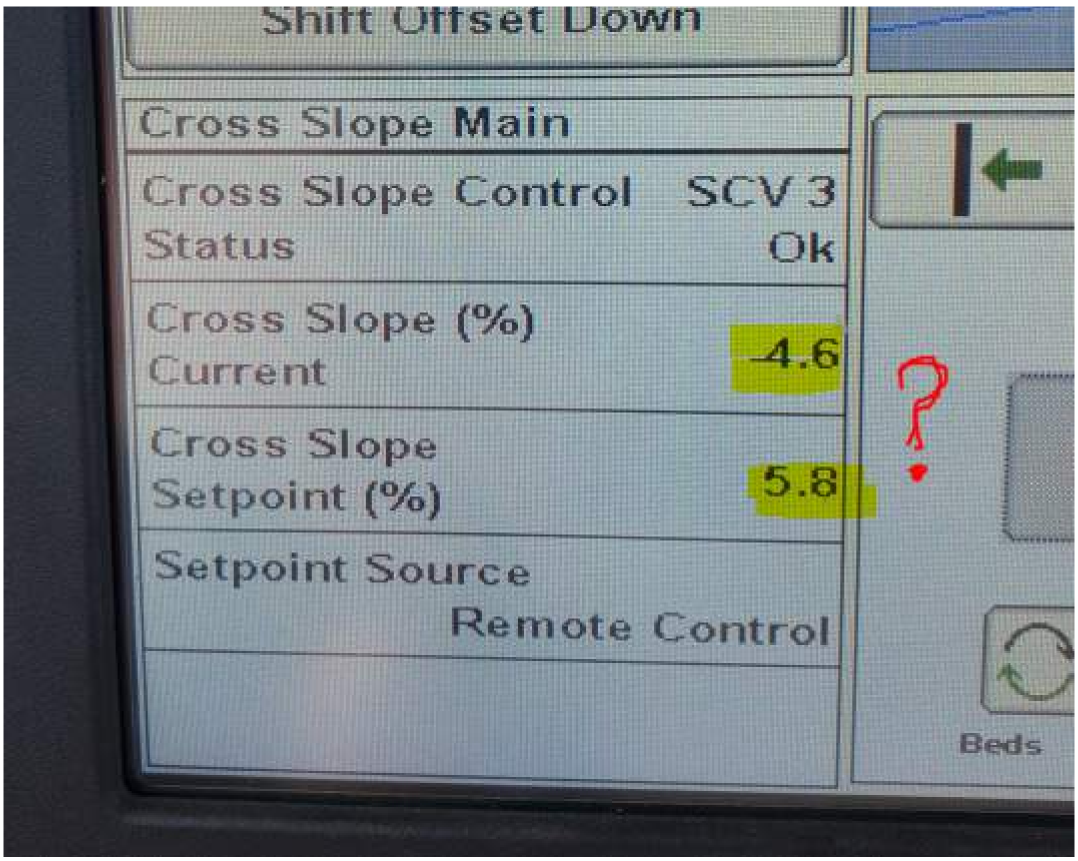
iGrade v2 gives the option of reversing the outputs.



Scraper cross slope appears to be the opposite of what it should be.

Symptoms:

When T3RRA is commanding a cross slope tilt to one side the scraper blade is doing the opposite. iGrade is showing a current cross slope % as positive when the implement is rolled to the left, and negative when tolled to the right. Reversing hydraulic hoses in the remotes does not help the problem.

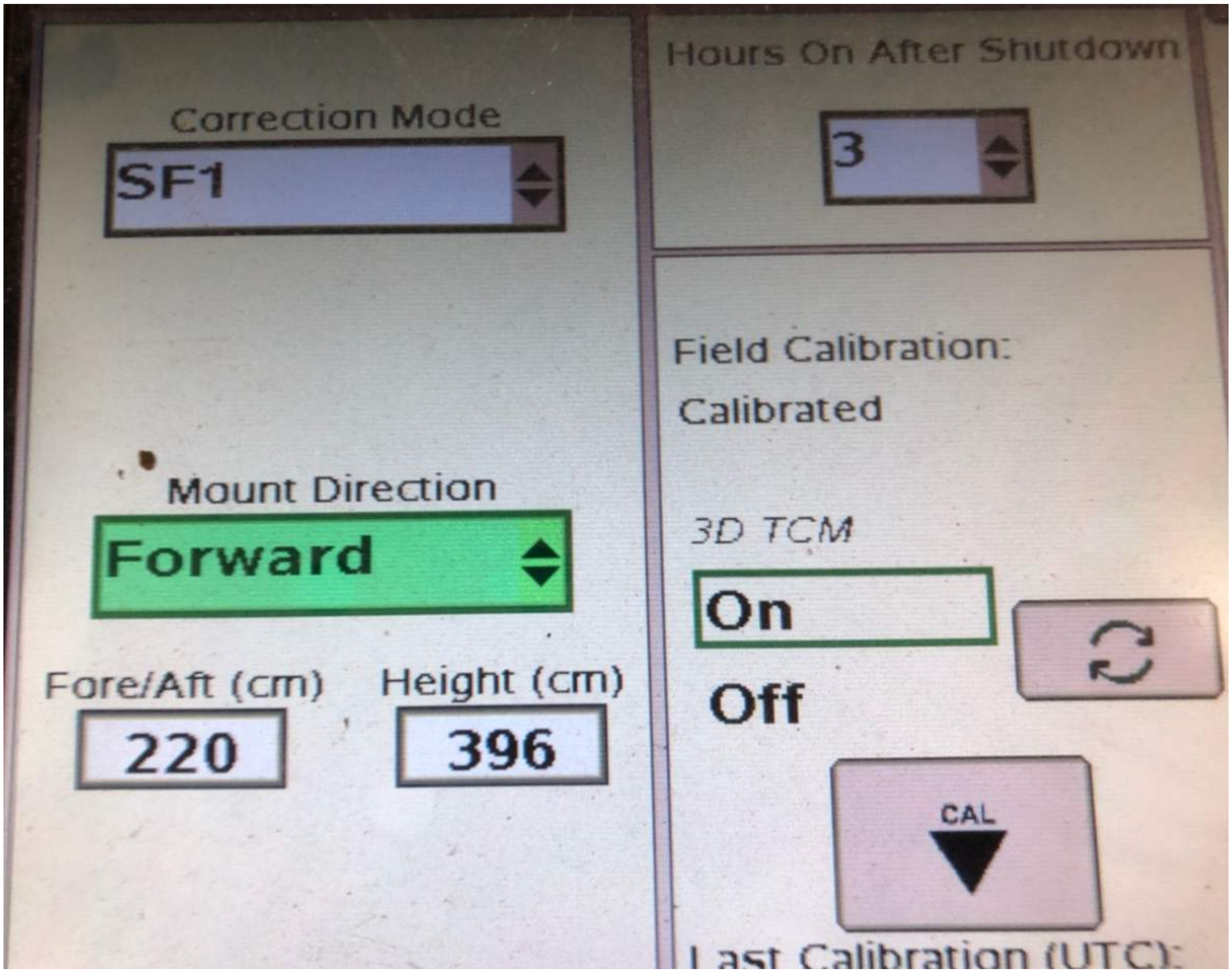


Cause:

The implement GPS mount direction has been changed to 'Backward' in the John Deere display. This causes receiver TCM readings to be the opposite of what they should be.

Solution:

Set implement GPS mount direction to 'Forward' if the receiver is facing forwards.



IMPLEMENTING

Troubleshooting performance.

Symptoms:

- Implement responds too slowly to changes in grade
- Blade fails to hold grade
- Unexpected shifts in blade elevation occur
- Implement appears not to respond to commands
- Cross slope not working
- Cross slope behaving unexpectedly

Cause:

“Performance” is a subjective term. There are many ways in which a system can suffer poor “performance”. Thus there are also many causes for this. The exact cause will differ with the type of performance degradation present. Specific types will be discussed further in other parts of this document. However the below advice is almost always relevant.

Solutions:

The first step when diagnosing any performance issue is to disconnect the T3RRA software and to test iGrade *in isolation*. Only once you have confirmed that iGrade is working properly, you can then start to troubleshoot the T3RRA software. Place iGrade in Plane Control or Grade Control and establish that it is performing as expected. If it is, reconnect the T3RRA software and continue with other solutions in this troubleshooting guide. If it isn’t please consult your John Deere dealer.

Implementing issues with iGrade (will occur without T3RRA connected)

NOTE: There will be situations where your dealer may ask you to capture a StarFire message log for further diagnosis. This can be done on the Deere display using the SF6000 VT as follows:

Bi-Directional error in iGrade.

Symptoms:
The implement consistently cuts when heading in one direction and fills in the other direction. Final grade is never achieved. If T3RRA software is halted and iGrade is run in 'Plane Control' only the problem is still present. Changing height control to SCV 3 may resolve the issue.

Cause:
This problem has been seen in cases where check valves within the tractor SCVs are malfunctioning. The implement blade is failing to hold height properly. The bidirectional nature of the issue perhaps comes from different amounts of dirt (weight) within the scraper when it is going in different directions. If changing height control to SCV 3 fixes the issue then it may indicate that only SCV 1 is malfunctioning.

Solutions:
Replace check valves with tractor SCVs.

Blade continuously loads on one side.

Symptoms:

System is grading low on one side.

Cause:

There are multiple possible causes for this.

- iGrade has not been set correctly.
- SCV's have been put accidently in float instead of detent.
- Manual nudge controls have been turned on by accident.

Solutions:

1) Ensure this is actually the case, try grading in both directions along a single pass be sure to confirm the blade stays low on one side
2) Be sure the SCV is set to the auto detent position
3) If using 'Cross Slope', ensure 'Cross slope' is set to control. Auto is active when the manual slope nudge buttons are greyed out. The blade controls the set slope when the slope nudge buttons are active. Check the iGrade setup - ensure cross-slope is set to remote commands and also SCV3 is set to cross slope for external commands,
4) Complete a TCM calibration on the receiver, be sure to drive a complete figure eight to wake up the TCM before completing the calibration, ensure the blade is close to the ground and level before proceeding through each step of the TCM cal.
5) If there are two receivers on the one scraper, check to see that the Implement GPS Receiver Offsets are set correctly in iGrade.

Poor “on grade” performance.

Symptoms:

Blade Struggling to hold grade.

Cause:

There are multiple possible causes for this issue.

- Interruptions to GPS.
- Incorrect surface offset.
- Incorrect settings in iGrade.

Solutions:

1) Disconnect T3RRA software. Perform performance tests using iGrade alone to simplify. After you are satisfied with the iGrade performance, reconnect T3RRA software and re-evaluate performance.
2) Be aware of your environment, GPS can experience interference from trees, buildings, the tractor, water and some soil types can cause interference.
3) Ensure the base is set up clear of trees and obstructions of its view of the sky.
4) Ensure the base is set up well clear of any traffic or vehicles passing by.
5) Ensure GPS accuracy is adequate, ensure you are operating within 1mile (1.6kms) of your base station.
6) Check the GPS accuracy is adequate, Ensure your VDOP is below 1.6, do this by either opening the GPS info window in T3RRA Cutta by tapping the GPS in the lower right of the display.
7) Ensure the settings in iGrade are correct and re-calibrate iGrade thresholds and set the grade sensitivity. Calibrate thresholds using a potentiometer or a pressure gauge. See dealer for details.
8) Check your base has adequate power and is configured as an absolute base, low base power when set as a quick base can cause strange results.
9) If using a StarFire 3000 be aware that John Deere recommended practice is to use an external antenna. Check that the coaxial cable is not squashed or damaged.

10) Dealers are encouraged to file a John Deere DTAC case if vertical accuracy issues are not solved using other recommendations in this guide.

11) Also see - The implement blade does not seem to follow the design surface.

Engaging auto causes the scraper to raise into the air.

Symptoms:

Operator engages scraper into detent (auto mode) and the scraper extends to full stroke on the lift cylinders.

Cause:

iGrade has Load Limiting and/or Max Cut enabled in Application controller settings.
The engine speed (RPM) threshold is set lower than the field working engine speed (RPM) threshold.

User is using UCC2 in Proprietary valve mode (CANBUS). But has the application controller also connected via the legacy option connector.

Solution:

Disable Load Limiting and/or Max Cut in Application controller settings.

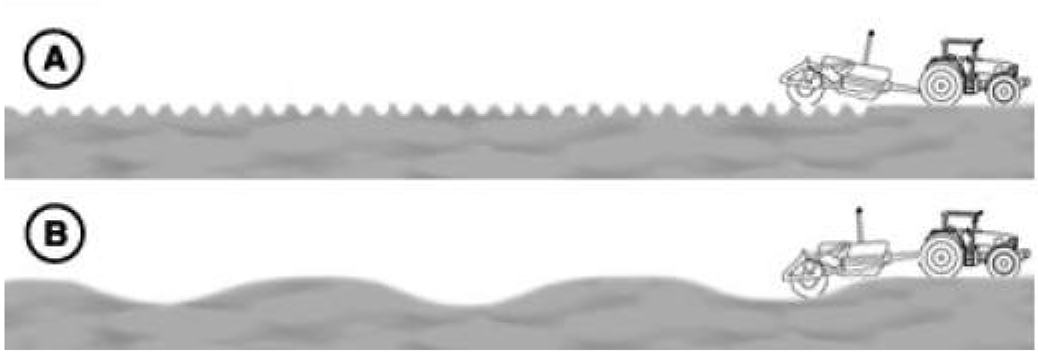
Enter an engine speed threshold that is greater than the factory default of 1500 rpm or make sure your working engine speeds are greater than your current load limiting engine speed.

Disconnect the legacy valve mode SCV connector at the application controller.

Scraper is “washboarding”.

Symptoms:

Scraper causes a washboard effect.



A-If washboarding is close together, flow rate is too high.

B- If washboarding is far apart, flow rate is too low.

Cause:

- SCV flow rate is set too high or too low.
- Washboarding can occur when the blade is at an overly aggressive angle (construction model scrapers have a more aggressive angle while 'finishing' scrapers do not).
- It can occur when the ground is hard and has not been prepped for dirt moving.
- It can also occur when the tires' air pressure on the scraper does not match (one is lower than the other).
- It can also occur if the scraper has split hydraulics and the cylinders controlling height over the right and left walking tandem are not equally pressurized (one cylinder may have a leak).
- It can also occur if the tractor hitch is mounted to the scraper drawbar too high or too low.

Solutions:

Decrease or increase the SCV flow rate. If still present, adjust counterbalance valve pressure. Contact implement service provider.

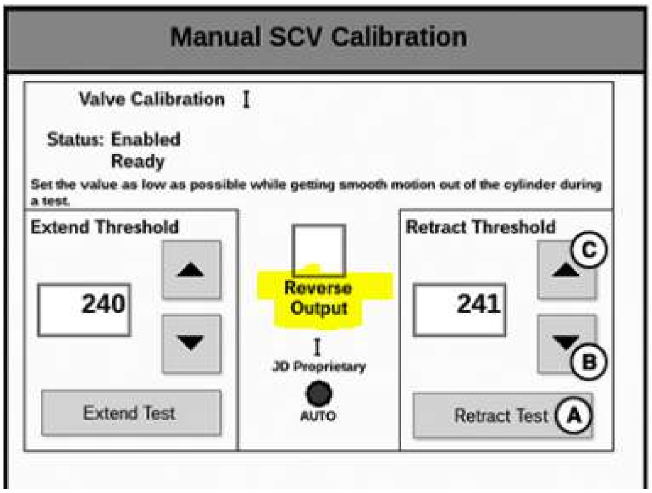
Implement blade moves to an extreme position when placed in Auto.

Symptoms:
When placing the machine in Auto, the implement's blade dives deep, climbs to full height, or tips fully to one side.

Cause:
SCV hoses are incorrectly configured (reversed).

UCC2 with JD proprietary mode configured for SCV control but JD Legacy "Option connector" is also connected to the tractor.

Solutions:
Short of altering the hydraulic hose configuration on the implement's cylinders, there is no known solution for iGrade v1.
iGrade v2 also gives the option of reversing the outputs.



Ensure Option connector on rear of machine is disconnected, Then complete 2X power cycles to reset the SCV Controller

Blade not staying on grade & acting inconsistently.

Symptoms:

Blade is acting erratically.

Blade height is on grade for a while but then moves down a few inches and then back up.

Blade is reacting inconsistently while implementing. The blade wants to cut over ground that is already on grade.

When implementing design, the system is not cutting and filling as per map on screen.

Causes:

Base is being used as a Quick Survey base.

Base power is low.

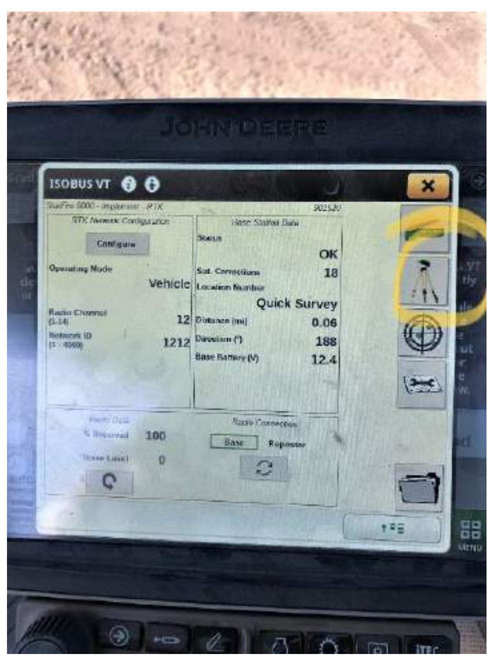
iGrade and/or application controller need to be updated.

This is related to the GPS receiver not being mounted correctly and not moving with the blade.

Solutions:

Use an Absolute Base.

Charge base to fullest amount.



Mount GPS receiver so that it moves with the blade.

ITC 2.80 S	StarFire™ 3000 Receiver
ITC 3.73 H	StarFire™ iTC Receiver
LCR 1.10 C	StarFire™ 300 Receiver
SF 7.70 B	StarFire™ Gen II Receiver
1.10A	Machine Communication Radio
TCM 1.09 A	TCM
2.71 Z	Application Controller 1100 (iGrade™, Active Implement Guidance, Distance Trip) (S.N. PCXL01B100000 -)
1.51 Y	Application Controller 1120 (Yield Documentation Specialty Crop, Mobile Weather, Harvest Identification, Cotton) (S.N. PCXL02B100000 -)
3.14 A	**Application Controller 1100 (iGrade™, Active Implement Guidance, Distance Trip) (S.N. PCXL01C201000 -)**
3.14 A	**Application Controller 1120 (Yield Documentation Specialty Crop, Mobile Weather, Harvest Identification, Cotton) (S.N. PCXL02C201000 -)**
ATU 1.13 A	AutoTrac™ Universal 100
ATU 2.30 A	AutoTrac™ Universal 200
ATU 3.23 J	**AutoTrac™ Universal 300**
RG2 2.04 B	AutoTrac™ RowSense™ – Universal
CAT 1.11 B	AutoTrac™ Controller (Deere)
ATC 3.23 J	**AutoTrac™ Controller 300**
GRC 3.70 K	GreenStar™ Rate Controller
GDC 2.11 A*	GreenStar™ Rate Controller Dry
VGC 4.01 V	AutoTrac™ Vision Guidance
HMCT 1.20 A	Harvest Monitor™ Cotton SCM
CMFS 2.07 C	Cotton Mass Flow Sensor CMFS

Contact your John Deere dealer and ask if updates are available for iGrade and/or application controller.

Implementing issues with T3RRA connected

The implement blade does not seem to follow the design surface.

Symptoms:
The blade is moving up and down in ways that indicate that it is being successfully controlled. However the blade positions do not seem to be what is expected based on the design in T3RRA.

Cause:
iGrade is not in “Remote Control” mode. It may be in Plane Control, or Grade Control
Drain design bottom width is narrow and the implement is traveling outside the design width. The user is working outside of the drain bottom width design so the blade is not going to the design height.

Solutions:

Place iGrade in “Remote Control” mode <u>and cycle power on the tractor</u>. Consult your iGrade manual for instructions.

Increase the width of the drain bottom in Drain Design to accommodate the desired drain path.

Bi-Directional error in T3RRA.

Symptoms:

The implement consistently cuts when heading in one direction and fills in the other direction. Final grade is never achieved. If T3RRA software is halted and iGrade is run in 'Plane Control' only the problem goes away.

Cause:

There is a slight time lag from when a GPS location is measured to when the blade actually actuates to seek the desired target elevation. If the look-ahead time is set incorrectly, when going up a slope this causes the cutting edge to be consistently low, and when going down a slope it causes the cutting edge to be consistently high.

The key to understanding this problem is to realize there is a slight time delay from when iGrade first sends the T3RRA software a position, and when the T3RRA software returns a target elevation value to iGrade. In this time the tractor has moved a certain distance and the target elevation is technically out of date. It is intended for a position in the field that is now some distance behind the cutting blade. If the tractor is traveling down a slope this will result in the blade being higher than it should be. If the tractor is traveling up a slope this will result in the blade being lower than it should be. The problem is repeatable and the vertical offset is always in the same direction (relative to whether you are going uphill or downhill). If you understand why the problem occurs it is normally quite simple to adjust for this time delay and nullify the issue.

Solutions:

Refer to the Machine tab section of the Setting chapter of the Operator's manual for more information.

Implement blade is intermittently jumping up or attempting to deep dive.

Symptoms:
Work is progressing normally but occasionally the blade will suddenly rise up, or attempt to aggressively dig.

Cause:
A bad USB-to-Serial conversion dongle/adapter is causing corrupted height commands to be sent to iGrade. This can be diagnosed by checking the I/O Voltages page on the iGrade display and observing the last received messages. Occasionally you may see values being received to be truncated or otherwise corrupted.

Solution:
1. Replace your USB-to-Serial cable with the one recommended. - FTDI US232R.
2. Contact T3RRA or your dealer for a recommended make and model.

Erratic performance during drain implementation.

Symptoms:

1. Implement moving erratically while implementing drains.
2. Implement moving erratically while implementing drains with Cross Slope enabled.

Cause:

T3RRA creates a surface using a raster which is a grid of elevation heights. These gridded cells are referred to as “pixels” and have a uniform edge size. As the vehicle moves it reads the elevation from consecutive pixels beneath the blade. If the neighboring pixels are significantly different in elevation the blade can move substantially as it crosses pixel boundaries.

Solutions:

1. In some situations, it may make sense to decrease pixel size so that neighboring pixels are closer in elevation. If your implement is 2 meters wide and your drain width is 4 meters, try decreasing your pixel size or increasing your drain width.
2. Disable Cross Slope.

iGrade says Remote Commands are not received from T3RRA software or indicating ‘No Surface Defined’.

Symptoms:

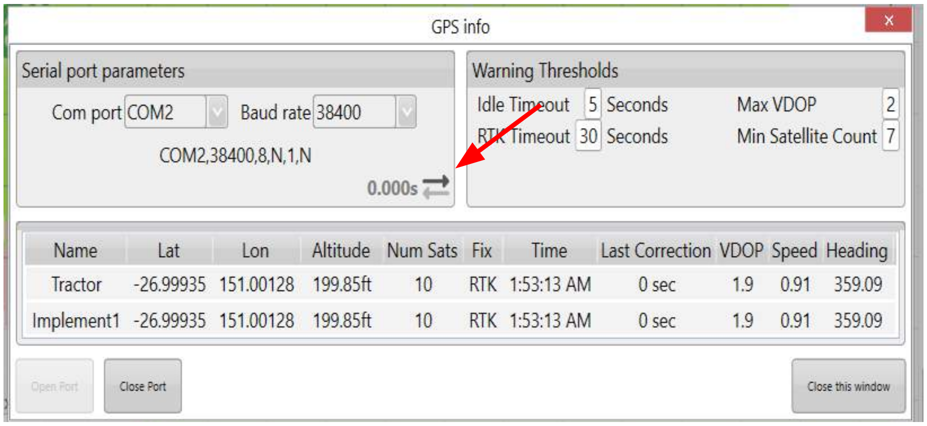
The iGrade display is showing a “No Remote Commands” error message, and iGrade is not controlling your implement.
iGrade v2 displays “No Surface Defined” when moving.

Causes:

- Your T3RRA software may not actually be sending control messages.
- If it is sending messages there may be a problem with the messages, or the cable may be incorrectly attached, or damaged.
- SCV’s have not been set to detent.
- iGrade is expecting Cross Slope commands but they are not being sent from T3RRA.

Solutions:

1. Check that you are in the ‘Implementation’ screen in your T3RRA software, and that you have pressed on the ‘**Start**’ button.
2. Check that the T3RRA software is not in ‘Demo’ mode.
3. Check that the data sending spinner is rotating (T3RRA v1) or the send arrow is flashing (T3RRA v2).



4. Check that your iGrade Remote Control Harness is in place and connections at both ends are well seated, and that no pins are loose/bent/damaged/pushed-in.
5. If you are using a USB-to-Serial dongle that has activity lights (recommended) check to see that the appropriate TX light is indicating activity.

6. Make sure that your iGrade Remote Control Harness does not have reversed TX and RX lines. The iGrade manual describes the required pin configuration for this cable. Check that the pin configuration is correct.
7. Check continuity in your iGrade Remote Control Harness TX and RX lines to ensure that a pin has not become disconnected.
8. Check the I/O voltages screen on the iGrade display to view the "Last Received Command". If there are messages being shown it is possible that the messages are defective in some way. Take a photo of this screen and forward it to T3RRA or your dealer for diagnosis.
9. Check that **both** iGrade and T3RRA are configured to send and receive Cross Slope commands (if using Cross Slope). If you are not using Cross Slope, check that **both** do not have Cross Slope enabled.

Tractor position icon is far above or below the surface.

Symptoms:
When implementing the position icon appears to be a long way above or below the surface (the tractor icon will normally rise to surface height if it is below the surface, but as-applied cuts will be far too deep).

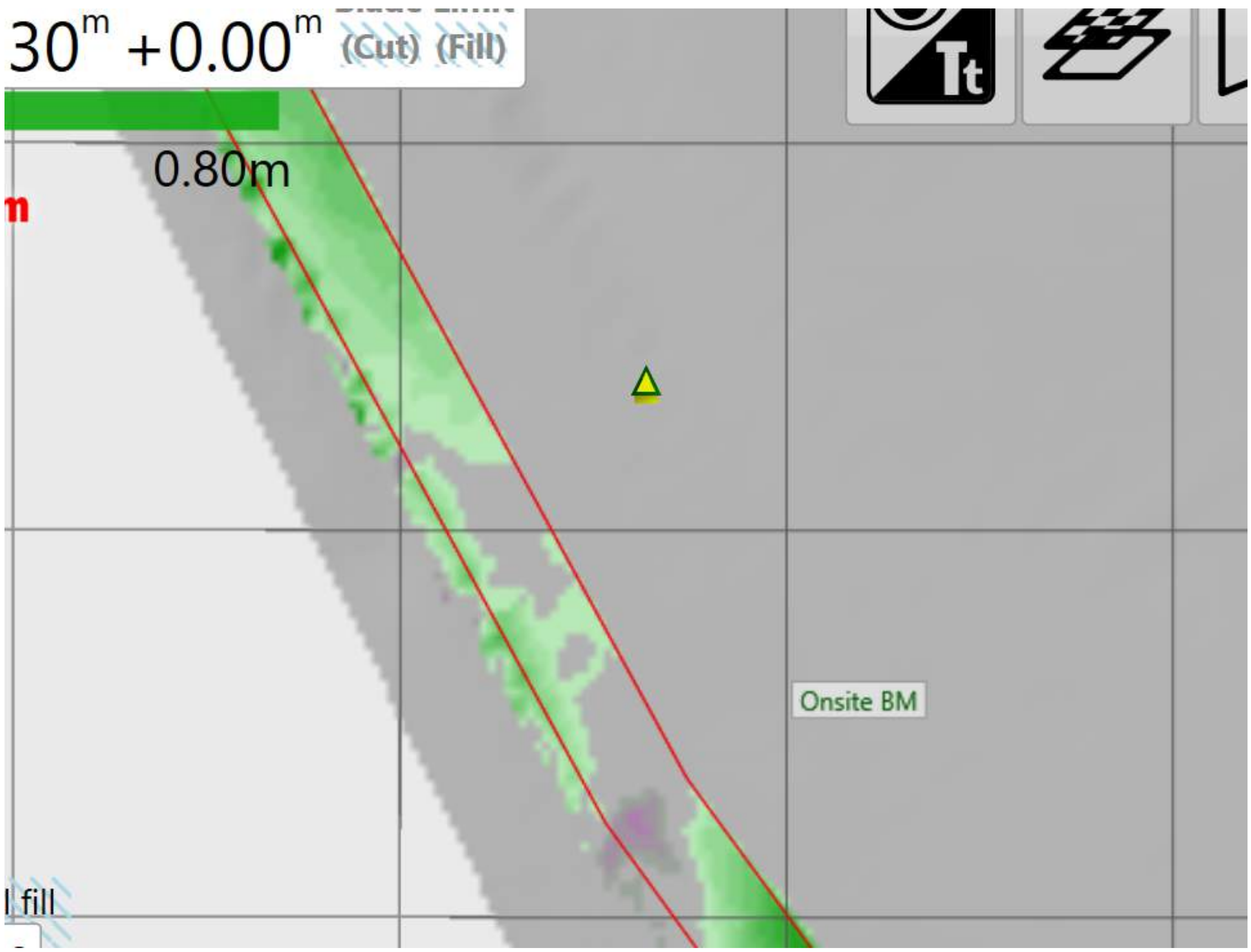
Cause:
The zero value has been incorrectly set, or the base station elevation has changed since zeroing.

Solutions:

1. Re-zero the T3RRA software
2. Check to see that the base station coordinates have not changed. If they have, return them to the original coordinates (latitude, longitude, height).
3. Be sure to save your project if you believe you will need to finish implementation at a later date in order to retain the zero value.

Tractor position icon does not adjust when you zero against a benchmark.

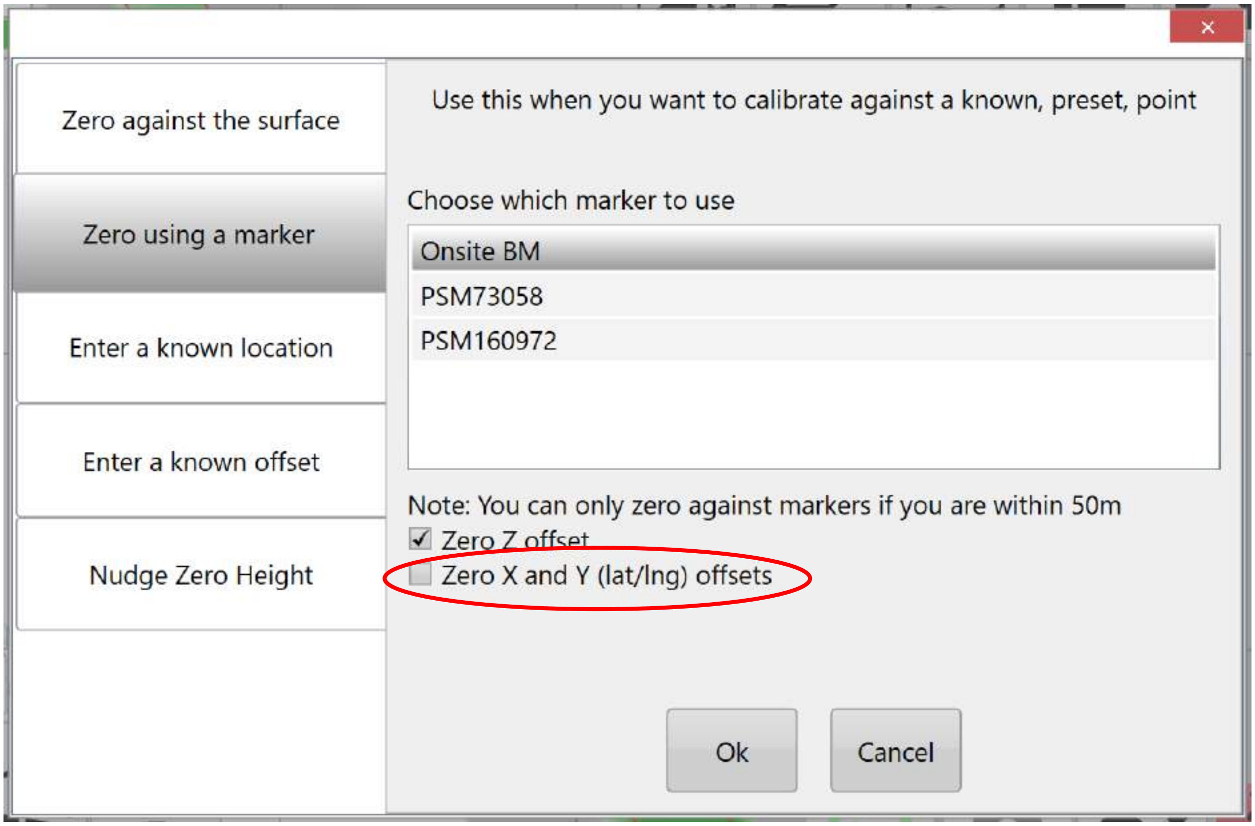
Symptoms:
You are parked over a physical benchmark and want to adjust the map location so that the related on-screen benchmark icon matches the location on the tractor icon. However when you perform the “Zero using a marker” action nothing changes. The icons for the benchmark and the tractor remain separated.



Cause:
You have forgotten to check the “Zero X and Y (lat/lng) offsets” box.

Solution:

Check the “Zero X and Y (lat/lng) offsets” box before pressing the Ok button.



Error from grade values do not match on iGrade and T3RRA software.

Symptoms:

When stationary, or at very low speeds, the value for error from grade reads 0 on the iGrade display. The error from grade value in the T3RRA software is non-zero and at the expected error value. As soon as you start moving the error value on iGrade returns to expected levels.

Cause:

At low speeds (below iGrade's activation speed) T3RRA software stops sending iGrade true target elevations. Rather, the T3RRA software returns the current blade height to iGrade. This is done as a safety measure to ensure that the blade will not move, as well as to keep the remote connection alive.

Solutions:

This is a software issue that is being investigated for alternative solutions. Ignore the error value on iGrade when stationary. Make sure your are updated to the latest software version as this problem may have been solved.

Map icon on T3RRA screen lags behind real position

Symptoms:

The screen update appears to be “laggy”. When you turn a corner and are back on a straight path you may see that the position icon on the screen is still turning the corner.

Cause:

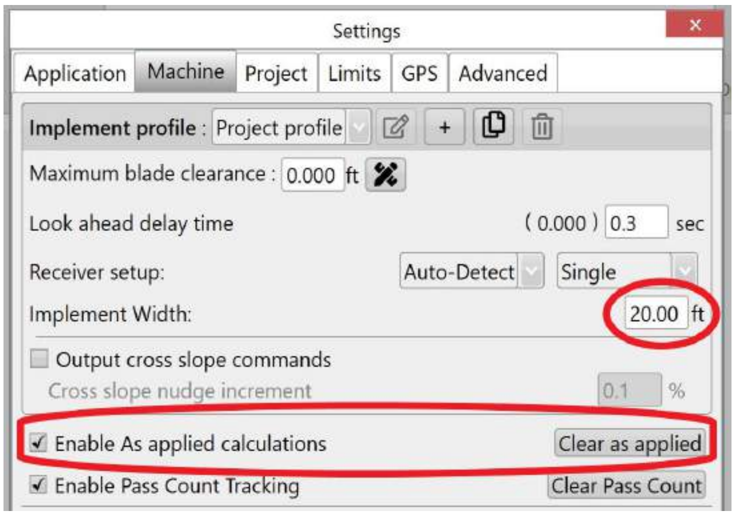
This normally indicates that the software is having to do a lot of calculations, or that there are insufficient resources (CPU, HDD, Memory) available on the tablet.

Solutions:

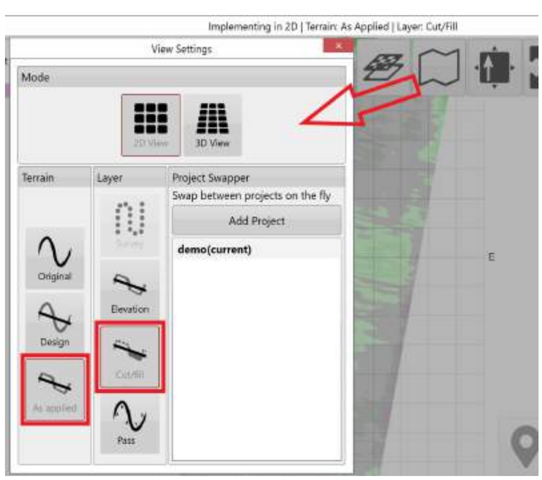
1. Check for updates online. There may have been performance enhancements included in newer versions of code.
2. Check that the tablet you are running meets our minimum specifications.
3. Do any Windows updates that are pending.
4. Make sure that your tablet has no other applications running. Close any unneeded applications.
5. Divide the work area in your project into smaller areas. Having to process a smaller data set should result in better performance.
6. Surface your elevations with a larger pixel size. Larger pixel sizes result in smaller data sets and this will result in a performance increase.

‘As-Applied’ not updating correctly.

Symptoms:
When on the implementation screen, the “As-Applied” Cut/Fill map was not updating as per pass on the field.
Cause:
Ensure the "Implement Width" is entered and they have "As -Applied" enabled.



Solution:
If "Implement Width" is entered and "As -Applied" is enabled, make sure you have selected in "View Settings" the "Terrain" As-Applied and "Layer" Cut/Fill maps. If ‘As Applied’ button is unavailable, it is a good indication that As Applied is disabled in Settings.



Project has moved N/S or E/W.

Symptoms:

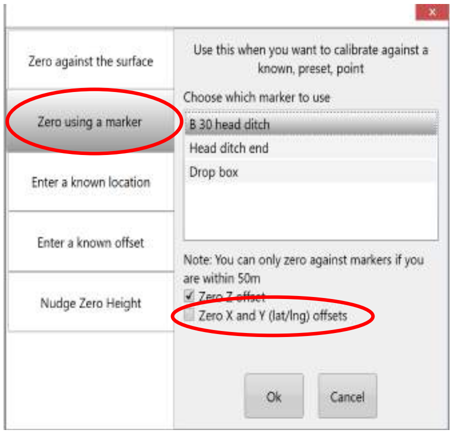
When you return to an existing job the map is no longer aligned with the position of the tractor. The project surface has moved North/South or East/West.

Cause:

- Previously entered offsets have been cleared under the Machine tab in settings.
- The Base station has been moved.
- The Base station is configured as a Quick survey and has been power cycled or reset.

Solution:

1. Keep a record of any horizontal offsets you have used for a project in case you need to re-enter them. If you look back in the project 'activity log' you may be able to find previously entered ones there (depending on version).
2. Always use a Base configured as 'Absolute Base' where possible
3. Reference any newly established base station from a "dealer network" or permanent base network where possible
4. If using a 'Quick Survey' have it connected to a permanent and always-on power source for the entire duration of a job.
5. Never move a Base station position during a job.
6. Establish permanent "benchmark" locations to check against and re-align the job. You can use the regular 'Zero' button in the implementation screen for this.



7. Use T3RRA software offsets to re-align the map.

User cannot turn “Grade On” with iGrade 2.

Symptoms:

You have iGrade setup for remote Control. You have a field design in T3RRA Cutta with your zero set and you are on the design surface in the field. You select the “Grade Off” button to turn “Grade On” with no luck.

You have checked T3RRA Cutta to make sure you are sending commands to iGrade and it is. Under the Status tab near the “Grade Off" button you will see the “Status: Disabled” and “Last Exit Code: No Surface Defined”.

Cause:

iGrade is not receiving messages from T3RRA Cutta, therefore “No Surface Defined” will be displayed and iGrade will not let the user turn “Grade On”

Solution:

Check the serial connection from T3RRA Cutta to iGrade. Use the Diagnostics built into iGrade to ensure serial communications are being received. You should see the “Line Count” steadily counting up.

Check that the iGrade harness is not faulty, or has pins backed out

My drain design is no longer present in the 'Apply' wizard step.

Symptoms:

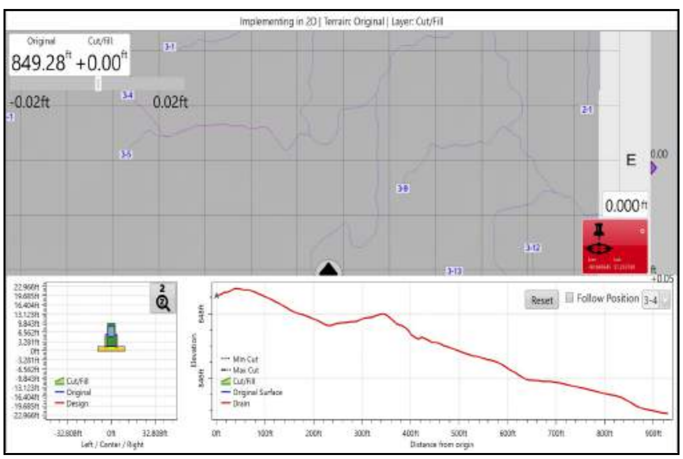
The Cut/fill map of drain surface in the Apply step is representing no cut and no fill.
The profile view in the Apply step of the drain is a solid red line.

Causes:

A drain design was created for one or more of the multiple drains in one project and the user went back to the Collect step and recorded another drain survey within the same project.
All drain designs were 'overwritten' when returning to Collect step to add more drains to the same project.

Solutions:

Design and Implement one drain at a time saving each as one project file.
Design and Implement each drain completely within one project before adding more drains.
Survey all drains, design them, and finally implement them without returning to add more drains.



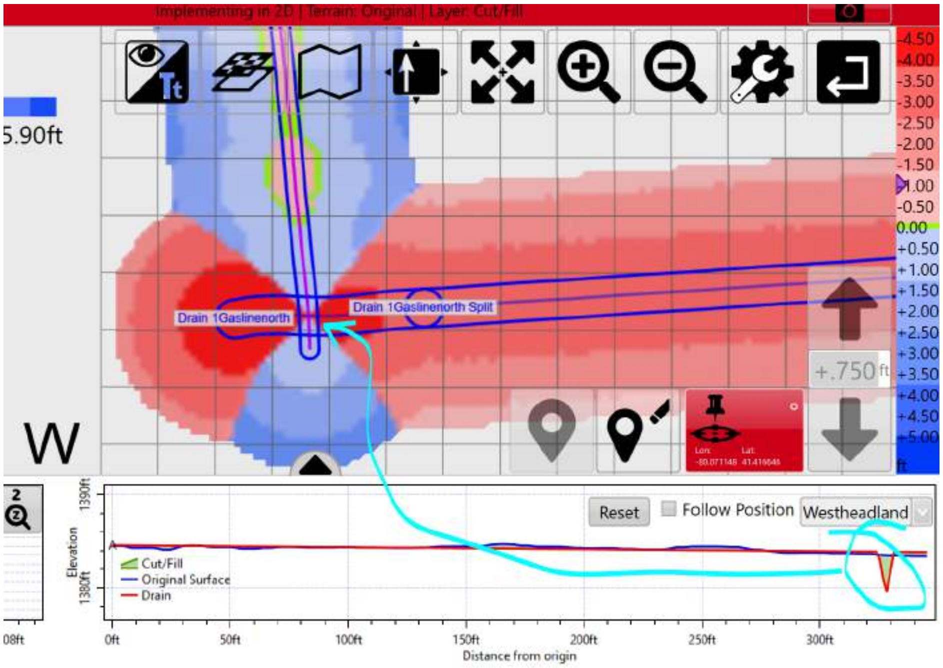
My drains have ‘bumps’ in them that weren’t present when I designed them.

Symptoms:

A drain line was created with a set profile but when implementing it seems to have unexpected deviations.

Cause:

Multiple drains were designed and have overlapping sections. The profile of a drain gets ‘overwritten’ by the profile of a subsequent drain.



Solution:

Design and implement one drain at a time. That way you will get exactly what is shown in the design step (if you always implement on the original surface for instance)

In the design step apply each drain individually rather than choosing the 'Apply all' option. Each subsequent drain should use the 'Design surface' as the surface to apply on rather than the original surface. In this way you are designing the drain profile on a surface that accounts for the effect of previous drain lines. Note that the order of drain design matters in this case.

Drive survey of drains individually instead of driving one drain to inevitably need to ‘split’ the drain where overlapping another drain.

Poor as-applied coverage.

Symptoms:

The as-applied map looks blotchy, streaky, incomplete, or otherwise incorrect.

Cause:

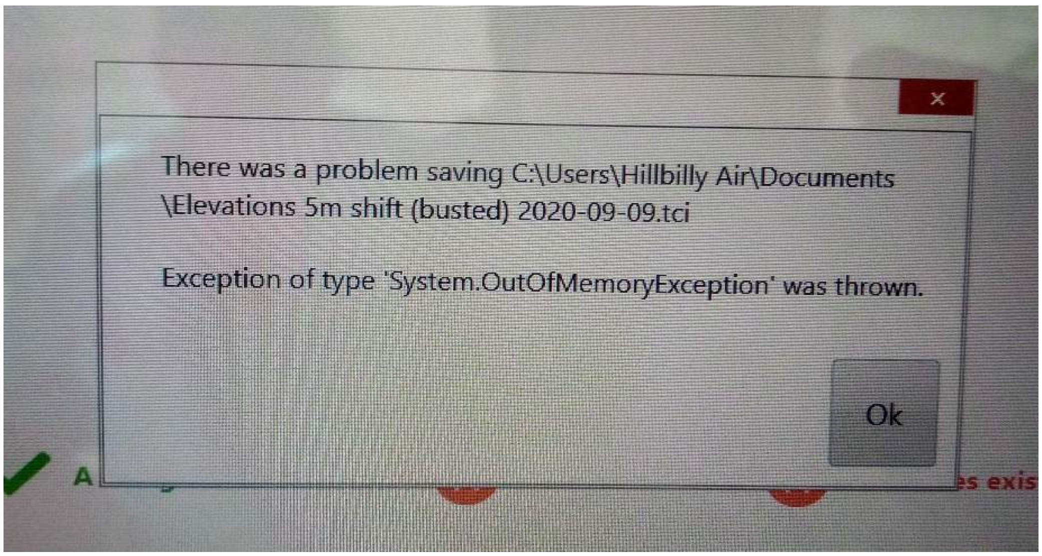
- The as-applied map will only be correct for a single machine working in a field. If part of the field is done by another machine this information will not be relayed to the current machine.
- Blade shift is altering the implementation of the design.
- Pixel size on screen is too large.

Solutions:

1) Ensure the machine and implement settings are correct to allow as-applied to work correctly.
2) Ensure your pixel size is no more than half the implement width you are using.
    a) Pixel size can be adjusted in the “Projects” tab of settings.
    b) It is recommended to select the option closest to ⅓ of your implements width and no more than ½ of its width.
3) Check your zero range setting. Some very low zero range settings can give undesirable results.
4) Ensure your blade shift is set to zero, the blade nudge will apply above or below the design updating the as-applied to show the work is not complete.
    a) If blade shift is on in the T3RRA software it will be seen in the lower left of the screen.
    b) If the shift value here is not zero press the up and down arrows until it is zero.
    c) Do not use the blade shift function for shifts that are meant to be permanent. Alter the vertical offset value for this purpose (ie., re-zero)

‘Out of memory’ error when saving.

Symptoms:
Attempting to save a project causes an ‘Out of Memory’ error and no file is saved. This error will also occur periodically when auto-saves occur. This error **will completely disrupt** your ability to use the T3RRA software. Prior to the error occurring you may have noticed the project getting progressively slower and slower to load. If you run Task Manager you will see that the project is using excessive amounts of memory while loading.



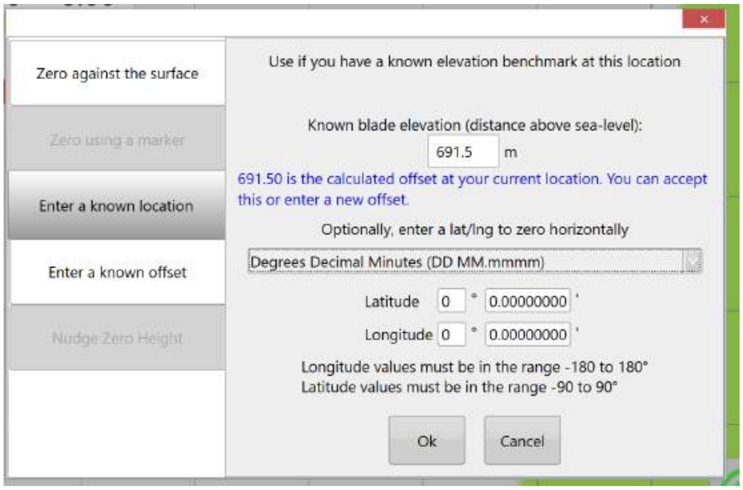
Cause:
There is a bug in earlier software versions that causes replication of unnecessary data within the project each time a save occurs. Eventually this will bloat the project file to the extent that internal variables can no longer process the data objects that exceed memory limits.

Solutions:
Upgrade your software to at least v2.137. Load the offending project (it may take a long time to load) and then save it again. The project will have offending data sections removed and now should go back to normal load time on subsequent loads.

You have bench mark locations but they are not in Latitude and Longitude.

Symptoms:

If you are attempting to calibrate your GPS against a design and you have known bench mark locations you can use the “Enter a known location” option to achieve this. However you may find that your bench mark values do not match any of the formats requested.



Cause:

Your bench mark locations are in an incompatible projection or coordinate system. Commonly they are in UTM easting or northings or similar.

Solutions:

Contact your provider and request the bench mark locations in WGS84 Latitude and Longitude format. If possible, request that they use ‘decimal degrees’.

Blade height drifts after setting Zero to Surface or Benchmark

Symptoms:
When setting zero by choosing either to surface or benchmark and going into auto, the blade height drifts up 2 or 3 tenths and then level out at that height. It does not stay at the zero height saved.

Cause:
Load Limiting is enabled in iGrade.

Solutions:
Disable Load Limiting in iGrade. Reset Zero correctly.

T3RRA Educational Resources
www.t3rra.com