1. General

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 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, 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.

Choosing a tablet to run T3RRA software in-cab

Our in-cab software, such as T3RRA Cutta, will run on any 64bit Windows 11 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 11 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 connector**
Cons	• **Requires 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 (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 swapped in.

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:

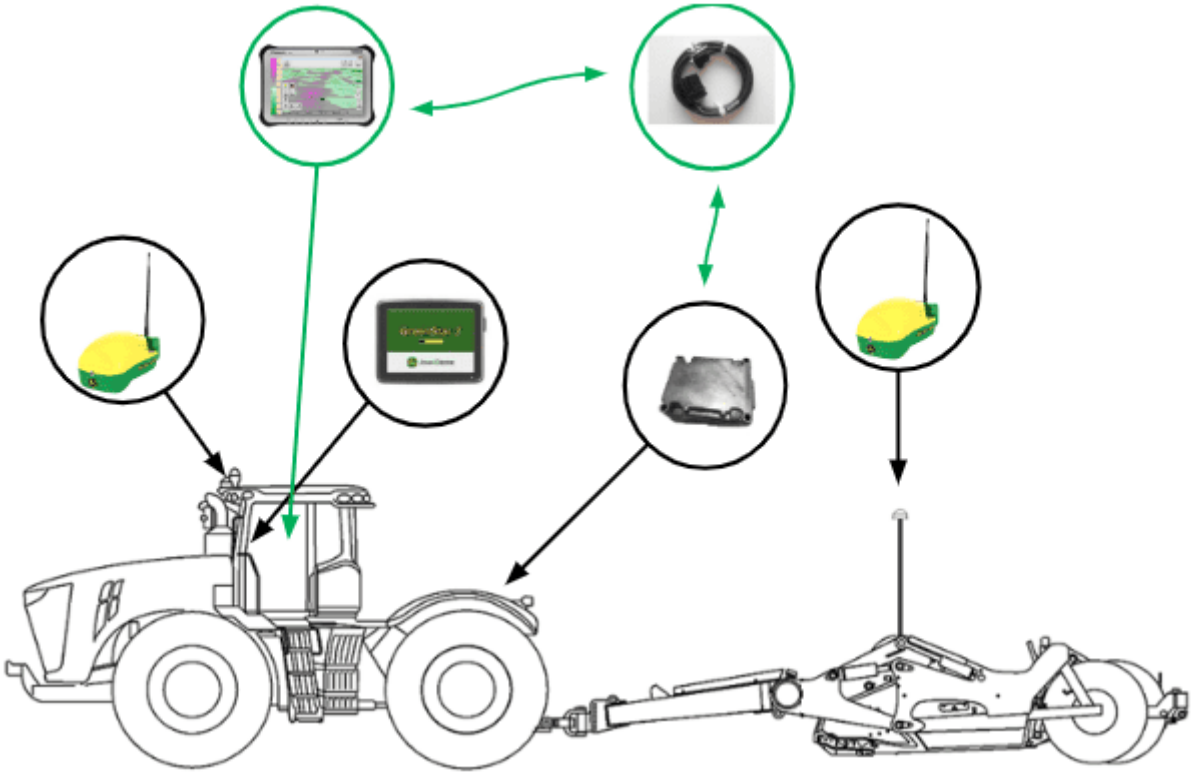
- **Your tractor is in good condition with all mechanical, hydraulic, and electronic systems in proper working order.**
- **Your implement is in good condition with all mechanical and hydraulic systems in proper working order.**
- **Your RTK GPS (including base station) is properly configured for best 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.

How we work with iGrade™

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.

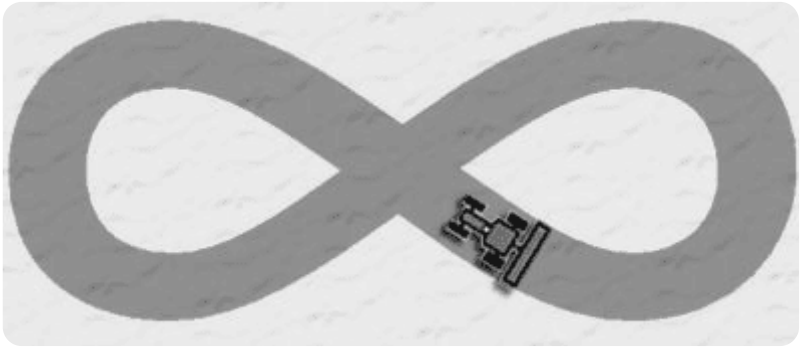


It might seem obvious, but it is important to note that iGrade™ will work without T3RRA software. Before setting up T3RRA, best practice is to first test iGradetm in isolation. Only once you have confirmed that iGrade™ is working properly should you start to troubleshoot the T3RRA software.

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.

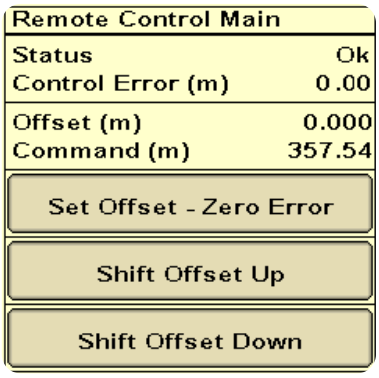
T3RRA software “talks” to iGrade™ over the “iGrade™ Remote Control Harness”. For iGrade™ and T3RRA software to communicate, the serial port settings of each must match. If an iGrade™ UCC1 unit is being used we recommend setting the baud rate to 38400 and NMEA - GGA & GSA and a rate of 5Hz. If an iGrade™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

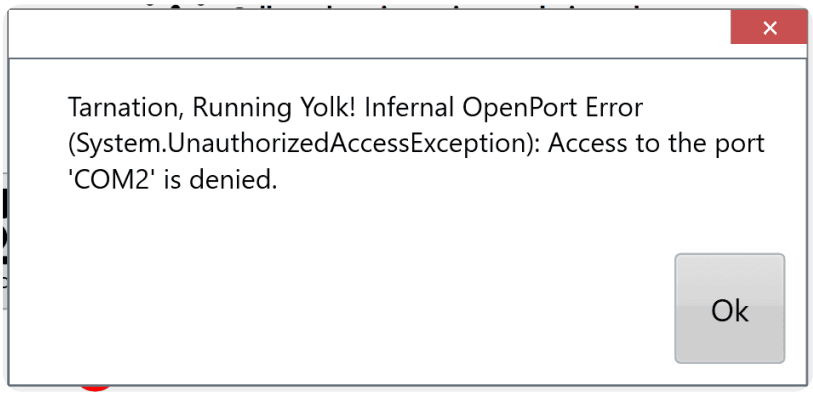
System Startup

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 article on Serial Mouse errors.



Installing T3RRA Software

There are two main points we would like to address before diving into 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.**

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. After completing your earthmoving jobs, update your T3RRA software by opening the ‘Settings’ window, choosing the ‘Application’ tab, and then clicking on ‘Download Updates’.

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

Once you’ve opened up your T3RRA software, you can control whether it starts up with Windows from settings. To change it, go to ‘Settings’, choose the ‘Application’ tab, then the ‘Setup’ tab near the bottom, and select the “Start T3RRA when computer starts” option.

Updating T3RRA Software

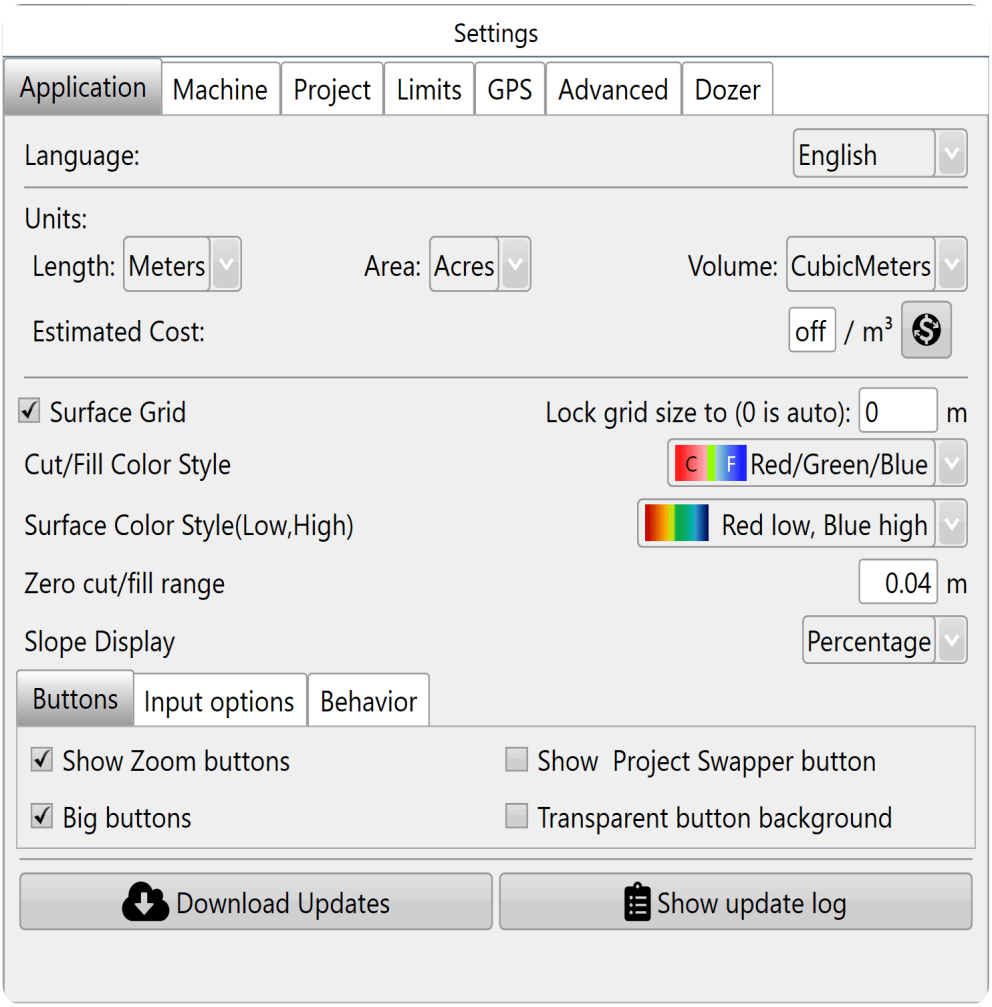
The software developers at T3RRA have many faults. One of them is that we love tinkering with our software in an effort to make it better. In order to allow our users to benefit from our latest efforts we've built-in a system to allow users to update the software whenever a new fix or feature is available.

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. Before restarting, make sure you've saved anything you were working on. One you've restarted, 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.

Notes for those upgrading from v1 to v2 of T3RRA 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.

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.**