Precision-IQ

Application Reference Manual for Supported Displays

Version 5.60
Revision A
September 2018

Trimble

Agriculture Business Area

10368 Westmoor Drive

Westminster, CO 80021

USA

800-361-1249 (toll free in USA)

+1-937-245-5154 Phone

+1-937-233-9441 Fax

www.trimble.com

Email: trimble_support@trimble.com

Legal Notices

Release Notice

This is the September 2018 release (Revision A) of the Precision-IQ documentation. It applies to the version 5.60 of the display software.

Legal Notices

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

Product Limited Warranty

Trimble warrants that this Trimble product and its internal components (the "Product") shall be free from defects in materials and workmanship and will substantially conform to Trimble's applicable published specifications for the Product for a period of two (2) years, starting from the earlier of (i) the date of installation, or (ii) six (6) months from the date of original Product shipment from Trimble. This warranty applies only to the Product if installed by Trimble or a dealer authorized by Trimble to perform Product installation services.

Software Components

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

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

For purposes of this warranty the following definitions shall apply:

(1) "Fix(es)" means an error correction or other update created to fix a previous software version that does not substantially conform to its Trimble specifications;

(2) "Minor Update" occurs when enhancements are made to current features in a software program; and

(3) "Major Upgrade" occurs when significant new features are added to software, or when a new product containing new features replaces the further development of a current product line.

Trimble reserves the right to determine, in its sole discretion, what constitutes a Fix, Minor Update, or Major Upgrade.

Warranty Remedies

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

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

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Official Language

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

Registration

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

Precision-IQ Application

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Safety and Compliance Information

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

⚠ **WARNING –** This alert warns of a potential hazard which, if not avoided, could result in severe injury or even death.

⚠ **CAUTION –** This alert warns of a potential hazard or unsafe practice which, if not avoided, could result in injury or property damage or irretrievable data loss.

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

Warnings

⚠ **WARNING – Auto Guidance**

Auto guidance systems cannot avoid items in the field such as obstacles. Make sure you are adequately trained to operate the auto guidance system.

Many large and sudden changes in satellite geometry caused by blocked satellites can cause significant position shifts. If operating under these conditions, auto-guidance systems can react abruptly. To avoid possible personal injury or damage to property under these conditions, disable the auto-guidance system and take manual control of the vehicle until conditions have cleared.

⚠ **WARNING – Articulated Tractors**

Articulated tractors pivot in the middle. Avoid putting yourself in a position where you could be injured by the pivoting rear section of the vehicle.

⚠ **WARNING – Satellite Geometry**

Many large and sudden changes in satellite geometry caused by blocked

satellites can cause significant position shifts. If operating under these conditions, auto guidance systems can react abruptly. To avoid possible personal injury or damage to property under these conditions, disable the auto guidance system and take manual control of the vehicle until conditions have cleared.

⚠ WARNING – Display

When the temperature of the display case reaches 65° C (149 ° F) the display shows the following: **WARNING! HOT SURFACE, DO NOT TOUCH**. The display will dim the screen until the temperature returns to normal. Use caution when touching the display when this warning is visible.

The display may contain a single-use, lithium-sulfide LiSO2 battery. Do not expose the battery to temperatures greater than 85 °C (185° F) as the battery may vent poisonous gases.

⚠ WARNING – NH_3, Anhydrous Ammonia

Anhydrous valve and flow calibrations require the vehicle and implement to be moving and the implement must be in the ground (the implement lift switch must be down). Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

NH_3 is an irritant and corrosive to the skin, eyes, respiratory tract and mucous membranes, and is dangerous if not handled properly. It may cause severe burns to the eyes, lungs, and skin. Skin, and respiratory-related diseases could be aggravated by exposure. It is recommended that protective gloves, boots, slicker and/or pants and jacket, and chemical-splash goggles that are impervious to anhydrous ammonia are worn at all times. See Working with Anhydrous Ammonia (NH3).

⚠ WARNING – Implement Master Switch

When the implement is down and the master switch or section master is in the On position, the machine is fully operational. Take all necessary precautions to ensure user safety. Failure to do so could result in injury or death.

⚠ WARNING – Calibration

Incorrect adjustment of *Manual Override Sensitivity* could cause this critical

safety feature to fail, resulting in personal injury or damage to the vehicle. Do not to choose a setting that is either too sensitive or not sensitive enough. It is vital to avoid setting the sensitivity so low that the system will not detect any steering wheel motion.

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

⚠ WARNING – Steering

The automated assisted steering system is solely intended for Agricultural use in an open field environment with agricultural vehicles approved by the manufacturer for use with the automated system, and should not be used with any other type of vehicle or for any other purpose.

Contact your local Trimble-authorized dealer or check www.trimble.com to confirm that the automated steering system has been tested and approved by the manufacturer for use with your vehicle make and model.

The automated steering system should not be installed on a vehicle not approved by the manufacturer for such use. Installation of the automated steering system on an unapproved vehicle will invalidate the product warranty.

The steering coulters can move abruptly during the Proportional Steering Gain procedure while the TrueTracker system tests the hydraulic response to the steering commands. These sudden movements can cause collisions with nearby obstacles or cause injury. Be prepared for sudden steering coulter movements.

When you tap the liquid flow, control valve, or fill disk calibration Start button, the machine will become operational. Take all necessary precautions to ensure user safety. Failure to do so may result in serious injury or death.

Material will be dispensed during calibration. Make sure that the implement is safe to operate.

⚠ WARNING – Vehicle Safety

When you are working on the vehicle's hydraulic systems, vehicle attachments that are suspended can drop. If you are working around the vehicle, you could suffer serious injury if an attachment dropped on you. To avoid this risk, lower all vehicle attachments to the ground before you begin

work.

The operator must remain in the driver's seat at all times when the vehicle is in motion and the auto-steering system is engaged.

If someone else attempts to drive the vehicle while you are working on or under it, you can suffer serious or fatal injuries. To avoid this possibility, install a lockout box on the battery terminal to prevent the battery from being reconnected, remove the key from the vehicle's ignition switch, and attach a "Do not operate" tag in the cab.

Vehicle cabs can be quite high in the air. To avoid potentially serious injury through falling from this height, always use the steps and handrails, and face the vehicle, when you enter or exit it.

Agricultural chemicals can pose serious health risks. If the vehicle has been used to apply agricultural chemicals, steam clean the vehicle to remove any chemical residue from the areas of the vehicle where you will be working.

The vehicle will need to move during the Hydraulic Tracked Pump Knees calibration procedure. To avoid injury, be prepared for vehicle movement.

The wheels can move abruptly during the Deadzone calibration or Proportional Steering Gain procedure while the Autopilot system tests the hydraulic response to the steering commands. These sudden movements can cause collisions with nearby obstacles or cause injury to occupants of the vehicle. To avoid injury, be prepared for sudden vehicle movement.

Cautions

⚠ CAUTION – **Batteries**

Battery posts, terminals, and related accessories contain lead and lead compounds, which can cause serious illness. To avoid ingesting lead, wash your hands thoroughly after touching the battery.

Also take care not to short circuit battery with tools and/or by the incorrect fitting of cables as fire, burns, and damage can occur.

⚠ CAUTION – **Calibration**

Obstacles in the field can cause collisions, which may injure you and damage the vehicle. If an obstacle in the field makes it unsafe to continue the Automated Deadzone calibration, stop the vehicle and turn the steering

wheel to disengage the system.

1. Wait until Precision-IQ prompts you that the phase is ready to begin.

2. Look at the screen to determine whether the next phase will require a left or right turn.

3. Reposition the vehicle so that the turn will use the space that you have available.

4. Tap the button to begin the next phase.

The wheels can move abruptly during the Steering Proportional Gain procedure while the Autopilot system tests the hydraulic response to its steering commands. To avoid injury, be prepared for vehicle movement.

⚠ CAUTION – **Chemical Safety**

The system installation may bring you into contact with chemical substances, such as oil, which can cause poisoning. Wash your hands thoroughly after you finish working on the system.

⚠ CAUTION – **Antennas**

The GNSS antenna may experience interference if you operate the vehicle within 100 m (300 ft) of any power line, radar dish, or cell phone tower.

Wireless, cellular, radio, and GNSS signals can interfere with each other. For best performance, mount antennas at least 1 meter away from each other.

⚠ CAUTION – **Display**

Take the following precautions to preserve the integrity of the display.

- If you leave the display powered on after shutting off the vehicle's ignition, the display power can drain the battery.

- Do not attempt to power the display without an appropriate guidance controller module.

- Do not press on the screen with a sharp item, such as a pencil. You may damage the surface of the screen.

- Do not apply glass cleaner directly to the touchscreen.

⚠ CAUTION – **Cabling**

Connecting the Port Replicator of the NavController cable to the P4 or P12

connector of the NavController harness will result in damage to the equipment, and will void the warranty.

⚠ CAUTION – Pressurized Water

Do not direct pressurized water at:

- Electronic or electrical components or connectors.
- Bearings.
- Hydraulic seals.
- Fuel injection pumps.
- Any other sensitive parts or components.

Set the hose pressure as low as practicable, and spray at a 45° to 90° angle. Keep the nozzle of the power washer away from the machine at the distance recommended by the manufacturer.

⚠ CAUTION – Modems

Do not mount the modem in direct sunlight or in areas of high heat. This will cause degraded performance.

⚠ CAUTION – Protective Gear

Always wear protective equipment appropriate to the job conditions and the nature of the vehicle. This includes wearing protective glasses when you use pressurized air or water, and correct protective welder's clothing when welding. Avoid wearing loose clothing or jewelry that can catch on machine parts or tools.

⚠ CAUTION – USB Drive

Take the following precautions to protect your USB drive:

- Do not remove the USB drive while the display is writing to or from the drive. This will corrupt the data.
- Do not use a USB drive in each USB socket at the same time. If you are attempting to upgrade firmware using a USB drive and another USB drive is already in one of the sockets, the firmware upgrade will fail.

⚠ CAUTION – Vehicle Setup

Take the following precautions when setting up your vehicle:

- If you select a Vehicle Profile that is not suitable for your vehicle, you may experience degraded system performance.

- If you delete a vehicle, all information about the vehicle will be erased.

When the vehicle has been running, parts of the vehicle, including the engine and exhaust, can become extremely hot and can cause serious burns. To avoid burns, allow hot machine parts to cool before you begin working on them.

Always hold the steering wheel while you adjust the column tilt. Otherwise, the weight of the motor may cause the steering wheel to drop suddenly and cause damage to the steering column or dash.

If the vehicle has a master electrical disconnect, make sure the power cable ground connections are not directly attached to the battery terminal.

Attach the ground connects of the power cable to the chassis side of the main disconnect so that it is as close as possible to the battery, but still gets disconnected when the master disconnect is turned off. Failure to connect the power cable ground will cause damage to the display.

Parts of the vehicle may be under pressure. To avoid injury from pressurized parts, relieve all pressure in oil, air, and water systems before you disconnect any lines, fittings, or related items. To avoid being sprayed by pressurized liquids, hold a rag over fill caps, breathers, or hose connections when you remove them. Do not use your bare hands to check for hydraulic leaks. Use a board or cardboard instead.

To prevent damage to the system, make sure that no wires or hoses interfere with or catch on any mechanical linkages, or contact any machine parts that get hot.

Make sure the vehicle power is off when you are connecting system components.

Working with Anhydrous Ammonia (NH_3)

Contact your NH_3 supplier to review all safety requirements associated with anhydrous ammonia (NH_3).

Always wear correct personal protective equipment. This includes, but is not limited to:

- Goggles or face shield

- Protective suit and gloves

- Respirator

Do not allow anyone to operate the system without proper instruction and training.

Stand up-wind when working around NH3 and related equipment.

Always keep NH_3 equipment away from buildings, livestock, and other people.

Never work on NH_3 equipment in confined spaces.

Before you attempt to transport the implement, discharge the system of all NH_3 and completely shut down the system. See Discharging the System.

If symptoms of illness occur during or shortly after use of NH_3products, seek immediate medical attention.

Keep a source of clean water (at least five gallons) readily available. In case of exposure, flush exposed skin or eyes immediately with large quantities of water and seek immediate medical attention.

NH_3 can be harmful to the environment if not used correctly. Follow all local, state, and federal regulations regarding proper handling of this chemical.

Servicing the Equipment

1. Remove the system from operation before performing any maintenance.
2. Thoroughly bleed all system lines and disconnect the nurse tank hose. See Discharging the System.
3. Make sure that the gauge pressure is at zero before you open the system.
4. Use extreme caution when opening a previously pressurized system.

Discharging the System

1. Turn off the console or vehicle master switch.
2. Completely close the main shut-off valve on the supply or nurse tank.
3. Resume field application until the pressure gauge shows zero pressure.
4. Check again that the console and/or vehicle master switch, and all section switches, are turned off.
5. Completely close the emergency shut-off valve the cooling tower.
6. Bleed and disconnect the nurse tank supply hose from the system.
7. Turn on the console master switch and all section switches.
8. Stand up-wind from the implement and then slowly open the bleed valve(s) until fully open.

9. Allow at least one (1) hour for the system to fully discharge.

10. Before you open the system, make sure that the pressure gauge on the manifold reads zero and that the cooling tower is not cold to the touch. This ensures that all liquid NH_3 has evaporated and that the pressure is discharged.

NOTE – *Frost on any component is a positive indication of trapped NH_3 at low pressure. Lack of frost does not always indicate a lack of NH_3.*

COMPLIANCE INFORMATION

Federal Communications Commission (FCC) Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or service provider for help.

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.

Contains FCC ID: TLZ-NM230NF and Z642564N

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Interference Statement

This device complies with Industry Canada's license-exempt RSSs. 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.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:

1. Ce dispositif ne peut causer d'interférences; et

2. Ce dispositif doit accepter toute interferene, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appereil.

Radiation Exposure Statement

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Déclaration d'Exposition aux Radiations

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

Contains IC: 6100A-NM230NF and 451I-2564N

INTERNATIONAL COMPLIANCE

Australia and New Zealand

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

Canada

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

Cet appareil numérique de la classe B est conforme à la norme ICES-003 du Canada.

This apparatus complies with Canadian RSS-GEN.

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

Europe

This product has been tested and found to comply with the requirements for Class B device according to Radio Equipment Directive 2014/53/EU, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA). Contains a radio module. These requirements are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential or commercial environment.

RECYCLING WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

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

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

Trimble Europe B.V. WEEE Recycling

C/O Menlo Logistics

Gate 19 to 26

Meerheide 43

5521 DZ

Eersel

The Netherlands
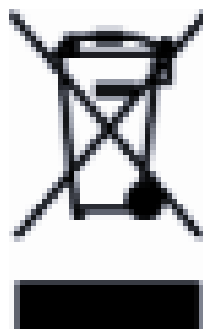
Introduction to Precision-IQ for Supported Displays

▶ Display Overview

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▶ Compatibility with Automated Guidance and Steering

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▶ Upgrade or Apply a License for a New Feature

▶ Precision-IQ Setup and Selection Workflow

The Precision-IQ field application for the supported displays is an easy-to-use advanced field management system.
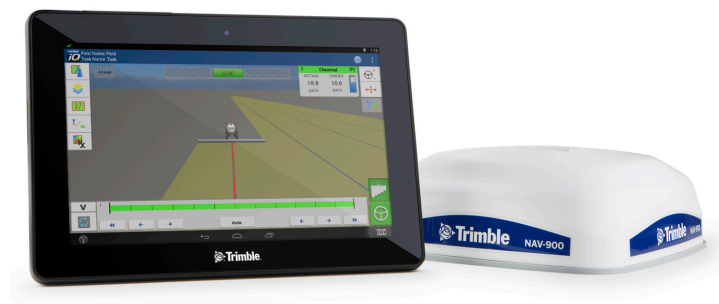
This reference manual is intended for those people responsible for setting up the Precision-IQ application and for those who will be in the cab accessing the application through a supported display.

NOTE – Depending on your display, the screen shot examples in this document may vary.

Display Overview

This section provides some basic information about your display.

To interact with the Precision-IQ application on a supported display, use your fingers to tap buttons, pan through maps, select items from lists, and adjust values of selectors. Precision-IQ will automatically display a keyboard or number pad as needed.

⚠ **CAUTION –** Do not press on the screen with a sharp item, such as a pencil. You may damage the surface of the screen.

For details on how to tap, swipe, pan, etc., refer to your favorite Android user guide.

*NOTE – The display must be correctly installed **before** powering on.*

Power On/Off the Display

To **power on** the display:

> **Automatic:** If the display is connected to the ignition source, power on the vehicle. The NAV-900 guidance controller sends power to the display when the vehicle powers on.

> **Manual:** To turn on the display manually, hold the power button down briefly (about half a second). The power button is on the rear of the display. After a short pause, the Launcher screen opens.

To **power off** the display:

> **Automatic**: If the display is connected to the ignition source, when you switch the ignition off, a shutdown/reboot dialog displays. If you do nothing, then the display shuts off in 60 seconds. If you choose not to shutdown the display, it will remain powered on indefinitely.

> ⚠ **CAUTION –** If you leave the display powered on after shutting off the vehicle's ignition, the display power can drain the battery.

> **Manual:**
>
> 1. Hold the power button down for about two seconds.
> 2. Choose one of the following options:
>   - Shutdown: Powers down the display
>   - Reboot: Restarts the display
>   - Cancel: Cancels the power off process

NOTE – *Sometimes after you press the power button and tap* **Shutdown***, the display does not immediately turnoff. This is because the Precision-IQ application is saving settings. The display will power off after all settings are saved.*

If these steps do not cause the power to go off, you can force a shut down of the display by holding the power button for five seconds.

USB Port

The display has two USB ports. You can use a USB drive to transfer data to and from your display.

⚠ CAUTION – Take the following precautions to protect your USB drive:

- Do not remove the USB drive while the display is writing to or from the drive. This will corrupt the data.

- Do not use a USB drive in each USB socket at the same time. If you are attempting to upgrade firmware using a USB drive and another USB drive is already in one of the sockets, the firmware upgrade will fail.

To insert a USB drive:

1. Move the display so you can see the USB port on the side or back of the display.

2. Pull the rubber cover off the USB port.

3. Insert the USB drive into the USB port. On the status bar, a USB icon displays.

NOTE – *The display automatically senses when a USB drive is inserted into either the side or rear port.*

To remove a USB drive:

1. Move the display so you that can see the USB port.

2. Make sure the LED light of the USB drive is not blinking (indicating data transfer is occurring).

3. Pull the USB drive out of the USB port.

4. Press the rubber cover back onto the USB port.

Cleaning the Touch Screen

Use the following supplies to clean the touch screen of the display:

- Ammonia-free glass cleaner.

- Soft, lint-free cotton cloth such as a microfiber towel.

- 50% isopropyl alcohol.

⚠ CAUTION – Do not apply glass cleaner directly to the touchscreen.

1. Apply a small amount of ammonia-free glass cleaner to the cloth.

2. Gently rub the touchscreen with the cloth.

3. To remove stains or smudges, use a cotton cloth dampened with 50% isopropyl alcohol.

TIP – Clean the touch screen while it is powered down. It is easier to see dirt and fingerprints with the touch screen is dark.

Precision-IQ Home Screen Tour

This section provides an overview of the Precision-IQ Home screen. From the Launcher screen, tap the **Precision-IQ** icon to launch the application:

By default, the Precision-IQ Home screen displays:
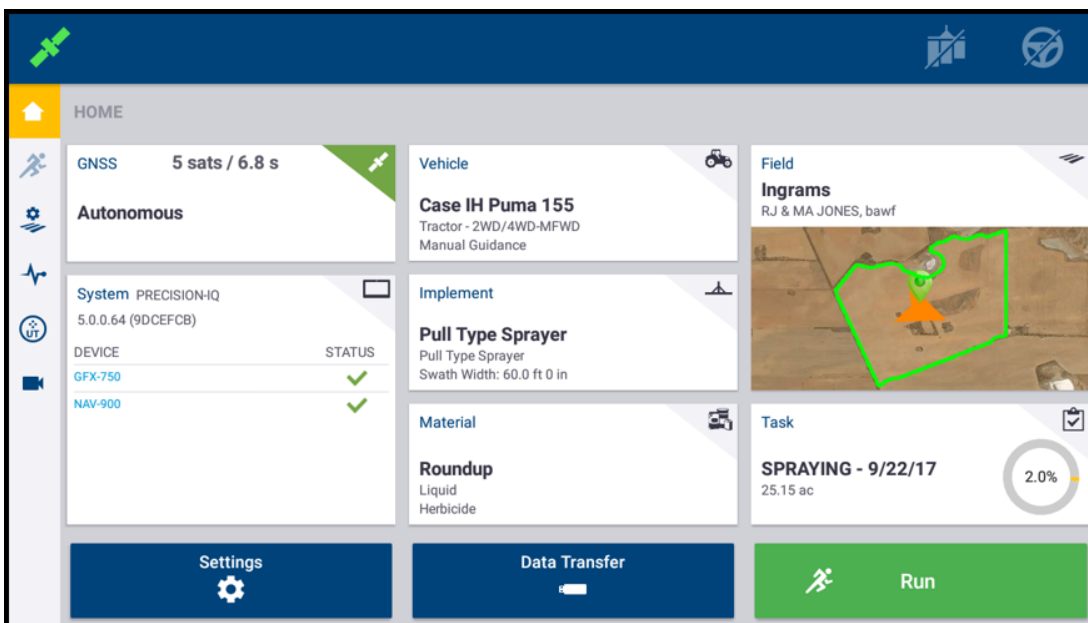
The Precision-IQ Home screen provides a variety of status and equipment details. There are three main regions with which you will be working:

- Activity Bar
- Productivity Tiles

- Settings, Data Transfer, and Run/Stop Buttons

Activity Bar

The activity bar appears on the left side of the Home screen:

Icons with the yellow background show your current screen location. Tap an icon to enter the:

- Run screen (you can only enter this screen after all equipment is correctly set up, selected, and the Run screen button has been tapped)
- Field Manager
- Diagnostics
- Universal Terminal
- External Camera

Productivity Tiles

This region shows the connectivity, equipment, field, and task details. Each tile includes information specific to its area. For example:

Vehicle

Case IH Puma 155
Tractor - 2WD/4WD-MFWD
Manual Guidance
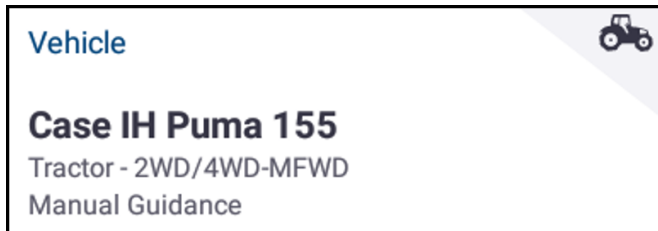
The example vehicle tile shows the make and model as well as the guidance method selected.

The productivity tiles shown include:

- **GNSS:** This tile shows the number of satellites connected and the type of corrections service selected. For more details about this tile, see GNSS Connectivity and Supported Correction Services.

- **Vehicle:** This tile shows the make and model of the vehicle along with the guidance functionality selected. For more details about this tile, see Vehicles.

- **Implement:** The Implement tile shows the type of implement selected and any appropriate measurements associated with it. Because there are a variety of implements supported by Precision-IQ, this tile will update to show the information relevant to the selected implement. For more details about this tile, see Implements.

- **Material:** The material tile shows the name and type of material selected. For more details about this tile, see Materials.

  NOTE – *The availability of material types available depend on the implement selected.*

- **Field:** In addition to the field, farm, and client name details, this tile includes a thumbnail image of the selected field:
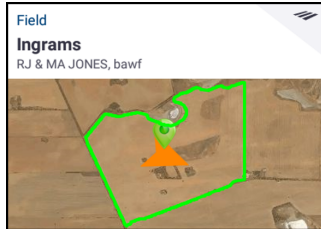
  For more details about this tile, see Fields.

- **Task:** Once you have selected a material and a field, you can select the appropriate task for the work to be done in the field and then tap the Run button to enter the Run screen.

- **System:** The system tile provides information about the Precision-IQ system, including the current firmware version and devices connected and managed through the system. See also:

  - GFX-750/XCN-1050 Display Data Sheet
  - NAV-900 Data Sheet

Productivity Tile Status

Each productivity tile provides a color-coded, at-a-glance status in the upper-right corner of the tile:

- **Grey/Green:** If the color is gray (or green for GNSS), then the all details have been correctly set and the item selected. With this color, you can tap **Run** to enter the Run screen to begin your task.
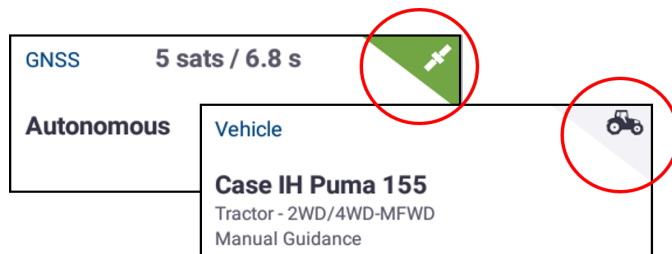
- **Red:** This color indicates that there is a problem that must be corrected before you can enter the Run screen:
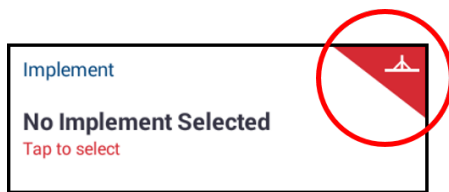
The details of the tile will show the problem and provide an action for you to complete. For example, in the sample image above, the problem is that "no implement is selected" and the action is to "tap to select."

- **Yellow** (Material and GNSS tiles only): The yellow status indicates:

  - GNSS: The GNSS connection is converging.

  - Material: A generic or default material is selected. You can still enter the Run screen, but Precision-IQ may not record the applied material.
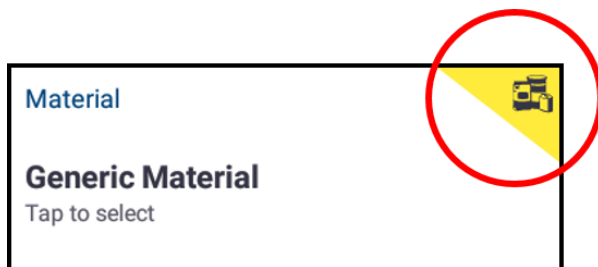
Settings, Data Transfer, and Run/Stop Buttons

These buttons appear below the productivity tiles:

- **Settings:** Tap this button to set up preferences for using Precision-IQ. See Set Preferences for Precision-IQ and the Display.

- **Data Transfer:** Tap this button to manually transfer data files from the display to a USB drive. Also, you can manually download and install updated software and licenses. See also:

  - Data Transfer.

  - Upgrade or Apply a License for a New Feature.

- **Run:** Tap this button to enter the Run screen:

You can only enter the Run screen after you have successfully set up and selected a vehicle, implement, material, field, and task.

While you are in a Run operation, this button will update to show Stop:

Tap this button to stop the run. All data recorded by Precision-IQ can be transferred to your back office.

Set Preferences for Precision-IQ and the Display

To interact with the Precision-IQ application on a supported display, use your fingers to tap buttons, pan through maps, select items from lists, and adjust values of selectors. Precision-IQ will automatically display a keyboard or number pad as needed.

> ⚠ **CAUTION** – Do not press on the screen with a sharp item, such as a pencil. You may damage the surface of the screen.

For details on how to tap, swipe, pan, etc., refer to your favorite Android user guide.

Swipe down from the top of the screen as quick access to:

- Brightness
- Wi-Fi settings
- USB settings
- Android settings
- USB drive details

Configuration of Precision-IQ application settings is managed on the Settings screen. To access this screen:

1. From the Launcher screen, tap the **Precision-IQ** icon to open the Precision-IQ application.

2. From the Precision-IQ Home screen, tap the **Settings** button to open the Settings screen.

From the Settings screen, tap a setting option to set your preferences for Precision-IQ as described in the sections below.

Display Setup

Tap **Display Setup** to configure:

- **Display Units:** toggle between US (feet and inches) and Metric (meters and centimeters) measurement values.

- **Number Format:** toggle between using a period (for example, 100.0) or comma (for example (100,0).

- **Digital I/O Port Setup:** This setting is used enable the ports on the display for connecting a peripheral. Tap **Digital I/O Port Setup** to make your selection from the

following choices:

- Remote Logging with External Camera
- Radar Output with Remote Logging
- Radar Output with External Camera

Mapping

With the mapping setting, you can set options for how you want maps to be displayed in Precision-IQ. For details, see Run Screen.

Patterns

As you work within a field, Precision-IQ provides a variety of guidance pattern mapping icons you use to identify elements within your field. This setting allows you to adjust how these icons display. For details, see Run Screen.

Steering and Guidance

This setting provides options you can set to adjust the steering and guidance functions of your vehicle. For details, see Auto Guidance Setup.

Safety and Alarms

This setting allows you to set a timeout for when you want Precision-IQ to automatically disengage auto steering or application control operations.

- **Auto Steering Operator Timeout:** The amount of time before Precision-IQ disengages auto guidance and stops applications when there is no response to a shutdown message. For details, see Safety and Alarm Settings.
- **Application Control Operator Timeout:** The amount of time before Precision-IQ disengages automatic application control when there is no response to a shutdown message. For details, see Add an Implement with Application Control .

Application Control

Use this setting to:

- Allow access to advanced implement setup and calibration.
- Switch on/off coverage logging based on applied flow rate when using application control.
- Automatically calculate the manual boundary increment based on the section widths of the primary channel.

For details, see Add an Implement with Application Control .

ISOBUS

If you are using an ISOBUS implement, then use this setting to:

- Enable Universal Terminal.
- Enable Task Controller support.
- Enable automatic ISO configuration updates.

For details, see Configure an ISOBUS Implement.

Office Sync

This setting enables or disables Office Sync, which allows Precision-IQ to send collected data files to your back office automatically.

Trimble Ag Software includes the licenses and support for Precision-IQ's Office Sync feature. For details about Trimble Ag Software, see:
https://agriculture.trimble.com/software/farmers/

See also: Data Transfer.

Users and Passwords

This setting allows you to manage and maintain users and passwords for the Precision-IQ application. When enabled, Precision-IQ allows for multiple user/operators to login and perform a variety of tasks, as needed. For details, see Users and Passwords.

Logging

Use this setting to:

- Enable GNSS data logging at startup.
- Enable verbose Application Control data logging.

For details about how to transfer these data files, see Data Transfer.

About

Tap **About** for a summary of:

- **Software information:** Shows a list of all installed software packages. Details include the name of the software, the version of the software, and when it was installed onto the display.
- **Current user information:** This option is available when a user is logged into Precision-IQ. For more information, see Users and Passwords.

- **Current preference information:** Shows a summary list of all preferences you have set.
- **Device information:** Shows a summary of hardware information about the display and any available network information.

Compatibility with Automated Guidance and Steering

The Precision-IQ application is compatible with the following automated guidance and steering:

- Trimble Autopilot™ automated steering system.
- Trimble Autopilot™ Motor Drive automated steering system.
- Trimble EZ-Pilot Pro™ automated steering system.
- Trimble EZ-Steer® assisted steering system *(TMX-2050/XCN-2050 only)*.
- Trimble EZ-Pilot® steering system *(TMX-2050/XCN-2050 only)*.

Precision-IQ can use an array of additional products to maximize efficiency, including:

- Creating fields and guidance patterns.
- Using guidance patterns for automatic guidance systems.
- Logging coverage data.
- Output of information for analysis in office-based software (for example, Farm Works Software® solutions).
- Rate control for liquid and granular products.
- Section control for liquid products.

View Installed Licenses

Your display includes several licenses already enable for you to begin using. Depending on the functionality you need to use in Precision-IQ, you may need to install and unlock the associated license.

Follow the steps below to view the installed licenses for your display:

1. From the Launcher screen, tap the **App Central** icon.
2. On the App Central screen, tap the menu icon in the upper left-hand corner to display the App Central menu.
3. Tap **Licenses** for a list of active licenses for the display. You can also tap the NAV-900 module button for a list of active licenses for the NAV-900 module.

See Upgrade or Apply a License for a New Feature for details on how to add a license for your display, NAV-900 module, or any other device managed through the display.

Upgrade or Apply a License for a New Feature

To apply a license you have purchased for an upgrade or to unlock a new feature:

1. Insert a USB drive containing the license into a USB port of the display.

2. From the Launcher screen, tap the **App Central** icon.

3. On the App Central screen, tap the menu icon in the upper left-hand corner to display the App Central menu.

4. Tap **Licenses** for a list of active licenses for the display.

5. Tap ⊕.

6. To scan the QR code:

   a. Tap 🔲. Aim the camera of the display at the QR code.

   b. To scan more than one QR code, tap ☰+.

   c. When you are finished scanning, tap ☰✓.

7. To download a license from a USB drive:

   a. Insert the USB drive into a USB port of the display.

   b. Tap 💾.

   c. Tap on the file explorer. Within the file explorer, go to the USB drive and find the license file you want.

   d. Tap on the license file. The system applies the license you selected and returns to the App Central Licenses screen.

   > ⚠ CAUTION – Do not remove the USB drive while the display is writing to or from the drive. This will corrupt the data.

8. To enter the license code, tap the **Edit** icon and enter the code with the on-screen keyboard.

Precision-IQ Setup and Selection Workflow

This section provides an overview of the Precision-IQ setup workflow to follow in order to enter the Run screen of the Precision-IQ application. Complete details and optional settings are described in their respective chapters.

If you have not set up Precision-IQ, then the following workflow diagram shows a general overview of each step you will need to configure before using the application:

Add GNSS Connection
- Verify **Basic Positioning** license installed for NAV-900
- Tap **GNSS** tile

Add a Field
- Tap **Field** tile

Add a Vehicle
- Tap **Vehicle** tile
- Tap **New**

Add an Implement
- Tap **Implement** tile
- Tap **New**
- Set to use with or without Application Control

Add a Material
- Tap **Material** tile
- Tap **New**
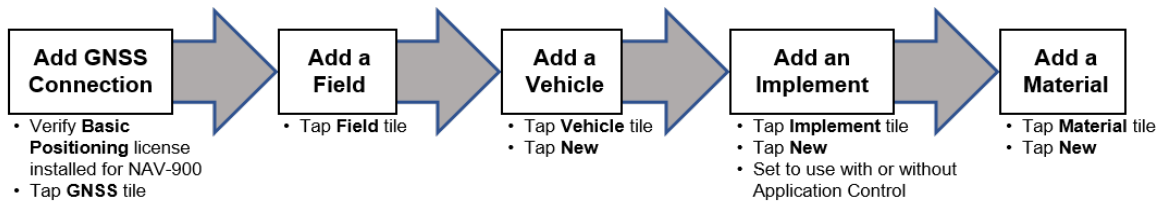
Once you have created the necessary profiles, you will need to select a profile from each category. You can have multiple profiles (such as vehicles, implements, etc.) depending on the type of work you need to perform. The following workflow diagram shows a general overview of each step you will need to select before using Precision-IQ:

Select a Field
- Tap **Field** tile

Select a Vehicle
- Tap **Vehicle** tile
- Select and tap **Change Vehicle**

Select an Implement
- Tap **Implement** tile

Select a Material
- Tap **Material** tile

Select a Task
- Tap **Task** tile
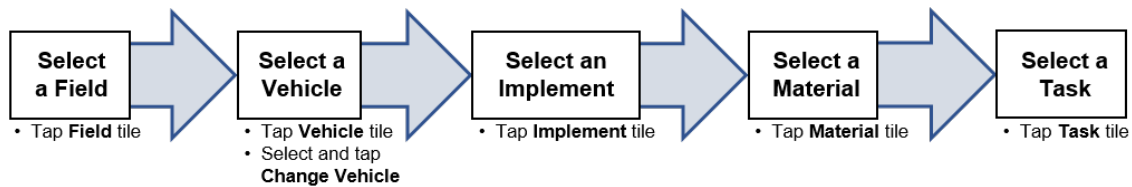
NOTE – Generally, you will not need to select a GNSS connection, but you will need to select a task.

After you have set up and selected the appropriate components, tap the Run button to begin your work:

2

Users and Passwords

▶ Add or Edit a User/Operator

▶ Enable User/Operator Login

▶ Delete a User/Operator Profile

▶ Restore Default Preferences

This chapter provides the instructions for management and maintenance of users and passwords for the Precision-IQ application. When enabled, Precision-IQ allows for multiple user/operators to login and perform a variety of tasks, as needed.

Add or Edit a User/Operator

Follow the steps below to add or edit a user/operator for the Precision-IQ application:

1. From the Home screen of Precision-IQ, tap **Settings**. Then, on the Settings screen, tap **Users and Passwords**.

2. In the Operators section, tap the option to **Enable Operators**:

NOTE – *By default, the Enable Operators option is not selected.*

3. Select an action:

   - **Add User:** In the Users section, tap **Add User**.

   - **Edit User:** In the Users section, tap the user that you want to edit.

4. A pop-up will appear for you to add a **New User Profile**: or edit **User Settings**.

5. Enter the following information:

   a. Operator ID: Create or modify a unique user name for the operator.

   b. Password: Enter a unique password or change an existing password.

   c. Confirm Password: Reenter the password. Passwords must match.

   d. Picture *(optional)*: Tap the silhouette to activate the forward camera of the display. You can take a photo of the operator to associate with the profile. Tap **Capture** to take the picture, then tap **Done** to save it to the profile.

6. Tap **Create User** or **Save Changes**.

Enable User/Operator Login

Follow the steps below to enable Precision-IQ login option and for instructions to login to the application:

1. From the Home screen of Precision-IQ, tap **Settings**. Then, on the Settings screen, tap **Users and Passwords**:

2. In the Operators section, tap the option to **Enable Operators**, if it's not already selected:

NOTE – *By default, the Enable Operators option is not selected.*

(Optional) In the Persistent User section, tap the **Persistent Login** option to set a user/operator to login by default:

PERSISTENT USER

Persistent Login
Roy Mustang   ☑
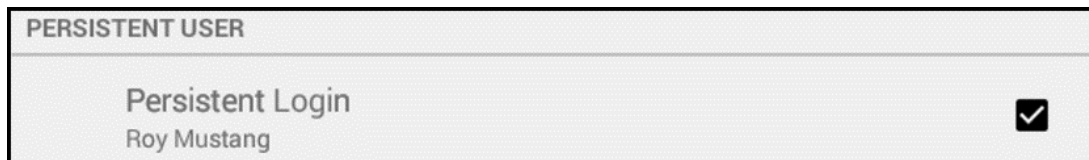
NOTE – *By default, the Persistent Login option is not selected.*

3. Exit the Precision-IQ application.

4. To login to Precision-IQ, tap the **Precision-IQ** icon on the Launcher screen. Instead of the Home screen, a login window appears.

5. Enter the password/PIN and tap **Log In**.

Delete a User/Operator Profile

Follow the steps below to delete a user/operator profile:

1. From the Home screen of Precision-IQ, tap **Settings**. Then, on the Settings screen, tap **Users and Passwords**:

2. In the Operators section, tap the option to **Enable Operators**, if it's not already selected:

OPERATORS

Enable Operators   ☑

3. In the Users section, tap the user that you want to delete. A pop-up will appear for you to edit the **User Settings**.

4. Tap **Delete User**. The user profile is deleted immediately.

Restore Default Preferences

As part of the day-to-day operation of Precision-IQ, a user/operator has a variety of preferences that can be set. Over time, you may wish to reset preferences for a user or for the entire device. Follow the steps below to restore default preferences:

1. From the Home screen of Precision-IQ, tap **Settings**. Then, on the Settings screen, tap **Users and Passwords**:

2. In the Restore Default section, tap one of the following options:

    - **Restore Default User Preferences:** Tap this option to restore the preferences of the currently logged in user.

    - **Restore Preferences to Factory Defaults:** Tap this option to restore the display to its factory default settings.

3. A confirmation pop-up will display. Tap **Restore Default Preferences** to continue or tap **Cancel** to cancel the restore operation.

GNSS Connectivity and Supported Correction Services

GNSS (**Global Navigation Satellite System**) is a satellite system that is used to pinpoint the geographic location of a user's receiver anywhere in the world.

This chapter contains information regarding setting up connectivity and corrections and provides some basic concepts for selecting the best connectivity for your configuration. Tap the **GNSS** tile on the Home screen to begin:

GNSS Overview

GNSS (**Global Navigation Satellite System**) is a satellite system that is used to pinpoint the geographic location of a user's receiver anywhere in the world. The display connects to and manages a NAV-900 navigation controller to connect to the various GNSS constellations.

See also: NAV-900 Data Sheet

Supported GNSS Constellations and Correction Services

Constellations	Correction Satellites	Correction Streams
• GPS	• CenterPoint® RTX	• CMR+
• GLONASS	• WAAS	• sCMR+
• Galileo	• EGNOS	• SCMR+ with SecureRTK
• BeiDou (COMPASS)	• MSAS	• CMRx

GNSS Details in Precision-IQ

From the Precision-IQ Home screen, the GNSS tile provides a high-level, "at-a-glance" overview of the status of your GNSS connection. These details are:

Selected correction service: By default, **Autonomous** is selected as your correction service.

Satellites connection status: In the upper-right corner of the tile, the following colors indicate the GNSS status:

- **Green:** This status indicates a strong satellite connection, with enough connected satellites in a constellation for the correction service to respond accurately.

- **Yellow:** This status indicates a weak satellite connection, with fewer connected satellites in a constellation. Because there are fewer connected satellites, the correction service accuracy will be reduced.

- **Red:** A red status indicates that there are no satellites connected. You cannot enter the Run screen when the GNSS status is red.

Tap the **GNSS** tile for a full summary of the configuration.

From the GNSS screen, you can review all details about the GNSS settings and configuration. Tap the **Edit** button if you need to adjust the:

- Correction Services
  - SBAS Corrections
  - RangePoint RTX Correction Service
  - CenterPoint RTX Corrections
  - CenterPoint VRS Corrections
  - RTK Corrections
  - xFill Premium
- CAN Messaging
- NMEA Messaging

Frequency and Baud Rates

The frequencies and baud rates for regions are:

Region	Frequency	Baud Rate
Asia/ Pacific	1539.8325 MHz	600
Central North America	1557.8150 MHz	2400
Eastern North America	1557.8590 MHz	600
Europe/ Africa	1539.9525 MHz	600
Europe (RTX EU)	1529.7250 MHz	2400
Latin America	1539.8325 MHz	600
Western North America	1557.8615 MHz	600

Correction Services

GNSS satellites are in continuous motion as they orbit the earth twice per day in a repeated pattern. Satellites transmit signals that the GNSS receiver translates to determine its position.

While performing field activities, you may notice differences in:

- Where the crop row is located.
- Where the guidance line was established.
- Where the display is indicating the guidance line is now located.

This happens because GNSS satellite constellation patterns change over time and can experience interference, such as local and atmospheric conditions, temperature and humidity, etc.

Precision-IQ supports a variety of correction services that are available to compensate for deviations in GNSS constellation patterns as well as interference with the satellite signal.

Tap the **Edit** button on the GNSS details screen to display the GNSS Edit screen. By default, the Corrections option is selected. With this option, you can change the correction service, position quality, and radar output.

Correction Service: Tap this item for a pop-up list of all available correction services.

By default, **Autonomous** is selected as the correction source. Tap a different correction source to select it.

NOTE – Most correction services require an unlock. See *Upgrade or Apply a License for a New Feature* for details.

If you change the correction service, then you may need to adjust additional settings, depending on your selection. Available correction services include, but are not limited to:

- SBAS Corrections
- RangePoint RTX Correction Service
- CenterPoint RTX Corrections
- CenterPoint VRS Corrections
- RTK Corrections
- xFill Premium

Position Quality: Tap this item to allow Precision-IQ to give preference to:

- **Favor Accuracy:** Use for operations needing highest accuracy (such as row crop planting and strip-till). This option is selected by default.
- **Favor Availability:** Expands production time further with potential for reduced accuracy.
- **Balanced Quality:** Trades potential accuracy for longer production time.

Radar Output: Tap to enable radar output. If enabled, then tap **Radar Output Frequency** to enter a specific radar frequency. You can choose between **27.36** and **96.56** Hz/mph.

Correction Services Licensing Requirements

The following permanent licenses, subscriptions, and VRS daemon licenses are required to enable the following features on supported displays:

Correction Service	License	License Type Required
RangePoint RTX	Basic	Permanent license (installed at factory)
	Valid RangePoint	Subscription
CenterPoint RTX Std-Cell	Intermediate	Permanent license (purchased)
	Valid Std-Cell, Std-Sat, or Fast-Sat	Subscription
	DCM Correction Services	VRS daemon licenses unlock
CenterPoint RTX Std-Sat	Intermediate	Permanent license (purchased)
	Valid Std-Sat or Fast-Sat	Subscription
CenterPoint RTX Fast-Sat	Intermediate & High	Permanent licenses (purchased)
	Valid Fast-Sat	Subscription
CenterPoint RTK (SBL)	Intermediate & High	Permanent licenses (purchased)
CenterPoint VRS	Intermediate & High	Permanent licenses (purchased)
	VRS daemon	May be required on display if using third-party modem. Not required for Trimble GX450 modem.
xFill Premium	Intermediate & High	Permanent licenses (purchased)
	Valid xFill Premium or Std-Sat or Fast-Sat	Subscription

SBAS Corrections

The satellite-based augmentation systems (SBAS) with free correction services are:

- WAAS (Wide Area Augmentation System) in North America
- EGNOS (European Geostationary Navigation Overlay Service) in Europe
- MSAS (Multi-functional Satellite Augmentation System) in Asia Pacific regions

From the GNSS Edit screen, tap **Correction Services** and then tap **SBAS** from the pop-up list to select it. Tap **Setup** to:

- **Correction Satellite Select:** By default, **Automatically selected from current location** is selected. Tap this item to select a specific correction satellite from a pop-up list.
- **SBAS+**: Tap to enable. This feature uses uncorrected satellites in addition to SBAS.

RangePoint RTX Correction Service

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

RangePoint® RTX is a satellite-based subscription service for corrections with pass-to-pass accuracy < 6" (15 cm) and GLONASS compatibility.

The GNSS receiver in the NAV-900 Module receives these signals.

From the GNSS Edit screen, tap **Correction Services** and then tap **RangePoint RTX** from the pop-up list to select it. Update the appropriate specific RangePoint RTX options, then tap **Home** to return to the Home screen.

CenterPoint RTX Corrections

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

The types of CenterPoint® RTX correction are:

- CenterPoint RTX Modem Corrections
- CenterPoint RTX Modem Corrections: Standard convergence, fast convergence for US, fast convergence for EU.

CenterPoint RTX Modem Corrections

CenterPoint RTX Modem / Standard is a cellular broadcast subscription service for corrections with < 1.5" (3.8 cm) accuracy and GLONASS compatibility. A connected wireless modem receives these signals.

From the GNSS Edit screen, tap **Correction Services** and then tap **CenterPoint RTX Modem (Standard Convergence)** from the pop-up list to select it. Update the appropriate specific CenterPoint RTX Modem options, then tap **Home** to return to the Home screen.

CenterPoint RTX Satellite Corrections

CenterPoint RTX satellite broadcast subscription services for corrections have a < 1.5" (3.8 cm) accuracy and GLONASS compatibility. The RTX satellite corrections available are:

- CenterPoint RTX Satellite Standard.
- CenterPoint RTX Satellite Standard Fast for US.
- CenterPoint RTX Satellite Standard Fast for EU.

The GNSS receiver in the [[[Undefined variable TRMB_Variables.Shifter-900]]] receives these signals.

From the GNSS Edit screen, tap **Correction Services** and then tap **CenterPoint RTX Satellite (Standard Convergence)** from the pop-up list to select it. Update the appropriate specific CenterPoint RTX Satellite options, then tap **Home** to return to the Home screen.

CenterPoint VRS Corrections

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

CenterPoint® VRS™ is a cellular-broadcast RTK correction service from a ground-based reference station using the a modem. (Requires a connected wireless modem.)

From the GNSS Edit screen, tap **Correction Services** and then tap **CenterPoint VRS** from the pop-up list to select it. Update the appropriate specific CenterPoint VRS options, then tap **Home** to return to the Home screen.

RTK Corrections

RTK is a radio-broadcast correction service originating from a ground-based reference station, and received by radio signal. Follow the steps below to set RTK options:

1. From the GNSS Edit screen, tap **Correction Services**.

2. Tap **RTK** from the pop-up list to select it.

3. Update the appropriate specific RTK options.

4. Tap **Home** to return to the Home screen.

About VRS

VRS™, an integrated system available with a subscription, is complementary to RTK and provides RTK corrections over a large geographic area, where robust cellular data coverage is available. Network processing ensures high accuracy throughout the whole coverage area.

VRS consists of:

- GPS/GNSS reference stations spread out over a large area, typically 30-45 miles (50-70 km) apart.

- A central server that uses Trimble proprietary software to create a correction model for the region covered by the network. GPS rovers communicate using a cell modem with the VRS server and receive RTK type corrections. The data from the reference stations is used to model errors throughout your region. The model is used to:

    ○ Create a network of virtual reference stations near your current location.

    ○ Provide a localized set of standard format correction messages for your roving receiver. Since the error models are updated every second, all rovers receive an

optimal correction model after connecting on to the network. This ensures a high quality correction, and accuracy.

All reference stations used in a VRS system can be interpreted as a network of continuously operated reference stations. The difference between VRS and CORS is that VRS provides a network solution. The position accuracy is maintained even if you move away from the single base but are still within the network.

Due to the longer range, fewer base stations can cover a greater region. Additionally, VRS networks may offer better signal coverage in rough terrain if the local cellular network is robust and provides good data coverage.

xFill Premium

The xFill Premium service allows continued field operations during RTK/VRS signal interruptions, delivering Trimble RTX position accuracy for the duration of the interruption. This service extends the Trimble standard xFill service, which is limited to 20 minutes.

In the RTK configuration setup, make sure that **xFill** is switched on. Turning on xFill will also turn on xFill Premium.

The xFill Premium service will converge in the background and then calibrate itself as a backup to the specific RTK base station or VRS stream that is being used. This automatic calibration process typically takes between 15 and 60 minutes.

Once the automatic calibration is complete, if the display experiences RTK/VRS corrections outages, then the display will initially transition into standard xFill service, and subsequently transition into xFill Premium service. The display will continue to operate in the xFill Premium service until the RTK/VRS corrections resume.

About xFill Technology

xFill™ technology uses Trimble RTX technology to "fill in" for RTK corrections when there are temporary radio or Internet connection outages. xFill technology is a standard feature and is compatible with the AG25 GNSS antenna. The xFill technology can function with corrections from single-baseline RTK, VRS and CORS systems.

When there is an interruption of the RTK correction signal (either from the radio base station or from the VRS cellular network), the xFill technology performs corrections. xFill technology uses the last-known RTK position combined with the RTX precision satellite data to maintain a high level of horizontal positioning accuracy for up to 20 minutes. There is a smooth transition from RTK to xFill technology and back to RTK.

Automatic Guidance Systems

If an auto-steering system is engaged using RTK, the auto-steer system will stay engaged during the 20 minute xFill coverage. As soon as an RTK signal is available, the receiver will switch back to the RTK correction service and xFill will remain on standby in the background. If the system cannot resume an RTK Fixed status within 20 minutes the system will fall back to DGPS correction and the auto-steer system will disengage.

Accuracy

xFill technology can maintain a relatively high level of horizontal accuracy throughout the RTK outage period. However, accuracy is primarily dependent on three factors:

- GNSS satellite availability and obstructions between the satellite and receiver (trees, buildings, and so on).
- Exactness of the base station position.
- Length of time since the last RTK position (maximum allowable time is 20 minutes).

If you are concerned with maintaining sub-inch precision, disable the xFill feature.

Estimated accuracy over time while the xFill function has been active (with base station accuracy <20 cm) is as follows:

- xFill runtime – no RTK corrections estimated error
- 1-5 minutes 1-5 cm
- 6-10 minutes 5-9 cm
- 11-20 minutes 10-15 cm

Dependence on Satellite

xFill technology requires correction data from at least 5 satellites higher than 10 degrees from the horizon. If GLONASS is unlocked at the RTK level, xFill technology will also be able to use GLONASS satellites. Additionally, large objects such as trees, buildings, and grain bins will significantly decrease or completely block signal reception from all satellite types, including GPS, GLONASS, and corrections satellites. If these same obstructions are between the receiver and the satellite, they may also block xFill signals.

⚠ WARNING – Many large and sudden changes in satellite geometry caused by blocked satellites can cause significant position shifts. If operating under these conditions, auto-guidance systems can react abruptly. To avoid possible personal injury or damage to property under these conditions, disable the auto-guidance system and take manual control of the vehicle until conditions have cleared.

Dependence on Base Station Position

When the RTK correction signal is lost, the RTX satellite begins providing correction based on the last RTK position. When you setup xFill and select the datum in which you surveyed your base station, the firmware translates your position into the ITRF datum reference frame to minimize drift. Any other inaccuracies in the base station position can cause a drift in position over time.

As time elapses, correction data from the satellites causes drift from the RTK line. The larger the difference in surveyed base station position, the larger the drift as shown in following table.

The following table shows how the xFill drift over time is impacted by the accuracy of the base station survey coordinates:

xFill Elapsed Time	Survey Accuracy <20cm	Survey Accuracy <2m	Survey Accuracy <5m
0 to 5 min	0 to 5 cm	0 to 15 cm	0 to 25 cm
5 to 15 min	2 cm to 12 cm	10 cm to 0.3 m	15cm to 0.5 m
15 to 20 min	9 cm to 15 cm	15 cm to 0.4 m	0.3m to 0.8 m

If you discover that the surveyed location of your base station is not accurate, your options are:

- Turn off xFill (recommended).
- Resurvey your base station. However, this will cause the movement of any stored AB lines that are reloaded/reused which is very undesirable to many RTK customers.

Base Station Survey

At initial base station installation, it is recommended that you survey base stations by taking a 24-hour log and processing the data to receive position on your local datum. The accuracy of this position is stated in the report. Over time, primarily due to normal geological events, the base station position may change up to 7cm per year.

When you select the datum used to survey your base station during the xFill technology setup, the receiver will automatically convert your position in the datum you select to the equivalent position in ITRF2008.

If your base station was properly surveyed within the last five years using one of the following coordinate systems, the xFill technology accuracy error will typically be less than 15cm over 20 minutes.

- WGS84/ITRF2008
- NAD83

- ETRS89
- GDA94

When working within an area with several RTK base stations, each base station should have a unique Base ID. When moving in range of another base station, go to the GPS setup on the display and enter the Base ID. This enables the receiver to recognize the new base station.

Base Station Survey with AutoBase™

If the Trimble AutoBase feature was used to survey the base, the accuracy can be >5m, which decreases the xFill technology accuracy. The datum used for this feature is WGS84. Trimble recommends testing xFill prior to using it in an application where the base station has only been surveyed with AutoBase.

VRS Base Station

If using VRS, the accuracy is typically <1 cm . Contact your VRS network owner to determine the datum used for surveying and enter this datum during the xFill technology set-up. Trimble VRS Now™ network uses the following:

- VRS Now US: NAD83
- VRS Now Europe: ETRS89
- VRS Now TEC Europe: ETRS89

Base Station, Survey Unknown

If you do not know if your base station has been surveyed or the datum used for surveying, you should perform testing to approximate your base station errors or turn off xFill technology.

Estimating Base Station Errors

To estimate the error in the position f the base station, options include:

- **Calculate Current Position and Compare to Set Position:** Collect two hours of position logs and submit them for post-processing (using the same coordinate system as previously used). Then enter the current set position and the newly calculated position into a GPS distance tool calculator.

- **xFill Accuracy Detection Using Cross Track Error:** Set-up your antenna and receiver in an open air environment (field or parking lot). Create an A+ line based on your parked position with RTK fixed. Unplug the radio or the modem if using cellular signal. xFill technology will engage. Watch your cross track error (XTE) for a maximum of 20

minutes. Repeat several times. Keep in mind that this static test only tests the error in one direction (N/S or E/W).

- **xFill Accuracy During Passes in a Field:** To best see the drift of the xFill position over time:

  NOTE – *This procedure will only be accurate if you have already completed the Roll Calibration for auto-steering.*

  1. Create an A/B line in your field (or use an existing line). See Guidance Patterns: AB Line.

  2. Drive the line and once your cross track error (XTE) is very small, stop and drop a flag in the center of your hitch.

  3. Turn off RTK by changing the network ID or frequency.

  4. Drive around the field for several minutes (to represent your typical outage time) and return to the A/B line.

  5. Engage on the line and then when XTE is small and you're over you previous flag, stop and drop another flag. Compare the distance.

  6. Make a pass in the other direction on the same A/B line and drop a third flag. Compare the distance.

When Not to use xFill Technology

xFill technology is not recommended for:

- Land leveling and water management applications where a high degree of vertical accuracy is required.

- Any operation where you need accuracy better than 1" (2.4 cm).

- When the base station has not been properly surveyed, or has been surveyed only with the AutoBase functionality and no tests have been performed to assess the risk of using xFill technology with that base station.

CAN Messaging

If you wish to send messages from the GNSS receiver in the NAV-900 guidance controller, you can set up what messages will be sent from CAN port A or B. If you are using an ISO-certified implement, use this setting to send information to the implement such as speed.

1. From the GNSS Edit screen, tap **CAN Messaging**.

2. Tap the CAN port that you want to change settings for. Choose the messages for the GNSS receiver in the NAV-900 to send to ISO-certified equipment.

The list that displays for each CAN port shows the messages and their parameter group number (PGN).

For each message, you can choose how often the message is sent:

- Off (never sent)
- 10 Hz, 5 Hz or 1 Hz
- Every 5, 10, 30 or 60 seconds

3. When you are finished, tap the green check mark.

To use ISO-certified equipment, set up what messages will be sent from the GNSS receiver to the implement, such as speed:

1. From the Activity bar on the Home screen, tap the **Universal Terminal** icon to open the Universal Terminal.

2. In the upper right corner, tap the **Menu** icon, then tap the **Messaging** tab.

3. Turn on the settings appropriate for your setup:

   - GNSS Vehicle Position (PGN 65267)
   - GNSS Vehicle Direction/Speed (PGN 65256)
   - Wheel-based Speed (PGN 65096)
   - Ground-based Speed (PGN 65097)

4. When you are finished, tap the green check mark.

See also: Configure an ISOBUS Implement.

NMEA Messaging

For the location of this position based on configuration, see NMEA Message Calculation.

Setting	Explanation
Message Rate	How often the message is sent. Options are: - Off - 1 min - 30 sec - 10 sec - 1 Hz - 3 Hz - 5 Hz - 10 Hz
Output Port	Use the NMEA port on your cable harness.

Setting	Explanation
Baud Rate	Baud rate. Options are: • 2400 • 19200 • 4800 • 38400 • 9600 • 57600
Maximum CGA Quality	How high the quality of the message should be.
Lat / Lon Precision	Options are 1 through 10.
Messaging	Choose which messages are on or off.

NMEA Message Calculation

The calculation of the GPS position depends on your configuration.

Type of Steering	Source / Port
Manual guidance	N/A
Autopilot system	Cable harness
Autopilot system	NavController

Supported NMEA Messages

Message	Description	Information Contained
GGA	Fix information	• UTC date and time • Position
GSA	Overall satellite data	• UTC date and time • Position
GST	GPS Pseudorange Noise Statistics	
RMC	Recommended minimum data for GPS	• UTC date and time • Position • Course • Speed

Message	Description	Information Contained
VTG	Vector track and Speed over the Ground	• Course • Speed
ZDA	Date and time	

4

Vehicles

- ▶ Add a Vehicle
- ▶ Edit a Vehicle
- ▶ Select a Vehicle
- ▶ Delete a Vehicle

On-screen vehicles in the Precision-IQ application represent actual vehicles, and include basic information about your vehicle as well as its type of guidance system and calibrations.

This chapter describes how you can add, edit, delete, and select vehicles. A vehicle profile must be set up so that Precision-IQ can collect activity data for the vehicle.

To get started, tap the **Vehicle** tile on the Home screen.

For details about calibrating a vehicle for auto guidance, see Auto Guidance Setup.

Add a Vehicle

This section describes how to create a vehicle profile in Precision-IQ.

NOTE – You must complete all vehicle setup and calibration steps before you can select and use the vehicle for field activities on the Run screen.

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

   This screen shows a list of available vehicles. Tap a vehicle to view details about the selected vehicle.

2. Tap the **New** button to launch the Vehicle Setup wizard. Select a type of vehicle you expect to use in a field run. Available vehicle types are

Combine	Sprayer	Tractor - Articulated 4WD
Floater	Swather	Tractor - Tracked
Harvester	Tractor - 2WD/4WD-MFWD	Truck

   Tap **Next** to continue.

3. The next screen prompts you to select the make and model details for the vehicle. Tap each field to select the appropriate vehicle details. Depending on the vehicle type you select, a pop-up window appears for you to select from a list of make and model details. A variety of these details are already included in Precision-IQ.

Vehicle Detail	Description
Make	Vehicle manufacturer
Series	Vehicle series (when applicable)
Model	Vehicle model
Option	Vehicle options from the manufacturer (for example: Super Steer, Non Super Steer, ILS, Non-ILS, or ISO CAN Ready)
Name	The name of the vehicle is pre-filled from the options you chose for Make, Series, and Model. You can optionally change this name if you wish.

   Tap **Next** to continue.

4. For the Guidance step:

   a. **Selection:** By default, *Manual Guidance* is selected. Tap the field to chose a different guidance option (for example, Autopilot).

      NOTE – Auto guidance options may require an unlock before you can select it.

When you select an available auto guidance option, the screen will update for you to enter the appropriate details to enable the select guidance option. See Auto Guidance Setup for complete details.

> ⚠️WARNING – Auto guidance systems cannot avoid items in the field such as obstacles. Make sure you are adequately trained to operate the auto guidance system.

Tap **Next**.

b. **Antenna:** Tap each field to enter antenna measurement details:

- Antenna height.
- Antenna left/right offset.
- Antenna to rear axle.

Tap **Next**.

c. **Measurements:** The measurement fields that display depend on the vehicle type you select. Tap each field to enter vehicle measurement details. For example:

- Rear axle to tow hitch.
- Rear axle to 3-point hitch.
- Wheelbase.
- Width.

Tap **Next**.

5. On the Summary screen, review the details about the vehicle:

6. Tap the **Save** icon to complete the process and exit the Vehicle Setup wizard.

   To exit the Vehicle Setup wizard without saving, tap the Android **Back** button (tap **No** on the confirmation pop-up window).

7. Tap **Home** to return to the Home screen.

Edit a Vehicle

Follow the steps below to edit your selected vehicle's details:

1. On the Home screen, tap the **Vehicle** tile.

   The Vehicle screen shows a list of available vehicles. Tap a vehicle to view details about the selected vehicle.

2. Tap a vehicle to select it. Tap the **Edit** button.

   The Vehicle Summary screen displays.

3. Navigate to the section(s) where you want to make changes. Tap **Vehicle Type** or **Guidance**.

   NOTE – *If you are changing the Guidance from Manual Guidance to an auto guidance option, see Auto Guidance Setup for complete details.*

4. After you have completed your changes, tap **Summary**.

   NOTE – *If you have not completed all the required information, you can save the edits you made. However, you cannot use the vehicle on the Run screen.*

5. Tap the **Save** icon to complete your changes and exit the Vehicle Setup wizard.

   To exit without saving, tap the Android **Back** button (tap **No** on the confirmation pop-up window).

6. Tap **Home** to return to the Home screen.

Select a Vehicle

Before you can calibrate a vehicle or enter the Run screen, you must select the vehicle you want to use for field activities.

NOTE – *You can only enter the Run screen with a vehicle that has had vehicle setup and calibration steps completed.*

1. On the Home screen, tap the **Vehicle** tile.

2. On the Vehicle screen, tap a vehicle to highlight it. Tap the **Select Vehicle** button.

3. The list of available vehicles will update to show the vehicle chosen:
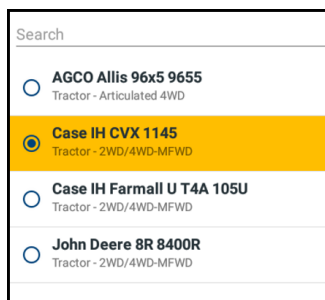
4. Tap **Home** to return to the Home screen.

See also:

- Auto Guidance Setup
- Implements
- Materials
- Fields

Delete a Vehicle

On some occasions, you may need to delete a vehicle's profile. Follow the steps below to delete a vehicle from Precision-IQ.

> ⚠ **CAUTION** – If you delete a vehicle, all information about the vehicle will be erased.

1. On the Home screen, tap the **Data Transfer** button.
2. In the upper-left corner of the Data Transfer screen, tap the Delete action item.
3. Expand the Vehicles list and select a vehicle you want to delete.
4. Tap the **Delete** button at the bottom of the screen.
5. A confirmation pop-up identifying the vehicle you want to delete appears. Tap **Yes** to continue. Then tap **OK** to acknowledge the deletion.
6. Tap **Home** to return to the Home screen.

5

Auto Guidance Setup

▶ Trimble Autosteer Comparison

▶ Configure Precision-IQ Settings for Auto Guidance

▶ Auto Guidance Calibration

▶ Autopilot

▶ Autopilot Motor Drive and EZ-Pilot Pro

▶ NextSwath

Trimble offers assisted and automated steering options to help keep your farming vehicles on line-so you can focus on other farming tasks. With the added benefit of terrain compensation technology, you can operate in difficult terrain conditions while minimizing skips, overlaps, and guess rows.

This chapter describes how to set up a variety of supported auto guidance systems.

Trimble Autosteer Comparison

The following table shows a comparison between the current autosteer offerings:

Feature	EZ-Pilot Pro	Autopilot Motor Drive	Hydraulic Autopilot
License name required	EZ-Pilot Pro	Auto Guidance	Auto Guidance
Max Approach angle	45°	90°	90°
Engage/Disengage Off line Distance	¼ of the implement width	No limit	No limit
Minimum actuation speed	0.5 mph/0.8 kph	0.1 kph	0.1 kph
Stay engaged when stopped	15 sec max	No limit	No limit
Reverse operation	15 sec max	No limit	No limit
OnSwath™ (line acquisition)	Supported	Supported	Supported
Continuous reverse operation	No	Yes	Yes
NextSwath™ (End-of-row turns)	No	Yes - license required	Yes - license required

Configure Precision-IQ Settings for Auto Guidance

The following sections describe how to adjust the various settings within Precision-IQ to use the available auto guidance features:

- Steering and Guidance Settings
- Safety and Alarm Settings
- Auto Guidance Setup
- Controller Setup
- Sensor Setup
- Vehicle Measurement Settings

Steering and Guidance Settings

1. From the Home screen, tap the **Settings** button. Then on the Settings screen, tap **Steering and Guidance**.

2. Configure the following settings:

Setting	Tap to view or change...
Lightbar	Chevron (LED) spacing.
Display Mode	Options are: • Show Correction ("Chase") • Show Error ("Pull")
Adjustments	**Nudge Increment:** The increment used to nudge the guidance system with each tap. You can incrementally nudge a pattern in a perpendicular direction relative to the pattern. Nudging a pattern helps adjust for satellite drift. **Implement Draft Increment:** The increment used to nudge the implement to the current guidance line. **Remark Reset with Import:** Remove all re-mark entrees with an import.
Guidance	**End of Row Distance:** Distance for the end of row warning to display. **Vehicle Direction Detection:** Turn on or off
Autoguidance	**Autosteering Lockout:** Whether the feature is on or off. When lockout is on, the Precision-IQ application does not offer an option to use auto guidance. **Aggressiveness Increment:** The increment used to change aggressiveness.

Safety and Alarm Settings

Precision-IQ provides a safety feature where you can set a timeout for when you want Precision-IQ to automatically disengage auto steering operation.

To set the timeout option:

1. From the Home screen, tap the **Settings** button. Then tap **Safety and Alarms** to display the Safety and Alarms options.

2. Tap **Autosteering Operator Timeout** and set a time (in minutes). By default, **5.0 minutes** is entered.

   The value you enter is the amount of time before Precision-IQ disengages auto guidance and stops applications when there is no user response to a shutdown message.

3. Tap **OK** to save your changes.

4. Tap the Android **Back** button at the bottom of the screen to return to the Home screen.

Auto Guidance Setup

⚠️WARNING – Auto guidance systems cannot avoid obstacles in a field. Make sure you are adequately trained to operate the auto guidance system.

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

2. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Edit** button.

3. Tap the **Guidance** tab at the top of the screen, then tap **Selection**.

4. Complete the following settings:

Tap...	Explanation
Selection	Autopilot or EZ-Pilot Pro
Autopilot Platform	Choose **Autopilot Motor Drive** if a SAM-200 motor is installed onto the steering column. Choose **Hydraulic** if a valve/manifold assembly and hose kit was installed on your machine.
External Guidance Device	Select **NavControllerII/III** (if attached), otherwise choose **NONE**.
Vehicle Profile Origin	Choose the source of the vehicle profile: • **From Vehicle Profiles:** use the factory profile from the display's built-in vehicle database (recommended). • **Import from NavController:** use the machine profile already existing in the NAV-900, or NavController II or III. • **Import from USB:** use `*.CFG` or `*.VDB` profile stored on a USB drive (`AgData/Profiles` folder). If you select to import a profile, tap **Retrieve Vehicle Profile** to import the vehicle profile from either the NavController or USB device. ⚠ CAUTION – If you select a Vehicle Profile that is not suitable for your machine, you may experience degraded system performance.

5. Continue to Controller Setup.

Controller Setup

To set up the controller, you must indicate the position/orientation of the controller as it is currently installed in the vehicle.

For example, if the controller is positioned with the connectors of the controller facing to the left side of your vehicle, you indicate this in Precision-IQ.

The CONTROLLER SETTINGS section of the vehicle setup panel shows an image of the controller as though you are looking down on the vehicle from above, with the front of the vehicle at the top of the screen.

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

2. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Edit** button.

3. Tap **Guidance** at the top of the screen, then tap **Controller Settings**.

   NOTE – *The onscreen picture changes based on the autosteer type selected.*

   NAV-900 guidance controller:
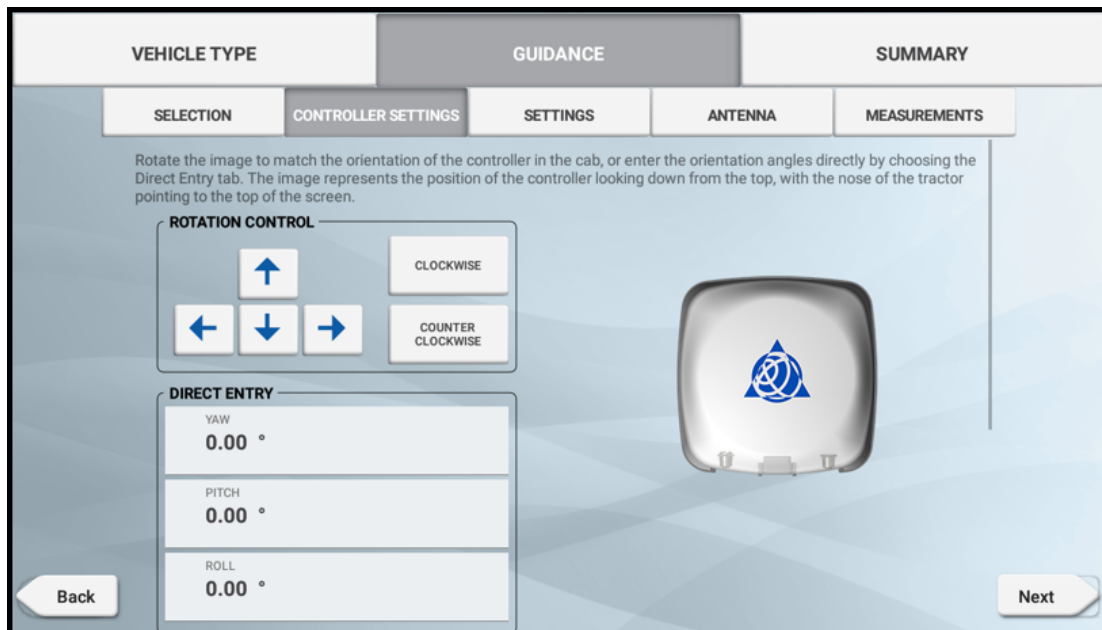
   NavController II or III:
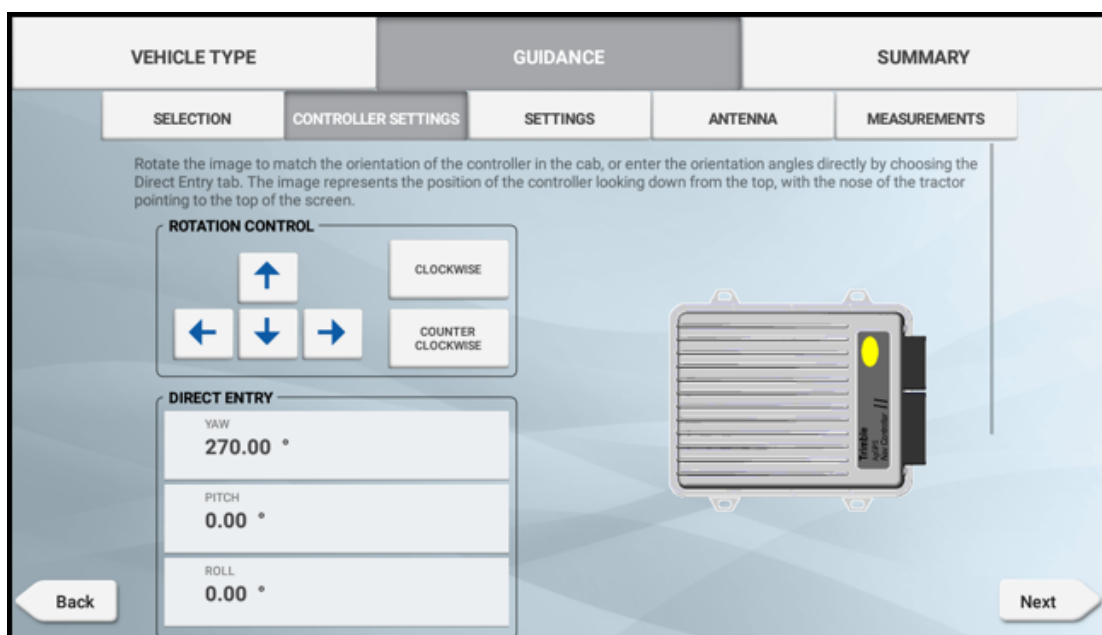
4. Rotate the onscreen controller to match the position of the actual controller in the vehicle as you are looking down from the top, with the nose of the tractor point to the top of the screen.

    Tap the arrow buttons to move the on-screen navigation controller clockwise or counterclockwise:
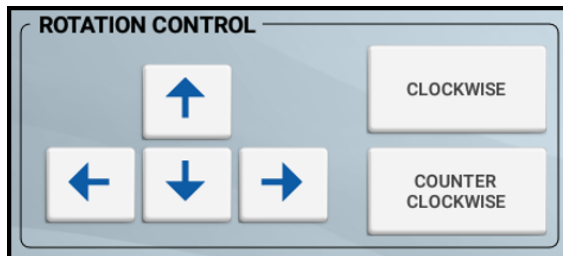
5. Optionally, you can directly enter the degrees of the position by tapping **Yaw**, **Pitch** and **Roll**. By default, the values for the NAV-900 navigation controller module is **0°**. Enter a value between **0** and **360** to manually set the position. You can also use an angle finder tool for precise measurement.

6. When the controller position on the screen matches the controller installed in the vehicle, continue to Sensor Setup.

Sensor Setup

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

2. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the Edit button.

3. Tap **Guidance** at the top of the screen, then tap **Settings**. Complete the setup:

    NOTE – Not all sensor options will be available for all vehicles.

Tap...	To...
Steering Sensor	Select the type of angle sensor installed on the vehicle:
	• Potentiometer (for hydraulic Autopilot)
	• AutoSense™ (for hydraulic Autopilot)
	• None (for EZ-Pilot Pro or Autopilot Motor Drive)
AutoSense Location	Select the location of the AutoSense device:
	• Left Wheel
	• Right Wheel

Tap...	To...
AutoSense Orientation	Indicate the direction the AutoSense label is facing: • Label Up • Label Down
Valve On Speed	Select speed. For vehicles operating at very slow speeds, select **Low** or **Ultra Low**. • Normal: 0.89 mph (0.4 kph) • Low: 0.2 mph (0.09 kph) • Ultra Low: 0.05 mph (0.02 kph) • EZ-Pilot Pro: minimum 0.5 mph (0.22 kph) • John Deere CAN: minimum 0.9 mph (0.15 kph)

4. Continue to Vehicle Measurement Settings.

Vehicle Measurement Settings

NOTE – **Do not** *change vehicle measurements unless they are not correct.*

⚠️ CAUTION – The dimensions of the vehicle itself and antenna location are critical for autosteer accuracy.

1. Before you take measurements, park the vehicle on level ground. Make sure the vehicle is straight, with the center line of the body parallel to the wheels.

2. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

3. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Edit** button.

4. Tap **GUIDANCE** at the top of the screen, then tap **Antenna**. Based on your selections up to this point, some measurements will be pre-filled. Set a value for the following antenna measurements:

   a. **Antenna height:** The distance from the top of the antenna to the ground.

   b. **Antenna left/right offset:** The distance from the antenna to the center line of the vehicle.

   c. **Antenna to rear axle:** If the antenna is forward of the axle, then the value should be a *positive* number. If the antenna is behind the axle, then the value should be a *negative* number (for example, **-1.0 ft 3.0 in**).

5. Tap **MEASUREMENTS** (or **Next**). Based on your selections up to this point, some dimensions will be pre-filled. Confirm all pre-filled measurements and enter the others.

    NOTE – A yellow warning triangle indicates a non-zero number is required.

6. Tap **Next**.

7. Tap the **Save** icon to store the newly created vehicle with auto guidance setup.

Auto Guidance Calibration

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

The calibration process for auto guidance records additional details about your vehicle, which helps the system to steer the vehicle more accurately. For high accuracy applications, you must have all the correct calibrations.

NOTE – CAT Challenger vehicles (Autopilot hydraulic installation) OR John Deere Tracked vehicles (SIU-200 Interface box installation) cannot be calibrated with the Precision-IQ application. Autopilot Toolbox software application must be used. Contact Trimble Agriculture Support.

NOTE – Calibration is only complete when all calibrations on the screen show results instead of Incomplete. Prior to performing calibrations ensure you completed the steps to Controller Setup.

1. Remove any implement and excessive front ballast from the vehicle. Drive the vehicle to an open area free of obstacles in which the vehicle can make long passes (400m/0.25 mile).

2. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

3. From the list of available vehicles, tap the name of the vehicle you want to edit.

4. Tap the **Calibrate** button. The display shows *only* the calibrations required for the vehicle you have selected.

5. Perform each of the CALIBRATION selections presented. Follow the on-screen instructions when applicable. More detailed information on each calibration follows.

    NOTE – The CALIBRATION section lists only the routines required for the selected vehicle and auto guidance steering system.

6. When you are finished, tap the **Save** icon to store the calibration values.

Auto Guidance Calibration Routines

NOTE – Not all calibration items listed below will be available for your machine.

Calibration	Explanation
Manual Override Sensitivity *NOTE – For vehicles that use a pressure transducer for the manual override.*	Adjusts how much steering wheel rotation is required to disengage Autopilot. *NOTE – The system detects whether the vehicle configuration includes this type of sensor. This option only appears if required.*
Enable Auto Cal	Recommended to turn ON this feature.
Auto Cal	Automated calibration of Angle-per-Turn, Dead Zone, Steering Servo Response, Sensor Estimation and Steering CL Servo. Executed calibration routines are dependent upon vehicle and autosteer system type selected.
Steering Sensor *NOTE – For vehicles that use a rotary potentiometer for measuring steering angle.*	Converts the voltage output of the rotary potentiometer sensor into an equivalent steering angle measurement *NOTE – The system detects whether the vehicle configuration includes this type of sensor. This option only appears if required.*
Automated Steering Deadzone (Manual Calibration)	For learning the vehicle's steering dead zones. Determines the minimum valve command required for steering movement.
Steering Proportional Gain (Manual Calibration)	Sets the proportional gain to control steering overshoot and responsiveness.
Roll Correction	Compensates for minor variations in the placement of the navigation controller and vehicle tilt.
Line Acquisition	Controls how fast the guidance system attempts to steer the vehicle onto the current guidance line (50% - 150%). Two modes: **Classic** and **OnSwath**.

See also Autopilot System Diagnostics.

Manual Override Sensitivity

This section applies to an Autopilot (hydraulic steering) installation.

⚠️WARNING – Incorrect adjustment of Manual Override Sensitivity could cause this critical safety feature to fail, resulting in personal injury or damage to the vehicle. Do not choose a setting that is either too sensitive or not sensitive enough. It is vital to avoid setting the sensitivity so low that the system will not detect any steering wheel motion.

NOTE – This control is for vehicle platforms that use a pressure transducer for manual override.

You disengage the Autopilot system by manually rotating the steering wheel. This motion creates a hydraulic pressure increase that can be measured.

Manual Override Sensitivity sets the level that the sensor voltage change must reach before the guidance system disengages. The voltage must also drop below that level before Autopilot can be re-engaged again.

TIP – Manual override calibration must be completed with the machine's hydraulic oil at normal operating temperature.

A high level of sensitivity results in very small steering wheel rotation to induce a disengage. A low level of sensitivity results in large steering wheel rotation to induce a disengage.

1. At the Vehicle setup panel, select the vehicle you want to work with. See Select a Vehicle for detailed instructions. Tap the **Calibrate** button.

2. On the Guidance Calibration screen, tap **Manual Override Sensitivity**.

3. Manually rotate the vehicle's steering wheel. If the set voltage threshold is exceeded, the steering wheel icon will change color.

4. If the disengage response is acceptable, then tap the green check mark .

5. If the response is *not* acceptable, and:

   a. The system disengages too easily (barely touching the steering wheel), then move the slider bar to the right to increase the value and decrease the sensitivity.

   b. The system requires too much steering wheel rotation, then move the slider bar to the left to decrease the value and increase the sensitivity.

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

TIP – Evaluate *Manual Override Sensitivity* under conditions which may affect the pressure of the hydraulic system. For example, turn on the auxiliary hydraulics while you evaluate the sensitivity.

   c. Repeat steps 4 and 5 until the disengage response is acceptable.

6. Tap the red "x" button to exit *without saving*. The display returns to the CALIBRATION section where you can perform another calibration or exit.

7. Tap the **Save** icon to store the new setting.

Enable Auto Cal

It is recommended to turn ON this feature.

1. On the Home screen, tap the **Vehicle** icon to display the Vehicle screen.

2. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Calibrate** button.

3. On the Guidance Calibration screen, tap **Enable Auto Cal**.

4. Move the **Enable Auto Cal** slider to the right and tap the green check mark.

5. Tap the **Save** icon to store the new setting.

Auto Cal

TIP – The machine's hydraulic fluid must be at normal operating temperature.

Follow the steps below for instructions on how to use Auto Cal:

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

2. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Calibrate**button.

3. On the Guidance Calibration screen, tap **Auto Cal**. Read the instructions and tap **OK**.

4. Auto Cal will then run through the automated process as long as the GNSS quality and forward speed are sufficient.
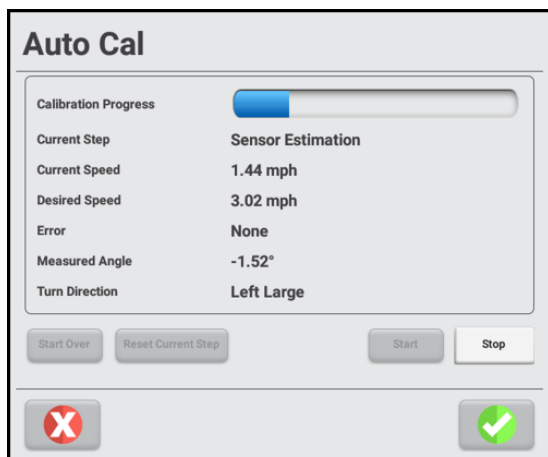
Example

TIP – Use maximum engine speed, **2.2-3** kph (**1.4-1.8** mph) works well. Do not attempt running Auto Cal in mud, rain, snow, or frost. Must be dry field conditions only. Firm and smooth soil conditions result in the best calibration values.

⚠ CAUTION – The hydraulic fluid must be at normal operating temperature. Cold oil will yield incorrect calibration values and degraded auto steer accuracy.

5. Once complete, the results will be shown. Tap the green check mark to save the calibration values.

6. Tap the **Save** icon to store the new setting

7. On the Precision-IQ Home screen, tap the **Run** button, and create an AB line, engage auto steer, and test steering performance accuracy.

Auto Cal Error Messages

Error Message	Description
Manual Override Detected	Manual override was detected before the calibration cycle could be completed. Restart the calibration and do not rotate the steering wheel.
No GPS	The GNSS position quality is not ready. In the activity bar, tap the **Diagnostics** icon.
	Look at GNSS RECEIVER, tap **Performance**. RTX status must be **Converged**, RTK status must be **Fixed** and SBAS status must be **DGPS**, before calibration can be started.

Error Message	Description
No Direction	Direction estimator is not initialized. Drive forward, then stop and retry the calibration.
	OR
	NavController orientation is wrong. Recheck mounting angles and verify the values are correct in the display.
Moving Too Slow	Increase vehicle speed. **2.3-4** kph (**1.5-2.5** mph) works well when running Auto Cal.
Direction unknown	Nav controller's direction estimator has not initialized:
	1. Exit Auto Cal.
	2. From the Home screen, tap **Run**.
	3. Enable auto guidance and drive forward until the steering wheel icon color is yellow.
	4. Go back to vehicle calibration and restart Auto Cal.
	OR
	Steering sensor is disconnected:
	1. Check cabling.
	2. Clear the nav controller fault.
	3. Drive forward for 10 seconds and start Auto Cal again.
	OR
	Wrong steering sensor type selected:
	1. Clear the nav controller fault.
	2. Drive forward for 10 seconds and start Auto Cal again.
	3. Check sensor setup in display.
	OR
	Nav controller orientation is incorrect:
	1. Recheck mounting angles.
	2. Verify the values are correct in the display.

Error Message	Description
Auto Cal completed, but some calibration steps experienced issues and did not finish correctly	Drive the machine forward and start Auto Cal again. If the problem happens repeatedly, then reboot the display.
Disengage detected	Center the machine's steering, drive forward for 10 seconds, and restart Auto Cal.
Timeout	A calibration routine did not complete within an expected period of time. Center the machine's steering, drive forward, and tap **Start over**.

Steering Sensor

This section applies to an Autopilot (hydraulic steering) installation.

Steering sensor calibration converts the voltage output of the rotary potentiometer sensor into an equivalent steering angle measurement. The calibration process maps the values for a full left turn, a full right turn, and center steering.

*NOTE – Steering sensor calibration is only for platforms with a **rotary potentiometer** installed. If the angle sensor is an AutoSense device, or if Auto Cal is enabled, this calibration is not available.*

NOTE – Complete this calibration before you attempt the Automated Steering Deadzone (Manual Calibration) or Roll Correction.

1. Drive the vehicle to a field with a hard, level surface without obstructions.

2. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

3. Select the vehicle you want to work with, then tap the **Calibrate** button.

4. On the Guidance Calibration screen, tap **Steering Sensor**.

5. Read the onscreen instructions and tap the **Next** in the center of the window:
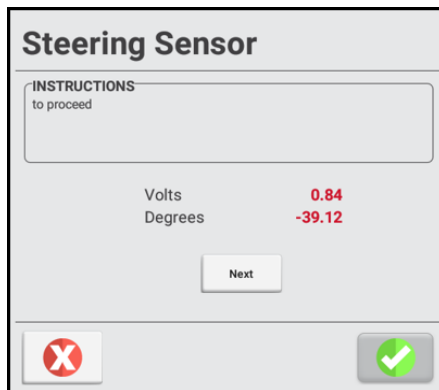
6. Steer straight ahead and drive forward slowly. Maintain a tractor speed above **1.6 kph (1 mph)**. Tap **Next**.

7. Turn the steering wheel all the way to the left and continue moving forward.

   While the steering wheel is at the full left position, tap **Next**.

8. Turn the steering wheel all the way to the right.

   While the steering wheel is at the full right position, tap **Next**.

9. Rotate steering to straight ahead and drive forward.

10. With wheels straight, tap **Next**.

11. Do a quick diagnostic test. Rotate the steering wheel to full left, full right, and center.

    a. Full left voltage should be approximately **0.5** volts. Full right voltage should be approximately **4.5** volts. Center voltage should be near **2.5** volts.

    b. If the left and right sensor values are not approximately symmetrical, tap the red "x" button to discard the calibration and repeat step 6 through step 10.

12. Tap the green check mark to accept the calibration. To repeat the calibration, tap **Restart**.

13. Tap the **Save** icon to store the new setting.

Steering Sensor Calibration Error Messages

Error Message	Description
Steering Angle sensor voltage too high	Wrong sensor type selected.
	OR
	Sensor is rotated near or beyond the **5.0** volts limit. Shorten mechanical linkage to produce less sensor rotation.

Error Message	Description
Steering Angle sensor voltage too low	Wrong sensor type selected.
	OR
	Sensor is rotated near or beyond 0 volt limit. Shorten mechanical linkage to produce less sensor rotation.
	OR
	Sensor is disconnected. Check cabling connections.
Sensor range not large enough	Loosen mechanical arm at sensor. Rotate the sensor's shaft. Set at **2.5** volts with wheels straight ahead. Tighten mechanical arm clamp. Adjust increase length of linkage to create more sensor rotation. Make full left movement close to **0.5** volts and full right movement close to **4.5** volts.
	OR
	Sensor may have failed. Check voltage output on display diagnostics. If the sensor voltage does change during steering movement, check for sensor rotation and/or consider replacing the potentiometer.
	OR
	Sensor's voltage output is not consistent. Check voltage output in display diagnostics. Rotate machine's steering very slowly.

Automated Steering Deadzone (Manual Calibration)

This section applies to an Autopilot (hydraulic steering) installation.

The *Automated Deadzone* calibration runs a series of tests on the hydraulic valve. In this test, the system independently calibrates both sides of the valve to determine the command signal at which wheel movement occurs for each direction.

NOTE – A smooth, level surface is recommended for this calibration.

NOTE – If Auto Cal is enabled, then this calibration is not available.

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

Precalibration Steps

Complete these steps **before** you begin calibration:

1. Complete the vehicle profile steps for setup.

2. Warm up the vehicle. The hydraulic fluid must be at normal operating temperature.

3. Prepare the steering sensor. If the vehicle has a potentiometer, complete the Steering Sensor calibration first.

Calibration Steps

1. Drive the vehicle to a large field without hazards or obstructions. The field should have smooth soil that is loose but firm.

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

2. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

3. Select the vehicle you want to work with, then tap the **Calibrate** button.

4. On the Guidance Calibration screen, tap **Automated Steering Dead Zone**.

5. Read each onscreen instruction and then tap the **Next** button in the center of the window:
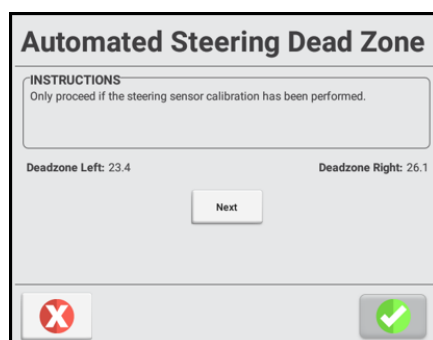
6. Center the steering on the tractor and move forward in first gear at maximum engine RPM for at least five seconds. **1.2** mph (**2.2** kph) or higher is recommended.

7. Tap **Test Right** and continue moving forward while the system performs a coarse right side test.

8. When the test is finished, center the steering again and drive forward for five seconds.

9. Tap **Test Left** and continue moving forward while the system performs a coarse left side test.

10. Continue driving ahead slowly and tap **Test Right**. The system will perform the first right turn fine calibration.

11. Continue driving ahead slowly and tap **Test Left**. The system will perform the left turn fine calibration.

12. Repeat the right and left hand fine calibrations a minimum of three (3) times until there is a change of less than **0.5** in each of the deadzone values.

13. Tap the green check mark to accept the calibration or the red "x" button to exit without saving. The display returns to the CALIBRATION section where you can perform another calibration or exit.

14. Tap the **Save** icon to store the new setting.

Automated Deadzone Error Messages

Error Message	Explanation
Manual Override Detected	Manual override was detected before the calibration cycle could be completed. Retry the calibration.
No GPS	The GNSS position quality is not ready. From the activity bar, tap the **Diagnostics** icon.
	Look for GNSS RECEIVER, tap **Performance**. RTX status must be Converged, RTK status must be Fixed and SBAS status must be DGPS, before calibration can be started.
No Steering Response Detected	During the calibration cycle, there was not enough movement for the calibration to complete.
	Check the steering sensor setup in the display and cabling connections.
Software Problem Detected	The software was unable to complete the calibration due to insufficient movement of the vehicle. If the problem persists, contact Technical Support.
Steering Close To End Stops	Before the calibration cycle could be completed, the measured steering angle approached the end stops. Retry, and if the problem persists, instead of centering the steering at the start of each cycle, try turning the steering in the opposite direction to that which is being tested so that the calibration procedure has a greater range to test over.
Unable To Determine DZ: Try Again	A problem occurred when trying to compute dead zone. Retry. If the problem persists, contact Technical Support.

Error Message	Explanation
Valve Connectors Could Be Swapped	The calibration test sensed the steering turning in the opposite direction to what was expected. Retry. If the problem persists, then either the valve connectors need to be changed or the steering sensor calibration was interrupted by the user rotating the steering wheel opposite to the steering commands during the calibration.
	OR
	The steering sensor type is incorrect. Check the vehicle's auto guidance setup. For example: **Potentiometer** is the sensor selected when AutoSense installed on the machine.
	OR
	AutoSense is not initialized. Drive forward with wheels straight for 10 seconds. Go to: **Diagnostics -> Autopilot -> Performance -> Steering**. Verify the actual steering angle reported close to 0.
Vehicle Moving Too Slow	The vehicle was moving too slowly for the calibration cycle to successfully finish. Make sure the vehicle is moving at least **1.6** kph (**1** mph) during each calibration cycle.

Steering Proportional Gain (Manual Calibration)

This section applies to an Autopilot (hydraulic steering) installation.

NOTE – Adjust the steering gain only when the Autopilot steering performance is less than satisfactory.

Proportional steering gain (PGain) balances rapid steering response and stability. PGain affects the following:

- **Slew Time:** The amount of time that the front wheels take to move from the far left to the far right position.

- **Overshoot:** The percentage by which the steered wheels exceeded the maximum angle before stopping.

Type	Description
High Gain	Decreases the slew time and increase the overshoot. This provides rapid responses, but can cause the steering to exhibit signs of instability (for example, a tendency to excessively overshoot).

Type	Description
Low Gain	Increases the slew time and decrease the overshoot. This improves the stability but can introduce delays in the steering response and can cause the vehicle to oscillate from side to side.

Precalibration Steps

1. Drive the vehicle to a large field without hazards or obstructions. The field should have smooth soil that is loose but firm.

2. Perform a steering valve deadzone calibration. Two methods are possible:

   - Use Auto Cal's automatic process (recommended).

   - Manual calibration using Automated Steering Deadzone by following onscreen instructions.

   See Automated Steering Deadzone (Manual Calibration) or Auto Cal before you perform the calibration for steering gain.

3. Warm up the vehicle. The hydraulic fluid must be at normal operating temperature for deadzone calibration.

   ⚠ CAUTION – The wheels can move abruptly during the Steering Proportional Gain calibration procedure while the Autopilot system tests the hydraulic response to its steering commands. To avoid injury, be prepared for vehicle movement.

Calibration Steps

1. From the Home screen, tap the Vehicle tile to display the Vehicle screen.

2. Select a vehicle you want to work with, then tap the **Calibrate** button.

3. On the Guidance Calibration screen, tap **Steering Proportional Gain**.

4. On the Steering Proportional Gain window, tap the **Run Slew Test** button.

5. Read each on-screen instruction, then tap **Next**.

6. Drive forward at **1** mph (**1.6** kph) or faster. Tap **Next**.

7. Read each on-screen instruction, then tap **Next**.

8. Turn the front wheels completely to the right and then tap **Turn Left**. Drive forward while the vehicle turns left, until the screen shows the test is complete.

9. Turn the front wheels completely to the left and then tap **Turn Right**. Drive forward while the vehicle turns right, until the screen shows the test is complete.

NOTE – *With some vehicles, valve size and hydraulic capabilities of the machine will limit the slew time and overshoot In such cases, optimizing the P-gain value will be difficult..*

10. Note the Slew Time and Overshoot values.

11. Adjust the gain value.

12. Repeat step 3 through step 9 until the Gain is just below the level where any one of the following occurs:

   - Slew times no longer decrease (**1200-1800** milliseconds is ideal).

   - Overshoot exceeds **5 – 8%** (can be a higher value depending on the vehicle).

   - Wheels noticeably shake near end stops.

   - Slew time and overshoot for both Left and Right sides are consistent and similar values. When you find the optimum gain, tap the green check mark to accept the calibration or the red "x" button to exit *without saving*. The display returns to the CALIBRATION section where you can perform another calibration or exit.

Steering Proportional Gain Error Messages

Error	Description
Wheels do not rotate	If steering is starting from full right or left lock, on some machines manual override could be triggered.
	1. Go to: **Diagnostics -> Autopilot -> Performance -> Sensors**
	2. Verify manual override voltage is below the preset sensitivity voltage.
	3. Restart PGain calibration again.

Roll Correction

Roll correction compensates for non-level navigation controller mounting and vehicle left or right tilt.

NOTE – *For best results, use a RTK or RTX GNSS correction source. RTX must be converged for at least 10 minutes. RTK must be* **Fixed**. *Repeat the steps below at least four times for greater accuracy.*

Precalibration Steps

1. Set up a vehicle and perform all calibrations preceding this one.

2. Read and understand the instructions provided below for the calibration procedure.

3. Remove any implement from the vehicle and drive it to a flat, smooth area where you can complete passes of at least 400 ft (125 m) in length.

4. Create a field. See Add a Field.

Calibration Steps

1. Select a Vehicle and On the Implements screen, you can add, edit, and delete an implement as well as calibrate one for application or section control. From the Home screen, tap the Implement tile to get started. you want to work with.

2. On the Home screen, Select a Field and tap the **Run** button to enter the Run screen.

3. Create a new, straight guidance line. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.

4. Make sure the on-screen lightbar is displayed on the screen. See Using Onscreen Widgets.

5. Engage automatic steering on the guidance line. Autosteer until the onscreen off-line distance number is as close to zero as possible, and then roll to a stop.

6. Mark the vehicle's position:

   a. Place the vehicle in park and exit the cab.

   b. Place a flag in the ground that will mark the vehicle's center line. Use the drawbar pin hole or use another feature of the vehicle as a reference point.

      On vehicles such as sprayers, swathers, or combines, determine a reference point in the center of the vehicle to mark (preferably near to the reference location for the antenna such as front axle, rear axle, or center of track rotation).

Drawbar Hitch
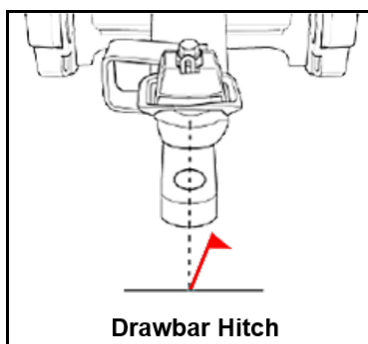
7. Re-enter the cab and continue to drive down the guidance line.

8. Turn the vehicle around and re-engage automatic steering *on the same line* in the opposite direction.

9. Roll to a stop with the drawbar (or other feature used to mark the center line of the vehicle) as close to the first flag as possible.

10. Mark the vehicle's position:

    a. Place the vehicle in park and exit the cab.

    b. Place a second flag in the ground to mark the vehicle's center line.

    c. Measure the distance between flag 1 and flag 2 and note it.
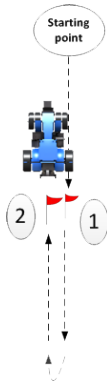
Distance between flag 1 and flag 2 (step c): _____

    d. Also note where the vehicle's current position is in relation to flag 1 (in other words, the vehicle is either to the right or left of flag 1). The diagram, this example shows the vehicle is to the left of flag 1.
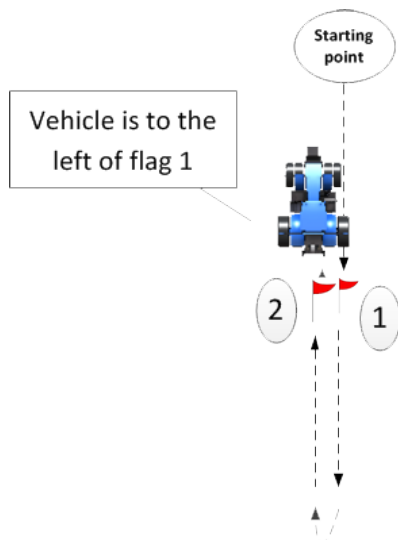
Vehicle is to right or left of flag 2 (step d): _____

    e. Return to the cab and in the Run screen note the cross-track error (the number on the on-screen lightbar).

0' 2.00"

Cross-track error (number on Run screen) (step e): _____

f. Note the direction highlighted on the lightbar (left or right).

Direction highlighted on lightbar (left or right) (step f): _____

11. On the activity bar, tap the **Diagnostics** icon to display the Diagnostics screen.

12. Listed under AUTOPILOT or EZ-PILOT PRO, tap **Performance**, then tap **ADVANCED** at the top of the screen:

13. At the **Roll Offset** entry box and **Vehicle Position** selection box:

- Calculate the roll offset and enter it in the display. Refer to your notes and compare them to the following table to determine how to calculate roll offset.

- Determine the direction of the Vehicle Position and enter it on the display. Refer to your notes and compare them with the following table to find which Vehicle Position to select.
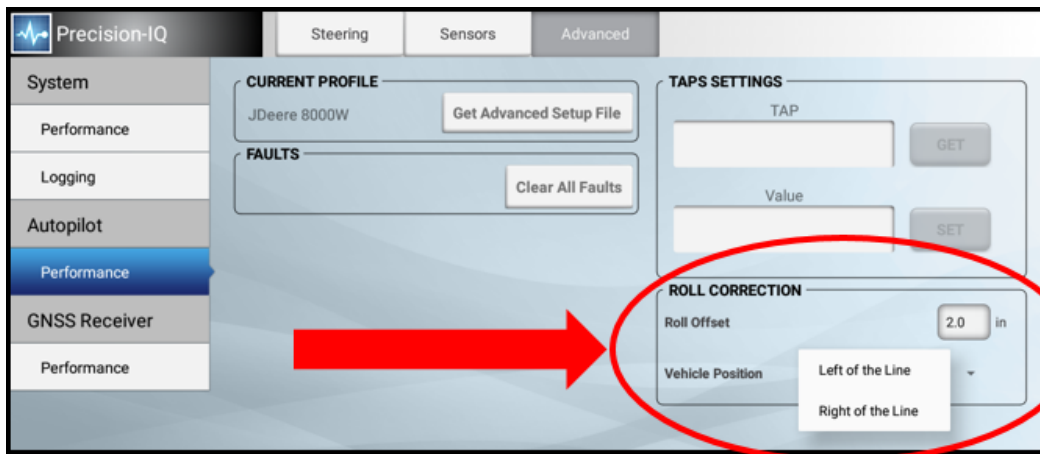
Current vehicle position is to the _____ of flag 1	Lightbar highlight is on the:	Calculate Roll Offset value:	Lightbar (cross-track) value is _____ than flag distance value	Vehicle Position selection
Right	Right	Flag distance minus Cross-track value	Less	Right
Right	Right	Flag distance minus Cross-track value	Greater	Left
Left	Left	Flag distance minus Cross-track value	Less	Left

Current vehicle position is to the _____ of flag 1	Lightbar highlight is on the:	Calculate Roll Offset value:	Lightbar (cross-track) value is _____ than flag distance value	Vehicle Position selection
Left	Left	Flag distance minus Cross-track value	Greater	Right
Right	Left	Flag distance plus Cross-track value	N/A	Right
Left	Right	Flag distance plus Cross-track value	N/A	Left

14. Pull both flags out of the ground and continue driving down the line.

15. Turn the vehicle around again so that you are traveling in the same direction as you were when you originally set the line.

16. Repeat the steps starting at Step 4 until the two flags are under 1" (2.54 cm) apart.

Line Acquisition

Classic Mode

NOTE – Exceeding the capability of the tractor will cause instability (such as oscillating back and forth up and down the line) during line acquisition. Stock values are recommended since excessive values will cause oscillation, the number 1 cause of poor performance.

1. From the Home screen, tap the **Run** button to enter the Run screen.

2. Create a new, straight guidance line. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.

3. On the activity bar, tap the **Diagnostics** icon to display the Diagnostics screen.

4. Under the AUTOPILOT heading in the left-hand list, tap **Performance**, then tap **Steering** at the top of the screen:

5. Tap the **Engage** button in the lower-right part of the screen:

Let the machine autosteer until the cross track error is close to **0**.

6. Evaluate the time and distance and travel path it took the machine to drive onto the guidance line.

7. Tap the **Line Acquisition** button at bottom of the screen.

8. On the Line Acquisition window, tap the **Classic** button at top of the screen.

> ⚠ CAUTION – Stability needs to be checked at 4.5 mph.

9. Move the **Line Acquisition Aggressiveness** percentage slider to the left or right. Tap the **+** or **-** buttons.

10. Drive forward and re-engage auto-steering if necessary to test the setting.

11. When you find the optimum aggressiveness, tap the green check mark to accept the calibration or tap the red "x" button to exit without saving.

Calibration	Explanation
Line Acquisition Aggressiveness	Line acquisition controls how fast the guidance system attempts to steer the vehicle onto the current guidance line (50% - 150%).
	• With a high setting, the vehicle approaches the line quickly, but may overshoot the line and drive into instability.
	• With a low setting, the vehicle steers onto the line more slowly, but is less likely to overshoot the line.
Engage Aggressiveness	Controls to set how aggressively the vehicle initially turns towards the guidance line.
	• With a high setting, the vehicle will initially respond quickly.
	• With a low setting, the vehicle will respond more smoothly when initially engaged.

OnSwath Mode

With OnSwath™, you can customize line acquisition to the vehicle, operation and operator preference. Vehicle behavior during line acquisition is more controlled, more predictable, and more repeatable.
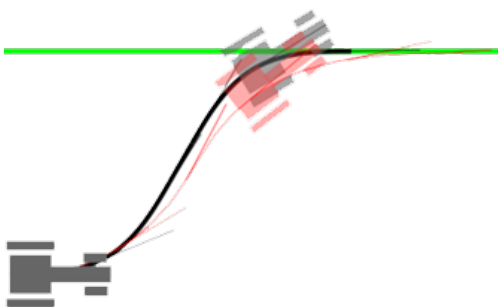
The benefits of OnSwath include:

- Up to 50% faster line acquisition.
- Separate tuning for online and line acquisition.
- More repeatable performance.
- Consistent performance over entire speed range.
- Cab shake eliminated on articulated machines.
- Limited turn rates reduce impact on field for tracked machines.
- Front axle/nose overshoots more, so that the rear axle acquires the line faster.

OnSwath requires:

- NavController firmware version 6.00 and higher.

OnSwath Line-Acquisition Mode Setup

NOTE – Autopilot Motor Drive and EZ-Pilot Pro use only OnSwath line acquisition.

1. From the Home screen, tap the **Run** button to enter the Run screen.
2. Create a new, straight guidance line. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.
3. On the activity bar, tap the **Diagnostics** icon.
4. Under the AUTOPILOT heading in the left-hand list, tap **Performance**, then tap **Steering** at the top of the screen:
5. Tap the **Engage** button in the lower-right part of the screen:

   Let the machine autosteer until the cross track error is close to **0**.
6. Evaluate the time and distance and travel path it took the machine to drive onto the guidance line.
7. Tap the **Line Acquisition** button at bottom of the screen. On the Line Acquisition window, tap the **OnSwath** button at top of the screen and tap the **+** or **-** buttons to adjust the following settings as needed:

Field	Description
Steering Angle (normal maximum)	Set the desired maximum steering angle (turn radius) for the system to use during line acquisition and end-of-row turns. This is not a hard limit, but the value the system plans for.
Steering Angle Aggressiveness at High Speeds	Set the speed at which the maximum steering angle starts to reduce.
Slew Rate (normal maximum)	Set the slew rate that the Autopilot system will plan for during line acquisition and end- of-row turns. A higher slew rate increases the rate at which the steering angle (turn radius) changes, up to the vehicle's physical capabilities. If you ran Auto Cal previously, do not adjust the value shown. Auto Cal calculated the maximum value possible for the steering response limits of your machine.
Steering Slew Rate Aggressiveness for High Speeds	Set the slew rate for high speeds at which the Autopilot system will begin to reduce the slew rate. A lower aggressiveness will reduce the slew rate more at high speeds. This results in a smoother and more stable operation.
Approach Angle	The desired approach angle that the Autopilot system will drive to the line if adequate space is available. If space is not available, the angle may not be achievable.
Initial Turn Aggressiveness	Adjusts how sharp or smooth the initial turn toward to the line will be in comparison to the final turn onto the line. This affects only the initial turn towards, while the final turn onto the line is not affected. If the value is: • **Lower:** The initial turn will be smoother and more gradual. • **Higher:** The initial turn will be harder and sharper toward the line.

8. Once you have completed and checked the entries in all sections, tap the green check mark to save the settings.

Autopilot

🔓 This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

The Trimble® Autopilot™ steering system combines the accuracy of the NAV-900 guidance controller with the highest level of autosteer performance.

Benefits

- Sub-inch accuracy inertias from the NAV-900 guidance controller.

- Slow and high speed.

- Reverse operation.

- Compatible with factory-equipped, auto guidance ready machines: Challenger, Claas, CaseIH, John Deere, JCB, Kubota, Massey Ferguson, New Holland, and Valtra.

Dependencies

Autopilot (CAN bus factory-ready machines) using a NAV-900 guidance controller, requires a **CAN BASED STEERING** license installed into the NAV-900 guidance controller and is managed through the display. The license is available in App Central:
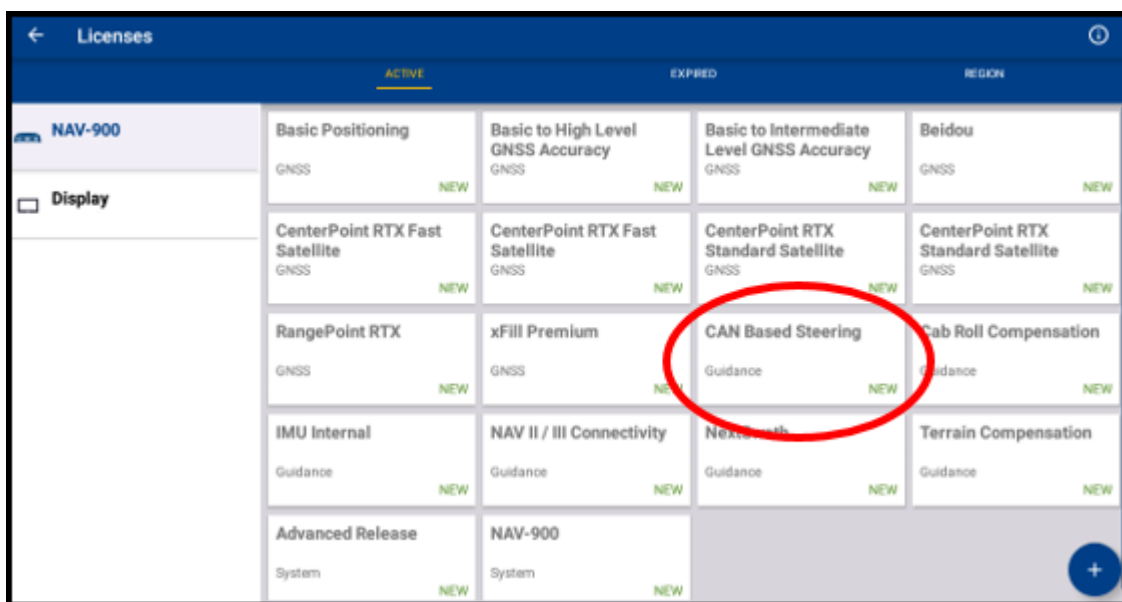
Autopilot (hydraulic) requires a **NAV II/III CONNECTIVITY** license installed into the NAV-900 guidance controller and is managed through the display. The license is available in App Central:

Licenses

ACTIVE   EXPIRED   REGION

Display

NAV-900

Basic Positioning
GNSS   NEW

Basic to High Level
GNSS Accuracy
GNSS   NEW

Basic to Intermediate
Level GNSS Accuracy
GNSS   NEW

Beidou
GNSS   NEW

CenterPoint RTX Fast
Satellite
GNSS   NEW

CenterPoint RTX Fast
Satellite
GNSS   NEW

CenterPoint RTX
Standard Satellite
GNSS   NEW

CenterPoint RTX
Standard Satellite
GNSS   NEW

GLONASS
GNSS   NEW

Galileo
GNSS   NEW

L2 Frequency
GNSS   NEW

L5 Frequency
GNSS   NEW

NAV II / III Connectivity
Guidance   NEW

NextSwath
Guidance   NEW

Terrain Compensation
Guidance   NEW

NAV-900
System   NEW

+

NOTE – The NAV II/III Connectivity license is installed from the factory and does not require purchase.

System Layout

Autopilot CAN Steer (in-cab connection)

❷

❹

❸

4 Pin D code   5 Pin A code

Sonalert

❻

❶

❺

NMEA
OUT

5 Pin B code   4 Pin D code

Remote
engage

to vehicle

❽

❿

❾

❼

for port
expansion

to vehicle

radio

⓫

to Battery

Item	Description	Part Number
1	GFX-750/XCN-1050 display, with Precision-IQ App	
2	NAV-900 guidance controller	
3	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR), 5 m	110540
4	Cable Assy, NAV-900 to in-cab RTK Radio, DTM06, 4.5 m	110544
5	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR) Extension, 2.5 m. Optional extension for large vehicles	112082
6	Cable Assy, NAV-900, CAN ISO to cab Guidance, 4 m	110550
7	Cable Assy, NAV-900, CAN ISO in-cab, Guidance Cable Assy, NAV-900, CAN ISO in-cab ext, Guidance, 2 m	112611
8	Cable Assy, GFX-750/XCN-1050, Expansion Port Basic, RS232, Dig I/O, 2.5 m	110545
9	Cable Assy, GFX-750/XCN-1050, Power to display, CAN, 2.5 m	110551
10	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM1000 Power with Relay and Switch (Acc) (optional)	67259
11	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM1000 Basic Power, 4 m	67258

Autopilot (using NavController II/III)
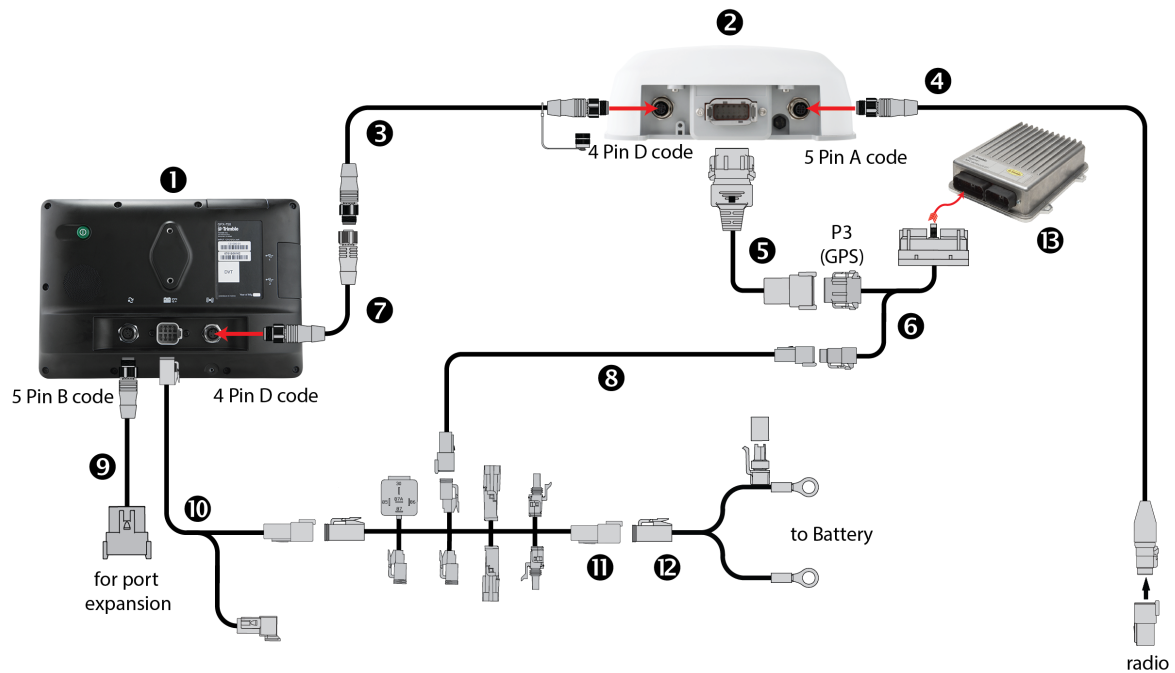
Item	Description	Part Number
1	GFX-750/XCN-1050 display, with PIQ App	
2	NAV-900 guidance controller	
3	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR), 5 m	110540
4	Cable Assy, NAV-900 to in-cab RTK Radio, DTM06, 4.5 m	110544
5	Cable Assy, NAV-900 to Nav II/III, Autopilot	110547
6	Cable, NavController II/III, Main	54601
7	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR) Extension, 2.5 m. Optional extension for large vehicles	112082
8	Cable Assy, 2 PIN DTM to 2 PIN DT Power Adapter	67095
9	Cable Assy, GFX-750/XCN-1050, Expansion Port Basic, RS232, Dig I/O, 2.5 m	110545
10	Cable Assy, GFX-750/XCN-1050, Power to display, CAN, 2.5 m	110551

Item	Description	Part Number
11	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM1000 Power with Relay and Switch (Acc)	67259
12	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM1000 Basic Power, 4 m	67258
13	NavController II/III	

Autopilot (Hydraulic) Setup

1. Set up auto guidance as described in Auto Guidance Setup. Return to this step when completed.

2. Set up navigation controller as described in Controller Setup. Return to this step when completed.

3. Set up the steering sensor as described in Steering Sensor. Return to this step when completed.

4. Enter machine dimensions as described in Vehicle Measurement Settings. Return to this step when completed.

5. Calibrate Autopilot as described in Auto Guidance Calibration. Follow steps for each routine listed:

   - Manual Override
   - Auto Cal
   - DeadZone (not required if you ran Auto Cal)
   - Steering Sensor
   - Proportional Gain
   - Roll Correction
   - Line Acquisition

Autopilot Motor Drive and EZ-Pilot Pro

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

Combining the accuracy of the NAV-900 guidance controller with the ease of installation of SAM-200 motor brings high levels of performance.

Benefits

- Sub-inch accuracy inertias from the NAV-900 guidance controller.

- Slow speed and reverse operation.

- Eliminates the requirement for a steering angle sensor.

- Autopilot performance without the requirement for hose or hydraulic manifold installation.

- Automatic steering for vehicles not factory equipped with auto guidance.

Dependencies

EZ-Pilot Pro auto guidance requires an **EZ-Pilot Pro** license installed into the NAV-900 guidance controller and managed through the display. The license is found in App Central:
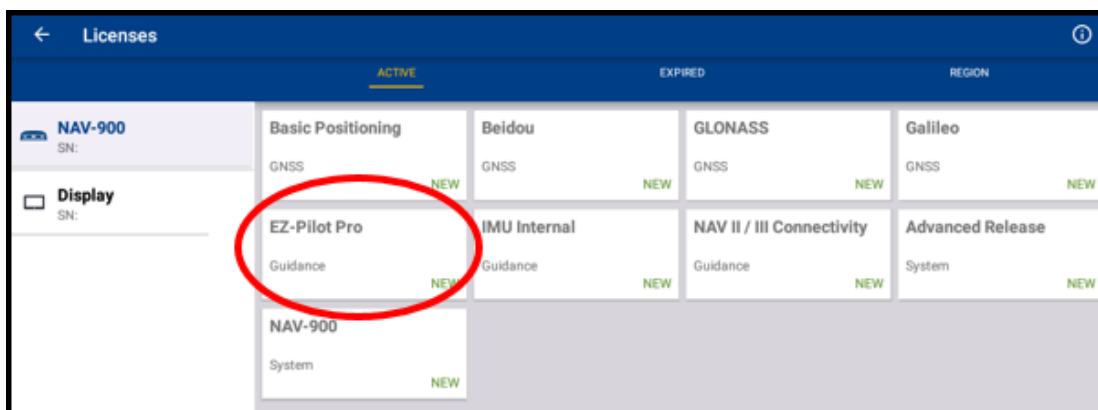
Autopilot Motor Drive requires an **AUTOPILOT** license installed into the NAV-900 guidance controller and is managed through the display. The license is found in App Central:
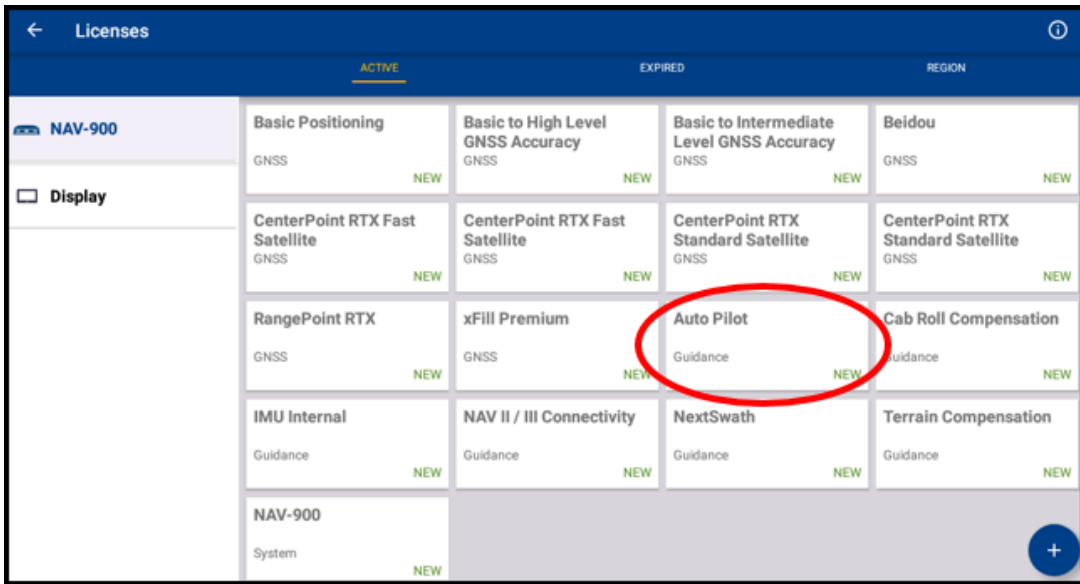
System Layout (EZ-Pilot Pro or Autopilot Motor Drive)

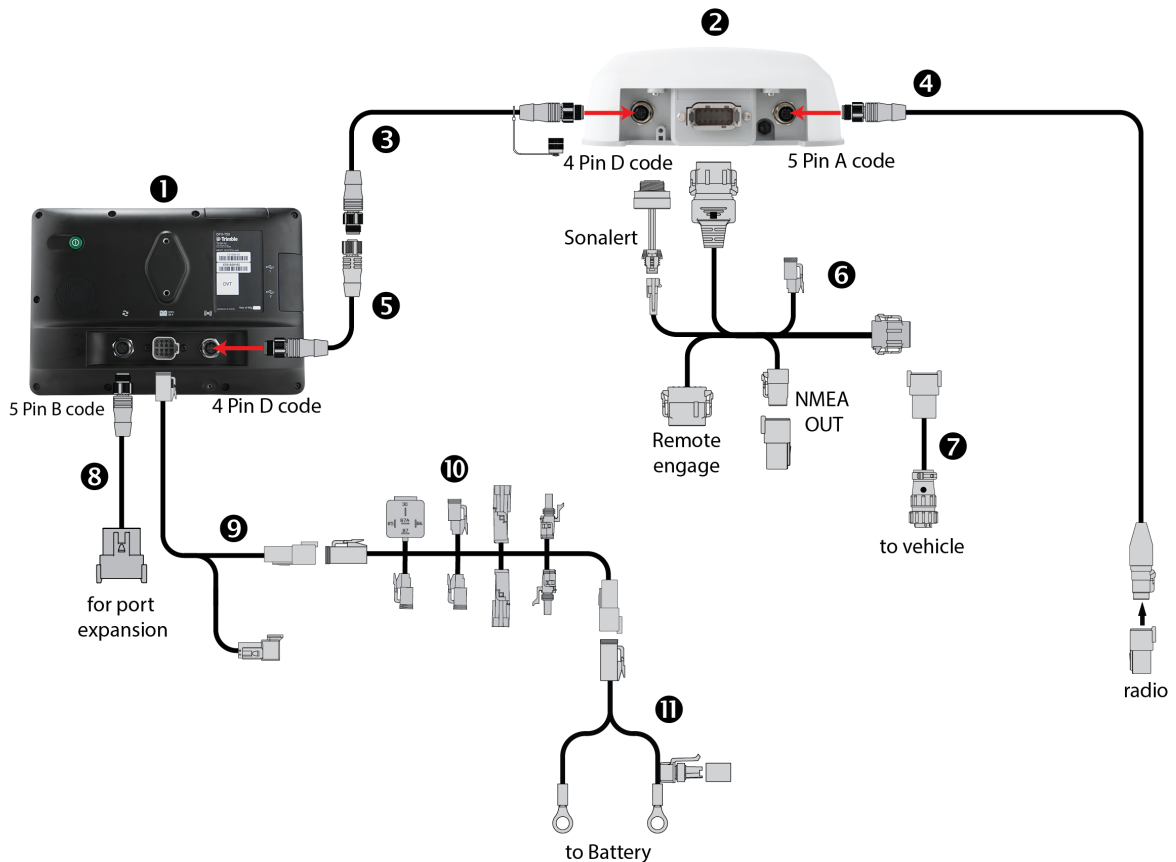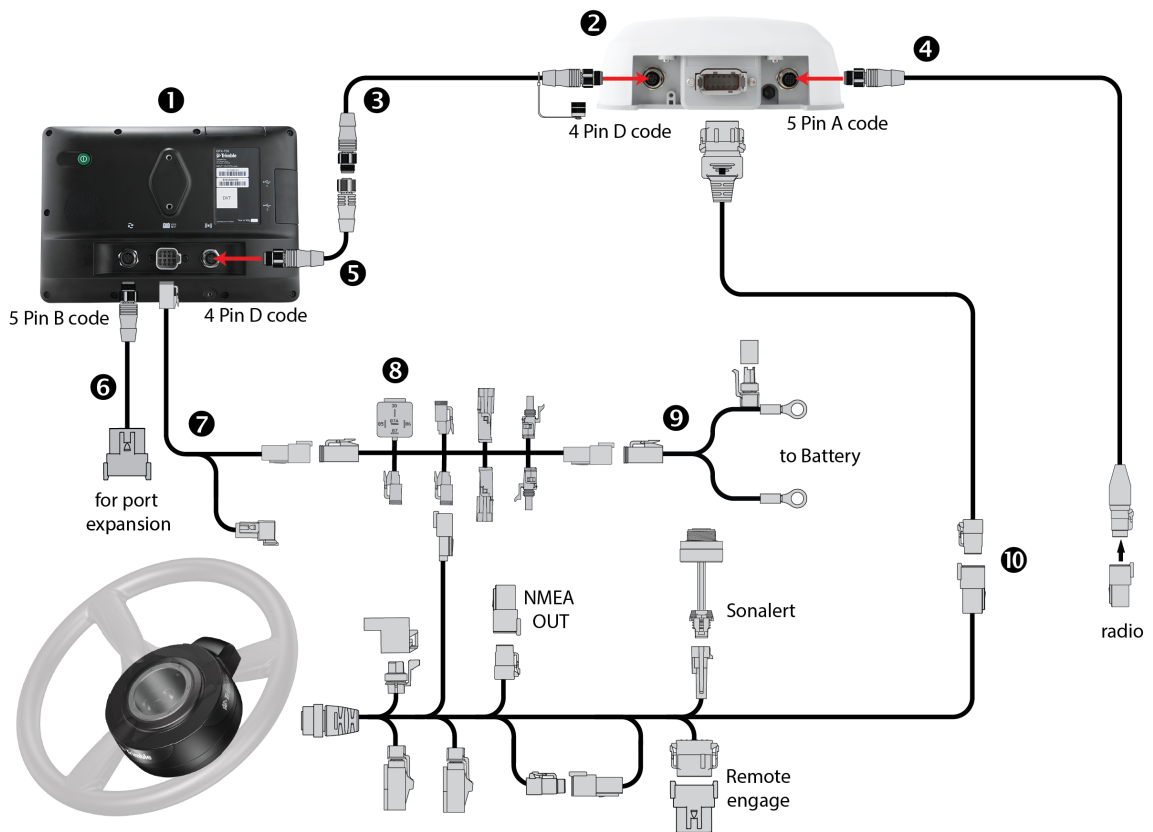| Item	Description	Part Number
1	GFX-750 display, with Precision-IQ Application	121000-XX
2	NAV-900 Guidance Controller	108993-XX
3	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR), 5 m	110540
4	Cable Assy, NAV-900 to in-cab RTK Radio, DTM06, 4.5 m	110544
5	Cable Assy, GFX-750/XCN-1050 to NAV-900, Power/Ethernet (BRR) Extension, 2.5 m. Optional extension for large vehicles	112082
6	Cable Assy, GFX-750/XCN-1050, Expansion Port Basic, RS-232, Dig I/O, 2.5 m	110545
7	Cable Assy, GFX-750 , Power to display, CAN, 2.5 m	110551
8	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM-1000 Power with Relay and Switch (Acc)	67259
9	Cable Assy, GFX-750/CFX-750/FM-750/XCN-1050/FmX/FM-1000 Basic Power, 4 m	67258
10	Cable Assy, NAV-900 to SAM-200, Motor Drive	110549

Autopilot Motor Drive and EZ-Pilot Pro Setup

1. On the Home screen, tap the **Vehicle** tile to display the Vehicle screen.

2. On the Vehicle screen, tap the **New** button. Then tap the machine type you want to configure.

   For Autopilot Motor Drive and EZ-Pilot Pro, the available *supported* vehicle types are:

   - Harvester
   - Tractor - 2WD/4WD-MFWD
   - Tractor - Articulated 4WD

3. Tap **Next** to continue with the vehicle setup.

4. Tap the **Make**, **Series**, **Model**, and **Option** fields. Enter information about your machine:

Tap	To enter or select...
Make	Vehicle manufacturer
Series	Vehicle series (when applicable)
Model	Vehicle model number
Option	Vehicle options factory installed from the manufacture. (Examples: Super Steer, ILS, ISO CAN Ready, AccuGuide Ready)
Vehicle Name	The name of the vehicle is pre-filled from the options you selected for Make, Series, and Model. You can change this name.

Tap **Next** to continue.

5. Tap the **Selection** field. Setup of Selection, Autopilot Platform, and External Guidance Device (if applicable) is based on the autosteer system installed:

- EZ-Pilot Pro.
- Autopilot Motor Drive + NAV-900 guidance controller.
- Autopilot Motor Drive + NavController III + NAV-900 antenna.

  For example:

NOTE – *The display contains a database of Trimble-supported platforms for Autopilot Motor Drive and EZ-Pilot Pro.*

If the **Selection** does not list Autopilot Motor Drive or EZ-Pilot Pro, then there are two possibilities:

- Your display is missing a license to enable Autopilot Motor Drive or EZ-Pilot Pro. Check the installed NAV-900 licenses shown in **App Central** for your display. If Autopilot Motor Drive or EZ-Pilot Pro licenses are not shown, contact your Trimble dealer with your NAV-900 serial number. The license is available for purchase.

- The selected vehicle chosen for Make/Series/Model/Option does not support Autopilot Motor Drive or EZ-Pilot Pro. Tap **Back** and choose a different name for Make/Series/Model/Option. Pick a similar sized vehicle compared to your actual machine. Remember, the vehicle name can be changed.

6. Tap **Next** to continue.

7. Set the controller mounting orientation. The on-screen picture changes based on autosteer type selected:

   - EZ-Pilot Pro *or* Autopilot Motor Drive + NAV-900 guidance controller:
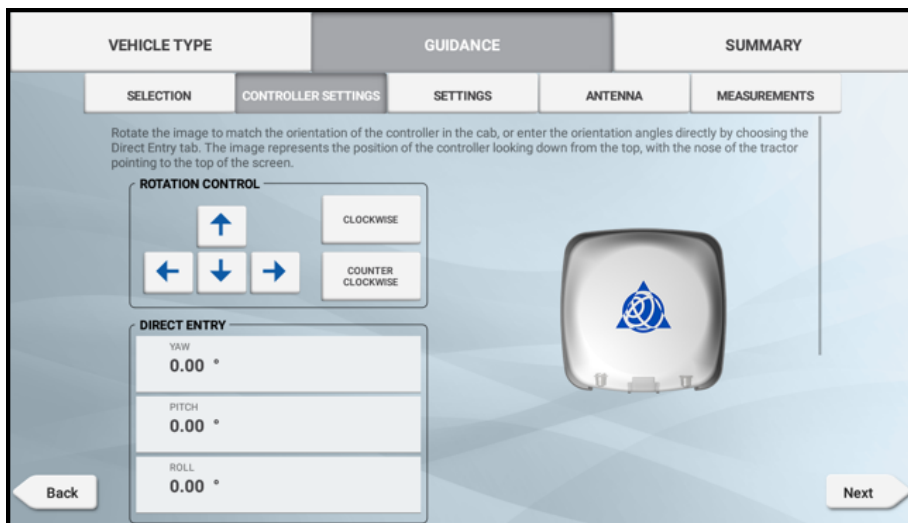
   - Autopilot Motor Drive + NavIII controller + NAV-900 antenna
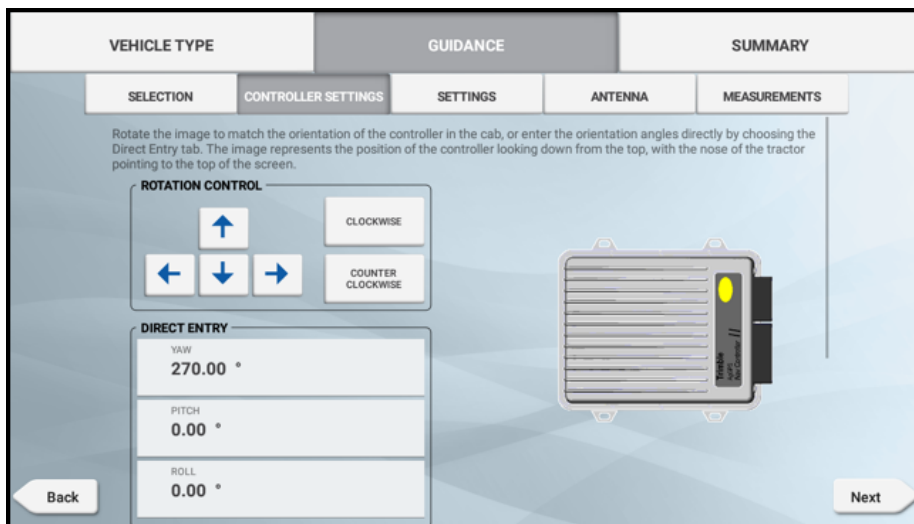
8. Tap **Next** to continue.

9. The Steering Sensor cannot be changed.

   NOTE – *The SAM-200 motor has a built-in sensor that measures steering angle.*

SELECTION	CONTROLLER SETTINGS	SETTINGS	ANTENNA	MEASUREMENTS
	STEERING SENSOR **Not required**			
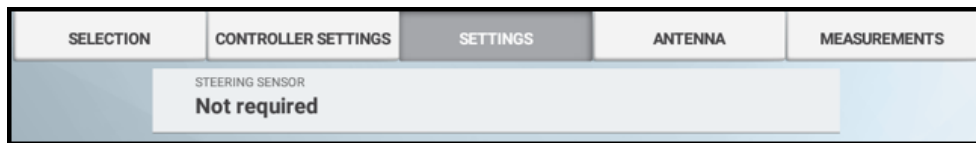
   Tap **Next** to continue.

10. Enter antenna location dimensions on machine. Make certain the values are correct.

    Tap **Next** to continue.

11. Enter all measurements of the machine. Make certain the values are correct.

    NOTE – *A yellow warning triangle indicates the dimension is required, you cannot proceed to the next setup until the value is entered.*

12. Tap **Save** to save the new machine configuration and return to the Vehicle screen.

13. Tap the new machine name listed and tap the **Select Vehicle** button to select it.

14. From the list of available vehicles, tap the name of the vehicle you want to edit. Then tap the **Calibrate** button.

15. Run Auto Cal calibration as described in Enable Auto Cal or Auto Cal. Return to this step when completed.

    NOTE – *Only attempt this calibration on a dry field surface. Do not attempt this calibration in a field with snow, mud, frost, or rain.*

16. Calibrate Steering Proportional Gain.

    NOTE – *The process for EZ-Pilot Pro and Autopilot Motor Drive is different than the Autopilot hydraulic installations.*

    a. From the Home screen, tap the **Run** button to enter the Run screen.

    b. Create a new, straight guidance line. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.

    c. In the activity bar, tap the **Diagnostics** icon to go to the Diagnostics screen.

    d. Find AUTOPILOT or EZ-PILOT PRO on the left side and tap **Performance**. Tap **Steering** at the top of the screen.

e. Tap the **Vehicle Aggressiveness** slider. Set value to **100%**.
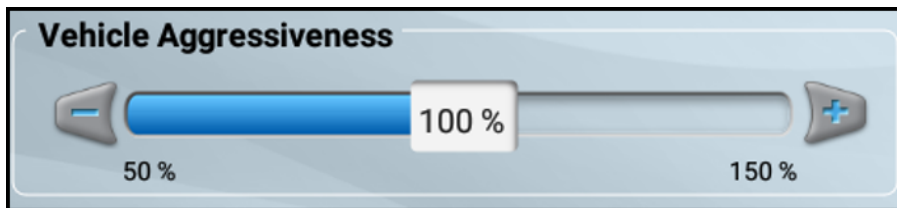
f. Watch the cross track error at top of screen. Note the largest value seen. Drive a normal field speed.

g. Tap the **Steering Proportional Gain** slider at bottom of screen. Move the percentage slider to the left or right. Tap the plus (**+**) or minus (**-**) buttons:
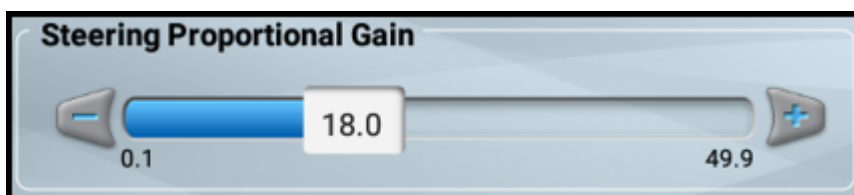
h. Drive forward, re-engage auto-steering, and watch the cross-track error at the top of the screen:

- If the maximum value observed is larger, then *decrease* the p-gain.

- If the maximum value is getting smaller, then *increase* p-gain.

NOTE – There is limit to improving steering accuracy using p-gain. You can make steering accuracy worse by using a value that is too high or too low for your machine. Typical range of values for Autopilot Motor Drive or EZ-Pilot Pro is 12-19. If you notice the motor jerking the steering wheel, decrease the p-gain value. Only attempt this calibration on a dry field surface. Do not attempt this calibration in a field with snow, mud, or frost.

17. Calibrate Roll Correction as described in Roll Correction. Return to this step when completed.

18. Adjust Line Acquisition as described in Line Acquisition.

NOTE – Autopilot Motor Drive and EZ-Pilot Pro use only OnSwath line acquisition.

NextSwath

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

The NextSwath feature is used to automatically turn the vehicle at the end of a straight line guidance pattern to align with the next selected swath. Vehicle functions on some specific vehicles can also be used for more efficient operation.

Even if you have used other guidance systems before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

The following sections describe how to set up and operate the Trimble® NextSwath™ end-of-row turn technology:

- NextSwath Dependencies.

- NextSwath Requirements.

- Implement Setup for NextSwath.

- Vehicle Controller Setup for NextSwath.

- Configuring NextSwath.

- Running NextSwath.

NextSwath Dependencies

NextSwath requires an installed license into the NAV-900 controller and is managed through the display. The license is found in App Central:
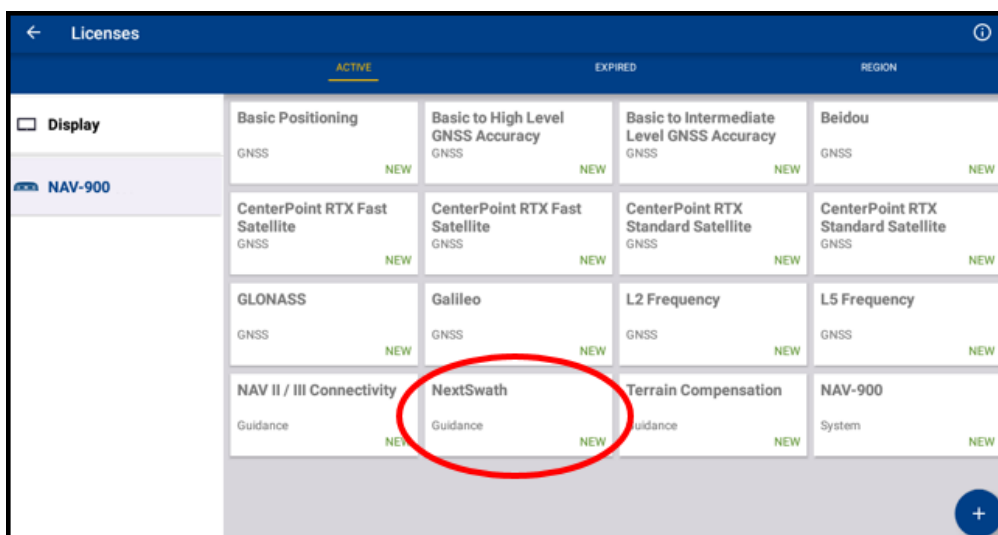
NextSwath Requirements

The NextSwath feature consists of two parts:

- NextSwath end-of-row technology, which enables both end-of-row turning and simple event timing commands.

- NextSwath Connect, which uses the vehicle's end-of-row operational controls to trigger the interface, is only available with NavController III.

⚠️ **CAUTION –** The NextSwath technology cannot be used with Autonomous, SBAS, or OmniSTAR® VBS correction sources. RangePoint RTX Correction Service is the minimum supported correction service.

⚠️ **CAUTION –** NextSwath technology within Precision-IQ within TMX-2050/XCN-2050 version 4.6 does not support the RG-100 row guidance system or True Tracker.

The following technologies are required before configuring and using NextSwath:

- NextSwath technology requires the Autopilot steering system to be installed.

- NextSwath technology can be used only with vehicles defined as capable in the supported platforms list.

- NextSwath requires the use of internal vehicle profiles found within the Precision-IQ application.

- OnSwath advanced line acquisition is a requirement for using NextSwath technology. For more information, see Line Acquisition.

- NextSwath technology requires one of the following GNSS correction sources:
    - OmniSTAR® XP
    - OmniSTAR HP
    - RangePoint® RTX
    - CenterPoint® RTX (SS, FS, SC)
    - CenterPoint RTK
    - Trimble® VRS Now™

Implement Setup for NextSwath

1. Select an implement type and give the implement a name (see Implements for details). On the Implement Hitch screen, the **Hitch Type** and **Hitch to Application Point** values are required.

2. Tap **Next**.

3. On the Implement Measurements screen, update the values that are available for NextSwath technology. The following table describes the options you can configure:

Field	Description
Application Width	Enter the width of the operation that is actually performed by the machine or implement. This width is used for determining area covered.

Field	Description
Swath Width	Enter the width that is required for guidance line separation and turn planning.
Left / Right Offset	Enter the left or right offset of the center line of the implement from the center line of the vehicle.
Physical width	Enter the physical width of the implement.
Physical Length	Enter the physical length from the front to the rear of the implement.

Vehicle Controller Setup for NextSwath

As part of the Autopilot setup, enter additional measurements that are used for modeling purposes for the NextSwath technology and, as required, for the TrueSwath technology. Once you have completed/checked the entries in the *Vehicle / Edit / Guidance - Antenna and Measurements* screen, tap **Next**, and then tap **Save**.

1. On the Vehicle Guidance - Antenna screen, enter values for the following antenna attributes:

   - Antenna Height

   - Antenna Left/Right Offset

   - Antenna to Rear Axle: If the antenna is forward of the axle, then the value is positive (+). If the antenna is behind the axle, then the value is negative (-), for example, **-1.0 ft 3.0 in**.

   Tap **Next**.

2. On the Vehicle Guidance - Measurements screen, enter values for the following measurements:

   - Rear axle to tow hitch

   - Rear axle to 3-point hitch

   - Wheelbase

   - Width

3. Enter the following values:

Measurement	Description
Fixed Axle to Tow Hitch	Measure the distance from the control point of the vehicle to the center point of the drawbar hitch pin. The control point depends on the vehicle type: • MFWD: Rear axle • Tracked tractor: Center of rotation • Sprayers: Rear axle • Combine/Harvesters: Front axle • 4WD/Articulated: Rear axle *NOTE – If you are using a two-point hitch, measure the distance from the fixed axle to the pivot point on the apparatus.*
Fixed Axle to 3-Point Hitch	Measure the distance from the control point to the location where the three-point fixture, feeder, house, or boom attaches. This measurement is also used for fixed applications such as harvesting and spraying with a self-propelled sprayer. For front-mounted implements such as swathers, combines, and front-boom sprayers, you must make sure to set the offset to front.
Vehicle Width	Enter the physical width of the widest part of the vehicle.

Configuring NextSwath

When enabled, NextSwath is part of the implement setup in Precision-IQ. (See Implements for details about configuring implements.)

NOTE – If your implement does not support NextSwath, then this option will not appear.

On the NextSwath screen, tap the on/off slider to enable NextSwath. Tap the **Edit** button to begin NextSwath configuration.

1. **Turn Pattern:** Set the Turn Pattern values:

   a. *Type of Path:* There are two options to define the required turn trajectory:

      • Shortest (sharper turn): This is based on the swath width, the steering angle settings for the OnSwath technology, and the minimum turn radius (see below). This setting will turn as short as possible—generally the default.

      • Smoothest (rounder turn): This is used for large applications (wide spraying, some tillage, and so on) in which a smooth, gentle turn is required. This setting

uses the smallest constant radius to make the desired turn. For larger numbers of swaths changed in a turn, the radius expands.

b. *Turn Pattern:* When the steering system limitations and swath width do not allow a turn to be completed within the distance between swaths, the system must go outside the swath lines. There are three options for how the system will do this:

- Turn wide at start: All turning outside of the swaths is done at the start of the turn.

- Keyhole: An equal amount of turning outside of the swath region is done on each side of the turn.

- Turn wide at end: All turning outside of the swath region is done at the end of the turn.

NOTE – *When TrueSwath technology is used with this setting, the path the vehicle must take to bring the pull-type implement online affects the shape of the turn.*

c. *Swath Change Limit:* This defines the largest number of swaths that can be changed during a turn left or right. The value can be set to the smaller of 10 swath widths or a distance of 500 ft (150 m).

NextSwath technology makes a turn perpendicular to the swath direction so that when changing multiple swaths where the swaths intersect the boundary at a sharp angle, the path between the selected swaths will be extended to accommodate the furthest swath end point.

Tap **Next** to continue.

2. **Turn Location:** Set the Turn Location values:

a. *Shorten or Extend Swath:* When using a headland pattern or turn points determined by a boundary offset, you can select one of the following options to define how the system should make the turn:

- Minimize headland usage (shorten): This potentially starts the turn inside the infill area to allow for the full turn to be completed while minimizing use of the headland area. When using NextSwath technology for operations in which the swath lines do not intersect the boundary at a square angle, the point for the line that is closer in will be used.

- Maximize infill coverage (extend): This starts the turn at the boundary between the headland and the infill so that all of the turn happens outside the infill, provided there is space to do so within the headland area/outer boundary. When using NextSwath technology for operations in which the

swath lines do not intersect the boundary at a square angle, the point for the line that is further out will be used.

NOTE – *The ability of the vehicle to stay within the headland depends on the number of circuits or offset distances defined by the user.*

b. **Turn Within Boundary:** This parameter can be enabled for the vehicle, the vehicle and implement, or disabled. When set to:

- Vehicle: A turn will be planned so that the outside of the vehicle (based on the width entered in vehicle measurements) clears the edge of the boundary by the value entered in the Boundary Clearance field.

- Vehicle and Implement: A turn will be planned so that the outside edge of the vehicle/implement combination (based on the physical dimensions of the vehicle and implement that have been entered) clears the edge of the boundary by the value entered in the Boundary Clearance field.

- Disabled: The turn location will be set by the active swath A and B points.

NOTE – *For boundary clearance to be used the field must have a mapped boundary. If no boundary is available for the field; turn locations will be based on the A and B points of the swath. It is the operator's responsibility to ensure that the mapped boundary is accurate for the field.*

⚠WARNING – Obstacle avoidance is solely the responsibility of the Operator. A trained and qualified operator must be present in the vehicle at all times.

⚠ CAUTION – NextSwath boundary clearance relies on accurate vehicle steering settings and boundary mapping. Inaccurate boundaries will cause inaccurate clearance.

c. **Boundary Clearance:** Set the distance (inside or outside) by which you want the boundary to be avoided.

NOTE – *Due to geometry limits of field shapes and shrinking/expanding boundary clearance distances; the NextSwath technology may not be able to generate auto-turns based on the clearance distances entered.*

d. **TrueSwath Swath Extension:** When using TrueSwath technology, a distance offset to delay the vehicle turning into the end rows/headland circuit may be required to allow for proper coverage.

Adjust this value to alter the distance as required.

NOTE – *The Autopilot system's end-of-row warning distance/end-of-row time dictates when*

the prompt for acknowledging the automated end-of-row turns appears when approaching the turn point.

Tap **Next** to continue.

3. **Parameters:** Set the Parameters value:

   a. *Turn Speed:* The speed designated for auto turns and the speed for which the turn will be optimized.

   If the vehicle travels at a speed that is more than 1.1 mph (0.5 m/s) faster than the entered turn speed value, the NextSwath technology will not start the turn. Any speed that is slower than the turn speed is allowed. If, during the turn, the set speed is exceeded by 1.1 mph (0.5 m/s), the system will disengage and the turn will be abandoned.

   It is recommended that you set this value to the highest speed for which turns will be made.

   NOTE – OnSwath settings for the maximum nominal steering angle, maximum nominal steering slew rate, and aggressiveness affect the path of the planned turn.

   b. *Minimum Turn Radius:* This is the minimum turn radius for which the turn will be planned. Determine the radius by driving the vehicle and implement combination in the tightest turn required and then measuring the radius (half of the diameter) of the path of the control point of the vehicle (that is, the path of the center of the rear axle for MFWD or center of front axle for combines, and so on).

   If the turn speed and OnSwath settings dictate a larger turn radius than the radius entered, the larger radius will be used.

   These settings apply to both regular and TrueSwath-enabled turns. This setting will not affect line acquisition.

   c. *Remote Engage Confirms Auto Turn:* Enable this feature to allow the use of the remote engage button to accept the NextSwath turn as an alternative to touching the Run screen when the end-of-row automated turn notice appears.

   NOTE – Remote engage systems wired directly into the NavController will work with this functionality. CAN-based remote engage systems may or may not work depending on the vehicle manufacturer's message protocol.

   Tap **Next** to continue.

4. **Turn Start Actions:** Set Turn Start Actions values. Tap **Add** or a previously configured action row to edit the following event parameters:

   a. *Action:* Select the operation for which you want to set reminders or sequencing.

   b. *Distance or Time:* Select whether to use a Time or Distance offset for the action.

c. *Distance Before or After Turn:*

- When *Time or Distance* is selected, enter the action offset value.

- When *When* is selected, enter the required offset and whether it should happen before or after the turn is complete, when entering the swath.

d. *Reference:* Sets the reference point the action will coordinate with. Choose one of the following:

- Vehicle, which uses the control point of the vehicle.

- Implement Application Point, defined in Implement/Measurements.

- Implement ground contact point, defined in Implement/Measurements.

e. *Sound Alert:* Enable or disable an audible alert from the sonalert and display.

f. *Text alert:* Determines if the action appears in the list of user prompts during turning activity.

NOTE – When using "Log when engaged" for managing coverage logging; to stop logging after turning, you must set up a Stop application action. Adjust the "When" value to obtain the proper coverage. It is recommended that you use distance rather than time, as time is affected by travel speed.

Tap **Next** to continue.

5. **Turn End Actions:** Set the Turn End Actions values. Tap **Add** or a previously configured action row to edit the following event parameters:

a. *Action:* Select the operation for which you want to set reminders or sequencing.

b. *Distance or Time:* Select whether to use a Time or Distance offset for the action.

c. Distance Before or After Turn:

- When *Time or Distance* is selected, enter the action offset value.

- When *When* is selected, enter the required offset and whether it should happen before or after the turn is complete, when entering the swath.

d. *Reference:* Sets the reference point the action will coordinate with. Choose one of the following:

- Vehicle, which uses the control point of the vehicle.

- Implement Application Point, defined in Implement/Measurements.

- Implement ground contact point, defined in Implement/Measurements.

e. *Sound Alert:* Enable or disable an audible alert from the sonalert and display.

f. **Text alert:** Determines if the action appears in the list of user prompts during turning activity.

NOTE – When using "Log when engaged" for managing coverage logging; to start logging after turning, you must set up a Start application action. Adjust the "When" value to ensure the proper coverage. It is recommended that you use distance rather than time, as time offsets change with speed.

Tap **Next** to continue.

6. **NextSwath Connect:** Set the NextSwath Connect values.

For implementation, you must purchase the NextSwath Connect unlock and use a NavController III to output the signal from the third solenoid. As there is only one solenoid output on the NavController III, only one button can be triggered.

You can use this output to initiate a recorded sequence on the vehicle only. You must set up the timing for the sequences using the interface on the tractor. Refer to the tractor operator's manual for recording methods. You can adjust the timing for the start of the sequences by changing the Occurs Before/After value in the Swath Start Events/Swath End Events tabs for the Sequence A and/or Sequence B event.

NOTE – You cannot use Vehicle Integration on vehicles that use the third solenoid output for the "On when engaged" function.

7. Tap the **Save** icon to save the settings.

With the configuration settings saved, you are now ready to use NextSwath.

Running NextSwath

This section describes how to run the NextSwath technology.

⚠ CAUTION – The NextSwath technology is designed to only be used with straight AB, A+, and headland infill patterns. It does not work with curve patterns, pivot patterns, freeform, or feature line guidance.

The following topics are provided for running NextSwath:

- Engaging NextSwath
- Using NextSwath End-of-Row Auto Turns
- Setting the End-of-Row Point
- NextSwath Operating Tips

Engaging NextSwath

From the Home screen, tap the **Run** button to enter the Run screen. NextSwath is accessed and used from the Precision-IQ Run screen.

The NextSwath slide-out menu provides the interface for you to select an action described in the following table:

NextSwath Action	Description
Enable NextSwath	Tap to enable NextSwath technology. Each time you enter a field or create / load a new swath, you must enable the NextSwath technology and accept the liability warning. Within the same session you can disable / re-enable the NextSwath technology without needing to accept the liability warning.
Auto Manual	Tap to select between an auto-initiated turn or a manually-initiated turn. The system defaults to auto-initiation and will prompt you at the end-of-row warning location if you would like to turn the selected direction. *NOTE – A direction that remains within the field boundary must first be selected. To carry out a manually-initiated turn, select the manual button and then set the turn direction. If the speed requirements are met for a NextSwath turn and you are engaged on a swath, you can tap the manual turn start button.*
← ↺1 →	Tap to select the turn direction and number of swaths to change. To create an automatic turn, you must select a swath to turn onto. To do this, tap the left or right arrow button to select the direction and by how many swaths the turn will be made. The number of swaths allowed each way is entered in the Swath Change Limit field when you set up the system, see Configuring NextSwath. The selected swath appears in yellow with green borders on the Run screen, and the direction and number away from the current swath appear on the panel. *NOTE – The direction refers to the forward travel direction of the vehicle. The system does not turn around back onto the same swath. Once the first automatic turn is complete, the next automatic turn that is prompted by an end-of-row location will be auto-populated with a turn in the opposite direction but with the same number of swaths changed as the previous turn.* If no swath is selected, this is indicated by a dash on the swath number indicator. *NOTE – The NextSwath System will not make an Automated turn to a guidance line outside of a boundary.*

NextSwath Action	Description
Turn Actions	Tap to enable or disable the Turn Actions as configured in Implement Setup for NextSwath. When performing a manually initiated automated turn, and with the Turn Action button enabled, the earliest programmed event will start when you tap the Turn Now button and work toward the turn.
Enable TrueSwath	Tap to enable TrueSwath implement turn compensation. Use the TrueSwath implement turn swath button in association with, or independently of, automated turns.
	Either when performing an automated turn or during line acquisition, a yellow path for the implement is plotted for drawn implement types in addition to the green path for the vehicle.
	When used in an automated turn, the TrueSwath swath extension offset is added to the turn point to allow the implement to reach the turn point before the turn is started.
	NOTE – *The parameters entered in the setup for vehicle control point-to-hitch offset and hitch-to-ground contact point dictate the path planned for the implement. Adjust these values to change performance.*
	NOTE – *Rigid mounted implements (those using the three-point hitch) cannot use the TrueSwath technology.*

The Turn Now button shows the status of automated turns. The direction of the turn is indicated by the arrow direction. There are three states available for the Turn Now button:

Icon	State	Description
	Ready (yellow)	Automated turns are ready. Tap to start a turn.
	Turning (green)	The system is counting down to a turn or turning. Tap to cancel the automated turn.
	Disabled/error (red)	Automated turns are not available. Turns must be enabled, with a valid direction selected. The vehicle speed must be at or below the turn speed.

Using NextSwath End-of-Row Auto Turns

When the vehicle arrives at the end-of-row location and if the NextSwath technology is enabled, you are prompted to auto turn at the end-of-row point.

The first occurrence requires the operator to indicate the swath to turn to as well as enabling the Turn End/Start events and TrueSwath technology.

Each following turn will auto-populate with the settings of the previous turn except that it will be in the opposite direction (to keep the operation moving in the same cardinal direction).

If it can be generated (based on field geometry and entered offset distances, see Turn Location tab in Configuring NextSwath), the proposed path appears on the Run screen. The NextSwath technology will not propose paths that turn a vehicle outside of a field boundary.

You can:

- Dismiss the auto turn and either initiate an auto turn at the required location or drive the vehicle manually.

- Adjust the auto turn. Open the NextSwath control panel to adjust the turn settings and/or manually initiate an auto turn.

- Accept the auto turn as presented by pressing the Auto Turn button above the Engage button. The system then proceeds to count down to the auto turn (you can also initiate this function by tapping the remote engage button, if the function has been enabled on the Parameters page).

If the auto turn is accepted, you are notified if your speed is above the defined turn speed. If the speed is not reduced before the auto turn is started, the system will disengage.

If the vehicle speed increases above the defined turn speed during the turn, you are given a two second warning to slow down. If no action is taken, the system disengages.

Setting the End-of-Row Point

In order for the NextSwath technology to suggest automated end-or-row turns, the end-of-row point must be known. This point is determined by three methods in the following order:

1. Headland pattern infill line intersection with inner boundary. When a headland pattern is used, the intersection of the infill and the inner boundary sets the end-of-row point.

2. Productive area field boundary. If the field has a productive area boundary and the headland pattern is not in use, the end-of-row point is determined by the user-

defined distance offset from the boundary along the swath or by the offset distance and clearance options selected. See Turn Location tab in Configuring NextSwath.

3. A and B points for the line. If there is no boundary and a headland pattern is not in use, the A and B points of the line set the end-of-row point. These points adjust every time the Autopilot system is disengaged or when a manually-initiated automatic turn is performed. When this happens, all of the following will have the A or B point updated in accordance to the length of the swath that the vehicle is currently on:

- The guidance line the vehicle is on.

- The swath on either side of the guidance line that the vehicle is on.

- The swath being turned to for an automatic turn will have the A or B point updated (if more than one swath is changed).

During the turn, the NextSwath widget shows the status of the turn. Start Turn and End Turn values are continuously updated based on your vehicle's speed.

NextSwath Operating Tips

Before using the NextSwath technology, OnSwath settings must be properly set up and calibrated. Excessively aggressive OnSwath settings that function well for line acquisition may be too aggressive for the NextSwath technology due to the increased heading change in the maneuvers (up to 90° for line acquisition; generally 180° for the NextSwath technology).

For best results, it is recommended that you use field boundaries or headland patterns as this will make adjustments for the shape of the field.

For AB operation without boundaries, the turn location is based on the end-of-row points that are adjusted to the vehicle's current location by either disengaging or

performing a manually-initiated automatic turn. When this happens, the length of the swath you are currently engaged on, the swaths to either side, and the swath being turned to for automatic turns (if different than the swaths adjacent to the current swath) are adjusted.

The smallest radius that the system will turn in is determined by the largest value of:

- Minimum turn radius setting
- Path size determined by OnSwath maximum nominal steering angle and maximum nominal slew rate adjusted by the speed aggressiveness for each.

To decrease a turn radius try the following:

NOTE – *After adjusting the OnSwath Settings, make sure that line acquisition performance is still safe.*

NOTE – *Always verify that the smaller radius turn will not damage equipment.*

1. Decrease the minimum turn radius.
2. Increase the OnSwath Steering Angle.
3. Increase the OnSwath Slew Rate.
4. Decrease the speed at which the turn is performed.

NOTE – *The highest the OnSwath steering angle can be is 80% of the vehicle profile's maximum steering angle. If you set it higher than this value, the steering angle used to plan the turn will not increase.*

NOTE – *Different vehicle types may have different turn paths due to platform stability and capability.*

When using boundaries, the adjustment of the boundary offset and TrueSwath offset is important to obtain a correct turn point location. This has to be determined empirically by experimentation.

When using boundaries that are not perpendicular to the general swath operation of the field, allow more space for the turns.

When using end rows, a boundary offset around the width of the end rows is a good starting point. For example, using three end rows with a 30 ft planter would use a boundary offset of 90 ft to start with.

When using a three-point/rigid mounted implement, setting the turn pattern to Turn Wide at End for rear-mounted implements and Turn Wide at Start for front-mounted implements is suggested for best results. Also, make sure to set the implement offset direction correctly.

6

Fields

▶ Field Basics

▶ Add a Field

▶ Edit a Field with Field Manager

▶ Delete a Field

▶ Select a Field

▶ Client/Farm Filter and Entry

A *field* is an area of land on a farm where you perform a series of tasks. When you provide more information about a field, then Precision-IQ can generate detailed reports about the field, which are then used to efficiently manage the entire farm. The information you provide includes field boundaries, landmarks, materials applied, tasks performed, etc.

To get started with a field, tap the **Field** icon on the Home screen. Once a field is created, you can use Field Manager to fine tune the profile information. On the Home screen activity bar, tap the Field Manager icon to begin.

Field Basics

A field is an item you create that represents an area of land. A field can contain one or more boundaries (perimeters) or no boundaries. Information associated with each field includes:

- Boundaries, guidance lines and patterns for steering assistance.
- Landmarks such as points, lines, and area features.
- Tasks.
- Coverage information recorded during field activities when logging is activated.
- Attributes such as client and farm names.

Add a Field

Follow the steps below to add a field:

1. On the Home screen, tap the **Field** tile.
2. On the Field screen, tap the **New** button.
3. In the Create New Field pop-up window, enter a unique **Field Name**, select or create a **Client** name, and select or create a **Farm** name.
   - If the client/farm already exists, then tap the **Client** or **Farm** drop-down to select it from the list.

     Or

   - If the client/farm is new, then tap the **Plus** icon to enter a new client or farm.
4. Tap the **Create** button:
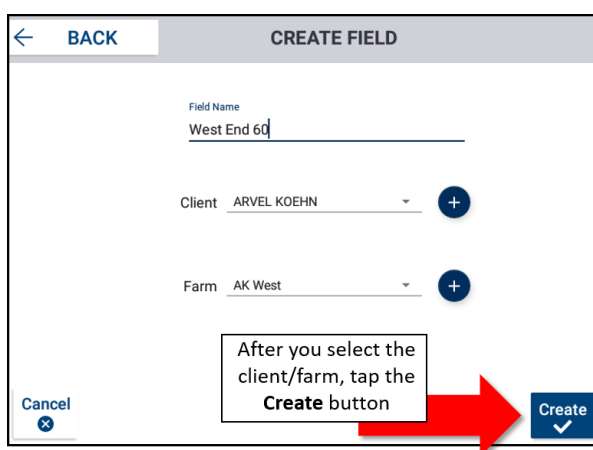
The new field is added to the list of fields and is selected.

NOTE – *To maintain an accurate client, farm, field data structure, Precision-IQ now enforces a client/farm-to-field association.*

Alternatively, you can transfer existing field data files directly to the display using a USB drive:

1. Insert a USB drive into the USB port of the display.

2. On the Home screen, tap the **Data Transfer** button.

3. On the Data Transfer screen:

   a. The left side of the screen (labeled **Internal**) shows the data files currently available on the display.

   b. The right side of the screen (labeled **USB**) shows the data files of the USB drive.

   c. From the USB region, tap **Fields** to expand the menu and display all available fields.

   d. Tap the select box for the Fields category to transfer all fields or tap the select box for each field to transfer individually. Then tap the **Copy** button at the bottom of the screen.

4. Tap the Android **Back** button to return to the Home screen.

For details about copying and converting files, see Data Transfer.

Edit a Field with Field Manager

Use Precision-IQ's Field Manager to edit and refine elements in and associated with each field. To access Field Manager:

- On the Home screen, tap the **Field** tile. Then select a field on the Field screen.

  Or

- On the Activity bar, tap the **Field Manager** icon.

The Field Manager's Field Overview screen displays by default and provides:

- Overview details such as the total field area, total productive area, and total nonproductive area. See Set Preferences for Precision-IQ and the Displayto set the display units.

- Map view, including relative vehicle and field location.

- Name details. Tap the fields to edit Field Name, Client Name, and Farm Name.

The Field Manager screen provides the following functionality:

- Field Manager Guidance Patterns

- Field Manager Boundaries

- Field Manager Landmarks (Point - Line - Area)
- Field Manager Task History
- Field Manager Access Paths

Tape the **Home** icon to return to the Home screen.

Field Manager Guidance Patterns

On the Field Manager screen, tap **Guidance Patterns** for a view of guidance patterns that have been assigned the field.

The following buttons and icons are available:

Button or Entry Box	Tap to...
╱	**Deactivate** (black). Deactivate a line.
╱	**Activate** (red). Activate a line.
▢	**Deactivate Shape** (black). Deactivate a pattern (headland, boundary, pivot).
▢	**Activate Shape** (red). Activate a pattern (headland, boundary, pivot).
🔄	**Pivot Adjust**. Adjust the radius of a pivot shape.
↗	**Resize Shape**. Resize a shape other than a pivot shape.
➡	**Line Shift**. Shift a line.
🗑	Delete a selected line, pattern, or boundary.
Name of Pattern	Change the name of the line or pattern.

Editing a Guidance Pattern with Field Manager

1. On the Field Manager screen, tap **GUIDANCE PATTERNS**. The map and the patterns list show the patterns in the selected field.

2. Tap the pattern you want to edit.

   The pattern must be active before you can edit it. If the pattern is not active, tap the **Activate** button (red) to make it active.

NOTE – *If you activate a pattern that was created with a different implement width, the display will prompt you to shift the line for the new width or keep the original position.*

3. The application highlights the active pattern in blue on the map.

4. If you have chosen a headland, you can change the number of circuits in a headland.

5. Tap the **Resize** button to resize the pattern you have chosen:

Or for a pivot pattern, tap the **Pivot** button:

6. Edit the size of the pattern and tap the green check mark.

To cancel the change, tap the **Cancel** button.

Shifting a Guidance Pattern with Field Manager

1. On the Field Manager screen, tap **GUIDANCE PATTERNS**.

2. Tap the pattern you want to edit. If the selected pattern is active, tap the **Deactivate** (black) button to make it inactive.

If the selected pattern is not active, tap the **Activate** (red) button to make it active.

NOTE – *If you activate a pattern that was created with a different implement width, the application will prompt you to shift the line for the new width or keep the original position.*

3. If you have chosen a headland, you can change the number of circuits in a headland.

4. Tap the **Shift** button to display the Shift Pattern tool.

5. Tap the left or right arrow to indicate the direction you want to shift the pattern.

6. Tap the **Shift Current Position** button to shift the pattern to the vehicle's current position, or you can enter the amount you want to shift the pattern:

7. Edit the size of the pattern and tap the green check mark. To cancel the change, tap the **Cancel** button.

Activating and Deactivating a Guidance Pattern with Field Manager

You can activate or deactivate patterns in a selected field. To engage your auto guidance system on a line, pattern or headland, it must be active.

1. On the Field Manager screen, tap **GUIDANCE PATTERNS**.

2. On the Patterns pane:

   - Tap **AB Guidance** and select an available AB guidance pattern.

     or

   - Tap **Line Sets**. The pane updates to show all of your line sets that are *guidable* and which were created with the Landmarks tab.

     *NOTE – A line set can only be guidable if the Guidable line attribute for the Line (in the Landmark Library) is set to **Yes**. If a field containing line sets is imported into Precision-IQ, the line sets will appear in the Patterns menu.*

     Precision-IQ does not support fields that contain over 1,000 feature lines.

3. To activate, tap the **Activate** (red) button.

4. To deactivate, tap the **Deactivate** (black) button.

Enabling Tramlines

A **tramline** (also referred to as *controlled traffic farming*) allows you to highlight the guidance swaths on which the planter/drill should have the tramline system row(s) shut off. This functionality is available for straight line **AB** and **A+** for inline and offset tramline functionality. Curve tramline functionality is for inline (non-offset) tramlines only. Precision-IQ's tramline functionality supports both centrally mounted and double-pass tramline systems.

Centrally Mounted Tramline System Setup

1. On the Activity bar, tap the **Field Manager** icon. Then tap **Guidance Patterns** at the top of the screen.

2. In the list of All Guidance, tap **AB Guidance**.

3. Tap an **AB Line**, **AB+ Line**, or **Curve** to which you want to assign the Tramline functionality. This action should highlight the pattern on the map. Tap the **Tramline** button on the pattern adjustment panel.

4. On the Tramline Settings pop-up window:

   a. Tap the **Enable Tramline** toggle to activate tramline functionality for the selected line.

   b. Set the **Swath Spacing** value based on the cycle interval.

c. Select the Offset to be **Center**.

d. Tap the green check to save the settings.

NOTE – Curves only allow center offsets. The Initial Swath and Location From AB Line are status items only.

5. When in the Run screen *and* on the pass that you want to the designate as the start of the tramline cycle interval. Tap the **Guidance Adjustments** button and then tap the **Set Tramline** button on the pop-up.

6. A confirmation pop-up will ask if you want to create a guidance line in this location for the following operations that will use the tramline (for example, spraying). If so, tap **OK**; otherwise, tap **Cancel**.

7. The Run screen will update to show Tramline shutoff rows highlighted with a white background behind the swaths.

*NOTE – If changes are to be made to the tramline settings (for example, if you need to change the offset), then you must tap the **Set Tramline** button again on the desired swath for the changes to be applied.*

Double-Pass Tramline System Setup

1. On the Activity bar, tap the **Field Manager** icon. Then tap **Guidance Patterns** at the top of the screen.

2. In the list of All Guidance, tap **AB Guidance**.

3. Tap an **AB Line**, **AB+ Line**, or **Curve** to which you want to assign the Tramline functionality. This action should highlight the pattern on the map. Tap the **Tramline** button on the pattern adjustment panel.

4. On the Tramline Settings pop-up window:

a. Tap the **Enable Tramline** toggle to activate tramline functionality for the selected line.

b. Set the **Swath Spacing** value based on the cycle interval.

c. Select the Offset to be **Left** or **Right** based on implement setup.

d. Tap the green check to save the settings.

NOTE – Curves only allow center offsets. The Initial Swath and Location From AB Line are status items only.

5. When in the Run screen *and* on the pass that you want to the designate as the start of the tramline cycle interval. Tap the **Guidance Adjustments** button and then tap the **Set Tramline** button on the pop-up.

6. A confirmation pop-up will ask if you want to create a guidance line in this location for the following operations that will use the tramline (for example, spraying). If so, tap **OK**; otherwise, tap **Cancel**.

7. The Run screen will update to show Tramline shutoff rows highlighted with a white background behind the swaths.

NOTE – *If changes are to be made to the tramline settings (for example, if you need to change the offset), then you must tap the Set Tramline button again on the desired swath for the changes to be applied.*

Field Manager Boundaries

On the Field Manager screen, tap **Boundaries** for a view of boundaries that have been assigned to the field. On the left side of the screen, tap a boundary item to select it. Once selected, you can modify the boundary details: boundary name, delete boundary, and activate/deactivate boundary.

Boundary Name: Tap in the Boundary Name field to edit the name of the boundary.

Delete: Tap the **Delete** button to delete the boundary.

NOTE – *This action cannot be undone.*

Resize: To expand or contract the boundary:

1. Tap the **Resize** button:

2. Tap the text box and use the on-screen number pad to enter the distance to move the boundary:
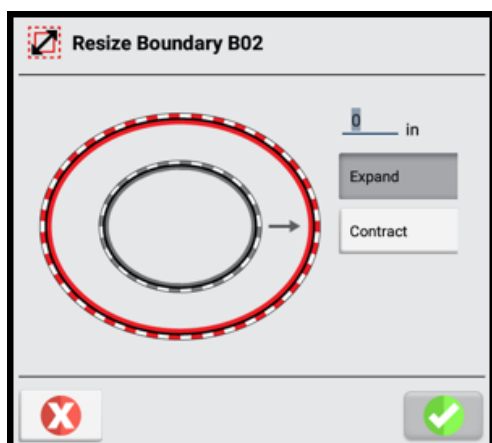
To shift the boundary outward (making the area larger), tap **Expand**.

To shift the boundary inward (making the area smaller), tap **Contract**.

3. Tap the green check. The application saves a copy of the pattern with a new name at the new position.

Activate/Deactivate: Once created, a boundary is active by default.

- Tap **Deactivate** to deactivate the boundary. The map will update to show the boundary with a black line.

- Tap **Activate** to activate the boundary. An active boundary shows on the map with a red line.

Tap the **Home** icon to return to the Home screen.

Field Manager Landmarks (Point - Line - Area)

On the Field Manager screen, tap **Landmarks** for a view of landmarks that have been assigned to the field from the Run screen.

Assigning a Landmark Type to the Run Screen P/L/A Buttons

When you tap the P/L/A Landmarks button on the Run screen, there are four (4) buttons that can now be customized to fit the desired operation style:

1. In the Activity bar, tap the **Field Manager** icon.

2. Tap **Landmarks** (at the top of the screen) and then tap the **Manage** button.

3. On the Manage Landmarks pop-up screen, tap **Button Assignment** (displayed by default) and tap the button you want to configure to select it.

4. Then scroll the list of available landmarks and tap to select a new landmark type.

5. After you have assigned your landmark types, tap **Save** before leaving the Button Assignment tab.

When you return to the Run screen, the button will now show the new type of landmark you have assigned.

*NOTE – You must tap **Save** any time you make a new button assignment.*

Set Recording Position

You can determine the position on the boom where a landmark is applied to a field:

1. On the Manage Landmarks pop-up screen, tap **Recording Position**.

2. Select either Point Recording Position or Line/Area Recording Position:

- Tap **Point Recording Position** to set a position for landmark points (such as a tree, rock, gate, etc.).

- Tap **Line/Area Recording Position** to set a position for landmark line (such as a fence, ditch, etc.) and area (such as, pond, obstacle, etc.).

3. Tap the position: **Center**, **Left**, or **Right**. The image will update to show the new position.

   NOTE – *The recording position corresponds to the defined application point of your implement.*

4. Tap **Save**. You must tap **Save** any time you change the recording position.

Customize Landmark Library

You can customize an existing landmark or add a new one:

1. On the Manage Landmarks pop-up screen, tap **Landmark Library**.

2. Tap a landmark type on the left (Point, Line, Area) and tap the **Edit** button on the lower right.

   Tap **New** if you want to create a new landmark.

3. Depending on the landmark type you select, you have several options that you can customize. For example, if you select a Line landmark, you can change the:

   - Landmark Name

   - Color

   - Obstacle: tap to toggle between **Yes** and **No**.

   - Guidable: tap to enable the line to be guidable. You'll need to enable this feature when you use Precision-IQ's Guide-to-Line function.

4. Tap **Update** (or **Create** if you are creating a new landmark).

NOTE – *While you can create and modify any number of landmarks, you cannot delete a landmark. Use caution when creating a new landmark.*

Guide-to-Line: Create a Line Set with Coverage

When you tap the **P/L/A Landmarks** button on the Run screen, a fifth button can now be used specifically for creating a line set when coverage is applied:

1. On the Manage Landmarks pop-up screen, tap **Button Assignment** (displayed by default) and select **Line with Coverage**.

2. Scroll the list of available lines and select a line name. Lines must be guidable (**Yes**). You can set a line to be guidable in the Landmark Library tab.

   NOTE – *Changes must be saved before leaving the Button Assignment tab. Tap **Save** any time you make a new button assignment.*

3. Tap **Save**.

When you return to the Run screen, the line with coverage button will now appear.

Like the other buttons, you can customize it in the Landmark Library tab. When you change the **Line/Area Recording Position**, the button on the Run screen will update to show the new position.

Field Manager Task History

On the Field Manager screen, tap **Task History** for a view of tasks that have been performed on the field.

The left side of the screen shows all of the tasks that have been recorded for the selected field. Tap a task to expand the list. Then, tap a task from the list to select it. Once selected, the Task Name on the right side of the screen updates to show the start and stop times recorded for the task.

If needed, you can tap in the Task Name field to edit it.

Tap **Home** to return to the Home screen.

Change the Infill Pattern

NOTE – This process assumes you have an existing headland and an infill pattern has been created.

1. To create a new infill pattern to change to, go to step 3

   - At the Run screen, create a new guidance line to use as the infill pattern. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.

     NOTE – This new guidance line is automatically made active by the system, which deactivates all other guidance patterns, including the headland you are working with.

   To edit an existing infill pattern you want to change to:

   - Tap the **Field Manager** button in the Activity bar to open Field Manager.
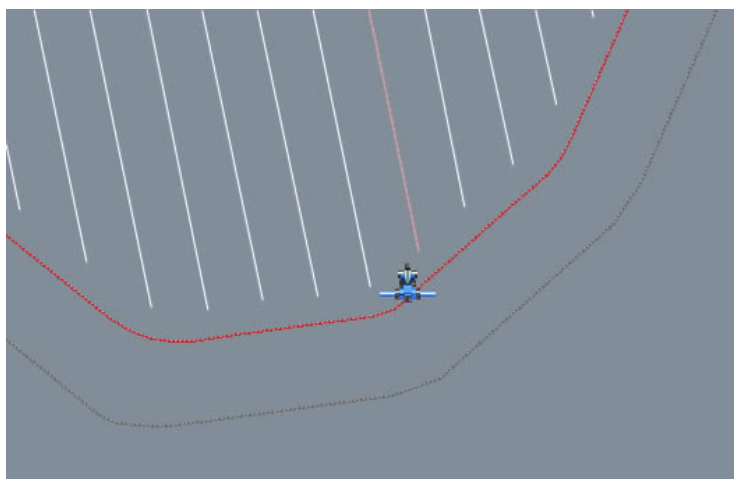
NOTE – *If the system has been turned off, when you enter the field you will only see the headland on the Run screen and not the infill pattern.*

2. At the Guidance Patterns tab:

   a. Highlight the headland circuit pattern you want to work with and tap **Activate**. (This is not necessary if you want to change to an existing line and did not need to create a new one in step 3.)

   b. Tap **Infill**. The Infill Selection list displays. This lists the infill pattern that is currently assigned to use with the headland.

   c. Tap the **Settings** icon.

   The All Guidance Lines list displays. This lists all guidance lines that have been created for this field that are within the headland boundary.

   d. Tap to highlight the guidance lines you want to associate with the headland (including the new guidance line you created above).

   Tap the green check mark.

   The Infill Selection list displays again.

   e. At the Infill Selection list, highlight the guidance line you want to change to and tap the green check. This assigns the guidance line to the headland.

3. Tap **Boundaries**. In the Boundaries list on the left-hand side, tap the inner boundary of the headland, then tap **Activate**.

4. Exit the Field Manager.

   The new infill pattern will show in the inner boundary of the headland:
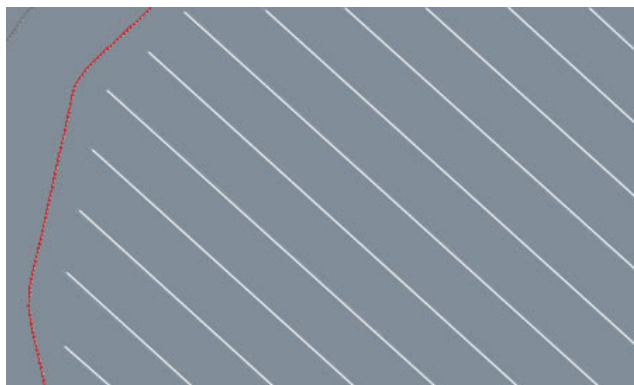
Shift the Infill Pattern

To shift the infill pattern, complete the following steps:

1. Tap the **Field Manager** button on the Activity bar.

2. On the Field Manager screen, tap **GUIDANCE PATTERNS**.

3. In the list of patterns, tap to select the infill pattern you want to shift, and tap **Activate**.

4. Tap **Shift**. The Shift Pattern tool displays.
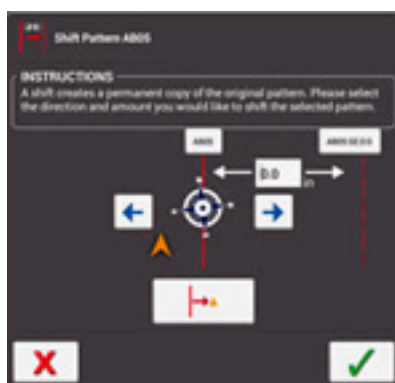
5. Tap the **Left Arrow** to shift the pattern left or tap the **Right Arrow** to shift the pattern right.

6. In the entry box, enter the distance you want to shift the pattern.

7. Tap the green check mark to save the shift.

    The shifted pattern is saved with a new name.

8. Tap the headland circuit pattern to select it, and tap **Activate**.

9. Tap **Infill**. The Infill Selection list displays.

10. Tap the **Settings** icon.

    The All Guidance Lines list displays.

11. Tap to highlight all the infill patterns (including the shifted pattern you just created) you want to associate with the headland pattern you activated.

12. Tap the green check mark. The Infill Selection list displays again.

13. Highlight the shifted swath and tap the green check.

14. The shifted infill is now activated along with the headland swath.

15. Tap **Boundaries**. Activate the inner headlands boundary.

16. Tap **Exit** to close the Field Manager.

17. Verify that the shifted infills are now shown and can be used for guidance.

Field Manager Access Paths

Precision-IQ includes the functionality to identify a set of AB line or Curve swaths that should be interrupted on a given interval to allow for an access path, or a designated right of way. An access path is a row in your field that is not in production, and is typically used for frequent right of way travel. This right of way does not interfere with production crop swaths in a field. For example, strawberry bedding typically needs defined access paths between planted beds to move harvest vehicles and people through the field.

An Access Path button has been added to the Field Manager's Guidance Pattern screen:
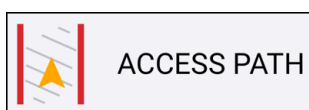
Creating an Access Path

Follow the steps below to create an access path:

1. In the Run screen, create an AB line or Curve.

2. Tap the **Field Manager** icon in the Activity Bar, and then tap the **Guidance Patterns** tab.

3. In the Patterns pane, tap **AB Guidance** and select an AB line that you want to define as an access path.

4. Activate the selected AB line.

5. Tap the **Access Paths** button. The Access Paths pop-up window appears:

6. Update the following settings:

- **Enable Access Paths:** By default, Access Paths is disabled. Tap the switch to enable the feature.

- **Swaths between Access Paths:** Enter the number of swaths between the access path.

- **Path Width:** Enter the width of the access path. Use a width of the expected traffic flow.

- **Swaths in the First Group:** The very first group may not be the same as the repeating swaths. Enter the number of swaths to repeat before the first right of way access path break.

- **ABs Place in the First Group:** The location of the Master AB Line or Curve within the first group.

- **Provide Guidance To:** Default is guide to Swaths (for this release).

7. Tap the green check mark.

NOTE – Access Path is not supported with the use of Pivot or Headland guidance patterns. Currently, the Provide Guidance to setting only supports Swaths.

Access Paths in the Field

Once you have configured your access path settings, the swaths of your field will look something like this:
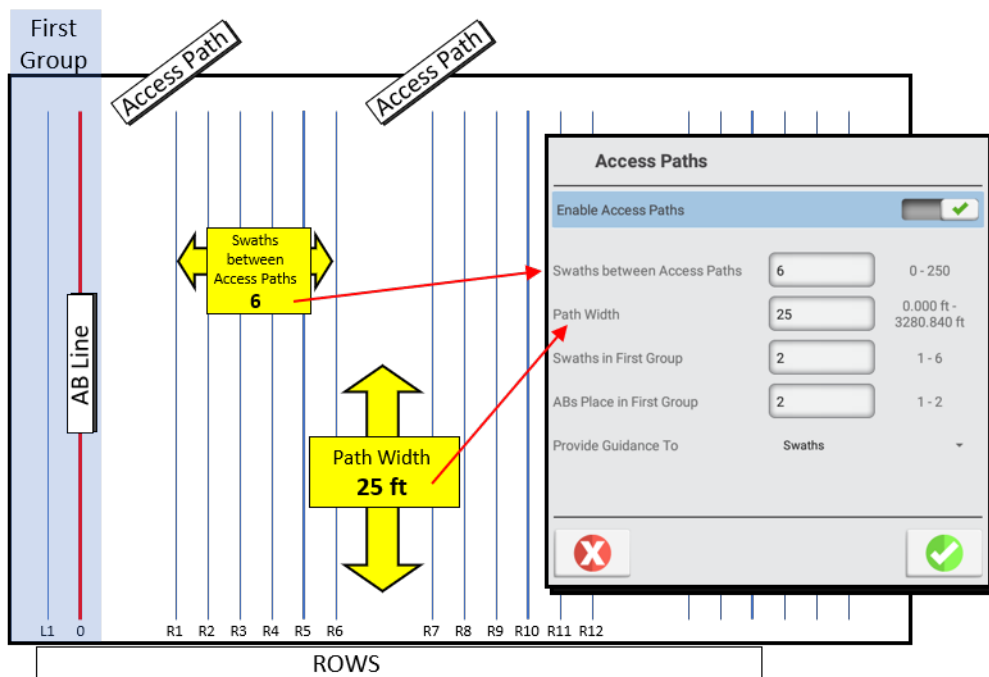
Delete a Field

Follow the steps below to delete a field:

1. On the Home screen, tap the **Field** tile. Then, tap the field you want to delete to select it.

2. With the field selected, tap the **Delete** button.

3. On the Delete Field confirmation pop-up, tap **OK**.

4. The Field screen updates with the field deleted. After the deletion, no field will be selected. Tap a different field to select it or Add a Field.

5. Tap **Home** to return to the Home screen.

Select a Field

To work with a field to work within it, you select it. When you add a field, it is selected automatically.

If you have multiple fields, you can:

- **Select a Field Using a Map Point**

  The points on the map of the Home screen indicate fields you have created. Tap the point that represents the field.

- Select a Field from the Field List

  The outlines on the map of the Home screen indicate fields you have created.

  1. On the Home screen, tap the **Field** tile. Then tap a field name to select it.

  2. Tap **Home** to return to the Home screen.

- Select a Field from a Field Search

  1. On the Home screen, tap the **Field** tile.

  2. On the Field screen, tap the search icon above the list of fields.

  3. Using the Android on-screen keyboard, type part of the field name. Then tap the name of the field to select it.

  4. Tap **Home** to return to the Home screen.

Client/Farm Filter and Entry

In the Home screen Field tile, the field selector list may be filtered to show only the client's fields that are important to the current operation and operator. Filters can be removed in the field selector menu or in the filter creator screen.

Tap the **Field filter** icon to build a filter by focusing on a single client along with the farms from that client that contain the fields that they wish to view in the field selector:

*NOTE – A newly created field **must** belong to a client and a farm, which is similar to all Trimble Agriculture legacy software applications.*

In previous releases, the operator could only sort the field list by distance or by alphabet, and earlier versions of Precision-IQ allowed a field to be created without associating it to a client or farm. To maintain an accurate client, farm, field data structure, Precision-IQ now enforces a client/farm-to-field association.

To create a new filter on the Home screen, tap the **Fields** tile. Then on the list of fields, tap the new **Field filter** icon. The Field Filter screen appears:

Select **one** client

Select one or more farms

Selected filters appear here
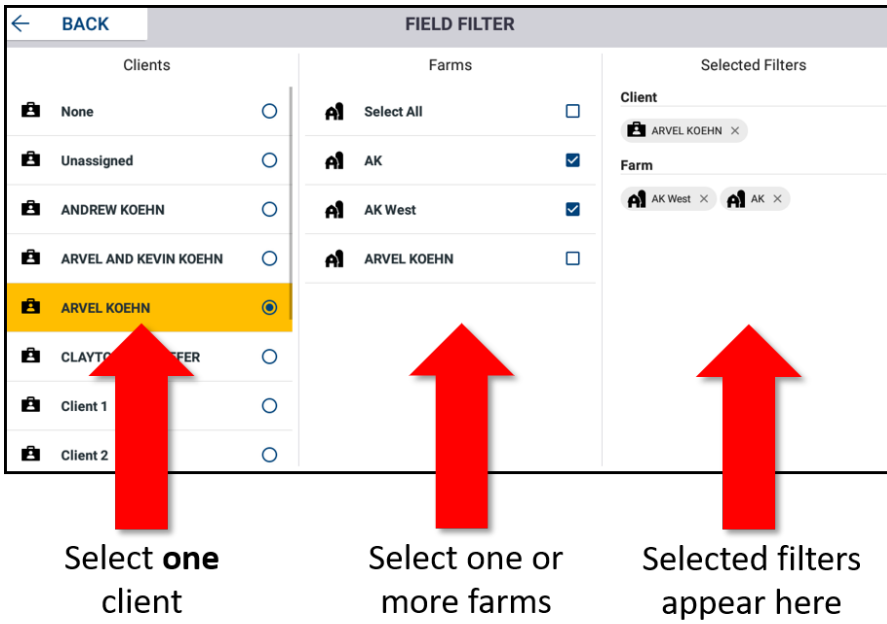
Once you have created a set of filters, they are immediately applied to your list of fields. From the Field Filter screen, tap **Back** to return to the list of fields:

Filter based on this Client **and** these Farms

Unfiltered

Filtered Fields
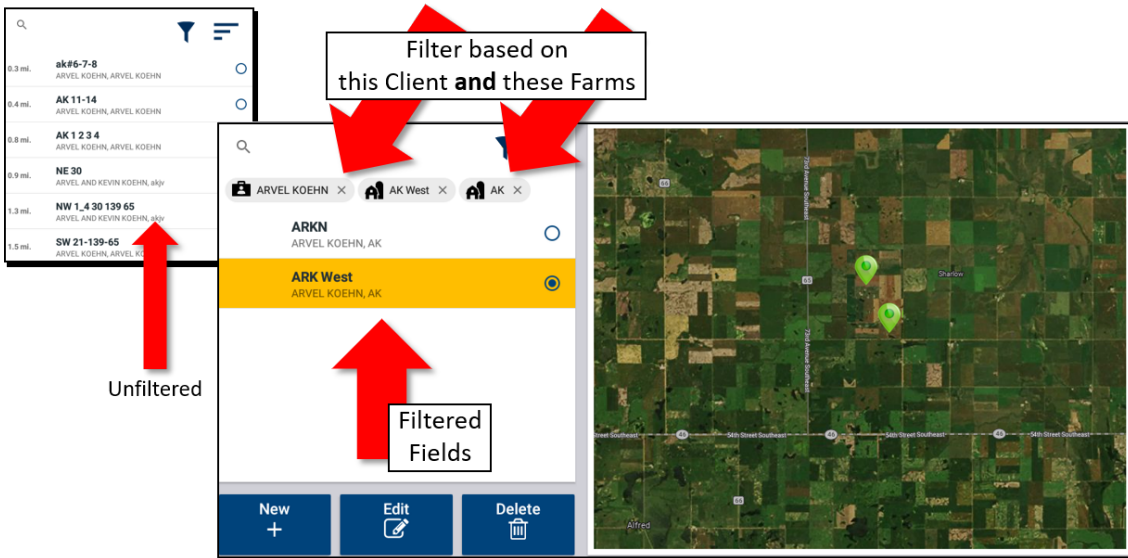
NOTE – *Tap the **X** of a filter item to remove it.*

NOTE – *All filters are saved over a power cycle.*

Implements

▶ Overview of Implement Setup

▶ Taking Implement Measurements

▶ Add and Configure an Implement without Application Control

▶ Add an Implement with Application Control

▶ Edit an Implement

▶ Delete an Implement or Application Control Channel

▶ Application Control Widgets on the Run Screen

▶ Master Switch Box and 12-Section Switch Box Support

On the Implements screen, you can add, edit, and delete an implement as well as calibrate one for application or section control. From the Home screen, tap the **Implement** tile to get started.

For details about using Field-IQ, see Field-IQ Basic Rate and Section Control System.

Overview of Implement Setup

Use the Implement setup panel to select, add, edit, calibrate, or delete an implement. Implements can be pull-type equipment or attachments for self-propelled equipment.

Before you set up an implement, you must first set up a vehicle. See Add a Vehicle. The following chart shows a general overview flow of setting up an implement:
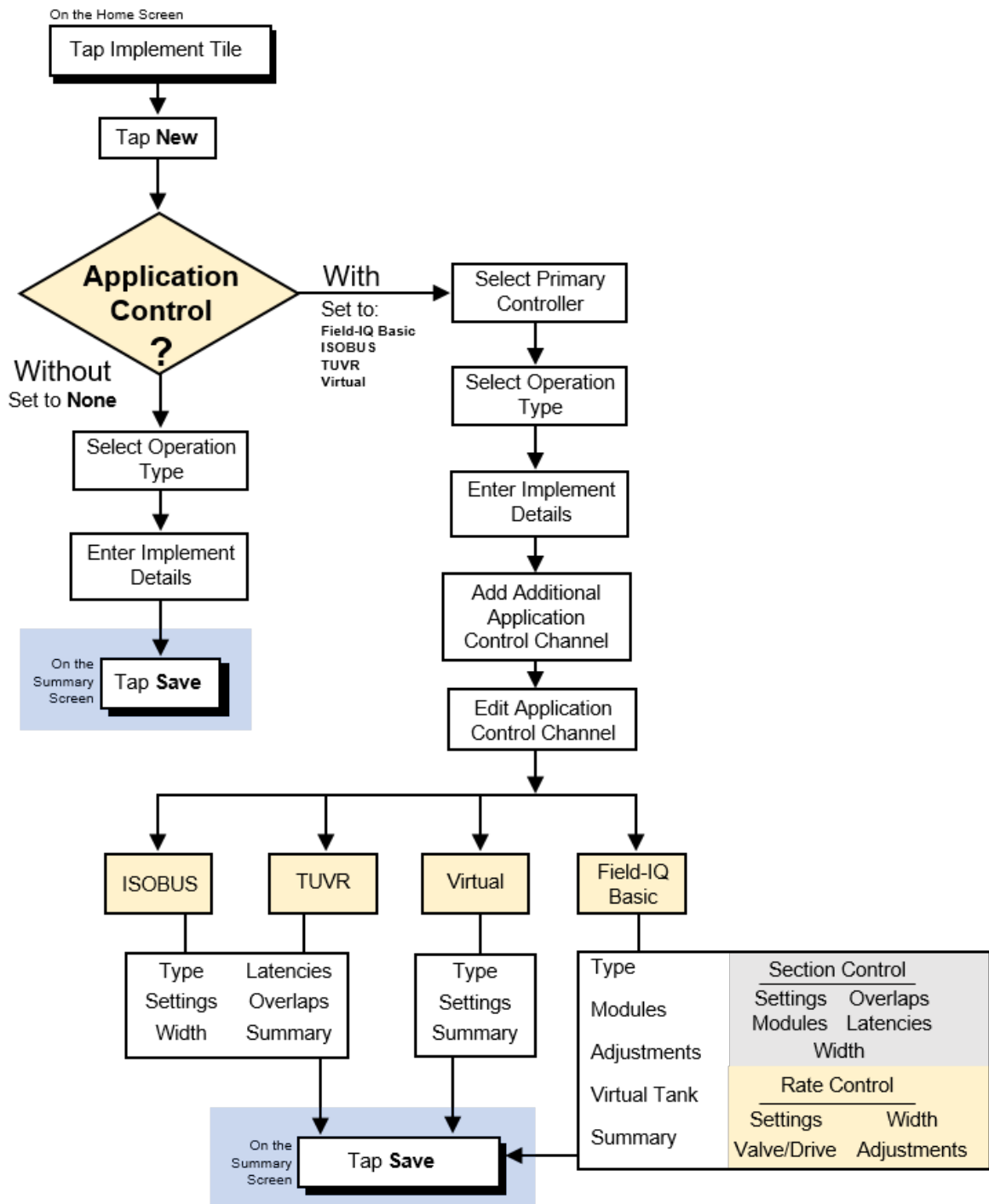
Taking Implement Measurements

This section describes how to take measurements for your implement. This information is used to complete an implement's profile.

Before you take measurements:

- Park the vehicle on level ground.
- Make sure the implement's center is lined up with the vehicle's center.

The measurement sections show only the measurements required for the type of implement you selected.

1. Tap the button for each measurement.
2. Use the on-screen number pad to edit the measurements for:

    - Pull-Type Implements
    - Self-Propelled Equipment

Pull-Type Implements

Measurement	Instructions
Hitch Type	Select how the implement connects to the vehicle: - Drawbar - Fixed mount
Application Width	Measure the width of the area where the implement applies material (working width). The application calculates swath spacing using the *Application Width* and *Overlap/Skip* settings.
Hitch to Application Point	No Application control - Hitch to Application point - Non ISO Application control - Hitch to ground contact point - ISO application control - Hitch to device reference point.
Hitch to Ground Contact Point	Measure the distance from the hitch pin to the point where the implement makes contact with the ground. This is the point that the implement rotates about.
Left/Right Offset	Measure from the center of the vehicle to the center of the implement. Select *Left* or *Right* to indicate the direction the implement is offset, when looking at the vehicle from behind. This measurement adjusts the tractor's path so that the implement is centered on the line.

Measurement	Instructions
Overlap/Skip	Set the amount of overlap or skip between swaths: - Set **Overlap** to intentionally overlay the edges of each swath by this amount. - Set **Skip** to intentionally add this amount of space between swaths.
Swath Width	The application calculates swath width using the *Application Width* and *Overlap/Skip*. To change *Swath Width*, edit the *Application Width* or *Overlap/Skip*.

Self-Propelled Equipment

Measurement	Instructions
Application Width	Measure the width of the area where the implement applies material. The display calculates swath spacing using the *Application Width* and *Overlap/Skip* settings.
Rear Axle to Application Point	Measure the distance from the rear axle to the point where the implement applies material.
Left/Right Offset	Measure from the center of the vehicle to the center of the implement. Select **Left** or **Right** to indicate the direction the implement is offset, when looking at the vehicle from behind. This measurement adjusts the tractor's path so that the implement is centered on the line.
Overlap/Skip	Set the amount of overlap or skip between swaths: - Set *Overlap* to intentionally overlay the edges of each swath by this amount. - Set *Skip* to intentionally add this amount of space between swaths.
Swath Width	The application calculates swath width using the *Application Width* and *Overlap/Skip*. To change *Swath Width*, edit the *Application Width* or *Overlap/Skip*.

Add and Configure an Implement without Application Control

This section describes how to add and configure an implement for Precision-IQ using no application control.

Before you begin, take accurate measurements of your implement as described in Taking Implement Measurements. If your implement does not use Application Control (that is, the Application Device is set to **None**) and you wish to activate a remote logging switch, then follow the steps outlined in Remote Logging Switch - Without Application Control.

 As you complete each step, tap **Next** to continue to the next one.

Tap the **Save** icon to save unique implement details.

1. From the Home screen, tap the **Implement** tile to display the Implement screen.

    This screen shows a list of available implements.

2. Tap the **New** button to launch the Implement Setup wizard.

3. On the Select Application or Device screen, tap the field and select **None**. Selecting None allows you to configure the implement without Application Control. Tap **Next**.

4. The next screen of the Implement Setup wizard prompts you to select a type of operation you expect your implement to perform:

    Available operations for your implement are:

Harvesting	Spraying	Surface Leveling/Drainage
Planting	Spreading	Swathing
Seeding	Subsurface Drainage	Tilling
Slurry		

    Tap the tile for the operation that applies for your implement. If you select an implement that would normally apply a product (such as Slurry, Spreading, Seeding), then tap **Next** and select **None** as the application control type from the pop-up window.

    Tap the **Save** icon to continue with your implement configuration.

5. **Implement Type.** On this screen, the choices available are determined by operation type you selected earlier. For example, if you selected the Swather operation, then the implement types you can select are *Pull Type Swather* and *Self Propelled Swather - Header*.

    Tap **Next** to continue.

6. **Implement Name.** Enter a name for your device or use the name provided.

   Tap **Next** to continue.

7. **Implement Hitch.** Tap the **Hitch** field and select either **Drawbar** or **Fixed**. If you select Drawbar, then specify the **Hitch To Ground Contact Point** value:
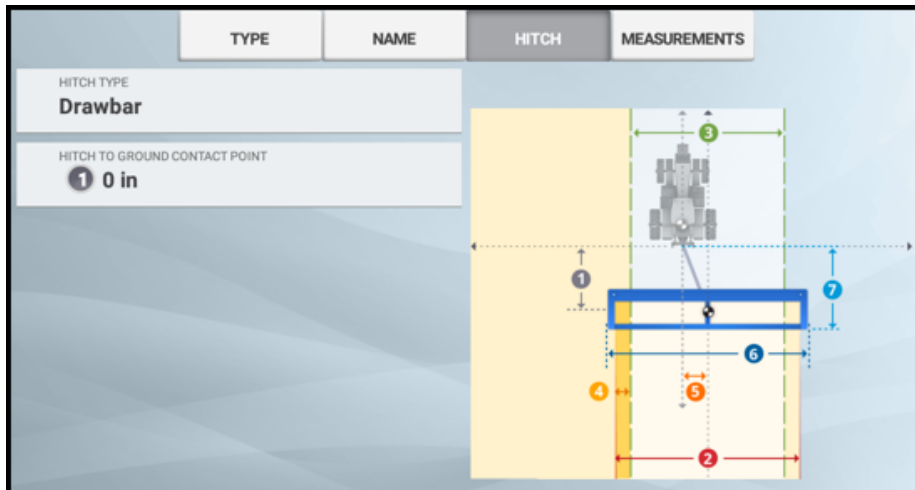
   Tap **Next** to continue.

8. **Implement Measurements.** Enter the implement measurements. See Taking Implement Measurements for details about each data point.
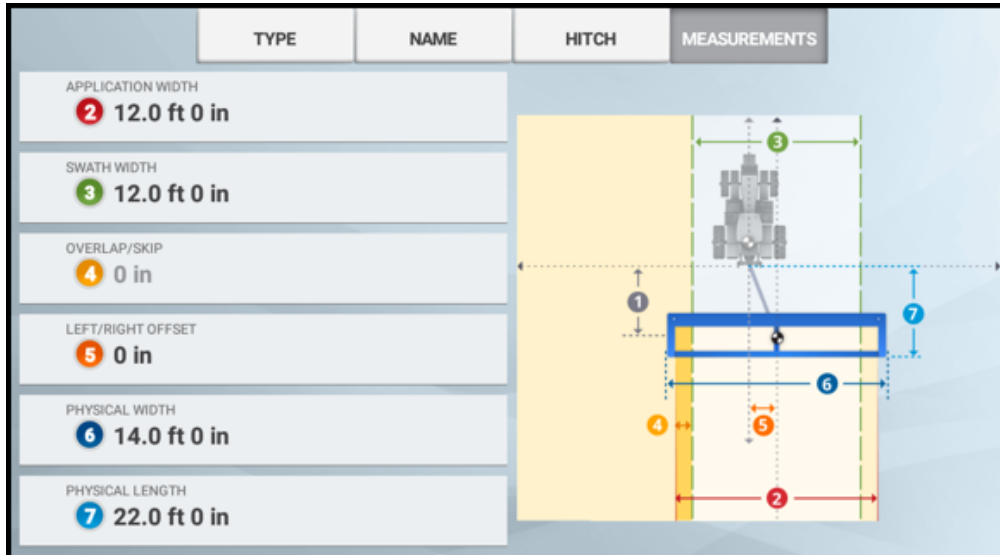
Field	Description
Application Width	Working width of the implement.

Field	Description
Swath Width	Sets the distance between swaths. **Overlap** or **Skip** field will be adjusted by altering the swath width. A positive value will indicate an overlap and a negative value will indicate a skip.
Left/Right Offset	This value represents the offset of the vehicle drawbar to the center of the application.
Physical Width and Length	Used for NextSwath to ensure boundary clearance. See Implement Setup for NextSwath for details.

Tap **Next** to continue.

9. **NextSwath** *(optional)*. The NextSwath feature is used to automatically turn the vehicle at the end of a straight line guidance pattern to align with the next selected swath. See Implement Setup for NextSwath for details.

   NOTE – *If your implement does not support NextSwath, then this option will not appear.*

10. **Summary.** The summary screen provides an overview of the implement that was just configured:

Tap the **Save** icon to save the implement configuration.

Once your implement is set up, you can return to the Implement Setup wizard to make any changes. See Edit an Implement for details.

See also Delete an Implement or Application Control Channel.

Remote Logging Switch - Without Application Control

If your implement does not use Application Control (that is, the Application Device is set to **None**) and you wish to activate a remote logging switch, then follow the steps below:

1. On the Settings screen, tap **Mapping**. Then verify the **With Active Remote Switch** option is enabled as shown below:
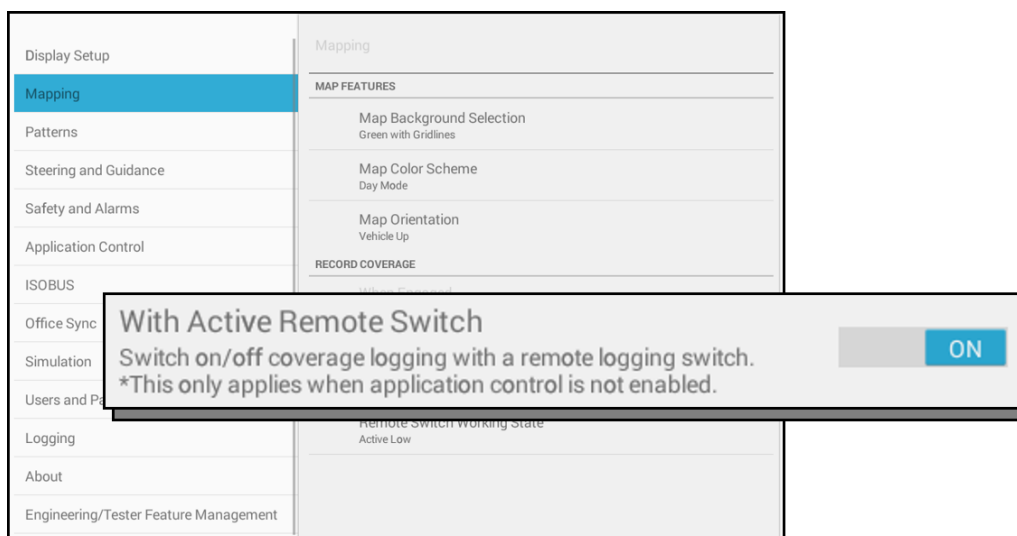
NOTE – *If you use the* ***With Active Remote Switch*** *option, then the* ***When Engaged*** *option cannot be enabled.*

2. Then tap the **Remote Switch Working State** and set to the state based on the switch being used. For example, set to **Active Low** when using a closed grounded circuit to trigger an active work state:
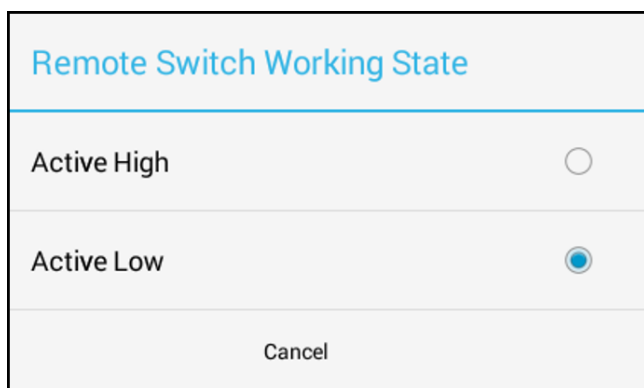
On the Run screen, an arrow will display in the header to indicate whether the implement is lowered or lifted. If your implement does not use Application Control, then the Run screen will look like this:
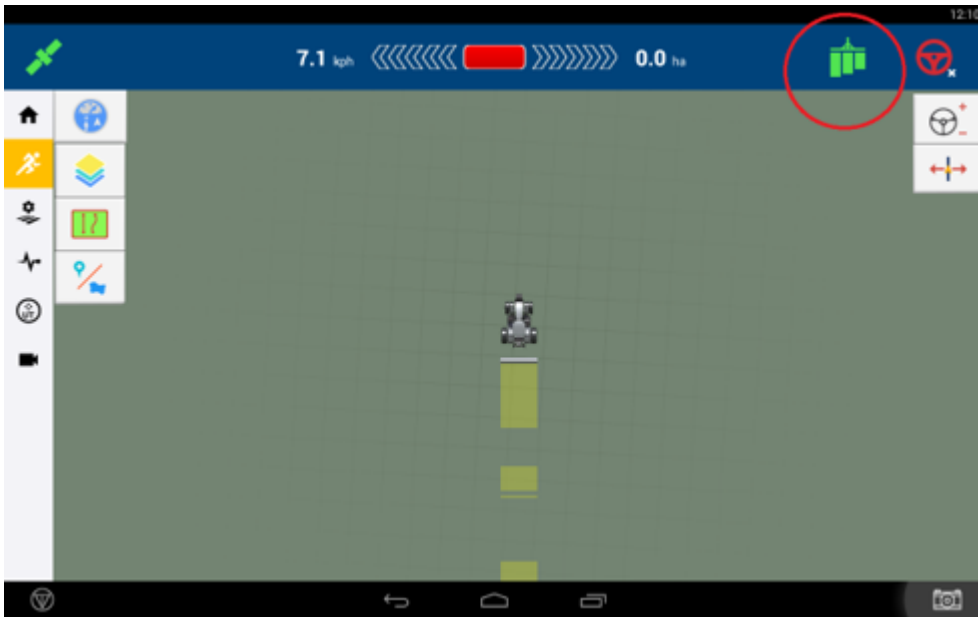
Add an Implement with Application Control

Follow the steps below to add an implement for Precision-IQ that uses application control:

1. Verify Application Control Preferences

2. Verify ISOBUS Preferences

3. Verify Safety and Alarms for Application Control

4. Select an Implement Application Type

5. Add an Application Control Channel. You can also Configure or Edit an Application Control Channel. See also Master Switch Box and 12-Section Switch Box Support

6. Once you have selected the Application Control type, refer to the following sections for details on how to configure your implement:

   - Configure a Field-IQ Basic Channel

   - Configure an ISOBUS Implement

   - Configure a TUVR or Virtual Implement

7. Enter Implement Inputs.

8. Enter Signal Input Module details.

9. Enter NextSwath details if supported by the implement.

   The NextSwath feature is used to automatically turn the vehicle at the end of a straight line guidance pattern to align with the next selected swath. See Implement Setup for NextSwath for details.

   NOTE – If your implement does not support NextSwath, then this option will not appear.

10. *(Field-IQ Basic Implements only)* Field-IQ Basic Application Control Calibration

11. The final step for adding an implement with application control is to review and save the details:

As you complete each step, tap **Next** to continue to the next one. Tap the **Save** icon to save unique implement details.

Verify Application Control Preferences

For implements that include Application Control functionality, update the preference settings in Precision-IQ to enable access to the Application Control feature for ISOBUS, Trimble Universal Variable Rate (TUVR), Field-IQ Basic, and Virtual implements:

1. From the Home screen, tap the **Settings** button.

2. On the Settings screen, tap **Application Control**. Tap the **ON/OFF** switch to enable or disable the Application Control options as described below.

3. Implement Setup

    - **Enable Access to Installer Setup.** Enable this option to allow access to advanced implement setup and calibration. When disabled, the implement setup will limit access to many of the implement configuration parameters.

        NOTE – *This setting only needs to be enabled when editing a previously configured implement. Installer level access is always enabled when performing setup on a newly created implement configuration.*

4. Coverage Mapping

    - **Adjust Rate Themes for Material.** When enabled, the as-applied coverage layer is automatically scaled to the application.

    - **Adjust Applied Rate Theme for Prescription.** When enabled, the as-applied coverage layer is automatically scaled to the prescription target rates.

5. Prescriptions

    - **Enable Prescription Usage Automatically.** When enabled, the system will automatically set the target rate to the prescription. When off, the user will need to manually tap the **RX rate** icon.

6. **Manual Boundary Control** *(Sequential Section Switching)*

    - **Enable Auto Manual Boundary Increment.** When enabled, each tap of the Manual Boundary left/right arrow buttons will cause the boundary to snap to the next section based on the section width. This feature is useful when section widths of a boom are not uniform.

    - **Manual Boundary Increment.** If the Enable Auto Manual Boundary Increment setting is not enabled, then each tap of the Manual Boundary left/right arrow buttons will cause the boundary to snap to the user-defined width.

7. Section Control

- **Turn Off All Sections on Zero Target Rate.** When enabled, all sections will close if the target rate is set to **0**. This option is useful when running prescriptions with rate zones that contain a rate of **0** as the target rate.

8. Rate Control

- **Rate Snapping Level.** When the as-applied rate is within the defined percentage of the target rate, then the system will snap the as applied rate to match the target.

9. Tap **Home** to return to the Home screen.

Verify ISOBUS Preferences

From the Home screen, tap the **Settings** button. Then on the Settings screen, tap **ISOBUS** to configure the following settings:

Information	Tap to view...
Enable Universal Terminal	To use Universal Terminal when using ISO-certified equipment, tap **OFF** to **ON** to activate this feature.
Enable Task Controller Support	*NOTE –* *This feature is optional and requires an unlock. See* Upgrade or Apply a License for a New Feature. *Without a TC license, this setting will remain off*
	To use Task Controller (TC) for automatic section control when using ISO-certified equipment, tap **OFF** to **ON** to activate this feature.
	This preference *must* be enabled for Precision-IQ to detect and communicate with the ISOBUS ECU for automatic rate and section control.
Enable Automatic ISO Configuration Updates	Enable this setting to automatically update the implement configuration when changes are made to the ISOBUS ECU via the Universal Terminal (UT).
	This ensures that Precision-IQ will update, store, and use the most current implement settings as reported by the ISOBUS ECU.

Verify Safety and Alarms for Application Control

Precision-IQ provides a safety feature where you can set a timeout for when you want Precision-IQ to automatically disengage application control operations.

To set the timeout option:

1. From the Home screen, tap the **Settings** button. Then on the Settings screen, tap **Safety and Alarms** to display the Safety and Alarms options.

2. Tap **Application Control Operator Timeout** and set a time (in minutes). By default, **30.0 minutes** is entered.

   The value you enter is the amount of time before Precision-IQ disengages automatic application control after the last user interaction with the system.

3. Tap **OK** to save your changes.

4. Tap the Android **Back** button to return to the Home screen.

If the application timer is not reset, application control shuts off.

Select an Implement Application Type

This section describes how to select an application controller for your implement that uses application control.

Before you begin, take accurate measurements of your implement as described in Taking Implement Measurements.

As you complete each step, tap **Next** to continue to the next one. Tap the **Save** icon to save unique implement details.

1. From the Home screen, tap the **Implement** tile to display the Implement screen.

   This screen shows a list of available implements. Tap an implement to view details about the selected implement.

2. Tap the **New** button to launch the Implement Setup wizard.

   The first screen of the Implement Setup wizard prompts you to select an application device. If you are using multiple application devices, chose the controller that will be assigned to the primary application channel. The Primary Channel is used to define the base implement dimensions. Secondary controllers will be added to the configuration in a later step.

   Available application devices are:

   - None
   - Trimble Serial VR (TUVR)
     - For GFX-750/XCN-1050 displays, this option is represented as the GFX or XCN serial port.
     - For TMX-2050/XCN-2050 displays, this option is represented as the available EXP-100 serial port.

- Field-IQ Basic

  ○ Represented as the serial number (SN) of the connected module.

- ISOBUS

  ○ Represented as the ECU descriptor, which is usually the ECU manufacturer and SN.

- Virtual

  ○ Simulated rate and section control

Tap **Next** to continue.

3. Review the controller summary screen to confirm that the correct application controller has been selected. Tap **Save** to save the application type option.

4. Select the implement operation:

   NOTE – *If using ISOBUS or TUVR implements, then the operation type may be pre-selected, and this selection can be overwritten.*

   Available operations for your implement are:

Harvesting	Spraying	Surface Leveling/Drainage
Planting	Spreading	Swathing
Seeding	Subsurface Drainage	Tilling
Slurry		

   Tap the tile for the operation that applies for your implement.

   Tap **Next** to continue.

5. Set an **Implement Hitch** value. Tap the **Hitch** field and select either **Drawbar** or **Fixed**. If you select **Drawbar**, then specify the **Hitch to Ground Contact Point** value:

NOTE – *If you are configuring an ISOBUS or TUVR implement, then some of these fields may be provided by the ECU and may not be editable.*

This setting affects the modeling of the drawn implement on the Run screen.

Tap **Next** to continue.

6. Enter **Implement Measurements** values. Enter the implement measurements. See Taking Implement Measurements for details about each data point:

Field	Description
Application Width	Working width of the implement
Swath Width	Sets the distance between swaths. *Overlap* or *Skip* field will be adjusted by altering the swath width. A positive value will indicate an overlap, and a negative value will indicate a skip.
Left/Right Offset	This value represents the offset of the vehicle drawbar to the center of the application.
Physical Width and Length	Used for NextSwath to ensure boundary clearance. See Implement Setup for NextSwath for details.

NOTE – *If you are configuring an ISOBUS or TUVR implement, then some of these fields may be provided by the ECU and may not be editable.*

7. Tap **Next** to continue to Add an Application Control Channel.

Add an Application Control Channel

1. On the Application Control screen, tap the on/off slider to enable Application Control.

2. Tap the Add button to add an additional channel.

3. Select the controller type for the new channel.

    NOTE – *If you are adding an ISOBUS ECU with multiple products, then Precision-IQ will add more than one channel.*

    Only one Field-IQ BASIC or TUVR channel can be added per implement.

4. Tap **Next**.

5. Review the controller summary. If the controller details are correct, tap the **Save** icon.

6. Repeat this process until all application controllers have been selected.

7. Once you have selected the application controllers, refer to the following sections for details on how to configure your implement:

    - Configure a Field-IQ Basic Channel

    - Configure an ISOBUS Implement

    - Configure a TUVR or Virtual Implement

See also:

Configure or Edit an Application Control Channel

Delete an Implement or Application Control Channel

Master Switch Box and 12-Section Switch Box Support

Configure or Edit an Application Control Channel

To configure or edit an application control channel for an existing implement:

1. From the Home screen, tap the **Implement** tile to display the Implement screen.

2. Tap the **Edit** button to display the Summary screen of the implement.

3. Tap the **Application Control** tab. For the control channel you want to modify, tap the **Settings** button, then select **Modify**.

4. When you finish making changes, tap **Summary** at the top right corner of the screen.

   If any part of the setup is not complete, you can save the changes but you cannot use the implement on the Run screen.

5. Tap **Save** to save the channel and return to the Application Control section.

See Also:

Add an Application Control Channel

Delete an Implement or Application Control Channel

Configure a Field-IQ Basic Channel

Configure an ISOBUS Implement

Configure a TUVR or Virtual Implement

Master Switch Box and 12-Section Switch Box Support

Configure a Field-IQ Basic Channel

After you have selected the Field-IQ Basic implement application type and added the available application control channels, follow the steps below to configure a Field-IQ Basic channel for Precision-IQ. Once your implement is set up, you can return to the Implement Setup wizard to make any changes. See Edit an Implement for details.

See also:

- Delete an Implement or Application Control Channel
- Edit an Implement
- Field-IQ Basic Application Control Calibration

Follow the steps below to configure a Field-IQ Basic channel:

1. **Type** screen: enter or verify the following fields:

Field	Description
Name	Allows the entry of a custom name to identify the channel.
Control Type	Selected control type (not editable).
Material Type	For Field-IQ Basic implements, limited to **Liquid** application (not editable).
Use as Primary Display Channel	When enabled, this becomes the primary application channel.

Tap **Next** to continue.

2. **Offsets** screen: enter the channel application offsets. These are referenced from the ground contact point.

Tap **Next** to continue.

3. **Modules** screen: verify the primary and/or secondary device assignments or tap the fields to change the value.

This screen allows the selection of the primary (and secondary) Field-IQ module use for rate and section control with this implement configuration. The initial selection will reflect the choices made at the start of the implement setup.

The (re)selection of the modules, by serial number, can be made here in order to change the Field-IQ modules used with an existing implement configuration.

Tap **Next** to continue.

4. **Section Control** screen: Enter and verify the following details:

- *Settings*. Tap the active fields to update the values:

Field	Description
Section Control	Toggle section control on or off.
Control Type	Field-IQ Basic implements, for individual section switching.
	Rate as Section - Treats the Drive or Flow control valve as a section, spanning the entire boom width.
Number of Modules	Identifies the modules available for configuration. The value is determined by the initial selection of a primary and/or secondary module. *(not editable)*
Section Control Type	Boom Valve - For use with standard boom valves.
	Air Clutch, Electric Clutch, Liquid block - Inverts the section signal for use with TruCount products.
Fence Row Nozzles	Used to define what fence rows are being used. Settings are: • Left only • Right only • Both
Fence Row Wiring	This option sets the output used for the R/H fence row. • Raven/ EZboom +1 (Adds the output 1 section after the last section.) • +12 sets the output to the 12th section wire.

Tap **Next** to continue.

- *Modules*. Verify the section control module details:
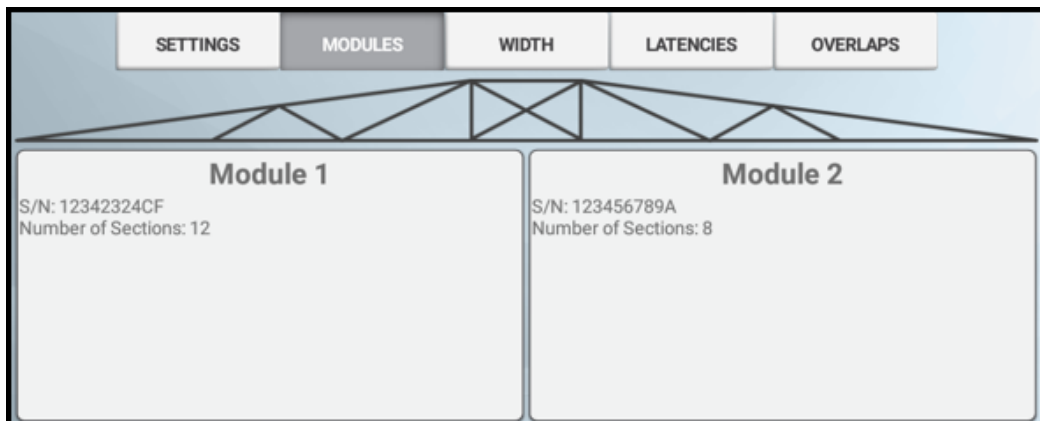
Tap a module to change the **Number of Sections** value:

Tap **Save** to save the new number of sections for the module.

Tap **Next** to continue.

- *Width*. Tap each section to enter a width value, if needed:
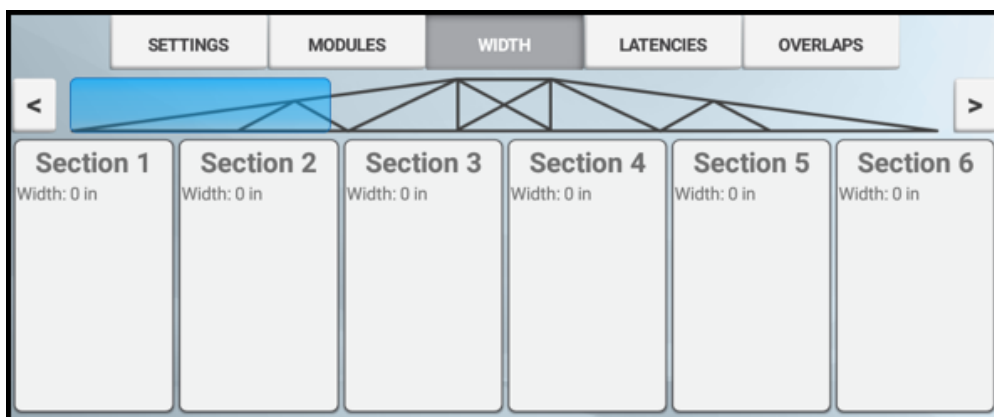
This screen will show the measured section width for each section on the boom. The widths of individual section can be changed by pressing on the section button. Note that total boom width cannot be changed from here. Any changes made to individual sections will result in the altering of the width of the last section in order to maintain a constant boom width.

Tap **Next** to continue.

- *Latencies*. Tap each field to set latency details:

Field	Description
On Latency	This specifies the number of seconds it takes for the system to reach the correct rate after the boom sections have switched on.
Off Latency	This specifies the number of seconds it takes for the system to turn off after the boom sections have switched off.
Apply On Latency to Boundary	Tap to toggle on or off. When on, compensates for hardware delays.
	On = The system determines when to switch on so that application can begin as soon as the boundary is crossed.
	Off = The system switches on when the boundary is reached. Any mechanical delay could leave a gap between the boundary and where the product is applied. When GPS accuracy is low, this option is recommended to prevent application outside of the boundary
Sections Off When Stopped	**On** = Section valves automatically close when you are not moving.
	Off = Section valves stay open, even when you are not moving.

Tap **Next** to continue.

- *Overlaps*. Tap each field to set overlap details:

Field	Description
Start Overlap	The distance of intentional swath overlap when you exit a previously applied area. The higher the number, the greater the overlapped area.
End Overlap	The distance of intentional overlap when you enter a previously applied area. The higher the number, the greater the overlapped area.

Field	Description
Coverage Switching Overlap	The percentage of the section width for intentional overlap of a swath. The higher the number, the greater the overlapped area before the section is turned off.
Boundary Switching Overlap	The percentage of the section width for intentional overlap of a boundary. The higher the number, the greater the overlapped area before the section is turned off.

Tap **Next** to continue.

5. **Rate Control** screen: enter and verify the following details:

- *Settings*. Tap each field to set settings details:

Field	Description
Rate Control	Toggle Rate control on or off.
Drive Type	Sets the control valve type
	Servo Valves:
	- Fast Servo - 4 wire servo valves
	- Hard% bypass - Used with flowback boom valves.
	- Pump Servo - Servo used to control hydraulic flow to a motor or pump
	- Standard Servo - 2 wire servo valves
	Inline vs Bypass: Sets the plumbing type of the servo. Inline systems directly control flow to the boom valves. Bypass systems meter the flow going back to the tank.
	PWM - Electronic solenoid used to control hydraulic flow to a motor.
Auxiliary Valves	Master
	Dump
Number of Nozzles	Number of nozzles used on the boom not including fence rows.
Control Valve Behavior When Sections Close	**Close:** Valve closes when all sections are off
	Lock in last position: Valve locks in last position when all sections are off
	Lock in minimum position:*(PWM only)* Sets valve to a predefined position when all sections are off

Tap **Next** to continue.

- *Valve/Drive*. Verify the rate control valve/drive details. This screen allows the configuration of the flow meter for the selected module:
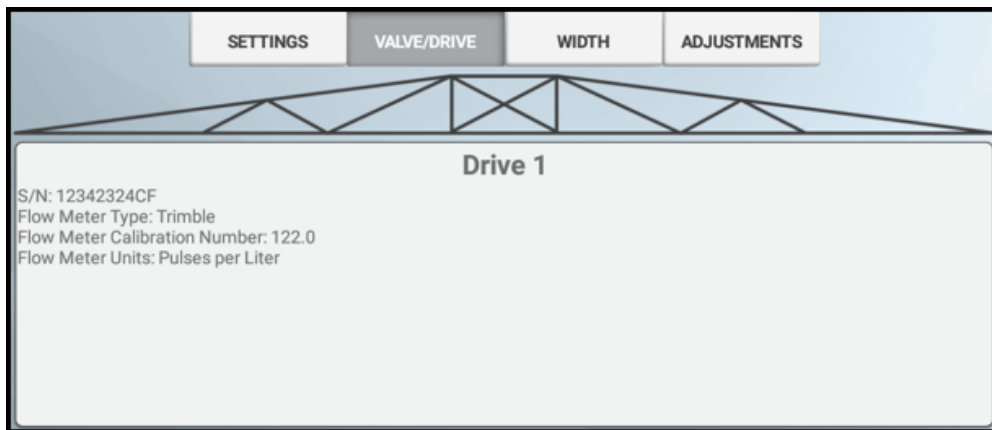
Tap **Drive** to change the flow meter setup for the valve/drive:

Field	Description
Flowmeter Type	Sets the meter type. The meter type defines the units that can be selected.
Units	Type:
	Raven (Enter the meter cal as it reads on the tag)
	• Pulses per 10 gallon
	• Pulses per 10 liter
	Other
	• Pulses per gallon
	• Pulses per liter
	• Pulses per in 3
	Trimble
	• Pulses per gallon
	• Pulses per liter
Flowmeter Calibration Number	Enter the meter cal from the flowmeter. This will be updated with the corrected value after a catch test is complete.

Tap **Save** to save the flow meter settings for the valve/drive.

Tap **Next** to continue.

- *Width*. Verify the rate control width value. This value is used to confirm the application width for the control valve. This setting is important when using rate

as section. This value is based on the boom width and is not editable here.

Tap **Next** to continue.

- *Adjustments*. Tap each field to configure the rate control adjustment settings:

Field	Description
No/Low Flow Timeout	When applying, this is the time limit in which no flow can be reported by the flowmeter before the system will automatically shut off.
Pump Disarm Switch	Used with self-propelled sprayer platforms to trigger a relay that allows Field-IQ to take control of the pump away from the OEM harnessing. The pump disarm switch does not turn the pump on or off.
Rate Snapping	Due to pump constraints, liquid flow will vary slightly. By enabling this option, you will have a steadier reading of the applied rate. If you are within the allowable error, the displayed applied rate will be the target rate. This option is available only if Rate Control is on.
Applied Flow State	**ON** - Logging based on as applied rate. Most accurate method of logging. Used when system has little or no delay in feedback from flow meter. **OFF** - Logging based on Section state. Coverage logging when sections are on. Used when the meter is slow to report flow or stalls at lower flow readings.

Tap **Next** to continue.

6. **Adjustments** screen: tap to enable Auto Jump Start and set a speed:

Field	Description
Enable Auto Jump Start Speed and Jump Start Speed	Auto Jump start is a feature specific to Field-IQ Basic, it provides a simple way to "jump start" the system when stopped.
	• Jump Start speed - the speed at which the system will apply at when Jump start is on.
	• When enabled, the jump start speed will be used for application control when the vehicle's speed is below the jump start speed threshold. Once the vehicle has exceeded this speed the vehicle's speed will be used for application control instead.
	• When disabled, a shut off speed can be entered.

See Field-IQ Auto Jump Start for more details about this feature.

Tap **Next** to continue.

7. **Virtual Tank** screen: tap to enable Virtual Tank and enter values as needed:

Field	Description
Virtual Tank	Toggle to enable or disable.
Show Units As	Sets the displayed tank units.
Full Capacity Volume	Set to match the capacity of the system.
Warning Type	Set to **Volume** or **% remaining**.
Warning Level	Sets the level at which a low tank warning will be displayed.

8. **Summary**. Review the details about the application control channel:

Tap **Save** to save the application control channel details and continue with Implement Inputs.

Configure an ISOBUS Implement

🔓 This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

ISOBUS is a set of software and hardware standards that makes possible the communication between equipment made by different manufacturers.

With ISOBUS, you can use the Precision-IQ application to control an ISO-certified implement without an additional display.

- With Precision-IQ, using task controller functionality (an optional feature)
- With Universal Terminal, an on-screen window that opens on the Precision-IQ application to access directly the functions provided by the electronic control units (ECUs).

1. Unlock Task Controller. See Upgrade or Apply a License for a New Feature.

2. Turn on the Task Controller feature.

3. Ensure that ISO UT and/ or ISO Task Controller (TC) are enabled. These settings are found in the Precision-IQ settings.

4. ECU Settings should be verified via the UT before creating implement in Precision-IQ.

5. Connect the display to the ISO-certified implement with ISO cabling.

6. Set up the GNSS receiver to send the required speed messages to the implement. (Refer to the ECU ISO manual for the required speed messages.) See CAN Messaging.

Prior to setting up the ISOBUS implement and Precision-IQ for task controller functionality:

NOTE – *You must have unlocked and activated the ISOBUS Task Controller feature to set up an implement for ISOBUS. See Upgrade or Apply a License for a New Feature and Configure an ISOBUS Implement.*

Follow the steps below to configure an ISOBUS implement:

1. Enter ISOBUS Implement Application Control Details

2. Implement Inputs

3. After all details are entered, review a summary and save implement details.

Once your implement is set up, you can return to the Implement Setup wizard to make any changes. See Edit an Implement for details.

See also: Delete an Implement or Application Control Channel.

Supported ISOBUS Configurations

- GFX-750/XCN-1050 display up to 2 channels:
  - One material/ rate per channel.
  - Single ECU with multiple channels up to 2 channels.
  - Multiple ECU's with one channel each.
  - 256 sections per channel.
- TMX-2050/XCN-2050 display up to 6 channels:
  - One material/rate per channel.
  - Single ECU with multiple channels up to 6 channels total.
  - Multiple ECU's with multiple or single channels up to 6 channels total.
  - 256 sections per channel.

Enter ISOBUS Implement Application Control Details

For implements to be used to apply a material (such as seed, fertilizer, etc.), follow the steps below to enter details about the application control channel:

1. **Type** screen: enter a name, if needed, and material type:

Field	Description
Name	Allows the entry of a custom name to identify the channel.
Control Type and Implement data	Selected control type (not editable).
ISO Implement Data	
Material Type	The material type will determine what types of materials can be assigned to the channel. For ISO this will generally will be determined by the ECU.
Use as Primary display channel	*(Only available when channel isn't currently assigned as the primary channel)* When enabled, the coverage layer for this channel will be shown by default on the Precision-IQ map screen. Only one channel may be selected as the primary.
Use Signal Input Module	When enabled, the channel uses the inputs from the Signal Input module.

Tap **Next** to continue.

2. **Offsets** screen: enter the Application offsets for the channel. These measurements are based off of the device reference point.

Tap **Next** to continue.

3. **Settings** screen: tap the active fields to update the values:

Field	Description
Rate Control	Enable this to allow rate control. For ISO this will default to the functionality reported by the ECU. The user can overwrite the selection.
Section Control	Enable to allow section control. For ISO this will default to the functionality reported by the ECU. The user can overwrite the selection.
Link to Channel	For use with multi-channel ECU's only. Used when the ECU is sharing section outputs between channels.

Field	Description
Number of Sections	Number of boom sections controlled by this channel. For ISO, this will be set to the reported sections from the ECU and will not be editable.

For ISOBUS implements, the following selections are available for the **Record Coverage Using** option:

Coverage Option	Description	Use Case
Commanded States	Logging based off of section states as commanded by Precision-IQ (PIQ).	ECUs that are slow to report their work state, Section state, or as-applied rate back to PIQ. In this mode, coverage may be logged even though no application is actually occurring. Use this mode only if none of the other modes result in a satisfactory coverage logging performance. Best to avoid using this mode if possible.
Reported States	Logging based on reported section state of application device.	ECUs that are slow to report their work state or as applied rate back to PIQ. In this mode, coverage may be logged even though no application is actually occurring.
Reported State + Work State	Logging based on the reported section state and overall work state of the application device.	ECUs that are slow to report their as applied rate back to PIQ. In this mode, coverage may be logged even though no application is actually occurring.
Applied Flow state	Logging based on reported section states and as applied rate from application device.	ECUs that are slow to update the overall workstate.
Applied Flow + Workstate	Logging based on reported section states, as-applied rate and overall work state from application device.	ECUs that report all their states in a timely manner. In this mode, coverage logging will most closely reflect the state of application.

Tap **Next** to continue.

4. **Width** screen: tap the section to enter a width value, if needed:
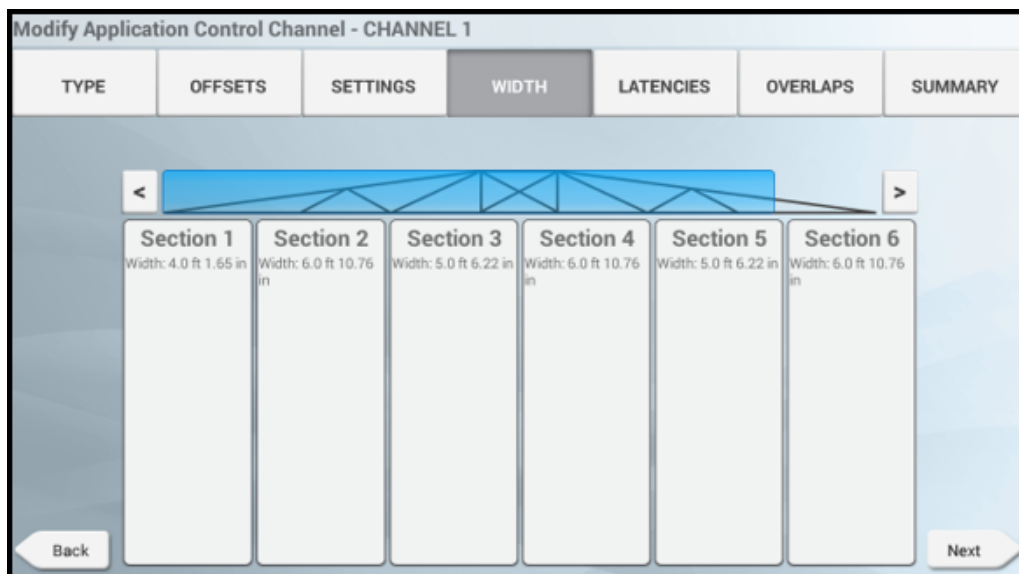
This screen will show the measured section width for each section on the boom. For ISOBUS implements, these values are reported by the ECU and are not editable.

Tap **Next** to continue.

5. **Latencies** screen: tap each field to set latency details:

Field	Description
On Latency	This specifies the number of seconds it takes for the system to reach the correct rate after the boom sections have switched on. For ISOBUS, this value may be determined by the ECU and not be editable.
Off Latency	This specifies the number of seconds it takes for the system to turn off after the boom sections have switched off. For ISOBUS, this value may be determined by the ECU and not be editable.

Field	Description
Apply On Latency to Boundary	Tap to toggle on or off. When on, compensates for hardware delays.
	On = The system determines when to switch on so that application can begin as soon as the boundary is crossed when entering from the outside.
	Off = The system switches on when the boundary is reached. Any mechanical delay could leave a gap between the boundary and where the product is applied. When GPS accuracy is low, this option is recommended to prevent application outside of the boundary
Sections off when stopped	**On** = Application stops when you are not moving.
	Off = Application continues, even when you are not moving.

Tap **Next** to continue.

6. **Overlaps** screen: tap each field to set overlap details:

Field	Description
Start Overlap	The distance of intentional swath overlap when you exit a previously applied area. The higher the number, the greater the overlapped area.
End Overlap	The distance of intentional overlap when you enter a previously applied area. The higher the number, the greater the overlapped area.
Coverage Switching Overlap	The percentage of the section width for intentional overlap of a swath. The higher the number, the greater the overlapped area before the section is turned off.
Boundary Switching Overlap	The percentage of the section width for intentional overlap of a boundary. The higher the number, the greater the overlapped area before the section is turned off.

Tap **Next** to continue.

7. **Summary.** Review the details about the application control channel:

Tap **Save** to save the application control channel details.

Repeat these steps for **Channel 2**, if needed.

Tap **Next** to continue to enter the Implement Inputs.

Configure a TUVR or Virtual Implement

This section described how to add and configure a Trimble Universal Variable Rate/Trimble Universal Serial Rate (TUVR) implement for Precision-IQ.

Before you begin, take accurate measurements of your implement as described in Taking Implement Measurements.

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

Precision-IQ supports these rate controllers for automatic rate and section control using serial communication. For specific capabilities on each model, please see its respective documentation.

Prior to setting up the implement and Precision-IQ for Task Controller:

1. Connect the display using the serial connection on the back of the display.

2. Set up the GNSS receiver to send messages to the implement. Generally, radar is sent to these controllers.

NOTE – *To set up and use any of these implements, you must have purchased and unlocked the variable rate control feature. See Upgrade or Apply a License for a New Feature.*

Manufacturer	Supported Models
Berthoud	EC Tronic
Hardi / Evrard	Regulor 6
Kuhn / Blanchard	REB
Rauch / Kuhn	Quantron A, Quantron E2
Sulky	Vision
Vaderstad	Control Station (with and without remote control)

Once your implement is set up, you can return to the Implement Setup wizard to make any changes.

See also Delete an Implement or Application Control Channel.

For implements to be used to apply a material (such as seed, fertilizer, etc.), then follow the steps below to enter details about the application control channel:

1. **Type** screen: enter a name, if needed, and offset measurements. For TUVR implements:

For Virtual implements:

Field	Description
Name	Allows the entry of a custom name to identify the channel.
Control Type	Selected control type (not editable).
Material Type	The material type will determine what types of materials can be assigned to the channel.
Application Forward/Back Offset	This is the offset from the toolbar.
Application L/R offset	This is the L/R offset from the center of the toolbar.
Use as Primary *(For Virtual implements only.)*	When enabled, the coverage layer for this channel will be shown by default on the Precision-IQ map screen. Only one channel may be selected as the primary.

Tap **Next** to continue.

2. **Offsets** screen *(Virtual only)*: enter the Application offsets for the channel. These measurements are based off of the device reference point.

Tap **Next** to continue.

3. **Settings** screen: tap the active fields to update the values:

Field	Description
Rate Control	Enable to allow rate control.
Section Control	Enable to allow section control.
Link to Channel	*(For Virtual implements only.)* For use with multi-channel virtual rate control only. Used when there is a desire to share the same section settings across channels.
Number of Sections	Number of boom sections controlled by this channel. For TUVR implements: Sections may be populated by controller.
Fence Rows	Allows the configuration of virtual fence rows.

For TUVR implements, the following selections are available for the **Record Coverage Using** option:

New Coverage Option	Description	Use Case
Commanded States	Logging based off of section states as commanded by Precision-IQ.	Controllers that are slow to report their Section state or as applied rate back to PIQ. In this mode, coverage may be logged even though no application is actually occurring. Use this mode only if none of the other modes result in a satisfactory coverage logging performance. Best to avoid using this mode if possible.
Reported States	Logging based on reported section state of application device.	Controllers that are slow to report their applied rate back to PIQ. In this mode, coverage may be logged even though no application is actually occurring.
Applied Flow state	Logging based on reported applied rate and Section state	Controllers that report the as-applied and section state in a timely manner.

Tap **Next** to continue.

4. **Width** screen: tap each section to enter a width value, if needed. This screen will show the measured section width for each section on the boom:

- **TUVR:** The section widths are provided by the TUVR ECU and are not editable.
- **Virtual:** You may edit the Section widths by tapping on the corresponding section.

Tap **Next** to continue.

5. **Latencies** screen: tap each field to set latency details. Generally, when running virtual control, these values are left alone.

Field	Description
On Latency	This specifies the number of seconds it takes for the system to start applying material after the boom sections have switched on.
Off Latency	This specifies the number of seconds it takes for the system to stop applying material after the boom sections have switched off.
Apply On Latency to Boundary	Tap to toggle on or off. When on, compensates for hardware delays.
	On = The system determines when to switch on so that application can begin as soon as the boundary is crossed when entering from the outside.
	Off = The system switches on when the boundary is reached. Any mechanical delay could leave a gap between the boundary and where the product is applied. When GPS accuracy is low, this option is recommended to prevent application outside of the boundary
Sections off when stopped	**On** = Application stops when you are not moving.
	Off = Application continues, even when you are not moving.

Tap **Next** to continue.

6. **Overlaps** screen: tap each field to set overlap details:

Field	Description
Start Overlap	The distance of intentional swath overlap when you exit a previously applied area. The higher the number, the greater the overlapped area.

Field	Description
End Overlap	The distance of intentional overlap when you enter a previously applied area. The higher the number, the greater the overlapped area.
Coverage Switching Overlap	The percentage of the section width for intentional overlap of a swath. The higher the number, the greater the overlapped area before the section is turned off.
Boundary Switching Overlap	The percentage of the section width for intentional overlap of a boundary. The higher the number, the greater the overlapped area before the section is turned off.

7. **Summary.** Review the details about the application control channel:
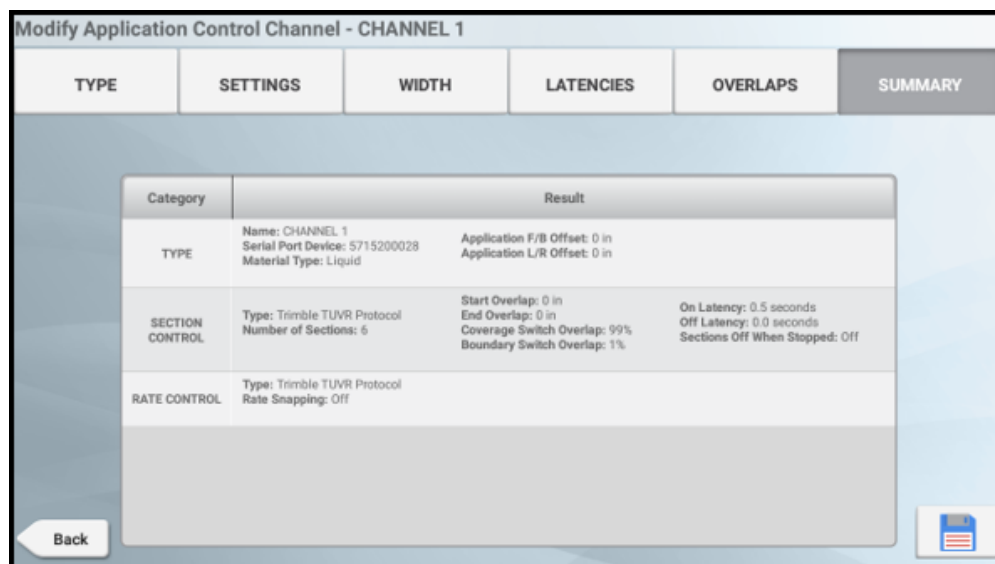
Tap **Save** to save the application control channel details and then tap **Next** to continue to enter the Implement Inputs.

Implement Inputs

Depending on your implement, enter the following information:

1. **Switches** screen: tap to enable and select switch details:

- *Auxiliary Master Switch*. The auxiliary master switch must always be connected via the "primary" module. When enabled, the external master is used to start/stop the rate control drive calibration. The soft master button will not appear on the calibration screen when enabled. When enabled, the external master must be ON to operate the system. It is used in conjunction with the section master on the

run-screen.

- *Implement Lift*. The implement lift switch input must always be connected to the "primary" module. Specify whether the lift switch working state is *active high* (open circuit) or *active low* (closed circuit).

- *Remote Logging Switch* - For Field-IQ Basic implements, only both lift switch types are selectable: **FIQ Basic Module** and **Remote Logging Input**. Update or verify the settings of the **Inputs - Switches** configuration step:

  a. The Lift Switch option must be **enabled**.

  b. *(TMX-2050/XCN-2050 displays only)* For the Input Location, select the **EXP-100 Remote Logging Switch** item.

  c. For the Working State, set to the state based on the switch being used. For example, set to **Active Low** when using a closed grounded circuit to trigger an active work state:
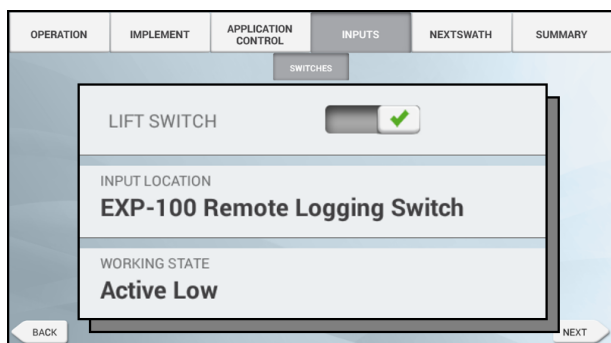
On the Run screen, an arrow will display in the header to indicate whether the implement is lowered or lifted:

Tap **Next** to add a new sensor for Field-IQ Implements or to continue to Signal Input Module for all other implements.

2. **Sensors.** Tap to enable a sensor *(Field-IQ Basic implements only)*. Tap **Add** to add a new sensor:

- *Type*. Tap a button to select a sensor type. Choose from:
  - Air pressure.
  - Liquid pressure.
  - Vacuum pressure.

  Enter a name for the sensor in the field provided.

  Tap **Next** to continue.

- *Location*. Tap the fields to select location values.

  Tap **Next** to continue.

- *Alarm*. Tap to enable and set thresholds for the sensor alarm.

  Tap **Save** to continue to Signal Input Module.

Signal Input Module

This section describes the signal input module options.
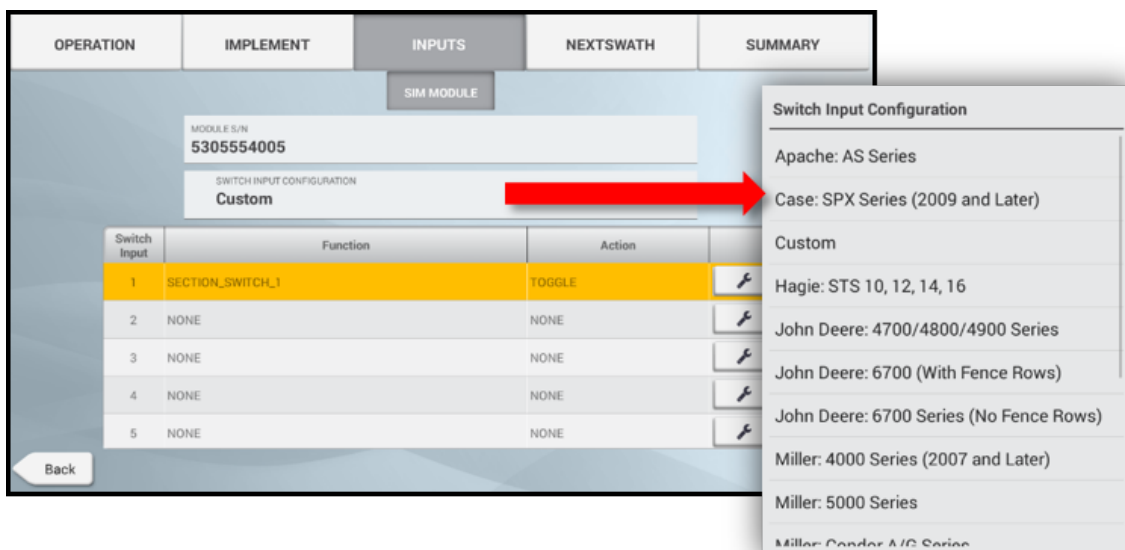
1. **Module S/N.** The serial number of the connected signal input module.

2. **Switch Input Configuration.** Select a field to change from Custom inputs to predefined inputs:

   - *Predefined platforms* - to be used with Field-IQ Basic self-propelled sprayer platform kits.

   - *Custom* - inputs are manually assigned.

3. **Switch Assignments** to:

- *Assign an input:*

    a. Tap the **Settings** button on the input to assign its function.

    b. Toggle a switch that is connected to the signal input module. This will highlight the input it is connected to. Tap the **Settings** icon to assign the inputs.

- *Clear inputs* - Select or reselect the **Custom** switch input configuration.

Category	Function	Input Type
Guidance	Engage/Disengage	Momentary
	Nudge Right	Momentary
	Nudge Left	Momentary
Field-IQ Basic	Increment Rate	Momentary
	Decrement Rate	Momentary
All Application Control	Left Fence Row	Toggle (On/Off)
	Right Fence Row	Toggle (On/Off)
	OEM Master	Toggle (On/Off)
	Section Switches 1 - 24	Toggle (On/Off)

4. Tap **Next** to:

- Select NextSwath details. The NextSwath feature is used to automatically turn the vehicle at the end of a straight line guidance pattern to align with the next selected swath. See Implement Setup for NextSwath for details.

    NOTE – *If your implement does not support NextSwath, then this option will not appear.*

    or

- To review a summary and save implement details.

Field-IQ Basic Application Control Calibration

Access to the calibration for a implement requires that the installer UI be enabled.

On the Implements screen, tap the Calibrate button to open the Calibration screen to view the calibration summary status. Follow the calibration instructions in the following sections:

- Drive/Valve Calibration

- Sensors

- Calibration Types
- Flow Calibration

Drive/Valve Calibration

1. Tap the **Application Control** tab.

2. Select the module that you want to calibrate. For Field IQ Basic, this will be the "primary" module. Follow the steps on the screen to set the following values:

   a. Drive limits - Maximum Flow. This should be calculated with one of the following:

      - Nozzles/ Orifice. Multiply the maximum rate flow of the nozzles by the number of nozzles on the sprayer. If using multiple tips install the largest tip that will be used.

      - Maximum Flow rating of the pump or flow meter, whichever is lowest

   b. Auto Tuning - The system will automatically tune the valve.

   c. Drive Settings - Editable calibration values. Most valves can be tuned with the settings described in the table. The system can also be turned on in this screen to check the valve performance.

Value	Description
Gain	Adjusts the speed response of the control valve. Increasing the value will increase the speed at which the valve adjusts. - If the gain is too high, then the valve overshoots the target rate. The valve may surge. - If the gain is too low, then the system will take too long to respond to rate changes.
Minimum Response	Minimum Command applied the valve to initially open the valve. - Setting this to high can cause the valve to overshoot when making rate changes. If the Minimum Response is too low, then the valve may not respond, allowing the flow to stay above or below the target rate. - Large adjustments to this value may affect the Gain setting.
Allowable Error	Sets the % of target rate error that the control system accepts. For Servos, this is usually left at 3% as most valves aren't quick enough to keep up with small flow fluctuations. - Setting this to low or can cause excessive valve oscillation. - Setting this to high can cause the valve not to respond to as applied rate errors.

Sensors

Tap the **Sensors** tab and select the module to calibrate. For Field-IQ Basic, this module will be the "primary" module. Follow the steps on the screen.

Calibration Types

Select **Calibration Types**, and select **Air/Liquid/ Vacuum** sensors. The following table describes the calibration types:

Type	Description
Point/Slope	Uses the slope value of the sensor and a set point. The set point must be known, it can be 0. The slope value will be provided by the sensor manufacturer.
High/Low	Also known as two-point calibration. The sensor must reference two separate known pressures. The display will calculate the slope between these two values (0 is acceptable as the low pressure). This method is generally considered more accurate as it is tuned to the specific sensor.

Flow Calibration

The flow calibration is linked to the material. To access the calibration screens, tap the **Material** tile on the Precision-IQ Home screen to open the **Material Setup** screen. A material must be assigned to a channel. Once assigned, select **Flow Calibration**.

Follow the steps in the Calibration menus and enter the following information:

1. Enter or Modify the meter cal.

2. Calculate the system minimum flow.

    - Nozzle/ orifices- Multiply the minimum flow of the tip by the number of tips on the smallest section of the sprayer.

    - Minimum flow rating of flow meter or pump, what ever is higher.

3. Enter a target rate and speed appropriate for the applicator.

4. To start the calibration, select **start flow**, then turn on the master switch.

5. Using a measuring container, catch 1-minute samples from at least 3 sections across the boom. Average the results.

    NOTE – It is important to let the flow stabilize before taking the sample

6. Enter the results. If the corrected cal number is acceptable, tap **OK**.

Edit an Implement

1. From the Home screen, tap the **Implement** tile to display the Implement screen.

   This screen shows a list of available implements. Tap an implement to view details about the selected implement.

2. Tap an implement to select it. Then tap the **Edit** button. The Summary screen of the implement displays.

3. Tap the section where you want to make edits and enter the appropriate changes. For example, if you need to update an implements measurements (as described in Taking Implement Measurements), tap **Inputs** to enter the appropriate measurement values.

4. When you are finished, tap **Summary** at the top right corner of the screen.

   If any part of the setup is *Not Complete*, you can save the changes but you cannot use the implement on the Run screen.

5. Tap the **Save** icon to save your changes to the implement. The Home screen displays.

   To cancel / remove your edits and not change the existing profile, tap the Android **Back** button on the display. A message displays, asking if you want to save your changes. Tap **No**.

Delete an Implement or Application Control Channel

You can delete an implement or application control channel. However, when you do so, all settings associated with that implement or application control channel will also be deleted.

To delete an implement or application control channel:

1. From the Home screen, tap the **Implement** tile to display the Implement screen.

   This screen shows a list of available implements.

2. Select an action:

   - Delete an Implement
   - Delete an Application Channel

Delete an Implement

1. Tap the implement you want to delete to select it.

2. Tap the **Delete** button.

3. On the confirmation pop-up window, tap the green check to confirm that you want to remove the implement and to complete the delete process.

Delete an Application Channel

1. Tap an implement to select it. Then tap the **Edit** button to display the implements Summary screen.

2. Tap the **Application Control** tab to display all channels assigned.

3. For the application control channel that you want to remove, tap the **Settings** button.

4. On the confirmation message, tap **Yes** to confirm the removal. Otherwise, tap **No** to cancel the removal.

5. When you finish making changes, tap **Summary** at the top right corner of the screen. If any part of the setup is *Not Complete*, you can save the changes but you cannot use the implement on the Run screen.

6. Tap **Save** to save the channel and return to the Application Control section. The application returns you to the Implement setup panel.

   To exit channel setup without saving, tap the Android **Back** button. A message displays, asking if you want to cancel without saving your changes. Tap **Cancel**.

Application Control Widgets on the Run Screen

- Run Screen
- Rate Widget
- Section Master Icon
- Section Widget

Run Screen
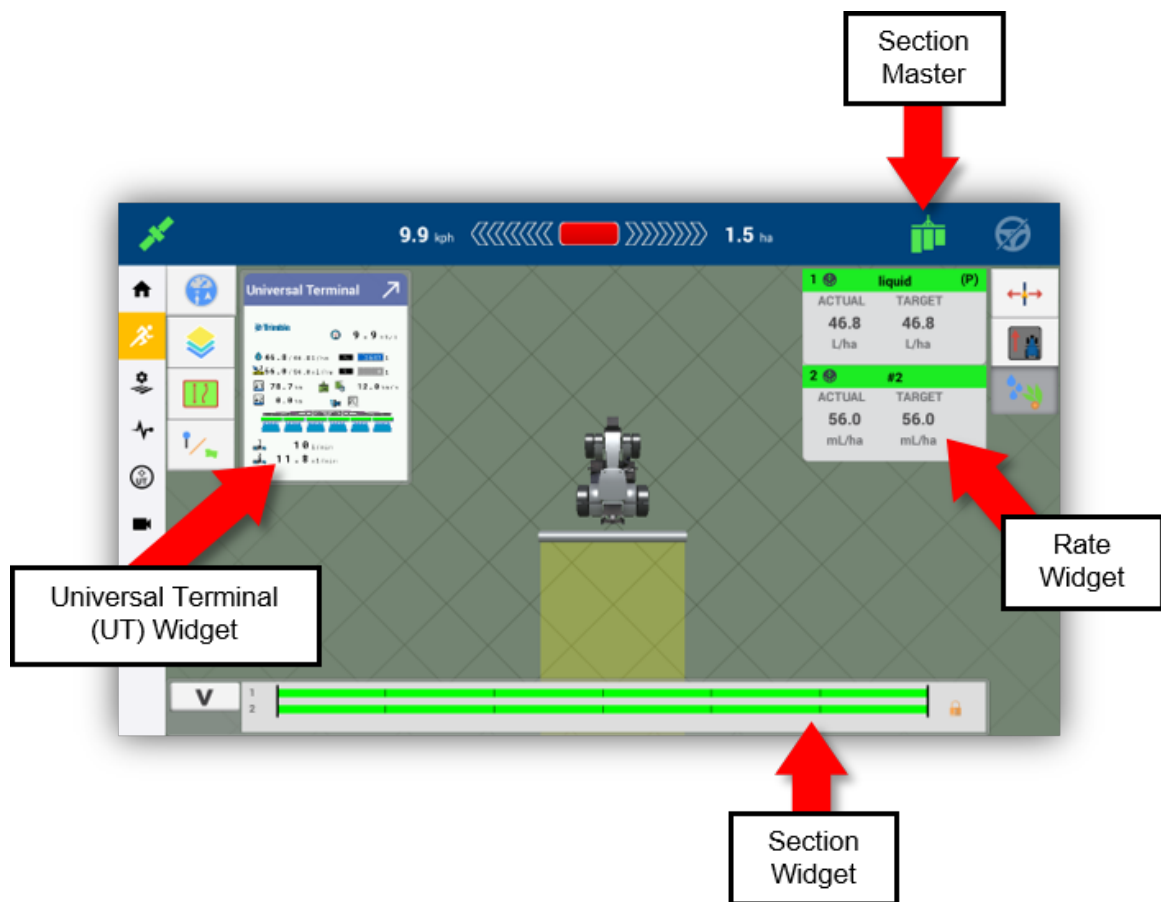
Rate Widget

Tap the **Rate Widget** button to open the Rate Widget:

The Channel Details view:
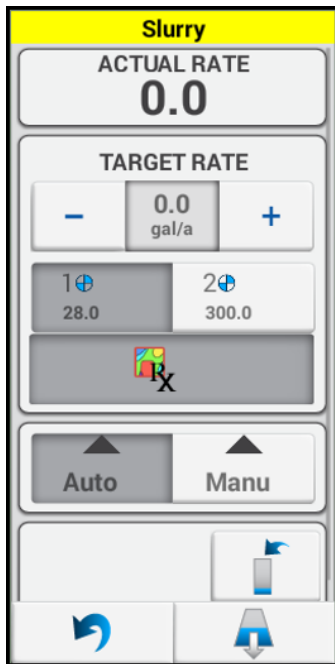
The Rate widget has the following states:

1. **Collapsed/Channel overview.** Details include work state, actual rate, and target rate:

2. **Channel details.** Allows the user to:

   - Select a predefined target rate or adjust the target rate using the increment and decrement buttons.

     NOTE – The Rx rate selection is only available when a prescription is active.

- Select the Section Control State:

  ○ *Auto Section Control.* Automatically switches sections based on Coverage, Boundary's, or Non-productive zones:

    If either *off when stopped* is enabled or the implement is over covered ground the sections will remain closed and no application will occur.

    If *off when stopped* is disabled and the implement is over clear ground the section will open and application will occur. If jump start is enabled, application will occur at a rate corresponding to the jump start speed.

  ○ *Manual Section Control:*

    Off: *(For ISOBUS implements only)* Disables Task Controller (TC) Section Control.

3. Virtual Tank and Flush *(for Field-IQ Basic implements only):*

   a. To view details, tap the **Virtual Tank** button:

   b. To start the flush:

      1. Tap the **Flush** button:

         The *stay clear* notification will be displayed.

      2. Press the flush button. The "stay clear" notification will be displayed.

      3. Tap the screen to dismiss the notification.

      4. Press the section master (and/or enable the remote master switch) to start the flush process.

   c. To stop the flush:

      1. Press the section master and/or disable the remote master switch.

      2. Note that the system flow will show non-zero on the rate widget while flush is in progress.

   This feature can be tested with the BRASS module simulators.

4. Tap the **Collapse** icon to collapse the rate widget details:

Channel Work State

Heading Color	ISOBUS State	Field-IQ Basic State
Gray	OFF: ECU work state is **off**. *OR* Channel is disabled. *OR* An error that would prevent application is present.	OFF: Ready for application
Yellow	Channel work-state is **on**, but no application is reported.	
Green	ON:	ON: Master Switch on

Section Master Icon

At the Run screen, the on-screen master switch button is available for controlling sections.

Button	Explanation
	Coverage logging not available. Invalid task, application setup, controller connection issue or no communication with guidance controller.
	ISOBUS: (Yellow) The task controller is ready to control sections. All sections are off. **Field-IQ Basic, TUVR, Virtual:** Application control is off. System is ready for application to start
	ISOBUS: (Green) The task controller is controlling sections. **Field-IQ Basic, TUVR, Virtual:** Master switch is on.

Section Widget

The Section Widget has four states:

1. Section State Indicators (This is the default state):

2. Manual Boundary Control (sequential switching):
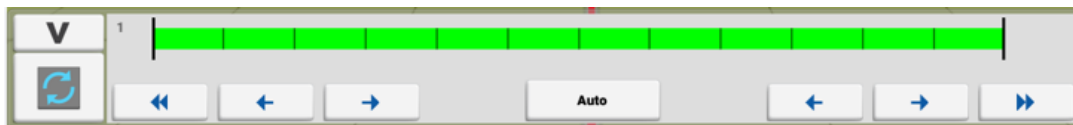
3. Manual Section Control:
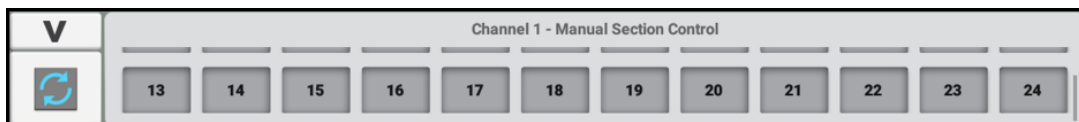
NOTE – *If you have over 12 sections, then the Manual Section Control widget updates to allow the view to scroll.*

4. Collapsed:

Navigating Through the Section Widget States

Expanding and collapsing the widget:

- To collapse the section widget, tap the down arrow:

- To expand the section widget, tap the up arrow:

Default view to manual boundary control:

- From the default state, tap anywhere inside the widget.

- To return to the default view, tap on the section indicators of the manual boundary screen.

Manual Boundary to Manual Section screens:

- To cycle between the Manual Boundary mode and the Manual Section mode, tap the **Cycle** icon:
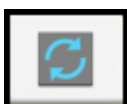
If multiple channels are available, each tap of the cycle key will move through the available channels. After the last channel, the widget will return to the Manual Boundary mode.

Other Section Widget Icons

Lock icon: Used to represent channels that's sections are not controllable by Task Controller:

Link icon: Used to represent channels that are linked:

Master Switch Box and 12-Section Switch Box Support

If you have a Field-IQ Basic, ISO, TUVR, or Virtual implement, then support of the Master Switch Box and 12-Section switch box is now available.

NOTE – *Use of the switch boxes is optional, and when assigned to an application channel the physical switches and master switch replaces the use and function of all on screen virtual switches in Precision-IQ.*

When used with Field-IQ Basic, the following functions are enabled:

- Manual rate control of Field-IQ Basic channels.

- Jump Start with Field-IQ Basic channels.

When Switch boxes are present, Channels 2 - 6 may "opt out" of switch box control. This setting can be specified on the Application Control Type page of the Application Control Setup wizard:

NOTE – This option will not appear if a switch boxes is not detected by the system.

NOTE – This option will not appear for Channel 1, as Channel 1 cannot "opt out" if a switch box is present.

Master Switch Box (MSB)

Only one Master Switch box (MSB) can be used per display. When connected, the (MSB) master switch state is applied to all channels. The on-screen Section Master button becomes a status icon, and its state is slaved to the physical master switch.

Master Switch Box Setting	Description
	Jump Start Jump Start is only applied to the Field-IQ channel. ISO and TUVR channels will be be set to "On" when the switch is in the Jump Start position. If the master switch box and signal input module are connected, the signal input module is slaved to the master switch state.

Master Switch Box Setting	Description
	Increase or Decrease Can be used to offset target rate. Will change rate for every channel assigned to the box when in rate 1 or rate 2 modes.
	Section Auto or Manual Sets section control mode for channels using the switch box.
	Target Rate Change Target rate change can be set between rate 1, 2, and Manual. The following options apply for Manual rate control: • **Field-IQ.** Using the Increase or Decrease switch (+ or -), the valve can be opened and closed manually. The as applied rate will read in as flow/minute. • **ISO and TUVR Channels.** These will lock to the last target rate if the switch is set to Manual rate control (M). They will not be affected by the increment/decrement rate events while in manual rate control mode.

12 Section Switch Box

NOTE – Only one 12-section switch box can be used per display.

If the signal input module (with section switches assigned) and 12-section switch box are connected at the same time, the SIM section inputs will be ignored. The 12-section switch box must be used. The following notification will appear when this situation occurs:
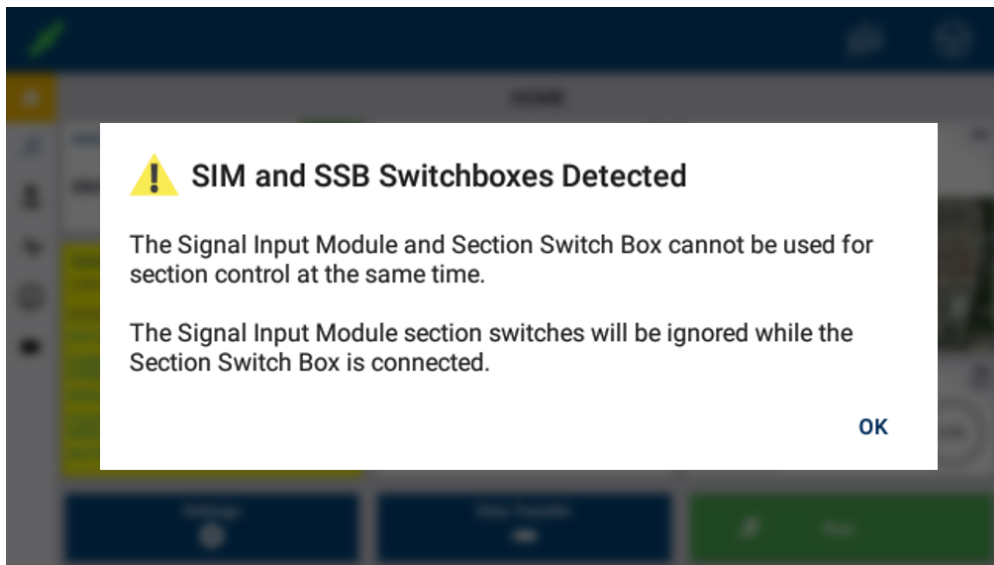
If there are more than 12 sections, then the 12-section switch box will begin to group sections to switches. The system will start to pair sections working from the middle of the implement out.

If multiple channels are in use, then the channel with the smallest section count will be used for switch assignments. Channels with higher section counts will have their sections grouped to match the channel with the lowest count. The number of switches assigned to regular sections will be based on the channel with the smallest section count.

Fence Rows

The **Left Hand** fence row will always be tied to switch 1. Section 1 and following sections will be offset by one switch.

The **Right Hand** fence row will be tied to the switch next to the last section.

For example: If the last section is on **switch 7**, then the right hand fence row will use **switch 8**.

Multi-Channel Example with Fence Rows

This example uses two (2) channels: one channel for ISO (with four (4) regular sections) and one channel for Field-IQ (with six (6) regular sections). The Field-IQ channel has both left and right fence sections enabled.

The Rate and Section switch mapping would be as follows:

- Switch 1 = Field-IQ left fence section
- Switch 2 = ISO regular section 1, Field-IQ regular section 1
- Switch 3 = ISO regular section 2, Field-IQ regular sections 2 and 3
- Switch 4 = ISO regular section 3, Field-IQ regular sections 4 and 5

- Switch 5 = ISO regular section 4, Field-IQ regular section 6
- Switch 6 = Field-IQ right fence section

8

Materials

▶ Categories and Types of Materials

▶ Adding a Material

▶ Editing a Material

▶ Deleting a Material

As part of a field run, a *material* is that which you apply to a field through an implement. Precision-IQ records the amount and coverage of each material applied to your field. This data is then sent to your farm office and is used to effectively and efficiently manage the farm.

On the Materials screen, you can add and edit materials as well as calibrate material flow. From the Home screen, tap the **Material** tile to get started.

Categories and Types of Materials

This section lists the categories and types of material supported by Precision-IQ.

Anhydrous

Anhydrous

Other

Granular Fertilizer

Adjuvant	Growth Regulator	Manure	Other
Fertilizer/Lime	Herbicide	Nematacide	Rodenticide
Fungicide	Insecticide		

Liquid

Adjuvant	Regulator	Manure	Other
Fertilizer/Lime	Herbicide	*(used with Slurry operations only)*	Rodenticide
Fungicide	Insecticide	Nematacide	Water
Growth			

Granular Seed

Barley	Cotton	Popcorn	Sugar Beets
Beans, Dry	Millet	Potatoes	Sunflowers
Canola	Oats	Rice	Wheat
Corn	Other	Rye	
Corn, seed	Peanuts	Sorghum Grain	

Row Crop Seed

Barley	Cotton	Popcorn	Sugar Beets
Beans, Dry	Millet	Potatoes	Sunflowers
Canola	Oats	Rice	Wheat
Corn	Other	Rye	
Corn, seed	Peanuts	Sorghum Grain	

Adding a Material

A material must be assigned to an application channel before it can be applied to a field. This section describes how to add a material.

1. From the Home screen, tap the **Material** tile. The Material Assignment screen shows the following information:

    Available Channels: This section shows the number of channels available to the selected implement. Some implements can deliver more than one material (for example, fertilizer *and* herbicide). Implements deliver a particular material through *channel*. Tap the **On** button to enable or disable a channel.

    Available Materials: This section shows the material profiles that have already been created. Tap a material from this list to select it and review its details. Materials will only be listed that have the same category as the application channel.

    Material Detail: This section shows details about the selected material.

2. Tap **New**.

3. A form appears for you to enter details about the material. Tap each field to update it:

    Material Name: Enter a name for the material.

    Category: Select the category of material to be applied from the pop-up list.

    Type: Select the type of material to be applied from the pop-up list. The items from the list depends on the category you select. For example, if you select **Row Crop Seed** as the category, then the Type options show only those items that apply.

    Distributed Units: Select the units to use with the selected material.

    Target Rate 1 and **Target Rate 2:** Control the volume that the implement supplies when Rate 1 or Rate 2 is selected.

    Rate Increment: Set rate increment. When you increment/decrement Rate 1 or Rate 2 on the Run screen, the current application rate increases or decreases by this amount.

    Minimum Rate and **Maximum Rate:** Set the minimum and maximum rates that will be applied.

4. Tap **Material Details** *(optional)*. You can also add additional details about the material. These details are not required to start a field run, but can be useful for tracking in the farm office. In the Material Details pop-up, tap each field to update it.

    Product Number: Enter the registration number for the material from the environmental protection agency for the area, if applicable.

    Manufacturer: Enter the material manufacturer's name.

    Restricted Use: Tap to enable Precision-IQ to record whether use of the material is restricted by local, regional, or national laws.

    Posting Required

Buffer Distance: Enter the buffer distance from the product label of the material.

Max Wind Speed: Enter the maximum wind speed from the product label of the material.

Notes: Enter any other notes that you want to record with the material.

When you have entered the optional material details, tap the green check mark to save the changes.

5. Tap **Save** to complete the process. Once you have saved the material profile, it will appear in the Available Materials list depending on the implement you have selected.

See also:

- Categories and Types of Materials
- Implements

Editing a Material

As you apply a material to a field, you may find that some details need to be modified. Precision-IQ allows you to modify some options of the selected material:

1. On the Home screen, tap the **Material** tile. Then, on the Material Assignment screen, tap a material from the Available Materials list that you want to edit to select it.

2. Tap the **Edit** button.

3. On the Material Assignment screen, tap the field(s) you want to update and make your changes.

4. When you are satisfied with your changes, tap **Save**.

Deleting a Material

If you no longer need to use a material, you can delete it from the list of Available Materials.

NOTE – There is no "undo" for deleting a material. However, you can always add it again. See Adding a Material.

1. From the Home screen, tap the **Material** tile. Then, on the Material Assignment screen, tap a material from the list of Available Materials that you want to delete to select it.

2. Tap the **Delete** button.

3. A confirmation pop-up window will display. Tap the green check to complete the material deletion.

Run Screen

Once you have successfully set up and selected the equipment and field details, tap the **Run** button on the Home screen to enter the Run screen:

From the Run screen, Precision-IQ records data for all work and materials for your selected field.

This chapter describes the settings and selections you can make on the Run screen, including fine tuning a field configuration with guidance mappings and landmarks.

Run Screen Settings

Precision-IQ offers a variety of settings you can use to customize the look of the Run screen. To get started, tap the **Settings** button at the bottom of the Home screen.

Mapping Settings

The Precision-IQ mapping settings allow you to change the look and feel of the map as it appears on the Run screen. You can also select when application coverage is recorded. From the Settings screen, tap **Mapping**.

Map Features

- **Map Background Selection** - Tap this option to change the background color values for the Run screen. You can also select whether or not to include a textured background or a background with grid lines.

- **Map Color Scheme** - Tap this option to toggle between day mode or night mode.

- **Map Orientation** - Tap this option to set the point of view for how you want the Run screen to follow the position of your vehicle. The orientation options are:

  - **North Up** where the map always shows north at the top. The vehicle icon on the Run screen will change depending on the direction.

  - **Vehicle Up** where the map always shows the vehicle pointing up. The vehicle icon remains stationary and the map rotates around it depending on the direction.

Record Coverage

When Application Control is not enabled, you can set Precision-IQ to begin coverage logging:

- **When Engaged** - Tap to enable or disable coverage logging with Autosteering engaged or disengaged.

  or

- **With Active Remote Switch** - Tap to enable or disable coverage logging with a remote logging switch. When enabled, you can set the Remote Switch Working State to be **Active High** or **Active Low**.

Patterns Settings

From the Run screen, you can fine tune the details of a field with a variety of markers for such things as landmarks, curves, borders, etc. The more details you provide about a field greatly improves the reporting of work done to that field.

The Precision-IQ patterns settings allow you to change the look and feel of these markers as they appears on the Run screen. From the Settings screen, tap **Patterns**.

Curve Features

- **Curve Smoothing** - Tap to enable or disable this feature. When enabled, Precision-IQ smooths out the guidance curve, making it wider.

- **Smooth Turn Radius** - Tap to enter the size of the circle that Precision-IQ will guide to. The larger the circle (degrees), the wider the turn.

- **Tight Turn Warning Angle** - Tap to enter the number of degrees that will trigger a warning about a tight turning angle. See Alerts and Warnings.

- **Tight Turn Look Ahead Time** - Tap to enter the number of seconds before you approach a tight turn angle when the tight-turn warning will show on the screen. See Alerts and Warnings.

Headlands

- **Auto Close** - Tap to enable or disable Precision-IQ to automatically close the beginning and end point when you create headlands.

- **Auto Close Distance** - Tap to enter the distance between your beginning point and ending point for a headland.

Boundaries/Area Features

- **Auto Close** - Tap to enable or disable Precision-IQ to automatically close the beginning and end point when you create boundaries.

- **Auto Close Distance** - Tap to enter the distance between your beginning point and ending point for a boundary.

- **Boundary Smoothing** - Tap to enable or disable.

Alerts and Warnings

The Precision-IQ application will display warnings and alerts, depending on your features and the situation. For example, warnings or alerts that display include, but are not limited to:

- Loss of GNSS coverage.

- The vehicle is approaching a tight turns or the end of a row.

- The system detects the steering wheel is being used.

- A lack of interaction with the display after a specific amount of time.

End of Row Warning		Tight Turn Warning	
	If you are following a guidance line, when you begin approaching the end of a row, an End of Row warning displays:		When you are approaching a tight turn, the system displays a tight turn warning:

To customize your settings for tight turn warnings (including the angle of the turn and how soon the warning displays before the turn), see Patterns Settings

Coverage Layers

From the Run screen, you can view a variety of map layers for coverage, which are then recorded for each task. To view the available coverage layers:

1. From the Run screen, tap the **Coverage Layer** button:

   By default, the Coverage Layers widget appears, though the last layer you selected will display.

2. Tap anywhere in this widget to display the Available Layers pop-up window:

3. Tap any of the items on this window to update the Coverage Layer widget. For example, if you tap **Speed** in the Available Layers pop-up window, the Coverage Layer widget updates to show you the speed ranges.

4. Tap the **Coverage Layer** button again to hide the Coverage Layer widget.

Edit Coverage Layers

Precision-IQ allows you to customize the coverage layer. To edit a coverage layer:

1. Tap the **Coverage Layer** button.

2. The last layer you selected will display. In this example, the Speed coverage layer was selected.

3. Tap anywhere in this coverage layer widget to display the Available Layers pop-up window.

4. Tap the **Settings** icon.

5. In the Settings pop-up window, tap the coverage layer you want to edit. In this example, select **Speed** from the list of Available Layers:
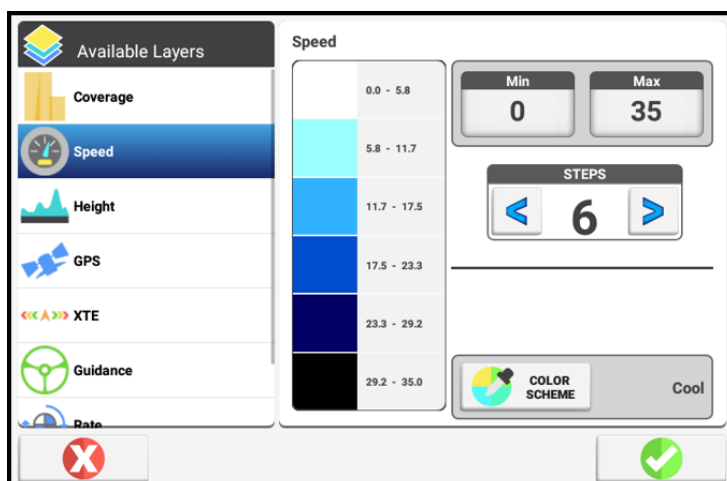
6. From this view, you can change:

- **Minimum** and **Maximum** values - For the speed values, tap **Min** to enter a minimum value (default is **0**). Tap **Max** to enter a maximum value. If a coverage layer does not require a minimum or maximum value, these buttons are grayed out.

- **Steps** - Tap to adjust the number of range s in the Coverage Layer widget.

- **Color scheme** - Tap to change the color family of the Coverage Layer widget. Choose from **Cool**, **Hot**, **Grey Scale**, or **Rainbow**.

7. When you have completed your selections, tap the green check mark to save your changes.

Coverage Logging

The Precision-IQ application's Coverage Logging records the area that you have covered when you carry out an operation, for example applying fertilizer to a field. It also allows you to view different map layers of your coverage as you are working in the field.

You can set up varieties that make it easy to see the difference between different types of coverage. This enables you to:

- Change product part way through a field, so that you can later identify which parts of the field are covered in which product.

- Plant or apply two or more different products side-by-side and record the locations in your field. For example, you could put corn seed in the left side hoppers on your planter and clover seed in the right side hoppers and track where each set of seeds is planted. The varieties are assigned to rows on your implement. Specify the number of rows on your implement when you configure it.

Once you enter the Run screen, coverage logging is not engaged by default, which is indicated by the following icon:

Tap this icon to engage coverage logging. The icon changes to:

Automatic Logging with Engage

If your system has been configured to do so, coverage will start when your auto guidance system is engaged in the Run screen. Coverage will stop when auto guidance is disengaged.

If automatic logging is activated, you can still turn logging on or off when engaged or when disengaged by tapping the coverage logging icon.

Landmarks

As you perform work within a field, you can fine-tune the details about the field by using landmark markers. These markers allow you to identify specific areas or points that can affect how Precision-IQ records the work done.

1. On the Run screen, tap the **Landmarks** button:

2. A selection of landmark buttons appears.
3. Tap the **Landmarks** button again to hide the landmark selection buttons.

After you have created landmarks, you can edit them and assign them to categories using Field Manager. See Field Manager Landmarks (Point - Line - Area).

Landmarks: Points

Use the landmark point marker on the field map to identify landmarks such as:

- Generic (such as a gate, riser, tile inlet, water trough, well)
- Rock

- Pest or crop damage (such as from insects, weeds, etc.)

- Obstacle (hole, tree, hazard)

Landmark points can trigger warnings when you approach them.

To set a landmark point:

1. From the Run screen, tap the **Landmarks** button.

2. From the list of available landmark buttons, tap the **Point** button:

    Precision-IQ places the marker at the vehicle's current location, based on the recording point.

3. Use Field Manager to edit, rename, or set alarms for a landmark point. See Field Manager Landmarks (Point - Line - Area).

4. Tap the **Landmarks** button to close the list of available landmark buttons.

Landmarks: Lines

Use the landmark line marker to record a line such as:

- Generic (such as border, drip tape, gate, path, road)

- Obstacle (cable, ditch, fence, hazard, pipe, river, stream, terrace, trees)

Landmark points can trigger warnings when you approach them.

To record a landmark line:

1. From the Run screen, tap the **Landmarks** button.

2. In the list of available landmark buttons, tap the **Line** button:

3. Position your vehicle where you want to the landmark line to begin.

4. Tap the **Record** button:

Precision-IQ draws a dashed line beginning at the vehicle's current location, based on the recording point.

Tap the **Cancel** button if you need to discard the line path that is being recorded.

5. Drive to the end of the line you want to record and tap the **Record** button again to save the line.

6. Use Field Manager to edit, rename, or set alarms for a landmark line. See Field Manager Landmarks (Point - Line - Area).

7. Tap the **Landmarks** button to close the list of available landmark buttons.

Landmarks: Areas

Use the landmark areas marker to record a shape marking a productive landmark area such as:

- Generic
- Pest or crop damage (such as from insects, weeds, etc.)
- Obstacle

NOTE – Productive-area landmarks are not used to switch sections on and off, but they can trigger warnings when you approach them.

Or a nonproductive landmark area such as:

- Generic (such as clover, exclusion, grassed waterway, slough, waterway).
- Obstacle (hazard, hole, lagoon, pond, rocks, tree).
- Pest or crop damage (such as from disease, weeds, etc.).

NOTE – Nonproductive area landmarks can be used to switch sections on and off.

To record a productive or nonproductive area:

1. From the Run screen, tap the **Landmarks** button.

2. In the list of available landmark buttons, tap the area button you want to record:

Productive Area	Nonproductive Area

3. Position your vehicle where you want to the landmark area to begin.

Tap the **Record** button.

Precision-IQ places a marker beginning at the vehicle's current location, based on the recording point.

Tap the **Cancel** button if you need to discard the area path that is being recorded.

4. Drive around the area you want to record and tap the **Record** button again to save the area.

5. Use Field Manager to edit, rename, or set alarms for a landmark area. See Field Manager Landmarks (Point - Line - Area).

6. Tap the **Landmarks** button to close the list of available landmark buttons.

Guidance Patterns

To take full advantage of the auto guidance and auto steering capabilities of Precision-IQ, you must define the appropriate guidance patterns for your field.

From the Run screen, use the guidance pattern to define:

- Boundary of the field, including the headland area to incorporate an inner and outer boundary.

- Pivots for implements that generate concentric circles.

- Straight lines to identify parallel guidance lines.

- Curved lines to identify guidance lines with both straight and curved segments.

Once you have created a guidance pattern, you can use Field Manager to edit, activate, and deactivate the pattern. See Edit a Field with Field Manager.

A variety of guidance patterns are provided by Precision-IQ.

1. To begin, tap the **Guidance Patterns** button on the Run screen:

A selection of available guidance pattern buttons appears.

2. Tap the **Guidance Patterns** button to dismiss the buttons.

For details about setting a guidance pattern, refer to the following sections:

- Guidance Patterns: Boundaries

- Guidance Patterns: Headlands

- Guidance Patterns: Pivots

- Guidance Patterns: AB Line

- Guidance Patterns: A+ Line

- Guidance Patterns: Curves

- Pattern Select

In the Field Manager AB Guidance menu when a Guidance line has been selected, it is possible on the right side of the display to see the Line Name (which is editable) as well as the assigned operation type that was given to the line when it was created. You can change that operation type by tapping on the operation type and selecting the new operation type from the drop-down list:
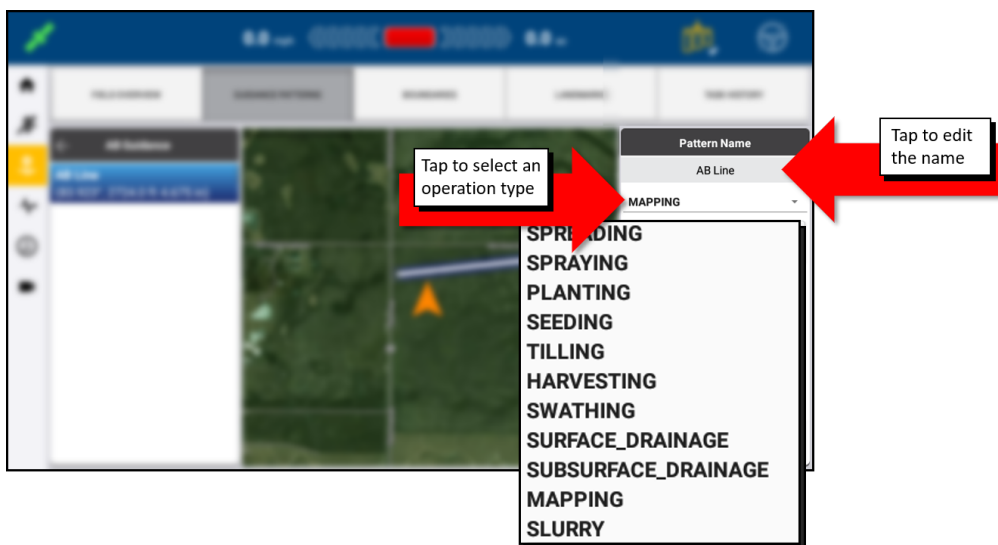
Guidance Patterns: Boundaries

A boundary defines the outer edge of your field. To set a boundary:

1. From the Run screen, tap the **Guidance Patterns** button.

2. From the list of available guidance pattern buttons, tap the **Boundary** button:

3. Position your vehicle where you want to begin recording the field boundary. You can change the point on the implement's swath where you wish to record the boundary's edge:

    Tap the **Recording Point** button, then select a recording point location for your implement. Choose from **Right**, **Center**, or **Left**:
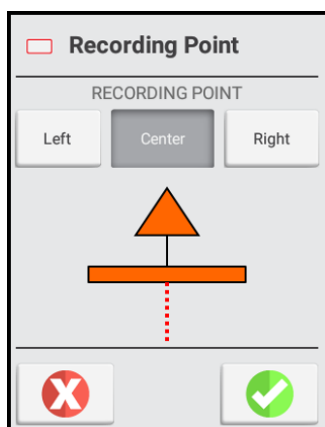
Tap the green check to save your recording point selection.

4. Tap the **Record** button to start the recording.

As you being driving around the perimeter of the field, Precision-IQ marks the point where you began recording and shows the recorded path with a dashed line.

To suspend recording while creating the boundary, tap the **Pause** button.

Precision-IQ will replace the path you travel while paused with a straight line, from the point where you tapped the Pause button to the point where you resume recording. To resume recording, tap either the **Pause** button or the **Record** button.

To cancel the boundary line creation, tap the red **X** button.

5. Drive around the field until you are near your starting point.

- If Auto-Close is **on**: When you reach auto-close distance, Precision-IQ will connect the vehicle's current location to the starting point with a straight line and save the boundary.

- If Auto-Close is **off**: Drive to the beginning point and tap the **Record** button. The application will connect the vehicle's current location to the starting point with a straight line and save the boundary.

To set the auto close feature setting, see Patterns Settings.

6. When you have completed the boundary creation, tap the **Guidance Patterns** button to hide the selection of guidance pattern buttons.

To edit any boundary you have created, see Field Manager Boundaries.

Guidance Patterns: Headlands

A headland is a strip of land within the boundary of your field to allow space for the vehicle to turn around to continue the work within the field. To set a headland:

1. From the Run screen, tap the **Guidance Patterns** button.

2. From the selection of available guidance pattern buttons, tap the **Headlands** button:

   Tap the **Circuits/Infill** button to modify the Headlands Options:

   If the number of circuits is not correct, tap the number and enter the correct amount.

   If you want to specify an Infill Pattern (the default is **No**), tap **Yes** and then tap to select an **AB Line** or an **A+ Line**. See Guidance Patterns: AB Line or Guidance Patterns: A+ Line.

   Tap the green check mark to save the headland options you have selected.

3. Position your vehicle where you want to begin recording.

4. Tap the **Record** button.

   As you being driving around the perimeter of the field, Precision-IQ marks the point where you began recording and shows the recorded path with a dashed line. The controls for the infill line (if any) appear below the headland recording controls.

   To suspend recording while creating the headland, tap the **Pause** button.

   Precision-IQ will replace the path you travel while paused with a straight line, from the point where you tapped the Pause button to the point where you resume recording. To resume recording, tap either the **Pause** button or the **Record** button.

   To cancel the boundary line creation, tap the red **Cancel** button.

5. Drive around the field until you are near your starting point.

   - If Auto-Close is **on**: When you reach auto-close distance, Precision-IQ will connect the vehicle's current location to the starting point with a straight line and save the headland pattern.

   - If Auto-Close is **off**: Drive to the beginning point and tap the **Record** button. The application will connect the vehicle's current location to the starting point with a straight line and save the boundary.

   To set the auto close feature setting, see Patterns Settings.

6. When finished, Precision-IQ saves the headland pattern with a unique name (for example, *HL01*).

   Also, an inner boundary and an outer boundary is generated based on the recorded path and the width of the implement. The headland boundaries are saved with a

unique name related to the headland (for example, *HL01 inner boundary* and HL01 *outer boundary*).

An infill swath is generated based on the number of circuits selected and the width of the implement. The infill swath is saved with a unique name related to the headland (for example, *DefaultInfillSwath*).

7. Tap the **Guidance Patterns** button to dismiss the selection of guidance pattern buttons.

NOTE – *To edit the infill line, see* *Field Manager Guidance Patterns.*

Guidance Patterns: Pivots

Use the Pivot guidance pattern to record the exterior curve of a circular field and repeat the pattern. Precision-IQ uses the implement width to generate concentric circles. It also creates a pivot field boundary based on the specified distance to the pivot field edge.

To create a pivot guidance pattern:

1. From the Run screen, tap the **Guidance Pattern** button.

2. From the selection of guidance pattern buttons, tap the **Pivot** button:

3. Position the vehicle where you want to be recording the pivot pattern.

4. Tap the **A** button.

Precision-IQ marks your starting point on the map, at the vehicle's location when you tapped the record button. It shows the recorded path with a dashed line.

5. Drive at least 50 feet on an outer tower rut and then tap the **B** button.

Enter the distance to the pivot field edge in the Distance to Edge pop-up window:
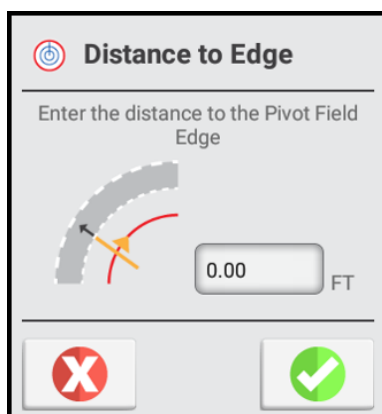
Tap the green check mark to save the distance-to-edge value, or tap the red **Cancel** button to cancel.

6. When finished, Precision-IQ:

   - Saves the pivot pattern with a unique name (for example, *P01*).

   - Generates a pivot boundary based on the recorded path and the width of the implement. The pivot boundary is saved with a unique name related to the headland (for example, *P01 Boundary*).

   - Makes the pivot boundary active.

7. Tap the **Guidance Patterns** button to dismiss the selection of guidance pattern buttons.

Guidance Patterns: AB Line

With AB lines, you define the start and end points. Precision-IQ records a straight line from point A to point B. Parallel guidance lines (or swaths) will be projected multiple times on either side of the AB line.

NOTE – Precision-IQ uses the implement width to project swaths for the master line. Active lines project swaths in either direction based in the width used to create the line.

To create an AB line:

1. From the Run screen, tap the **Guidance Pattern** button.

2. From the selected list of available guidance pattern buttons, tap the **AB Line** button:

3. Position the vehicle where you want to begin recording the AB line.

4. To set the beginning of the AB line, tap the **A** button.

   Precision-IQ marks on the map where you tapped the A button. It shows a straight dashed line between the A point and the vehicle's current location.

5. To complete the line and close the controls, tap the **B** button.

6. To save the line, tap the green check mark, tap the red **Cancel** button to cancel the AB line creation.

   The distance between swath lines is based on the width of the implement that was used to create the line.

Guidance Patterns: A+ Line

With an A+ line, you define a point on the line and the direction the line is heading.

Precision-IQ sets a straight directional line from point A toward the selected direction (compass direction, path of travel, or heading value). Parallel guidance lines will be projected multiple times on either side of the A+ line.

To create an A+ line:

1. From the Run screen, tap the **Guidance Pattern** button.

2. From the selected list of guidance pattern buttons, tap the **A+** button:

   Precision-IQ changes to an overhead view if you were in trailing view. The A point is set at the vehicle's current location. The A+ line controls appear in the center of the screen.

3. Select the direction you want for the A+ line from the compass:
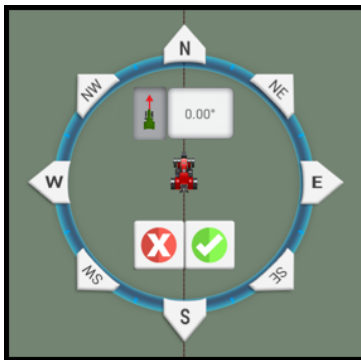
   - To use the direction that the vehicle is facing as the heading, tap the vehicle direction:

     NOTE – This option is selected by default.

   - To enter a specific, exact heading, use the on-screen number pad.

   - To use a cardinal (N, S, E, W) or ordinal (NE, SE, SW, NW) direction, tap that direction on the compass.

   Precision-IQ saves the line direction.

4. To accept the line and direction and close the controls, tap the green check mark, or tap the red **Cancel** button to cancel the A+ line creation.

Precision-IQ saves the A+ line. The distance between swath lines is based on the width of the implement that was used to create the line.

Guidance Patterns: Curves

You can record a line with curved and/or straight segments. Matching guidance lines will be projected multiple times on either side of the curved line.

To create a curved guidance pattern:

1. From the Run screen, tap the **Guidance Patterns** button.

2. From the list of available guidance pattern buttons, tap the **Curve** button:

3. Position the vehicle where you want to begin recording the curve.

4. Tap the **Record** button to start the recording.

   As you being driving, Precision-IQ marks your starting point on the map, at the point where you tapped the record button. It shows the recorded path with a dashed line between the starting point and the vehicle's current location.

   To create a straight line as part of your curved line, tap the **Pause** button.

   To resume recording the curve, tap either the **Pause** button or the **Record** button.

   To cancel the curve line creation, tap the red **Cancel** button.

5. When you are at the end of the curve line, tap the **Record** button.

6. Tap the **Guidance Pattern** button to dismiss the selection of guidance pattern buttons.

Guidance Pattern Adjustments

To adjust guidance while performing field activities, at the Run screen, tap the **Guidance Pattern Adjust** button:

The guidance adjustments buttons display.

NOTE – *These adjustments are removed if you enter a new task. Your system may also be set up to remove these adjustments with a power cycle. See* *Steering and Guidance Settings* *for these settings.*

Buttons	Use to...
Nudge	Temporarily move the vehicle left or right depending on the direction you chose. To set the increment that nudge moves, see Steering and Guidance Settings.
Remark	Temporarily move the pattern to the vehicle's current location. For information on re-mark settings, see Operating a Vehicle
Implement Draft Correction	Move the implement back on the guidance line if the implement is physically drifting offline in the field. The value between the arrow buttons indicates the amount of distance for the correction. To set the increment that implement draft correction moves, see Steering and Guidance Settings.

Pattern Select

For fields and farms that use a variety of guidance lines and boundaries, Precision-IQ includes the ability to select them directly from the Run screen. Tap the **Pattern Selector** button to toggle between all AB guidance patterns for a selected field, or you can long hold the button for a list of all AB guidance lines and created boundaries for the selected field:

By default, an onscreen help window appears on the Run screen. You can dismiss this window and opt for it to remain hidden. You can reset this help text window by going to Precision-IQ Settings under Display and resetting the systems help menus and text.

In previous releases, the operator had to enter the Field Manager to select and activate AB guidance patterns and boundaries; now this action can be done from the Run screen.

When you enter the Run screen, an onscreen help window highlights the **Pattern Selector** button:
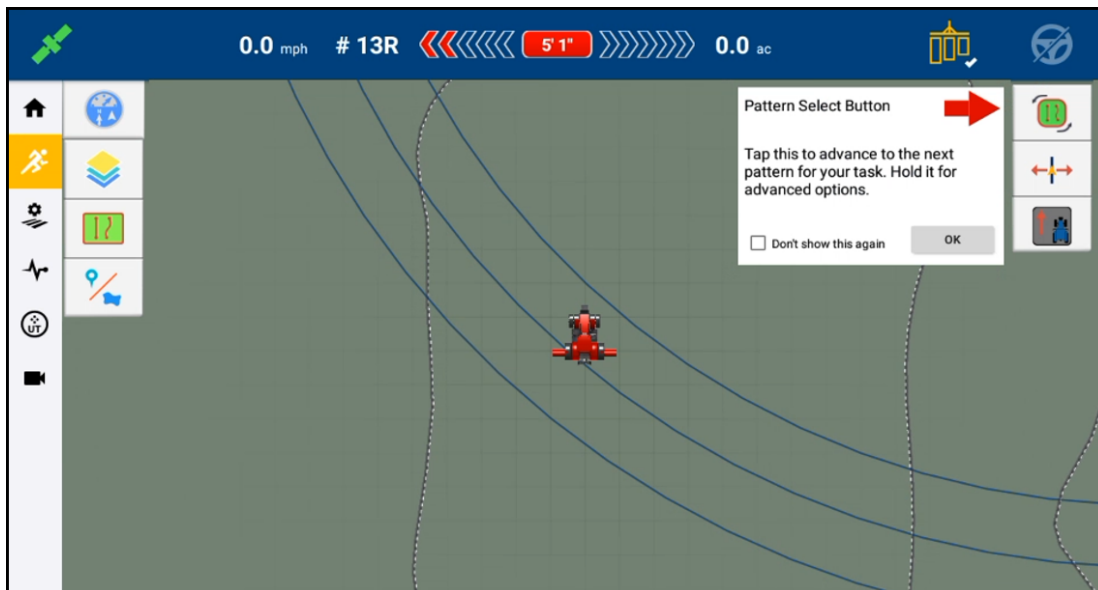
Tap **OK** to dismiss this help window.

NOTE – *Enable the* **Don't show this again** *option to keep this help window hidden. You can reset this option in Precision-IQ's Display Settings menu.*

For farms that have multiple AB guidance lines, briefly tap the **Pattern Selector** button to select and activate the first line in the AB line manager. Tap **Pattern Selector** again to toggle to the next guidance line in the library:

As you toggle through the available guidance lines, a pop-up notification will appear to show the current selected (activated) pattern, and the pattern that will be activated with the next tap:

Long hold the **Pattern Select** button for a pop-up list of all available guidance lines and boundaries, as well as set AB guidance line filter settings:
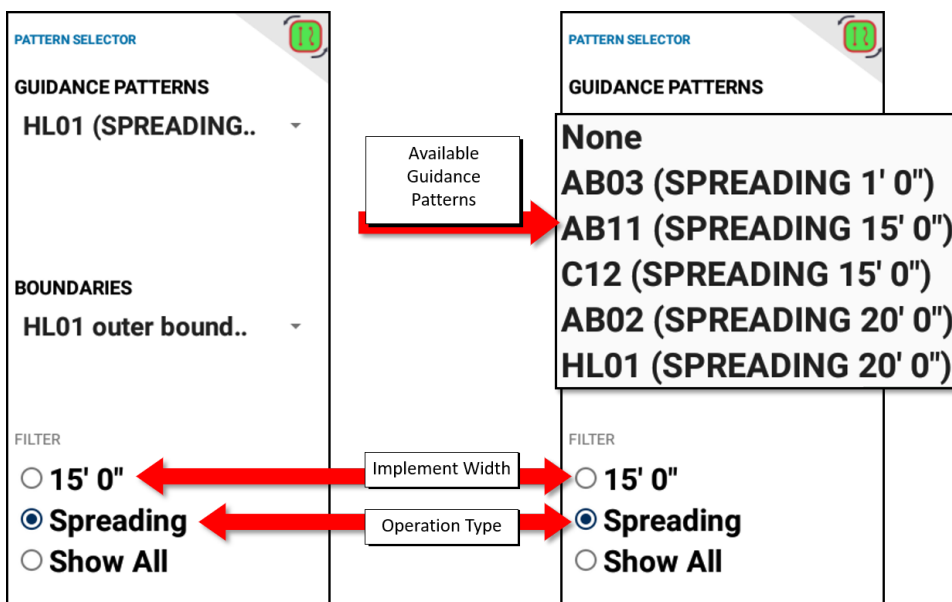
*NOTE – You can filter AB guidance lines displayed and activated by the short tap function of the Pattern Selector based on: current implement width, current operation type, or turn the filter off by selecting **Show All** for a complete list of **all** guidance lines regardless of implement width or assign operation type (operation types can be changed in the Field Manager).*

NOTE – Pattern Selection feature is disabled when: actively engaged on a AB line set, or when using Line Sets associated with "Guide to Line" functionality.

Prescriptions

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

The information in a prescription is used to send target rates to the variable rate controller. Applied rates are received from the controller, and both target and applied rates appear on the screen. With prescriptions functionality, you can:

- Transfer one or more prescription files to or from the Precision-IQ application (import or export).

- Assign a prescription to a channel.

- Use a prescription to determine the rates to be applied in different areas of a field.

On the Run screen, tap the **Prescriptions** icon to open the Prescriptions Manager:

You can use the Prescriptions Manager to assign a prescription to a channel.

The following ESRI shape-file formats are supported:

```
<prescription_name>.shp
```

```
<prescription_name>.dbf
```

```
<prescription_name>.shx
```

See also:

- Importing Prescriptions

- Exporting Prescriptions

- Assigning a Prescription

- Using a Prescription

Importing Prescriptions

NOTE – *If you are using USB to import, make sure your USB drive has the AgGPS folder on the root, and the prescription files are in this folder.*

You can import prescription files using a USB drive or through Office Sync. See Data Transfer.

1. When transferring using USB, at the USB list on the left side of the data transfer panel, you can select the entire prescriptions folder or individual files within the folder.

   The prescription on a USB drive should be stored in the `\AgData\Prescriptions\` folder.

2. During the transfer, the Precision-IQ application shows the progress of the transfer:

3. If the amount of polygons exceeds the limit that can be stored by the Precision-IQ application, a warning message displays.

Exporting Prescriptions

NOTE – *If you are using USB to export, make sure your USB drive has the AgGPS folder on the root.*

You can export prescription files from the Precision-IQ application using a USB drive. See Data Transfer.

Assigning a Prescription

Before you can assign a prescription, you must:

- Have a field selected. See Select a Field.
- Have a channel set up.

To assign a prescription:

1. Make sure you have a field selected.

2. At the Run screen, tap the **Prescriptions** icon to show the Prescriptions Manager screen.

3. In the Enabled Channels list on the left, tap the channel you want to assign the prescription to.

4. On the right, tap **Prescription File Name**. The Precision-IQ application displays a list of prescription files that are available for the field you selected.

5. Tap the prescription file you want and tap the green check mark.

6. Tap **Next**.

7. Tap **Column Name**. The list of column names displays.

8. Tap the column you want to use, then tap the green check mark.

9. Tap **Column Units**, then tap either **gal/a** or **L/ha**. Tap the green check mark.

10. Tap **Next**.

11. Optionally, tap **Lead Time** and enter the number of seconds (0 - 10). Tap the green check mark.

12. Tap **When outside Prescription** and tap one of the following:

    - Close
    - Last Rate
    - Default Rate.

    Tap the green check mark.

13. Tap **Default Rate** and enter the rate. Tap the green check mark.

14. If you have completed the information, tap **Finish**.

15. If you need to change previous information, tap **Back**.

16. To save your entries, tap the green check mark. pr tap the red **Cancel** button to discard your entries.

Using a Prescription

Before you can use a prescription, you must:

- Have a field selected.
- Assign the prescription to a channel.

To use a prescription, complete the following steps.

1. Make sure you have a field selected.
2. At the Run screen, tap the **Rate Control Adjustment** button:

   The rate control adjustment buttons display.

3. To begin using the prescription, tap the **Prescriptions** icon.

   The other buttons will become gray and cannot be tapped unless you stop using the prescription. Follow the onscreen wizard to assign prescription rate columns to the individual channels.

4. Verify the following details:

   - Rate column assignments
   - Units
   - Lead Time
   - "When Outside Prescription" behavior

5. Navigate to the **Rate Widget, Expand** individual channels in the rate control widget of the run screen and switch the Rx button to **On**.

6. View the prescription on the Run screen:

   a. Click the **Layer** button.

   b. Click the gear wheel icon (top right) of the "Available Layers" dialog and select "Applied Rate" layer:

      - Adjust the Min and Max values to match the values stored in prescription map
      - Enter an appropriate number of "Steps"

7. To stop using the prescription, tap the **Prescriptions** icon.

Rate Control

This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

Precision-IQ provides automatic rate control for a supported implements that are either ISO-certified or can be controlled by Trimble's serial rate protocol.

NOTE – *For ISOBUS, you must be connected to an ISO-certified implement that has been set up. See* *Configure an ISOBUS Implement.*

NOTE – *To use the Trimble protocol for serial rate, you must be connected to a supported implement that has been set up. See Configure a TUVR or Virtual Implement.*

At the Run screen, tap the **Rate Control Adjust** button to open the Rate Control widget:

Tap the widget again to maximize it.

Button	Explanation
	Tap either the target rate 1 or target rate 2 to set the rate for application.
	To change the rate for either target rate, tap the - or + buttons. Optionally, tap the middle where the rate value is. Use the on-screen keyboard to enter the rate you want.

Under Rate Control, enter details for the following subtabs:

- Settings subtab

- Modules subtab

- Width subtab

- Adjustments subtab

Settings subtab

Select to enable or disable Rate Control. A green check indicates that Rate Control is enabled. Tap the following buttons and enter the appropriate information:

Drive Type. This option sets the control type for the rate control valve ,motor, or pump. The following table describes the available drive types:

Drive Type	Description
Servo Standard	For two-wire servo's plumbed inline
Fast Servo	For four-wire servo's plumbed inline. These valves generally react quicker than two-wire servos.
PWM	For Pulse Width Modulated coils. These are typically used to control the flow of hydraulic oil to a motor.
Pump Servo	For hydraulic servos. These are used to control the flow of hydraulic oil to a motor.
Hardi % Bypass	Used on Hardi Sprayers equipped with three-way section valves that return flow to the tank when the boom section is closed.
Standard Bypass Servo	For two-wire servo's plumbed to bypass excess flow to the tank.
Fast Bypass Servo	For four-wire servo's plumbed to bypass excess flow to the tank.

Auxiliary Valve type. Use this option to set the auxiliary valve type. Choose from:

- Master - Valve opens when sections are open.
- Dump - Valve opens when sections are closed.

Number of Nozzles. Enter the number of outlets on the implement. This value may be nozzles or shanks depending on the implement.

Control Valve behavior on Sections close. The following table describes the available options:

Behavior	Description
Close	Control valve closes when all sections are off.
Lock in Last Position	When the section/s close, the valve locks in its current position.
Lock at Minimum	*(PWM only)* When sections close the valve locks in this set position. This position is set via the calibration menu.

Modules subtab

Tap **Modules** to enter the edit menu. Enter details for the following modules:

- Flow Meter Type
- Flow Meter Units
- Calibration number from encoder tag.

Width subtab

This will default to the application width.

Adjustments subtab

Tap **Adjustments** to enter the edit menu. Enter details for the following adjustments:

- No/ Low flow timeout. If the system receives no feedback in the specified time, the system will shut off.
- Pump Disarm Switch. This adjustment is for platform kits with an arming relay. Typically, it is found on self-propelled sprayers. This adjustment allows the control of the valve to be transferred from the OEM to Field-IQ Basic.
- Rate Snapping:
  - **ON**: When the product flow is within 10% of the Target rate, the as applied rate will snap to the target rate.
  - **OFF**: The as applied rate will report the true system flow.

Virtual Tank

Under **Virtual Tank**, enter the following details:

1. Select to enable or disable **Virtual Tank**. A green check indicates that the virtual tank is enabled.
2. Show units as. This option sets the displayed tank units.
3. Full Capacity Volume. You can use this option to set to match the capacity of the system
4. Warning type.
   - Volume
5. Warning Level. This option sets the level at which a low tank warning will be displayed.

Expand the rate widget to reveal the virtual button at the bottom right. Enter the appropriate detail for the following options:

- Full Refill - Sets the Volume to the "full volume" of the tank

- Partial Refill - Allows the user to enter the volume of the tank.

Operating a Vehicle

At the Run screen, tap the screen to display the vehicle position buttons. The **Engage** button shows the status of your auto guidance system as well as enables you to tap on the button to engage the system.

⚠ WARNING – Auto guidance systems cannot avoid items in the field such as obstacles. Make sure you are adequately trained to operate the auto guidance system.

⚠ WARNING – Many large and sudden changes in satellite geometry caused by blocked satellites can cause significant position shifts. If operating under these conditions, auto-guidance systems can react abruptly. To avoid possible personal injury or damage to property under these conditions, disable the auto-guidance system and take manual control of the vehicle until conditions have cleared.

Vehicle Position

Tap the vehicle in the center of the Run screen to display the perspective change buttons:

Button	Tap to...
	Change point of view on the Run screen to an overhead view.
	Change the point of view on the Run screen to a view with the horizon.
	Zooms view in or out on the Run screen.

Auto Guidance Status

When the **Engage** button turns yellow, you can tap it to engage the auto guidance. After your guidance system is engaged, the button changes to green.

Indicator/Button	Auto Guidance System is...
	Gray - Engage Disabled. Enable it in the steering control panel. This is an indicator only.
	Yellow - Ready to Engage. Tap to engage the auto guidance system.
	Green - Engaged. Indicates you are engaged on a pattern or line and are using auto guidance. Tap to disengage.
	Red - Cannot Engage. Does not have the proper conditions met to engage. Tap to determine the reason.

Steering Adjustments

To adjust steering while performing field activities, at the Run screen, tap the **Steering Adjust** button to displays the steering adjustment options.

Button	Use to...
Vehicle Aggressiveness	Adjust the vehicle aggressiveness.
Autosteering Enabled	Enable or disable auto steering.

Using Onscreen Widgets

Widgets are software gadgets on the screen that can provide functionality control, information and status on the Run screen during field activities.

There are two types of widgets:

- Status Widgets: Provide information only and do not control any function.
- Control widgets: Enable you to control a function, and may include status information

For some widgets, you can choose to display or not display them. On the Run screen, tap the **Widgets** button to show the available widgets you can use:

Tap the select box for a widget you want to display. Tap the select box again to dismiss an enabled widget.

Status Widgets

The following table describes the available status widgets:

Status Widget	Description
Compass	The direction in which you are traveling.
Digital Compass	The degrees of the angle you are traveling.
Position	Your current position's: - Latitude - Longitude - Elevation - VDOP
Steering	Your current steering options: - Roll - Yaw - Steering Angle

Status Widget	Description
Area	• Total Area of the field
	• Productive area: Total field area minus the unproductive areas
	• Task coverage area: The amount of coverage in the field
	• Percent of coverage: The amount of coverage over the productive area multiplied by 100

The Onscreen Lightbar

The on-screen lightbar provides the status of where the vehicle is in relation to the guidance line. When the vehicle is perfectly on the guidance line, the value in the center is 0 and the background color is green.

The center of the lightbar represents your position. As your vehicle's position moves farther from the line, the farther the highlighted arrows will be from the center of the light bar.

As the vehicle moves farther from the guidance line, the numerical indicator shows the distance from the guidance line and the highlight color changes from green, to yellow, to red.

Universal Terminal

🔓 This feature is optional and requires an unlock. See Upgrade or Apply a License for a New Feature.

To use Universal Terminal, make sure:

• An ISO-certified implement is connected. See Configure an ISOBUS Implement.

• You have a Universal Terminal unlock that has been applied. See Upgrade or Apply a License for a New Feature.

• You have turned on the Universal Terminal feature in the ISOBUS settings.

To launch the Universal Terminal, tap the **Universal Terminal** button on the Activity bar in Precision-IQ or tap the **Universal Terminal** icon on the Launcher screen.

From this terminal interface, you can control the implement using Universal Terminal.

Delete Previous ISO Data

Data loaded from previously used ECUs will take up storage space. To remove this data from the Precision-IQ application:

1. At the maximized Universal Terminal, tap the menu icon in the upper-right corner of the screen.

2. On the pop-up window, tap the **Delete** button.

3. Tap the green check mark to confirm.

   The system removes all previous data.

Tasks

A task consists of the combination of implement type and the selected field. The Precision-IQ application stores field activities related to each task. By using tasks, you do not have to continually configure frequently used field profiles.

When you enter a field with the same operation and implement that you used previously, the application continues the previous task unless the *Max Task Time* has already passed.

When you change operation, implement, or field, the application automatically starts a new task.

Use Field Manager Task History to:

- Open a previous task.

  This is helpful if you enter a field and do not see coverage that you want to see from an earlier activity. This shows the coverage from the previous task in the field, and adds the new activity to the previous task

- Start a new task.

  This is helpful if you enter a field and you see coverage from an earlier activity that you do not want to see for the current activity. When you start a new task, the application removes the previous coverage from the Run screen and saves the current activity in a new task.

- Review the task history.

  Tap a specific task to select it. Each task is shown with its start and end date and time.

  The map shows the coverage layer(s) saved for the selected task

Data Stored in Each Task

The data stored in each task includes:

- The field you are working in.

- Date and time for starting and stopping task.

- Coverage list: The list of task coverages for the field.

- Coverage overlap: The area of coverage overlap.

- Height: Mean height above sea level.

- Speed: The speed of the vehicle.

- Material: The material being applied, if applicable.

- Guidance engaged: When the automatic guidance system was and was not engaged.

- Applied rate: The rate material is applied.

- GPS Quality: The quality of GPS.

Create a Task

To create a valid task, you must select an implement and, if applicable, an appropriate material. On the Home screen, the task tile will update to show the associated task:
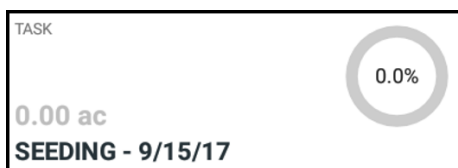
Tap this tile to modify the name and date of the task. If the implement and material selected are not appropriate or if no task is selected, the Task tile will show a red status:
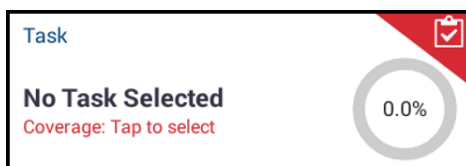
You cannot enter the Run screen without selecting a task.

Data Transfer

This chapter describes how to transfer data to and from your display and your office.

Data Transfer Overview

Precision-IQ provides support for the transfer of data between a field and your back office or between the back office and your field. Your data can be transferred:

- **Wirelessly** through a cellular or Wi-Fi network (depending on your modem choice). It is recommended to use the wireless option because data transfers can be configured to be done automatically and seamlessly.

- **Manually** using a USB device.
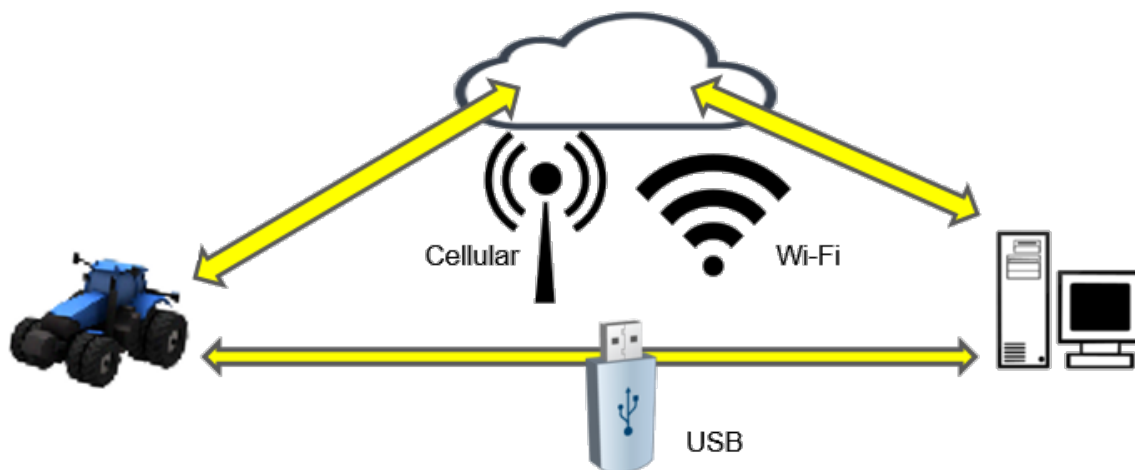
When a wireless communication is established, all jobs that are completed in the field (using required hardware) are sent to the web server. The display looks for updated information to download from your Trimble Ag Software storage area. If you lose communication with the web server, then your completed jobs are sent once communication is reestablished. All data is safe and secure.

Wireless Data Transfer Benefits

With the wireless capabilities enabled for data transfer, the following benefits are available to you:

- Send and receive data files wirelessly using Trimble Ag software (cloud-based solution) and Farmer Basic (desktop-based solution) with an online account.

- Take advantage of using Trimble Ag software:
  - Data can be accessed from a web browser.
  - Data can be shared with other third-party agricultural software.
  - Data can be accessed from a mobile device with the Trimble Ag Software mobile app.

- Provides added flexibility for you and your trusted advisor for data management.

Data Transfer Requirements

The following in-field hardware is required for data transfer:

- Trimble-supported modem, such as a Sierra Wireless GX450 modem, including the display modem cable assembly.
- Roof-mounted, high-gain cellular antenna with large magnetic base.
- Cellular data plan for modem internet connection.
- Wi-Fi antenna for a modem if transmitting data via wi-fi.
- Farmer Pro or Farmer Pro Plus license plus active vehicle connection service for each machine sending data.
- USB drive (for manual data transfer).

Types of Data

You can wirelessly exchange the following data between your field and office:

- Client/farm/field
- Boundaries
- Feature lines, points, and areas
- A/B guidance lines
- Prescription maps
- Planned and completed drainage designs.

Completed tasks with summary and map data including:

- As-applied data
- Coverage data
- Yield data

Resources:

- Materials
- Vehicles
- Operators
- Implements

Data Available to Third-Party Software

As needed, you can also exchange the following data with other third-party agriculture software:

- Boundaries
- Coverage

- Guidance Lines
- Features

- Yield (polygon coverage maps)

NOTE – Yield point data is provided in an ISOXML file format.

Setup and Configuration for Wireless Data Transfer

To establish an effective wireless data transfer, Precision-IQ must be properly set up and configured to collect the appropriate data to be transferred. This section describes how to set up and configure your display for wireless data transfer.

Both Office Sync and FarmStream enable data transfer to and from a display and the Trimble Ag Software.

- **Office Sync** is limited to file transfer to and from a display.
- **FarmStream** includes file transfer as well as real time vehicle location and status information.

For more information on FarmStream and how it compares to Trimble Ag's traditional telematics solution visit:

https://agriculture.trimble.com/software/farmstream-faq/

Office Sync does not need to be turned on in order for FarmStream to be enabled - it doesn't affect FarmStream operation.

Likewise, Trimble Ag software should be configured to receive a data transfer from Precision-IQ. Refer to the websites below for information about Trimble Ag software:

- General information on how to set up and configure Trimble Ag software:

  https://agriculture.trimble.com/software

- New vehicle setup instructions:

  https://agriculture.trimble.com/software/support/fleet-help/#CreatingANewVehicle

- Vehicle connection license assignment instructions:

  https://agriculture.trimble.com/software/support/fleet-help/#AssigningVehicleLicense

Follow the steps below to set up and configure Precision-IQ for wireless data transfer:

1. Configuring Office Sync Settings
2. Enabling an Operator
3. Setting Implement and Vehicle Thresholds

Configuring Office Sync Settings

Office Sync is a feature of Precision-IQ that allows your display to connect and send data.

*NOTE – Office Sync is for file transfer **only** to and from a vehicle and is independent of FarmStream.*

1. From the Precision-IQ Home screen, tap the **Settings** button. Then, on the Settings menu, tap **Office Sync**.

2. On the Office Sync settings screen, tap **Office Sync** to enable the feature. Once enabled, other settings become available to you to configure:

- **Check Server** - Set how often you want the display to attempt to retrieve data from the server.

- **Send Data** - Choose when you want the display to send information to the office.

- **Auto Send Without Prompt** - Select whether or not you want the display to send information to the office automatically.

- **Auto Import Inbox** - Turns this feature on or off.

3. When you have completed the configuration for Office Sync, tap the Android **Back** button to return to the Home screen.

FarmStream Settings

NOTE – *The Productivity tab is only visible if the Enable Operators feature is turned on. This feature is accessed by tapping* **Settings** *on the Home screen and selecting* ***Users and Passwords****.*

To use the Utilization app and FarmStream Fleet Manager reporting on the display with Precision-IQ field application, you must first set up the thresholds in the Precision-IQ application.

Setting Vehicle and Implement Thresholds for FarmStream Reporting

After opening Precision-IQ, you can set up the Implement and Vehicle settings for the Utilization app, so the utilization data shows up as you want it to in FarmStream Fleet Manager.

1. On the Precision-IQ Home screen, tap the **Vehicle** tile to set the vehicle settings. Then tap the **Productivity** tab.

   In the Productivity tab, set a threshold for the vehicle maximum moving speed for the Utilization app. Any time that the vehicle travels over this maximum moving speed, it is reported as speeding. If you turn the Maximum Moving Speed off this means that the "speeding" state will not be used for the vehicle in FarmStream Fleet Manager.

2. To set the maximum moving speed option, tap **Maximum Moving Speed**. Choose a maximum moving speed for the vehicle and then tap the green check button. There is also an option to display the speed in US or Metric units. The range of the allowed moving speed that can be selected is noted in the dialog:

Maximum Moving Speed

Enter a value between 0.00 and 90.00 mph

mph

14.98

Units

❌   ✅

3. Tap the **Summary** tab and save your changes.

4. Return to the Precision-IQ Home screen and tap the **Implement** tile to set the Implement thresholds for the Utilization application. Then tap the **Productivity** tab.

If an operator exceeds the functional speed for an implement, possible damage can occur to the implement, the vehicle, the crop or the field. The display can send information about the implement status to FarmStream Fleet Manager in the Trimble Ag Software solution.

*NOTE – The Productivity tab is only visible if the **Enable Operators** feature is turned on. This feature is accessed by tapping **Settings** on the Home screen and selecting **Users and Passwords**.*

These settings determine what information is sent about the implement from the Utilization application to FarmStream Fleet Manager.

5. To set the Maximum Transport speed, tap **Maximum Transport Speed** and enter a value in the range indicated. Select the Units, if required. Tap the green check to save.

Maximum Transport Speed

Enter a value between 0.00 and 90.00 mph

mph

12.54

Units

❌   ✅

6. Tap **Maximum Operating Speed** and **Stopped To Delayed Timeout** to set the values and/or select units for these two parameters. Tap the green check to save.

7. Tap the **Summary** tab and save your changes.

The table below describes the different settings options:

Setting	Description
Maximum Transport Speed	The functional speed limit for transporting the implement. The options are **On** or **Off** and a numerical value for the speed. *Maximum Transport Speed* is used to determine when a vehicle enters the "speeding" state. The minimum of Maximum Transport and Maximum Moving speed will be used in this determination; Maximum moving speed is configured under the vehicle setup (Productivity tab). If Maximum Transport Speed is turned off, then the Maximum Moving Speed for the vehicle is used to determine the "speeding" threshold (if Maximum Moving Speed is turned on).
Maximum Operating Speed	The functional speed limit for the implement when coverage logging is on. The options are **On** or **Off** and a numerical value for the speed. *Maximum Operating Speed* is used to determine when the vehicle enters a "rushing" state.
Stopped to Delayed Timeout	The length of time the vehicle can be paused before the vehicle is considered delayed. The options are **On** or **Off**. *Stopped To Delayed Timeout* is the amount of time that will pass after the vehicle has entered a "stopped" state before it's considered to be in a "delayed" state (and the operator may be prompted to select a reason for the delay).

Setting up an Operator for FarmStream Reporting

NOTE – *The **Enable Operators** feature must be enabled in order for FarmStream to run. This feature is accessed by tapping **Settings** on the Home screen and selecting **Users and Passwords**.*

Signing in as an operator is not required for Utilization or FarmStream to run, but if you want to see operator information in the application, you must sign in. In order to use operator login with Precision-IQ, the **Enable Operators** feature must be turned on. This feature is accessed by tapping **Settings** on the Home screen and selecting **Users and Passwords**.

For additional details, see Users and Passwords.

To set up operator information, turn on your display. You should see the Operator app. Tap on the **Operator** app icon to launch it.

Operators can be created in the Fleet page of the Trimble Ag Software. All operators in the display's organization are automatically sent to the display when it has connectivity. These operators can be seen under the Connected Farm menu in the Operator app. If operators in the Fleet page are changed, any changes will be visible in the Operator app after the app has been killed and restarted, or when the display has rebooted.

Operators can also be created locally on the display, but they will not be sent to the Trimble Ag Software to be seen on the Fleet page. These local operators will not show in the menu in the Operator app.

1. Login to the Operator app in order to track who is using the vehicle, for reporting in the Utilization app and FarmStream.

2. Enter or scan your operator PIN to login.

Once logged in, the operator information will be recorded along with any utilization data.

Enabling an Operator

NOTE – Enabling operators is required for FarmStream operation. For more details on how to set up the software and display for FarmStream, refer to the FarmStream guide here:

http://agriculture.trimble.com/software/farmstream-setup/

If you want to see operator information in your Trimble Ag software application as part of a data transfer, then there must be an operator enabled to use Precision-IQ, with the **Enable Operators** setting active. For details on creating and editing an operator on your display and for how to login to Precision-IQ, see Users and Passwords.

For details on how to manage operators using Trimble Ag software, visit:

https://agriculture.trimble.com/software/support/fleet-help/#OperatorsScreen

Once logged in, the operator information will be recorded along with any utilization data.

Using Data Transfer Wirelessly

Once Precision-IQ is configured, as described in Setup and Configuration for Wireless Data Transfer, the utilization data collected is sent to Trimble Ag software. When you enter the Run screen to perform a task, Precision-IQ begins to record the utilization data. Data is sent according to the settings described in Configuring Office Sync Settings:

- Hourly.

- On job completion (tap the Stop button to end a run).

- When display powers up.

For details on what to do with the utilization data sent to Trimble Ag software, visit:

https://agriculture.trimble.com/software/support/fleet-help/#Utilization

Transferring Data to the Display Using Trimble Ag Desktop Software

For details on how to access transferred files in the Trimble Ag Software visit:

https://agriculture.trimble.com/software/support/fleet-help/#DownloadingandUploadingFiles

Follow the steps below to upload data to the display using desktop software:

1. Go to the **Online** tab in the desktop software and log on with your Trimble Ag Software username and password. If applicable, select the organization you are working with.
2. Click **Send Resources**.

   Use the **Send Resources** button to specify data you want uploaded to Trimble Ag Software server so it can be downloaded to your display.
3. In the **Farms/Fields** tab, select the Clients/Farms/Fields to upload.
4. In the **Inputs** tab, select the Machines/People/Supplies to upload.
5. Select **Job Types** to be sent.
6. Select the **Options** tab to send field boundaries and/or guidance lines
7. Click **OK**.
8. Select **Trimble Display(s)** to upload resources to and click **OK**.
9. Selected resources are added to Outbox for mobile devices that you chose.

As soon as software communicates with Trimble Ag Software server, data is uploaded and moved to the device Inbox where it stays until the display downloads the resources.

Using Data Transfer Manually

Precision-IQ supports data transfer using a USB drive (sometimes called a *thumb drive*). To manually transfer data, you must insert a USB drive into one of the USB ports on the display, and then select the files you want to transfer.

Follow the steps below to transfer data manually:

1. Insert a USB drive into one of the USB ports on the display.
2. From the Precision-IQ Home screen, tap the **Data Transfer** button to display the Data Transfer screen.

3. Select a data transfer action from the list below:

    ● Data Transfer Between Precision-IQ Displays

    ● Import Data (AgGPS, ISOXML) into Precision-IQ

    ● Export Data From Precision-IQ to a USB Drive (AgGPS, ISOXML)

4. Once the data transfer is complete, you can remove the USB drive from the display.

See also:

● Supported Data Transfer Functions

● Delete Precision-IQ Data

USB VDB Transfer

When you transfer data, saved vehicles do not include the vehicle configuration file (.vdb) for Autopilot. To transfer this configuration data:

1. Connect a laptop that has the Autopilot Toolbox software to the serial port of the NavController that contains the vehicle config file you want.

2. Using Autopilot Toolbox, save the config (.cfg) file to the laptop.

3. Transfer the saved config file from the laptop to a USB drive in the folder AgData/Profiles.

4. Make sure you have the Precision-IQ application open.

5. Insert the USB drive containing the config file in the USB socket of the display.

6. Insert the USB drive containing the config file in the micro USB adapter cable.

Data Transfer Between Precision-IQ Displays

To transfer data between one Precision-IQ display and another:

1. In the upper-right corner of the Data Transfer screen, make sure that the **Show All USB Files** option is deselected:
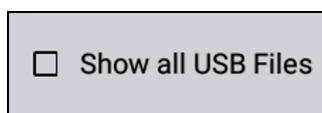
☐ Show all USB Files

2. To copy data *from* the Precision-IQ display *to* a USB drive:

    a. On the Internal pane (left side), select the resources you want to copy. Tap a folder to expand and show all data. You can select each item individually, or you can select a folder to select all resources within the folder.

    b. Tap the **Copy** button.

3. To copy data *from* a USB drive *to* the Precision-IQ display:

   a. On the USB pane (right side), select the resources you want to copy to the Precision-IQ display. Tap a folder to expand and show all resources. You can select each item individually, or you can select a folder to select all resources within the folder.

   NOTE – If you have the Show All USB Files selected, you will need to navigate into the AgData folder before you can select and copy them.

   b. Tap the **Copy** button.

Import Data (AgGPS, ISOXML) into Precision-IQ

There are two steps to import data from other sources (such as FmX or other application that can create an ISOXML file). The first step is to convert the file(s) and then to copy them to the Precision-IQ display.

NOTE – Not all files can be transferred to/from Precision-IQ into other formats (AgGPS, ISOXML). See Supported Data Transfer Functions for formats supported by the Precision-IQ's data transfer service.

1. In the upper-right corner of the Data Transfer screen, make sure that the **Show All USB Files** option is selected:
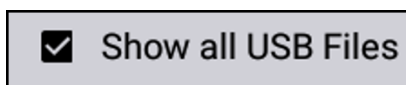
2. On the USB pane (right side), navigate to the files you want to copy to the Precision-IQ display.

   NOTE – Some USB drives may contain multiple files. Make sure you know where you are in the navigation of your USB drive.

3. Tap the files you want to convert:

   - **AgGPS** folder - This folder contains files from other displays that use an AgGPS file format. Tap this folder to convert the AgGPS files to an AgData format for use in Precision-IQ.

   - **ISOXML** file - This XML (`TASKDATA.XML`) file is exported from third-party applications. Tap this file to convert the ISOXML format to an AgData format for use in Precision-IQ.

4. The files are converted to AgData and stored in a folder at the same level as the files that were converted:

   - **AgGPS** - An **Output_AgGPS** folder is created. Within this folder, the converted AgGPS files are stored in an **AgData** folder.

- ISOXML - An **Output_ISOXML** folder is created. Within this folder, the (`TASKDATA.XML`) file is converted and stored in an **AgData** folder.

NOTE – *If you convert the files again, a new* ***Output_*** *folder is created with an incremental number appended (for example,* ***Output_AgGPS (1)***, ***Output_AgGPS (2)***)*.

5. Navigate into the newly created **AgData** folder. Select the items you want to copy to the Precision-IQ display. Tap a folder to expand and show all resources. You can select each item individually, or you can select a folder to select all data within the folder.

6. Tap the **Copy** button.

Export Data From Precision-IQ to a USB Drive (AgGPS, ISOXML)

To transfer data from a Precision-IQ display for use in another application:

1. In the upper-right corner of the Data Transfer screen, make sure that the **Show All USB Files** option is selected:
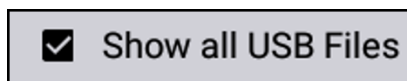
2. To copy data *from* the Precision-IQ display *to* a USB drive:

   a. On the Internal pane (left side), select the files you want to copy. Tap a folder to expand and show all resources. You can select each item individually, or you can select a folder to select all items within the folder.

   NOTE – *Not all resource types can be transferred to/from Precision-IQ into other formats (AgGPS, ISOXML). See* Supported Data Transfer Functions *for formats supported by the Precision-IQ's data transfer service.*

   b. Tap the **Copy** button.

3. In the Copy As pop-up window, select a format (**AgGPS**, ISOXML):
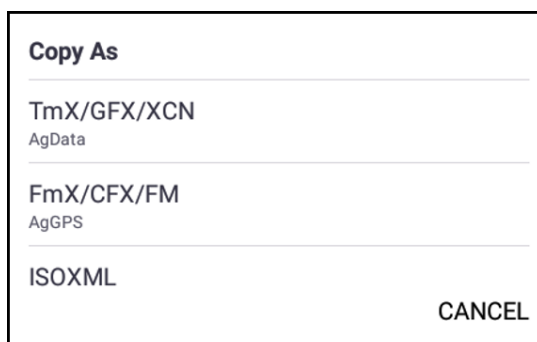
4. The data are converted and stored in an **Output_AgData** folder on your USB drive.

  NOTE – *If you convert the data again, a new* **Output_*** *folder is created with an incremental number appended (for example,* **Output_AgData (1)**, **Output_AgData(2)**).

Delete Precision-IQ Data

You can delete Precision-IQ data from the display or USB drive:

1. Tap **DELETE** in the left-hand action list.

2. Tap the items you want to delete. You can tap individual resources or tap an entire folder to select that folder's contents. While you can delete a folder from a USB drive, you cannot delete a folder from the Precision-IQ display.

  NOTE – *You can delete data from the display or from the USB drive, but not at the same time.*

3. Tap the **Delete** button. Tap **Yes** in the Confirm delete pop-up window. The selected items are removed.

NOTE – *Currently, you can* **only** *delete Precision-IQ (AgData) data.*

Supported Data Transfer Functions

Not all resource types can be transferred to/from Precision-IQ into other formats (AgGPS, ISOXML). The following tables shows the functions and formats supported by the Precision-IQ's data transfer service.

	From Precision-IQ To:		
Profile	USB (AgData)	USB (AgGPS)	ISOXML
Vehicles	✔		
Implements	✔		
Materials	✔		
Fields	✔	✔	✔
Guidance Lines	✔	✔	✔
Tasks	✔		
Users	✔		
Diagnostics	✔		
Screenshots	✔		
Prescriptions	✔		
Point/Line/Area	✔	✔	✔

To Precision-IQ From:			
Profile	USB (AgData)	USB (AgGPS)	ISOXML
Vehicles	✔	✔	✔
Implements	✔	✔	✔
Materials	✔	✔	✔
Fields	✔	✔	✔
Guidance Lines	✔	✔	✔
Tasks	✔		
Users	✔		
Diagnostics	✔		
Screenshots	✔		
Prescriptions	✔		✔
Point/Line/Area	✔	✔	✔

Diagnosing and Troubleshooting Data Transfer

This section provides details for diagnosing and troubleshooting common data transfer issues not related to FarmStream.

Office Sync Diagnostics

Tap the **Diagnostic** icon in the Activity bar. On the Diagnostics screen, tap **Office Sync** under Connectivity:
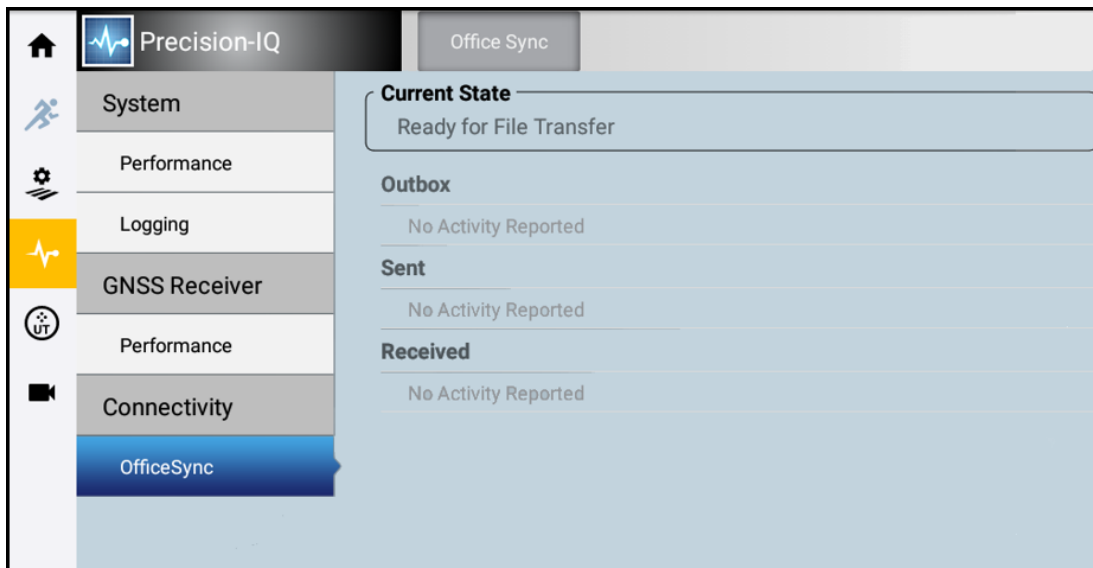
Office Sync wirelessly transfers files between the display and Trimble Ag Software and the office. As files are created from field activities, Office Sync places these in an outbox. At the time you have specified for transfers to occur, Office Sync sends the files from the outbox in the display to the office.

At Office Sync diagnostics, the following information displays:

Section	Explanation
Current State	The state of sending or receiving files using Office Sync. Options include: • Disconnected: Display is not authorized for Office Sync • Authenticating: Display is checking for permission to use Office Sync • Ready for file transfer: Display is connected to the Internet and Office Sync is enabled • Checking for files: Display is checking for updates to be transferred • Receiving files (and percentage): Display is receiving files from the office. Percentage indicates the progress of the download. • Sending files (and percentage): Display is sending files to the office. Percentage indicates the progress of the send.
Outbox	A list of files waiting to be sent.
Sent	A list of files that have been transferred.
Received	The list of files that have been received from the office.

Diagnostics and Troubleshooting

▶ System Diagnostics

▶ GNSS Diagnostics

▶ ISOBUS Diagnostics

▶ GNSS Troubleshooting

▶ Display Troubleshooting

▶ Autopilot System Diagnostics

Precision-IQ offers a wide variety of diagnostic and performance data that you can review and analyze to improve the efficiency of your field operations. This chapter covers information about the status of equipment and services, as well as troubleshooting and diagnostics information.

To get started, tap the **Diagnostics** icon on the Precision-IQ activity bar.

System Diagnostics

From the Precision-IQ activity bar, tap the **Diagnostics** icon to display the Diagnostics screen.

Performance

By default, the System's Devices Performance screen displays and shows the following information:

Title: This column lists all devices managed by Precision-IQ.

Firmware Version: This column shows the installed firmware version for each connected device.

Serial Number: This column shows the serial number for each connected device.

Connected: This column shows whether or not a device which is managed by Precision-IQ is actually connected to the display.

This reference information is useful should you need to submit a support request.

Logging

Tap **Logging** for a summary of logging details. By default, the screen shows all system logs. Tap **Logging Level** to filter the system log report by:

- **Info:** Show only informational details.
- **Warning:** Show only warning details.
- **Error:** Show only error details.
- **Assert:** Show only assert details.
- **Fault:** Show only fault details.

Tap the **Pause** button to suspend logging. While paused, the Pause button will slowly blink. Tap the **Pause** button again to resume logging.

Save Log Report to USB Drive

If needed, you can save a log report to an external USB device:

1. Insert a USB drive into the USB port of the display.
2. Tap **Logging Level** to filter the report.
3. Tap the **Pause** button to suspend logging.

4. Tap the **Save to USB** button to save the log report to your USB device:

The Support screen displays:

By default, the **last 1 hour** of logging data is exported. Tap **Log Settings** to change the value.

*NOTE – If you select the **last 4 days** of log data, then allow for at least 30 minutes for the log file to be exported.*

5. Tap **Save to storage** to save the log file to your USB device. Select a location on your USB device, then tap **Save**. The display shows a save status as the log file is exported and will show when the logs are successfully saved.

6. Tap the Android **Back** button to return to the Diagnostics screen.

7. Tap the **Pause** button to resume logging.

8. Remove the USB device from the USB port.

The log files are compressed into a zip file on the USB device. The file name is structured:

`PIQ_<display's serial number>_<file save date>.zip`

For example: `PIQ_1234567890_20171106.zip`

Save CAN Logs to a USB Drive

Tap the **CAN Logs** tab for a list of all available CAN buses.

To save the CAN logs:

1. Insert a USB device into the USB port of the display.

2. On the CAN Logs screen, the **Save to USB** button will turn green when the USB device is recognized by the display. Once it turns green, tap the **Save to USB** button:

3. Once complete, the display will return the following message:

The export was successful. Please check your media drive.

4. Remove the USB device from the USB port.

At the root level of your USB device, the CAN log files are stored under a new **can_logs** directory.

NOTE – Any existing CAN log files will be overwritten.

Once you have saved the CAN log files, tap the **Delete** button to clear them from the display.

GNSS Logging

Tap the **GNSS Logging** tab for status of GNSS logging. This screen shows the file name and the number of files being recorded.

GNSS Diagnostics

From the Precision-IQ activity bar, tap the **Diagnostics** icon to display the Diagnostics screen. On the Diagnostics screen, tap **Performance** under GNSS Receiver to display overview details about the GNSS connection:
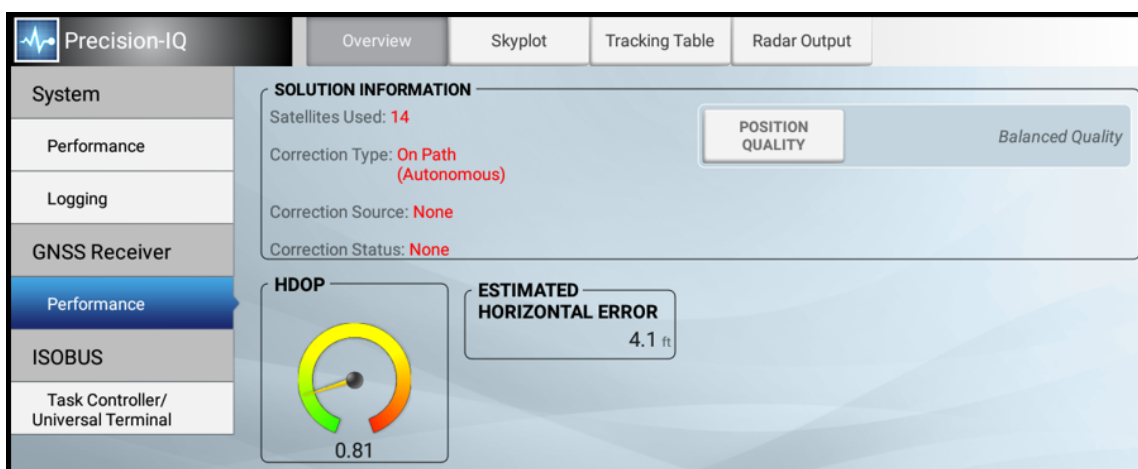
For information on GNSS connectivity, see GNSS Connectivity and Supported Correction Services.

> ⚠ CAUTION – The GNSS antenna may experience interference if you operate the vehicle within 100 m (300 ft) of any power line, radar dish, or cell phone tower.

On the Overview tab, the following GNSS details are provided:

Solution information

- Satellites used: Indicates number of satellites currently being used.
- Correction Type: The correction service indicated at setup. See also: Correction Services.
- Correction Source: Modem, satellite / fast, satellite /SBAS.
- Correction Status: Fixed, Float or xFill.
- Position Quality: Tap to change. Favor accuracy, balance quality or favor availability.

HDOP (Horizontal Dilution of Precision)

This image indicates:

- Good (green): <1
- Moderate (yellow): 1 - 3
- Poor (red): >3

Estimated Horizontal Error

Current value in feet/inches or meters/centimeters

Additional Diagnostics	Explanation
Correction Age	Green / ,<5 = good; yellow / 5 - 10 = moderate; Red / >10 = poor
Iono Scintillation	Amount of scintillation in the ionosphere: - Good (green): <2 - Moderate (yellow): 2.0 - 4.0 - Poor (red): >4.0
Max Correction Age	Shows highest value over the last 100 seconds
Cell Signal Strength	Strength of cell signal
CMR %	Shows current CMR percentage
Cell Data Packets Send/Received	Shows the amount of packets sent and received
VDOP	Vertical Dilution of Precision: - Good (green): <2 - Moderate (yellow): 2- 6 - Poor (red): >6
ANTENNA	Connection is on (green checkmark) or off (red X).
Correction Status	Status of the correction
Subscription Status	Shows date the subscription ends

Skyplot

Tap **Skyplot** to view the number of satellites nearest to your position:

This screen shows satellites used and unused from all supported GNSS constellations.

Tracking Table

Tap the **Tracking Table** tab for location and connection details for all used and unused satellites from supported GNSS constellations.

Radar Output

Tap the **Radar Output** tab for details on adjusting the radar output frequency.

ISOBUS Diagnostics

From the Precision-IQ activity bar, tap the **Diagnostics** icon to display the Diagnostics screen. On the Diagnostics screen, tap **Task Controller/Universal Terminal** under ISOBUS to display details about ISO devices.

The following details are provided:

- **Device Name:** The name of the ISO device.
- **Device S/N:** The serial number of the ISO device.
- **CAN Connection:** The status of the CAN connection.
- **VT Pool Loaded:** Indicates (**Yes** or **No**) whether or not Virtual (Universal) Terminal data from the ECU is loaded.
- **TC Pool Loaded:** Indicates (**Yes** or **No**) whether or not Task Controller data from the ECU is loaded.

- **ISO-VT:** Virtual (Universal) Terminal data is available.
- **ISO-TC:** Task Controller data is available.

NOTE – *If ECU data does not auto-populate, it may be necessary to cycle power to the ECU.*

NOTE – *If the implement's ECU is power cycled while still in the Run screen, it is necessary to exit and re-enter the Run screen before being able to resume Task Controller.*

GNSS Troubleshooting

Refer to the following troubleshooting details:

- Conditions Affecting GNSS Accuracy
- Poor Accuracy (Multipath)
- Intermittent Loss of Lock on Satellite
- Loss of Initialization
- Not Tracking RTK Corrections
- Poor Signal/Not Receiving a Clear Signal
- The Receiver is Not Tracking Any Satellites

Conditions Affecting GNSS Accuracy

The GNSS positioning method influences the accuracy of the GNSS position reflected in your GNSS receiver. Additionally, the following conditions can affect GNSS accuracy.

Condition	Explanation
Atmospheric effects	GNSS signals are degraded as they travel through the ionosphere. The error introduced is in the range of 10 meters. The error is removed by using a differential or RTK positioning method.
Number of satellites used	To calculate a 3D position (latitude and longitude, altitude, and time), four or more satellites must be visible. To calculate a 2D position (latitude and longitude, and time), three or more satellites must be visible. For RTK positioning, five satellites are needed for initialization. Once initialized, four or more satellites provide RTK positions. The number of visible satellites constantly changes and is typically in the range 5 through 9. The receiver can track up to 44 satellites simultaneously.

Condition	Explanation
Maximum PDOP	Position Dilution of Precision (PDOP) is a unitless, computed measurement of the geometry of satellites above the current location of the receiver. A low PDOP means that the positioning of satellites in the sky is good, and therefore good positional accuracy is obtained.
Signal-to-noise ratio	Signal-to-noise ratio (SNR) is a measure of the signal strength against electrical background noise. A high SNR gives better accuracy. SNR can be degraded by other electronic equipment operating nearby, including transmitters, cell phones, or data modems. It may also be degraded by solar flares and changing atmospheric conditions.
Minimum elevation	Satellites that are low on the horizon typically produce weak and noisy signals and are more difficult for the receiver to track. Satellites below the minimum elevation angle are not tracked.
Multipath environment	Multipath errors are caused when GNSS signals are reflected off nearby objects and reach the receiver by two or more different paths.
RTK Base station coordinate accuracy	For RTK positioning, it is important to know the base station coordinates accurately. Any error in the position of the base station affects the position of the rover; every 10 m of error in a base station coordinate can introduce up to 1 ppm scale error on every measured baseline. For example, an error of 10 m in the base station position produces an error of 10 mm over a 10 km baseline to the rover. For more information about how to make sure the position of your base station is accurate, refer to the manual for your base station receiver.
Multiple RTK base stations	If you are using several base stations to provide RTK corrections to a large site area, all base stations must be coordinated relative to one another. If they are not, the absolute positions at the rover will be in error. For more information about how to use several base stations to cover your site, contact your local Trimble Reseller.

Poor Accuracy (Multipath)

Poor accuracy can be due to GNSS signals reflecting off nearby trees and/or metal buildings and horizontal surfaces. (Reflection is also called multipath.)

To reduce multipath noise, mount the GNSS receiver so that it has a clear view of the sky. The receiver must be away from trees and large metal objects.

Intermittent Loss of Lock on Satellite

- The receiver loses the satellite signal from time to time: Make sure that the receiver is mounted on the highest point of the vehicle and is clear of metal surfaces.

- Signal takes a long time to initialize:

  - In RTK mode, longer baselines require longer initialization times. (The baseline is the distance between the base receiver and the rover receivers.)

  - Wait for the receiver to initialize or consider repositioning the base receiver to shorten the baseline. Make sure the rover receiver is in a clear area.

Loss of Initialization

In RTK mode initialization can be lost when the rover receiver is close to trees or buildings and the number of satellites falls below four. Additionally, initialization may be lost if the receiver has not been tracking RTK corrections for some time.

- Move away from trees and obstructions to initialize. Once initialized, approach the obstructed area again. If the obstructions are severe, GNSS positioning may not work in that area.

- Because the GNSS satellites move, there may be times of the day when you are working in an area with obstructions.

Not Tracking RTK Corrections

The radio link is down or intermittent. Ensure that:

- The line-of-sight between the base and rover receivers is not obstructed.

- The rover receiver is within range of the radio.

- The radio power supply is on.

Poor Signal/Not Receiving a Clear Signal

- Interference from 2-way radios

Transmitting FM 2-way radios can interfere with WAAS and GNSS signal reception. Make sure that there is at least 1 m (3 ft) between the FM 2-way radio antenna and the receiver.

- Vehicle issues

  An unshielded ignition system can cause enough noise to block reception of a differential signal. Use resistor spark plug wires on the vehicle ignition system.

  An alternator can cause noise that interferes with a differential signal.

  NOTE – *Before replacing engine parts in an attempt to solve this problem, make sure that the problem is not caused by a computer or power source near the receiver. Some computers and their power sources cause noise that disrupts GNSS and satellite DGNSS signals.*

  Possible solutions include:

  - Use bypass capacitors, commonly available in automotive stores for cleaning up interference to CB and other radios. If the problem persists, shield engine components with aluminum foil.

  - Relocate the antenna on the machine. Determine the optimal antenna location.

- GNSS receiver issues:

  - Mounting location: The receiver may not be picking up a clear signal due to mounting location. Mount the receiver on the centerline of the vehicle, away from any sources of interference and with a clear view of the sky.

  - Cable problems: Use an ohmmeter to check the cable. The resistance of a good cable between connector pins at each end of the cable is zero. If the cable is sound, but the problem persists, try exchanging the cable with one that you know is working. If the cable is defective, contact your local Trimble Reseller for an RMA number (if the Trimble product is still under warranty), or to purchase a replacement cable.

  - Battery: A Lithium-ion battery in the receiver powers the internal real-time clock. This clock enables the receiver to get an initial fix faster. The battery has a life of 7.5 years. When the battery fails, the internal clock cannot keep accurate time and the receiver may take longer to output GNSS positions. Please contact your local Trimble Reseller to get the batteries replaced. You cannot replace the battery yourself.

The Receiver is Not Tracking Any Satellites

Possible Cause	Solution
The GNSS antenna does not have clear line of sight to the sky.	Ensure the antenna has a clear line of sight.
The cable between the receiver and the GNSS antenna is damaged.	Replace the cable.
The cable connections at receiver or antenna are not tightly seated, or are connected incorrectly.	Check all cable connections.

Display Troubleshooting

This section describes some possible issues with the display, possible causes, and how to solve them:

- The Display Does Not Turn On
- The Display is Not Responsive
- The Map is Not Visible on the Home Screen

Read this section before you contact technical support.

The Display Does Not Turn On

Possible Cause	Solution
External power is too low.	Check: • The charge on the external power supply • The fuse if applicable If required, replace the battery.
Internal power is too low.	Check the charge on the internal batteries and replace if required. Ensure battery contacts are clean.
External power is not properly connected.	Check: • That all power connections are seated properly • For any broken or bent pins

Possible Cause	Solution
There is a faulty external power cable.	Try a different cable. Check pin outs with a multimeter to ensure internal wiring is intact.

The Display is Not Responsive

1. Hold down the power button for 20 seconds.

2. After the display has shut down, press the power button again to power on the display.

The Map is Not Visible on the Home Screen

If your system has no map on the Home screen, check for:

- Possible cable disconnection

- Weak signal bars.

- All cables are connected securely.

- Poor GNSS connection. See GNSS Troubleshooting.

Autopilot System Diagnostics

You can use diagnostics for Autopilot to:

- View the degree of the steering angle being given by the navigation controller and the actual degree of angle.

- Calibrate:

  - Manual override sensitivity

  - Vehicle system aggressiveness

  - Line approach aggressiveness

  - Engage aggressiveness

  - Proportional steering gain (P gain)

  - Roll calibration

  - Make incremental adjustments to a pattern using the nudge increment tool

- View:

  - Vehicle roll and yaw

  - Navigation controller orientation

○ IMU parameters

○ Sensor settings

• Set the NavController to output NMEA Messages.

Steering Performance for Autopilot System

1. On the Diagnostics screen, tap **Performance** under Autopilot.

2. Tap **Steering**.

Button/Control	Explanation
P Gain	Balances rapid steering response and stability. See Steering Proportional Gain (Manual Calibration) for more information on calibrating. *NOTE – This setting is not available for certain vehicle types.*
Engage Aggressiveness	Controls how aggressively the vehicle initially engages the automatic guidance system.
Line Approach Aggressiveness	Controls how fast the guidance system attempts to steer the vehicle onto the current guidance line. See Line Acquisition for more information on calibrating.
	Engage. Use to engage the system in the diagnostics screen. For more information on the engage button, see Operating a Vehicle.
Vehicle System Aggressiveness	How aggressively the vehicle responds to cross track error.
System Feedback, Angle Desired	The degree of the steering angle command being given by the navigation controller.
System Feedback, Angle Actual	The degree of the steering angle that is actually occurring.
Nudge Increment	This function is for advanced users to test the systems response to cross track error. While driving the vehicle online, tap the left or right button to move the line. Observe the response of the guidance system and adjust as necessary.

Sensor Performance for Autopilot System

1. At the Diagnostics panel, tap **Performance** under Autopilot.

2. Tap **Sensors**.

Button/Control	Explanation
VEHICLE ORIENTATION	Graphically indicates the roll and yaw settings. The yaw value is the heading error for the system in reference to the heading of the guidance swath.
CONTROLLER ORIENTATION	Orientation of the controller as entered by the user.
MANUAL OVERRIDE SENSITIVITY	Sets the level the voltage must reach before the guidance system disengages. The voltage must also drop below that level before automated steering can be engaged again. You can calibrate this control here or at the Vehicle setup panel. For instructions, see Manual Override Sensitivity.
IMU PARAMETERS	The raw voltage reading from the accelerometer and gyroscopes in the navigation controller.
SENSORS	The raw voltage of all connected sensors.

NMEA Messages

Before you can setup NMEA output, you must turn on NMEA capability in settings. See Steering and Guidance Settings.

To set the NavController to output NMEA messages:

1. At the Autopilot Diagnostics screen, tap **Performance** under Autopilot.

2. Tap the **Advanced** tab.

3. In the TAP SETTINGS section, tap in the TAP entry box.

4. Enter how often you want the NMEA message to be output by the NavController and tap **GET**. Enter the value in milliseconds. 1000 milliseconds equals 1 Hz.

NMEA Message	Message Information
RawNMEAOutputIntervalGGA	Fix data including 3D location and accuracy data
RawNMEAOutputIntervalGSA	GPS dilution of precision (DOP) and active satellites

NMEA Message	Message Information
RawNMEAOutputIntervalGST	GPS pseudorange noise statistics
RawNMEAOutputIntervalVTG	Velocity made good
RawNMEAOutputIntervalZDA	Date and time

5. To configure the baud rate:

   a. Enter "RawNMEAOutputBaudRate" in the TAP entry box, then tap **GET**.

   b. Enter the baud rate that is required by the external device.

   c. Tap **SET**.

A

Data Sheets

▶ GFX-750/XCN-1050 Display Data Sheet

▶ TMX-2050/XCN-2050 Display Data Sheet

▶ NAV-900 Data Sheet

▶ AG-820 Integrated Radio Data Sheet

This appendix provides hardware specifications listed in the available data sheets.

GFX-750/XCN-1050 Display Data Sheet

Technical	
Power	Input voltage/current: 9 - 16 VDC, 5A max
	Output voltage/current: 12v nominal, 2.5A max
Processor (CPU)	Quad-Core iMx6 PLUS @ 1 GHz
Storage (eMMC/RAM)	16 GB/1 GB
Operating system	Android™ 6.0
Wi-Fi	Integrated 802.11b/g/n (2.4 GHz)
Bluetooth	Bluetooth® 4.1
BroadR-Reach (Ethernet)	Transmit and receive 100Mb/s

Mechanical	
Dimensions	L 263 mm x W 182 mm x
	D 45 mm (at connector belt)
Weight	2.00 kgs (4.4 lbs)
Mount	RAM – 1.5" Ball
Hard Buttons	Power Button Only
Speaker	Integrated Multitone Speaker

Shock and Vibration	
Drop	ISO 16750-3
Shock	ISO 15003
Vibration	ISO 15003

Housing	
Material	Cast aluminum
Environmental Rating	IP66

Temperature	
Operation	-20 °C to 60 °C (-4 °F to 140 °F)
Storage	-40 °C to 85 °C (-40 °F to 185 °F)

LCD Display

Size	10.1" Color display
Touch screen	Projected Capacitive (optically bonded)
Resolution	1280 x 800
Brightness	900 nits max
Backlight	Dimmable

Front-facing camera

Type	Low light level, color
Resolution	1.0 M pixels, 720 p

Connections

Power/CAN	Deutsch DT15-6p
USB (2 side facing)	USB 2.0 Type A (1 Host, 1 OTG)
BroadR-Reach/Power (GNSS)	M12 D-code Female 4 pin
Expansion (RS-232, 2 I/O (Imp Lift, Remote Out, or Video In (PAL/NTSC))	M12 B-code Female 5 pin

TMX-2050/XCN-2050 Display Data Sheet

Technical	
Power	27 volts, 3.5 amps (supplied by the TM-200 Module)
Processor	1 GHz quad core
Storage	Primary embedded memory - 32 GB

Mechanical	
Dimensions	312 mm x 214 mm x 45 mm (plus connectors) (1 ft 8/32 in x 8 1/4 in x 1 49/64 in)
Weight	2.5 kg (5.5 lb)
Mount	4 M6 screws on 75 mm centers (3 inch). VESA MIS-D 75.

Housing	
Material	Magnesium
Environmental Rating	IP55

Temperature	
Operation	0 °C to 65 °C (32 °F to 149 °F)
Storage	-40 °C to 85 °C (-40 °F to 185 °F)

LCD display	
Size	307 mm (1 ft 3/32 in)
Touch screen	Capacitive touch
Resolution	1280 x 800

Front-facing camera	
Type	Low light level, color
Resolution	1.3 M pixels

Connections	
USB	USB side (side of display), USB rear (back of display)
Ethernet	RJ45 connector. Power input for Precision-IQ only.

NAV-900 Data Sheet

Physical	
Dimensions	213 mm (length) x 213 mm (width) x 80 mm (height)
	83.9 in (length) x 83.9 in (width) x 31.5 in (height)
Weight	1.2 kilograms (2.6 lbs)
Housing Material	Low-profile, chemical-resistant plastic casing with UV-resistant paint

Electrical	
Power	9 VDC to 16 VDC external power with over-voltage protection on input ports
Power Consumption	5.5 watts
	17.5 watts with external accessories connected
Power Out	12 VDC (nominal), 1 amp limit for external radio = 12 watts

Connectors	
To Display	M12 4-pin connector
To External Radio	M12 5-pin connector
For I/O	Deutsch 12-pin connector

Operational Range	
Operating Temperature	-40 °C to 70 °C (-40 °F to 158 °F)
Storage Temperature	-40 °C to 85 °C (-40 °F to 185 °F)
Humidity	up to 100%, condensing
Ingress Protection	IP66, dustproof, waterproof, IPx9K

Communication and I/O

Bluetooth®	Version 4.1, enabled
Serial Ports	1 Tx/Rx, 1 Tx only
CAN Ports	2
BroadR-Reach® Port	1
Digital Out	Sonalert
Analog In	Remote engage
NMEA Output	1, 5, 10, Hz

Inertial Measurement Unit (IMU)

Gyroscope	3-axis, 200 Hz
Accelerometer	3-axis, 200 Hz

GNSS Receiver Specifications

Satellite Signals	• GPS: L1 C/A, L2C, L2E, L5 • GLONASS: L1 C/A, L1P, L2 C/A, L2P, L3 CDMA • Galileo: E1, E5AltBOC • BeiDou (COMPASS): B1, B2
Satellite Corrections	CenterPoint® RTX Fast, CenterPoint RTX, RangePoint® RTX, SBAS (WAAS, EGNOS, MSAS), xFill
Land-Based Corrections	CenterPoint RTK, CenterPoint VRS
Correction Formats	CMR+, sCMR+, sCMR+ with SecureRTK, CMRx, RTCM 3.0, RTCM 3.1, RTCM 3.2

Guidance

Electric	Autopilot™ Motor Drive (APMD)
Guidance Ready	CANBus J1939
Hydraulic	External NAV III Autopilot

AG-820 Integrated Radio Data Sheet

Technical	
Power	Via NAV-900 via a 5-pin M12 connector
Power Consumption	450 MHz radio: 3.6 Watts
	900 MHz radio: 3.6 Watts

Mechanical	
Dimensions	121.9 mm (diameter) x 50.8 mm (height) (4.8 in (diameter) x 2 in (height))
Weight	0.91 kg (2.0 lb)
Mount	The AG-820 integrated radio is designed to be mounted either: • Magnetically via the four (4) built-in magnets. • Bolt-on after the built-in magnets are removed.

Housing	
Material	Die-cast aluminum
Environmental rating	IP55

Environmental	
Operating Temperature	-30 °C to 65 °C (-22 °F to 149 °F)
Storage Temperature	-40 °C to 85 °C (-40 °F to 185 °F)
Operating Humidity	5% to 100% (condensing)
Altitude	-400 m to 18,000 m (-1312 ft to 59,055 ft)

Radio options	450 MHz radio	900 MHz radio
Range	13 km (8 miles); varies with terrain and operating conditions	13 km (8 miles); varies with terrain and operating conditions
Frequency band	403 MHz to 470 MHz	902 MHz to 928 MHz
Networks	20 user-selectable networks	40 user-selectable networks

Radio options	450 MHz radio	900 MHz radio
Wireless data rates	128 Kbps	128 Kbps
Modes	Rover (receive only)	Rover (receive only)

Connections		
Radio (NMO connector) Radio whip antenna		

B

Field-IQ Basic Rate and Section Control System

This appendix provides instructions for using Field-IQ's basic rate and section control system.

Field-IQ Supported Features

The following features are supported by Field-IQ:

- Section Control up to 24 sections including up to two fence rows
- Rate Control of one liquid material.
- Prescriptions supported with 96553-07 unlock.
- Two pressure sensors (Air, Liquid, Vacuum)
- External Master Switch input
- One lift switch

Field-IQ Supported Configurations

- 1 Rate and Section Control Module - rate and section control, max 12 sections
- 1 Rate and Section Control Module + 1 Section only module - rate and section control, max 24 sections
- 1 Section only module- section control only, max 12 sections
- 2 Rate and Section Modules. Rate control of 1 drive and control of 24 sections
- Pressure Sensors, Lift Switch, External Module and Rate control valves can only be connected to the "primary module". When a RSCM and an SCM are attached the RSCM will default as the primary module. If two RSCM's are attached the user must identify the primary module.

NOTE – No switch boxes are required for Field-IQ Basic operation. Switch boxes should not be connected during Field-IQ Basic operation.

Field-IQ (FIQ) Basic Rate and Section Control License Upgrade UI

This feature allows for Field-IQ Basic Rate Only or Section Only modules to be unlocked to a Rate and Section module.

Verify Application Control System Settings

On the Precision-IQ Home screen, tap the Settings button. On the Settings screen, tap Application Control. Verify that the Enable Access to Installer Setup option is enabled as shown below:
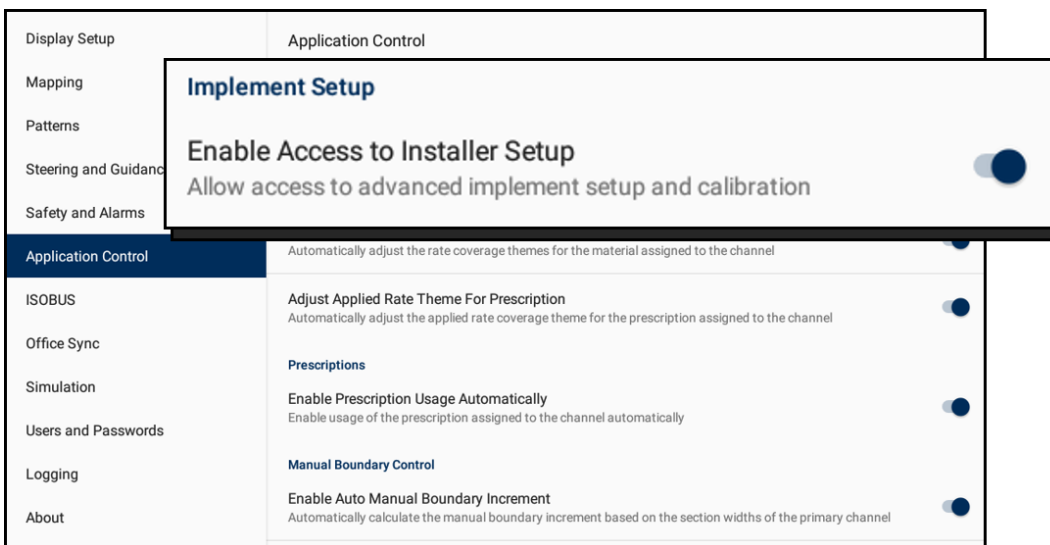
NOTE – This setting must be enabled before you can unlock an ECU.

Unlock a Field-IQ Basic Rate/Section Control Module

Once you have verified the Implement Setup option is enabled, follow the steps below to unlock an Field-IQ Basic Rate/Section Control Module:

1. Purchase the required unlock from the Partners Store, and assign it to your Field-IQ Basic Rate/Section Control Module. A module unlock code will be sent that you will need to apply to the display.

2. On the Precision-IQ Home screen, tap the **Diagnostics** icon in the Activity bar.

3. On the Diagnostics screen, the System Performance menu displays by default. Locate the Field-IQ Basic Rate/Section Control Module that you wish to unlock. Then, tap and hold the Title of the module for 2 seconds to be presented with the module upgrade UI.

4. Tap the **Apply Module Unlock** text to gain access to the module unlock UI:
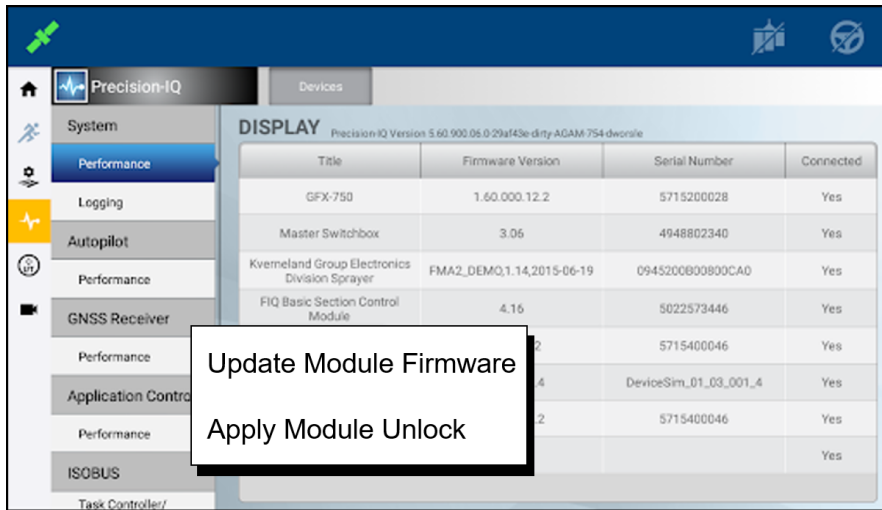
5. Enter the **Module Unlock** code for the Field-IQ Basic Rate/Section Control Module and tap **OK**:
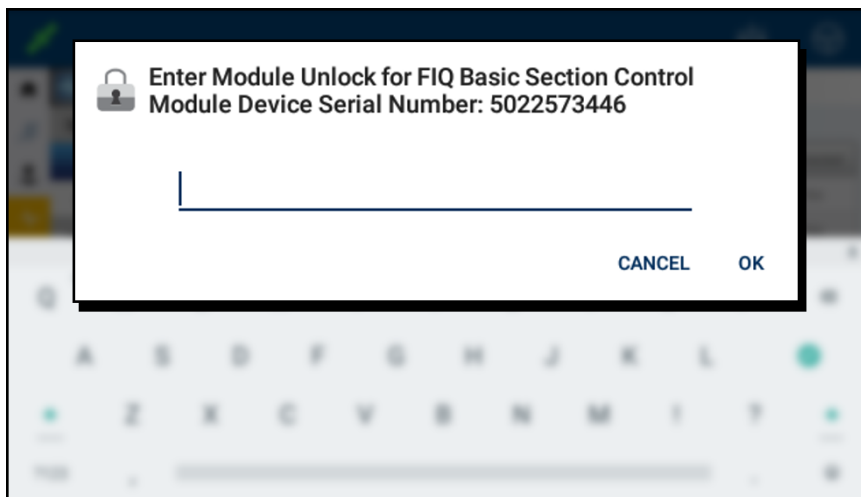
The Diagnostics screen will update to show that the Passcode entry was successful:
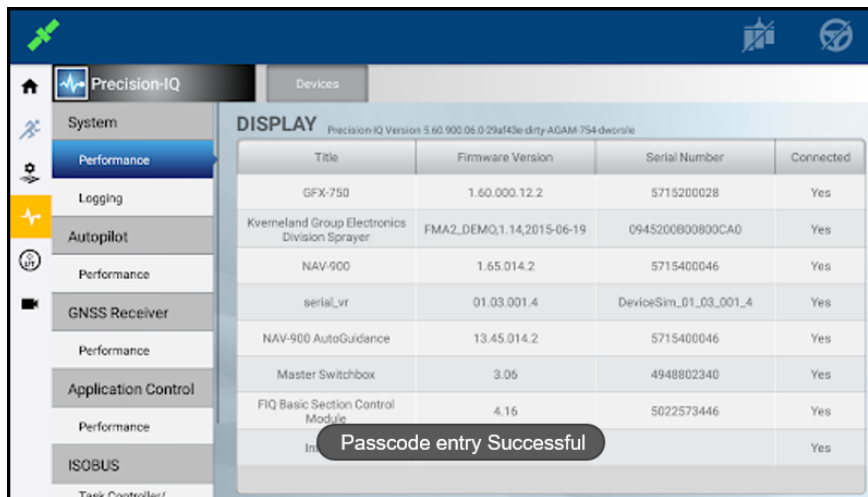
6. Once the unlock is applied, it is recommended to cycle power to the ECU by disconnecting power from the module for at least 10 seconds.

Field-IQ Implement Setup

1. From the Home screen, tap the **Implement** tile.

2. On the Implement screen, tap **Add Implement** and select the operation type that best fits your application.

   Tap **Next** to continue.

3. Select the Application options and control module/s.

   When creating an implement, a list of connected devices is automatically generated.

   - If more than one device is detected, then it is assumed that two devices should be included in the implement.

   - If an SCM is selected as the "primary" device, then the implement will only be configurable for section control only, even if the "secondary" device is an RSC.

4. Tap **Save** to move to the next menu.

Field-IQ Implement and Application Control Details

When setting up a new Field IQ Basic implement the user is launched into the "installer" menus.

The installer version allows the editing of various parameters, not allowed in the "user" version of the setup workflow. For example, the installer may change the application width or the number of sections in the configuration. In the user workflow these parameters are read-only.
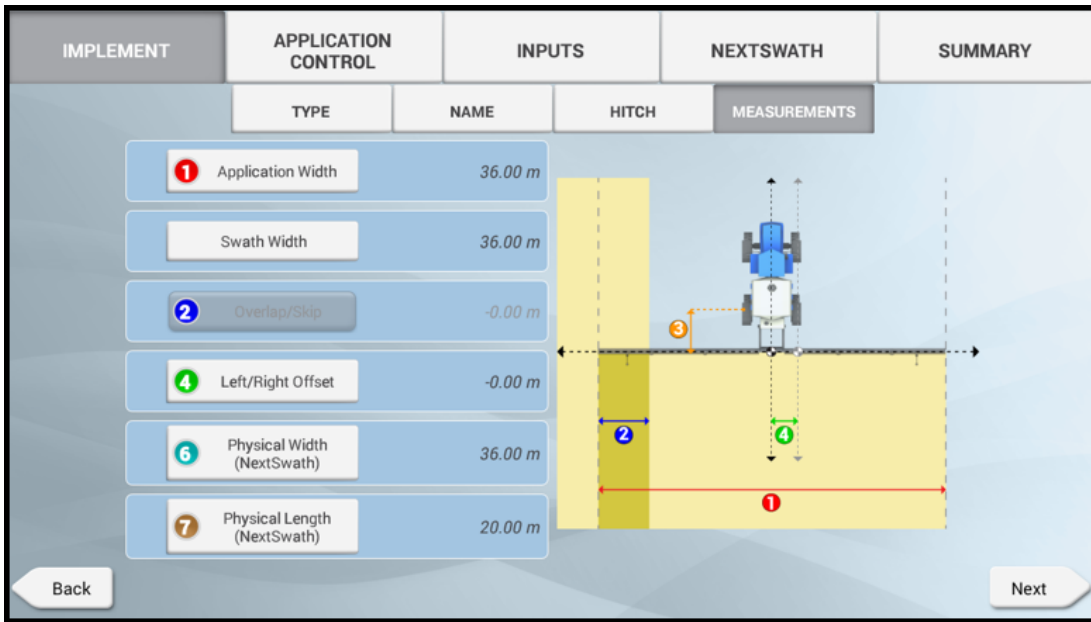
Configure the Implement details with the following information:

- Implement layout
- Implement name
- Hitch type/measurements
- Implement measurements

Option	Description
Application Width	Total application width of implement
Swath Width	Working Width of implement. Sets the distance between swaths. (does not have to match application width)
Left/right Offset	Distance between center of applicator and center of the implement hitch/vehicle
Physical Width	Physical width of the implement
Physical Length	Physical length from hitch to the rear of the implement

Modify/Edit the Application Control Channel

Select the channel that you want to edit and tap **Modify**. For the **Type** value, select the layout that best fits your implement.

Field-IQ Section Control

Under **Section Control**, enter details for the following subtabs:

- Settings subtab
- Modules subtab
- Width subtab
- Latencies subtab
- Overlaps subtab

Settings subtab

Select to enable or disable Section Control. A green check indicates that Section Control is enabled. Tap the following buttons and enter the appropriate information:

1. Control Type. Select one of the following control types:

    - Section Control: This mode results in the control of individual sections, as defined for the section control modules.

    - Rate as Section: This mode results in the entire boom being treated as a single section.

2. Section Control Type. This option sets the section switching logic.

3. Fence Row Nozzle. Use this option to enable the fence row nozzle. Select **Left**, **Right** or **Both**.

4. Fence Row Wiring. This option sets the output used for the R/H fence row.

    - Adds the output 1 section after the last section.

    - +12 sets the output to the 12th section wire.

Modules subtab

Tap **Modules** to enter the edit menu. From there, you can define the number of sections connected to the module/s.

Width subtab

Tap **Width** to edit the width of each section. Tap the section to edit the measurement.

Latencies subtab

Tap **Latencies** to enable or disable latency. Select from:

- **On Latency**. Time delay between when a command is sent to turn a section on to when it is fully open or applying.

- **Off Latency**. Time delay between when a command is sent to turn a section off to when it is fully closed.

Overlaps subtab

Tap **Overlaps** to set the overlap details. The following table describes the available options:

Option	Description
Start Overlap	Sets the amount of intentional application overlap when exiting a previously applied area.
End Overlap	Sets the amount of intentional application overlap when entering a previously applied area.
Coverage Switching overlap	Based on the section width. Sets the % of the section that needs to be over a previously applied area to turn on or off. Increasing this value increases section overlap.
Boundary Switching overlap	Based on the section width. Sets the % of the section that needs to be over a boundary area to turn on or off. Increasing this value increases boundary overlap.

Field-IQ Rate Control

Under Rate Control, enter details for the following subtabs:

- Settings subtab

- Modules subtab

- Width subtab

- Adjustments subtab

Settings subtab

Select to enable or disable Rate Control. A green check indicates that Rate Control is enabled. Tap the following buttons and enter the appropriate information:

Drive Type. This option sets the control type for the rate control valve ,motor, or pump. The following table describes the available drive types:

Drive Type	Description
Servo Standard	For two-wire servo's plumbed inline
Fast Servo	For four-wire servo's plumbed inline. These valves generally react quicker than two-wire servos.
PWM	For Pulse Width Modulated coils. These are typically used to control the flow of hydraulic oil to a motor.
Pump Servo	For hydraulic servos. These are used to control the flow of hydraulic oil to a motor.
Hardi % Bypass	Used on Hardi Sprayers equipped with three-way section valves that return flow to the tank when the boom section is closed.
Standard Bypass Servo	For two-wire servo's plumbed to bypass excess flow to the tank.
Fast Bypass Servo	For four-wire servo's plumbed to bypass excess flow to the tank.

Auxiliary Valve type. Use this option to set the auxiliary valve type. Choose from:

- Master - Valve opens when sections are open.
- Dump - Valve opens when sections are closed.

Number of Nozzles. Enter the number of outlets on the implement. This value may be nozzles or shanks depending on the implement.

Control Valve behavior on Sections close. The following table describes the available options:

Behavior	Description
Close	Control valve closes when all sections are off.
Lock in Last Position	When the section/s close, the valve locks in its current position.
Lock at Minimum	*(PWM only)* When sections close the valve locks in this set position. This position is set via the calibration menu.

Modules subtab

Tap **Modules** to enter the edit menu. Enter details for the following modules:

- Flow Meter Type
- Flow Meter Units
- Calibration number from encoder tag.

Width subtab

This will default to the application width.

Adjustments subtab

Tap **Adjustments** to enter the edit menu. Enter details for the following adjustments:

- No/ Low flow timeout. If the system receives no feedback in the specified time, the system will shut off.
- Pump Disarm Switch. This adjustment is for platform kits with an arming relay. Typically, it is found on self-propelled sprayers. This adjustment allows the control of the valve to be transferred from the OEM to Field-IQ Basic.
- Rate Snapping:
  - **ON**: When the product flow is within 10% of the Target rate, the as applied rate will snap to the target rate.
  - **OFF**: The as applied rate will report the true system flow.

Field-IQ Adjustments

Under **Adjustments**, select to enable or disable Field-IQ Auto Jump Start. Auto Jump Start is a feature specific to Field-IQ Basic, it provides a simple way to "jump start" the system when stopped.

- **Enabled**. The Jump Start speed value is the speed at which the system will apply at when Jump start is on. Once the vehicle has exceeded this speed Jump Start will stop automatically.
- **Disabled**. When disabled, a shut off speed can be entered manually. Shut off speed sets the speed that the system will close all sections. The sections will not reopen until the vehicle speed exceeds the shut off speed.

Field-IQ Virtual Tank

Under **Virtual Tank**, enter the following details:

1. Select to enable or disable **Virtual Tank**. A green check indicates that the virtual tank is enabled.
2. Show units as. This option sets the displayed tank units.

3. Full Capacity Volume. You can use this option to set to match the capacity of the system

4. Warning type.

- Volume

5. Warning Level. This option sets the level at which a low tank warning will be displayed.

Field-IQ Inputs

Under **Inputs**, enter the following details:

- **External Master Switch**. The external master switch must always be connected via the "primary" module. When enabled, the external master is used to start/stop the rate control drive calibration. The soft master button will not appear on the calibration screen when enabled. When enabled, the external master must be ON to operate the system. It is used in conjunction with the section master on the run-screen.

- **Pressure Sensors**. These can only be connected via one of the two analog sensor inputs on the "primary" module. Secondary modules will be ignored. To configure the pressure sensors:

  1. Select the sensor type.

  2. Select the input it is connected to. Sensors are calibrated via the calibration screens.

- **Implement Lift**. The implement lift switch input must always be connected to the "primary" module. Specify whether the lift switch is "active high" (open circuit) or "active low" (closed circuit).

Field-IQ Editing Implement/Installer Menus

From the Precision-IQ Home screen, tap the **Settings** button, then on the Settings screen, tap **Application Control**. Tap the **ON/OFF** switch to enable or disable the Application Control options as described below.

Enable access to Installer Menu

Once the implement is initially created and saved, re-entering the edit workflow will show the simplified version of the workflow that will only display settings that are commonly adjusted. In order to gain access to the "installer" workflow again, you must enable access via a user preference under the Application Control category.

Record coverage on applied flow rate

When enabled coverage logging will not begin until the section(s) are open and the applied rate is greater than 0 (>0). When disabled the system will ignore the as applied rate, logging will start when the sections open.

Enable Auto Manual Boundary Increment

When enabled, this sets the Left/Right arrow buttons to snap to the next section. This is useful when sections widths are variable widths. If off the system will snap to the user defined width.

Field-IQ Calibration

Access to the calibration for a implement requires that the installer UI be enabled.

When opening the calibration screen you will be presented with the calibration summary status. Follow the calibration instructions in the following sections:

- Drive/ Valve Calibration
- Sensors
- Calibration Types
- Run Screen
- Rate Widget

Drive/ Valve Calibration

1. Select **Application Control**.

2. Select the module that you want to calibrate. For Field IQ Basic, this will be the "primary" module. Follow the steps on the screen to set the following values:

    1. Drive limits - Maximum Flow. This should be calculated with one of the following:

        - Nozzles/ Orifice. Multiply the maximum rate flow of the nozzles by the number of nozzles on the sprayer. If using multiple tips install the largest tip that will be used.

        - Maximum Flow rating of the pump or flow meter, whichever is lowest

    2. Auto Tuning - The system will automatically tune the valve.

    3. Drive Settings - Editable calibration values. Most valve can be tuned with the settings described in the table. The system can also be turned on in this screen to check the valve performance.

Value	Description
Gain	Adjusts the speed response of the control valve. Increasing the value will increase the speed at which the valve adjusts.
Minimum Response	Minimum Command applied to the valve to initially open the valve. • Setting this to high can cause the valve to overshoot when making rate changes. • Large adjustments to this value may affect the Gain setting.
Allowable Error	Sets the % of target rate error that the control system accepts. For Servos, this is usually left at 3% as most valves aren't quick enough to keep up with small flow fluctuations. • Setting this to low or can cause excessive valve oscillation. • Setting this to high can cause the valve not to respond to as applied rate errors.

Sensors

Select **Sensors** and select the module to calibrate. For Field-IQ Basic, this module will be the "primary" module. Follow the steps on the screen.

Calibration Types

Select **Calibration Types**, and select **Air/Liquid/ Vacuum** sensors. The following table describes the calibration types:

Type	Description
Point/Slope	Uses the slope value of the sensor and a set point. The set point must be known, it can be 0. The slope value will be provided by the sensor manufacturer.
High/Low	Also known as two-point calibration. The sensor must reference two separate known pressures. The display will calculate the slope between these two values (0 is acceptable as the low pressure). This method is generally considered more accurate as it is tuned to the specific sensor.

Flow Calibration

The flow calibration is linked to the material. To access the calibration screens, open the **Material Setup** screen, a material must be assigned to a channel. Once assigned, select **Flow Calibration**.

Follow the steps in the Calibration menus and enter the following information:

1. Enter or Modify the meter cal

2. Calculate the system minimum flow.

    - Nozzle/ orifices- Multiply the minimum flow of the tip by the number of tips on the smallest section of the sprayer.

    - Minimum flow rating of flow meter or pump, what ever is higher.

3. Enter a target rate and speed appropriate for the applicator.

4. To start the calibration, select **start flow**, then turn on the master switch.

5. Using a measuring container, catch 1-minute samples from at least 3 sections across the boom. Average the results.

6. Enter the results. If the corrected cal number is acceptable, tap **OK**.

Run Screen
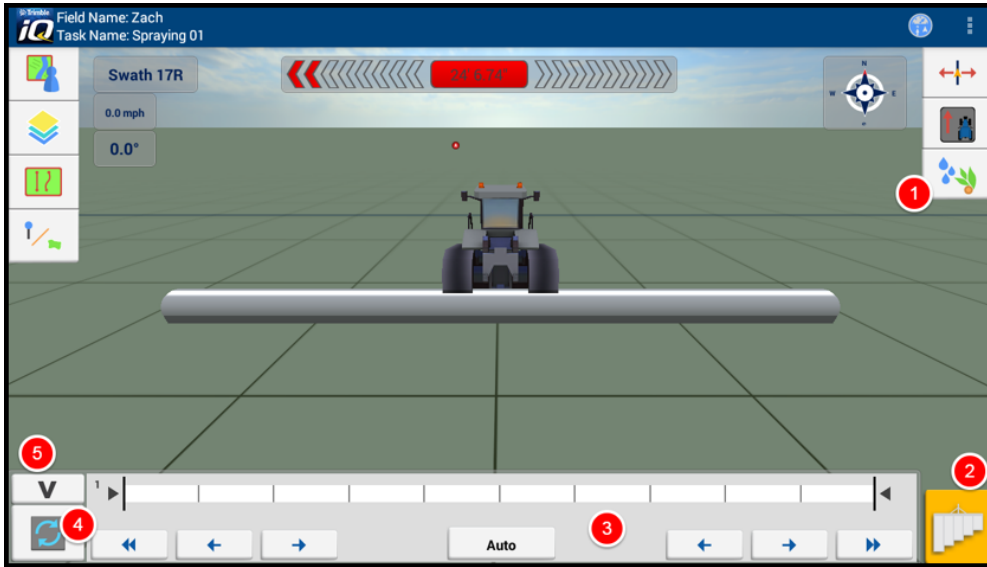
Basic Rate and Section Interface

1	Rate Widget
2	Section Master

Basic Rate and Section Interface	
3	• Boom manual boundary mode
	• Boom manual section control mode
	• Boom Section status mode
4	Boom Mode Cycle key
5	Boom screen collapse/ expand (status to control)

Rate Widget

The Rate widget is used to perform the following tasks:

1. View the as applied rate (this widget is always visible when rate widget is collapsed).

2. Change the Target Rate:

   • Two predefined rates

   • Use + and - to adjust the target rate by the manual rate increment value.

   • When a prescription is available, follow the prescription rate. Target rate must also be set to rate 1.

3. Auto / Manual Section mode.

   • Auto mode.

      ○ If either "off when stopped" is enabled or the implement if over covered ground the sections will remain closed and no application will occur.

      ○ If "off when stopped" is disabled and the implement is over clear ground the section will open and application will occur at a rate corresponding to the jump start speed.

   • Manual mode. The sections will open and application will occur at a rate corresponding to the jump start speed.

4. View the virtual tank controls.

5. Widget collapse icon.

6. Flush controls.

Field-IQ Section Station

The Section Station mode shows the status of sections. When collapsed, the boom cycle key is no longer visible.

There are 3 section views.

1. **View only**. Can only be viewed when the section bar is collapsed (to expand tap on the section bar)

2. **Manual Boundary Mode**. Incremental section switching from the outside of the boom into the center, This mode controls all channels

3. **Manual Section Control Mode**. Allows individual section switching of all sections and (one per channel)

Field-IQ Auto Jump Start

Jump start speed is used when the vehicle is stopped or not at nominal operating speed. When enabled, the system will use the predetermined jump start speed.

When the section master button is enabled (and the auxiliary master, if using), the jump start speed will immediately be applied.

When using the auto jump start feature:

- Once the vehicle speed exceeds the jump start speed, the vehicle speed will be used to determine the applied rate.

- If the vehicle's speed drops back below the jump start speed, the jump start speed will once again be used to determine the applied rate.

- There is a delay built into this feature of 0.5 m/s around the jump start speed to prevent a rapid activation/deactivation of the jump start speed feature.

- When jump start is active, an indicator (yellow triangle with the jump start speed icon) will appear at the lower left hand side of the run-screen just above the section widget hide/show button.

- The following can occur at zero vehicle speed depending on the section control mode:

  - Auto mode.

    - If either "off when stopped" is enabled or the implement if over covered ground the sections will remain closed and no application will occur.

    - If "off when stopped" is disabled and the implement is over clear ground the section will open and application will occur at a rate corresponding to the jump start speed.

  - Manual mode. The sections will open and application will occur at a rate corresponding to the jump start speed.

Field-IQ Flush

To start the flush:

1. Expand the rate widget to reveal the flush button at the bottom right.

2. Press the flush button. The "stay clear" notification will be displayed.

3. Tap the screen to dismiss the notification.

4. Press the section master (and/or enable the remote master switch) to start the flush process.

To stop the flush:

1. Press the section master and/or disable the remote master switch.

2. Note that the system flow will show non-zero on the rate widget while flush is in progress.

This feature can be tested with the BRASS module simulators.

Virtual Tank
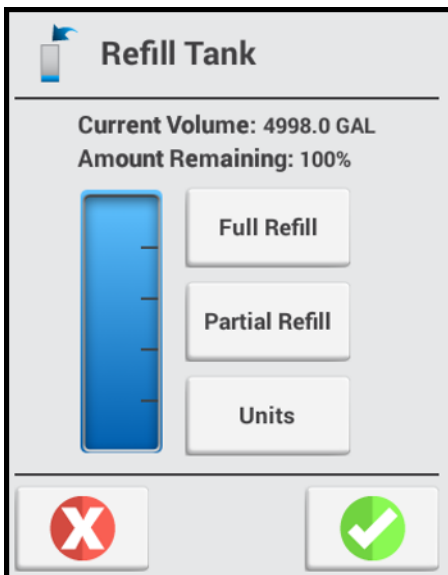
Expand the rate widget to reveal the virtual button at the bottom right. Enter the appropriate detail for the following options:

- Full Refill - Sets the Volume to the "full volume" of the tank
- Partial Refill - Allows the user to enter the volume of the tank.

Field-IQ Prescriptions

The following topics are described:

- Prescription Format
- Copying Prescription to the Display

- Activating Prescription

Prescription Format

The following ESRI shape-file formats are supported:

`<prescription_name>.shp`

`<prescription_name>.dbf`

`<prescription_name>.shx`

Copying Prescription to the Display

From a USB device:

1. Store the prescription to a USB drive in the `\AgData\Prescriptions\` folder.

2. Open Precision-IQ and use the Data Transfer menu to import into the display. The prescriptions should show under "Internal" of the Precision-IQ Data Transfer screen.

Activating Prescription

1. Open the Run screen and make sure the Rx button is available on the left hand side of the screen.

2. Tap the **Rx** button and follow the onscreen wizard to assign prescription rate columns to the individual channels:

3. Verify the following values:

- Rate column assignments

- Units

- Lead Time

- "When Outside Prescription" behavior

4. Navigate to the Rate Widget and expand individual channels in the rate control widget of the run screen.

5. Switch the Rx button to **ON**.

6. To view the Rx on the Run screen:

   a. Click **Layer**.

   b. Click the gear wheel icon (top right) of the "Available Layers" dialog and select "Applied Rate" layer.

   - Adjust the Min and Max values to match the values stored in prescription map.

   - Enter an appropriate number of steps.

Updating Field-IQ and EZ-Pilot Firmware

Follow the steps below to update the Field-IQ firmware and EZ-Pilot™ firmware (for displays that support EZ-Pilot):

1. Update the Precision-IQ settings to allow an update. From the Home screen, tap the **Settings** button.

2. On the Settings screen, tap **Application Control** and verify that **Enable Access to Installer Setup** under Implement Setup is set to **ON**.

3. Tap the Android **Back** button to return to the Home screen.

4. In the Activity Bar of the Precision-IQ Home screen, tap the **Diagnostic** icon.

5. On the Diagnostics screen, tap the **Performance** button.

6. Tap the row containing the module to be updated. For example, tap the row containing Field-IQ module information. Tap the **Update Module Firmware** pop-up button:

7. A pop-up window will appear that lists the available firmware versions. Tap the desired firmware version from the list to begin the upgrade.

    A confirmation pop-up window appears. Tap **OK** to dismiss the window. The firmware will update in the background.

    To monitor the progress of the update swipe down on the information bar (top left corner).

8. Tap the **Home** icon in the Activity Bar to return to the Home screen.

Glossary

A
___

A+ line

A guidance line you define on your field. The A+ line is defined fixing a point, then heading in a direction.

AB line

A guidance line you define on your field. You set a beginning point (A) and an end point (B).

Accelerometer

A device that measures non-gravitational acceleration.

Access path

A space between your guidance lines. They can be useful if there is road (or other field feature that breaks the consistent flow of swaths) through the middle of your field.

Aggressiveness

The measure of how strongly the system makes steering changes.

Application Type

Type of material to be applied: - Liquid - Granular fertilizer - Granular seed - Anhydrous

Auto DGPS

The receiver automatically switches between GPS and DGPS mode, depending on the availability of differential correction data.

Autonomous GNSS positioning

Autonomous GNSS positioning uses no corrections. The rover receiver calculates its position using only the GNSS signals it receives. This method does not have high absolute accuracy, but the relative accuracy is

comparable to the other methods. RTK GNSS positioning uses the RTK positioning method to achieve centimeter-level accuracy. To use the RTK method, you must first set up a base station. The base station uses a radio link to broadcast RTK corrections to one or more rover receivers.

B

Boom Switching

When controlling boom sections, select *ON*. This enables you to adjust settings in the Boom and Section tab. When not controlling boom sections, select *OFF*.

Boundary

A line indicating the border surrounding a field.

Bypass Servo

A servo that adjusts the flow of material back to the tank.

C

CenterPoint™ RTK for radio

Positioning correction service for radio communication systems. Requires access to a base station located within a eight-mile radius (approximately) from your farm. An RTK base station sends corrections via a radio transmitter to a mobile receiver attached to your vehicle. Works well for farms within 8 miles of an established RTK base station or base station network, without line-of-sight obstructions such hilly terrain or an abundance of trees.

CenterPoint™ RTX™

Positioning correction service for satellite communication systems. Delivers GPS or GNSS enabled corrections via satellite directly to your receiver. Does not require a base station or cellular data plan. CenterPoint RTX corrections are provided on a subscription basis.

CenterPoint™ RTX™ for cellular

Positioning correction service for cellular communications. Delivers corrections via cellular network directly to your receiver. Requires a cellular data plan.

CenterPoint™ VRS™

Virtual reference station. Positioning correction service for cellular communication systems. Enables RTK (Real-Time Kinematic) corrections over a large geographic area where robust cellular data coverage is available. Provides high accuracy for guidance applications throughout the whole coverage area. Requires a cellular data plan. Uses a cellular communication modem. Relies on CORS.

Client

The customer for whom the work is being done.

composite slope

Combination of primary and cross slopes. When both Primary and Cross slopes are defined, the Composite Slope direction shows the actual heading where water will fall. If you have 0.000% slope on the Cross axis, the Composite Heading will be the same as the Primary Heading.

Controller orientation

Correctly associate the outputs of the Autopilot controller sensors with the direction of the vehicle.

Correction service

A service which provides corrections to create a higher GPS accuracy.

CORS (Continuously Operating Reference Station) network

A network of GPS/GNSS reference stations situated within the coverage area to transmit RTK (Real-Time Kinematic) corrections to the cellular modem. The distance between the reference stations and the modem on the vehicle does not affect accuracy. CORS works well in areas with spotty RTK radio tower coverage.

Current Volume

Quantity of product in the tank/ bin.

Curved line

A guidance line you define on your field. You begin recording and drive until you are at the end of the curved line or segment, then stop recording.

cut

The volume of dirt that must be cut for the current design.

D

Density (granular and granulated material only)

Used in system setup and calibration to ensure accuracy in applying a product. When changing material, this setting must be updated.

design height

The height at the current location determined by the design plane.

DGNSS

Differential GNSS positioning. The GNSS receiver uses corrections from WAAS/EGNOS satellites or from OmniSTAR HP, XP, G2, or VBS satellites. These differential systems use special algorithms to provide differential corrections that allow the rover receiver to calculate its position more accurately. Not all corrections services support the use of GLONASS satellites in their solution.

DGPS

Differentially corrected Global Positioning System (GPS).

E

EGNOS

European Geostationary Navigation Overlay Service. An SBAS operated by the European Space Agency.

Electric over Hydraulic

A valve that uses electric current to control the hydraulic valve output.

Elevation mask

Establishes the minimum elevation angle for satellites to be used. Satellites located near the horizon are more difficult to track due to signal attenuation, and are less accurate. When there are no obstructions, the receiver can track a satellite down to near the horizon. If the Elevation Mask is set too low, the receiver can experience frequent constellation switching due to low elevation satellites being obscured. Frequent constellation switching is undesirable because position jumps may occur. The benefit of a low elevation mask is that more satellites are available for use in a solution and a better PDOP may result. High accuracy users may prefer a higher mask angle.

Event

A precision agriculture activity on a particular field. For example: planting seed, applying fertilizer or lime, or spraying with fungicide, herbicide or insecticide.

Ez-Boom (+1)

This setting will be appropriate when either a full installation or a Raven Replacement kit is installed on the implement.

F

Farm

A collection of fields.

Field

Settings created in the Precision-IQ application to represent an actual field, one or more parts of an actual field, or a group of two or more fields. Field profiles include guidance lines for steering, pivot patterns and landmarks.

Field-IQ (12th)

This setting will be appropriate when a platform kit has been installed on a self-propelled sprayer.

fill

The volume of dirt that must be added for the current design.

Freeplay

Movement in the steering linkage through which a movement of the steering wheel will cause no change in wheel angle.

Freeplay offset

A value entered to give the control system a way to account for freeplay during guidance.

G

GLONASS

A Russian space-based satellite navigation system.

GNSS

Global Navigation Satellite System. A system of satellites that provide information about geo-spatial positioning. A GNSS receiver can determine its longitude, latitude and altitude.

GPS

Global Positioning System. A space-based satellite navigation system. A GPS receiver can determine its position by using GPS satellites.

GPS autonomous positioning

A mode of operation in which a GPS receiver computes position fixes in real time from satellite data alone, without reference to data supplied by a base station. Autonomous positioning is the least precise positioning procedure a GPS receiver can perform, yielding position fixes that are precise to ±100 meters.

H

Hardi % Bypass

Used on Hardi Sprayers equipped with three-way section valves that return flow to the tank when the boom sections are off.

HDOP

The horizontal component of PDOP.

Headland

A guidance pattern that contains straight lines within a boundary.

I

IMD

Inertial Measurement Device.

IMEI

International Mobile Station Equipment Identity. A number to identify mobile equipment. The GSM network uses this number to identify valid devices. The IMEI number has no relationship to the subscriber.

IMU

Inertial Measurement Unit. An electronic device that measures and reports on a vehicle's velocity, orientation, and gravitational forces, using a combination of accelerometers and gyroscopes.

Integrated radio

Trimble integrated radios contain a radio antenna integrated with the GNSS receiver or display in a single unit. These integrated radios receive corrections transmitted by Trimble GNSS RTK base stations.

J

Jump start speed

A manual override option that can be used to operate the system when the vehicle is stationary. Jump start is also used in times when GPS has become unavailable.

Jump start timeout

Time that jump start speed will be active.

L

License

A license enables a feature, and is valid for a predetermined period of time. A license does not need to be activated, but does need to be assigned to an organization or a device. Assignment of a license occurs on the Reseller Admin site. Once assigned, a hardware license QR code or text string can be emailed or downloaded from the Reseller Admin site and delivered to a device.

Linear Actuator

A valve that creates a linear motion (as opposed to a rotary motion).

Logging

Also called coverage logging. Logging records the area that you have covered when you carry out an operation, for example applying fertilizer to a field.

M

Manual DGPS

The receiver only computes solutions if corrections are available for the selected satellites. Manual DGPS is the most accurate mode but, it is also the most selective since the fix density is dependent on the availability of corrections. Use the manual DGPS mode if accuracy is critical.

Manual GPS

Differential correction processing is disabled and position fix solutions are determined without DGPS corrections.

Manual override

Required for platforms that employ a pressure transducer for the manual override function. Change the default only if the operation of the manual override function is unacceptable.

Manual Rate increment

Sets the aggressiveness of the increase/decrease switch when in manual rate.

Material

A product that is controlled by a PWM valve, Servo valve, or Rawson™ drive. You can use a planter (seed), liquid, granular seed and granular fertilizer, all of which have different setup parameters.

Minimum Override Speed

A setting used to hold the operating speed at a preset minimum to prevent the control system from operating out of a controllable range.

Multipath error

An error caused by the interference of the same signal reaching the receiver by two different paths: once via the direct path, and once via a reflection. A major cause of GPS errors.

N

NMEA standard

An electrical, hardware and data standard designed by the National Marine Electronics Association that dictates the content and format of communication between GPS receivers and other devices.
NMEA messages include data that provides location and accuracy, the number of satellites being used, the dilution of precision and signal strength.

No/Low Flow Timeout

This setting adjusts how long the system waits before displaying an error related to No/Low product flow. (Available in Field-IQ Version 7.0 firmware and newer. Modules must be on V3.05.)

O

Office Sync

Optional feature that enables you to transfer data between a supported display and the Trimble Ag Software - both the online software and the desktop version. This feature is enabled by a Vehicle Connection license.

ON/OFF Latency

Setting used to adjust for hardware delays.

overshoot

The percentage by which the front wheels exceed the commanded angle before they settle on the correct value.

P

PDOP

Position Dilution of Precision. A calculation that takes into account the satellites that can be seen, how high they are and their bearing. The outcome of the calculation is an estimation of how prone to error your GPS position is. The lower the value, the more accurate your position. You may wish to plan your field work for periods of low PDOP. Generally, the more satellites in view, the better (lower) the PDOP.

Pivot

A guidance pattern you define for your field by recording the outer circular boundary of the pivot area and then entering a value to compute the rows within the pivot.

pivot benchmark

The single benchmark where the plane is defined. All slopes will pivot around this point.

Pump Arming Switch

If the applicator is equipped with a pump disarming switch that is connected to the controller, then this enables a tab on the run screen (09 and newer SPX, 07 and up RoGator, and JD 4XXX).

Pump Servo

A servo that is used to control the hydraulic flow to a hydraulic motor.

PWM (valve)

An electronic solenoid valve that controls the hydraulic flow to a hydraulic motor.

R

RangePoint™ RTX™

Positioning service for satellite communication systems. RangePoint RTX works with a built-in GNSS receiver. Does not require a base station or cellular data plan.

Rate 1, Rate 2

Preset rates to be applied.

Rate Adjustment

When in Rate 1 or 2, the current application rate increases or decreases by this amount. Also referred to as Rate Increment.

Rate Control

Select *ON* to have the system operate a rate control component. Select *OFF* for no rate control.

Rate Snapping

Due to pump constraints, liquid flow generally is inconsistent with the information on your display. Enabling this setting gives you a more steady reading of the applied rate.

Rate switch for Field-IQ

Used to select Preset Rate 1, Preset Rate 2, or Manual Rate Control.

roll correction

Compensates for antenna height and static roll caused by minor variations in the navigation controller and the mounting of the GPS receiver.

Row

The individual row unit which seed comes from on the planter. This can be controlled individually as a single row section, or as a group with other rows in a multiple row section.

RTK

Real Time Kinematic. A navigation technique to improve the information received from satellite-based positioning systems. Used with GPS, GLONASS and Galileo.

RTK GNSS positioning

uses the RTK positioning method to achieve centimeter-level accuracy. To use the RTK method, you must first set up a base station. The base station uses a radio link to broadcast RTK corrections to one or more rover receivers.

RTX™ ViewPoint™

Corrections for satellite communication systems.

Run screen

The screen where you perform field activities.

S

SBAS

Space-Based Augmentation System. A system of Earth-based systems at points surveyed for location accuracy that measure satellites, signals and factors that can impact the signals. The SBAS then broadcasts corrections to satellite signals to improve accuracy.

Scintillation

Causes extreme fluctuations in signals that are received. Scintillation can be caused by turbulence that creates air pockets with different temperatures and densities.

Section

A number of rows or spray nozzles that are controlled by existing shut-off valve, Tru Count air clutches, or Tru Count LiquiBlock™ valves. A section can have either a single row/nozzle or multiple rows/nozzles depending on how the system is set up.

Section Control Module

Controls 12 sections/rows per module with up to 4 modules (48 module sections / rows).

Section Control Type

Setting to select type of sections control hardware (for example, air clutch, electric clutch, boom valve, liquiblock).

Sections Off When Stopped

Select "YES" to turn all sections off when vehicle is stopped. Select "NO" to keep sections on when vehicle is stopped.

Servo

An electric motor that turns a valve to increase or decrease flow of the product. The servo can be plumbed inline or as a bypass.

Shutoff Speed

This setting will shut the control system down when the vehicle reaches a minimum speed.

Signal Input Module

The signal input module (SIM) can interface with existing equipment inputs to control on-screen buttons and features.

Singulation

The percentage of time an individual seed is placed for every intended drop.

slew time

The amount of time that the front wheels take to move from the far left to the far right position and back.

slope heading

The heading direction of the slope, when the two slopes are combined.

SNR mask

Defines the minimum signal strength for a satellite to be used. The SNR mask should only be lowered cautiously since this mask is also used to minimize the effects of jammers on the receiver. High accuracy users should use a mask set to 5.0 or 6.0 since weaker measurements can contain slightly more noise.

Spinner Pulses per Revolution

Enter the number of magnetic pick up points per revolution of the spinner.

steering deadzone

The amount of pressure that the system must apply to the hydraulics before the wheels begin to turn.

T

Tank/Bin Capacity

Amount of product that the tank or bin holds when full.

TAP

Tuning parameter for guidance algorithms.

U

Unlock

A passcode that unlocks access to a feature or upgrade.

V

Valve calibration for Field-IQ

The process for adjusting the valve performance parameters to get the best performance out of a valve.

VDOP

A measurement of the vertical PDOP.

W

WAAS

Wide Area Augmentation System. An SBAS operated by the US Federal Aviation Administration.

Warning Level

Setting that triggers a low bin warning.

wheelbase

The distance between the front and rear axles. On tracked vehicles, the wheelbase is exactly half the length of the track.