Operator's Manual

Modified: Aug 21, 2024

IMPORTANT INFORMATION

CAUTIONS, WARNINGS, STATEMENTS

	DANGER: Indicates an immediate hazardous situation that, if not avoided, will result in death or serious injury.
	WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
	CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in injury. It may also be used to alert against unsafe practices.
	IMPORTANT: Indicates specific settings, calibrations, and procedures that must be followed for proper system performance and operation.

	CALL BEFORE YOU DIG WARNING Before commencing any operation, it is your responsibility to contact the relevant utility operators to identify underground gas lines, electrical lines, fiber optic or other telephone lines, or any other underground objects in the areas you will be operating. Follow instructions from utility owners regarding working near any buried utilities.

	RECOGNIZE SAFETY INFORMATION ● This is an example of a safety-alert symbol. ● When you see this or a similar symbol on your machine or in this manual, be alert to the potential for personal injury. ● Follow recommended precautions and safe operating practices.
	FOLLOW SAFETY INSTRUCTIONS ● Carefully read all safety messages in this manual and on your machine safety signs. ● Keep safety signs in good condition. ● Replace missing or damaged safety signs. ● Be sure new equipment components and repair parts include the current safety signs. ● Replacement safety signs are available from your dealer. ● Learn how to operate the machine and how to use controls properly. ● Do not let anyone operate without instruction. ● Keep your machine in proper working condition as specified by the manufacturer. ● If you do not understand any part of this manual and need assistance, contact your dealer.
	REMOVE PAINT BEFORE WELDING OR HEATING ● Avoid potentially toxic fumes and dust. ● Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. ● Remove paint before heating:
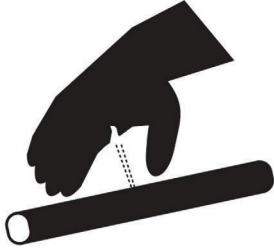
	- Remove paint a minimum of 100 mm (4 in.) from the area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding. - If you sand or grind paint, avoid breathing the dust. Wear an approved respirator. - If you use a solvent or paint stripper, remove the stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from the area. Allow fumes to disperse at least 15 minutes before welding or heating. - Do not use a chlorinated solvent in areas where welding will take place. - Do all work in an area that is well ventilated to carry toxic fumes and dust away. - Dispose of paint and solvent properly.
	AVOID HIGH-PRESSURE FLUIDS - Escaping fluid under pressure can penetrate the skin causing serious injury. - Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. - Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids. - If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source.
	CHECK HOSES FOR DAMAGE - Hydraulic hoses can fail due to physical damage, kinks, age and exposure. - Check hoses regularly. - Replace damaged hoses.

WARNING: DANGERS ASSOCIATED WITH OPERATING DITCH ASSIST

IMPORTANT SAFETY NOTICE

1. **Remote Control of Implement Hydraulics**: The Ditch Assist system allows for the remote control of implement hydraulics via a wireless connection to an Android tablet. This capability, while enhancing operational efficiency, introduces significant safety risks if not managed properly.

2. **Risk of Serious Injury or Death**: Operating Ditch Assist can result in the movement of heavy machinery and implements. Failure to observe proper safety protocols can lead to severe injury or death. It is imperative that all operators and bystanders are aware of the following dangers:

   a. **Unintended Movement**: The remote control feature can cause the implement to move unexpectedly. Always ensure that no individuals or animals are within the vicinity of the machinery before engaging the system.

   b. **Crushing Hazards**: Implements such as scrapers, ditchers, land levelers, and blades can cause crushing injuries. Never stand or allow others to stand near or under the implement when it is in operation or when the system is powered on.

   c. **Pinch Points**: Hydraulic components and moving parts create pinch points that can trap and injure fingers, hands, or other body parts. Maintain a safe distance from all moving parts during operation.

3. **Operational Protocols**: To mitigate these risks, adhere strictly to the following safety protocols:

   a. **Pre-Operation Check**: Before activating Ditch Assist, conduct a thorough inspection of the work area to ensure it is clear of all personnel, animals, and obstructions.

   b. **Communication**: Establish clear communication protocols with all team members. Use hand signals, radios, or other communication devices to ensure everyone is aware of the machine's status and movements.

c. **Emergency Stop**: Familiarize yourself with the emergency stop procedures for both the Ditch Assist system and the machinery it controls. Ensure that all operators know how to quickly disable the system in case of an emergency.

    i. **Ditch Assist hydraulic control can be stopped in an emergency by any one of the following:**

        1. Disabling tractor hydraulics by either switching off the tractor engine or turning off flow to the hydraulic circuit connected to the Ditch Assist Valve
        2. Pressing STOP on the Ditch Assist App's Grading Screen
        3. Switching OFF power to the Ditch Assist Control Module via the power switch on the power harness

d. **Training**: Only trained and authorized personnel should operate the Ditch Assist system. Comprehensive training on the system's functionality, safety features, and emergency procedures is mandatory.

e. **Supervision**: Always supervise the operation of Ditch Assist, especially when used in remote control mode. Never leave the system unattended while it is powered on.

4. **Legal Liability**: Failure to comply with these safety warnings and protocols may result in legal liability for any injuries or damages that occur. Operators and owners of the Ditch Assist system are responsible for ensuring safe operation and adherence to all relevant safety guidelines and regulations.

5. **Manufacturer Disclaimer**: Northern Plains Drainage Systems Ltd, the manufacturer of Ditch Assist, disclaims any liability for injuries, damages, or losses resulting from improper use or failure to follow safety protocols. By using the Ditch Assist system, you acknowledge and accept the inherent risks associated with its operation.

6. **Emergency Contact**: In case of an emergency or if you encounter any issues with the Ditch Assist system, immediately contact our support team at +1-877-354-2899 (Press 3 for Support) or use the Contact Form available at [Ditch Assist Contact Form](.).

	STAY ALERT. STAY SAFE. ALWAYS PRIORITIZE SAFETY OVER CONVENIENCE. By adhering to these warnings and protocols, you help ensure a safer working environment for yourself and those around you.

Statements & Certifications

Ditch Assist Control Module

Contains Transmitter Module FCC ID: QOQWF121
Contains Transmitter Module IC: 5123A-BGTWF121

Certifications

Compliant to the following specifications:

CE

WF121 is in conformity with the essential requirements and other relevant requirements of the R&TTE Directive (1999/5/EC). The product conforms with the following standards and/or normative documents.

🎬 EMC (immunity only) EN 301 489-17 V.1.3.2 in accordance with EN 301 489-1 V1.8.1

🎬 Radiated emissions EN 300 328 V1.8.1

FCC and IC

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

FCC RF Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This transmitter is considered as mobile device and should not be used closer than 20 cm from a human body.

IC Statements:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

To Comply with FCC and Industry Canada RF radiation exposure limits for general population, the antenna(s) used for this transmitter must be installed such that a minimum separate distance of 20cm is maintained between the radiator (antenna) and all persons at all times and must not be collocated or operating in conjunction with any other antenna or transmitter.

End User License Agreement

This End User License Agreement (the "Agreement") is made between Northern Plains Drainage Systems Ltd (the "Vendor") and the user, having purchased the Ditch Assist system from an approved vendor (the "Licensee"). Under this Agreement, the Vendor grants the Licensee a non-exclusive and non-transferable license (the "License") to use Ditch Assist Software, which comprises both the mobile (Android) application and proprietary operating software that is run on the Ditch Assist Control Module (collectively referred to as the "Software").

1. **Grant of License**: Upon purchasing the Ditch Assist hardware from an approved vendor, the Licensee is granted a non-exclusive, non-transferable license to use the embedded logic/software and the Ditch Assist mobile application. This License is strictly for the Licensee's use and does not transfer any ownership rights of the Software to the Licensee.
2. **Ownership and Intellectual Property**: The Software, including all of its components, the user interface, and any accompanying printed, electronic, and online documentation, remains the exclusive property of the Vendor. All intellectual property rights, including copyright and distribution rights of the Software, are retained solely by the Vendor.
3. **Restrictions on Use**: The Licensee agrees not to modify, reverse-engineer, or decompile the Software through any currently available or future technology. Any violation of these terms will be considered a substantial breach of this Agreement and may result in its termination.
4. **License Fee**: The initial purchase price paid by the Licensee for the Ditch Assist hardware includes the entire license fee for the Software. This fee covers the Software's functionalities as of the time of purchase. If the Vendor introduces new features in the future that result in an increase in the price of the Software, the Vendor reserves the right to offer the Licensee an opportunity to access these additional features as an upgrade for an additional cost.
5. **Disclaimer of Warranties**: The Software is provided "as is." The Vendor assumes no liability for any direct, indirect, incidental, or consequential damages that the Licensee may suffer due to the use or failure to use the Software. This includes, but is not limited to, loss of profits, loss of production, loss of data, or any other business or economic losses.
6. **No Guarantee of Fitness**: The Vendor does not guarantee that the Software will be fit for the Licensee's particular purpose or requirements, or that its use will be

uninterrupted or error-free. The Licensee acknowledges that software, in general, may have bugs or flaws within an industry-accepted level.

7. **Termination**: This Agreement will be valid from the time the Licensee installs the Software and will continue indefinitely unless terminated. The Agreement may be terminated if the Licensee fails to comply with any of its terms.

8. **Force Majeure**: In the event of unforeseen and uncontrollable occurrences such as natural disasters, war, or any other force majeure event, the Vendor will not be held liable for failing to fulfill its obligations under this Agreement, provided that the Vendor has taken all reasonable measures to mitigate the impact of such events.

9. **External Factors**: The Licensee recognizes that external factors beyond the Vendor's control, such as the accuracy of GPS signals, satellite interference and outages, or the performance of hydraulic systems on which Ditch Assist is installed, may influence the operation of Ditch Assist. The Vendor will not be held responsible or liable for any such occurrences.

10. **Governing Law**: This Agreement will be governed by the laws of the Province of Manitoba, Canada, and will be enforced or construed in accordance with these laws. Both parties agree to submit to the jurisdiction of the courts of the Province of Manitoba for any disputes or enforcement arising from this Agreement.

11. **Software Updates**: The Vendor commits to providing updates and maintaining the Software to remain compatible with future hardware and Android OS releases as per industry standards. However, the Vendor does not guarantee that the Software will always be compatible with all future hardware and Android OS releases. The Vendor will provide updates and support for a period of at least one year from the date of purchase. After this period, the Vendor may offer updates and support at its discretion and reserves the right to charge additional fees for such services.

12. **Entire Agreement**: This Agreement constitutes the complete agreement between the Vendor and the Licensee, superseding all prior agreements or representations, whether written or verbal. Any modifications to this Agreement must be made in writing and signed by both parties. The Vendor's successors and assigns are bound by the terms of this Agreement.

13. **Notifications**: All notifications to the Vendor under this Agreement should be sent to the following address: Northern Plains Drainage Systems Ltd, Box 9, Elm Creek, Manitoba, R0G 0N0, Canada.

By installing and using the Software, the Licensee acknowledges that they have read, understood, and agree to be bound by the terms and conditions of this Agreement.

Hardware Warranty Information

The Vendor guarantees that for a duration of 12 months from the "Warranty Start Date" (defined as the date Ditch Assist is purchased from the Vendor or an Authorized Dealer of the Vendor), all hardware components will be free from defects in materials and workmanship when used normally and in accordance with the product's intended usage and installation.

1. **Warranty Coverage**: In the event of any hardware failure during normal operation within the 12-month warranty period from the "Warranty Start Date," the Vendor commits to repairing or replacing the faulty hardware component at no cost to the Licensee. This warranty is the sole and exclusive remedy for any breach of this express warranty.
2. **Disclaimer of Additional Warranties**: No additional express or implied warranties are offered by the Vendor. THE VENDOR EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
3. **Exclusions from Warranty**: The Vendor does not provide a warranty for damages caused by:
   a. Misuse
   b. Alterations
   c. Negligence
   d. Accidents
   e. Vandalism
   f. Natural disasters
   g. Incorrect installation
   h. Improper storage
   i. Any other event outside the normal, intended use and installation of the system
4. **Right to Repair or Replace**: The Vendor retains the right to repair products that malfunction within the warranty period, particularly when a product failure is reported after successful installation and usage for its intended purpose for any duration of time. The Vendor may require malfunctioning products within the warranty period to be returned for assessment. Products that have been repaired, rebuilt, or replaced will have a warranty for the remaining duration of the original product warranty. Any original product or product components replaced during repair, rebuilding, or replacement will be retained by the Vendor.

5. **Software and Firmware**: All software and firmware developed and/or provided by the Vendor is sub-licensed "as is." The Vendor will not be held responsible for any direct, indirect, incidental, or consequential damages, including data loss, resulting from the usage of software and firmware provided by the Vendor.
6. **Limitation of Liability**: The Vendor's liability under this warranty is limited to the repair or replacement of defective hardware components. The Vendor shall not be liable for any incidental, consequential, or special damages, including but not limited to loss of profits, loss of production, or loss of data, arising from the use or inability to use the product.
7. **Governing Law**: This warranty shall be governed by and construed in accordance with the laws of the Province of Manitoba. Any disputes arising under or in connection with this warranty shall be subject to the exclusive jurisdiction of the courts of the Province of Manitoba.
8. **Contact Information**: For warranty claims or inquiries, please contact:
    a. Northern Plains Drainage Systems Ltd
       Box 9, Elm Creek, Manitoba, R0G 0N0, Canada
       Phone: +1-877-354-2899

By using the Ditch Assist system, the Licensee acknowledges that they have read, understood, and agree to be bound by the terms and conditions of this Hardware Warranty Information.

Ditch Assist System Overview

Welcome to our growing community of Ditch Assist users and dealers! We applaud your decision to take a stand against major corporations and demand better solutions. Congratulations on your purchase of a Ditch Assist system.

Ditch Assist is the revolutionary alternative solution to modern machine control. This state-of-the-art automatic machine control system is specifically designed to transform operations in surface drainage, land leveling, land forming, and simple tile drainage installation. With a focus on user-friendly automation, Ditch Assist effectively manages the raise and lower hydraulics on a variety of machines such as scrapers, ditchers, land levelers, and blades, among others.

With the benefits of wireless technology, and operated via the Ditch Assist Android App on a standard 10" Android tablet, Ditch Assist is simple and affordable, yet advanced and powerful.

Ditch Assist takes versatility to a new level with Universal Grade Control. This unique feature, facilitated by a custom-designed PWM valve, ensures precise control of any implement, irrespective of the age, make, or model of your tractor.

Packed with advanced features, Ditch Assist is future-ready. Our system facilitates fully customizable ditch, tile, and plane designs via Slope-IQ, and supports the import of land forming designs, thereby granting you complete control over your projects.

The Ditch Assist system easily sets up with any tractor, regardless of its age, make, or model. With no need for CAN or ISO, it supports any implement including scrapers, ditchers, blades, and levelers. Furthermore, Ditch Assist is GPS-ready and works with any brand, making use of a low-cost RTK or your existing RTK.

Whether you're creating surface drains, leveling land, or installing tile drainage, Ditch Assist offers simple, fully automated grade control through our PWM valve, with the option of manual operation using a guidance-only kit.

With the innovative Slope-IQ Design Customizer, Ditch Assist lets you personalize the system to suit your specific needs. Add to this the capacity to implement complex land

leveling designs using advanced 3D designs in XYZ text format from service providers such as OptiSurface, AgForm3D, and Ezigrade, Ditch Assist truly stands at the forefront of advanced earthworks solutions.

In essence, Ditch Assist provides a comprehensive, user-friendly, and cost-effective automatic machine control system. As you delve into this user manual, you will discover how to leverage the full potential of Ditch Assist to revolutionize your operations and boost efficiency on your farm.

Let's begin this exciting journey to better water management, advanced land forming, and optimal farming operations with Ditch Assist.

To give you a clearer understanding of how Ditch Assist can benefit you and your operation, let's delve into four typical use case scenarios:

Use Case I: Using Ditch Assist for Basic Drainage, Grading, and Leveling

At its simplest, Ditch Assist can work like a laser guidance or control system but with the added advantage of using GPS technology. It's easy to use - just set the cutting edge of the implement on the ground at a starting point, enter the desired grade and whether you are working uphill or downhill, and start working. Ditch Assist will do the rest, calculating the target elevation and guiding the operator using on-screen UP/DOWN arrows or by directly controlling the implement's hydraulics via our proportional valve. When paired with RTK GPS, Ditch Assist achieves precision equal to a laser, without the need for transmitter repositioning or environmental interference.

Ditch Assist is great for creating basic surface or subsurface drains that follow a fairly straight path. It can also quickly survey a path by determining the grade between two points. The target elevation is calculated based on the distance from the current location to the starting point.

If you're creating level areas like a level pad, you can either input a grade of zero or specify a target elevation value. Ditch Assist, paired with high-accuracy GPS, ensures the implement maintains the same elevation wherever it travels, resulting in a perfectly flat, level surface.

Use Case II: Utilizing Ditch Assist to Craft & Execute Multi Slope Surface & Subsurface Drains

Ditch Assist comes equipped with an advanced feature known as Slope-IQ. It lets users survey a proposed route and design an optimal drain in a similar fashion to most other surface and subsurface drainage grade control systems available. After driving the proposed route in Survey mode to record all points' coordinates and elevations, the operator can employ Slope-IQ to devise a best-fit solution. This maintains a specified minimum grade throughout the route and aligns with the existing topography to follow natural contours where there's adequate slope. This approach reduces the amount of material needing to be moved and maximizes the benefit of the existing terrain.

Slope-IQ also introduces an industry-first advanced Customizer. It enables operators to manually design a fully custom solution based on their target points drawn on the screen, offering complete control over the job. It's a distinctive feature that enables designing subsurface (tile) drainage installations with complete control and flexibility, outpacing systems that don't permit customization of the calculated solution.

By combining the Full Automation Kit, which includes our proprietary PWM valve, with your RTK GPS receiver, Ditch Assist delivers highly accurate grade control, resulting in highly effective drainage with minimal earth displacement.

Use Case III: Using Ditch Assist to Design & Execute Multi Slope Planes on Small Fields or Areas

You can also use Slope-IQ to create multi slope planes - for example, to landform a small land parcel to ensure all water drains from east to west. In this instance, the design crafted by Slope-IQ is automatically offset at 90 degrees on either side of the original route. You can implement the same design over the entire parcel by surveying down the parcel's center, creating the design, and working outwards from the original survey route. While this method works best in relatively uniform landscapes and is generally suited to smaller areas, users have found it successful for flood irrigation on small fields and for grading small plantation fields to prevent water pooling.

Use Case IV: Using Ditch Assist to Execute Advanced 3D Landforming or Land Leveling Designs Created using Third-Party Software or Services

One of Ditch Assist's popular applications in many geographic markets is implementing advanced 3D land leveling or land forming designs from software/service providers like OptiSurface, Topcon's AgForm3D, and EZ Grade software.

After creating an earthworks design in the chosen software, the design is exported in a text file format. This file is then loaded into the Ditch Assist App, where it's recognized as a land forming design file and loaded into the grading engine.

Ditch Assist smartly interpolates (aka *smoothes*) the original points to fill in the gaps between them based on the surrounding points' values. This results in a highly accurate calculation of the intended design elevation at all locations within the design footprint, regardless of the distance from any given data point. This process also eliminates the problem of larger areas ending up flat where the original point spacing of the design is greater.

As you work the field, Ditch Assist continuously calculates the target elevation from the original design and adjusts the implement hydraulics accordingly. Using Ditch Assist in this manner offers an incredible value to benefit ratio as it achieves comparable results to systems costing significantly more - a sentiment echoed by many of our new users and dealers!

Understanding How Ditch Assist Works and its Limitations

Ditch Assist's main job is to keep your implement blade at the right elevation at your current location, and keep recalculating and adjusting this target elevation as you work. This target elevation can come from a few different sources:

- **Best-Fit Design**: Created through Slope-IQ based on a survey and your input.
- **Pre-Established Land Leveling Design**: Made in third-party software and loaded into the Ditch Assist app.
- **Simple Target Elevation**: Based on a specific elevation (like leveling an area to a certain height) or a grade plane starting from a set elevation.

Here's how it all works:

1. **GPS/GNSS Position Information**: The Ditch Assist Control Module receives position data from your GPS system multiple times per second.
2. **Wireless Transmission**: This data is wirelessly sent to the Android tablet in your tractor cab running the Ditch Assist App using Wi-Fi (think of Wi-Fi in this case as replacing a pesky cable that you'd otherwise need to run from outside and into the cab)..
3. **Target Elevation Calculation**: The app reads the position information, figures out where you are, and then determines the target elevation for your current location based on the currently loaded design or grading parameters.
4. **Target Elevation Communication**: The app then sends this updated target elevation information back to the Control Module, again over the Wi-Fi connection.
5. **Intelligent Elevation Control**: The Control Module compares the desired elevation with the current elevation, determining whether the implement needs adjustment. Activation of the solenoids in the PWM proportional valve controls hydraulic cylinder movement, adjusting the implement's height. The Control Module employs intelligent logic to automatically modify the duty cycle based on the required adjustment. This allows for precise movements when close to the on-grade deadband and quicker responses when more substantial cylinder movement is necessary.

Due to the constant movement of the vehicle and slight fluctuations in the GPS/GNSS calculated position, accurately hitting the target is challenging, even when stationary and utilizing RTK technology. The GPS elevation constantly fluctuates within approximately 1-2 cm, resulting in continuous small adjustments. Consequently, the system continuously

raises and lowers the implement to maintain proximity to the target as much as possible. While minor movements may not be noticeable, significant discrepancies will cause noticeable changes in the hydraulic cylinders' positions to adjust the implement's height.

Important GNSS (GPS) Limitations to Understand

Ditch Assist greatly relies on the precision of GNSS (Global Navigation Satellite System) information. Without highly accurate positioning data, its performance can be compromised. Here are some crucial limitations to keep in mind:

1. **Non-RTK GNSS**: Standard GNSS systems, such as GPS, that lack corrections like Real-Time Kinematics (RTK) can have position errors of up to several meters. For Ditch Assist, which demands centimeter-level accuracy, this can lead to inconsistencies in land alignment and leveling. For instance, a non-RTK GNSS might move the implement unnecessarily or fail to signal when movement is needed, resulting in uneven terrain.
2. **RTK Challenges**: While RTK offers more precise data compared to standard GNSS, it's not immune to issues. RTK relies on a stable connection between the base station and the receiver. Disruptions can temporarily reduce RTK's precision. If the radio link fails or the base station loses its GNSS signal, the receiver may revert to standard GNSS accuracy until the issue is resolved, causing errors similar to non-RTK GNSS.
3. **Multipath Errors**: Both non-RTK GNSS and RTK can be affected by multipath errors. These errors occur when satellite signals bounce off nearby objects like buildings, trees, or grain bins, before reaching the receiver or base station receiver. The reflected signals can confuse the receiver, resulting in incorrect position calculations and, consequently, improper implement adjustments.
4. **GNSS Signal Blockage**: Tall trees, buildings, or other obstacles can obstruct the line of sight to GNSS satellites, impacting the accuracy of position calculations. For Ditch Assist, this could lead to errors in implement movement. In northern latitudes for example, older systems that do not utilize GLONASS will be particularly impacted.
5. **Space Weather**: In northern regions, solar flares and coronal mass ejections, while giving us beautiful auroras, can negatively affect GNSS, particularly high-precision systems like RTK. These space weather events can disrupt satellite signals, causing temporary inaccuracies.
   a. Check current and forecast space weather conditions at https://www.swpc.noaa.gov/

Utilizing RTK GNSS technology can alleviate some of these challenges, providing higher accuracy for precision agriculture applications like Ditch Assist. However, it's crucial to be aware of potential sources of error and take steps to minimize them for optimal performance.

Quick-Start Guide to Using Ditch Assist

While we strongly advise reading the entire manual for the best user experience, if you're in a hurry, here are the key steps to get Ditch Assist up and running as quickly as possible:

1. Configure GNSS Settings:
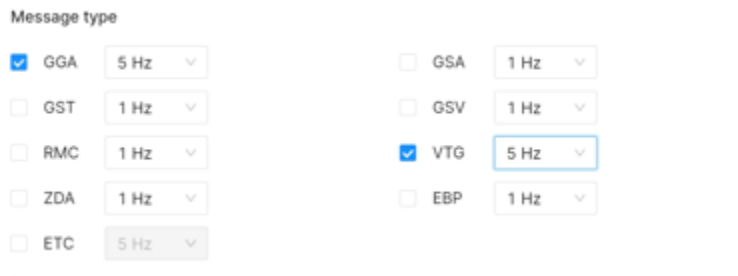
Set your GPS/GNSS to output **GGA** and **VTG** messages at **5Hz** or **10Hz**, with a baud rate of **38,400**. Turn OFF all other messages.

- You may need to do this while it is on the tractor and connected to the tractor display (e.g. for John Deere, Trimble, CHH, etc)

2. Install Ditch Assist Hardware

Connect the Power Harness:

- Connect the Power Harness directly to the tractor battery terminals.
- Avoid connecting it to a trailer power connector or an in-cab power strip.

Position the Ditch Assist Control Module:

- Attach the module on the implement using the provided magnet mounts.
- Ensure a clear line-of-sight between the module and the cab.

Assemble and Mount the PWM Valve:
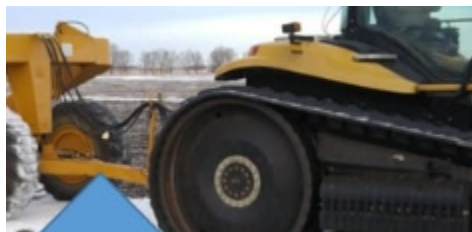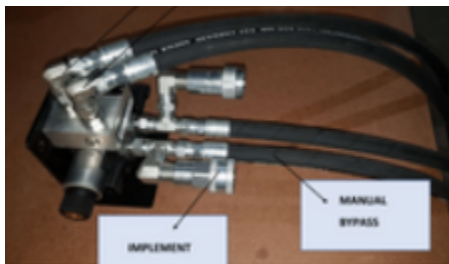

- Assemble and connect hydraulic fittings and hoses as shown in included guide
- Install the PWM valve on the implement or the rear of the tractor using the supplied bracket.
- Alternatively, you may fabricate a custom mounting bracket if preferred.

Install the RTK GNSS Antenna:

- Attach the antenna on the implement at a location that moves up and down with the blade or cutting point.

- Ensure the antenna is mounted high enough that it has an unobstructed view of the sky from all operating positions, from approximately 15 degrees above the horizon.
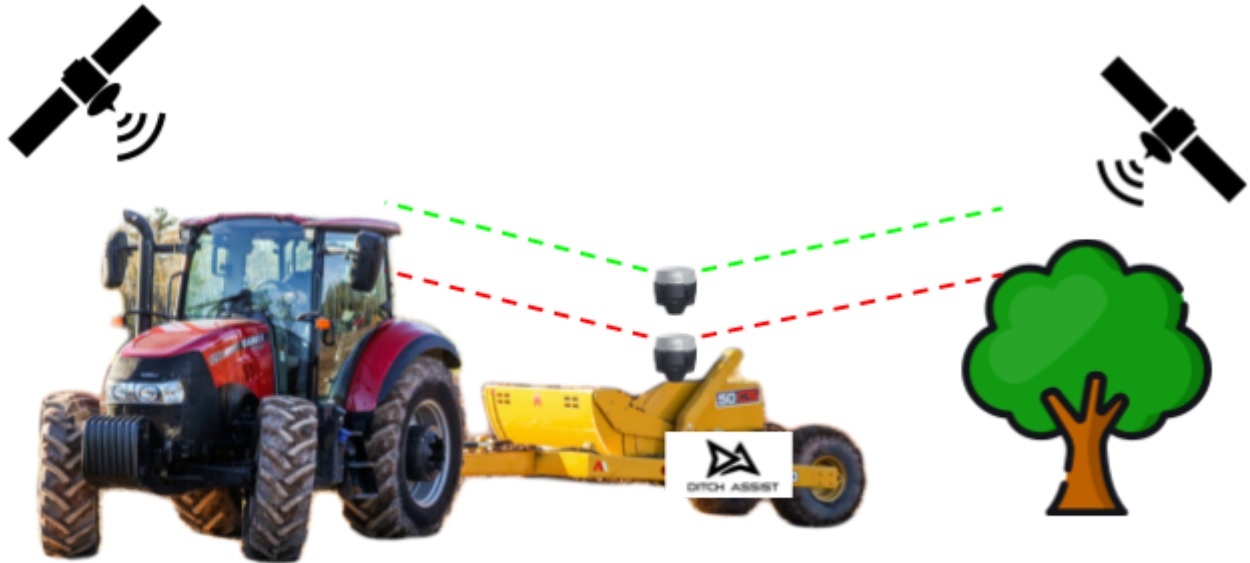
3. Connect Components:

- **Connect Power Cable**: Attach the power cable to the main harness.
- **Connect GNSS**: Use the GPS-specific cable for your device to connect GNSS to the main harness.
- **Connect Hydraulic Raise and Lower Connectors**: Attach these to the solenoids on the PWM valve (direction is not crucial at this point).
- **Connect Main Harness**: Attach the main harness to the Ditch Assist Control Module (connectors will only fit into their corresponding ports on the controller).
- **Protect the Control Module**: Use the provided plug connectors to seal the two empty ports on the Ditch Assist Control Module. This step is important to prevent dirt and moisture from damaging the controller electronics.

## 4. Download and Install the Ditch Assist App

- Search for *Ditch Assist* at the Play Store, or scan the QR code with your tablet

- Download and install the app
- Run the app and accept all permission requests

5. Connect Tablet to Ditch Assist Control Module

- Ensure that the Control Module is switched ON – you should see the LED lights glowing on the module.
- Go to your tablet's Wi-Fi settings and search for a Wi-Fi network name that starts with DitchAssist.
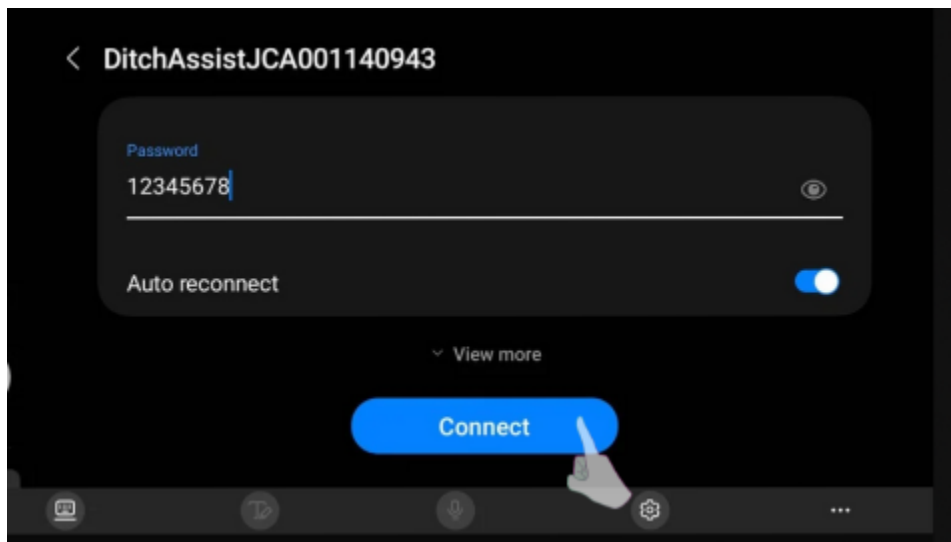
- Connect your tablet to the DitchAssist Wi-Fi network using the password 12345678.
- If your tablet alerts you about the network lacking an internet connection, select the option to continue with the connection.
- Open the Ditch Assist app. Tap "Connect WiFi."
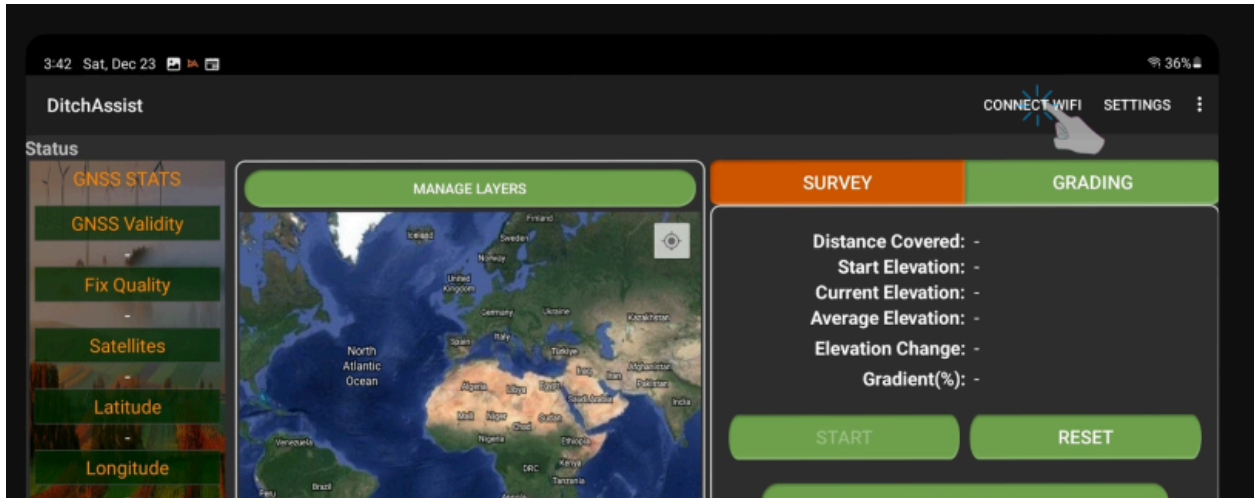
- Confirm that you're connected to the Ditch Assist Control Module. This can be confirmed via the Status details on the upper left corner of the screen (it should state that you're connected to DitchAssistxxxx, with xxxx representing the unit's serial number).
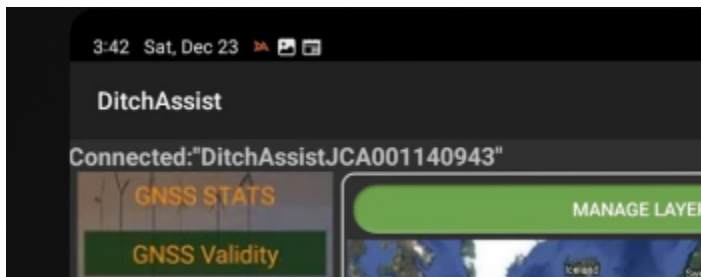
- Ensure that the GNSS info panel is filled – it should display details about your current positional coordinates, number of satellites, fix status, etc. If this panel remains empty, refer to the GNSS settings and troubleshooting sections of the user manual.

6. Verify Implement Hydraulic Control from the Ditch Assist App

- Identify the hydraulic remotes that are connected to both the bypass and the valve – manually operating the bypass controls should operate the implement hydraulics.
- Set the valve hydraulics to constant flow, and ensure flow is set to sufficient volume to move the implement
- On the Ditch Assist App, access the Grading screen by tapping on the "Grading" tab button.
- Press and hold the Implement Raise and Lower buttons on the tablet screen – the implement should raise and lower.
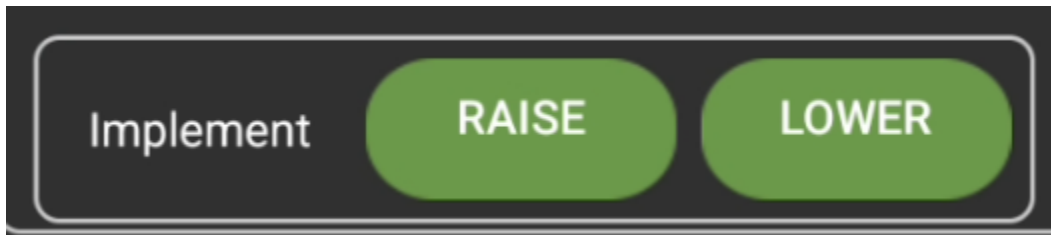
- If the implement goes up when pressing Lower (and vice versa), reverse the connections from the Ditch Assist harness to the valve solenoids.

7. Begin Operating

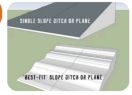- Run a Survey and use Slope-IQ to design a best-fit or customized drain profile.

- Import a 3D Landforming Design: Import from your desktop software.

DITCH ASSIST

13. SIMPLE LEVELING

How to level or create single slope or best-fit planes!
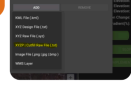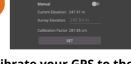
1 To create a flat, level area, lower the implement blade to the desired elevation, enter a **Target Grade** of *0*, and start working

2 Anything designed with Slope-IQ can also be implemented as a plane!

3 To grade a larger area, drive down the middle in a straight line and survey it, then design in Slope-IQ

4 Ditch Assist will automatically expand the original survey line, stretching it out at 90-degree angles on both sides

5 As you work parallel to the original route, you'll replicate the design, effectively creating a plane

To create level areas you may also enter a target elevation value, and can use the Auto Height Calibration tool to calibrate your GPS to a benchmark or known elevation. Using these techniques is effective for creating uniform flat areas of virtually any size, however for planes on larger areas it may be more appropriate to use a design from desktop software.

DITCH ASSIST

14. 3D LAND FORMING

How to import and implement advanced 3D designs from desktop software!

1 Export your land level design as a tab delimited text (.txt) file with attributes as shown above (no column headers)

2 Save the .txt file to your tablet. Load it into the App via **Manage Layers > Add > XYZP | Cutfill Raw File**

3 Select Auto or Manual Nudge. Optionally load cut/fill map image in .jpg format with .jgw file

4 Calibrate your GPS to the original survey if needed by stopping at a point with zero cut/fill or known elevation and using Auto Height Calibration tool

5 Begin working. Ditch Assist will calculate the design elevation at your location and set this as the target
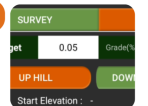
Configure the Ditch Assist App to use metric units for design files. If your design file lacks the original survey elevation column, select XYZ Design File under Manage Layers to import it. Note that Auto Nudge and auto-created cut/fill overlays won't be available. To verify GPS Height Calibration, park at a spot with no expected cut or fill, then hit START. The blade should rest on the ground.

- Enter a Straight Grade or Target Elevation: Perform simple grading or leveling.

DITCH ASSIST

13. SIMPLE GRADING

Don't want to use Slope-IQ or a custom design? No problem, just enter a grade & go!

1 Drive to the start location (it can be at either end of the run). Lower implement to the ground.

2 Open the Grading tab. Enter your target grade in % in the white box.

3 Select whether the slope should run UPHILL or DOWNHILL from your starting location

4 Tap START to begin working. The slope will be calculated and implement height adjusted as you move away

5 To set a depth from your start point, use NUDGE DOWN to add an offset and achieve the desired depth

This method will maintain a constant grade calculated in a straight line from your start location to your current location. To implement a grade break, hit STOP > RESET and then enter a new grade and continue from that point.

For detailed instructions and additional information, please refer to the appropriate chapters in the user manual.

Installation and Setup

Ditch Assist Components

Ditch Assist Control Module

The Control Module is the heart of the Ditch Assist system, connecting all its components. It powers the GPS receiver, processes incoming GPS messages, and enables wireless communication with the Ditch Assist Android app. Additionally, it intelligently manages the proportional valve for automated control when needed.

Built to withstand tough conditions, the Control Module features an environmentally sealed casing with an IP67 rating, ensuring durability across a wide temperature range from -40°C to +85°C. It works with both 12V and 24V systems and operates efficiently within a voltage range of 9V to 32V.

The module supports communication via CAN bus and RS232 protocols and includes Wi-Fi capability, making it easy to connect and use.
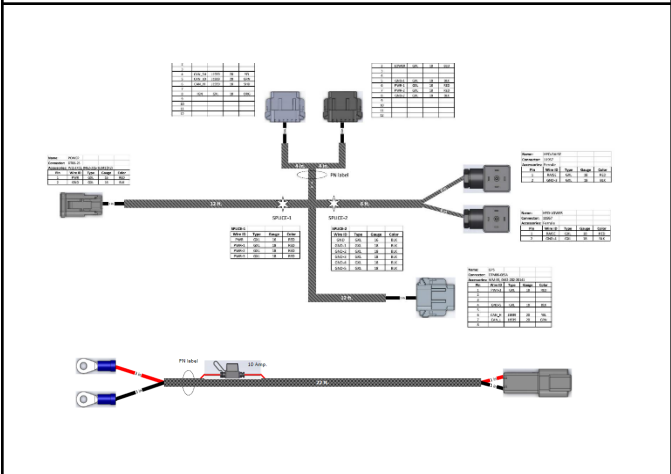
Ditch Assist Main Harness

The Ditch Assist Main Harness is a vital component of the system, designed for both convenience and flexibility. It comes with a detachable power harness, allowing for permanent installation or the option to install multiple power harnesses on different tractors as needed. This harness seamlessly interfaces with the Control Module, coordinating with both the GPS and the proportional valve.

	Additionally, it features a connector specifically designed for a GPS breakout, enabling the connection of brand-specific GPS cables. This ensures that your Ditch Assist system can easily integrate with a wide range of GPS receivers, providing you with the flexibility to use the equipment you prefer.
	## GPS Breakout Harness The GPS Breakout Harness is designed to provide a seamless connection and power supply to your GPS receiver, tailored specifically to your brand. We offer GPS harnesses compatible with most widely-used agricultural GPS receivers, including Emlid, ensuring broad compatibility. Additionally, we provide a DB9 cable to interface with various other devices using manufacturer-specific breakout harnesses. These harnesses include a DB9 connector designed to relay GPS messages to third-party devices, making it easy to integrate your GPS system with other equipment.
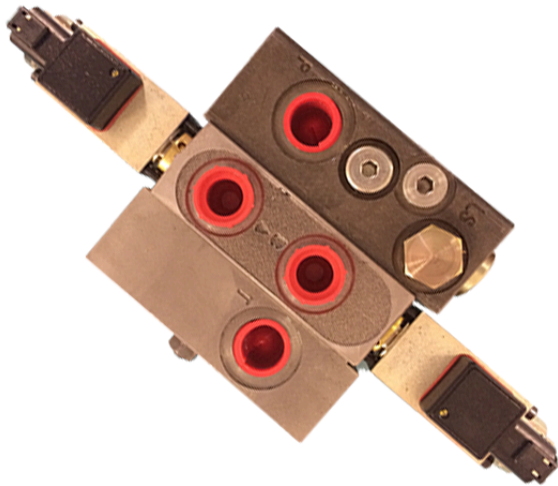
Pulse Width Modulation (PWM) Proportional Hydraulic Valve (Included in Full Automation Kit)

For automated hydraulic control, a PWM hydraulic valve is essential. The official valves provided with Ditch Assist are custom-assembled exclusively for use with our system. Only valves offered by our authorized dealers should be used. Please note that no support or warranty will be extended if alternative valves are utilized.

Valve Model and Configuration: The exact valve model and configuration may vary depending on your geographic location and specific equipment. Our proportional valve comes standard with hydraulic couplings and hoses to connect to your implement's up/down hydraulic hoses to the valve, and subsequently, the valve to the tractor remotes.

Adjustability and Options: Our standard valve is designed for closed center hydraulic systems and operates well with most commonly used equipment.

We also offer optional valves that can be adjusted to either open or closed center configurations, providing flexibility to suit various hydraulic systems.

Additionally, we offer a higher flow valve option for very large implements. For more information on this option, please contact your dealer.

Valve Bypass Kit

The Valve Bypass Kit allows you to integrate two additional lines into the tractor's remotes, providing the flexibility to bypass the valve when needed. This feature is particularly useful for situations where you require manual control or need to quickly switch to manual operation without using the manual raise/lower buttons on the application interface. With this kit, there is no need to disconnect the valve, ensuring seamless transitions between automated and manual control.
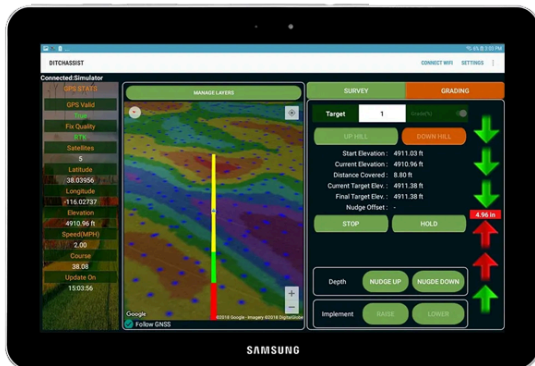
Ditch Assist App

The Ditch Assist App is a crucial part of the Ditch Assist system, offering an intuitive user interface for seamless operation. This Android application can be easily downloaded for free from the Google Play Store by simply searching for "Ditch Assist." Regular updates are published on the Play Store, ensuring you always have the latest features and improvements.
For added convenience, we also provide access to the current version of the app, as well as legacy and beta versions, on the App Releases page of the Ditch Assist website. To access these versions, visit https://www.ditchassist.com/app-releases/.

	## GNSS (GPS) Antenna Ditch Assist is compatible with a wide range of popular GNSS equipment, offering you the flexibility to integrate it with your existing technology. Alternatively, you may have acquired Ditch Assist bundled with a compatible GNSS system from your dealer. The GNSS antenna, mounted on the implement being controlled, delivers essential NMEA position messages to the Ditch Assist Control Module. This ensures precise operation and seamless coordination within your system.
	## Android Tablet The Ditch Assist App is specifically designed to operate on 10" Android tablets running a recent version of the Android operating system. While it is possible to run the app on phones and smaller tablets, you may encounter issues with resizing, layout, potential crashes, and missing features. Therefore, we strongly recommend using a 10" or larger screen tablet from a recognized manufacturer to ensure optimal performance. Current Recommendation: We currently recommend any current Samsung tablet with a 10-inch or larger screen. These tablets are known for their reliable performance, quality components, and sufficient memory resources, which are crucial for running the Ditch Assist App smoothly. Considerations for Other Devices: While the app is functional on other devices and various screen resolutions, the layout may not align as intended. Buttons and information windows might not appear in their designated locations

	on the screen, which can affect the overall user experience. Additionally, some budget-friendly units available in the market may compromise on the quality of components like Wi-Fi transmitters and available memory resources, potentially leading to suboptimal performance. For the best experience with the Ditch Assist App, we recommend adhering to our tablet specifications and using a device that meets or exceeds these criteria.

Installation Instructions

Depending on the type of equipment you plan to install Ditch Assist on, the exact method will vary somewhat. Ditch Assist is extremely simple to install and move between equipment. The following guidelines should help you determine a suitable installation for your particular equipment.

IMPORTANT: Make sure that Ditch Assist components are installed so that parts, cables, and hoses will not be stretched, pinched, or otherwise damaged during the operation of equipment. Keep in mind that cables and hoses may be subject to stretching when the implement is turning, and that components mounted near the hitch or rear of the tractor may come into contact with other parts when cornering.

Connect the Power Harness to the Battery ONLY

- Connect the Power Harness directly to the tractor battery terminals.
- Avoid connecting it to a trailer power connector or an in-cab power strip.
- Failure to follow this instruction may result in intermittent connectivity and hydraulic control issues caused by power fluctuations and insufficient current.

Proportional Valve Setup

Consult the specific installation instructions included in your installation kit. If these are missing, please contact your dealer to obtain them. Ensure you assemble the hydraulic components as shown. Below are common hydraulic assembly instructions for our Bucher and Rexroth valves (other valves may be slightly different):

Bucher Valve:

Connect the automation hoses necessary for constant flow to the external valve block (the block with the dial). Attach the fittings for the manual bypass and implement hoses to the central block situated between the solenoids.
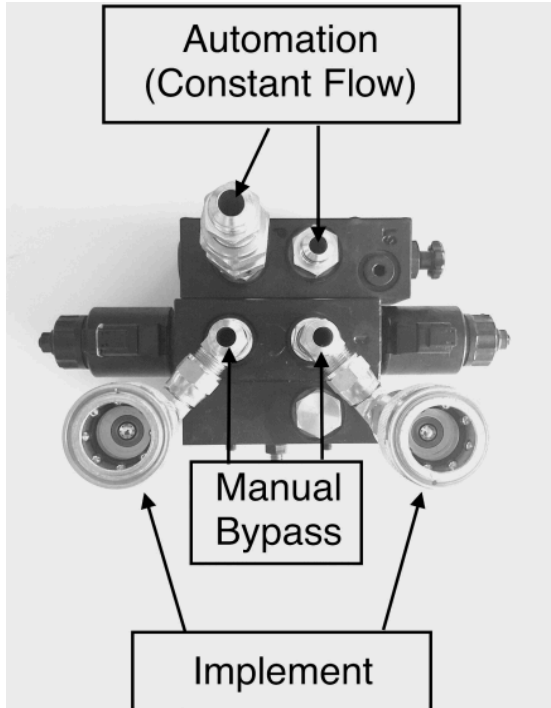
Rexroth Valve:

Connect the hydraulic hoses needed for automation (providing a constant flow) to the ports located on the valve block's top surface. Attach the implement connectors and manual bypass fittings to the ports situated on the valve's side.
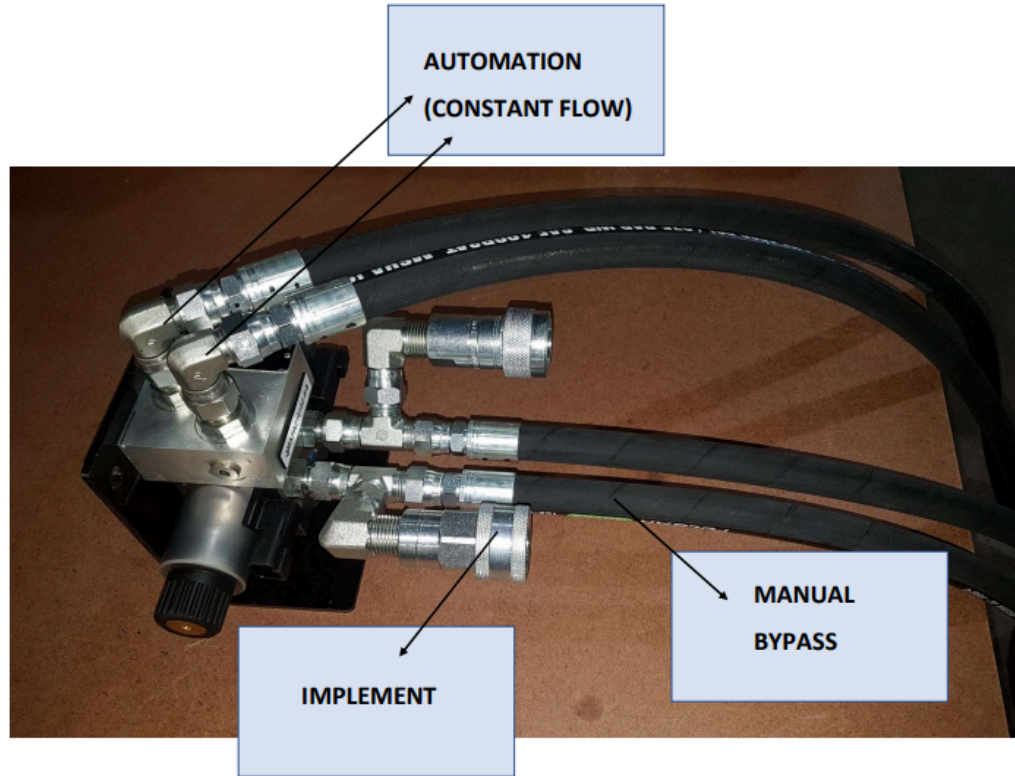
Control Module & Valve Installation

Ensure that the Control Module is securely installed either at the implement's front, near the hitch, or at the tractor's rear, with minimal obstructions to the line of sight to the cab. The included magnetic mount can be used for this purpose, or you can fabricate your own if needed. The Control Module can be installed in either a horizontal or vertical orientation.

IMPORTANT: While the Control Module is sealed against weather, and all connectors that plug into it come with waterproof gaskets, we strongly advise installing it with the ports facing downward to prevent water from accumulating in and around them. If the wiring harness connectors are removed from the Control Module, this might allow moisture to

infiltrate. Always ensure all port connectors or covers are in place when leaving the Control Module outside.

Position the proportional valve in a place that allows the implement hydraulic hoses to connect to it and enables the included hoses you attached to the valve to reach the remote ports at the tractor's rear. To prevent damage during operation, the valve must be securely installed.

Valve Mount Bracket: The kit ships with a steel valve mount bracket that is pre-drilled for the mount holes on the valve. It is up to the user to determine the optimum mount location and whether to permanently weld the bracket there, attach it using clamps or other suitable methods, or use another method to secure the valve. It is important that the valve is securely installed.

If the provided angle iron mount is used, the pre-drilled holes will align with the valve's mounting holes, and the mounting plate should be either bolted or welded to the equipment.

SUGGESTION: If you intend to use Ditch Assist with multiple different implements, consider permanently mounting the valve on your tractor, as it may be more practical.

Guidelines for Mounting Setup on a Scraper or Land Leveler

- **Valve Bracket:** Mount the valve bracket securely to the implement. Do not weld the bracket with the valve mounted. Remove the module before welding anything to the implement.
- **Module Placement:** Ensure the module is mounted where it will not be dislodged by debris, moving parts, or hydraulic lines.
- **Cable and Hose Management**: Secure all cables and hydraulic lines so they will not be pinched, stretched, or damaged during operation.

Connecting the Hydraulic Hoses

- **Hydraulic Connections**: The two hoses coming from the P and T ports on the valve, in addition to the hoses for the bypass, need to be connected to the tractor – a total of four hoses.
- **Continuous Flow**: The hydraulic remotes on the tractor that Ditch Assist is connected to should be set to a continuous flow when operating, allowing the valve to raise and lower the implement as required.
- **Valve Response Settings**: The app also contains settings for valve response – refer to the Settings Menu for more details. Exit the menu once the changes are complete. Tap "Connect WiFi."

By following these guidelines, you can ensure a successful and secure installation of your Ditch Assist system.

Mounting the GPS Antenna

IMPORTANT: The GPS antenna used with Ditch Assist must be mounted on the implement being controlled and attached to a part that moves up and down in proportion to the cutting edge or blade. Failure to adhere to this principle will result in incorrect operation.
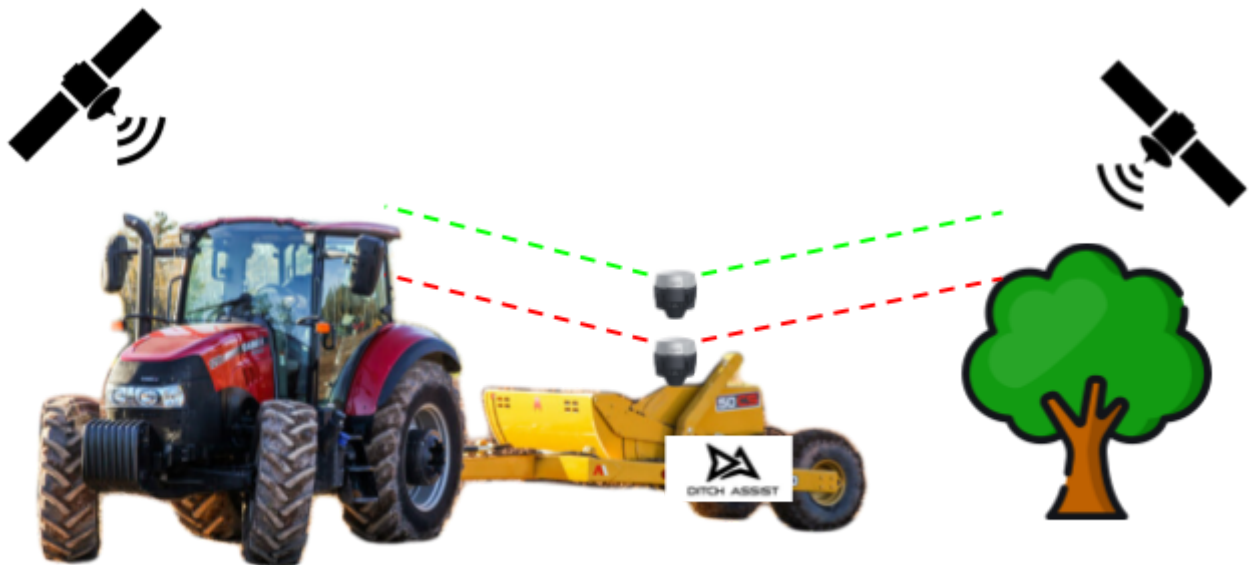
Key Guidelines:

- **Raised Position**: Mount the GPS antenna in a raised position so it sits above any objects that might block or deflect the satellite signal. This helps ensure a clear line of sight to the sky.
- **Avoid Metal Objects**: Ensure the antenna is mounted away from metal objects or other obstructions that could cause incoming GPS signals to bounce off and decrease accuracy.
- **Consider Working Position**: Keep in mind that the working position of the implement may be considerably lower than the transport position. A taller mast may be required to maintain a clear view of the sky in all positions.

Mounting Your Android Device

The Ditch Assist Kit includes a RAM mount designed for 10" tablets. Here's how to securely install your device in the tractor cab:

- **Secure Installation**: Use the RAM mount to securely install your tablet in a location where you can easily see and tap the screen.
- **Power Supply**: Powering your device to avoid battery drain using the supplied high-amp 12V charger. Note that the tablet and charge cables are not included in the standard Ditch Assist kit, but may optionally be purchased through your dealer

Connect All Cables

The Ditch Assist system is designed so that cable connectors cannot be mistakenly connected to the wrong component. Use the following checklist to verify all components are connected and dust covers in place:

- ☐ Power harness ring terminal connectors connected to tractor battery terminals
- ☐ Power harness Deutsch connector is connected to Ditch Assist main harness
- ☐ GPS/GNSS harness is connected to GPS/GNSS device
- ☐ GPS/GNSS harness is connected to Ditch Assist main harness
- ☐ Two small Deutsch connectors are connected to valve solenoid ports
- ☐ Two large Deutsch connectors are connected to ports A and C on the Ditch Assist Control Module
- ☐ Ports B and D are sealed using the included Deutsch plugs
  .

Typical Installations

The Ditch Assist Control Module and proportional valve (if used) are typically mounted either near the hitch on the implement being controlled or at the rear of the tractor. The power harness should be connected directly to the tractor battery. The GPS antenna is mounted in a raised position on the implement, ensuring it moves up and down proportionally with the cutting edge.

Land Leveler or Similar Implement:

- **PWM Valve**: Mount the PWM valve on the implement tongue, a few feet away from the hitch point.
- **Control Module**: Attach the Ditch Assist Control Module to the tongue or any other suitable spot that has clear line-of-sight to the cab using the provided magnetic mounts or a custom-made bracket.
- **GNSS Receiver**: Place the GNSS receiver at the top of the implement. If the implement has components that overhang or if it is shorter and might obstruct the GNSS's view of the sky due to the tractor, you may need a raised mount.

Pull-Type Scraper:

- **Valve Installation**: Install the valve on the tongue using either the provided bracket or a custom bracket.
- **Control Module**: Mount the Ditch Assist Control Module on the tongue. If there are any WiFi connectivity issues, the Control Module can alternatively be installed on the vertical part of the scraper frame (e.g., near the white label) to provide a better line of sight to the tractor cab.
- **GNSS Mounting**: Ensure the GNSS is mounted in a manner that allows it to move proportionately with the cutting edge. This generally requires a mast to keep it above the metal components surrounding it when the scraper is in its maximum lowered position.

GPS/GNSS Information & Configuration

Ditch Assist was developed with compatibility in mind, designed to work with a wide range of GPS brands and models. We support both the NMEA 2000 message standard, which is a CAN-based communication protocol, as well as the NMEA 0183, a standard associated with 'serial port' communication. Most GPS systems will use the NMEA 0183 serial standard.

GPS Requirements and Settings for Ditch Assist

NMEA Output Settings Required

You should configure your GPS to output the following NMEA messages:

- SET BAUD RATE TO 38,400
- GGA MESSAGE AT 10Hz (5Hz if 10Hz is not available)
- VTG MESSAGE AT 10Hz (5Hz if 10Hz is not available)
- DISABLE ALL OTHER MESSAGES IF POSSIBLE

(If you can't designate a specific message rate for each message, or cannot disable messages that are not required, then enable 5Hz rate for all messages.)

Diagnosing GPS/GNSS Connectivity using the Status 1 and Status 2 LEDs on the Control Module

- The Status 1 light blinks when a valid CAN NMEA 2000 GPS message is received. If you are connecting a GNSS receiver such as an Outback Smart Antenna, we typically expect to see this light begin to blink once the receiver is powered on and has established its position.
- The Status 2 light blinks when a valid RS232 NMEA 0183 GPS message is received. Most GPS connected to Ditch Assist will be using this format, so the Status 2 light is a critical indicator that the correct messages and rates are enabled - if the Status 2 light does not flash this means the Control Module is not receiving valid messages.
- The blinking pattern of both Status 1 and Status 2 LEDs mirrors the frequency of the message rate. Simply put, a consistent blink every second signifies a 1Hz message rate, implying that the GPS updates the position every second.

For best performance, it is advisable to have a message rate of at least 5Hz. A slowly flashing Status 1 or Status 2 light (e.g. flashing once every few seconds) could signify that the message rate might not be set adequately fast, leading to potential problems. For instance, the blade might bypass the target before receiving a new position, resulting in a 'bunnyhopping' effect as the system constantly tries to correct the previous overshoot. This might cause your implement to perform a continuous dance-like display. If you notice the Status 1 or Status 2 light blinking very quickly, then stopping, then flashing quickly again, this can be an indication that the message rate is too fast for the GPS receiver to output and a 'bottleneck' has formed. In this case, try turning the message rates down, e.g. from 10Hz to 5Hz.

Common GPS/GNSS Device Configuration

How to Configure John Deere Smart Antennas

When utilizing a John Deere smart antenna with Ditch Assist, the Ditch Assist GPS cable will provide power to the unit and directly extract the necessary position information into the Control Module. In this setup, there is no need to connect the GPS to the tractor or the GreenStar Display. It is essential to configure the receiver while it is connected to the John Deere CAN system, such as when it is installed on the tractor's roof. Once properly configured, you can remove the receiver and attach it to the implement, connecting it to the Ditch Assist Control Module using the appropriate cable. Ditch Assist will supply power to the receiver and retrieve the required GPS messages from it.

1. First, scroll through the main screens to the StarFire screen.
2. Next, tap on the icon that looks like a StarFire receiver.
3. Open the Serial Port tab.
4. Use the dropdown to set the baud rate to 38,400.
5. Adjust the output rate to 5Hz or 10Hz. Note that some receivers will not have 10Hz enabled if it hasn't been activated. So in this case 5Hz should be fine.
6. Finally, turn on the GGA and VTG message. Turn off any others that may be on.
7. Exit the menu once the changes are complete.
8. Your receiver should now be broadcasting the selected NMEA strings. Connect it to the Ditch Assist Control Module and verify that the Status 2 light on the module begins to flash as this indicates that GPS data are being received

To enable NMEA messages on Trimble/Case-IH GPS receivers, you can follow these general steps:

For Trimble systems using a NAV II or NAV III Controller:
On these setups, a good option is to use the DB9 serial cable on the Nav Controller harness to connect to our generic DB9 GPS Cable. Note here that the GPS cable will need to run into the tractor cab to connect to the Nav harness.

1. On a Trimble display running precision IQ, go into the GNSS settings.
2. Open the NMEA Messaging tab and turn messaging on.
3. Tap on message rate and set it to either 5Hz or 10Hz. Choose the fastest option available.
4. Next, select Autopilot as the output port.
5. Note that if a TM 200 is present, you cannot use it's Port A to output because this port is actually in use by the Nav controller, even though it gives you the option to select it!

1. For an Autopilot connected to a Pro 700 or Intelliview 4 display, the process is similar.
2. Open the Nav Settings, and click Edit under the NMEA Output Setup.
3. Turn NMEA output on, and confirm that the Baud Rate is set to 38,400.
4. The speed setting here aren't relevant for Ditch Assist so you can leave it off.
5. Make sure the Precision and Accuracy settings are set to 8, for the reasons we mentioned previously.
6. Return to the settings menu, and open the NMEA Message Settings. Here, you'll need to enable GGA and VTG at either 10Hz, or 5Hz if 10 isn't available.

For a **Trimble 372 receiver**, the easiest method is to use RDI on the Pro 700, or Ag Remote on Trimble displays. Usually you'll program Port A or C (assuming Port B is connected to the RTK radio), but this may differ with specific configurations.

1. On the RDI or Ag Remote screen, press the right arrow twice or until you reach the Configuration option
2. Press Down to enter the Configuration Menu
3. Scroll to the Port you need to configure
4. Set the position output to NMEA (it likely says TSIP currently), and make sure the baud rate is set to 38,400.
    a. You should see a line that shows something like 8N1 NMEA 38k.4 when correctly configured
5. Scroll down again to locate the entry for NMEA1
    a. Make sure GGA is capitalized here, and that all other messages are in lower case
6. Scroll down again to NMEA2
    a. Make sure VTG is capitalized here and all others are off
7. Locate the setting for NMEA OUT and set it to ASAP - this should get you 5Hz updates
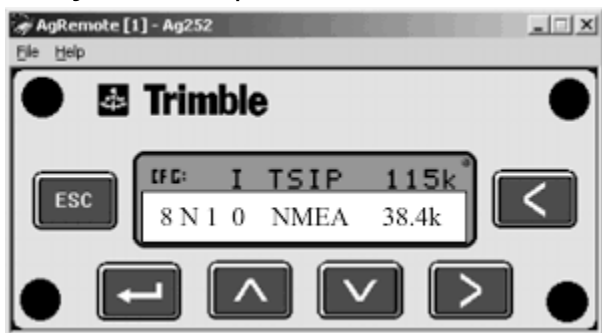
How to Configure Emlid RS2 and RS3 Receivers

To enable NMEA messages on the Emlid RS2 GNSS receiver, you can follow these steps:

1. Connect to the RS2 GNSS receiver using the ReachView app on your mobile device or web browser.

2. Open the ReachView app and navigate to the "GNSS Settings" or "RTK Settings" section.
3. Look for the option related to NMEA messages or NMEA output. The specific location may vary depending on the version of ReachView, but it is usually found within the GNSS or RTK settings.
4. Enable or toggle the NMEA messages option. You have the option to select specific NMEA message types or configure the message rate.
5. Set the baud rate to 38,400
6. Save the changes or apply the settings.
7. The RS2 GNSS receiver will now output the selected NMEA messages according to the configured settings.

How to Configure Outback GPS Receivers

Many Outback GPS smart antennas are plug-and-play and will provide the required GPS messages over CAN bus automatically when connected to Ditch Assist with our Outback GPS harness. If your Outback antenna has a small circular connector then it likely falls into this category. Otherwise, to manually enable NMEA messages on Outback GPS receivers, you can follow these general steps:

1. Access the GPS receiver's menu or settings. This is typically done through a display or user interface on the device.
2. Look for a section related to communication settings or NMEA output configuration.
3. Within the communication settings, you should find an option to enable NMEA messages or configure the NMEA output.
4. Enable the NMEA output or select the desired NMEA message types you want to receive.
5. Check if there are additional settings to adjust the baud rate and message rate (such as 10Hz or 5Hz).
6. Save the changes and exit the menu or settings.

Please note that specific steps may vary depending on the model and firmware version of your Outback GPS receiver. It is recommended to

refer to the user manual or consult the manufacturer's documentation for precise instructions related to your specific model.

GPS Corrections and Accuracy

As previously discussed, Ditch Assist relies on a precise GPS signal for optimal performance. If your GPS lacks accuracy, it may impact the performance of Ditch Assist.

IMPORTANT: If you are not using RTK with your own base station, we highly recommend using a subscription-based correction service with a published vertical accuracy of at worst 2-3 inches as a minimum requirement. It is possible that you may find the GPS accuracy provided by your current system to be insufficient. This is not a fault of Ditch Assist, as it simply processes the incoming GPS data it receives.

Ditch Assist is not compatible with low-accuracy correction signals like WAAS or low-accuracy SBAS corrections such as SF1 or OmniSTAR L1. We recommend, at a minimum, utilizing a subscription-based dual-frequency (L1/L2) satellite-delivered correction signal.

Below are specifications for the recommended GPS corrections:

USE WITH EXTREME CAUTION:
Subscription-based L1/L2 correction services like SF2, SF3, CenterPoint RTX, TerraStar, or Atlas are NOT RTK accurate. Expect fluctuations in elevation readings with these systems (e.g., the machine may experience up/down movements even when stationary). Not recommended for use in flat fields or for land leveling or tiling. The respective manufacturers do not endorse these corrections for vertical accuracy, and you will have no recourse in the event performance is not acceptable.

SHOULD BE OKAY UNDER MOST CIRCUMSTANCES:
Network RTK Correction through CORS, Cellular, or Long Range Radio link to a remote base station (e.g. on a nearby equipment dealers' rooftop). These corrections typically provide good accuracy for surface grading. Keep in mind that the closer you are to the base station, the better the repeatable accuracy will be, particularly if your GPS is older. Being near a cell tower does not necessarily mean you are close to the base station. If you don't experience issues with signal dropouts or loss of accuracy, this is a good option.

BEST OPTION FOR RELIABILITY AND ACCURACY:

RTK using your own portable base station or fixed mounted base station at your location within line-of-sight offers the highest level of accuracy. By setting up your own base station, you can determine the distance and adjust its position if necessary. For optimum accuracy, ensure that you are within 2 miles of the base station. With this type of RTK setup, you should experience minimal fluctuation in elevation readings while stationary, and the implement's hydraulic movements due to RTK fluctuations should be nearly imperceptible.

Please note that while we do not endorse using any correction less accurate than RTK, some users have chosen to use lower accuracy systems and have been satisfied with the performance.

Installing the Ditch Assist App on your Tablet

If you're new to installing apps it might be helpful to ask a friend or family member who has experience with this to give you a hand.

Connect Tablet to the Internet
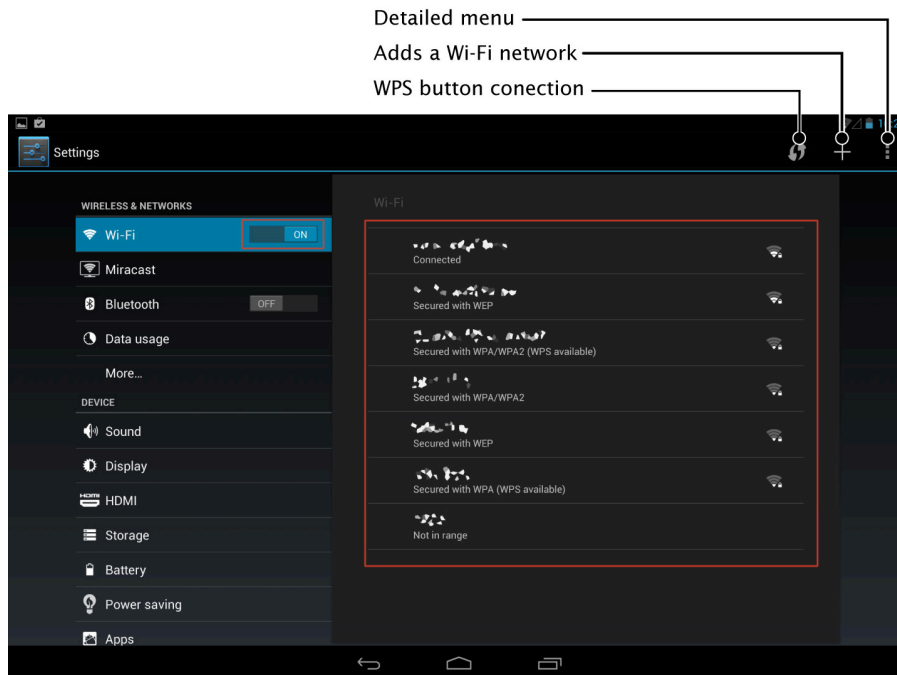
Make sure you're connected to the internet, not the Wi-Fi of the Ditch Assist Control Module, as it doesn't provide internet access.

Open the Play Store
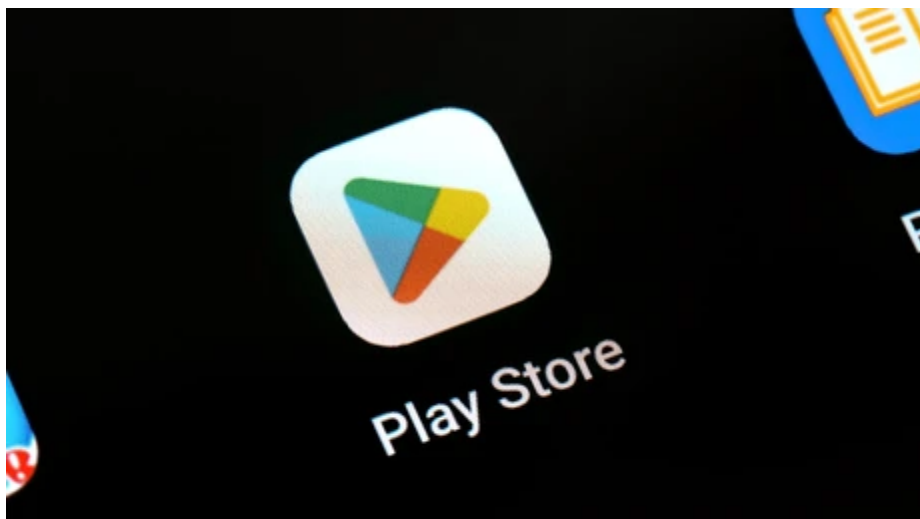
Open the Play Store app on your device.

Search for the App

Type "Ditch Assist Machine Control" by Northern Plains Drainage Systems into the search bar.
Install the App: Once you find the app, follow the on-screen prompts to install it.
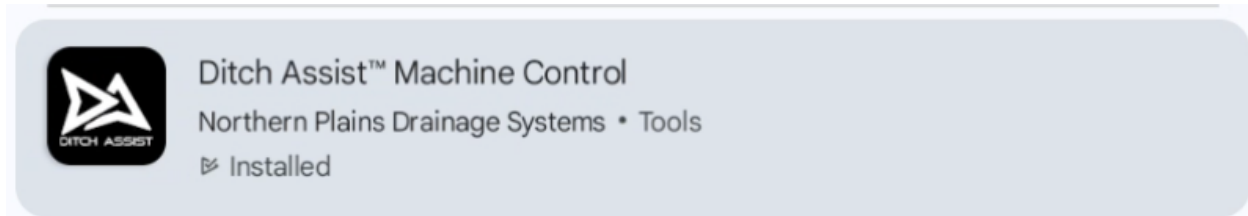
Optional: Sign Up as a Beta Tester
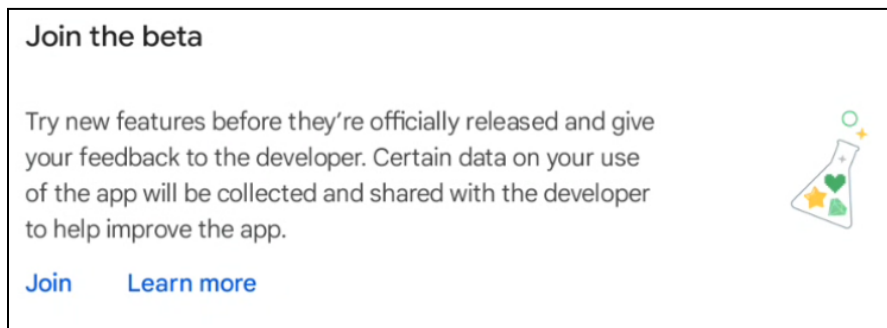
We usually roll out new features and updates as a Beta release for the first season so that in the event of any bugs or issues, users can revert back to the stable release. To get early access to any new features and updates, we encourage you to sign up to the Beta. You can leave the beta at any time, and when you do your installed version will automatically revert back to the standard version currently available on the Play Store.

Updating the Ditch Assist App

Android devices usually handle app updates automatically or notify you when updates are available. If you get a notification that an update for Ditch Assist is available, it's a good idea to install it right away.

Steps to Keep Your App Updated:

- **Check for Updates**: Occasionally connect your device to an internet-enabled Wi-Fi network to check for updates. This is important because the Wi-Fi connection used between your device and the Ditch Assist module doesn't provide internet access.
- **Install Updates**: When connected to an internet-enabled Wi-Fi network, check for updates in the Play Store and download any new firmware or app updates to keep your device up to date.

Keeping your app updated ensures you have the latest features and improvements, making your Ditch Assist system work even better.

Running the Ditch Assist App for the First Time

Required Permissions

When you launch the Ditch Assist app for the first time, you'll be asked to grant several permissions. These are essential for the app to function correctly:

- **Location**: This permission is needed to enable the map view and show your current position. It's also crucial for performing most auto-grading tasks. Without this permission, Ditch Assist won't work. If you decline this request, the app will not function properly.
- **Storage**: This allows the app to access specific sections of your device's storage to temporarily record data and store files, such as surveys and operation records. It also enables loading land leveling designs and map overlays from your device's storage. Without this permission, the app's functionality will be limited.
- **Bluetooth, Network, and Notifications**: These permissions are required for the app to communicate with the Ditch Assist Control Module and to send you important alerts. If any of these permissions are rejected, the app will not run.

If you accidentally decline any of these permissions, you can try to force close the app by using the Recent Apps button (usually found next to the home key, symbolized by a square or three vertical lines), and swipe away the active Ditch Assist app. Then, relaunch the app and grant the required permissions. If this doesn't resolve the issue, try uninstalling and reinstalling the app.

Caching Map Imagery

The Ditch Assist app includes a built-in Google Map frame that retrieves map image data from the internet. This is especially useful for providing a satellite view of your current position and an overall perspective of your field during work. However, when the app is connected to the Ditch Assist Control Module, it cannot pull map image data due to the lack of an internet connection.
To work around this, you can download and cache map image data before connecting to the control module. The app will store the images for offline access.

1. **Connect to the Internet:** Ensure your tablet is connected to the internet.
2. **Open the Ditch Assist App**: Manipulate the map by zooming and panning to focus on the areas where you'll be working until the map imagery appears on your screen. This imagery will then be stored for later use when you're offline.

You may need to repeat this process occasionally if the map imagery disappears. This method allows you to keep the imagery up-to-date and accessible for your offline work requirements.

Setting Units (Imperial or Metric)

Ditch Assist supports both Imperial and Metric units of measurement.
- **Imperial System**: Height and distance measurements, as well as user inputs, should be given in feet and inches.
- **Metric System**: These values should be provided in meters and centimeters.

You can switch between units through the Settings menu. Note that for the changes to take effect, you must completely shut down the app and then reopen it.

Ditch Assist App Settings Menu

> **IMPORTANT**: Before using the system you must enter at least the ***Transport Mode Blade Height*** setting so that the blade height during a survey run is subtracted from the measured elevation. Failure to do so will result in your implement digging significantly deeper than expected.
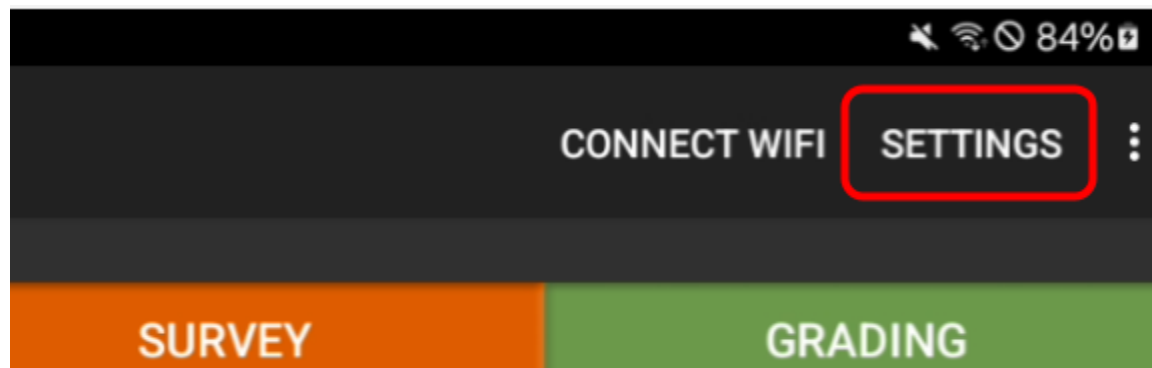
Tapping on ***SETTINGS*** at the upper right of the screen will open the Settings Menu. Use your tablet's back button to return to the main app screen at any time when in Settings

Item #	Title	Description
1	**Measurement System**	To switch between Imperial and Metric measurements for height and distance, you must force close the app and then reopen it for the updated settings to take effect.
2	**Log File Format**	When using Ditch Assist, log files are stored in the device's internal memory under "Internal (Main) Storage \> Documents \> Ditch Assist." Record log files in XYZ text or KML format, with XYZ being the default and recommended for exporting survey data to desktop software.
3	**GNSS Accuracy Loss Warning**	By enabling this option, your device will emit a persistent audible "beep" if RTK or subscription-based correction accuracy is lost. This audio alert serves as a notification to inform you when GPS accuracy is compromised.

4	**GNSS Message Delay Timeout**	This feature is designed to detect a loss of GPS/GNSS signal while allowing the system to continue operating for a set time using the last known position from the GPS. GPS receivers occasionally experience lag, buffering, or technical issues for a few seconds before resuming normal operations. When Ditch Assist notices that new messages aren't received, it will continue operating using the last known position—if the delay is only a few seconds, this will likely be fine. However, after a set period (default is 30 seconds), the system will time out, stopping any auto grading or survey activity, and the user will receive a warning message indicating that the GNSS signal has been lost.
5	**Transport Mode Blade Height**	The Blade Height parameter is used to correct the measured GPS height when performing a survey. It is assumed that the implement is fully raised and in its transport position. The measurement entered here should be an accurate measure from the ground to the lowest point on the cutting edge while the implement is raised in the transport position and parked on even ground. Enter the measurement in either inches or centimeters, depending on the measurement system currently set.
6	**GPS to Blade Height / Calibration Factor**	The GPS to Blade Height/Calibration Factor parameter adjusts the GPS antenna's height above the cutting edge to derive an accurate ground elevation. This is particularly beneficial for surface and subsurface drainage tasks like those using Slope-IQ. The GPS antenna center or another marker indicating the antenna's position within the casing should be measured to the lowest point of the implement's cutting edge. If this measurement is not provided or updated, your work won't be significantly affected as long as you don't adjust it during operation. However, the displayed GPS elevation may not be entirely accurate. This parameter can also be employed when executing a land leveling plan to align the current GPS elevation with the

		original survey. Agricultural GPS systems and survey equipment often have different calibrations, leading to relative differences in heights. You can enter a positive or negative value here to modify the reported GPS elevation until it aligns with the initial survey's benchmark elevation. To simplify this process, we've introduced **Auto Height Calibration**, the recommended method for making this adjustment, if necessary.

Item #	Title	Description

7	**Centimeter/Inches / Arrow**	The Inch/Arrow parameter specifies how many inches are represented by each arrow on the visual up/down guidance light bar located on the Grading screen at the far right of the screen. Note that it is also possible to customize the distance represented by each arrow directly on the Grading screen by long pressing on an individual arrow and then adjusting the associated distance value. Any manual changes to individual arrows will override values set here.
8	**Nudge Sensitivity**	The Nudge Sensitivity parameter specifies how many inches or cm the Current Target Elevation will be adjusted with each press of the Nudge Depth buttons on the Grading screen. Units will be either inches or centimeters depending on the Measurement System selected.
9	**Auto Nudge Max Cut**	To optimize Auto Nudge's performance, adjust this parameter to match your equipment's maximum comfortable cut depth in a single pass. The units of measurement (inches or cm) are determined by the selected Measurement Unit setting.
10 + 11	**Response Sensitivity (Raising /Lowering)**	The Response Sensitivity settings for Raising and Lowering allow fine-tuning the PWM valve's reactivity during manual control, specifically when pressing the raise/lower buttons on the Grading screen continuously. The selectable range is 1 to 9, with a default of 5. This adjustment is only necessary if the implement responds too quickly or slowly to the manual raise/lower buttons. A lower value reduces the valve's operation speed, while a higher value increases it. A setting of 9 delivers maximum flow at the valve almost instantly but can lead to unwanted movements and make it challenging to lower to a specific depth. However, this setting does not affect the hydraulic response speed or movement during automated grade control, which is influenced by the Valve DC settings.
13 + 14	**Min. and Max. Valve DC**	**Min Valve DC and Max Valve DC Settings:** ● Advanced settings for fine-tuning hydraulic response during automated grading.

- Modify the duty cycle algorithm to control the PWM valve.
- Careful adjustment ensures a balance between rapid action and precise control.
- Goal: drive the cutting edge quickly to its target without overshoot and continual rapid adjustments.

Min Valve DC Setting:

- Controls the initial speed of valve energization and 'ramp-up'.
- Determines the start of the response curve for elevation changes.
- Lower values: slower valve responses and flatter curve.
- Higher values: faster responses and steeper curve.
- Default: 300, suitable for most scraper applications (try 250 or lower for smaller implements).
- Increase if initial hydraulic response is too slow or for larger hydraulics.
- Decrease if the implement overshoots the target height

Max Valve DC Setting:

- Modifies the valve's responsiveness to significant elevation changes.
- Determines the continuation of the response curve.
- Impacts the algorithm when the implement begins to climb and the Control Module lowers the blade.
- Default: 700, suitable for most scrapers and larger blades/levelers, but reduce to 600 or less for smaller machines if movement is too jumpy..
- Gradually increase to 750 or 800 for bumpy ground and quicker response.
- Higher values may make the machine appear more 'jerky'.

		Important Considerations: - Always adjust in small increments to avoid unexpected results. - Start by increasing Min Valve DC in increments of 25 to 50 until the optimal setting is found. - Typically, exceeding 400/850 Min/Max values is unnecessary and may cause jerky movements and overshoot. **GPS Accuracy Impact:** - GPS accuracy affects the effectiveness of these settings. - With lower accuracy GPS, increasing the settings may lead to excessive up/down movements as the implement compensates for GPS drift. - Try reducing the Min and Max values (e.g., to 200 and 400) to reduce the impact of GPS inaccuracies, but slower responses may result meaning you should drive as slowly as possible.

Item #	Title	Description
15	**Map Marker / Log Interval Distance**	The Map Marker / Log Interval Distance parameter represents the distance that needs to be traveled before the painted coverage on-screen is updated. This parameter is also used to define the logging interval when surveying with Ditch Assist. The default is 10 feet, and usually it is not necessary to change this value.
16	**Over-Depth Indicator**	The Over-Depth Indicator setting provides an optional feature that allows you to mark areas on the map with yellow coverage indicators when you dig excessively deep. We don't recommend turning this on if you are using Auto Nudge.

17	**Grade Level Alert**	The Grade Level Alert is designed for manual operation, and for Ditch Assist X operators, this will turn on an audible 'beep' whenever your blade or bucket edge is within the on-grade deadband. Your tablet's volume will need to be turned up to hear the alerts.
18	**Log Alert**	When the Log Alert setting is activated during a survey, an audible "bing" will sound each time a point is recorded. This feature is particularly useful in whole-field topo surveys, as it promptly notifies the operator of any interruptions in the survey logging process. This immediate notification helps prevent missed data and wasted time, ensuring the accuracy and efficiency of the survey.
19	**Draw Markers on Map**	Toggles ON/OFF whether grading coverage is painted to the map. Can be useful to turn OFF if your tablet is having issues rendering the map (though this should generally not be an issue for most newer tablets)
20	**Commands to Controller**	The Control Module can be toggled ON or OFF to energize the PWM valve. This setting allows you to disable automated control without affecting the normal use of the app. For instance, when operating manually or for an extended period, you may choose to turn off automation. However, accidentally unchecking this setting will result in the loss of automatic and manual hydraulic control via the app. Therefore, it is crucial to ensure that this setting is checked if you experience any loss of control.
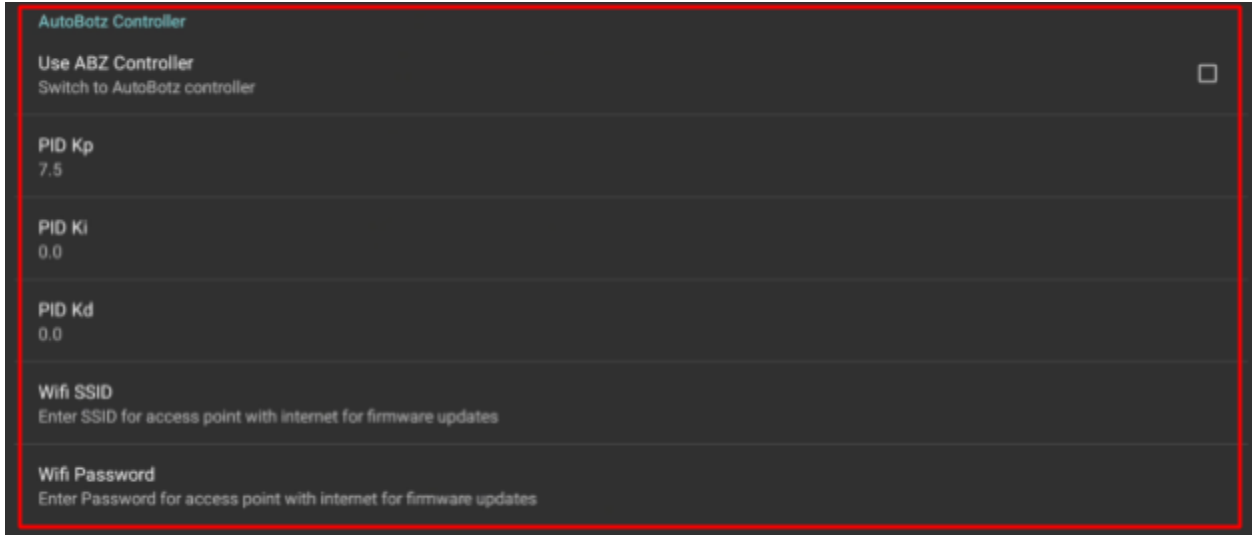
AutoBotz Controller Section

Please note that this feature is currently under development and not yet functional. Changing any of the provided settings will not impact the performance of your Ditch Assist system. To ensure proper connectivity between the app and the Ditch Assist Control Module, refrain from checking the box that enables the Use ABZ Controller option.

Item #	Title	Description

21	**Show GNSS Info Panel**	You have the option to enable or disable the GNSS Panel on the Grading screen as per your requirements. For instance, some users prefer to turn off the GNSS info panel to increase the size of the map for better visibility.
22	**Show Map Panel**	You have the option to enable or disable the Map Panel on the Grading screen as per your requirements. For instance, if you don't use the map, you might choose to hide it to allocate more screen space to other panels.
23	**Show Mode Panel**	Testing feature our Devs use - you shouldn't need to change it!

Ditch Assist App Overview
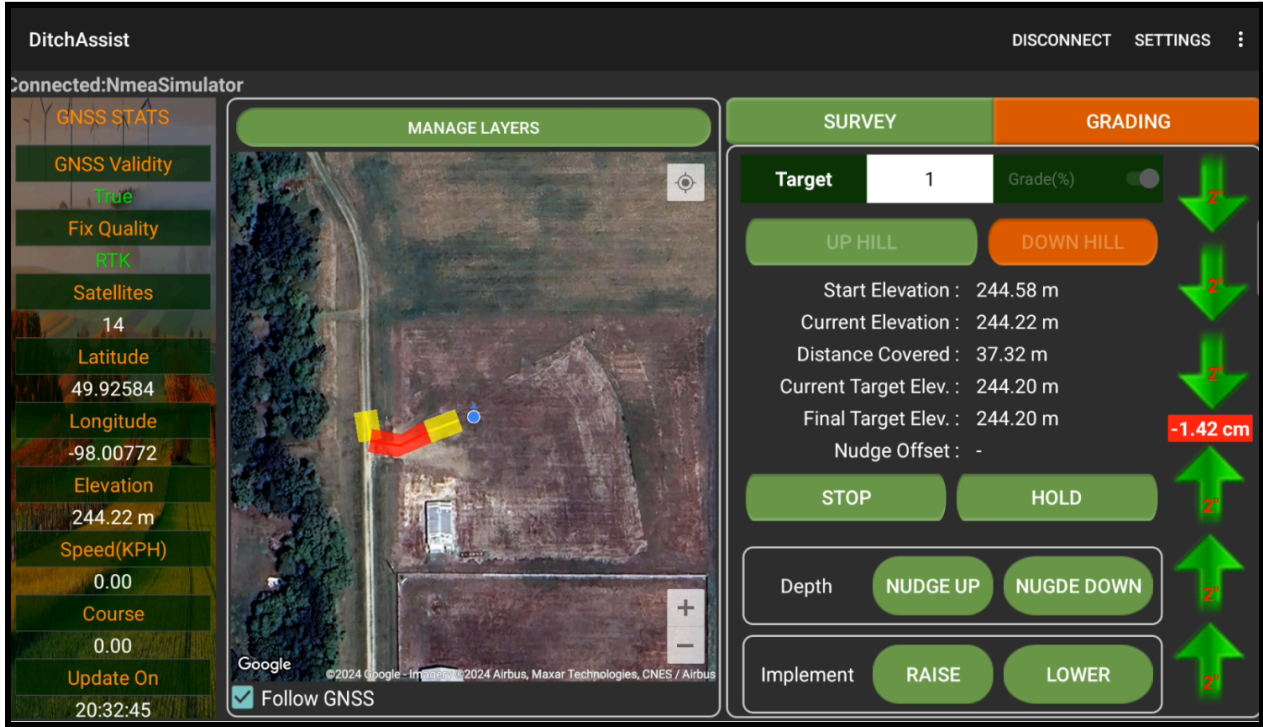
The Ditch Assist App is an Android-based application designed to operate on 10-inch or larger Android tablets. It is important to note that the app is exclusive to Android devices and is not compatible with iPads or Windows tablets.

Downloading and Installing the App

To obtain the Ditch Assist App, simply search for 'Ditch Assist' in the Google Play Store. Alternatively, you can manually download and install the app as a third-party application through the following page on the Ditch Assist website: https://www.ditchassist.com/app-releases/. Additionally, legacy and beta releases are made available on the website.

The Role of the App in the Ditch Assist System

The app plays a pivotal role in the operation of Ditch Assist. Unlike other systems that employ a display with embedded software, Ditch Assist utilizes an app to maintain affordability, enhance functionality, and facilitate simple field updates. The app connects to the Ditch Assist Control Module (typically installed on the implement) via Wi-Fi. The control module, in turn, is connected to the proportional valve (where applicable) and an RTK

GPS/GNSS receiver that provides positional information relative to the implement's cutting edge.

App Modes of Operation

The app features two primary modes of operation: Survey and Grading.

Survey Mode

In Survey mode, the operator drives along a proposed drain route or an entire field (if collecting mapping data for drainage design software). The app records data that can be utilized for drain design through the app's Slope-IQ features. Alternatively, the collected data can be exported in a text format for use in other software applications.

Grading Mode

In Grading mode, the app calculates a target elevation at the machine's current location. This elevation can be based on a survey and design using Slope-IQ or an imported land level or land forming design. The app then transmits this parameter to the Control Module, which adjusts the implement's height via hydraulic valve control.

App Layout Overview

The Ditch Assist App has been designed to be simple to navigate and learn, while providing advanced functionality.

App Screen (SURVEY TAB SELECTED)
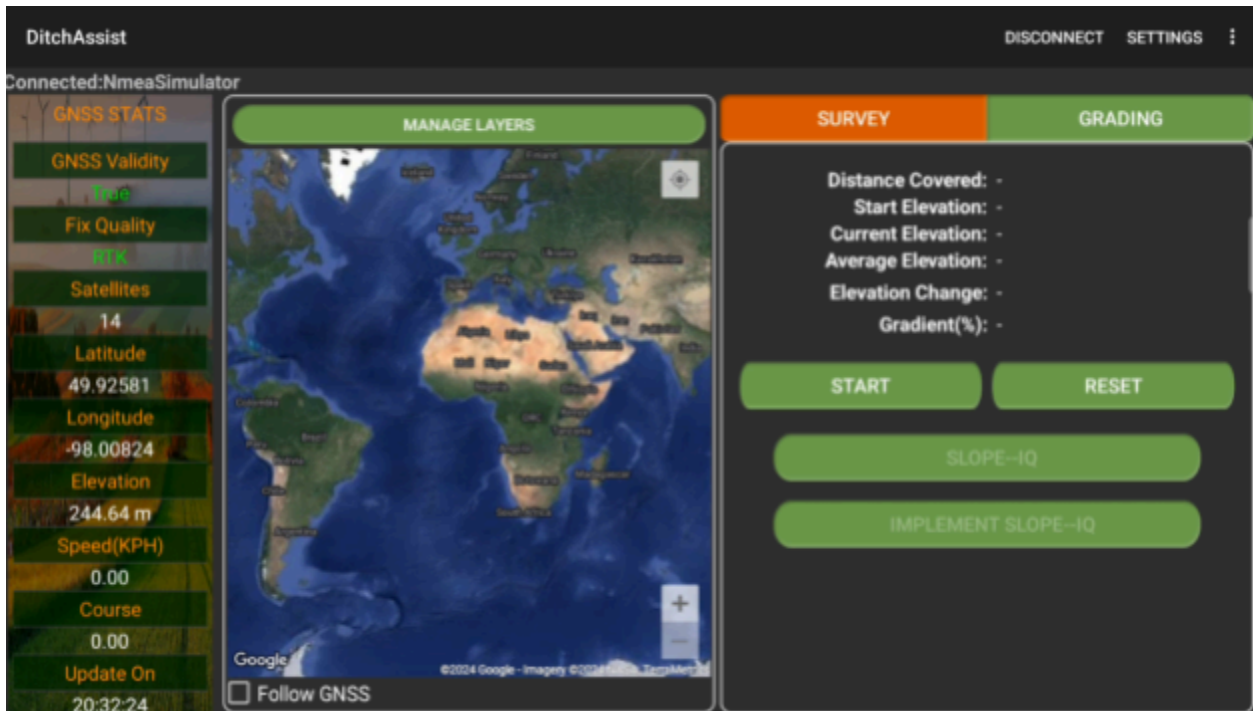
App Screen (GRADING TAB SELECTED)
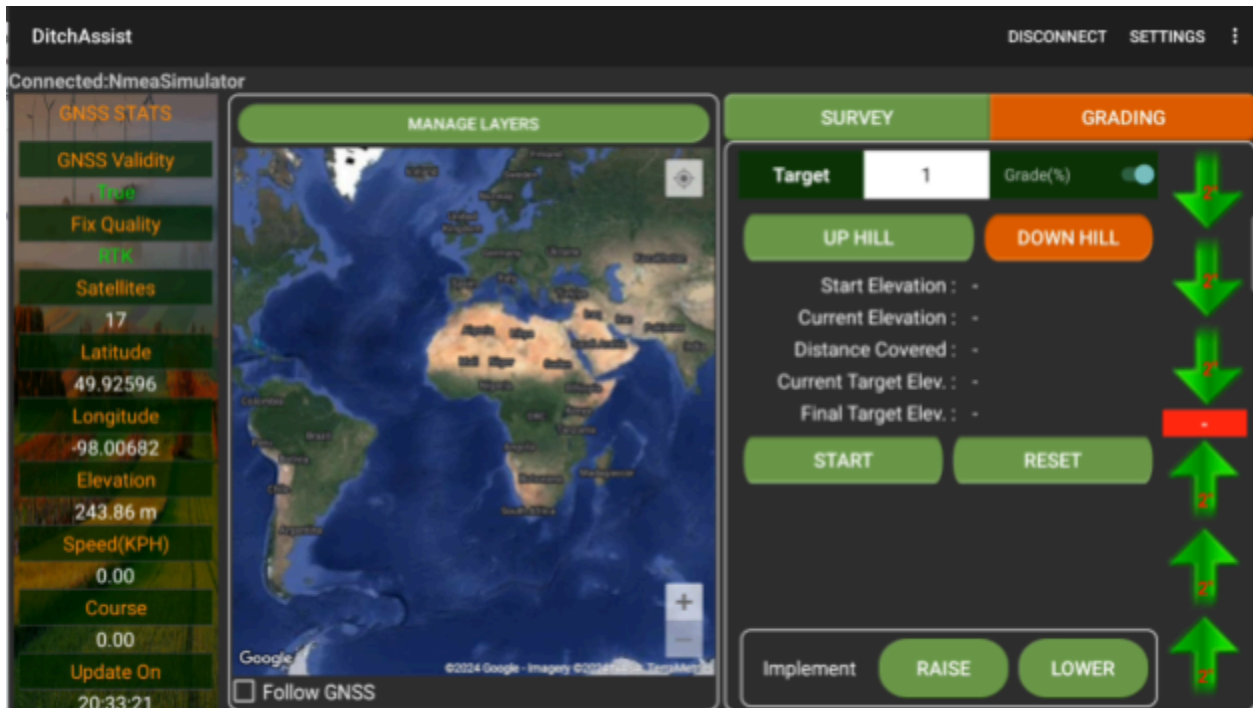
App Layout and Controls Explained

Initial View
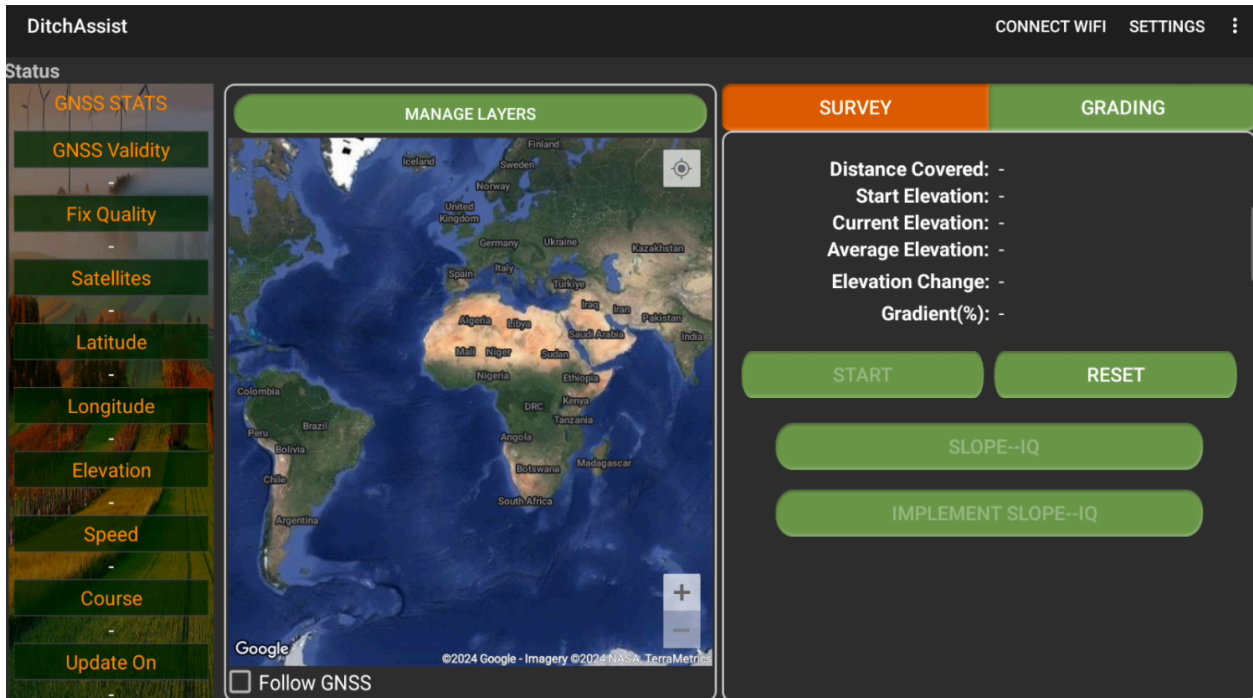
When first started, the above view will be provided (note you may not see satellite imagery in the map if your tablet isn't connected to the internet, or hasn't connected for a while).

Status

Information in this bar shows whether the app is connected to a Ditch Assist Control Module. Once you've tapped Connect WiFi, the serial number of the connected Module will display here if the connection is successful.

CONNECT WIFI

When the tablet is connected to the Ditch Assist Control Module's WiFi access point, tapping this control prompts the App to connect to the Control Module. It tries to connect to it, and if successful, the Status info (as explained earlier) will be updated. If a valid GPS/GNSS position is available from the GPS receiver connected to the Control Module, the GNSS STATS should also appear at this point.

GNSS STATS

GNSS Validity

Indicates whether valid GPS/GNSS messages are being received. Parameters are True or False.

Fix Quality

The reported fix quality based on the GGA NMEA messages being received. A numerical character at field #6 in the GGA message provides this information:
- 0: Fix not valid
- 1: GPS fix
- 2: Differential GPS fix (DGNSS), SBAS, OmniSTAR VBS, Beacon, RTX in GVBS mode
- 3: Not applicable
- 4: RTK Fixed, xFill
- 5: RTK Float, OmniSTAR XP/HP, Location RTK, RTX

You'll want to be seeing **RTK** here, indicative of a value of 4 (RTK Fixed), but some receivers using derivatives of RTK may use a value of 5 (RTK Float) or even 2 (Differential GPS) when they reach their full accuracy.

Satellites

Number of satellites being used in the position calculation by the GNSS receiver.

Latitude

Latitude in Decimal Degrees

Longitude

Longitude in Decimal Degrees

Elevation

Adjusted GPS elevation in metres or feet (depends on Measurement Units selected in Settings). Note that this value is adjusted from the raw data coming from the GPS to account for any value entered in the *GPS to Blade Height / Calibration Facto*r setting.

	Speed Speed of travel in either MPH or KMH depending on Measurement Units setting. This will only populate if the VTG message is enabled. **Course** Course of travel in degrees. This will only populate if the VTG message is enabled. **Update On** The UTC timestamp of the most recent valid GPS/GNSS message received. The seconds component of this message should change approximately every second, indicating that you are receiving frequent and consistent updates of your GPS position. If it does not update for several seconds, it could be a sign of an issue.
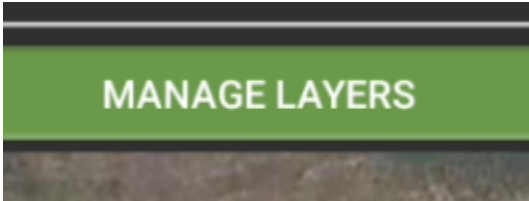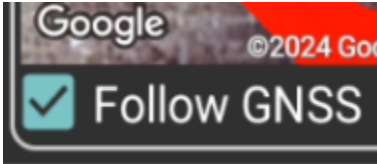
Map Window

	Map Overview The Ditch Assist application incorporates a Google Earth Map Window with the following features and functionalities: • Displays the current position on the map as an icon, based on the GPS/GNSS connected to the Ditch Assist Control Module. • Map can be panned and rotated three-dimensionally using one or two fingers, similarly to the mobile versions of Google Maps and Google Earth. • When connected to the internet, the application retrieves and caches satellite imagery of any locations you navigate to, such as your fields.

	This enables offline access to the cached imagery when you are in the field and connected to the Ditch Assist Control Module, which lacks internet connectivity. It is important to note that Android may occasionally purge the cache, requiring you to repeat the process to re-save the imagery. ● Additional map layers can be loaded on top of the background map imagery to assist in navigation and parameters. These layers include images like contour maps or cut-fill maps, as well as vector KML layers like designs or flow maps. ● In specific regions, the Ideal Drainage Mapping layer can be downloaded through WMS, saved, and loaded as a map overlay in future use.
	Manage Layers Button Used to open the Manage Layers function (see section devoted to this function)
	Follow GNSS Toggle When checked, the map will either zoom to your current location (if currently zoomed out), or lock the current zoom and panning angle. In both cases, the map will automatically pan as you drive.

SURVEY Tab

Distance Covered

Straight line distance between survey start location and current position. Note that this value does not take account of curvature in your driving route, and has no effect on Slope-IQ designs.

Start Elevation

Elevation at the location a survey was commenced

Current Elevation

Elevation at current location

Average Elevation

Average value of all elevation readings taken during the survey to the current time

Elevation Change

Difference in elevation values between survey start point and current location. Value may be positive or negative

Gradient

Gradient in % between start point location and current location. Note that this is the straight line gradient, and does not account for curvature in the driving route.

START Button

Toggle to START/STOP a survey

RESET Button

- Erases current survey parameters from memory and prepares system to run a new survey.
- Long pressing this button will delete

	the survey route markers from the map
	SLOPE–IQ Button
	Becomes enabled when a survey is completed (when STOP is pressed), and opens the Slope-IQ design tool.
	IMPLEMENT SLOPE–IQ Button
	- Becomes enabled when a valid design has been applied via the Slope-IQ design tool or customizer. - Loads the Slope–IQ design to the Grading Engine and opens the GRADING Tab

GRADING Tab

View when using Manual Nudge

View when using Auto Nudge

Functions Detail

1. Slope-IQ Profile Graph
   a. Enabled when implementing a Slope-IQ or customized design.
   b. Vertical axis (Y) represents elevation, horizontal axis (X) represents distance along the originally driven survey route.
   c. Shows the original survey profile (orange) and design profile (green).
   d. A small X icon indicates the current position in both X and Y.
2. Manual Setting Controls
   a. Used when not using a Slope-IQ or imported land leveling design to enter a single grade to implement.
   b. The user can manually enter a target grade (e.g., 0% (for a level area), 0.1% OR 1%, etc.)
   c. Must also set the slope direction (uphill or downhill - see the next section).
   d. Alternatively, the user can toggle between target grade and target elevation.
   e. Where target elevation is selected, you can input an elevation value, and the hydraulics will be adjusted to target this elevation constantly.

3. Uphill / Downhill Toggle
    a. Only used where manual settings (as above) are being implemented. Has no effect for Slope-IQ or imported land-level designs.
    b. Used to select whether the grade to be implemented is uphill or downhill from the starting location.
    c. Assuming 'Uphill' is selected, the system will assume that the operator will start at the lowest end (outlet), lower their implement to ground level, and tap START. The system will compute and implement the target grade based on it being uphill from the start location.
4. Grading Statistics
    a. Similar to statistics shown on Survey tab
    b. Also provides information on Current Target and Final Target elevations
        i. In the event that Nudge or Auto Nudge is being used, the Current Target is the adjusted target elevation for the current pass. For example, if the cut is too great for a single pass, you'll either manually or automatically nudge up to a cut depth that is manageable. This will be the Current Target Value.
        ii. Final Target Elevation is the finished grade elevation as per the design. On the final pass, the Current Target and Final Target Elevations should match, meaning the design has been implemented as desired.
    c. When using Manual Nudge, you'll see a parameter informing you how many inches or cm you are currently 'Nudged' from the Final target Elevation
    d. When using Auto Nudge you'll see the current pass number. Auto Nudge will adjust the Current Target each time you increase the nudge pass, until the Final Target can be achieved based on Auto Nudge parameters (see Auto Nudge chapter for more information).
5. START/STOP HOLD/RELEASE RESET Buttons
    a. Start and Stop Grading Mode by tapping the START / STOP button. This will enable or disable visual grading guidance on screen and automated hydraulic control.
        i. Press STOP at any time to disable hydraulic control and stop displaying grading guidance and statistics on the screen, for example at the end of the run, or when needing to take manual control to empty the scraper, etc
        ii. Operating manually via the hydraulic bypass circuit without pressing STOP or HOLD will mean you will be fighting the automation, and as you raise the implement manually, the automatic control will be trying

to lower it again!

b. Button to the right of START/STOP is RESET when no grading functions are active. Reset will remove currently loaded grading design or parameters from memory and ready the system for a new design or manual parameters. Long pressing RESET also removes as-applied markers from the map screen

c. When grading operation is active, this button becomes HOLD/RESUME toggle
   i. HOLD will stop all hydraulic control functions (valve will not operate) but still display on-screen guidance and statistics - useful when operating manually so you can still see how far from final grade you are
   ii. RESUME will resume auto grading hydraulic control and the valve will begin controlling implement height again

6. Manual and Auto Nudge Controls
   a. In Manual Nudge (6a) use these buttons to Nudge Up or Down
      i. For example, if the cut depth is too much for one pass, you can manually Nudge Up to a more suitable depth, then in future passes Nudge Down again until you hit the final target
      ii. Values for inches or cm per press of these buttons can be changed via Settings
   b. In Auto Nudge (6b) use these buttons to increase the Pass Number
      i. For example, if Auto Nudge Max. Cut value is set to 2-inches, then on Pass #1 you will never go deeper than 2" below the original survey elevation. On pass #2, the implement will be allowed to go up to 4" deeper, and so on.
      ii. Values for Auto Nudge Max. Cut can be changed in Settings

7. Implement Manual Raise and Lower Buttons
   a. The App can be used to manually raise and lower the implement by pressing and holding RAISE or LOWER
   b. Used to verify control during initial setup
   c. Most operators choose to operate manually via tractor controls using bypass, but optionally the app can be used instead
   d. Duty Cycle (speed of response) can be adjusted via Settings

8. Vertical Lightbar
   a. Similar to a steering lightbar, this tool indicates whether you are on-grade or how far off-grade you are.
   b. The values represented by each arrow can be adjusted in two ways:
      i. Via the Settings menu.

ii.   By long-pressing each arrow and entering a custom value for it in inches or centimeters.

Adding Map Image Overlays

Ditch Assist supports the use of both geo-referenced imagery using the WGS84 geographic CRS and KML file overlays (the native format of Google Earth). Both formats can be exported from GIS applications such as QGIS.

KML Reference Layers

Reference layers, such as flow routes and drainage designs, can be imported and overlaid onto the map screen in KML format. The reference data should be in polyline format without excessively complex geometry, as very large files may cause the app or tablet to freeze.

How to Import KML Layers:

- **Save KML Files**: Save the KML files directly onto the internal memory of your device.
- **Manage Layers**: Open the Ditch Assist app and navigate to the map window.
  - Tap the Manage Layers button.
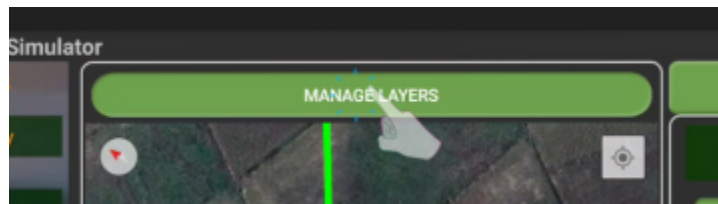
  - Select ADD.
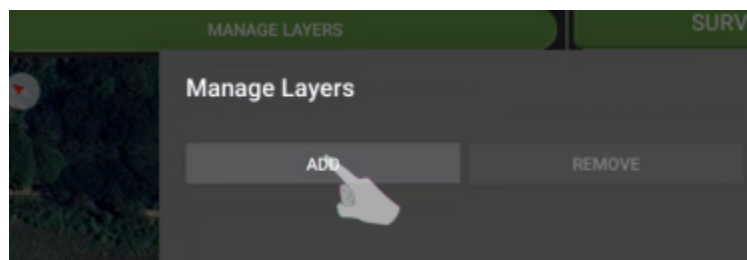
  - Select KML File type
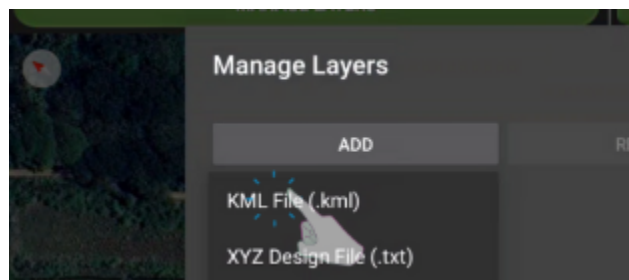
- **Choose KML File:**
  - Browse for and select the KML files you want to add.
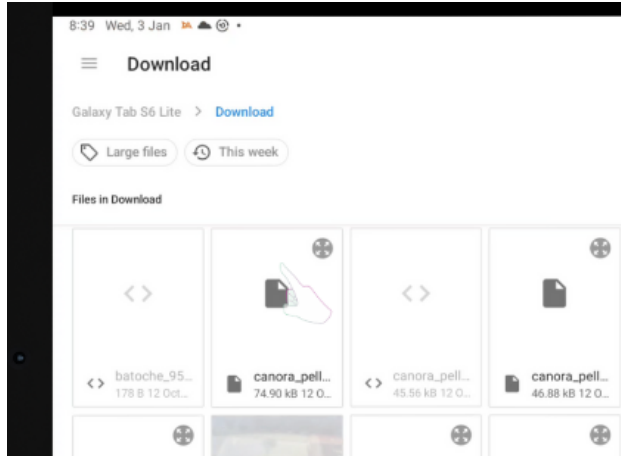
- **Return to main screen**
  - Use the tablet's Back button to return to the main screen and load the layer
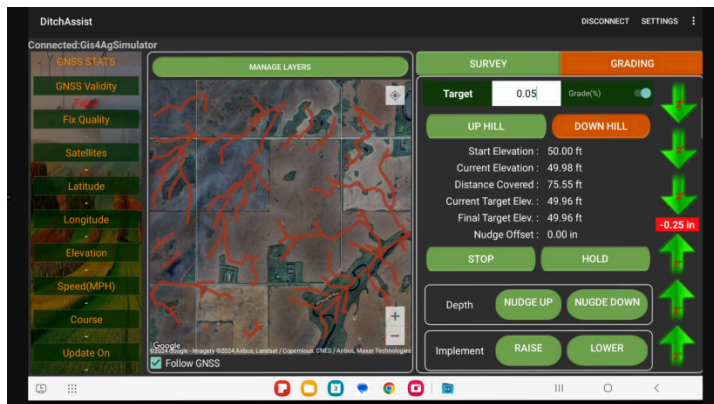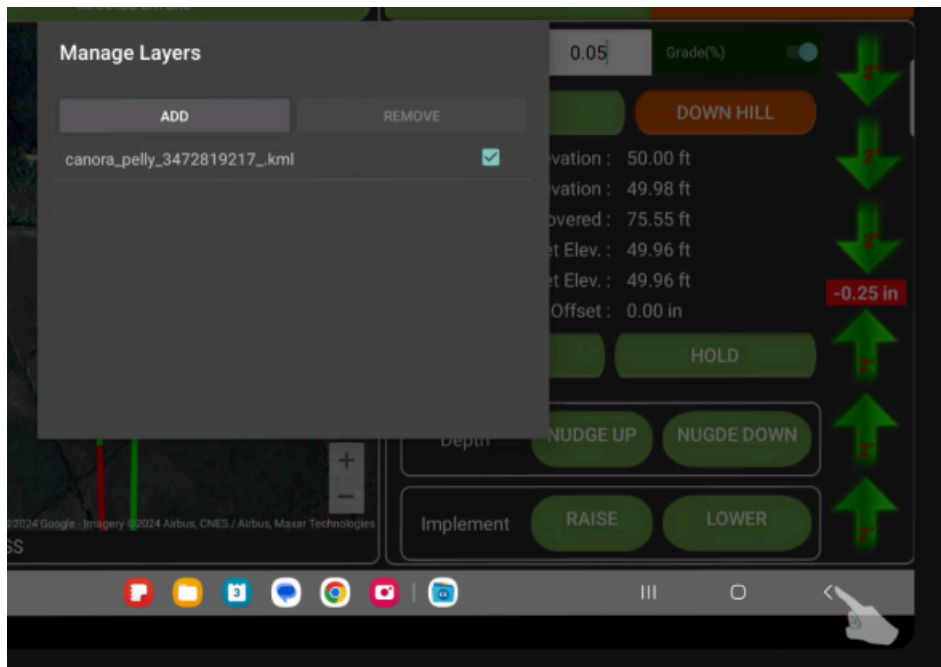
How to Format Image Reference Layers (JPG, PNG)

Ditch Assist supports georeferenced image overlays in both PNG and JPG formats. Typically, the JPG format offers the best balance between image quality and file size. It is important to note that the required coordinate reference system (CRS) for these images is Geographic WGS84 (EPSG:4326), rather than the more commonly used projected CRS (such as UTM) in GIS applications.

To properly use these images, they must be exported from your GIS application using the EPSG:4326 WGS84 geographic coordinate system. Each image file should be accompanied by an associated world file (.pgw for PNG, .jgw for JPG). For instance, if you have an image named sample_image_overlay.jpg, you should also have a corresponding sample_image_overlay.jgw file.

Both files must be transferred to your device and selected for import into Ditch Assist. For your convenience, we have developed a simple tool that allows you to georeference any JPG image, including pictures, screenshots, maps, or other reference layers. For more information and to access the tool, please visit https://www.ditchassist.com/geo/.

Importing .JPG and .PNG Image Overlays

To import image overlays in .JPG or .PNG formats into Ditch Assist, follow these steps:
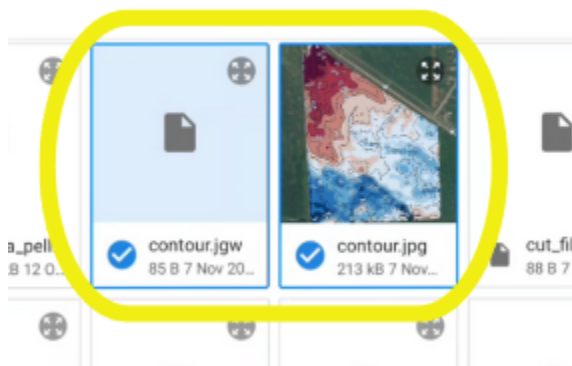
- **Generate Reference Layers:**
  - Ensure your image files are georeferenced and saved on your device. Each image should have an associated world file (.pgw for PNG, .jgw for JPG). For example, if your image is named sample_image_overlay.jpg, there should be a corresponding sample_image_overlay.jgw file.
- **Store Files on Device:**

- ○ Save both the image and its world file in a location on your device, such as the Downloads folder.
- **Navigate to Manage Layers:**
  - ○ Open the Ditch Assist app and go to the map window.
  - ○ Tap on Manage Layers.
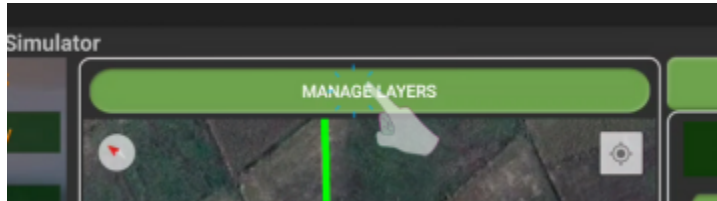
  - ○
- **Add Image File:**
  - ○ Select Add and then choose Image File (png, jpg...).

- Locate and select both the image file and its corresponding world file by long-pressing one file and then the other.
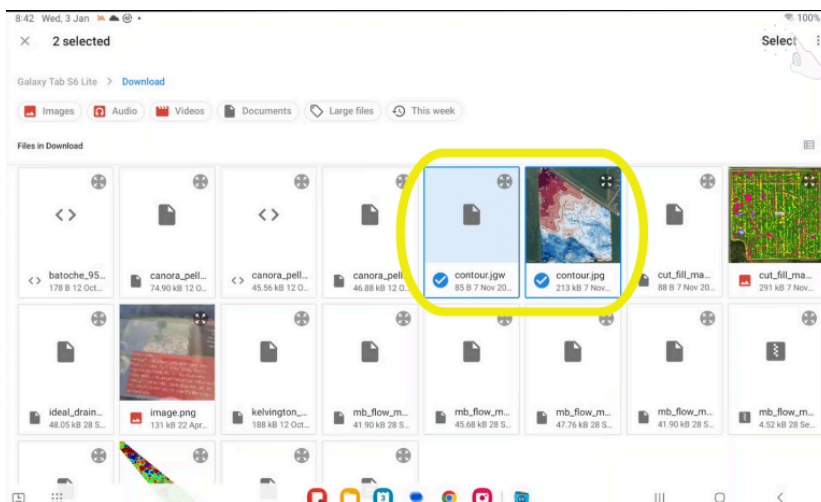
- **Return to Main Screen:**
  - ○ After selecting the files, return to the Manage Layers screen.

○ Use your tablet's Back button to exit the screen.
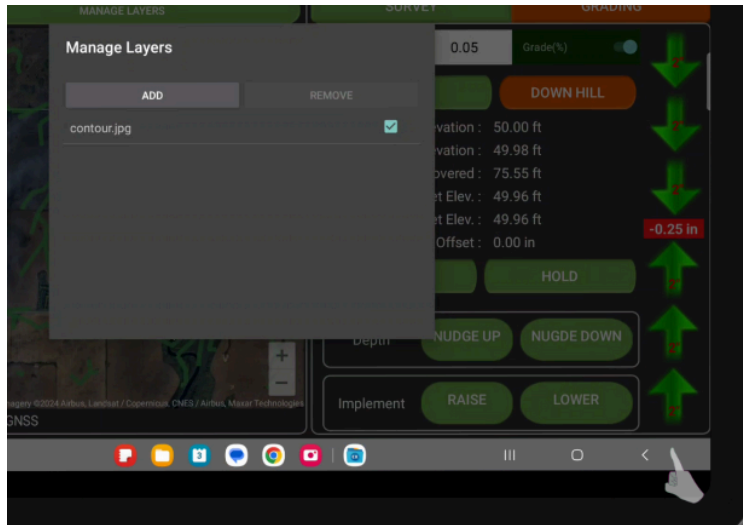
● **Confirm Overlay Addition:**
  ○ If the process was successful, the image overlay will be added to the map.
  ○ The map will auto-zoom to the location of the overlay after a few moments.
  ○ Verify Overlay Position:
  ○ Zoom out on the map to confirm that the overlay is positioned correctly.
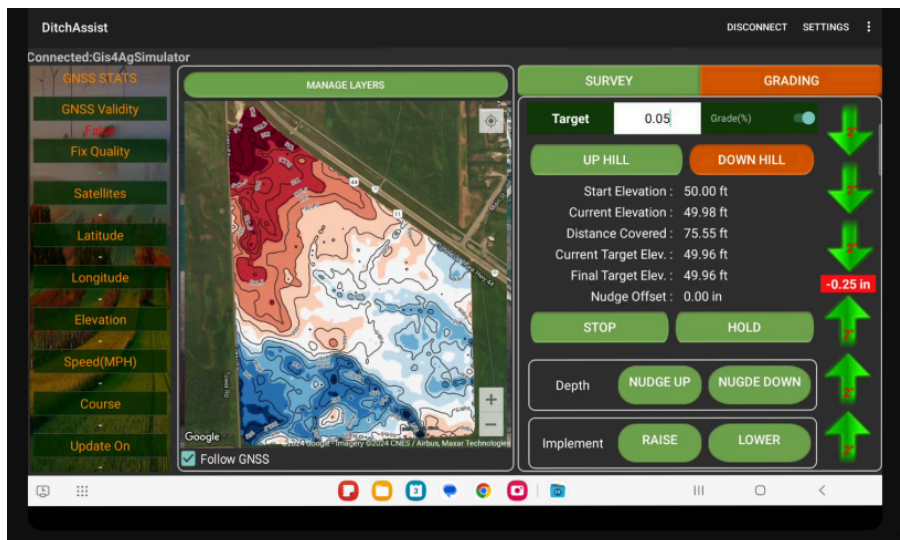
Exporting Survey Data and Work Completed

Ditch Assist automatically logs both survey data and completed work data, storing it directly on your device. You can opt to save the data in a delimited text format (XYZ) or as a KML file through the Settings. For those using Ditch Assist to survey fields for exporting into drainage or land level design software, we suggest using the XYZ text format. This will produce a text file with three columns: X, Y (coordinates in decimal degrees), and Z (elevation in either feet or meters, depending on your chosen measurement system).

However, recent Android updates have modified the permissions regarding how we can write data (such as survey and ditching log files) to the device storage. This has caused some users to experience crashes when the app is unable to write data, even after obtaining the necessary permissions during the initial app setup.

Starting from app version 4.20.5, we have shifted to saving data to the following directory:

Internal (Main) Storage > Documents > Ditch Assist
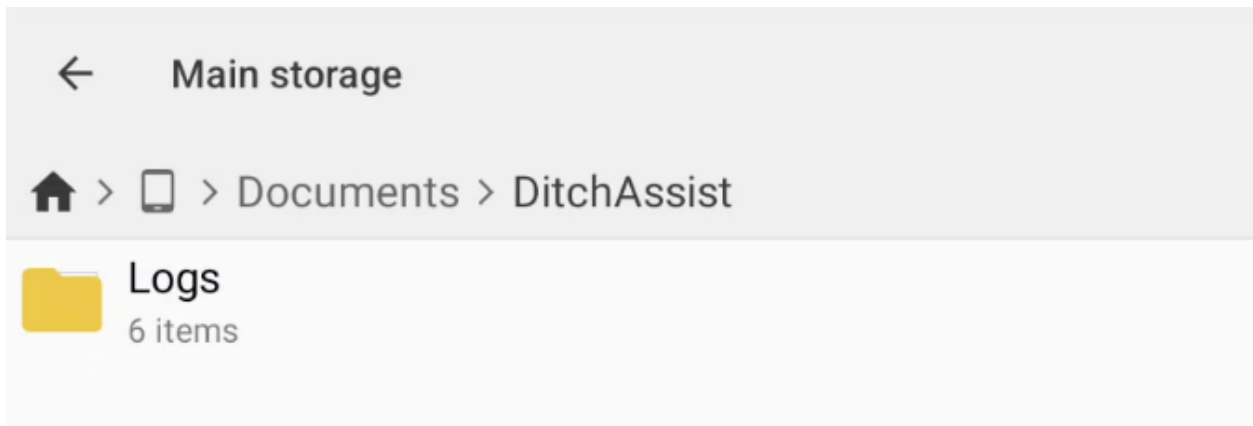
Survey files and as-built data are stored in the Documents > Ditch Assist > Logs folder on the tablet:
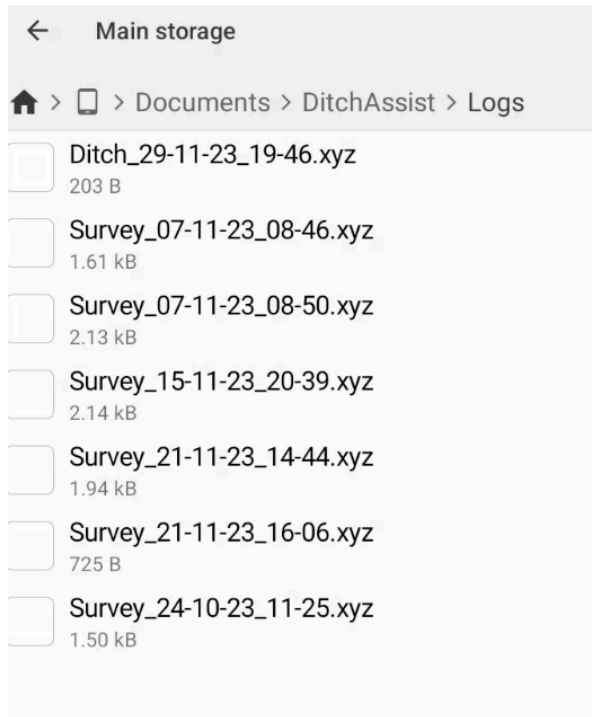
Accessing Saved Work Files in the Ditch Assist Directory

Typically, the built-in file manager on your device cannot access the Ditch Assist directory. To view the files in this location, we recommend installing a third-party file manager app, such as Cx File Explorer, available from the Play Store. Follow these steps:

- **Install Cx File Explorer**:
  - Download and install Cx File Explorer from the Play Store.
- **Navigate to the File Location:**
  - Open Cx File Explorer.
  - Navigate to the Documents > Ditch Assist directory.
- **Grant Permissions:**
  - The first time you attempt to access this location, you might need to grant Cx File Explorer the necessary permissions.
- **Follow the prompts to allow Cx File Explorer to access the files.**

Typical Workflows using Ditch Assist

Conduct a Survey for a Drainage Route or Whole Field

Ditch Assist can be utilized for various purposes:

- Surveying a single run to calculate the grade between points.
- Surveying a single run to design a best-fit or customized surface or sub-surface drain using Slope-IQ.
- Surveying a field or section of a field to gather data for creating a digital elevation model. This model can then be used in desktop GIS or drainage design software.

Regardless of the purpose, the following process should be followed:

- **Enter Survey Mode:**
  - Select the 'Survey' tab located at the top left corner of the screen.
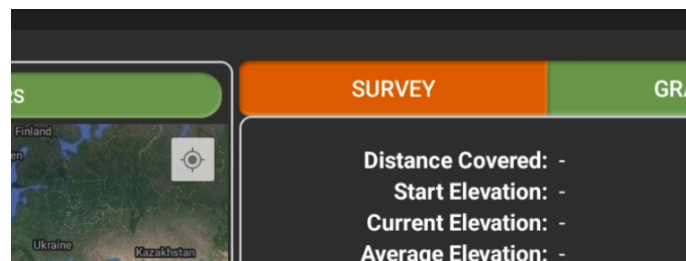
- **Reset if Needed:**
  - Use the 'Reset' function to clear any previous surveys if necessary.
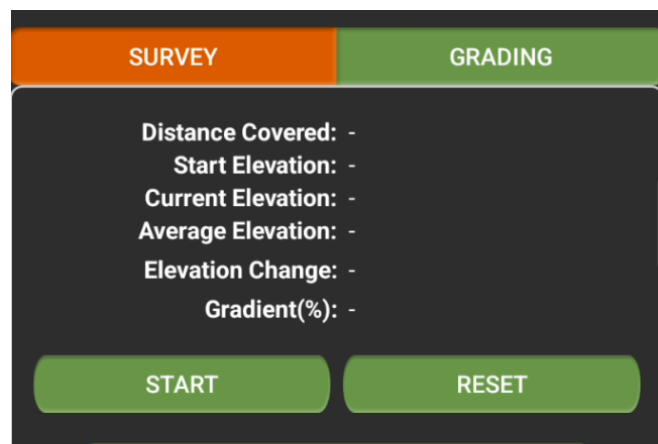
- **Drive to Starting Point:**
  - Navigate to your starting point, which could be either the outlet or inlet location.

- ○ Make sure your implement is raised in i's transport or survey position.
- **Start the Survey:**
  - ○ Press the 'Start' button and begin driving along the proposed path.
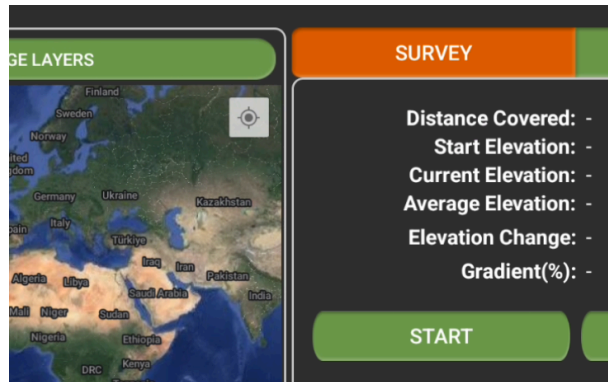
  - ■ If you're gathering mapping data, drive regular swaths back and forth across the field.
- **Flexible Path for Best-Fit Drains:**
  - ○ When creating best-fit drains using Slope-IQ, you don't need to drive in a straight line.
    - ■ Ditch Assist can calculate the best-fit slopes along any path.
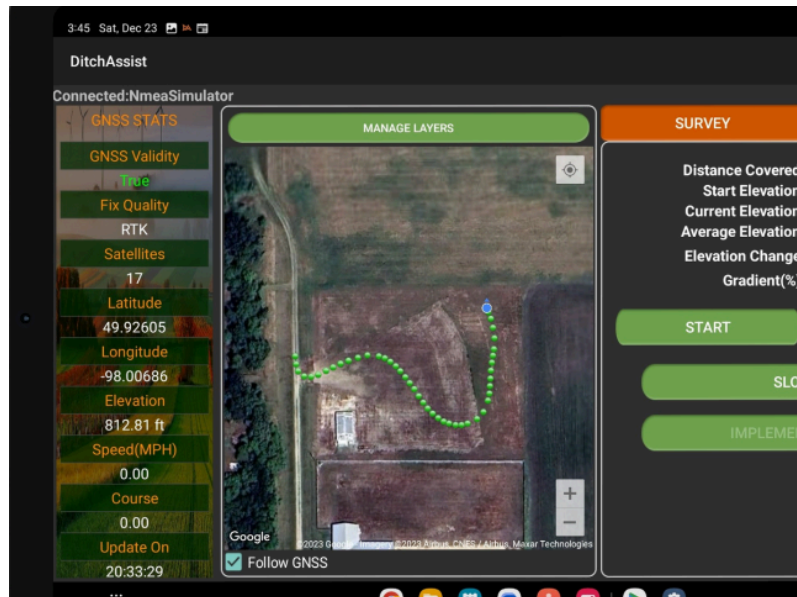
- **Drive Swaths for Field Mapping:**
  - ○ If you wish to collect data to build a digital elevation model (DEM) and/or use the survey data in a drainage or land leveling design software, you should drive the field in regular swaths.
    - ■ Collecting data by driving up and down the field in straight lines will give the best data to use for these purposes.

- Typically, swaths should be 20 to 60 feet apart, but exact requirements will vary by project.
- You may also need to drive along any ridges and valley bottoms to collect comprehensive data in these areas.
- **Stop the Survey:**
    - Press 'Stop' at the end of the survey.

(To access saved survey data navigate to Internal Memory > Documents > Ditch Assist > Logs).

Simple Grading Single Slope

One of the simplest applications for Ditch Assist is to use it like a laser level to create consistent straight grades—for instance, creating a surface drain or installing a tile drain with a consistent 0.1% gradient. A common workflow might look like this:

1. If necessary, conduct a survey of the proposed route to calculate the average grade between point A and B.
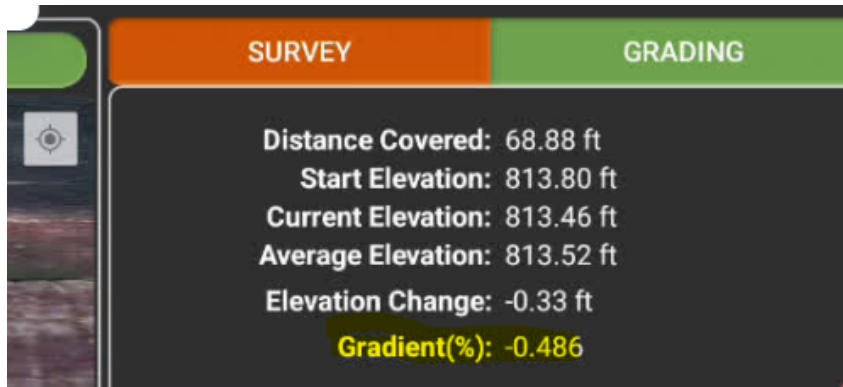
2. Navigate to the Grading screen and input the desired gradient into the Target Grade box.
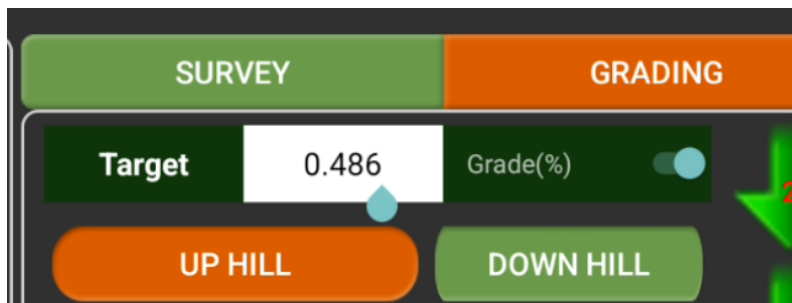
3. Specify the direction of grading—choose uphill if you're starting at the outlet and working toward the inlet, and vice versa.
4. Lower the implement to the desired starting position—this should be on the ground at the location where you intend to initiate grading.
5. Press START and begin grading away from the starting point.
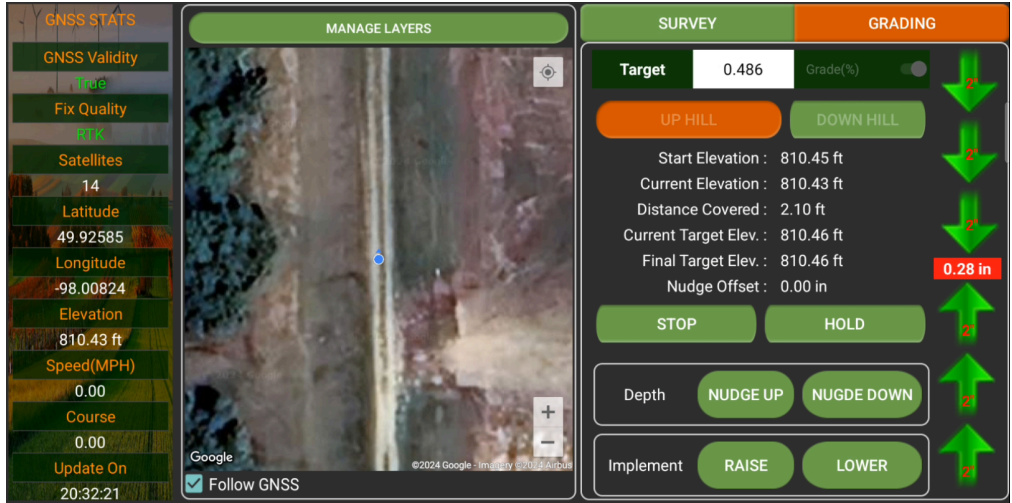
6. As you progress, the system calculates the target elevation based on the distance covered and the gradient you input, using a straight-line distance.
7. Utilize the STOP, HOLD, and NUDGE functions as necessary to empty the pan and tweak the cut depth until the desired final grade is attained.
8. If you need to implement grade breaks along the route, press RESET to erase all previous parameters, input a new grade, and start the process again.

Leveling a Pad or Large Area

Creating a level area is simple with Ditch Assist. Using the method for Simple Grading Single Slope, you can set the finished grade level by either:

- Entering a grade of zero and starting from a location that is already at the required final grade level
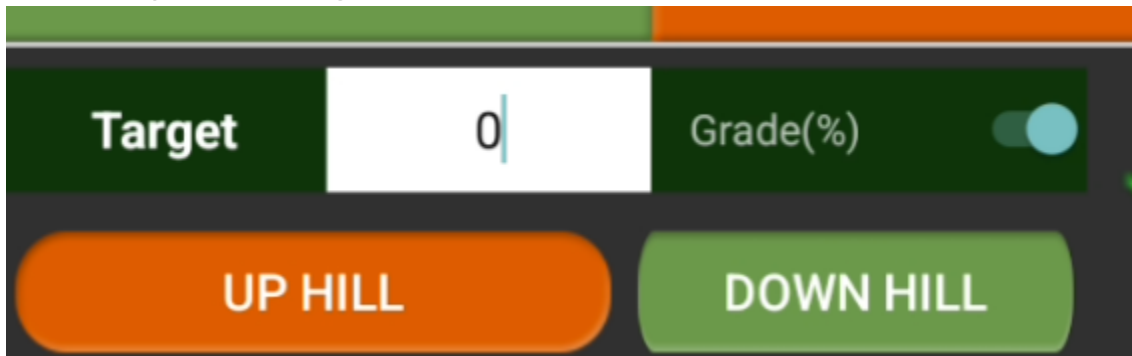
  - or
- Using the method above, and then nudging down to set the final grade level to be a set amount deeper than the start location
  - or
- Entering an elevation value in the Target Grade box by toggling the box to accept an elevation value instead of a grade. In this case, Ditch Assist will use the target elevation you have entered as the Final Target elevation.
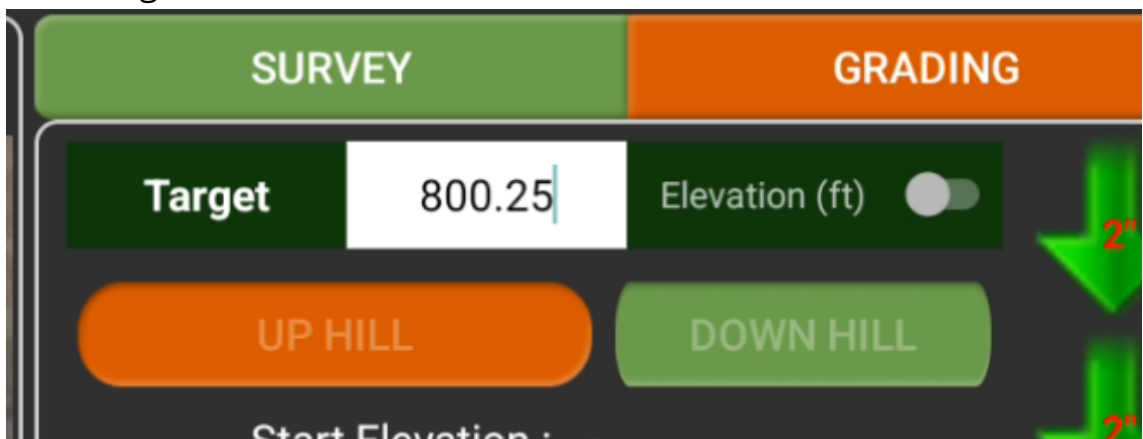
- Hit **START** to begin working

Note: If the elevation value you're using is based on an accurate survey, it's recommended that you carry out a calibration using a known benchmark. Adjust the displayed GPS elevation to match the benchmark elevation by modifying the GPS to Blade Height/Calibration Factor parameter in the Settings. This adjustment ensures your final grade aligns accurately with the original survey.

Using Slope-IQ for Best-Fit and Customized Drain Design

Slope-IQ is a feature designed to create optimal drainage paths, suitable for both surface drains (such as ditches) and subsurface drains (like tile runs). Using the data gathered from a survey (as mentioned earlier), it computes a best-fit solution according to the user-defined minimum slope parameters. Whenever the current landscape poses an obstacle to water flow at the specified minimum slope, Slope-IQ ensures the slope remains at the minimum grade. In essence, it 'cuts' through the obstruction, facilitating a consistent water flow.

Slope-IQ also includes a customizer tool, giving users the power to design their own solutions. When using this feature, any previously specified minimum slope parameters are disregarded. The user can then 'sketch' their desired actions directly on the profile. This feature has been highly appreciated by existing users as it allows them to include fill

areas (e.g., filling a low area instead of carving a ditch from its bottom), and adjust final outlet elevations. This is particularly useful for tile drainage installations, offering superior control over tile depths and slope breaks compared to many other systems.

Using Slope-IQ for Best Fit Drains

Slope-IQ requires the intended route to be surveyed using the Survey mode. Once the survey is finished (after hitting 'Stop'), the Slope-IQ button on the survey screen will become enabled.

You also have the option to import a previously conducted survey and load it into Slope-IQ. To do this, click on 'Manage Layers' on the 'Map' tab, navigate to 'Device' > 'Documents' > 'Ditch Assist' > 'Logs' and find the survey you need based on the date and time. Once it's loaded, the Slope-IQ button will be activated, as described before.

How To use Slope-IQ:

1. Complete a survey or reload a prior survey using the steps outlined above.
2. Press the 'Slope-IQ' button on the 'Survey' screen.
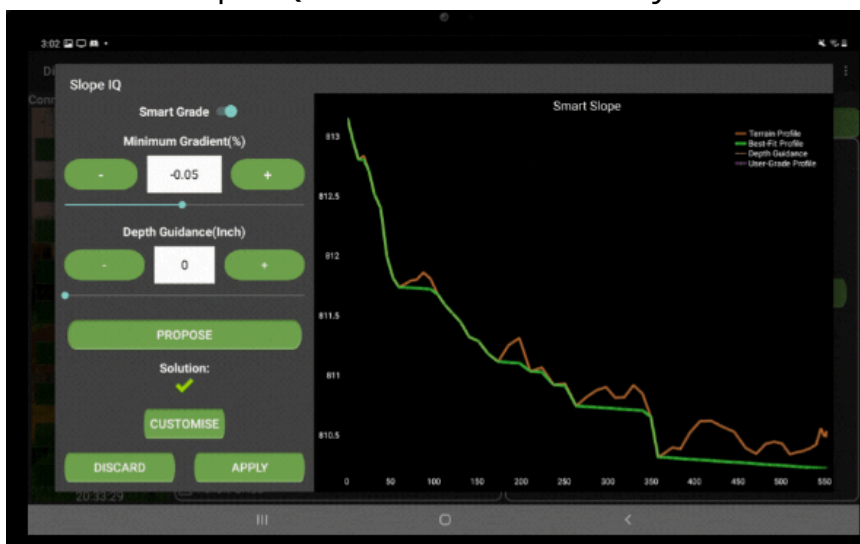
3. Enter a minimum gradient value – this represents the lowest acceptable slope at any point along the run for the new drain, expressed in percentage (%). Generally, values above 0.05% (ideally

0.1%) are considered suitable minimum slopes for surface drains, but the ultimate decision rests with you!

4. The tool assumes the lowest end of the survey is the outlet, defaulting to a positive grade representing a downhill slope from the highest to the lowest points. This assumption is usually correct, but not always. For instance, if you're draining a low point in the field that is lower than the outlet point where the drain will exit the field, you should adjust the minimum grade to a negative value (e.g., -0.05 instead of 0.05). This tells the calculator that you want the higher end of the survey to serve as the outlet point.

5. Optionally, you can input a value for 'Depth Guidance.'

6. This won't affect the calculated solution but will display an additional line on the profile representing the specified depth. This can be useful for visualizing the potential depth of your cuts – when the proposed solution crosses the depth guide line, the required cut will be that depth.

7. For tile drainage installations where you require a minimum and/or maximum depth, this function can be used to confirm the solution is feasible. For example, if your maximum required depth is 6ft and the minimum is 2ft, set a depth guide line at 4ft. If the solution profile crosses below the 4ft line, it means you won't be able to maintain a minimum depth of 2ft AND a maximum depth of 6ft at that location.

8. After inputting your parameters, click 'Propose.'

9. The proposed solution is then shown on a profile (green line) along with the existing topography along the route (orange line), and a grade guidance line (if entered).

10. Where there's enough natural slope, the solution line will follow the land's natural contours.

11. If the natural contours impede maintaining the minimum slope, the solution will display a 'cut' through the region, maintaining the minimum slope.

12. When implementing the drain, you may opt to slightly lower your target elevation to cut a small channel where the solution runs along the natural contours. In this case, remember that your deeper

cuts may also need to be proportionately deeper to maintain the minimum slopes.

13.   If you are satisfied with the proposed solution, press APPLY
14.   Alternatively, adjust your minimum gradient value and click Propose again or create a customized solution (see below).

Once you have created a design using Slope-IQ and clicked APPLY you'll be returned to the Survey Screen. To load the design into the Grading Screen click IMPLEMENT SLOPE-IQ.

Creating a Customized Design Solution using Slope-IQ

Upon reaching Step #7 in the process described above, you can choose to customize the design and create your own. We recommend taking some time to familiarize yourself with the design tool before heading out to the field. This will ensure you understand its operation and functions.

Please note: When opting for a custom design, the original solution is disregarded, and only the design you sketch will be implemented. If you have a long drain and only wish to customize a small section of it, you might prefer to design only that part, then survey the rest and use Slope-IQ to generate a best-fit solution. Alternatively, you can design the entire length – the decision is yours! Just remember, if you don't draw your design from start to finish, there will be gaps in your design where the target elevation will not change. In these cases, Ditch Assist will continue using the last known value from your design as you move away from that location and your drain may have no grade.

In this example, we have chosen to remove a little more of the hill near the inlet point, and will then use this material to fill areas downstream somewhat so that our outlet doesn't need to be deeper than the existing ditch it will drain into.

For greater precision in your designs, we recommend using a stylus when creating custom designs.

Follow these steps to create your design once you have created an initial best-fit design (steps 1-6 above):

1. Click on the 'CUSTOMIZE' button.
2. Click 'START'.
3. Click 'ADD', then tap a point on the profile that represents either the inlet or the outlet of the drain. A point will appear at the location.
4. Click 'ADD' again and repeat the process to add another point. A straight line will be drawn between the two points, representing a proposed cut line.
5. The gradient of the line in % will be displayed to provide you with the gradient information.
   a. To remove a point, tap it to highlight it and press 'REMOVE'.
   b. To move a point, tap on it, press 'MOVE', then tap on the new location on the profile where you'd like to move it.

      c. To clear the entire design and start over, press 'CLEAR'.

6. Once you are satisfied with your design, click 'STOP' then click 'APPLY'.

Once you have created a design using Slope-IQ and clicked APPLY you'll be returned to the Survey Screen. To load the design into the Grading Screen click _IMPLEMENT SLOPE-IQ_. You'll then be taken to the Grading Screen, and when you click Start your design will form the basis for the target elevations.

Implement Land Leveling / Land Forming Designs from Desktop Software
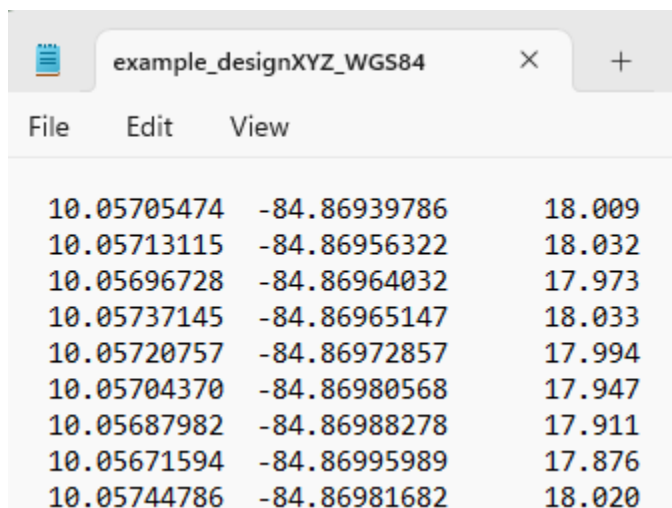
Note that you should switch your Ditch Assist Measurement Units Setting to METRIC for all land leveling tasks where you'll import a land level design

Design File Specifications

Ditch Assist is a very capable grade control system for implementing land leveling designs from several popular desktop software applications. A 3D landforming design must be exported in a tab delimited text (.txt) file format and contain at least the following three columns with no headers:

- **Column 1: Latitude in Decimal Degrees**
- **Column 2: Longitude in Decimal Degrees**
- **Colum 3: Target Elevation in Meters**
  - Note that the target elevation MUST be in meters

When viewed in Notepad or a similar program, the design file will look like this example representing a field in Costa Rica (obviously your coordinates and elevation values will differ):

```
example_designXYZ_WGS84          ×        +

File      Edit      View

10.05705474    -84.86939786        18.009
10.05713115    -84.86956322        18.032
10.05696728    -84.86964032        17.973
10.05737145    -84.86965147        18.033
10.05720757    -84.86972857        17.994
10.05704370    -84.86980568        17.947
10.05687982    -84.86988278        17.911
10.05671594    -84.86995989        17.876
10.05744786    -84.86981682        18.020
```

NEW - AUTO NUDGE AND AUTO CUT/FILL MAP FILE REQUIREMENTS

The above file format will continue to work, however since App Version 4.25.5 we have introduced Auto Nudge and Auto Cut Fill Map generator for land level designs. In order to use Auto Nudge with a land level design, as well as compute a simple cut/fill map that appears on the map at certain zoom levels, we also need to know the original (survey) ground elevations. Therefore, in order to use this functionality, we require the same type of tab-delimited text file, but with the following values:

- **Column 1: Latitude in Decimal Degrees**
- **Column 2: Longitude in Decimal Degrees**
- **Colum 3: Survey/Original Elevation in Meters**
    - Note that these elevation values MUST be in meters
- **Column 4: Design/Target Elevation in Meters**
    - Note that these elevation values MUST be in meters

Latitude in Decimal Degrees	Longitude in Decimal Degrees	Survey Elevation in meters	Design Elevation in meters
49.75923841	-97.89125413	245.258	245.264
49.7592474	-97.89125392	245.262	245.255
49.75925639	-97.89125372	245.259	245.25
49.75926538	-97.89125351	245.257	245.248
49.75927438	-97.89125331	245.248	245.238
49.75921129	-97.89124086	245.228	245.273
49.75922029	-97.89124066	245.242	245.262
49.75922928	-97.89124045	245.26	245.258
49.75923827	-97.89124025	245.247	245.244
49.75924727	-97.89124004	245.243	245.239
49.75925626	-97.89123984	245.239	245.234
49.75926525	-97.89123963	245.236	245.23
49.75927424	-97.89123943	245.237	245.232
49.75928324	-97.89123922	245.235	245.23
49.75929223	-97.89123902	245.215	245.207
49.75918418	-97.8912276	245.202	245.289
49.75919318	-97.89122739	245.221	245.285
49.75920217	-97.89122719	245.241	245.281
49.75921116	-97.89122698	245.26	245.277
49.75922015	-97.89122678	245.273	245.271

Cut/Fill Map Overlay

A cut/fill map may also be imported into Ditch Assist and used for visual reference. See the chapter on Adding Image Reference Layers for more information

Importing and Implementing a Land Leveling / Landforming Design

1. Save the .txt design file to your tablet - the simplest way is to email it to yourself, open the email on the tablet, then save the design into your Downloads folder
2. From the Grading screen, click on **Manage Layers** above the map

3. Click **ADD** and choose the appropriate option
    a. **Choose XYZ Design File** where your file contains only Latitude, Longitude, and Target Elevation values, or
    b. **Choose XYZP | Cutfill Raw File** where your file contains Latitude, Longitude, Survey Elevation, Design Elevation values
4. Navigate to the location you saved the design file and select it
5. You'll be returned to the Manage Layers window. Tap the **Back Button** on your tablet once
6. If the file is recognised as a correctly formatted land level design file, a prompt will appear asking you if you'd like to implement the design. Click **YES**
7. **If your file is detected as containing both Survey and Target elevation values you'll be prompted to choose between Manual Nudge and Auto Nudge**
    a. See the relevant section on Auto Nudge to learn about this feature
8. You'll be taken back to the Grading Screen, and the map will zoom to the design location. Verify the location is correct
9. If required, perform a GPS calibration to ensure the current GPS elevation is calibrated with the original field survey (see below for instructions)
    a. See section below on Auto Height Calibration to learn how to calibrate the machine GPS/GNSS elevation with the original survey elevation or a known benchmark elevation automatically
10. Pressing START on the Grading screen to begin working. Ditch Assist will compute the target elevation value from the design file and constantly adjust the implement hydraulics to meet the target
11. Utilize the STOP, HOLD, and NUDGE functions as necessary to empty the pan and tweak the cut depth until the desired final grade is attained.

Calibrating the GPS Elevation using Auto Height Calibration

Auto Height Calibration makes calibration of the current GPS elevation to the original survey elevation simple. There are two methods that can be used:

1. Loading a XYZ design then driving to a location that will remain unchanged (i.e. have no cut or fill) and calibrating based on the design elevation at that location, or
2. Using a benchmark with a known elevation that was established during the initial field survey, lowering the implement to the benchmark elevation, and then entering the known elevation into the tool

Using the XYZ Design File for Calibration

1. Import the XYZ or XYZP design file into the Ditch Assist App.
2. Navigate to a spot included in the design that won't undergo changes and let the implement rest on the ground. Utilizing a cut/fill map might be useful in identifying an appropriate location.
3. Tap on the three vertical dots at the top right corner of the screen and select 'Auto Height Calibration'.
4. An Auto Height Calibration window will appear, displaying the current design elevation and the present GPS elevation. If these values differ, a calibration factor will also be shown. This value indicates the adjustment that will be automatically applied to the GPS to Blade Height / Calibration Factor parameter in Settings.
5. Tap 'Set'.
6. Confirm correct calibration by pressing START on the Grading Screen. If the calibration is accurate, the off-grade distance displayed on the visual guide deadband should be close to zero, with minor fluctuations due to GPS drift.

Using a Known Benchmark Elevation for Calibration

Using the same process outlined above, this time park with the implement blade at the same elevation as the known benchmark. In the Auto Height Calibration window, toggle the selector to Manual, and enter the known elevation in the same units as shown next to the Current Elevation value (feet or metres). Tap SET and then verify the displayed elevation on the Grading Screen matches the benchmark elevation.

Troubleshooting

Common Troubleshooting Steps

Cannot Connect to Ditch Assist Wi-Fi

You connected the tablet to the Ditch Assist WiFi network, but in the Ditch Assist App you cannot connect to the Control Module (nothing happens when clicking 'CONNECT WIFI').

- ☐ When initially setting up the WiFi connection on the tablet you may need to acknowledge the connection has no internet but you'd still like to connect to it.
    - ☐ *If you see a notification like this, click on 'Always Connect' or similar so the tablet knows you always want to connect to Ditch Assist even though it has no Internet connection*
- ☐ Verify the tablet has not disconnected from the Ditch Assist WiFi and connected to another known WiFi connection that has Internet available
    - ☐ *Go to WiFi Settings and 'forget' all WiFi networks that are not Ditch Assist if this is happening*
- ☐ Confirm Control Module is powered on.
    - ☐ *Confirm that the Operating Status LED is illuminated*
- ☐ Ensure there are no obstructions, particularly solid metal objects, between the Control Module and Android device, or that the distance isn't too great.
    - ☐ *Try bringing the tablet close to the Control Module to eliminate this variable - if still no connection, move on.*
- ☐ Confirm that no other device (e.g. your cell phone) is currently connected to the Ditch Assist Module.
    - ☐ *Only one connection is allowed at one time - if you've previously used your cell phone to connect to Ditch Assist go into the phone settings and 'forget' the connection.*
- ☐ Power cycle the Control Module and force close the Ditch Assist App, then attempt connection again

Wi-Fi Connection keeps dropping

You seem to be losing WiFi connection to the Control Module when working. Automated control keeps cutting out. GNSS information stops updating.

- ☐ Usually caused by same factors listed above
- ☐ Has been reported when using Android devices with inferior WiFi components and slow memory
    - ☐ Try a recommended tablet
    - ☐ Try to bring Control Module closer to the tablet

Pressing RAISE on Manual Control causes implement to go down

When you press the RAISE button on the grading screen to manually raise the implement it goes down instead. Pressing LOWER also has the opposite effect.

- ☐ Reverse the connectors on the Ditch Assist harness that are connected to the PWM valve
    - ☐ Switch the Raise and Lower connectors to the opposite solenoids

DO NOT REVERSE HYDRAULIC FLOW ON THE TRACTOR. THIS ACTION IS INEFFECTIVE AND CAN CAUSE INCREASED PRESSURE IN THE RETURN LINE AGAINST THE VALVE, OBSTRUCTING FLOW WHEN YOU SWITCH BACK TO THE PROPER FLOW DIRECTION.

Difficulty Releasing Hoses from Quick-Release Hydraulic Fittings on the Valve

This issue often arises when the hydraulic flow from the tractor is inadvertently reversed, leading to pressurization in the return line.

It's more frequent during hot weather conditions, but can occur unexpectedly at any time.

- ☐ Ensure the hydraulic flow to the valve is turned off.
- ☐ Use the Ditch Assist App and firmly press and hold the 'UP' manual control, followed by the 'DOWN' control, each for approximately 5 seconds. This action is aimed at balancing the pressure between the tractor and the implement.
    - ☐ *Make sure the Control Module is powered on and the tablet is connected to it before performing this step*
- ☐ If the hoses remain attached, repeat the process until you can successfully release them.

Implement goes back Down after I Manually Raise it

Usually this is because you still have Auto Grading enabled, so the control system is trying to return the blade to the target elevation.

- ☐ Make sure you press the STOP button to disable automated control before manually raising

No Hydraulic Control of Implement

The hydraulics don't move at all either when using manual RAISE or LOWER, or in Auto Grading mode.

- ☐ Confirm valve is correctly connected to both implement raise/lower and tractor hydraulics.
    - ☐ *Consult the valve setup diagram for your PWM valve and confirm correct setup.*
    - ☐ *Verify no couplers popped out of tractor SCVs or valve couplers.*
- ☐ Confirm you have constant flow turned on for the circuit the valve is connected to.
- ☐ Verify solenoids on PWM valve are being energized when pressing manual RAISE or LOWER on the Ditch Assist App.

- ☐ *Usually you can hear or feel the vibration when they are*
- ☐ *Hold a metal object to the solenoids - they will magnetize when energized*
- ☐ Check Min and Max DC Settings in Ditch Assist App Settings.If they are set too low the blade will not move
  - ☐ *Increase the Min Max DC values for auto grading responsiveness.*
  - ☐ *Increase the setting for Manual Raise Lower Sensitivity for manual responsiveness.*
- ☐ Ensure tractor hydraulic flow is turned up enough to move the implement hydraulics.
  - ☐ *Turn UP tractor flow.*
- ☐ Verify hydraulic fittings are not leaking and causing a drop in pressure
- ☐ Are you using a Closed Center valve on an Open Center tractor?
  - ☐ *If so, contact your dealer for solutions*

Implement Hydraulics seem Slow to Respond/Implement will lower but not raise

Often characterized by the implement slowly lowering, but unable to raise against its own weight, particularly with larger scrapers.

- ☐ Turn up the hydraulic flow on the tractor to the valve
- ☐ Be sure you have your hydraulics in constant flow (not in float)
- ☐ Are you using our Closed Center valve on an open center tractor?
- ☐ Increase the MIN and MAX valve DC settings in the App
  - ☐ If these are set too low the valve will never allow enough flow to move a larger implement
  - ☐ Try values around MIN: 400-500 and MAX: 750-800, if nothing happens here then there's likely another issue

No GPS Connection, GPS Not Working, No GPS/GNSS Info Shows in Ditch Assist App

When you hit *CONNECT WIFI* you should immediately see GPS/GNSS info populate in the GNSS Stats tab down the left of the screen. If you don't it could be for one of these reasons:

- ☐ WiFi not connected to Ditch Assist Control Module
    - ☐ *Confirm the tablet is connected to Ditch Assist and not another WiFi network*
- ☐ GPS not connected or configured
    - ☐ *Verify GPS receiver is connected to the Ditch Assist harness and powered on*
    - ☐ *Confirm required NMEA messages (GGA and VTG) have been enabled, and baud rate is set to 38,400*
    - ☐ *Turn OFF any additional messages as these can cause conflicts*
- ☐ Verify GPS messages are being received by the Control Module
    - ☐ *For CAN GPS messages (e.g. Outback smart antennas), the STATUS 1 LED on the module should blink if messages are being received*
    - ☐ *For RS232 NMEA messages (most receivers) the STATUS 2 LED should blink*
    - ☐ *If neither STATUS 1 or 2 is blinking then the Control Module is not receiving valid GPS messages*
- ☐ Confirm correct GPS cable and pinouts for Tx and Rx
    - ☐ *If using DB9 serial cable, try switching pins 2 and 3 (Tx and Rx) on the GPS connector on the main Ditch Assist harness*
    - ☐ *Disconnect the Tx pin (pin 3) on the GPS connector on the Ditch Assist main harness (sometimes having this connected causes signal loops with some receivers, and it is not required as Ditch Assist only needs the Rx and signal ground)*
- ☐ Confirm all pins are correctly seated on GPS connectors and Ditch Assist harness

Keep Losing RTK Fix - Displayed GPS Fix Quality Bounces from RTK to GPS Fix

Your GNSS Fix Quality status keeps going from RTK to FLOAT or GPS Fix. When this happens you lose all grading accuracy and the implement either raises out of the ground or tries to bury itself deep into the ground.

This is usually a GPS issue, not an issue with Ditch Assist as the fix status is determined by the GPS:

- ☐ Make sure your GPS is mounted with a clear sky view and no obstructions to the horizon in all directions
- ☐ Ensure you aren't too far from your base station if using one.
- ☐ If using cellular RTK you may be dropping connection or the network may have high latency
- ☐ If you lose RTK fix when going over very bumpy ground you may have a loose radio or GPS receiver board inside your GPS antenna, or a faulty cable, or you may need to re-design your GPS mount to reduce vibration.
- ☐ Check power to the GPS receiver
    - ☐ Make sure fuses are pushed in on Ditch Assist power harness
    - ☐ Verify power is coming from tractor battery, and power harness is not connected to an auxiliary plug, trailer plug, or power strip
    - ☐ Confirm all connectors are properly seated

I'm using John Deere SF3 or StarFire RTK and Ditch Assist doesn't show I have RTK even when I know I do. It shows DGPS instead.

When using John Deere SF3 or StarFire RTK with Ditch Assist, the app might not display the RTK status even if you are certain it's active. This discrepancy is due to how the GGA message's fix status part is interpreted.

In the GGA message, a numeric value indicates the fix status. For an RTK fix, this number should ideally be '4'. However, John Deere receivers using SF3 or StarFire RTK emit a value of '2' in this field. In industry-standard terms, a '2' is decoded as 'Differential Correction', akin to a WAAS/SBAS type correction, not RTK. Therefore, when Ditch Assist decodes this message, it follows these standards and interprets the '2' accordingly. As a result, the Ditch Assist App displays the status as Differential Correction (WAAS/SBAS) instead of RTK.